California Public Utilities Commission

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Reliability Standards for Telecommunications Emergency Backup Power Systems and Emergency Notification Systems

Pursuant to California Public Utilities Code § 776, § 2872.5 and § 2892

DISCLAIMER: This document should be printed in color to enable a full understanding of the Figures and Tables.

Table of Contents

EXECUTIVE SUMMARY 1
Actions Taken by the CPUC in Support of OIR R.07-04-015 1
Analysis Work Undertaken in Support of OIR R.07-04-015 2
Overall Findings and Possible Options 3
Definitions 4
Issue #1 – Backup Power at Customer Premises 4
Issue #2 – Emergency Notification 6
Issue #3 – Backup Power at Network Sites 9
Issue #4 – Compliance to NRIC Best Practices 10
Issue #5 – Fuel-Cell Backup Generators 10
Work Status and Outstanding Issues 11
1 INTRODUCTION 12
1.1 Purpose 12
1.2 Background 12
1.2.1 Powering in Telecommunications Networks 12
1.2.2 Legislation: Assembly Bill No. 2393 12
1.2.3 Order Instituting Rulemaking (OIR) to Implement AB 2393 13
1.3 Problem Definition 14
1.3.1 Issue 1: Backup Batteries Installed on the Property of Residential & Small Commercial Customer Premises 14
1.3.2 Issue 2: Need for Standardization in Emergency Notification Systems and Protocols 15
1.3.3 Issue 3: Backup Power Installed on the Network Side to Ensure Communications during Power Outage 15
1.3.4 Issue 4: Level of Implementation of the NRIC Backup Power Best Practices by the Different Telecom Industry Segments 16
1.3.5 Issue 5: Feasibility of the Use of Zero Greenhouse Gas Emission Fuel Cell Systems 16
1.4 Scope 17
1.5 Document Organization 17
2 APPROACHES & STEPS TAKEN 20
3 PARALLEL REGULATORY EFFORTS RELEVANT TO AB 2393 21
3.1 FCC 21
3.1.1 Hearing Aid Compatibility 22
3.1.2 Emergency Alert Systems 22
3.2 Texas PUC 23

4 ANALYSIS OF INFORMATION & LIST OF AVAILABLE OPTIONS 25
4.1 Definitions 26
4.1.1 Small Commercial Customer 26
4.1.2 Emergency Usage 26
4.2 Backup Batteries Installed on the Property of Residential & Small Commercial Customer Premises (Issue 1) 27
4.2.1 Background Information 27
4.2.1.1 Description of Telecom Powering Architectures 27
4.2.1.2 Current Available Backup at Customer Premises 31
4.2.1.3 Reserve Time 32
4.2.2 Costs, Benefits and Financial Impacts 34
4.2.2.1 Outage Analysis 34
4.2.2.2 Backup Power Options 36
4.2.3 List of Available Options 38
4.2.3.1 Minimum Operating Lifetime 38
4.2.3.2 Available Backup Time 38
4.2.3.3 Battery Status 39
4.2.3.4 Performance Criteria 40
4.2.3.5 Consumer Awareness and Education for Battery Backup at Customer Premise 41
4.3 Need for Standardization in Emergency Notification Systems and Protocols (Issue 2) 43
4.3.1 Background Information 43
4.3.2 Current Status and Options for Notification Systems 44
4.3.2.1 Standardized Notification Systems 44
4.3.2.2 Random Activation and Congestion 46
4.3.2.3 Short Message Service (SMS) 46
4.3.2.4 Other Regulatory and Industry Initiatives 47
4.3.2.5 Education 48
4.3.3 Firestorm Workshop (Summary of Major Issues & Actions Taken) 49
4.4 Backup Power Installed on the Network Side to Ensure Communications during Power Outages (Issue 3) 51
4.4.1 Background Information 51
4.4.1.1 Current Available Backup in Network Sites 53
4.4.2 Cost Factors 54
4.4.2.1 Collateral Cost Effects 55
4.4.3 List of Available Options 55
4.5 Level of Implementation of Best Practices by the Different Telecom Industry Segments (Issue 4) 57
4.5.1 Background Information 57
4.5.1.1 NRIC-VII Best Practices: Industry's Perspective as Stated by Focus Groups 3A & 3B in 2005 57
4.5.1.2 NRIC-VII Focus Group 3A & 3B: Power Effectiveness Survey (2005) 57
4.5.1.3 NRIC-VII Focus Group 3A & 3B: Power Issues for Further Investigation (2005) 58

4.5.2 CPUC Questionnaire on NRIC-VII Power-Related Best Practices 58
4.5.2.1 CPUC Questionnaire Responses: Data Collection Process 58
4.5.2.2 CPUC Questionnaire Responses: Data Analysis 59
4.5.2.3 CPUC Questionnaire Responses: Summary of Analysis 60
4.5.3 Financial Implications – Summary 62
4.5.4 List of Available Options 64
4.6 Feasibility of the Use of Zero Greenhouse Gas Emission Fuel Cell Systems for Back-Up Power Systems Located in Telecommunications Service Provider Facilities (Issue 5) ... 65
4.6.1 Background Information 65
4.6.2 Financial Analysis 67
4.6.3 List of Available Options 69
5 OUTSTANDING ISSUES 70
5.1 FCC Order – Implications and Implementation 70
5.2 Massive Events 70
5.3 Fuel Cells and Other Alternative Energy Sources.. 71
6 CONCLUSIONS & SUMMARY OF POSSIBLE OPTIONS 72
6.1 Issue #1 – Backup Power at Customer Premises 72
6.2 Issue #2 – Emergency Notification 73
6.3 Issue #3 – Backup Power at Network Sites 74
6.4 Issue #4 – Compliance to NRIC Best Practices.. 75
6.5 Issue #5 – Fuel Cell Backup Generators 75
7 ACRONYMS 77

APPENDIX A: ORDER INSTITUTING RULEMAKING TO IMPLEMENT AB 2393....................... 82
APPENDIX B: DESCRIPTION OF TELECOM POWERING ARCHITECTURES 92
Current Telecom Powering Architectures 92
Wireline 92
Wireless... 95
Cable Television (CATV)... 97
Emerging Telecom Powering Architectures... 99
Wireline 101
Wireless... 108
Cable Television 110
Future Telecom Powering Architectures 111
Wireline 112
Wireless... 118
Cable Television (CATV)... 120
Future Backup Battery Choices 120

APPENDIX C: WORKSHOPS – SCOPE, AGENDA AND TIMELINES 122
APPENDIX D: LIST OF INFORMATIONAL REQUESTS 132
APPENDIX E: CPUC QUESTIONNAIRE 151
NRIC Power-Related Best Practices: CPUC Questionnaire Description 151
NRIC Best Practices: Numbering Format 152
CPUC Questionnaire in Spreadsheet Format 153
APPENDIX F: CPUC QUESTIONNAIRE: DATA COLLECTION AND ANALYSIS 172
Data Collection Process 172
Data Aggregation and Analysis Process 172
Findings: Observations and Recommendations 175
Overall Results 175
Implementation by Industry Segment 180
Statistical Summary of the Responses for Each Best Practice 182
Methodology for Ranking Best Practices 192
APPENDIX G: SITE VISITS 195
Typical Agenda of the Site Visit at a Telecom Service Provider 195
Highlights from the Central Office / Headend Site Visits 195
List of Companies Where the Site Visits Took Place 196
APPENDIX H: RECENT FCC ACTIONS RELATED TO AB 2393 197
FCC Review of Backup Power 197
Summary of FCC Activities Related to Backup Power 197
Latest FCC Rules on Backup Power (FCC 07-177) 200
FCC Review of the Emergency Alert System 202
FCC Summit on Network Surge Management 203
Commercial Mobile Service Alert Advisory Committee (CMSAAC) 204
Background information on the WARN Act 204
Background information on the CMSAAC 205
APPENDIX I: FCC 07-177, ORDER ON RECONSIDERATION 205
APPENDIX J: TEXAS PUC RULEMAKING ON POWER BACKUP AT CENTRAL OFFICE FACILITIES 242
APPENDIX K: SUMMARY OF NRSC ANALYSIS OF FCC-REPORTABLE OUTAGES FOR CENTRAL OFFICE POWER (1993-2004) 245
APPENDIX L: STATISTICAL ANALYSIS OF FCC-REPORTABLE OUTAGES WITH "POWER FAILURE" AS ROOT CAUSE (2005 – 2007) 249
APPENDIX M: GROUP SURVEY QUESTIONS FROM THE IEEE CQR CONFERENCE ON EMERGENCY POWER CONFERENCE (NOV. 22, 2004) 251
APPENDIX N: FCC COMMUNICATIONS SECURITY, RELIABILITY & INTEROPERABILITY COUNCIL (CSRIC) 254
APPENDIX O: FINANCIAL IMPLICATIONS ASSESSMENT 256
Customer Premises Backup Power 256

Current Situation 256
Assessing Exposure Risk 257
Costing Considerations 268
Use of Zero Emission Solutions for Network Power 274
Fuel-Cell Solutions 274
Representative Cost Comparison 275
APPENDIX P: POWER OUTAGE AND TELECOMMUNICATIONS 280
APPENDIX Q: WORKSHOP RESPONSES ON DEFINITIONS 284
APPENDIX R: WORKSHOP RESPONSES ON CONSUMER AWARENESS AND EDUCATION 286

LIST OF TABLES

Table 1. Mapping of Issues to Related Public Utilities Codes 14
Table 2. Mapping of Issues to Related Public Utilities Codes 25
Table 3. Average Power Usage in Watts 33
Table 4. Talk Time vs. Standby Time 33
Table 5. GR Power Requirements for Telecommunications Node Site 52
Table 6. Final Number of Returned Questionnaires 59
Table 7. Annualized Expenses for Different Engine Generators 68
Table 8. Customer Premises Battery Temperatures 107
Table 9. Energy Use at Individual Telecom Nodes 113
Table 10. Final Number of Returned Questionnaires 172
Table 11. Rating Values Assigned to Each Response in the Questionnaires...................... 173
Table 12. Percentages Indicating Extent of Questionnaire Completeness 174
Table 13. Example Average Implementation Ratings 179
Table 14. Ratings Implementation of Best Practices by Industry Segment 181
Table 15. Ranking of Best Practices with Respect to Implementation versus Effectiveness and Relative Cost 193
Table 16. Typical Run Time Specifications for Commercially Available BBU Units 256
Table 17. Outage Data to Time Interval Conversation 258
Table 18. Installed First Costs 276
Table 19. Operational Annual Costs 276
Table 20. Cost Comparisons per kWH 277
Table 21. Power Outage versus Time Correlation.. 281

LIST OF FIGURES

Figure 1. Basic FTTx Network Architectures ... 29
Figure 2. Small Business or Multi-Dwelling Unit (MDU) Architecture ... 30
Figure 3. Outage Duration Thresholds for Representative Major Events ... 36
Figure 4. Extended Backup Power Cost Profile: Wholesale ... 37
Figure 5. Implementation Responses Regarding All NRIC-VII Backup Power Best Practices ... 60
Figure 6. Distribution of Implementation Responses Regarding the NRIC-VII "Generator Best Practices ... 61
Figure 7. Average Rating of the "Generator Deployment" Best Practices in Terms of "Effectiveness", "Implementation", and "Relative Cost of Implementation" .. 63
Figure 8. Fuel-Cell Installation at Central Office ... 65
Figure 9. Installed First Cost per kW for Diesel and Fuel Cell Solutions ... 67
Figure 10. Estimated Annualized Expenses - Diesel Generator vs. Fuel-Cell Systems ... 68
Figure 11. Current Telecom Powering Architecture ... 93
Figure 12. Typical OSP Equipment Locales ... 95
Figure 13. Wireless Sites on Top of Buildings ... 96
Figure 14. CATV Network Architecture and HFC Broadband Platform ... 97
Figure 15. CATV Reference System Architecture ... 98
Figure 16. Basic Network Architectures ... 101
Figure 17. Schematic of Energy Flows within the Central Office ... 102
Figure 18. Evolution of the Central Office ... 103
Figure 19. Fiber Access Architecture – Current and Future ... 104
Figure 20. Emerging Telecom Powering Architecture ... 105
Figure 21. Wireless Networks ... 108
Figure 22. Mobile Cell Sites ... 109
Figure 23. Cable TV Main Switching Office (MSO) Powering Scheme Networks ... 110
Figure 24. Evolution from Circuit-Switched Networks ... 111
Figure 25. FTTP Reference Architecture: Powering Scheme ... 112
Figure 26. Customer Premises FTTP/FTTH Architecture ... 116
Figure 27. Small Business or Multi-Dwelling Unit (MDU) Architecture ... 117
Figure 28. Power Supply and Battery Backup – Verizon FiOS ... 118
Figure 29. Wireless Architecture ... 119
Figure 30. Distributions of Numerical Rating Responses per Best Practice ... 174
Figure 31. Distributions of Responses for the 52 "Backup Power" Best Practices ... 176
Figure 32. Distribution of Implementation Responses for the 52 "Backup Power" Best Practices (Restricted to the 92% Effective Numerical Response Ratings) ... 177
Figure 33. Distributions of Numerical Rating Responses per Best Practice for the 28 "Generator Deployment" Best Practices ... 178

Figure 34. Cumulative Percentage of Best Practices with respect to Implementation Average 180
Figure 35. Distribution of "Backup Power" Best Practice Responses with Respect to "Implementation" 183
Figure 36. Distribution of "Generator Deployment" Best Practice Responses with Respect to "Implementation" 184
Figure 37. Distribution of "Backup Power" Best Practice Responses with Respect to "Effectiveness" 185
Figure 38. Distribution of "Generator Deployment" Best Practice Responses with Respect to "Effectiveness" 186
Figure 39. Distribution of "Backup Power" Best Practice Responses with Respect to "Cost" 187
Figure 40. Distribution of "Generator Deployment" Best Practice Responses with Respect to "Relative Cost" 188
Figure 41. Average Rating of the "Backup Power" Best Practices in Terms of "Effectiveness", "Implementation", and "Relative Cost" 190
Figure 42. Average Rating of the "Generator Deployment" Best Practices in Terms of "Effectiveness", "Implementation", and "Relative Cost" 191
Figure 43. Number of FCC-Reportable Outages by Failure Category 246
Figure 44. Annual Aggregated Outage Index by Failure Category 248
Figure 45. Number of FCC-Reportable Events with "Power" Failure as Root Cause (2005-07) 249
Figure 46. Hourly Outage Distribution for 1-5 and 5-10 hour Data Segments 259
Figure 47. Event Profile: Heat Wave 260
Figure 48. Event Profile: Wind Storm 261
Figure 49. Event Profile: Wild Fire 262
Figure 50. Event Profile: Earthquake 263
Figure 51. Event Profile: Flood 264
Figure 52. Event Profile: Human Error 265
Figure 53. Event Profile: Lightning Storm 266
Figure 54. Outage Duration Thresholds for Representative Major Events 267
Figure 55. Extended Backup Power Cost Profile: Wholesale. 10W Average Load 270
Figure 56. Extended Backup Power Cost Profile: Retail. 10W Average Load 271
Figure 57. Extended Backup Power Cost Profile: Wholesale. 6W Average Load 272
Figure 58. Extended Backup Power Cost Profile: Retail. 6W Average Load 273
Figure 59. Installed First Cost per kW for Diesel and Fuel-Cell Solutions 278
Figure 60. Recurring Annual Expense per kW for Diesel and Fuel-Cell Solutions 279
Figure 61. Power Interruption and Disturbance 280

Executive Summary

On September 29, 2006, Governor Schwarzenegger approved California Assembly Bill No. 2393 (AB 2393 (Ch. 776, Stats 2006), Levine "Telecommunications: Emergency Service"), with provisions directing the California Public Utilities Commission (Commission or CPUC) to:

1. Consider the need for performance reliability standards, and to develop and implement performance reliability standards, for backup power systems installed on the property of residential and small commercial customers by a facilities-based provider of telephony services, upon determining that the benefits of the standards exceed the costs (Pub. Util. C. § 776)

2. Open an investigation, in consultation with the Office of Emergency Services (OES) and the Department of General Services (DGS), to determine whether standardized notification systems and protocol should be utilized by the above-described entities to facilitate notification of affected members of the public of local emergencies (Pub. Util. C. § 2872.5)

3. Open an investigative or other appropriate proceeding, in consultation with the OES and the DGS, to identify the need for telecommunications service systems not on the customer's premises to have backup electricity to enable telecommunications networks to function and to enable the customer to contact a public safety answering point operator during an electrical outage, to determine performance criteria for backup systems, and to determine whether certain recommendations for backup systems have been implemented by telecommunications service providers operating in California (Pub. Util. C. § 2892.1).

AB 2393 also appropriated $500,000 to accomplish the legislated tasks.

Pursuant to AB 2393 (Ch. 776, Stats. 2006), the Commission opened an Order Instituting Rulemaking (OIR) (R. 07-04-015) to investigate current practices for telecommunications backup power systems and emergency notification systems. In this investigation, the Commission established processes and procedures to develop a record on these issues to enable it to make determinations as required by the statute.

Actions Taken by the CPUC in Support of OIR R.07-04-015

In support of OIR R.07-04-015, the CPUC Communications Division (CD) staff:

1. Researched the areas of power backup systems, battery suppliers, and emergency notification systems to identify knowledgeable individuals and organizations with the ability to provide information to the CPUC related to AB 2393. These individuals and organizations were invited to participate in related meetings and provide input to the proceedings.
2. Engaged the contractor collaboration of SAIC/Telcordia to assist the CD accomplish the AB 2393 requirements.

3. Organized three (3) technical workshops for Subject Matter Experts (SMEs), as directed by R. 07-04-015:
    - Backup power systems on residential and small commercial customer properties (held on June 5, 2007)
    - Backup power systems <u>not</u> installed on customer premises (held on June 6, 2007)

- Emergency notification systems (held on June 19, 2007).

4. Issued three (3) Information Requests (IRs) to augment the information and data garnered from the above workshops. Specifically, these IRs were intended to:
   - Provide parties and those who were interested in this proceeding an additional opportunity to comment on issues discussed at the above workshops
   - Inform the Commission in its:
     - Consideration of the development of performance reliability standards for backup power systems
     - Analysis of the costs and benefits and technical feasibility of developing and implementing performance reliability criteria for backup power systems
     - Review of current standards and protocols regarding emergency notification systems and proposals for improving such systems.

5. Issued follow-up questions to information requests because the data received from the industry during the June 5th and 6th Technical Workshops and responses to Information Requests 1 and 2 (IR1 & IR2) was insufficient to perform analysis and draw conclusions regarding the implementation of the "NRIC[1] Power-Related Best Practices" in California.

6. Arranged site visits to telecom service provider locations to validate the best practices that the suppliers asserted to have implemented in their networks.

Analysis Work Undertaken in Support of OIR R.07-04-015

In support of OIR R.07-04-015, the information gathered from the workshops and various informational requests was combined with available research data to complete the analysis. In particular,

1. Performed a statistical analysis of the data provided by the carriers was performed to evaluate the implementation of the NRIC Power-related Best Practices. The goal was to develop a generic view of the level of implementation, effectiveness, and cost for power backup related best practices. This analysis was performed for the different industry segments: large carriers, small carriers, wireless, and Cable TV (CATV).

2. A framework and a set of questions were developed for *Calphoneinfo.com*. Based on that, the CD, in collaboration with the service providers, will develop a comprehensive set of information to be posted on the CPUC's "Consumer Education Information" website[2] regarding the battery backup systems at residential and small commercial customer premises. The information will include choices the consumers can make about technologies providing telephone service during emergencies, backup power equipment in their homes, service provider vs. customer responsibilities for maintaining backup power at customer premises, and related consumer issues.

3. Backup Power Best Practices were validated via site visits.

4. The overall analysis was completed and technical details provided for CPUC Commissioners to:

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[1] Network Reliability & Interoperability Council (www.nric.org)
[2] http://www.calphoneinfo.com/

- Develop a view on the sufficiency (or not) of current backup power related standards/requirements implemented in the networks
- Determine the need for standards and protocols for notification systems.

5. Documents related to the Warning, Alert and Response Network (WARN) Act and briefings published by the Federal Communications Commission (FCC) were reviewed and analyzed to integrate information into CPUC considerations for technical analysis, cost/benefit analysis, and final recommendations.

6. The 2007 large-scale wild fires in the greater Los Angeles and San Diego areas was investigated. The CD recognized the importance of these events as a scenario that can provide key learning on issues under investigation as part of AB 2393. Towards this end, the CD undertook an investigation involving the telecommunications service providers and notification service providers who were serving those areas. A discussion of the observations will be included in a separate report.

Overall Findings and Possible Options

The table below maps the major topics mentioned in AB 2393 to five (5) distinct issues and correlates them to the Public Utilities Codes.

Mapping of Issues to Related Public Utilities Codes

Related Public Utilities Code	Major Topic	Issue #	Issue Title in this Report
§ 776	Backup Power Installed on the Customer's Premises	Issue 1	Backup Batteries Installed on the Property of Residential and Small Commercial Customer Premises
§ 2872.5	Emergency Notification Systems	Issue 2	Need for Standardization in Emergency Notification Systems and Protocols
§ 2892.1	Backup Power <u>Not</u> Installed on the Customer's Premises	Issue 3	Backup Power Installed on the Network Side to Ensure Communications during Power Outages
		Issue 4	Level of Implementation of Best Practices by the Different Telecom Industry Segments
		Issue 5	Feasibility of the Use of Zero Greenhouse Gas Emission Fuel-Cell Systems for Backup Power Systems Located in Telecommunications Service Provider Facilities

Below are the overall findings and possible options organized per Issue # as defined in the above table.

Definitions

During the investigation, the need for definitions of "small commercial customer" and "emergency usage" were identified. After researching usage and reviewing input from carriers, the following working definitions were adopted and used in this investigation:

- *"**Small business customer**" is defined as a business customer with no more than five access lines, none of which belongs to a larger entity.*
- *"**Emergency usage**" is for a situation requiring an immediate response from public safety, law enforcement or medical emergency personnel, contacted via a PSAP[3] by means of dialing 911, which is available during a non-catastrophic commercial power outage.*

Issue #1 – Backup Power at Customer Premises

Based on statistical analysis of major incidents in California[4], the number of customers affected by power outages lasting over 4 hours in duration ranges from 1.4% to 14.2% of the power utility's customer base, with an average of 6.8%. The corresponding percentage of customers impacted by power outages lasting more than 8 hours ranges from 1.0% to 9.1%, with an average of 3.9%. Therefore, the implementation of an 8-hr backup solution at the customer premises could reduce the potential exposure of users losing telephony (voice) service from 6.8% to 3.9% of customers, compared to a 4-hr CPE backup power solution. The addition of even more battery capacity to achieve 15-20 hours backup can be expected to further reduce the exposure risk from 3.9% to roughly 2.0% of customers, on average. Extended power outages (greater than 14 hours) tend to be caused by large or state-wide incidents such as Santa Ana wind-storms, extensive flooding or large earthquakes where not only power is lost but widespread physical damage to telecommunications plant and customer equipment is likely.

The exposure levels calculated from this analysis can be considered "worst-case" values given that (i) most consumers have multiple telecommunications means available to them (e.g., both traditional wireline services and a wireless service), and (ii) not all customers have broadband services. With two or more services available, the customers' vulnerability is reduced proportionally since it is less likely for all their telecommunications services to be lost simultaneously. Secondly, not all the customers who lose electrical power will have broadband telephony services with backup batteries at their premises. Both these factors will reduce the percentage of customers whose telephony service will be affected by a power outage.

Industry-wide design criteria have not been established for the new range of Customer Premises (CP) devices and interface equipment being deployed to support Fiber-To-The Premises (FTTP) and Fiber-To-The-Home (FTTH) architectures. Broadband service providers in California provide backup at the customer residence. Reserve times of between 4 and 20 hours of "talk time" were typically cited during the CPUC Workshops and in subsequent submissions to the CPUC Questionnaires. Most CATV systems provide battery backup in their Set-Top Box (STB) for VoIP[5] battery backup designed for 4 to 5 hours reserve; with some ability in newer STB designs to expand the battery reserve by a factor of 2 or 3, if

3 Public Safety Answering Point

4 Refer to Section 4.2.2 and Appendix O for a full description of the statistical analysis of power outage data in California and the consequences for maintenance of telecommunications services at the customer premises.

5 Voice over Internet Protocol

requested. The design of newer customer premises equipment has led to allocation of expansion space for more batteries to be added or for high energy-density batteries to be substituted.

A cost analysis was performed based on an anticipated telecom loads to the battery of 6 and 10 Watts in the event of a power outage. The value of 10 Watts is representative of the higher standby loads reported for current FTTH systems needed to supply telephony service, maintain communication with network, monitor battery status and provide appropriate alarms and alerts to the customer. Decreasing the load on the battery through using low-power-use standby modes and idle settings on customer equipment would be more cost effective and permanent than simply adding extra batteries. For instance, if the load could be lowered to 6 Watts through more efficient use of the electronics, the use of the standard Optical Network Terminal (ONT) / Broadband Unit (BBU) device with no external expansion could yield an estimated 10+ hours of backup power compared to the 6-7 hours cited for current systems using 10 Watts (i.e., a 50+% increase in backup time).

From the technical review and cost analysis performed in this investigation, the following options are provided for the consideration of the CPUC:

1. Battery Lifetime at Customer Premises

   The choice of an acceptable or desirable battery lifetime can not be set independently of consideration of the service contract and maintenance agreement between the telecommunications service provider and customer. One of the more effective options for CPUC may be to help educate the customer to the pros and cons of backup battery ownership, care, and maintenance; so as to help the customer ensure the maximum lifetime is achieved for the battery at their premises. With these provisos, minimum battery life before replacement should be at least 3 years in the mild climates of California.

2. Battery Backup Reserve Time at Customer Premises:

   a) No minimum backup reserve at customer premises is required at this time: Such an option could be justified by pointing to the current practices and contingency plans by service providers as adequate to provide emergency telecommunications services in the large majority of power outage situations.

   b) Set a required minimum backup reserve at customer premises of 4 hours of emergency usage use or standby time. This time is for the telephone being available for emergency use, not 4 hours of talk time.

   c) Select a design minimum of 8 hrs backup as the desired level for telephony at the customer premises for broadband services. That is a minimum of 8 hrs of the phone being available for emergency use or standby time. Based on current cited loads, these 8 hours of standby time will equate to 4-6 hours of talk time[6]. The 8-hr value at the customer premises can be considered as matching the recent FCC requirement of Order 07-177 for 8 hours reserve time to be present at Remote Terminals (RTs).

   If option b) or c) above is selected, the CPUC should also allow for mitigating circumstances that provides an exemption to the 4- or 8-hr requirement. The CPUC should require that any such mitigating circumstances be documented by service provider with their contingency plans for their customers. Examples of acceptable possible mitigation reasons could include:

[6] The quantitative relationship between standby time and talk time can be significantly affected by operational factors of the network, component device choices within the set-top-box, backup battery age and quality, and other factors. Reader may refer to Section 4.2.1.3 for more detailed discussion of talk time versus standby time.

   (i) Documented high economic burden to provider and to customer when they need to replace with, or add, high-capacity battery backup, or

   (ii) Documented unacceptable increase in loading of toxic or hazardous materials (e.g., lithium, cadmium or lead in batteries) in residence or building – possible compliance conflicts with Environmental Protection Agency (EPA) or Occupational Safety & Health Administration (OSHA) rules.

3. Require that a battery monitor and status system be present at the customer premises with options for:

   (i) An audio signal with variable volume control,

   (ii) Static or blinking light system to indicate battery status and low battery, and

   (iii) Service for text or voice message being automatically sent from battery monitoring system to device.

4. Encourage the offering of optional services by service providers for disabled or other disadvantaged Californians with:

   (i) Possible low-priced optional service for additional battery capacity, and/or

   (ii) Low cost backup service as additional service to customer (e.g., wireless service for emergency backup if their wireline service goes down).

5. Encourage customers and service providers to use low-energy-using equipment with energy-saving sleep, idle and standby operational modes.

6. Expand the customer education outreach and initiatives using the "CPUC's Consumer Education Information" website (http://www.calphoneinfo.com/) and other education means (e.g., bill inserts, brochures, website links, with selected items from the suggestions provided in Section 4.2.3.5).

Issue #2 – Emergency Notification

AB 2393 requires the commission, in consultation with the OES and the DGS, to open an investigation determine whether standardized notification systems and protocol should be utilized by the described entities to facilitate notification of affected members of the public of local emergencies.

The California Public Utilities Code Sections 2871 to 2876[7] define the parameters for the connection and use of Automatic Dialing Announcing Devices (ADAD). However, the criteria were written to regulate mass dialing for non-emergency uses, and exempts entities using it for emergency notification. As such, its tenets may not be applicable to the current "next generation" base of emergency notification system users (i.e., public service entities). Furthermore, the current environment of notification solutions are next generation evolutions of these PSTN[8]-based ADADs with features and functionality (such as Short Message Service - SMS, and Internet Protocol -IP- based notifications) never envisioned in the existing California Public Utility Code.

[7] California Public Utility Codes 2871-2876; http://www.leginfo.ca.gov/cgi-bin/waisgate?WAISdocID=01436612864+1+0+0&WAISaction=retrieve

[8] Public Switched Telephone Network

In general, notification system vendors apparently are not familiar with the requirements of California Public Utilities Code Section 2875 to notify the telephone utility in writing of the intended use of ADAD equipment. In addition, telephone service providers seem to lack clearly defined policies for ADAD users (i.e., which individual or organization to call within their company and with what information should be exchanged with respect to Section 2875).

AB 2393 specifically tasks the commission to determine:

- *"Whether standardized notification systems and protocols should be used by entities that are authorized to use automatic dialing devices to facilitate notification of affected members of the public in the event of local emergencies?"*

The results of this study suggest that standardized notification systems or protocols should not be required. Furthermore, recommendations from the carriers to allow national (FCC) standards in the area of mass wireless notification to fully unfold before considering CPUC actions should be considered.

To standardize is in effect to mandate the requirements of the systems being used by the various municipalities, counties and universities within the State of California. The current set of notification systems work and save lives, as evident by the overwhelmingly positive comments regarding notification system performance received at the January 2008 CPUC-sponsored Workshop on the California Firestorms.

The study recognizes, however, there may be issues regarding optimization, performance, and operations of notification systems. As such, the following options are presented for further consideration:

1. The State of California OES should consider hosting a workshop to draft an optional set of minimum and model criteria for notification systems. This is not a set of standards, but rather an effort by the State to leverage the procurement and operations experiences of users within the State, and pass that information along to others. At the individual discretion of the various institutions with notification systems, this set of optional criteria could be utilized during their Request for Quote (RFQ) procurement process and implementation of notification systems. Such criteria should consider the needs of persons with disabilities, delivery of TTY (teletypewriter) messages and operational guidelines for the notification system.

2. The CPUC should consider promoting more communications between the carriers, end users (local notification system initiators), and vendors. Also, the CPUC should consider requesting that the predominant local carriers (AT&T and Verizon) work with the end users / system owners, and vendors, to:

    - Provide a single point of contact at each predominant local carrier, knowledgeable in the aspects of notification systems, to work with the municipalities and other originators of emergency notification messages to educate them on the carriers concerns.

    - Develop a mutually-agreeable set of guidelines for system installation and operation in order to minimize any impacts on the carrier's network. Such guidelines and points of contact should be developed in the context of California Public Utilities Code Section 2875.

Two (2) interpretive questions arise in support of the above central question of AB 2393:

1. *Whether the current state of technology will support a systemic, statewide rollout of notification systems or whether communities should continue their deployment of point solutions?*

Other states are conducting trials of systems that span multiple counties, or statewide systems. Given the embryonic nature of standards and other federal initiatives (such as FEMA's[9] Integrated Public Alert and Warning System - IPAWS) this study concluded that the current state of technology can not support a statewide rollout. This conclusion is based on both the lack of maturity of systems and operational experience of statewide systems. Since vendors and other states have initiated large roll-outs of systems, the CD may wish to monitor the effectiveness of these programs to evaluate (i) their operational impact, and (ii) whether or not they in fact deliver a better grade of service than the existing set of locally-based notification systems.

2. *Whether the random activation of emergency communications systems causes network congestion sufficient to hinder emergency communication?*

While it is possible, the study found no evidence that the random activation of notification systems cause sufficient congestion to hinder emergency communications. Other activities (such as mass dialing of 911) are more of a hindrance. Furthermore, through an education process[10], end users could be made aware that they may need to throttle back their notification alert system in order to lessen any impacts on their serving carrier(s).

The analysis highlighted the critical importance of effective communications between all participants, particularly the telecommunication service provider and end user/alert initiator. For example, comments from various carriers reflected the opinions of Verizon, which stated:

> *"When a carrier does not expect a mass notification or the mass notification is not programmed in a way to avoid system congestion, the carrier is forced to block calls to prevent switch overload and a potential widespread outage. Instead of balancing the desire or need to send mass notifications with the carrier's need to manage traffic to avoid system overload, mass dialers (including PSAPs and emergency agencies) largely ignore carrier warnings of blocked calls and system congestion and simply automate redialing, thereby imposing a greater burden on the network….."*
>
> *"…..Impacted carriers have asked the vendors and administrators of these systems to work with them so that both sides can understand the potential impacts of mass dialing on the network. Cooperation has either not occurred or been slow in coming…"*

Such generalizations without specific attributions to incidents in California is indicative of the need for further dialogue, exchange of operational information, and a single point of contact at the local service provider for which the local alerting entities may exchange operational information.

SMS-based text messaging is a critical component of existing notification solutions in order to reach a mobile population. The study:

- Recognizes that the current state of SMS is not intended for mass notification over a large geographic area, and

[9] Federal Emergency Management Agency (www.fema.gov)
[10] See Section 4.3.2.5 for further information re: education.

- Acknowledges SMS's limitations brought forth by various parties and that SMS is not appropriate for mass notification.

However, the word "mass" does not appear in AB 2393. Furthermore, the usefulness of SMS for targeted notifications has been demonstrated in various instances. It is further acknowledged that the notification system vendors are aware of SMS's limitations. A response from a notification system vendor recognized it is critical that:

- End-users (government and university officials) clearly understand the limitations and potential risks that mass SMS delivery can impose, and
- Delivery delays can result if an emergency notification provider attempts to deliver a high volume of SMS messages to a large population within small geographic areas served by a few cell sites.

Issue #3 – Backup Power at Network Sites

The current backup reserve capacity and design criteria used for remote terminals and Central Office (CO) facilities have proven adequate for most circumstances (>95% of power outages). The large majority of customers in California are served by providers who comply with the NRIC[11] Best Practices. The costs to harden network facilities further with increased fuel supplies at CO sites would require larger fuel tanks with commensurate environmental safeguards and hazard reduction protocols. The additional costs of such increased fuel capacity are far greater than the alternate approach of having an efficient fuel-delivery schedule and effective contingency plans in case of an emergency.

By a similar reasoning, the cost of permanently adding battery capacity at a remote terminal is far higher than having a contingency plan for delivery of new fully-charged batteries or portable generators to critical sites in the case of a long-term power outage or emergency. The probability of the additional battery capacity being needed over the lifetime of the cabinet or the lifetime of the battery is small.

Therefore, this review suggests that industry design standards are adequate for emergency planning:

- 72 hours fuel storage at the central office facilities, and
- Minimum of 4 hours backup capacity at remote terminals with an objective of 8 hours.

The CPUC should also allow for mitigating circumstances that may prevent achieving these design objectives. Regulatory compliance conflicts can easily arise with EPA rules, local fire codes, hazardous materials loadings, and building safety rules. Many RTs may be located in restricted right-of-ways, with prohibitions in lease agreements, limited floor loadings on roof tops, or other restrictions that limit the installation of heavy batteries with toxic compounds on the site. In addition, a wireless company may be able to boost power of adjacent RT sites to enhance coverage area or leverage roaming agreements with other carriers. For a CATV or landline telephone company, acceptable contingency plans may include rapid response repair crews that can be dispatched for restoration of service or some other emergency response plan to re-route traffic and maintain service.

The CPUC may require that any such mitigating circumstances be documented by the service provider to show that an emergency plan is in place to augment the backup power capacity at these affected sites. The CPUC should strongly consider providing flexibility to service providers to allow for software engineering and network re-configuration as a response to an emergency. For example, a provider could

[11] Network Reliability & Interoperability Council (www.nric.org)

reconfigure the network and flow of calls in the virtual switch (PTSN) world rather than force hardening all the site nodes. Hardening all the site nodes is expensive with duplication of costs for batteries, duplicate circuits, and generators.

Issue #4 – Compliance to NRIC Best Practices

The level of participation and responsiveness of service providers to the information requests on NRIC Best Practices was excellent. The information supplied was also sufficiently detailed to permit full statistical analysis[12]. The primary conclusion was that service providers have high implementation rates (90% or above) of the NRIC-VII Backup Power Best Practices. The secondary conclusion was that Small LECs, as a single group, had a lower implementation rate than those for the other service providers. The difficulty that smaller LECs have seems to be rooted in the capital costs associated with additional batteries, generators, and other backup hardware.

The review of NRIC Best Practice compliance suggests that the CPUC may wish to consider the following options for action:

- Encourage small LECS to seriously consider implementing the NRIC-VII Best Practices so the statistically significant gap in the implementation of Best Practices between them and the larger LECs will narrow.
- Encourage all service providers in California to continue participating at:
  - FCC-sponsored forums for Best Practices (e.g., the CSRIC[13] Focus Group on Best Practices when it is activated) or
  - Other industry-sponsored forums involved with the review and implementation of Best Practices (e.g., the ATIS[14]-sponsored Network Reliability Steering Committee - NRSC).

The high capital costs of implementing NRIC Best Practices were cited as the main hurdle by the *Small LEC* industry group that provided the response to the CPUC questionnaires. Since the majority of these smaller carriers reported as an industry group and not as individual companies, it is not possible to provide a definitive gap analysis of how difficult or costly it would be for these various small companies to meet the critical backup power requirements of the NRIC Best Practices and the proposed FCC criteria of Order 07-177. The CPUC may wish to consider a case-by-case analysis to identify for these smaller carriers what incentives and mechanisms should be used to effectively and efficiently encourage improvements in their backup capacity and contingency planning.

Issue #5 – Fuel-Cell Backup Generators

At present, the system of diesel generator and battery backup at the CO is viewed as more reliable and efficient, and has better economics than zero-emission fuel-cell systems.

Without external grants or incentives, the high initial expenditure of fuel-cell systems with associated hydrogen storage needs, the economic business case and return-on-investment calculations are not attractive.

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12 See Section 4.5 and Appendix F

13 Communications Security, Reliability and Interoperability Council

14 Alliance for Telecommunications Industry Solutions (www.atis.org)

The CPUC may consider:

1. Encouraging use of clean diesel in engines as much as possible to reduce harmful emissions.
2. Encouraging field trials of alternate energy – fuel cell, solar and wind. Any CPUC actions in this arena need to be done in concert with other federal and state government agencies such as the Department of Energy (DOE), Environmental Protection Agency (EPA) , and Department of Homeland Security (DHS).

Work Status and Outstanding Issues

AB 2393 mandated a report to the legislature within 18 months of AB 2393's effective date (i.e., June 30, 2008) with regard to each of the three (3) designated study topics. This is the final report. It contains the findings and analysis of the record compiled during the investigation of issues related to AB 2393.

As the analysis proceeded, outstanding issues such as the following were identified:

- Interdependencies between Initiatives: The consequences of the adoption and implementation of federal rules (e.g., FCC Order 07-177 on backup power) and other industry initiatives (e.g., work of ATIS's NRIC) adopted on these subject matters will have a direct impact on the service providers in California as well as nationwide. Those rules will also affect the financial impact analysis and outcome of any additional CPUC initiated rules. It may be premature for the CPUC to do a cost/benefit analysis of certain topics given all the uncertainties involved.

- Massive Events: Current communications architectures cannot easily sustain normal telecommunications services during abnormally massive events such as a Katrina-type (e.g., Category 4 or 5) hurricane direct hit on a major city, a Richter Level 8.5 earthquake in California, or a nuclear event. The widespread and massive destructive nature of such incidents results in the physical loss of many COs and multiple remote sites. As a result, communications will be severely disrupted. For such incidents, recovery and restoration plans will be critical to manage the rebuilding of telecom networks. These plans may involve extensive deployment of mobile cell tower sites for rapid re-establishment of services and links to the rest of the country and the world. In these events, the temporary recovery and restoration plans may be very different from traditional telecom services and also from the best solutions for long-term re-building of a telecommunications network.

The discussion of these outstanding issues was beyond the scope of this investigation.

1 INTRODUCTION

1.1 Purpose

The purpose of this report is to document and analyze findings and possible options resulting from the CPUC activities pursuant to AB 2393 (Ch. 776, Stats. 2006). This study was coordinated under the CD which assists the Commission in developing and implementing policies to promote competition in all telecommunications markets and to address regulatory changes required by state and federal legislation.

1.2 Background

1.2.1 Powering in Telecommunications Networks

Electrical power is a key to ensuring end to end telecommunications service. A central battery system was deployed by telecommunications providers in the 1920s to improve network operations, performance, and reliability. As a result, batteries and generators located in the telecommunications service provider's CO were able to power both the central office equipment and the customer's telephone in the event of a power outage (assuming the telephone system is otherwise intact). The same continues to be true today for customers receiving landline telephone service from a facilities-based provider of telephony services (telephony provider) through copper wires. However, newer communications transmission technologies, including fiber-optic and coaxial cable, require distributed backup power systems, both in the network and at the customer's premises, in order to maintain service.

To discuss these issues, an informational hearing was held by the California Assembly Utilities and Commerce Committee in Los Angeles on October 28, 2005. During the hearing, an extensive dialogue took place among the Committee and representatives of the telecommunications industry, state agencies, and local governments. The hearing, which was convened to discuss the readiness of telephone systems in California, highlighted a number of deficiencies regarding the adequacy of backup power in the emerging networks.

Assembly Bill No. 2393 is the result of that hearing.

1.2.2 Legislation: Assembly Bill No. 2393

AB 2393 added §§ 776, 2872.5, and 2892.1 to the Public Utilities Code, added three (3) study areas, and provided related funding. In particular, AB 2393 requires the CPUC to:

1. **[Public Utilities Code § 776]:** Consider the need for performance reliability standards, and to develop and implement performance reliability standards, for backup power systems installed on the property of residential and small commercial customers by a facilities-based provider of telephony services, upon determining that the benefits of the standards exceed the costs. Those standards shall do all the following:

    a. Establish minimum operating life for battery.

    b. Establish minimum periods of time during which a telephone system with a charged backup power system will provide the customer with sufficient electricity for emergency usage.

c. Establish means to warn a customer when the backup power system's charge is low or when the system can no longer hold a charge.

2. **[Public Utilities Code § 2872.5]:** Open an investigation, in consultation with the Office of Emergency Services and the Department of General Services, to determine whether standardized notification systems and protocols should be utilized by the above-described entities to facilitate notification of affected members of the public of local emergencies. The bill prohibits the CPUC from establishing standards for notification systems or standard notification protocols unless it determines the benefits of the standards exceed the cost.

3. **[Public Utilities Code § 2892.1]:** Open an investigation or other appropriate proceeding, in consultation with the Office of Emergency Services and the Department of General Services, to identify the need for telecommunications service systems not on the customer's premises to have backup electricity to enable telecommunications networks to function and to enable the customer to contact a public safety answering point operator during an electrical outage, to determine performance criteria for backup systems, and to determine whether certain recommendations for backup systems have been implemented by telecommunications service providers operating in California. The bill requires the Commission to develop and implement performance reliability standards if it determines doing so is in the public interest and determines that the benefits of the standards exceed the costs. The bill requires the Commission to determine the feasibility of the use of zero greenhouse gas emission fuel cell systems to replace diesel backup power systems.

1.2.3 Order Instituting Rulemaking (OIR) to Implement AB 2393

On April 12, 2007, the CPUC opened R. 07-04-015 (see Appendix A) addressing standards for telecommunications backup power systems and emergency notification systems pursuant to AB 2393.

The OIR identified procedural steps to implement §§ 776, 2872.5, and 2892.1 of the Public Utilities Code. Excerpts of those plans and procedures are set forth below.

To this end, the CD was directed to convene technical workshops of SMEs in each of the three (3) areas to inform the Commission on this matter. The purpose of the technical workshops was to develop a record on the three areas mentioned in R. 07-04-015.

The workshops were followed by Information Requests seeking more detailed information and data related to the above mentioned three areas. The Information Requests also directed parties to support their recommendations with any available cost/benefit analyses. The OIR stated that:

> "while the bill concerns itself with only backup power, a cost/benefit analysis should be viewed holistically. For example, there is no customer benefit if power is maintained/restored but the lines are flooded under water".

The Information Requests were sent to all facilities-based telephony service providers, users of emergency notification systems, and other interested parties.

1.3 Problem Definition

In defining the problem, Table 1 below maps the major topics and issues mentioned in AB 2393 and it correlates them to the Public Utilities Codes.

Table 1. Mapping of Issues to Related Public Utilities Codes

Related Public Utilities Code	Major Topic	Issue #	Issue Title in this Report
§ 776	Backup Power Installed on the Customer's Premises	Issue 1	Backup Batteries Installed on the Property of Residential & Small Commercial Customer Premises
§ 2872.5	Emergency Notification Systems	Issue 2	Need for Standardization in Emergency Notification Systems and Protocols
§ 2892.1	Backup Power Not Installed on the Customer's Premises	Issue 3	Backup Power installed on the Network Side to Ensure Communications during Power Outages
		Issue 4	Level of Implementation of Best Practices by the Different Telecom Industry Segments
		Issue 5	Feasibility of the Use of Zero Greenhouse Gas Emission Fuel Cell Systems for Back-Up Power Systems Located in Telecommunications Service Provider Facilities

The following five (5) major issues were raised by AB 2393:

1.3.1 Issue 1: Backup Batteries Installed on the Property of Residential & Small Commercial Customer Premises

This issue is linked to Public Utilities Code § 776.

In adopting AB 2393, the Legislature was concerned whether consumers had sufficient backup power during power outages for making and receiving emergency communications. Their concern stems from the fact that recent technological changes in telecommunications systems have changed the way voice service is delivered to customers. Fiber-optic cable is being rapidly deployed to homes and small businesses, replacing copper wire. The benefit of fiber-optic cable is that it can carry far more information than traditional copper wire, providing consumers with a host of benefits, from increased Internet speeds to clearer sounding phone calls. However, the deployment of fiber optics does present a challenge. Unlike copper wire, fiber-optic cable does not carry electrical power to operate remote telecommunications equipment at the residential premises. Therefore, delivery of services across fiber-optic cables relies on an independent power source. As a result, traditional telephone service can continue to function during a blackout or power outage owing to power received from the CO, whereas a phone connected to a fiber-optic cable will not function without some means of local back-up power. In an effort to provide continuity for phone service during a power outage, backup battery systems have been installed in homes and small offices when fiber-optic cable is deployed. Currently, however, there is a lack of standards and best practices to regulate these backup batteries. A residential or small commercial customer often does not know a lot about the expected battery reserve time and maintenance requirements for such backup power systems, or where to find information about them.

1.3.2 Issue 2: Need for Standardization in Emergency Notification Systems and Protocols

This issue is linked to the Public Utilities Code § 2872.5.

- *The commission, in consultation with the Office of Emergency Services and the Department of General Services, shall open an investigative proceeding to determine whether standardized notification systems and protocol should be utilized by entities that are authorized to use automatic dialing-announcing devices pursuant to subdivision (e) of Section 2872, to facilitate notification of affected members of the public of local emergencies.*

New communications technologies enable authorities to notify the public in an emergency by a phone call or text message delivered to landline or wireless devices, including cell phones and text pagers. What is emerging is not, however, a unified system.

Without common communication protocols, manufacturers are developing emergency notification systems that require proprietary software. Each system remains targeted toward those living in a particular area, resulting in an archipelago of "islands," with people unable to communicate with those who may be across county or municipal boundaries. Consequently, an escape route recommended by one county may lead those fleeing onto a road that is impassable in the next county.[15]

Across California, a number of communities have successfully deployed emergency notification systems, some of them being very sophisticated, while others have only rudimentary public notification systems, such as air raid sirens.

To help resolve these disparities, the task per AB 2393 is to determine:

- Whether standardized notification systems and protocols should be used by entities that are authorized to use automatic dialing devices to facilitate notification of affected members of the public in the event of local emergencies
- Whether the current state of technology will support a systematic, statewide rollout of notification systems or whether communities should continue their deployment of point solutions
- Whether the random activation of emergency communications systems cause network congestion sufficient to hinder emergency communications.

1.3.3 Issue 3: Backup Power Installed on the Network Side to Ensure Communications during Power Outage

This issue is linked to the Public Utilities Code § 2892.1.

Natural disasters (especially, earthquakes, firestorms, and floods) and their effects on the telecommunications infrastructure are of particular importance to the people of California and their

[15] Timothy Alan Simon, "Coordination is Vital for Warning Systems," The Sacramento Bee, August 12, 2007.

elected officials due to the geology and geography in this part of the world. The Legislature asked the Commission, in consultation with OES and DGS, to determine:

- The need for backup power systems <u>not</u> located on the customer's premises, and
- Related and appropriate performance criteria for such backup power systems.

1.3.4 <u>Issue 4:</u> Level of Implementation of the NRIC Backup Power Best Practices by the Different Telecom Industry Segments

This issue is linked to the Public Utilities Code § 2892.1.

Today, the FCC's National Reliability and Interoperability Council (NRIC) has 803 Best Practices on its Web site. Fifty-two (52) address issues of backup power and twenty-eight (28) address generator deployment. These best practices were developed over many years and were based largely on the practices of large incumbent local exchange carriers who had developed redundant power systems for their COs. For various economic, business, technical and political reasons, these best practices have not been implemented uniformly nationwide.

In its investigation, the CD sought to determine:

- Whether the Best Practices recommended by NRIC for power backup systems have been implemented by telecommunications service providers operating in California, and
- To what degree they have been implemented.

1.3.5 <u>Issue 5:</u> Feasibility of the Use of Zero Greenhouse Gas Emission Fuel Cell Systems

This issue is linked to the Public Utilities Code § 2892.1.

There is a desire for backup power systems that are designed to run on more environmentally friendly fuels or with lower emissions. Backup power systems based on fuel cell technology are being contemplated to replace diesel generators. However, given that fuel-cell systems are not considered a mature technology (at least for telecom users), there may be additional considerations to factor in, such as:

- Technology in early stages of maturity tends to correspond to higher costs – as deployment volumes increase, costs decrease
- Cost of built-in redundancy in back-up systems to help maintain and ensure the expected high reliability for telecommunications networks
- Benefits and savings of possible back-feeding power into the grid from fuel-cell system when it is not required to power telecommunications services.

Thus, the challenge is to assess of the feasibility of zero greenhouse gas emission fuel cell systems to replace diesel generators for backup power systems in the central office, the outside plant, and the customer premises.

1.4 Scope

The scope of this report is to (i) describe the major issues raised by AB 2393 along with the approaches and steps taken by the CD to investigate them, (ii) analyze the gathered information and related findings, and (iii) list viable options. This study considers the current and emerging telecommunications architectures in terms of the network elements being used by communications providers (wireline, wireless, and CATV) at facilities including:

- Central offices, CATV headends[16], and mobile switching centers (MSCs),
- Remote terminals and cross-connect locations in the outside plant, and
- Residential and small commercial customer premises.

The main objectives of this study are to examine the:

- Technical feasibility of, and issues concerning, backup power systems installed at customer premises,
- Standardization of the emergency notification systems,
- Level of implementation of the NRIC-VII Backup Power Best Practices,
- Level of, and issues concerning, backup power systems in the network facilities not at the customer premises, and
- Feasibility of the use of zero greenhouse gas emission, fuel-cell systems for backup power at CO facilities.

1.5 Document Organization

Section 1: Introduction – Contains material on the purpose, background, problem definition, and scope of the "Reliability Standards for Telecommunications Emergency Backup Power Systems and Emergency Notification Systems" study. In this section, five (5) key issues are identified for this study and mapped to the applicable CPUC Code.

Section 2: Approaches & Steps Taken – Describes the series of actions that CD took to (i) solicit input from the interested parties, and (ii) address the issues raised in AB 2393.

Section 3: Related Regulatory Efforts – Reviews some of the related regulatory efforts underway at the federal and state levels to address similar concerns to those raised by AB 2393.

Section 4: Analysis and Options – Provides summary of the information gathered from activities discussed in Section 2 along with various observations on that data. From review of this information and technical analysis of the issues, a series of available options is provided.

Section 5: Outstanding Issues – Identifies backup power and emergency notification system issues either outside the scope or not fully addressed by this study.

[16] A *CATV headend* is the facility at a local cable TV office that originates and communicates cable TV services to subscribers.

Section 6: Conclusions – Presents conclusions from this study and summarizes the list of options to address the issues raised in AB 2393.

Section 7: Acronyms – Provides a list of acronyms used in this report.

Supplemental information is provided in the following appendices:

Appendix A: Order Instituting Rulemaking to Implement AB 2393 – "*Rulemaking on the Commission's Own Motion into Reliability Standards for Telecommunications Emergency Backup Power Systems and Emergency Notification Systems Pursuant to Assembly Bill 2393*" – April 12, 2007: Rulemaking 07-04-015.

Appendix B: Description of Telecom Powering Architectures – Describes telecommunications powering architectures (both current and emerging) in terms of the main network architectures currently being used by communications providers (wireline, wireless, and CATV). It serves as a "mini-tutorial" for the reader who is not familiar with the major node sites in the current/emerging telecommunications networks.

Appendix C: Workshops – Scope, Agenda, and Timelines – Includes details of the announcements, agendas, and questionnaires used during the three CPUC Technical Workshops to investigate the issues pursuant to AB 2393.

Appendix D: List of Informational Requests – Provides the text of three (3) separate Information Requests sent to CPUC Workshop participants and other interested participants as follow-up efforts to the workshops. To facilitate the greatest possible supply of information, the CD provided procedures to safeguard responders' proprietary and confidential information as detailed in this appendix.

Appendix E: CPUC Questionnaire – Provides the full description and instructions of a questionnaire prepared and distributed to telecommunication service providers in California to ascertain the implementation of NRIC Power-related Best Practices. In addition, these questionnaires were designed to elicit information on the effectiveness and costs associated with the implementing these Best Practices.

Appendix F: CPUC Questionnaire - Data Collection and Analysis – Provides the details of the data aggregation and analysis processes that was used to analyze the comprehensive responses to the CPUC questionnaire, which included the views of two (2) large LECs, 17 smaller LECs, three (3) wireless, and two (2) CATV companies. This appendix includes detailed bar charts and statistical analysis of the data to provide a broad assessment of the implementation of the NRIC Best Practices for power-related concerns.

Appendix G: Site Visits – Includes the typical agenda and highlights observations from several field site visits organized by the CD to provide real-world view to the facilities under consideration. The locations visited included COs, CATV headend facilities, and some CP sites of five (5) wireline and two (2) wireless telecommunications service providers.

Appendix H: Recent FCC Actions Related to AB2393 – Provides a summary review of recent FCC actions related to backup power and emergency alert systems including a summit on network surge management and activities associated with implementation of the WARN Act.

Appendix I: FCC 07-177 Order on Reconsideration – Provides the text of the supplement to FCC Order 07-177 issued after re-consideration of the recommendations pursuant to comments received from the industry. The FCC Order 07-177 arose out of consideration of the report entitled, “Recommendations of the Independent Panel Reviewing the Impact of the Hurricane on Communications Networks”, released in 2007.

Appendix J: Texas PUC Rulemaking on Power Backup at Central Office Facilities - Contains the conclusions of Project 34742 of the Texas PUC to adopt a new PUC rule relating to the emergency power backup for telecommunications facilities locates in flood plains or hurricane prone areas.

Appendix K: NRSC Analysis of FCC-Reportable Outages for Central Office Power – Summarizes the analysis by the NRSC of historical FCC-reportable outage data from 1993-2004 related to CO Power troubles.

Appendix L: Statistical Analysis of FCC-Reportable Outages with “Power Failure” as Root Cause (2005-2007) – Summarizes the analysis of the 2005-2007 data of FCC-reportable outage data related to CO Power troubles.

Appendix M: Group Survey Questions – IEEE Communications Quality and Reliability Conference – Provides industry survey data from the IEEE Communications Quality and Reliability (CQR) Conference held in November 2004.

Appendix N: FCC Communications Security, Reliability and Interoperability Council (CSRIC) – Describes the CSRIC that was chartered by the FCC in 2007 to help ensure optimal security, reliability, and interoperability of the communications system.

Appendix O: Financial Implications Assessment – Describes the analysis conducted to assess the relevant financial impacts associated with (i) backup power systems installed on customer premises and (ii) the use of zero emission (fuel-cell) systems to replace diesel generators at COs.

Appendix P: Power Outage and Telecommunications – Describes impacts to telecommunications services as a result of several disaster scenarios including power outage of varying lengths.

Appendix Q: Summary Workshop Responses on Definitions – Summarizes the comments and information provided during the workshops regarding definitions of “small commercial customer” and “emergency usage”.

Appendix R: Workshop Responses and Suggestions for Consumer Education Initiatives – Summarizes the comments and information provided during the workshops, as well as gathered from the informational requests and questionnaires regarding the education needs, wants, and expectations of the customers and users of the telecommunications network.

2 Approaches & Steps Taken

Pursuant to AB 2393 the Commission initiated the OIR to investigate current practices for telecommunications back-up power systems and emergency notification systems. To this end, the CD undertook a series of actions to solicit input from the interested parties. In particular, it:

1. Pursued an extensive search to obtain the names of companies and their key contact people knowledgeable about the power backup systems, battery suppliers, and emergency notification systems to inform them and solicit information from these SMEs for the purpose of the investigation.

2. Organized three (3) technical workshops of SMEs, as directed by R. 07-04-015, on:
   - Backup power systems on residential and small commercial customer properties (held on June 5, 2007 in San Francisco)
   - Backup power systems not installed on customer premises (held on June 6, 2007 in San Francisco)
   - Emergency notification systems (held on June 19, 2007 in San Francisco).

3. Issued three (3) Information Requests to augment the information garnered from the above workshops and provided an additional opportunity to comment on the major issues under OIR 07-04-015.

4. Issued a questionnaire (in a spreadsheet form) to supplement information received from the industry during the June 5-6, 2007 Workshops and the responses to Information Requests 1 and 2. This step was necessary because the record was insufficient to enable the CD to do a meaningful analysis and draw conclusions regarding the implementation of the "NRIC Power-Related Best Practices" in California.

5. Arranged a number of site visits at telecom service provider services and customer premises to have a first-hand look at the backup power systems and equipment deployed.

6. Organized a workshop on "Communications Issues and Best Practices Post-SOCAL Firestorms (held on Jan. 9, 2008 in San Diego).

7. Followed (and continues to follow) FCC proceedings on Emergency Notification Systems.

Appendices C through G contain more detailed information about the technical workshops, informational requests, the questionnaire, and site visits mentioned above.

3 Parallel Regulatory Efforts Relevant to AB 2393

In parallel to CPUC's efforts stated above, there are federal and other state regulatory efforts, which are relevant to AB 2393. A quick mention of some of these efforts provides valuable background information, which will be helpful when reading the remainder of this report.

3.1 FCC

In particular, the FCC has under consideration proceedings looking at both back-up power and emergency notifications systems the outcome of which may have a direct bearing on the CPUC investigation pursuant to AB 2393.

One recent example was the issuance of FCC Order 07-177 based on emergency response analysis to Hurricane Katrina where increased levels of battery reserve power have been mandated to require:

- A minimum of 24-hr reserve power backup to be available at central offices and headends[17] of wireline and wireless service providers, as well as
- A minimum of 8 hours of reserve power at remote sites including wireless towers.

A review of the relevant FCC proceedings and orders are set forth in Appendices H and I.

The FCC recommendation for backup power is only required for service providers with 500,000 customers or more. The FCC exempted smaller carriers because of the financial burden it might impose on them[18].

Currently, the D.C. Circuit has granted a stay of the FCC rules associated with the FCC Order 07-177 and it is possible that (i) part or even all of the rules could be overturned by the court, or (ii) the FCC Order could be reviewed and remanded back to the FCC with directions to revise it according to comments in the court opinion.

Any federal rules adopted on these subject matters will have a direct impact on the telecommunications service providers in California as well as nationwide. Those rules will also impact the financial impact analysis and outcome of any additional state rules. For example, if the FCC mandates certain rules to enhance the backup power on the network side, then the telecom service providers in California will have to follow the FCC rules and absorb the additional cost as "part of doing business". Thus, the financial

[17] A *CATV headend* is the facility at a local cable TV office that originates and communicates cable TV services to subscribers.

[18] FCC Ruling 47 CFR PART 12, Redundancy of Communications Systems, Section 12.2, Backup Power, states that —"*.. Local exchange carriers (LECs), including incumbent LECS (ILECs) and competitive LECs (CLECs), and commercial mobile radio service (CMRS) providers must have an emergency backup power source for all assets that are normally powered from local AC commercial power, including those inside central offices, cell sites, remote switches and digital loop carrier system remote terminals. LECs and CMRS providers should maintain emergency back-up power for a minimum of 24 hours for assets inside central offices and eight hours for cell sites, remote switches and digital loop carrier system remote terminals that are normally powered from local AC commercial power. LECs that meet the definition of a Class B company as set forth in § 32.11(b)(2) of the Commission's rules and non-nationwide CMRS providers with no more than 500,000 subscribers are exempt from this rule*."

impact analysis required by AB 2393 to implement Public Utilities Code §2892.1, must take into consideration any final FCC rules.

The State PUCs often implement different rules for rural telephone companies[19] than does the FCC, because they often regulate the quality of service (QoS). Therefore, the CPUC may wish to consider extending FCC rulings on backup power to include all service providers under its jurisdiction.

Ongoing proceedings at the FCC regarding the standardization of the Emergency Notification Systems, may also impact the CD's investigation pursuant to the implementation of Public Utilities Code § 2872.5. It may be premature for the CD to do a cost/benefit analysis of that topic given all the uncertainties involved. There is a need to define a "reference case" (i.e., "a standardized approach") in order to determine the incremental impacts and associated costs of adopting different technologies for Emergency Notification Systems.

3.1.1 Hearing Aid Compatibility

Regarding persons with disabilities, the FCC recently sought comment on the Second Report & Order (2nd R&O) and Notice of Proposed Rulemaking (NPRM) regarding rules governing hearing aid compatible (HAC) mobile handsets [FCC 07-192[20]] and on the Further Notice of Proposed Rulemaking (FNPRM) in Review of Emergency Alert System [FCC 07-109[21]]. In FCC 07-192, the FCC reexamines their existing hearing aid compatibility requirements to ensure that they will continue to be effective in an evolving marketplace of new technologies and services.

3.1.2 Emergency Alert Systems

In FCC 07-109, Review of the Emergency Alert System, Paragraph 36 states:

> "*President Bush's Executive Order mandates that the Secretary of Homeland Security "include in the public alert and warning system the capability to alert and warn all Americans, including those with disabilities and those without an understanding of the English language." We [the FCC] believe that CAP (Common Alerting Protocol) could provide an important tool for helping to accomplish this goal. CAP should facilitate the provision of functionally equivalent EAS alerts and warnings to persons with disabilities. Using CAP, the original format of warning messages could be converted into various formats, including text, video, and audio. Critical information*

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[19] A "Rural telephone company" is defined by the FCC as a company serving a community with less than 10,000 inhabitants, or a company with less than 50,000 total access lines. More specifically , in 47 USC § 153(37), the following definition of a rural telephone company is provided : "*The term rural telephone company means a local exchange carrier operating entity to the extent that such entity*

(A) provides common carrier service to any local exchange carrier study area that does not include either

(i) any incorporated place of 10,000 inhabitants or more, or any part thereof, based on the most recently available population statistics of the Bureau of the Census; or

(ii) any territory, incorporated or unincorporated, included in an urbanized area, as defined by the Bureau of the Census as of August 10, 1993;

(B) provides telephone exchange service, including exchange access, to fewer than 50,000 access lines;

(C) provides telephone exchange service to any local exchange carrier study area with fewer than 100,000 access lines; or

(D) has less than 15 percent of its access lines in communities of more than 50,000 on February 8, 1996.

[20] http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07-192A1.doc

[21] http://a257.g.akamaitech.net/7/257/2422/01jan20071800/edocket.access.gpo.gov/2007/07-5331.htm

> *graphically portrayed, scrolled, or crawled on the screen also could be accompanied by an audio description.*"
>
> "*Persons with hearing disabilities would be able to read the entire emergency message instead of a brief summary. Audio and visual formats are both important and could contain the same information. Moreover, a CAP-formatted message could be converted to synthesized speech, as is done by NWS weather alerts, for visually impaired persons. Accordingly, in this Order, we promote the delivery of audio, video, and text messages to persons with disabilities by requiring EAS Participants to accept CAP-formatted alerts and warnings, should CAP be adopted by FEMA.*"

The CPUC should consider allowing these issues of standardization to be addressed first at the national level. Furthermore, the use of the CAP protocol as a future interface is consistent with the guidelines set forth by the CMSAAC in their NPRM.

3.2 Texas PUC

The Texas PUC, under Project Nos. 34742[22] , 34395[23], and 34594[24], (see Appendix J for further details) initiated a number of rulemaking proceedings to adopt new rules relating to CO emergency power and electric facilities in floodplains as related to infrastructure reliability. In addition, the Texas PUC held public workshops on September 5, 2007 and January 15, 2008, as well as a public meeting on February 22, 2008 regarding those proceedings. The Texas PUC said that a public hearing regarding the proposed requirements (Docket 34742) will be held, if requested, on April 30, 2008.

Specifically, the Texas PUC is proposing to adopt new requirements regarding the installation of emergency power at all telecommunications utilities' COs located in coastal areas to ensure "safe and reliable operation during power outages and severe flooding."[25]

The proposed new rules stem from Texas commission staff recommendations made in a hurricane infrastructure report, and will apply to all certificated telecommunications utilities (CTUs). The proposed requirement of emergency backup power would require all telecom utilities to ensure that each CO located in a coastal area is capable of full and complete normal operation for 72 hours after loss of the sources of electric utility provided electricity.

In addition, for a new CO or remote facility that will be located in a 100-year floodplain, a telecom utility must design and construct the CO or remote facility so that the electrically energized portions are not less than one foot above the 100-year floodplain.

The design of the power architecture for the telecommunications network is an integrated system design and therefore regulations that affect backup power reserves in the network facilities such as COs, wireless

[22] 34742 Rulemaking Proceeding to Adopt a New P.U.C. Substantive Rule 26.56 Relating to Location in Flood Plains and Emergency Power for Certificated Telecommunications Utilities' Facilities in Hurricane Prone Areas

[23] 34395 Rulemaking Proceeding to Adopt New Rule Relating to Central Office Emergency Power and Electric Facilities in Floodplains as Related to Infrastructure Reliability Under New Chapter 29

[24] 34594 Rulemaking to Repeal P.U.C. Substantive Rule 26.51 and Propose New 26.51 Relating to Reliability of Operations of Telecommunications Providers .

[25] http://www.puc.state.tx.us/rules/rulemake/34742/34742pub.doc - see Appendix J

centers, headends, and remote terminals can have consequences for power backup choices at the customer premises. Expending funds and effort to enhance network power backup is wasted if backup capacity at the customer site is not commensurate with the network reserve time.

4 Analysis of Information & List of Available Options

This section provides (i) an analysis of the information that was gathered as part of this study/investigation, (ii) makes appropriate observations, and (iii) identifies a list of available options.

The information is organized on a “per-issue basis” to facilitate the mapping of the findings to the corresponding section (§) of the California Public Utilities Codes (see Table 2 below).

Table 2. Mapping of Issues to Related Public Utilities Codes

Related Public Utilities Code	Major Topic	Issue #	Issue Title in this Report	Section Number
§ 776	Backup Power Installed on the Customer’s Premises	Issue 1	Backup Batteries Installed on the Property of Residential & Small Commercial Customer Premises	4.2
§ 2872.5	Emergency Notification Systems	Issue 2	Need for Standardization in Emergency Notification Systems and Protocols	4.3
§ 2892.1	Backup Power Not Installed on the Customer’s Premises	Issue 3	Backup Power installed on the Network Side to Ensure Communications during Power Outages	4.4
		Issue 4	Level of Implementation of Best Practices by the Different Telecom Industry Segments	4.5
		Issue 5	Feasibility of the Use of Zero Greenhouse Gas Emission Fuel Cell Systems for Back-Up Power Systems Located in Telecommunications Service Provider Facilities	4.6

4.1 Definitions

During the investigation, the need for definitions of "small commercial customer" and "emergency usage" were identified.

4.1.1 Small Commercial Customer

In pursuit of a lasting definition, the following question (Category E: Question #9) was included in Informational Request 1 (see Appendix C):

> "Regarding the working definition for "small commercial/business customer" that was adopted for this information request:
> a. Do you believe this is an appropriate definition for the Order Instituting Rulemaking (OIR) to implement Assembly Bill (AB) 2393?
> b. If not, what definition would you propose and what is your rationale?"

Based on responses provided during the investigation process in a revised ruling, Assigned Commissioner (Timothy A. Simon) determined that for the purposes of responding to the CPUC's Informational Request 1, the following working definition (Ruling, June 19, 2007)[26] would be adopted and used:

> "***Small business customer"*** is defined as a business customer with no more than five access lines, none of which belongs to a larger entity."

4.1.2 Emergency Usage

A definition of "emergency usage" is also required for the purpose of this investigation.

To research this definition, the following question (Category E: Question #10) was included in Informational Request 1 (see Appendix C):

> "If your company or organization has a definition for the term "emergency usage", what is it?
> a. How does that definition apply to the OIR to implement AB 2393?
> b. If not, do you want to propose a definition for "emergency usage" that should apply to this OIR to implement AB 2393?

There was general agreement from service providers that the ability to make an E-911 call was critical to emergency usage definition. Based on the responses provided during the investigation process, the following definition was adopted and used:

> "***Emergency usage*** is for a situation requiring an immediate response from public safety, law enforcement or medical emergency personnel, contacted via a PSAP[27] by means of dialing 911, which is available during a non-catastrophic commercial power outage."

See Appendix Q for further details on the responses received regarding these definitions.

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[26] (http://www.cpuc.ca.gov/EFILE/RULINGS/69259.htm).
[27] Public Safety Answering Point

4.2 Backup Batteries Installed on the Property of Residential & Small Commercial Customer Premises (Issue 1)

For Issue #1, the investigation addressed the following basic questions about the backup power capacity at the residential and small business customer premises:

A. What is an appropriate minimum operating lifetime for the battery?

B. What are the minimum periods of time during which a telephone system with a charged backup power system should provide the customer with sufficient electricity for emergency usage?

C. What are appropriate and useful means to warn a customer when the backup power system's charge is low or when the system can no longer hold a charge?

D. Are there appropriate performance reliability criteria for backup power systems installed on the property of residential and small commercial customer by a telephone service provider?

E. Whether benefits of any recommended power back-up power criteria or standards exceed the costs?

F. What programs are needed to educate consumers?

4.2.1 Background Information

The first step in the investigation was to determine the telecommunications providers' current practices regarding backup power systems, including the feasibility of establishing such systems where they do not exist.

4.2.1.1 Description of Telecom Powering Architectures

This section provides the necessary background of the telecommunications powering architectures (both current and emerging) to set the stage for discussing the specific issues associated with backup batteries installed at customer premises. Greater details about the network architecture and power schemes are provided in Appendix B.

The current telephony powering scheme was developed by telecommunications providers in the 1920s and has evolved over the decades to improve network operations, performance, and reliability. The primary power to operate the CO is provided by the utility electric power grid as AC[28] power, which is then converted to DC power for telecommunications service through banks of rectifiers. A system of flooded lead-acid batteries and diesel generators located on site at the CO ensures continuous source of power in the event that the commercial power is interrupted. If the commercial AC failed, the batteries would seamlessly assume the load and the engines would begin their starting sequences. Within several minutes, the engines will support the full load of essential telecommunications services. The CO provides the central DC[29] power source that provides power to the equipment on a customer premise.

For the link from the CO to the Network Interface Device (NID) (the terminating end of the service provider network) located on the customer premise the network is designed with a 99.99% availability objective. A power failure or disruption is only one point of possible failure in the distribution loop.

[28] Alternating Current
[29] Direct Current

Therefore, the percent availability assumed for the power supply and backup power within the distribution section is greater than 99.99%. To meet these high reliability objectives, the traditional telecommunications service providers paid a great deal of attention to the design and implementation of the backup power plant at the CO.

Wireline Services: Traditional telephony service does not require any powering at the customer premises since the landline telephone obtained power through the copper wires from the CO. However, current telecom equipment at the customer premises usually requires utility AC powering in part or in full to operate it. Examples of equipment at customer premise include Caller-ID boxes, cordless telephone handsets, and STBs.

CATV Services: For traditional CATV systems the assumption was that if AC power was interrupted at the house, the STB and the television would not operate. Therefore, there was no need for extensive backup facilities to keep broadcasting the TV signal to homes that had no operating TV set. As CATV companies move to expand their service offerings to include the full array of "triple play" telecommunications services (i.e., voice, data, and video), they are putting powering schemes similar to those provided by the traditional telecommunications service providers in place. These include backup power plants (battery plant and generators) at the headend[30] locations with batteries at some remote sites.

Wireless Services: Power management is critical for wireless systems since the ability to connect (i.e., coverage) to the wireless service requires a wireless signal of sufficient power between cell site and handset as well as sufficient electrical power for the remote antenna site (cell site) to operate. The need for backup power for wireless systems is somewhat reduced because their architecture may allow for possible re-configuration of the coverage zone for a specific antenna through (i) remotely or automatically modifying the emitting power of the transmitter, or (ii) expanding effective coverage through joint roaming agreements with other wireless companies in times of emergency or high traffic congestion.

Broadband Services and FTTx Architectures: Figure 1 shows the different Fiber-To-The-x (FTTx) architectures; where "x" represents curb, cabinet, home, premise or business. The left portion of the figure shows representative service provider network elements involved in providing services over the optical network. The elements in orange represent a point-to-point or point-to-multipoint distribution plant terminating at the home, business, curb or cabinet.

For these FTTx systems, the powering architecture close to the customer premises is considerably different from traditional telephony and entails an increased risk during utility power outages. For the FTTB (Fiber-To-The-Building) and FTTC (Fiber-To-The-Curb) systems shown in Figure 1, the bulk and reserve power units are usually contained within an enclosure that is maintained in close proximity to the subscribers, or can include small UPS[31] chargers or power control equipment inside the customer premises.

Multi-dwelling apartment buildings, small business locations or a small community of homes are examples where the main power control and utility feed is usually located in a sizable closure from which the customer's batteries are monitored and charged. The batteries can be located on the customer premises or nearby in garages, attics or closets of individual customers.

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[30] A *headend* is the facility at a local cable TV office that originates and communicates cable TV services to subscribers.
[31] Uninterruptible Power Supply

For FTTH and FTTP systems, the powering scheme requires a utility power feed supplied from the customer premises to operate the communications load equipment consisting of multi-function access cards which can provide video, data, and voice signals to subscribers along with the necessary monitoring and control circuitry. The power monitoring and control system along with battery backup are necessarily all located on the customer premises (garages, closets or attics usually). This powering scheme is fully localized with utility back-feeds from the customer AC service, which is in marked contrast to the traditional centralized powering scheme from the CO.

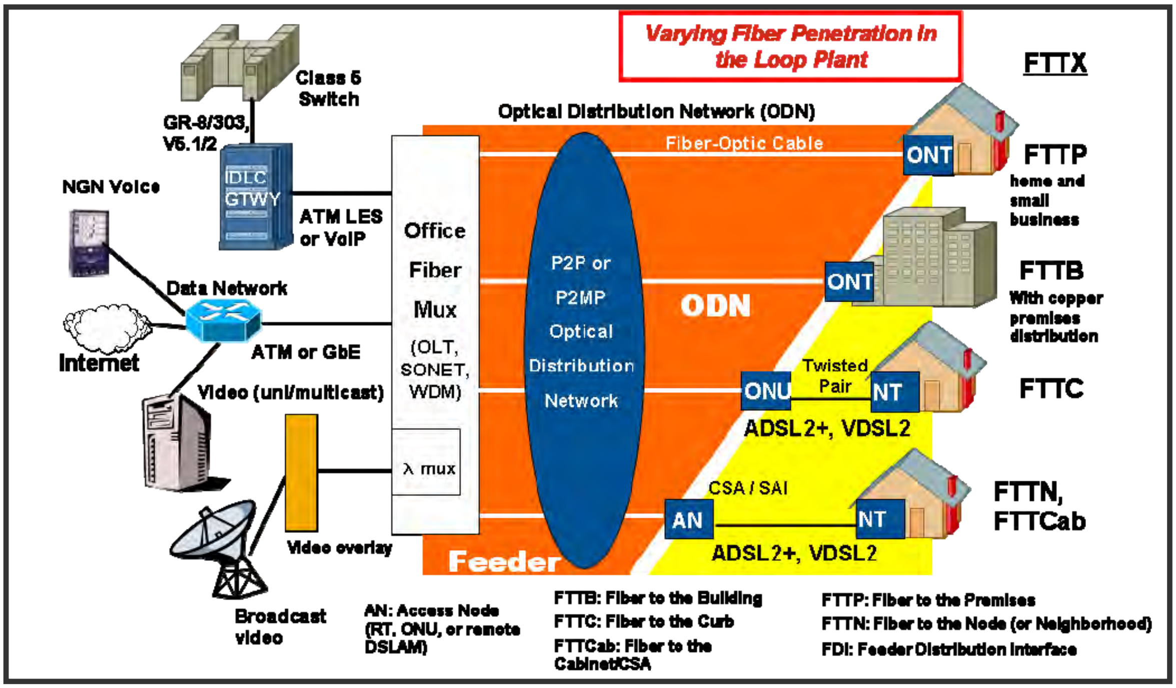

Figure 1. Basic FTTx Network Architectures

Customer Premises: At customer premises for "triple play" type circumstances where all telecommunications services are delivered over the optical-fiber line to the customer premises, telephony can only be maintained for a significant amount of time during a power outage if the video and data services are dropped. The higher power demand of the video and data services requires that these services are shed in emergency times so as to maximize telephony reserve time from the battery. Retaining the video and data services would either (i) require large battery reserves (4-6 times) to maintain 4-8 hours of operational time or (ii) the customer accepting a much reduced operational reserve time (less than 30-45 minutes) for the entire service.

Some small business customers, or those residential customers with a particular need or desire, can install a UPS to maintain operation of all their customer premises equipment. However, such actions may not ensure telecommunications service unless (i) sufficient power backup is present at both the CO and outside plant (OSP) sites, and (ii) the network and powering architecture is amenable to supplying Internet, TV, and telephony services during a power outage.

The backup time provided by a backup battery is also dependent on the telecom load placed on the system. The delivery of traditional Plain Old Telephone Service (POTS) over a copper pair through a RJ-11 jack would normally consume 1-2 watts. In contrast, the basic telecommunications broadband service is expected to include many items at the CP that use substantial power (5-20+ watts) when in active use and in standby modes.

Because of this growing equipment list, the power budget for telecommunications services per customer is expected to rise significantly in the future. Part of this will be directly seen (and paid) by the service provider, but the majority will be provided by the customer through their power utility bill. The increase in power use inside the customer residence for telecommunications services will rise significantly since the improved high-speed services will encourage additional use of communications, Internet, TV equipment, and their many associated peripherals. A conservative estimate would suggest that a minimum of 30-40% increase in power usage associated with telecommunication services can be expected.

The powering architecture at the customer premise is changing the most as the wireline plants are being converted into fiber-based architectures and CATV service providers are providing voice and data services over their infrastructure. The network telecommunications equipment at the customer premises is a broadband modem and router (possible both units combined into one box – a broadband gateway). This unit is powered by utility AC power provided directly by the customer. Battery backup will be chiefly designed to match the ONT function of supporting basic telephony service.

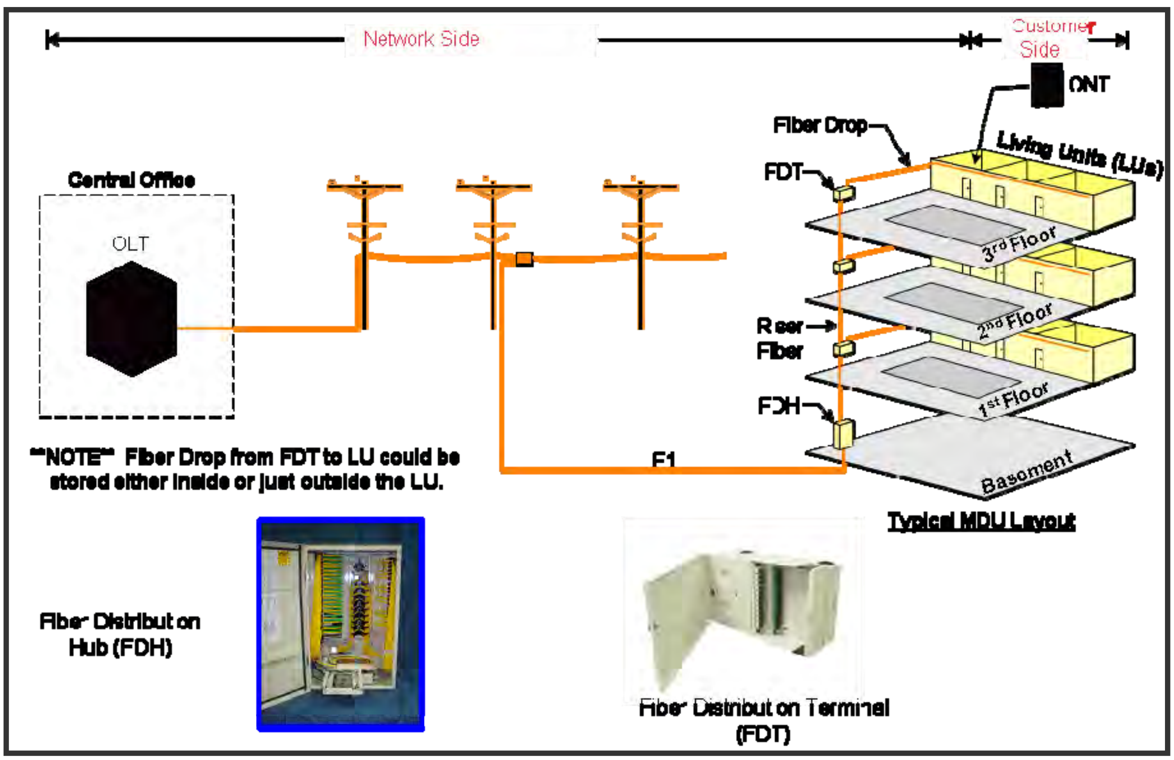

Figure 2. Small Business or Multi-Dwelling Unit (MDU) Architecture

For the customer premises, a wide range of ONT or ONU products provide the network interface function where the telephony signal is decoupled from the incoming optical signal, and the remaining data and video signal is passed onto the STB, Broadband Home Router or Broadband Gateway device. These products are undergoing rapid evolution in terms of not only functional performance, but also power design, power budgets and battery backup capacity. The ONT provides connection for the optical-fiber line, the existing household phone system, and an Ethernet jack for Internet access. Typically, the ONT is mounted on the exterior of the house, adjacent to the existing telephone network interface.

For multi-dwelling units and small business customers, the ONT units are in telecommunications closets or in individual offices or rooms. These ONTs are then connected together at Fiber Distribution Hubs (FDHs) and Fiber Distribution Terminals (FDTs) before exiting the building and joining the OSP plant back to the CO facility. Current architectures often have these FDHs and FDTs as passive devices (do not require AC power) within a passive optical network (PON) that extends from the ONT at the customer all the way back to the CO (as shown in Figure 2).

Driven by technical concerns, business strategies, and initiatives of regulatory bodies and industry forums, service providers are exploring technical solutions and operational trade-offs to enhance backup battery duration. Protocols are being developed and deployed where customer-specific configuration of backup capabilities is possible. This approach allows an operator (or possibly customer, in future) to customize the backup time for each service to match their needs and desires.

For a given power reserve capacity in the battery, each customer location may have different allocation of backup time for telephony, for Internet/data, and for Video services. One may even elect to trade-off the ability to receive calls and other service functionalities, if this would enable an extended ability to make emergency outgoing call.

In summary, the distinct battery backup needs for the telecommunications providers (ILECs/CLECs, wireline, wireless, and CATV) are for:

1. Start-up and support for the diesel generator backup powering systems provided at the telecom central offices, CATV headends, and wireless Mobile Switching Center (MSC) facilities.
2. Local powering at hubs within the local loop
    a. CEV or hut sites that may serve 100s to 1,000s homes
    b. Cabinet sites that may serve 10s to 100s homes
    c. Pedestals or small closures that may serve up to 12 homes
3. Backup within customer premises equipment and gateway units (ONU/ONT/STB) to provide continuous telephony service.

Whatever backup storage device or alternate power generator equipment technology is used, telecommunications providers and end-users (customers) will need to evaluate the functional performance, reliability, safety and end-of-life disposal characteristics of the products.

4.2.1.2 Current Available Backup at Customer Premises

Industry-wide design criteria have not been established for the new range of CP devices and interface equipment being deployed to support FTTP and FTTH architectures. One design principle could be based on the industry OSP node criteria. For the situation where the CO and OSP network of the telecommunications network are physically standing, operational, and capable of delivering signal to the customer premises, the minimum design philosophy for backup power at the customer premises would be a minimum of 4 hours of reserve power. That is, there shall be sufficient backup power at the customer premise of a “triple play” service customer to provide at least 4 hours of reserve talk time on their telephone.

Traditional copper-based wireline pairs provide service continuity through the backup diesel generator at the CO and 4 to 8 hours of battery backup at the RT sites.

Most, but not all, broadband service providers provide backup at the customer residence. Reserve times of between 4 and 20 hours of "talk time" were typically cited during the CPUC Workshops and in subsequent submissions to the questionnaires. Most CATV systems provide battery backup for their VoIP service designed with 4 to 5 hours reserve and with some ability to expand the battery reserve by a factor of 2 or 3, if requested. The design of newer customer premises equipment has allocated expansion space for more batteries to be added or for high energy-density batteries to be substituted.

Batteries used at the customer premises are usually sealed lead-acid batteries. Although they are old technology and heavy, these batteries have proven a reliable and inexpensive choice. The sealed lead-acid systems can be purchased on line or are available at many local stores. The newer high-capacity batteries (Nickel-Metal hydride and Lithium-based cells) are more expensive. The lithium based batteries (e.g., similar to PC laptop batteries) are beginning to be deployed in some of the multimedia terminal and set-top-boxes providing "triple-play" services. Environmentally friendly power sources such as fuel cells, solar and wind systems are presently not a good fit for telecom backup applications, being either too expensive or would require batteries for energy storage during nighttime or low wind conditions.

The term "reserve time" is widely used in product descriptions and advertising. Some background is useful for understanding of how people use the term.

4.2.1.3 Reserve Time

The term "reserve time" is used differently throughout segments of the industry and also within individual companies. This ambiguity can result in business and residential users significantly underestimating or over-estimating the power backup capability for long-term outages due to man-made or natural disasters.

The term "reserve time" needs to be been well defined. For a given battery capacity (Amp-hr) the amount of reserve time this equates to for a given device depends on what power usage (Watts) is assigned to the device. This wattage value varies depending on use of the device:

- Talk Time = The device is in active continual use for communications where the power use will vary but shall be greater by 50-100% or more than power needed in the idle or standby state
- Standby Time = The device is awake and ready to make a call
- Idle State = The device is in sleep mode where it is plugged in but power use is low
- Off = Turned off and powered down.

Internal energy management within the operation of the CPE can help extend availability of voice communications by decreasing the power consumption in the standby and idle modes. Many of the CP devices can have considerable power usage in standby and idle modes as shown in Table 3.

Table 3. Average Power Usage in Watts

Product /Device	Idle (Sleep)	Standby	Active Use or on Charge
Digital TV with VCR and DVD	18 to 20	28 to 35	200 to 220
Digital Cable STB	22	23	23
Satellite Receiver	16	16	17
DSL Modem	5	5	6
VoIP	N/A	2	4
Cordless Phone/Answering Device	1.1	2-3	3-4
Cell Phone Charger	1	---	5
POTS telephone	<0.2	<0.2	1-2
Personal Computer (PC)	2-5	80	125-150

(*) From (1) "Energy Use of U.S. Consumer Electronics at the End of the 20th Century" at http://eetd.lbl.gov/EA/Reports/46212/ , (2) "Energy Use of Set-Top Boxes and Telephony Products in the U.S. at http://eetd.lbl.gov/EA/Reports/45305/ , and (3) "U.S. Residential Information Technology Energy Consumption in 2005 and 2010" at http://www.tiaxllc.com/reports/residential_information_technology_energy_consumption_2006.pdf .

To reduce energy consumption and maximize reserve time for POTS-type telephony services, the service protocols include dropping TV services and disconnecting data services immediately or after some brief time (5 to 15 minutes). Many VoIP systems are integrated with cable modems to share the cable interface, thereby reducing incremental power draw. Broadband gateways require enough battery to sustain their network presence during the outage through exchanging signals with the CO or headend. Table 4 summarizes the typical reserve data provided during workshops and through responses to questionnaires.

Table 4. Talk Time vs. Standby Time

Service Provider	Standby (hrs)	Talk Time (hrs)
A	14-16	7-8
B	8-10	5-6
C	6-8	5-6
D	8-10	5-6

The reserve times are partially calculated from engineering parameters and general design features of the hardware. However, an equally important factor is customer determined and is based on the assumptions of service use during a power outage. Is the immediate reaction by a user to make multiple calls to friends, family, the local power company and other local officials trying to find out status of outage? If so, the load is large and the battery will drain fast. If provided with sufficient education and emergency broadcast announcements, the public will be able to conserve their capability to make telecommunications calls for as long as possible during a power outage or emergency situation.

The major factors that affect reserve time, in order of impact, are:

- Load on Battery – The more the phone is used, the more power is consumed and the faster the capacity is depleted.

- Operational Modes – Greater use of sleep, idle and standby modes will reduce load on battery.
- Battery Type – If one has two batteries of same size and one is a high-energy density Lithium ion battery, then it will last longer since its energy capacity is greater (assumes that the form, fit and function of both batteries are compatible with power interface of the system).
- Battery Age and Quality of Manufacture – As batteries age, their capacity to store the full designed energy is reduced. Lower quality batteries will decay faster. It would be best if tests were performed annually to confirm that the battery is retaining sufficient capacity and recharge capability over time.
- Battery Location (Temperature) – Batteries should be located in areas of moderate temperatures away from zones where large diurnal swings may occur (e.g., attics or outdoors). For example, a battery exposed at cold winter conditions (e.g., 0^{o}F) will lower its available reserve time by 30-50%.
- Electronics Design of Customer Equipment – some savings are possible through device and hardware design choices, however these factors are usually small for modern electronic equipment.

4.2.2 Costs, Benefits and Financial Impacts

In order to evaluate the implications of establishing minimum performance standards for customer premises equipment (CPE) backup power it is necessary to assess the tradeoffs between:

- The impact of electrical power outages in exposing customers to telephone service disruptions, and
- The costs associated with providing sufficient battery backup time in order to minimize customer exposure.

4.2.2.1 Outage Analysis

Using statistics from the last 10+ years available from published electric utility reliability reports for the State of California, a number of significant outage events have been profiled, including:

- Heat Waves
- Wind Storms
- Wild Fires
- Earthquakes
- Flooding
- Human Error
- Lightning.

The individual statistics for each type of event and outage profiles are provided in Appendix O along with a detailed analysis. A summary of the critical conclusions pertinent to the cost analysis for this investigation are provided below.

Figure 3 provides the impact of power outage events in terms of percentage of the population exposed to the risk of losing telecom service for systems with battery backup of (i) 4 hours, (ii) 8 hours, or (iii) 15-20 hours. Based on the statistical data from the power outage data, the percentage of a utility customers whose telephony service may be at risk can be calculated as a function of the battery backup present at the customer premises. The number of customers affected by power outages lasting over 4 hours in duration ranges from 1.4% to 14.2% of the power utility's customer base, with an average of 6.8%. The corresponding percentage of customers impacted by power outages lasting more than 8 hours ranges from 1.0% to 9.1%, with an average of 3.9%. Therefore, the implementation of an 8-hr backup solution at the customer premises could reduce the potential exposure of users losing telephony (voice) service from 6.8% to 3.9% of customers, compared to a 4-hr CPE backup power solution.

The addition of even more battery capacity to achieve 15-20 hours backup can be expected to further reduce the exposure risk from 3.9% to roughly 2.0% of customers, on average. Such extended power outages (greater than 14 hours) tend to be caused by large or state-wide incidents such as Santa Ana wind-storms, extensive flooding or large earthquakes where not only power is lost but widespread physical damage to telecommunications plant and customer equipment is likely.

To illustrate the use of Figure 3, consider a few scenarios. For example, if a major earthquake occurred and caused utility power to be lost for many days, 14.2% of the customers in the affected area will lose their telecommunications services if their FTTH system has 4 hours of battery backup. If their system has 8 hours of battery backup, the number of customers at risk of losing telecommunications service drops to 9.2% and, if they had 16 hours of battery backup, the number of customers affected drops to under 4%. An earthquake event may be localized to an area within a few miles of the epicenter or have levels of decreasing damage radiating out from the epicenter. At the epicenter, the percentage of affected customers would be higher than the average value calculated across all the customers of a particular utility company.

In contrast, high Santa Ana winds or flooding from heavy rains can cause a state-wide emergency that covers a much broader percentage of the state. In the case of a wind storm event causing an extended power outage, 6.9 % of the customers with 4-hr battery backup will eventually lose telecommunications service. For those systems with 8 hours of battery backup, the number of customers affected is only 5.3%.

The exposure levels (i.e., percentage of customers at risk) calculated from this analysis can be considered "worst-case" values given that (1) many consumers have multiple telecommunications means available to them (e.g., both traditional wireline services and a wireless cell-phone service), and (2) not all customers have broadband services. With two or more services available, the customers' vulnerability is reduced proportionally since it is less likely for all their telecommunications services to be lost simultaneously. Secondly, not all the customers who lose electrical power will have broadband telephony services with backup batteries at their premises. Both these factors will reduce the percentage of customers whose telephony service will be affected by a power outage.

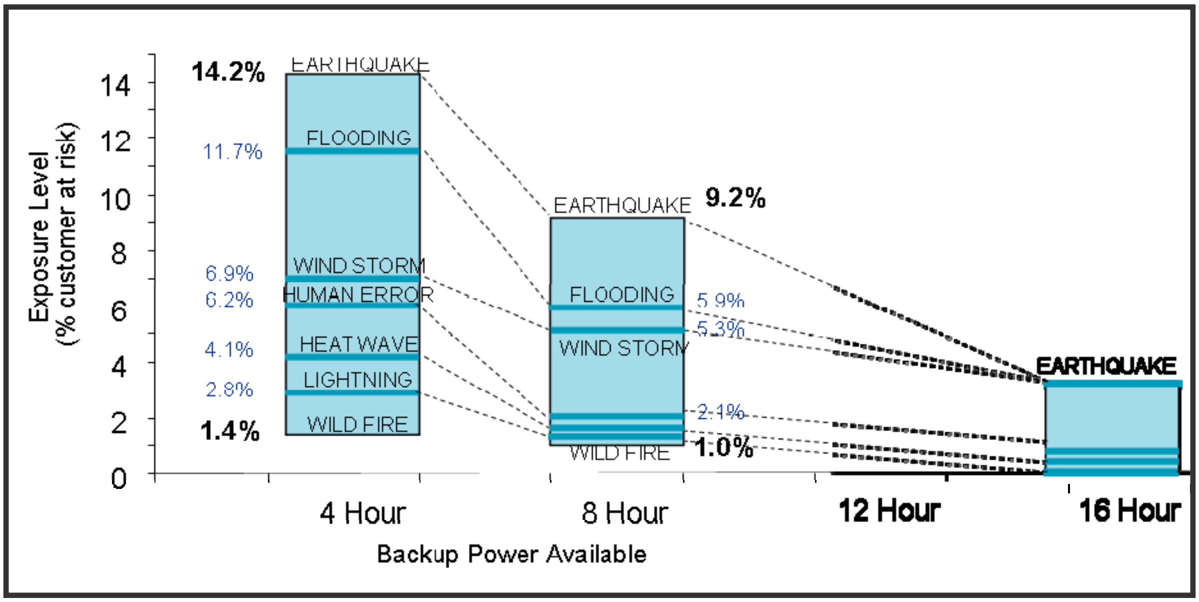

Figure 3. Outage Duration Thresholds for Representative Major Events[32]

Historical data from PG&E indicates that in 6 of the last 10 years at least one major incident has taken place involving power outages affecting over 500,000 customers or 10% of the served customer base; two such major events occurred in each of the calendar years of 1998 and 2002. This provides an indication of the incidence of such major outage events.

4.2.2.2 Backup Power Options

There are a number of options for extending backup power availability to FTTH users. Based on commercially available products used by carriers today, the least disruptive option to extend backup power duration at the customer premises involves the use of external battery packs.

If we consider the estimated cost of CPE backup extension options, at wholesale prices, we can derive a cost curve (Figure 4) for the additional one time costs required to extend the battery capacity to the next level of backup protection based on commercially available options. This additional cost is defined as the ”Solution Cost” in Figure 4.

For instance, a stand-alone ONT device with no BBU has an estimated wholesale cost of $45 per unit. This stand-alone ONT would provide no backup power protection on its own. This $45 is the baseline level from which the additional one time costs is calculated; i.e., Solution Cost of $0. The addition of a standard 7-Ah BBU involves an additional $15 per unit and provides 6.5 hours of backup power at a load of 10W. The next level of protection corresponds to the addition of a basic external battery pack. This would add another $20 per unit and extend the available backup power to 13 hours assuming the same constant load. Finally, to achieve backup durations over 13 hours (at the same load) a high-capacity battery pack would be required at a cost of $50 per unit (an incremental $30 over the basic pack).

[32] The percentages shown on this chart are absolute values corresponding to each major event. For example, the percentage of customers experiencing an outage longer than 4 hours due to a major wind storm is estimated at 6.9% on average, while the average percentage of customers experiencing an outage of 4 hours or more in duration due to flooding is estimated at 11.7%. The numbers are not cumulative.

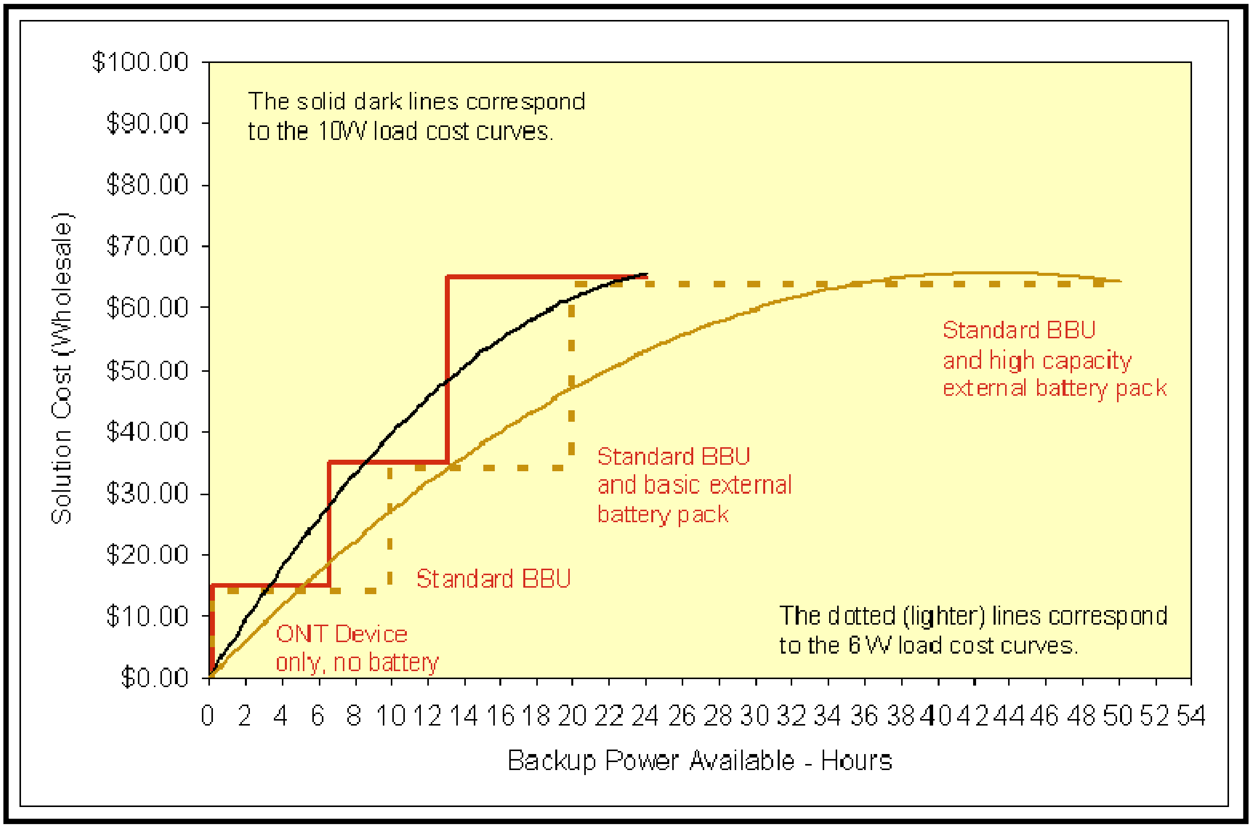

Figure 4. Extended Backup Power Cost Profile: Wholesale

The cost analysis was based on an anticipated telecom load to the battery of 10W in the event of a power outage. As discussed Section 4.2.1.3, energy is required to run (i) the customer premises interface equipment to monitor battery status and alarm systems, (ii) signal the presence and status of the customer to the network, and (iii) operate the telephony service. The value of 10W for this telecom load was representative of the higher loads reported for various current FTTH systems.

Through using the power conserving protocols discussed earlier in Sections 4.2.1.2 and 4.2.1.3, the load on the BBU may be significantly lower than the 10W considered above. If the load is reduced, the effect on the cost curves will be longer backup duration times for the same cost. The implication is that a more conservative view of power consumption at the customer premises during a power outage translates to significantly longer backup availability and thus reduced incremental costs. For instance, the use of the standard ONT/BBU device with no external expansion could yield an estimated 10 hours of backup power at an average load of 6W (i.e., a 50+% increase in backup time over the 10W case study).

Decreasing the load on the battery through using “low-power-use” standby modes and idle settings on customer equipment will be more cost effective and permanent than simply adding extra batteries.

For cases where extensive power outage occurs because of widespread floods, major earthquakes, hurricanes, or other event with extensive collateral infrastructure damage, one must consider that customer’s homes and other belongings will be destroyed or inaccessible. If telecommunications service is maintained to a flooded or destroyed house, there is no point and no benefit.

4.2.3 List of Available Options

Having reviewed the cost factors, technical issues, and industry provided data from workshops and questionnaires, we can now return to the initial questions raised for this Issue #1 and provide a series of answers and options based on the above discussions and observations.

4.2.3.1 Minimum Operating Lifetime

The technical answer for a given battery at the customer premises is “it depends”. The battery useful life depends on the quality of the initial battery product deployed, the climate and location of the battery (attic or basement), the frequency of discharge/charge cycles experienced, and the load on battery when needed. Battery lifetimes before replacement can be as short as 1-2 years in hot exposed applications, and as long as 7-10 years depending on the ambient temperatures and load placed on the batteries.

Given current battery technologies and the typical customer premises environments (i.e., located in the mild climate of California, inside garages and basements, and experiencing infrequent discharges), minimum battery life before replacement should be at least 3 to 5 years.

Since the owner of the battery has the responsibility for, and cost of, replacement, they will have an incentive to have units with long lives to minimize labor/replacement cost.

- If the telecommunications service provider remains the battery owner and is responsible for maintenance, the CPUC may need to consider setting minimum and/or maximum rates for battery maintenance programs offered by the service provider.
- If the customer is the owner, then a risk exists that batteries will not be replaced on an appropriate schedule (“people are busy”) and the battery capacity will degrade overtime. Therefore, when a power outage occurs, the full design backup time will not be available.

The choice of an acceptable or desirable battery lifetime can not be set independently of the service contract and maintenance plan between telecommunications service provider and customer.

One of the more effective options for CPUC may be to help educate the customer to the pros and cons of backup battery ownership, care, and maintenance; so as to help the customer make the purchasing and service contract decisions.

4.2.3.2 Available Backup Time

Based on the responses from the various broadband service suppliers, the available backup time varies from 0-20 hours. Based on current best practices associated with the backup facilities designed for CO and RT sites, a value for a backup power requirement for customer premises should not exceed the reserve capacity at either of those two network sites. Having a long battery backup requirement at the customer premises is pointless, if the power reserve at the RT site is exhausted.

<u>Possible options include:</u>

1) No required minimum backup reserve at customer premises.
   Such an option could be justified by pointing to (i) the current high implementation of the NRIC Best Practices, and (ii) the industry contingency plans by service providers that have proven adequate to provide emergency telecommunications services in the large majority of power outage situations including the recent firestorms (see Section 4.3.3).
2) Set a required minimum backup reserve at customer premises of 4 hours of emergency usage use or standby time. This time is for the telephone being available for emergency use, not 4 hours of

talk time. This minimum backup time matches the general industry backup capacity at the remote terminals that serve the customer premises (see Section 4.4 below).

3) Select a design minimum of 8 hrs backup as the desired level for basic telephony at the customer premises for broadband services. That is a minimum of 8 hrs of the phone being available for emergency use or standby time. Based on current cited loads, these 8 hours of standby time will equate to 4-6 hours of talk time . The 8-hr value at the customer premises can be considered as matching the recent FCC requirement of Order 07-177 for 8 hours reserve time to be present at Remote Terminals (RTs).

If either Option 2 or 3 are selected, the CPUC should also allow for mitigating circumstances that provides an exemption to the 4- or 8-hr requirement. In this case, the CPUC should require that any such mitigating circumstances be documented by service provider with their contingency plans for their customers. Some possible mitigation reasons could include:

- Documented high economic burden to provider and to customer when they need to replace with, or add, high-capacity battery backup.
- Documented unacceptable increase in loading of toxic or hazardous materials (e.g., lithium, cadmium or lead in batteries) in residence or building – possible compliance conflicts with EPA or OSHA rules.

Contingency options could (i) have an enhanced battery capacity at customer for an extra charge of monitoring and replacement by provider, or (ii) offer of a emergency cell phone as backup for landline (wireline) broadband service for emergency needs.

4.2.3.3 Battery Status

Basic levels of status monitors are routine for most systems with colored lights. For example:

- *Green* for fully charged
- *Yellow* for charging or below full capacity
- *Blinking yellow* indicating low capacity and may need replacement
- *Red* for battery exhausted.

Some units have audio signals although often the alarm beep is not particularly loud. If the broadband power unit or STB becomes unplugged, the customer may not realize or notice until service is lost.

<u>Possible options include:</u>

1) The CPUC may wish to consider a requirement that a series of announcement options be offered to the customer on request. For example:
   - Enhance audio signal with variable volume and/or different pitches for blind, visually-impaired, or hard-at-hearing customers.
   - Improve brightness or size of flashing or blinking light - for deaf, hard-at-hearing or audio-challenged individuals.
   - Add service for text or voice message being automatically sent from battery monitoring system to specific telephone number (SMS system).
2) The CPUC may also wish to encourage the offering of optional services by service providers for disabled or other disadvantaged Californians. For example:

- Subsidize service with additional battery capacity at customer premises at some discounted rate with proof of disability.
- Provide low cost backup of basic telephony service as additional service to customer (e.g., cell phone wireless service for emergency backup if their wireline service goes down or vise versa).
- Encourage with grants or education incentives to establish community service groups to assist disabled Californians in times of emergency (“a buddy system”) – e.g., school groups or local community groups can be provided with grants to have assistance plans and individuals in place to go to specific locations and homes to assist disabled in times of emergency – it would not have to be a power outage, it could be any type of emergency. For example, high school juniors/seniors who participate could get education grants or scholarships to Californian colleges for being active part of the emergency response teams.

The options for improving the battery status indicators are all inter-connected to efforts on customer education. The customer needs to be aware of what is available and what are the battery backup capabilities of their provided telecommunications service.

It should be noted that these added options for monitoring and alarms will increase the load on the battery during a power outage, and thereby decrease the reserve time available from a given battery.

4.2.3.4 Performance Criteria

The appropriate performance reliability criteria for backup power systems installed on the property of residential and small commercial customer by a telephone service provider varies considerably depending on customer expectation and needs. Based on historical power outage frequency data, a backup of 8 hours is more than sufficient for the vast majority of the power outages (see Appendices O and P for more details on power outage frequency and impact on telecommunications services).

The CPUC can consider an option to require service providers to give their customers the following performance data on their backup battery equipment at the customer premises.

- Lifetime of battery = how many years until the battery needs to be replaced.
- Reserve Capacity of battery during a power outage for emergency usage
    - Standby time
    - Talk time (continuous use)
- Recharge Time after outage – Should be less than 24 hours
- Alarm = provide options for lights and audio signals to indicate full, reduced and low battery status.

Individual customers and small business customers may have additional wants and needs above basic (POTS-like) telephony service, which would need to be discussed and negotiated with their telecommunications service providers.

This performance data should be shared with the customer as part of a comprehensive customer education program as described in the next section.

4.2.3.5 Consumer Awareness and Education for Battery Backup at Customer Premise

As noted above, customer education is a critical factor in maximizing the potential of backup systems to achieve their design purposes and objectives. Driving the industry to help provide accurate, relevant information to the customer and ensure that the information is read and understood by the customer may provide the CPUC with one of the more effective initiatives to help maintain telecommunications during emergencies and disasters.

One of the benefits will be that accurate and important information could be posted on the "CPUC's Consumer Education Information" website (http://www.calphoneinfo.com/) regarding the battery back-up systems at residential and small commercial customer premises.

Appendix R provides summary details of the remarks during workshops and later responses to information requests and questionnaires. Based on the submissions, there are various options for customer education materials to consider. The CPUC may wish to consider some of the following options for requirements pertaining to what information is provided and in what manner.

- Require customer disclosure by the service provider regarding battery backup systems at the customer premise per the performance criteria in Section 4.2.3.4 above.
- Specify **how** such information may be provided to consumers. For example, it may be provided in many different formats, including:
    - In advertising and marketing materials, including product brochures and company websites
    - A face-to-face interaction between the installer of the backup power systems and the consumer (e.g., specifically stated in the installer's checklist)[33]
    - Via a sticker to be placed on the telephone modem
    - In welcome kit, with brochures, or CD materials provided after installation
    - Bill inserts
    - Tailored information for consumers with special needs (e.g., hearing and visually impaired) regarding options available to extend the life of the battery in their homes

      NOTE: Information buried in "Service Subscriber Agreement" is NOT considered an effective means to communicate such information to the consumer.
- Specify **what** information shall be included. For example:
    - Why the backup power was installed
    - What that backup power does and does not do
    - How long the phones can operate under backup power
    - Capability to call E-911 in power outages (e.g., lack of backup power may hinder his/her ability to reach E-911)
    - What the maintenance requirements are for such backup power systems
    - Potential risks from such backup power systems

[33] For example, in "Verizon FiOS TV Customer Checklist" add text at the end of line that currently says "Explained ONT and BBU" to read "Explained ONT and BBU including backup power issues and options"

    - Where to find information to Frequently Asked Questions (FAQs) regarding these backup batteries – part of an emergency check list for telecommunications in case or power outage
    - Battery replacement information (800 number, supplier chain stores, etc.).

- Specify the framework of a partnership with the industry to volunteer information destined for the www.calphoneinfo.com website.
    - Appoint a single point of interface within the Commission (e.g., CSID) responsible for collecting information from the industry based on the above criteria
    - Ask CPUC to work with CSID
    - Issue a letter (or a new information request as part of R.07-04-015) to the industry requesting information for the www.calphoneinfo.com
    - Guide and challenge the industry to come up with generic text for posting at the www.calphoneinfo.com on a "win-win" basis for the industry and the consumer.
- Appoint a Commission-sponsored Focus Group[34] (or Task Force) to point out what needs to be done and the type of information needed per topic.

These education programs may need to establish particular vehicles to reach special needs groups such as the deaf, disabled, or visually impaired) regarding the options available to them to extend the life of the battery in their homes. However, it is expected that the current array of communications methods (telephone, written materials, websites, etc.) available should be sufficient.

[34] Similar to what FCC is doing with the NRIC Focus Groups (or ATIS is doing with NRSC Task Forces) to address specific problems or issues.

4.3 Need for Standardization in Emergency Notification Systems and Protocols (Issue 2)

New communications technologies enable local authorities to notify the public in an emergency by a phone call or text message delivered to landline or wireless devices, including cell phones and text pagers. What is emerging is not, however, a unified system.

Without common communication protocols, manufacturers are developing emergency notification systems that require proprietary software. Each system remains targeted toward those living in a particular area, resulting in an archipelago of "islands," with people unable to communicate with those who may be across county or municipal boundaries. Consequently, an escape route recommended by one county may lead those fleeing onto a road that is impassable in the next county.[35]

Across California, a number of communities have successfully deployed emergency notification systems, some of them being very sophisticated, while others have only rudimentary public notification systems.

To help resolve these disparities, the task per AB 2393 is to determine:

- Whether standardized notification systems and protocols should be used by entities that are authorized to use automatic dialing devices to facilitate notification of affected members of the public in the event of local emergencies.

Additional interpretive questions that arise in support of the above central question of AB 2393 include:

- Whether the current state of technology will support a systemic, statewide rollout of notification systems or whether communities should continue their deployment of point solutions
- Whether the random activation of emergency communications systems cause network congestion sufficient to hinder emergency communications.

4.3.1 Background Information

California Public Utilities Codes Sections 2871 to 2876 authorizes the Commission to control and regulate the use of automatic dialing-announcing devices, which are "… *any automatic equipment that incorporates a storage capability of telephone numbers to be called or a random or sequential number generator capable of producing numbers to be called and that, working alone or in conjunction with other equipment, can disseminate a prerecorded message to the telephone number being called*".

Existing law exempts from that Commission regulation law enforcement agencies, fire protection agencies, public health agencies, public environmental health agencies, city or county emergency services planning agencies, or any private for-profit agency operating under contract with, and at the direction of, one or more of these agencies, placing calls through automatic dialing-announcing devices to provide public service information relating to public safety, information concerning police or fire emergencies, or warnings of impending or threatened emergencies.

AB 2393 requires the Commission, in consultation with the OES and the DGS, to open an investigation determine whether standardized notification systems and protocol should be utilized by the above-described entities to facilitate notification of affected members of the public of local emergencies.

[35] Timothy Alan Simon, "Coordination is Vital for Warning Systems," The Sacramento Bee, August 12, 2007.

California Public Utilities Code Sections 2871 to 2876[36] defines the parameters for the connection and use of Automatic Dialing Announcing Devices (ADAD). However, the criteria were written to regulate mass dialing for non-emergency uses, and exempts entities using it for emergency notification. As such, its tenets may not be applicable to the current "next generation" base of emergency notification system users (i.e., public service entities).

The current environment of notification solutions is next generation evolutions of these PSTN-based ADADs, with features and functionality (such as SMS[37], and Internet Protocol based notifications) never envisioned in the existing California Public Utility Code. It appears that in general, notification system vendors are not familiar with the requirements of California Public Utilities Code Section 2875 to notify the telephone utility in writing of the intended use of ADAD equipment. Furthermore, it appears telephone service providers lack clearly defined policies for ADAD users (i.e., who with respect to Section 2875 within the telecommunications company should be contacted and what information should be exchanged).

4.3.2 Current Status and Options for Notification Systems

Across California, a number of communities have successfully deployed emergency notification systems, some of them being very sophisticated, while others have only rudimentary public notification systems, such as air raid sirens. To help resolve these disparities, the challenge is to determine the appropriate responses to various issues and concerns:

- Standard Notification Systems
- Random Activation and Congestion
- Related Regulatory and Industry Initiatives
- User Education.

Each of these topics is explored below.

4.3.2.1 Standardized Notification Systems

AB 2393 tasks the commission to determine:

- *Whether standardized notification systems and protocols should be used by entities that are authorized to use automatic dialing devices to facilitate notification of affected members of the public in the event of local emergencies?*

The results of this investigation suggest that standardized notification systems or protocols should not be required.

To standardize is in effect mandating the requirements of the systems being used by the various municipalities, counties, and universities within the State of California. The current set of notification systems work and save lives, as evident by the overwhelmingly positive comments regarding notification system performance received at the January 2008 California Firestorm Workshop (see Section 4.3.3).

[36] California Public Utility Codes 2871-2876; http://www.leginfo.ca.gov/cgi-bin/waisgate?WAISdocID=01436612864+1+0+0&WAISaction=retrieve

[37] Short Message Service

The study recognizes, however, there may be issues regarding optimization, performance, and operations of notification systems. As such, the following options are presented for further consideration:

1. The State of California OES should consider hosting a workshop to draft an optional set of minimum and model criteria for notification systems. This is not a set of standards, but rather an effort by the State to leverage the procurement and operations experiences of users within the State, and pass that information along to others. At the individual discretion of the various institutions with notification systems, this set of optional criteria could be utilized during their Request for Quote (RFQ) procurement process and implementation of notification systems. Such criteria should consider the needs of persons with disabilities, delivery of TTY (teletypewriter) messages and operational guidelines for the notification systems.
2. The State of California should consider promoting more communications between the carriers, end users (local notification system initiators), and vendors. The State of California should consider requesting that the predominant local carriers (AT&T and Verizon) work with the end users / system owners, and vendors to:
    - Provide a Single Point of Contact (SPOC) at each predominant local carrier, knowledgeable in the aspects of notification systems, to work with the municipalities and other originators of emergency notification messages to educate them on the carriers' concerns regarding potential impacts to the carrier's network.
    - Develop a mutually agreeable set of guidelines for system installation and operation in order to minimize any impacts on the carrier's network. Such guidelines and SPOCs contact should be developed in the context of California Public Utilities Code Section 2875, which states:
        - "*No person shall connect any automatic dialing-announcing device to any telephone line without first making written application to the telephone corporation within whose service area telephone calls through the use of such device are proposed to be placed. In such application, the person shall provide information as to the type of automatic dialing-announcing device proposed to be connected, the time of day such telephone calls are proposed to be placed using such device, the anticipated number of calls proposed to be placed during the specified calling period, the average length of a completed call, and such additional information as the corporation or the commission may require. Upon receiving such an application for service, the corporation shall review the furnished information and, if it appears that calling patterns would create a traffic overload condition or the service would be detrimental to the services of other customers of the corporation, it may deny the application or modify the application and grant the application as so modified.*"

The investigation also considered if the current state of technology will support a systemic, statewide rollout of notification systems or whether communities should continue their deployment of point solutions. Summary conclusions were that:

- Other states are conducting trials of systems that span multiple counties, or statewide systems. Given the embryonic nature of standards and other federal initiatives (such as FEMA's Integrated Public Alert and Warning System, IPAWS), the study concluded that the current state of technology can not adequately support a statewide rollout. This conclusion is based on both the lack of maturity of systems and the limited operational experience of statewide systems. Since vendors and other states have initiated large roll-outs of systems, the CD may wish to monitor the effectiveness of these programs to evaluate (i) their operational impact, and (ii) whether or not they in fact deliver a better Grade of Service (GOS) than the existing set of locally-based notification.

4.3.2.2 Random Activation and Congestion

The investigation considered whether the random activation of emergency communications systems would cause network congestion sufficient to hinder emergency communications. The findings indicate:

1. Although it is possible, the study did not find evidence that the random activation of notification systems caused congestion sufficient to hinder emergency communications. Other activities (such as mass dialing of 911 during a catastrophic event) appear to be more of a hindrance. Furthermore, through an education process such as that outlined in section 4.3.2.5, notification system message initiators could be made aware that they may need to moderate their system use in order to lessen any impacts on the supporting telecommunications carrier network.

2. The analysis highlighted the critical importance of effective communications between all participants, particularly the telecommunication service provider and end user/alert initiator. For example, comments from various carriers reflected the opinions of Verizon, which stated:

   "When a carrier does not expect a mass notification or the mass notification is not programmed in a way to avoid system congestion, the carrier is forced to block calls to prevent switch overload and a potential widespread outage. Instead of balancing the desire or need to send mass notifications with the carrier's need to manage traffic to avoid system overload, mass dialers (including Public Safety Answering Point, PSAPs, and emergency agencies) largely ignore carrier warnings of blocked calls and system congestion and simply automate redialing, thereby imposing a greater burden on the network……."

   "………Impacted carriers have asked the vendors and administrators of these systems to work with them so that both sides can understand the potential impacts of mass dialing on the network. Cooperation has either not occurred or been slow in coming….".

   Such generalizations without specific attributions to incidents in California is indicative of the need for further dialogue, exchange of operational information, and a single point of contact at the local service provider for which the local alerting entities may exchange operational information.

4.3.2.3 Short Message Service (SMS)

SMS-based text messaging is a critical component of existing notification solutions in order to reach a mobile population. It was (i) recognized that the current state of SMS is not intended to reach mass notification over a large geographic area, and (ii) acknowledged SMS's limitations brought forth by various parties that SMS is not appropriate for mass notification. However, the word "mass" does not appear in AB 2393.

The usefulness of SMS for targeted notifications has been demonstrated in various instances. For example, at St. John's University in New York where a man with a gun was spotted, text-based messages to cell phones was the primary means of notification.

The study further acknowledges that the notification system vendors are aware of SMS's limitations. NTI recognized it is critical that:

- End-users (government and university officials) clearly understand the limitations and potential risks that mass SMS delivery can impose, and
- Delivery delays can result if an emergency notification provider attempts to deliver a high volume of SMS messages to a large population within small geographic areas served by relatively few cell sites.

NTI does not consider SMS as a reliable primary vehicle to communicate during an urgent, time-sensitive situation due to the:

- Lack of predictability of the network protocol as it is designed today
- Inability for mass notification companies such as NTI and its partners to detect and subsequently route around network traffic to avoid further congesting the voice and text networks as can be done with voice calls
- Limit on the number of characters that can be sent per message
- Additional strain placed on the network when recipients call 911 to attempt to get more information than can be delivered via an SMS due to character limitations.

4.3.2.4 Other Regulatory and Industry Initiatives

Note that in addition to the FCC, other national standard bodies are investigating the issue of the possible negative effects of notification systems on the performance of the telecommunications network. For example, ATIS[38] is a U.S.-based body that is committed to rapidly developing and promoting technical and operations standards for the communications and related information technologies industry worldwide using a pragmatic, flexible and open approach. ATIS's Network Inter-Operability Committee (NIOC) is addressing an issue entitled "Emergency Notification Systems Jeopardize Network Reliability". They have not yet released recommendations, but they have publicly released some guidance (following) and are working with the carriers on a national basis to address this issue.

The CPUC should consider allowing ATIS to continue its work without subrogating to any state initiated standards.

Furthermore, this investigation suggests considering the recommendations of the carriers outlined during the proceedings to allow national standards in the area of mass wireless notification to unfold fully before considering CPUC actions. For example, general statements made by the carriers were to wait for the FCC actions through the CMSAAC report related to the October 12, 2007 findings scheduled for release soon. Typical comments included:

- Sprint Nextel: "…*respectfully suggested that the CPUC await the release of the CMSAAC findings and recommendations, participate in the ensuing rulemaking and follow the FCC's lead on this issue*".
- T-Mobile: "*… notes that these are the types of issues being fully considered by the CMSAAC as it develops and prepares its recommendations to the FCC for later this fall*". T-Mobile respectfully suggests that *"…this Commission examine the CMSAAC proposal before it takes any further action in this docket*".
- AT&T: "… *strongly believes that any solution for emergency notification must be developed and implemented at a national level and this is what is being done under the WARN Act with*

[38] www.atis.org

recommendations being developed by the CMSAAC". AT&T "…*respectfully suggest that the Commission should actively engage with the CMSAAC*".

4.3.2.5 Education

Public education regarding the availability of and use of emergency notification systems is critical, especially with the growing use of non-facilities based VoIP (i.e., Vonage) and wireless service, which require that the end user subscribe to the alerting entity in advance or they will not receive an alert.

The investigation suggests the CPUC consider adopting these recommendations submitted by the Disability Rights Advocates (DisabRA):

- Public education campaigns must be undertaken by a coalition of public safety, emergency management, private sector, and volunteer organizations to inform the public of the existence of the emergency notification system and how it will function. There must be aggressive outreach to inform people of the need to register their non-traditional communication devices, such as TTYs, internet phones, wireless phones, and pagers. Without registration, there is no way for a locality to maintain a current database of numbers other than those of landline telephones. The need to register should be publicized though public safety announcements, newspaper articles, and website pages, in collaboration with community based organizations. People with disabilities and other groups (e.g., college students) that are likely to use non-traditional communication devices should be specifically targeted.

Encouraging dialogue between those local public sector entities initiating alerts (e.g., municipalities, counties, and universities) and their supporting telecommunications carriers on each stakeholders concerns and issues is part of an ongoing education process.

As part of such an education initiative, the following publicly released points from ATIS should be considered during an exchange of information regarding system operational guidance[39]:

- Educate persons buying, specifying, and operating dial out systems, to the factors which impact network congestion including the following:
    - Number of attempts per minute
    - Number of attempts per minute through same switch, digital loop carrier, etc.
    - Number of redial attempts
    - Interval period between redial attempts
    - Length of message
    - Option to repeat message
    - Number of times a message may be repeated
    - Attempts, and re-attempts, to numbers not in service
    - Making all calls through a single switch
    - Voice mail/answering machine delay period

[39] ATIS NIIF/NIOC, "Short and Long Term Solutions", Issue #0281, Emergency Notification Systems, November 16, 2007

- Educate local entities operating emergency notification systems about network feedback which may be used as input to alert initiation processes related to number of attempts, numbers dialed, etc.
    - Special Information Tone (SIT)
    - Different busy tones
    - Percentage of busy signals per attempt
    - Dial tone delay
- Educate persons buying, specifying, engineering and operating dial-out systems to current and future alternative measures to alert public using telephone networks including:
    - Smart CPE - which can include:
        - A simple alarm, which directs people to use another method for event identification and information, such as radio, television, local information channel, number, etc., or
        - Through a text-message system
    - A Fixed-Line SMS (see SMS comments above)
- Educate the public to minimize the use of telephones during emergencies, and especially when they are aware that emergency notifications are being made using the telephone network.

4.3.3 Firestorm Workshop (Summary of Major Issues & Actions Taken)

Representatives of telecommunications companies, city and government officials, and 2-1-1 systems gathered on January 9, 2008 in San Diego for a California Public Utilities Commission sponsored workshop focused on best practices and lessons learned from the 2007 Southern California firestorms.[40] The objective of the workshop was summarized by CPUC Commissioner Timothy Alan Simon[41] who, with Commissioner Rachelle Chong, chaired the well attended session as follows:

> "…*As the Commissioner assigned to the proceeding in which we are addressing standards for telecommunications backup power systems and emergency notification systems, I want to ensure that we are even more prepared in the event of another disaster*…."

During the day-long event, a number of panels covered a series of topics with a common theme of how various entities responded to ways of improving the State's interoperability of emergency communications and notification systems.

The first panel, moderated by Commissioner Timothy Alan Simon, consisted of executives from the San Diego County Office of Emergency Services, 2-1-1 LA County, 2-1-1 San Diego, and the University of San Diego. This panel reviewed communications issues related to the firestorms and how the state, localities, and OES responded. Issues covered included interoperability, reverse 911/emergency notification systems, 2-1-1 and other systems.

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40 Workshop Agenda: http://www.cpuc.ca.gov/NR/rdonlyres/9658C6F2-E3E9-43BB-8DEE-ADEC4AB4E7C0/0/SB2393WorkshopFinalAgendaevw.pdf

41 Commissioner Timothy Alan Simon Opening Statement: ftp://ftp.cpuc.ca.gov/puc/hottopics/2telco/080109_WkshopEmergencyPrepOIR/Simon%20-%20Opening%20Comments%20San%20Diego%20Workshop.doc

A second panel, moderated by Commissioner Rachelle Chong, consisted of executives from AT&T, Verizon, Cox Communications, and Sprint allowed carriers to:

- Share their experiences during the firestorms, and
- Discuss best practices and lessons learned for emergency situations, including network issues, backup power issues, communication strategies with local authorities and impacted customers, outreach, and additional deployment of staff/repair crews.

A third panel comprised of notification system vendors such as Reverse 911, The NTI Group, and Twenty First Century Communications reviewed best practices and lessons learned.

The closing panel, moderated by Commissioner Timothy Alan Simon, discussed next steps for statewide Best Practices with representatives of carriers, vendors, OES, and DGS.

Several Commissioners provided positive feedback regarding the workshop at the Commission's meeting days later. Commissioner Simon noted that "…*the workshop had an excellent turnout, and that he had learned a lot*". He noted that "…*the workshops were attended by utilities, local officials, legislators, and Commission staff*".

Commissioner Simon remarked[42] that the "…*telecommunications networks continued to operate at high levels*" during the fires. He also stressed that improvements can be made, however, observing that "*getting the word out is not enough in an emergency*."

There needs to be follow-up as people cope with the emergency and its aftermath. Commission Simon emphasized the role that 2-1-1 services play in this process. He also reflected that "*most students no longer use landlines,*" so he expressed hope that the Commission would work with wireless carriers and others to ensure that text messaging and other wireless-oriented technologies could be utilized to notify people about emergency situations. Commissioner Simon stated his "vision" as one in which the state's emergency personnel will be able to deliver coordinated messages to people in emergency-stricken areas in an efficient manner, and that messages would be possible on a regional and a local level.

Commissioner Chong also listed some "takeaway items" from the workshop[43]. She underscored the need for further 2-1-1 rollout, and mentioned the possibility of creating a library of pre-packaged "in language" messages for distribution during emergencies. She also reinforced the need for emergency notifications to be accessible to hearing impaired and disabled individuals. Commissioner Simon echoed these sentiments, noting that disabled access should be a "top priority."

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[42] http://www.cwclaw.com/publications/alertDetail.aspx?id=258
[43] http://www.cwclaw.com/publications/alertDetail.aspx?id=258

4.4 Backup Power Installed on the Network Side to Ensure Communications during Power Outages (Issue 3)

4.4.1 Background Information

Basic network configurations were described earlier in Section 4.2.1 along with relevant observations about power architectures. Further details can be found in Appendix B.

Issue 3 of this investigation considers the backup powering provided on the network side, which covers both:

- The main switching centers (telecom COs, wireless switching centers, and CATV headends[44]), and
- The OSP facilities (not housed in the CO).

The OSP network covers all the facilities and components from the first manhole out from the CO to the wall of the customer premises. The OSP nodes and RTS are locally powered from the AC utility power grid with power interface units located within the cabinet or closure where switch-mode rectifiers convert AC grid power into DC power for telecommunications.

VRLA batteries have been traditionally used as the backup power source for these OSP remote sites such as huts, CEVs (Controlled Environmental Vaults), and cabinets supplying up to 8 hours of reserve time. With increasing demands for connectivity and higher service expectations, the required backup capacity for OSP sites has increased over the last decade. Deployment of alternate higher capacity battery systems has increased to meet this increased backup need. The wide range of climates and locales for OSP enclosures and equipment place environmental, thermal, and pollution stresses on the network equipment including the power interface components and the batteries. More recently NiCad (Nickel Cadmium), NiMH (Nickel Metal Hydride) and some Lithium-based batteries have been introduced as the backup power sources with higher capacities within the OSP environments.

Telcordia Generic Requirements (GRs)[45] are representative of the design and performance guidelines that have been built up over the long history of telecommunications engineering and design, field experience, and product development. Such industry guidelines are constructed through participation of product suppliers, manufacturers and service providers in industry forums. A review of the power-related requirements of the Telcordia GR documents finds a collection of inter-related powering and reserve backup time requirements built around the long-held design objective of meeting the >99.94% end-to-end network availability objective[46]. The high-level review presented in Table 5 provides the key functional performance requirements of note for each network architecture and equipment location were taken from the following telecommunications documents.

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[44] A *CATV headend* is the facility at a local cable TV office that originates and communicates cable TV services to subscribers.

[45] Telcordia (formerly Bell Communications Research or Bellcore) establishes industry-wide generic network equipment requirements pursuant to the guidelines and provisions of the Telecommunications Act of 1996.

[46] "Telcordia Notes on the Networks" Telcordia Special Report SR-2275, Issue 4, October, 2000, pages 4-43.

Telecommunications Power Systems

GR-513	LSSGR (LATA Switching System Generic Requirements) - Power
SR-4482	DC Bulk Power Systems
GR-1500	Powering Telecommunications Loads

Central Office, Wireless MSCs, CATV Headend Locations

GR-1275	Central Office Installation/Removal Guide
GR-1502	Central Office Engineering Guidelines

Remote Terminals and Closures in OSP

GR-57	Digital Loop Carrier (DLC) Systems
GR-487	Electronic Cabinet Closure
TR-1293	Remote Engines.

Table 5. GR Power Requirements for Telecommunications Node Site

Telecom→	CO	OSP Nodes
Wireless→	MSC Base Stations	Base Stations -- Cell Towers
CATV→	CATV Headend	Optical Power Nodes
Telcordia GR and Section	**Requirement**	
GR-513 : Section 2.3 Battery Reserve Time	15 minute battery for activating UPS 4hr + travel time to sites with engine backup 8-hour for site with no engine backup	
SR-4482 Reserve Time Requirement R4-15		Reserve Time of >8 hr
GR-1500 Battery Lifetime Objective O3-39 (VRLA)		>7yr (35C) or 10 yr (25C)
GR-1500 Reserve Time Requirement R4-15	Site without standby generator Reserve of >8 hr	
GR-1500 Reserve Time Requirement R5-25 Objective O5-26 Requirement CR5-27	Sites powered locally from AC utility grid R5-25 – reserve of > 4hr O5-26 – reserve of > 8hr CR5-27 – design shall be expandable to provide more reserve time as needed	
GR-1275 – Reserve Time Requirement R17-149	Backup reserve time never less than 3 hr	
GR-1502 – Reserve Time Requirements R8-6 & R8-32	Generator shall handle expected load for 10-12 yrs and a fuel storage tank capacity to enable 96 hr of engine operation.	
GR-57 (DLC Systems) Battery Reserve Section 11.4		Minimum of 8 hour battery reserve
TR-406 (Bulk Power in Confined Locations)		Size battery plants for RT sites for 8 hours at typical call rates
GR-487 Battery Section 3.19		Battery - 8 hour backup is described as typical reserve
TR-1293 Requirement R3-2		Fuel capacity – 96 hours operation at average load

Although these various requirement documents approach powering requirements from different perspectives, there is a consistent approach of using a minimum of 4 hours of backup service with design guidance of 8 hours (minimum) of battery backup at remote sites. For remote terminals, the design objective of the systems is usually cited as 8 hours at a fixed call rate and stipulations to include travel time to the OSP plant site into the battery plant reserve sizing.

A variety of operational and environmental factors also need to be factored into the battery choices for these OSP locations. A wide range of climates and locales for OSP enclosures and equipment place environmental, thermal, and pollution stresses on the network equipment including the power interface components and the batteries. For example, battery performance and reliability are particularly dependent on average temperature, and the telecommunications load at a specific site can vary greatly. The normal aging of the battery that decreases capacity is factored into the engineering design for the power reserve of the site.

Most CATV and wireless systems used similar design guidelines and traditional VRLA type of NiCaD batteries for providing power backup. Currently, there is greater variability in backup power capacity at wireless sites since they were not necessarily required to meet the same availability and reliability rules and regulations as a traditional telecom wireline provider. Furthermore, the need for backup power for wireless systems is reduced because their architecture may allow for possible re-configuration of the coverage zone for a specific antenna to reduce outage impact through:

a. Remotely or automatically modifying the emitting power of the transmitter, or
b. Expanding effective coverage through joint roaming agreements with other wireless companies in times of emergency or high traffic congestion, or
c. Using power-saving technologies such as beacon based wireless control and monitoring networks, to minimize power use at cell site.

As the future telecommunication networks expand it is assumed that FTTB and FTTH architectures will generally bypass the OSP node as the place that requires substantial utility power or battery backup power. Passive optical networks (PONs) will utilize these OSP nodes simply as passive cross-connect points in the network. However, in the interim, the OSP nodes will continue to provide power connection and backup for all the DLC, xDSL, and copper pair networks. The “interim” is expected to be a considerable number of years since the economic drivers to remove working equipment will not be present. Initial capital costs are high and Return-On-Investment (ROI) timelines are long.

4.4.1.1 Current Available Backup in Network Sites

Survey responses at workshops and information requests showed that most service providers have at least 4 hours of backup with larger provider companies having greater than an 8-hr reserve at over 90% of their RT locations. General conclusions for telecommunications service providers were that:

- Minimum reserve of at least 4 hours of battery backup is standard for RTs, although some providers were uncertain of precise backup reserve their system had.
- Most RT sites of wireline providers use the 8 hours of backup power as the design criteria for:
    - 95% of RT nodes of larger service providers
    - >80% of RT sites of medium and small providers
- Some critical RT sites had 12 hours reserve designed into them and/or had external hookups points for additional power or portable generators (gasoline, natural gas or propane powered).

Although wireless companies sites have a broader range of capacities because of the intrinsic nature and history of the wireless networks, the average levels are as follows:

- 88% of cell sites have emergency power backup
- 80% of these sites have 4 or greater hours of backup reserve.

Some smaller providers rely on the incumbent provider's network with their diesel engine capability at CO and the typical 4-8 hours of battery at the RT as their backup plan for the telephony service they offer. Medium-sized wireless companies design for minimum of 4 hours at most sites with some having longer reserve time. The reserve times cited for these sites are based on engineering and design considerations for the telecom equipment and initial service offerings that were used during the installation of the remote terminal sites to serve a particular community. Re-engineering will occur as the community grows and as the electronic equipment at the site is replaced, upgraded and superseded.

4.4.2 Cost Factors

To modify the backup systems of the RT sites, a company will need to allocate significant capital and operational costs including:

- <u>Batteries</u> – varies from installed cost of $5,000 for a small site up to $25-30,000 for larger sites with additional operational costs associated with disposal costs and a finite battery lifetime.
- <u>Generators</u> – varies from $5,000 to $20,000 for typical sites with some of the larger sites possibly reaching $40,000 or $50,000 for installed cost. Large diesel generators to support central office equipment are much lager and can easily cost $100,000 to $300,000 or more. Operational costs for these generators include fuel supplies, regular maintenance and routine test runs.
- <u>Associated Structural Engineering</u> – may vary from $2,000 to $4,000 for an average RT or cell site.

Enhancing the power reserve at certain locations (e.g., roof-top locations) can be restricted by lack of available space or sufficient structural support (floor loading capacity).

Solutions to such issues that involve using new battery technologies (lighter lithium batteries with greater power density) can be 3-4 times more expensive with additional commensurate costs associated with new rectifiers, controllers and monitoring systems that may be needed for new battery systems. These battery systems have increased energy densities in terms Amp-hr per floor space (square footage), per volume (cubic feet), and per weight (lbs). The network paradigm shift to broadband communication requires battery systems that:

- Can provide such improved volumetric and gravimetric energy density, and
- Have the thermal stability, service life, and cost of ownership attributes that will match the harsh environments found in OSP sites.

It has been a significant business challenge to find energy storage systems with all these characteristics to offset the considerable costs associated with the fundamental change in communication philosophy.

The technologies of alternative batteries have their own problems and auxiliary costs associated with safety factors and environmental regulations (e.g., hazardous cadmium in NiCad batteries, explosion risks of lithium-based batteries). One can consider the recent well-publicized laptop fires that caused large scale recalls of lithium-based batteries and restrictions for airline travel. Whatever backup storage device or alternate power generator equipment technology is used, telecommunications providers and end-users (customers) will need to evaluate the functional performance, reliability, safety, and end-of-life disposal characteristics of the products.

Considering the energy storage choices at RT sites, the traditional VRLAs are old familiar, reliable workhorse technology, with the least expensive initial cost but with environmental and weight issues that may eventually cause economic burdens. The NiMH and NiCad systems have higher (better) energy densities than VRLA and weigh less than VRLA. However, current systems are moderately expensive. Lithium-Ion (LION) systems have become very popular recently because of the much higher energy density and light-weight. With the higher power demands of broadband systems in all OSP and CP applications, the lithium-based batteries appear to offer a solution to meet the reserve times with small volume batteries despite their current high initial cost. There are industry requirements (e.g., Telcordia GR-3150) that address the potential explosion and safety hazards that have surfaced with the lithium batteries. However, it is economic considerations that will determine the marketplace progress and fate of these alternate battery systems. New battery technologies will continue to develop and will eventually provide safe and economically competitive products to provide enhanced reserve energy storage at remote nodes in the telecommunications network.

For the longer term, backup capacity needed at central switching facilities, diesel generators are the engines of choice. Industry standards for diesel generator require a minimum of 72 hours of fuel be on-hand in case of a power outage. Alternative choices for backup engines included fuel-cell systems, which are explored under Issue 5 in Section 4.6 below.

4.4.2.1 Collateral Cost Effects

With the FCC Order 07-177 pending, the cost of adding backup capacity at network facilities is uncertain. The telecom service providers may be required under the FCC mandate to achieve these backup levels.

Any federal rules adopted on these subject matters will have a direct impact on the telecommunications service providers in California as well as nationwide. Those rules will also impact the financial impact analysis and outcome of any additional state rules. For example, if the FCC mandates certain rules to enhance the backup power on the network side, then the telecom service providers in California will have to follow the FCC rules and absorb the additional cost as “part of doing business”. Thus, the financial impact analysis required by AB 2393 to implement Public Utilities Code §2892.1, must take into consideration any final FCC rules.

Ongoing proceedings at the FCC regarding the standardization of the Emergency Notification Systems, may also impact CD’s investigation pursuant to the implementation of Public Utilities Code § 2872.5. It may be <u>premature</u> for the CD to do a full cost/benefit analysis of that topic given all the uncertainties involved.

4.4.3 List of Available Options

Having reviewed the technical factors and industry provided data from workshops and questionnaires, the report can now return to the initial questions raised for this Issue 3:

- Is there a need for backup power systems <u>not</u> located on the customer’s premises?
- What are related and appropriate performance criteria for such backup power systems?

Battery backup values from industry generic requirements and Best Practices (e.g., Telcordia and NRIC) provide for a minimum of between 3 to 4 hours. The value of “8 hours” has been used as a design objective and is now under consideration by the FCC as to be required for all RT sites. Many (not all) RT sites of large and medium providers have at least 8 hours of backup power at those sites. COs, MSCs, and CATV headend facilities are routinely prepared with backup diesel generators.

The current backup reserve capacity and design criteria used for RT and CO facilities have proven adequate for most circumstances (>95% of power outages). As discussed in Section 4.4, all the service providers in California reported compliance meet the NRIC Best Practices:

- The NRIC-VII 52 “Backup Power” practices are extensively implemented
- The NRIC-VII 52 “Backup Power” practices are effective or very effective
- The NRIC-VII 28 “Backup Power” practices are extensively implemented.

The costs to harden network facilities further with increased fuel supplies at CO sites would require larger fuel tanks with commensurate environmental safeguards and hazard reduction protocols. The additional costs of such increased fuel capacity are far greater than the alternate approach of having an efficient fuel delivery schedule and contingency plans in case of an emergency.

By a similar reasoning, the cost of permanently adding battery capacity at a remote terminal is far higher then having a contingency plan for delivery of new batteries or portable generators to critical sites in the case of a long-term power outage or emergency. The probability of the additional battery capacity being needed over the lifetime of the cabinet or the lifetime of the battery is small.

Therefore, this review suggests that industry design standards are adequate for emergency planning:

1. 72 hours fuel storage at the central office facilities, and
2. 4 hours (minimum) of backup reserve capacity at remote terminals with an objective of 8 hours at critical sites.

If the CPUC decides to require minimum backup times, they should also allow for mitigating circumstances that may prevent achieving the desired objectives. Regulatory compliance conflicts can easily arise with EPA rules, local fire codes, hazardous materials loadings and building safety rules. Many remote terminals may be located in restricted right-of-ways, prohibitions in lease agreements, have limited floor loadings on roof tops, or have other restrictions that limits the adding of heavy batteries with toxic compounds to the site. In addition, a wireless company may have flexibility at antenna sites that may entail boosting power of adjacent RT sites to enhance coverage area or having roaming agreements with other carriers. For a CATV company or telephone company, effective contingency plans may entail rapid response repair crews that can be dispatched for rapid restoration of service or some other emergency response plan to re-route traffic and maintain service.

The CPUC can consider that any such mitigating circumstances be documented by service provider and for the service provider to show that an emergency plan is in place to augment the backup powering capacity at these affected sites. The CPUC should strongly consider providing flexibility to service providers to allow for software engineering and network re-configuration as a response to emergency. For example, a provider could reconfigure the network and flow of calls in the virtual switch (PTSN) world rather than force an engineering solution of hardening all the site nodes. Physically hardening all the site nodes with additional capacity can be expensive with duplication of costs for batteries, duplicate circuits and generators.

It should be realized that current communications architectures cannot easily sustain normal telecommunications services during abnormally massive events such as a Katrina-type (e.g., Category 4 or 5) hurricane direct hit on a major city, a Richter Level 8.5 earthquake in California, or a nuclear event. The widespread and massive destructive nature of such incidents results in the physical loss of many COs and multiple remote sites. As a result, communications will be severely disrupted. Increasing battery capacity or fuel supplies at network facilities will not produce a significant reduction in risk in these massive events.

4.5 Level of Implementation of Best Practices by the Different Telecom Industry Segments (Issue 4)

In this investigation of Issue 4, the objectives were to determine:

- Whether the Best Practices recommended by NRIC-VII for backup systems have been implemented by telecommunications service providers operating in California, and
- To what degree they have been implemented.

4.5.1 Background Information

4.5.1.1 NRIC-VII Best Practices: Industry's Perspective as Stated by Focus Groups 3A & 3B in 2005

Since AB 2393 refers to the NRIC-VII Best Practices, it may be beneficial to the reader to understand from what perspective the corresponding NRIC-VII Focus Groups[47] wrote them and what issues designated for further research. After all, the AB 2393 is asking for answers to certain questions left unanswered by the NRIC-VII activities back in 2005.

Also, it may be beneficial to the reader to understand the industry's position and perspective regarding the NRIC Best Practices in general. Below are some relevant excerpts from the corresponding reports of the NRIC-VII Focus Groups' final reports.[48]

> "*Best Practices are statements that describe the industry's guidance to itself for the best approach to addressing a concern. NRIC Best Practices are the most authoritative list of such guidance for the communications industry. They result from unparalleled industry cooperation that engages vast expertise and considerable resources*."
>
> "*The implementation of specific Best Practices is intended to be voluntary. In addition, the applicability of each Best Practice for a given circumstance depends on many factors that needed to be evaluated by individuals with appropriate experience and expertise in the same area the Best Practice is addressing*."
>
> "*It is critical to note that Best Practices are not applicable in every situation because of multiple factors. Therefore, government entities are cautioned that mandating Best Practices could contribute to sub-optimal network reliability or result in other negative consequences*."

4.5.1.2 NRIC-VII Focus Group 3A & 3B: Power Effectiveness Survey (2005)

It is interesting to note here the comparison of the Power[49] Best Practices "Effectiveness" survey done on a national basis by the Focus Groups 3A & 3B back in 2005 with the corresponding survey done by the CPUC in 2007. Specifically, the following statistics summarize the NRIC-VII survey results:

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[47] NRIC-VII Focus Group 3A on "Wireless Network Reliability, and NRIC-VII Focus Groups 3B on "Public Data Network Reliability"

[48] http://www.nric.org/meetings/docs/meeting_20051019/NRICVII_FG3B_FinalReport_September_2005.pdf

http://www.nric.org/meetings/docs/meeting_20051019/NRICVII_FG3A_FinalReport_September_2005.pdf

- NRIC-VII Focus Group 3A (wireless): The Power Best Practices selected for the "Effectiveness Survey" were rated as 99% "Effective" or "Moderately Effective" and, as such, no modifications were identified
- NRIC-VII Focus Group 3B (wireline): "The Power Best Practices selected for the "Effectiveness Survey" were rated effective or moderately effective and, as such, no modifications were identified"

4.5.1.3 NRIC-VII Focus Group 3A & 3B: Power Issues for Further Investigation (2005)

Back in 2005, the NRIC-VII Power Focus Group identified the following issue as one that is emerging as increasingly critical to the reliability of public data network services:

> "*The subject of power for residential and business premises equipment should be considered in future work, primarily as it relates to access to essential services during commercial power outages [Section 3.2.7*]."
>
> *Based on scope, there are some issues that will require further investigation. For the power area, there was one item identified for further investigation relating to the issue of back-up power for on-premise emerging data services equipment. The Power Task Group is providing the following recommendation:*
>
> "*The issue of power for residential and business premises equipment may need to be considered, primarily as it relates to access to essential services during commercial power outages. Cordless wireline phones require electrical power to operate, and wireless phones are limited to the life of the handset battery. The spread of alternate technologies (e.g., VoIP) as a primary communications service expands this issue. Focus Group 3B has identified this issue as something that may need attention, but is outside the area of its charter*."

With the above background information on the NRIC-VII power-related activities, this study now turns to the CPUC activities related to AB 2393.

4.5.2 CPUC Questionnaire on NRIC-VII Power-Related Best Practices

4.5.2.1 CPUC Questionnaire Responses: Data Collection Process

To determine whether the Best Practices[50] recommended by NRIC-VII for backup systems have been implemented and to what degree by telecommunications service providers operating in California, a CPUC questionnaire was prepared (see Appendix D for the Questionnaire description).

The questionnaire was in spreadsheet form and was aimed at collecting statistical information on the level of implementation of the NRIC-VII Power-related Best Practices, an assessment of their effectiveness, and the costs to implement those Best Practices. There are 98 Best Practices related to Power for all segments of the telecom industry (wireline, wireless, CATV, satellite, and equipment providers).

[49] The NRIC-VII Power area includes the internal power systems, batteries, grounding, high voltage and other cabling, fuses, back-up emergency generators, and fuel.

[50] The NRIC website (www.nric.org) has a link to the FCC website (https://www.fcc.gov/nors/outage/bestpractice/BestPractice.cfm) for the Best Practices mentioned in AB 2393.

The questionnaires were distributed electronically to telecommunications service providers (wireline, wireless, and Cable TV Industry segments) on August 27, 2007. The original due-date for responses was September 7, 2007. This date was extended to September 14, 2007, to include as many responses as possible. Some questionnaires were returned at the end of September. Of the companies which received questionnaires, 11 responded. These responses were sufficient to perform a statistical analysis and draw general conclusions regarding the implementation of the "NRIC[51] Power-Related Best Practices" in California. One response was received from a representative of 14 small LECs. This response reflected the collective views of those small carriers which did not provide separate responses. The 14 small LECs ranged in size from companies that serve as few as 300-to-1,000 customers to companies with 10,000 or more customers. These *Small LECs* group account for a total of 0.5-1% of the California telephony customers. Table 6 lists the final number of returned questionnaires.

Table 6. Final Number of Returned Questionnaires

Industry Segment	**Number of Responses**
Large LECs	2*
Small LECs	4
Wireless	3
Cable TV	2
Total	**11**

*NOTE: One Large LEC was also a wireless carrier.

The companies were asked to provide their responses in electronic form, and all responders did so.

4.5.2.2 CPUC Questionnaire Responses: Data Analysis

A statistical analysis of the data for the implementation of the NRIC-VII Backup Best Practices, which was collected via the questionnaires, was completed. For each questionnaire, the initial aggregation is a table with average ratings of each of the Best Practices. In addition, graphs of the average level of "Implementation", "Effectiveness", and "Relative Cost" were developed. These graphs present one variable at a time.

The above analysis approach was pursued (i) over the entire set of responses, and (ii) per industry segment (Large LECs, Small LECs, Wireless, and Cable TV) to get some meaningful results given the idiosyncrasies of each industry segment.

A composite graph, which simultaneously exhibits the three study metrics ("Implementation", "Effectiveness", and "Relative Cost"), was a useful way in analyzing the level of implementation of the NRIC-VII Backup Power Best Practices by the telecommunications service providers in California. These graphs were used to draw conclusions about the degree of implementation and the reasons that may prevent the service providers from fully implemented those Best Practices.

The detailed statistical analysis of the Questionnaire responses is provided in Appendix F while representative conclusions of that analysis are presented below in Section 4.5.2.3 below.

[51] Network Reliability & Interoperability Council (www.nric.org)

4.5.2.3 CPUC Questionnaire Responses: Summary of Analysis

All participants in the workshops were responsive to informational requests and questionnaires. Figures 5 and 6 illustrate answer to the two prime questions of Issue 4:

- Whether the Best Practices recommended by NRIC-VII for backup systems have been implemented by telecommunications service providers operating in California?
- To what degree they have been implemented?

The results are shown for all the telecom service providers overall, and for each specific segment of the industry (e.g., Large LEC, CATV, Wireless, and Small LEC).

Implementation Response Key (Figures 5 and 6):

YES = The practice is implemented by the service provider

PARTIALLY YES = Implementation plans for the practice are being developed.

UNDER CONSIDERATION = The practice is under consideration for implementation.

NO = The practice is not currently implemented and there are no plans to implemented.

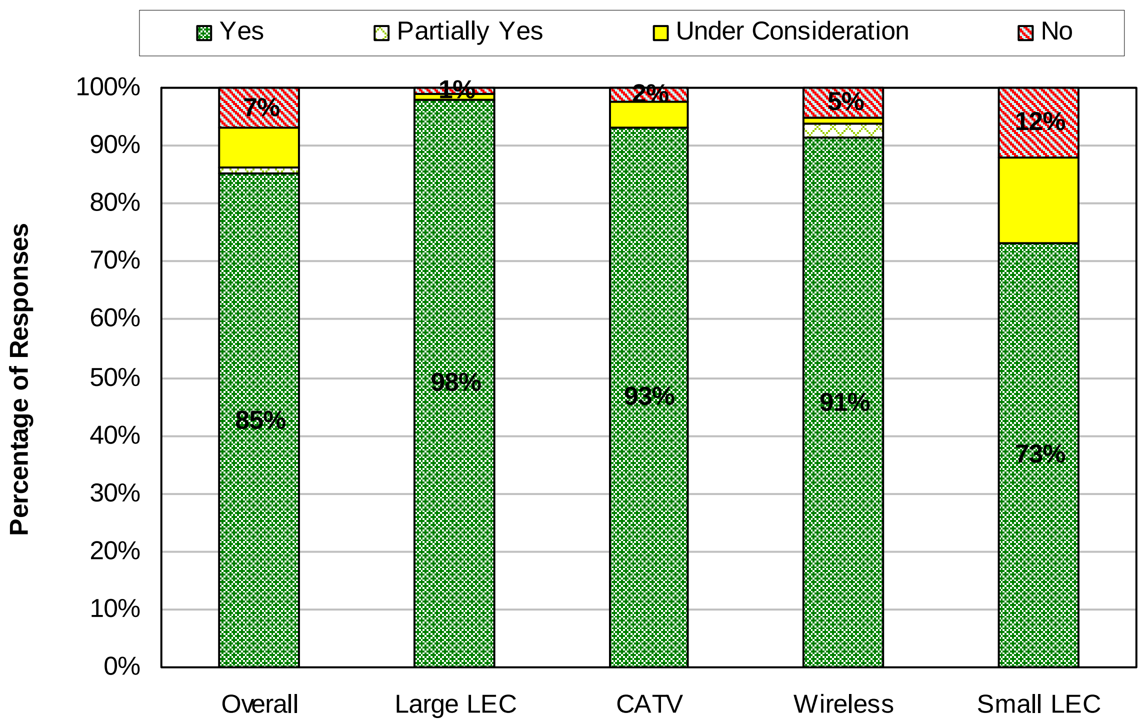

Figure 5. Implementation Responses Regarding <u>All</u> NRIC-VII <u>Backup Power</u> Best Practices

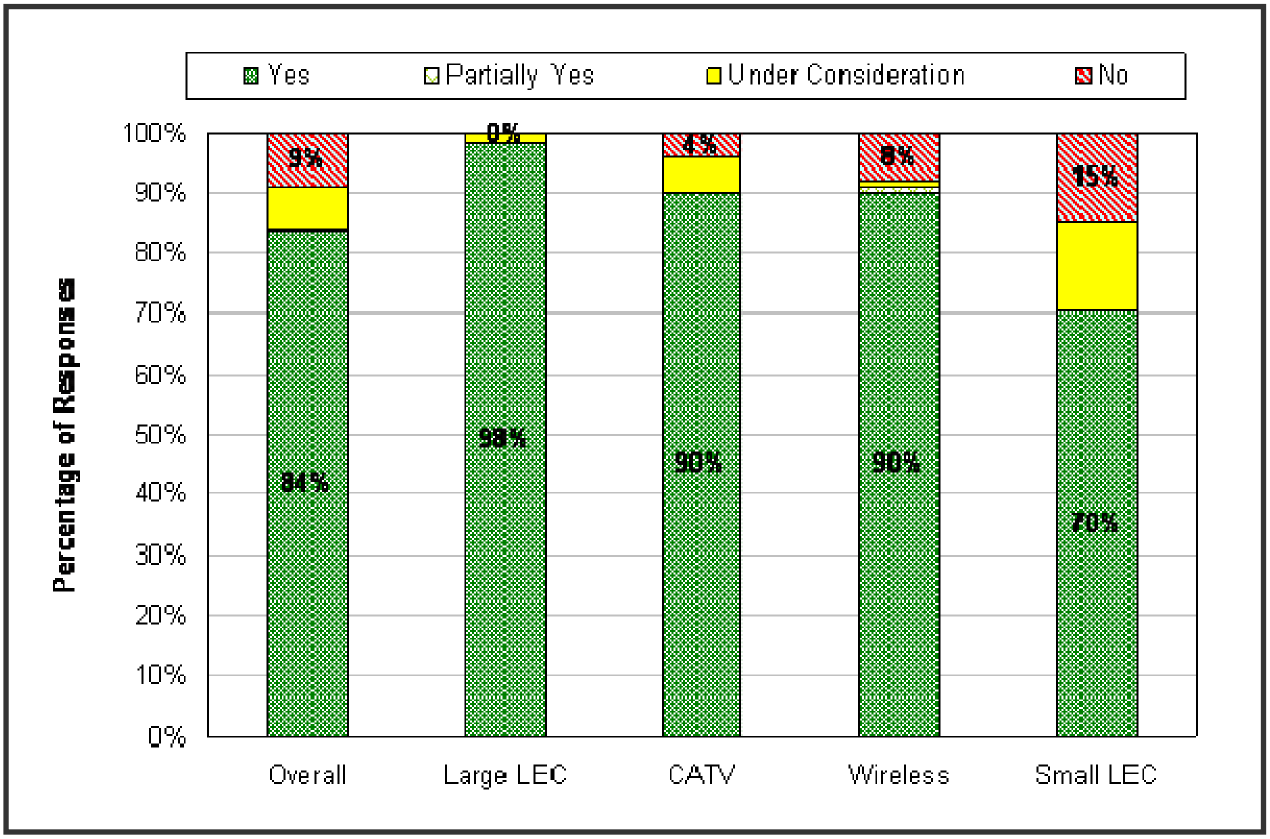

Figure 6. Distribution of Implementation Responses Regarding the NRIC-VII "Generator Best Practices

The main conclusions from the above two figures is that, all segments of the telecom industry with the exception of the *Small LECs* have very high implementation rates (90% or above) of the NRIC-VII Backup Power Best Practices. Statistical tests indicated that the average "Implementation" ratings by the *Small LECs* were lower than those for the other service providers treated as a single group.[52] Following are some specific observations:

- The NRIC-VII 52 Best Practices related to "Backup Power" are extensively implemented by the service providers in California. As shown in Figure 5 above, when taking the telecom service providers as a single group, the overall, the "Implementation" results are: "Yes" (85%), "Partially Yes" (1%), "Under Consideration" (7%), and "No" (7%)" among responses excluding "Don't Know", "Not Applicable", and "Blank".
- In general, the conclusions above appear to hold as well if the analysis is restricted to this subset the NRIC-VII 28 Best Practices related to "Generator Deployment". In particular, the overall "Implementation" results are: "Yes" (84%), "Under Consideration" (7%), and "No" (9%) among responses excluding "Don't Know", "Not Applicable", and "Blank".

[52] Several statistical tests were performed. All indicated that this difference was significant at the .0001 level. This means that there is less than a 0.01% chance that the observed difference is the result of randomness or luck.

- A great majority of the 52 Backup Power Best Practices are considered effective to some degree (scoring of 3 or higher). Almost half (47%) of responses providing a numerical “Effectiveness” rating found them to be “Very Effective (scoring 5)”.
- The “Relative Cost” of implementing these Best Practices is skewed toward the high end (almost four times as many responses above “Moderate [scoring 3]” as below). This indicates that, in general, respondents feel that these NRIC-VII Backup Power Best Practices are more costly to implement than other Best Practices.
- The fraction of “Not Applicable” responses to the CPUC questionnaire is minimal (on the order of 2% for each study metric – “Implementation”, “Effectiveness”, and “Relative Cost”). This indicates that the NRIC-VII Backup Power Best Practices are in general considered applicable by the questionnaire responders.
- The fraction of “Blank" and “Don’t Know” responses is highest for “Relative Cost” and lowest for “Implementation”, with “Effectiveness” in the middle. This indicates that the responding service providers have less understanding of the cost of implementing the Best Practices than they do of their effectiveness or the extent of their implementation.

4.5.3 Financial Implications – Summary

Appendix F contains a number of charts detailing the full analysis of each NRIC Best Practice in terms of their “Effectiveness”, “Implementation”, and “Relative Cost”. The average rating of the Best Practices is provided for the practices related to the “Backup Power” and “Generator Deployment”. The questionnaire responders’ consensus on each such Best Practice give a good indication which Backup Power Best Practices should be adopted first to get largest benefit for moderate cost investment.

For a company that is considering to adopt the NRIC-VII Best Practices but has a limited budget, a good approach is to start with the Best Practices that have the highest “Implementation” rating by the industry, have a high “Effectiveness” rating, and low “Relative Cost” rating.

Consideration of Figure 7 below illustrates the use of these charts. Consider the Best Practice # 7-7-0653, which states:

> “*Network Operators, Service Providers and Property Managers should retain complete authority about when to transfer from the electric utility and operate standby generators*”.

From Figure 7, the Best Practice #7-7-0653 has relative low cost to implement (2.8) and has high to very high “Effectiveness” rating (4.4). Therefore, it follows that the most providers are pleased to implement the practice widely at a rating close to 100% (i.e., 4.8 out of 5).

See the Appendix E for a full listing of all NRIC-VII Best Practices.

Response Key for Figure 7 below:

Implementation

Yes or Partially Yes = 5……….Under consideration = 3….……..No = 1

Relative Cost

Very High = 5…….. High = 4…...Medium = 3…...Low = 2..…Very Low = 1

Effectiveness – in Preventing or Reducing Outages

Definitely Effective and Measurable = 5

Effective Based on Intuitive Opinions or Anecdotal Evidence = 4

Moderately Effective = 3

Slightly Effective = 2

Ineffective = 1

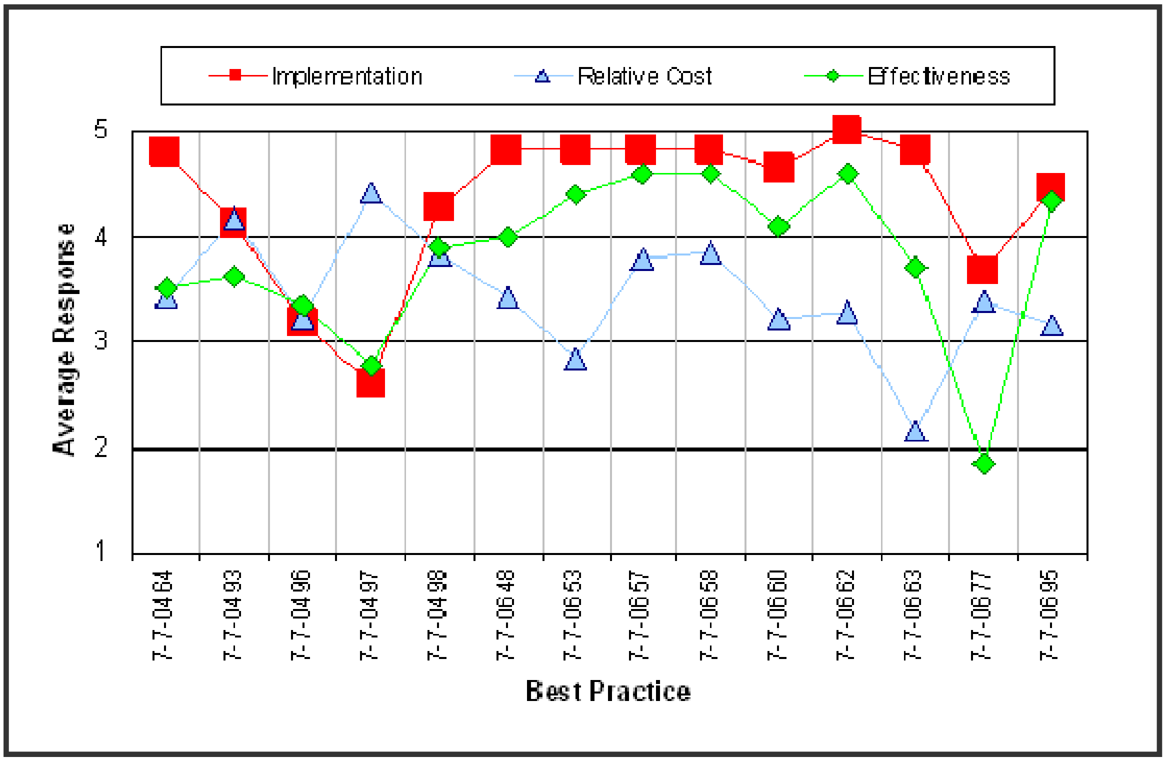

Figure 7. Average Rating of the "Generator Deployment" Best Practices in Terms of "Effectiveness", "Implementation", and "Relative Cost of Implementation"

To facilitate the process of adopting Best Practices under cost constraints, a more sophisticated methodology is given in Appendix F. Specifically, a table in that Appendix ranks the Best Practices with respect to "Implementation" versus "Effectiveness" and "Relative Cost".

4.5.4 List of Available Options

The level of participation and responsiveness of service providers to information requests on best practices was excellent. Generally service providers have a high implementation rates (90% or above) of the NRIC-VII Backup Power Best Practices. Small LECs, as a single group, were lower than those for the other service providers. The difficulty that smaller LECs have seems to be rooted in the capital costs associated with additional batteries, generators and other backup hardware. Some potential options are:

1) Encourage *Small LECs* to seriously consider implementing the NRIC-VII Best Practices so the statistically significant gap in the implementation of Best Practices between them and the larger LECs will narrow.
2) Encourage all service providers in California to continue participating at:
    - FCC-sponsored forums for Best Practices (e.g., the CSRIC Focus Group on Best Practices when it is activated), or
    - Other industry-sponsored forums involving with the review and implementation of Best Practices (e.g., the ATIS NRSC).

The industry group noted above as *Small LECs* above fall under an exemption to the FCC recommendation described in Section 3 for back up power (in CO 24 hrs and 8 hrs for remote) for utilities. The FCC exempted smaller carriers because of the financial burden it might impose on them.

The high capital costs of implementing NRIC Best Practices were cited as the main hurdle by the *Small LEC* industry group that provided the response to the CPUC questionnaires. Since the majority of these smaller carriers reported as an industry group and not as individual companies, it is not possible to provide a definitive gap analysis of how difficult or costly it would be for these various small companies to meet the critical backup power requirements of the NRIC Best Practices and the proposed FCC criteria of Order 07-177.

State PUCs often have different rules for small rural carriers than does the FCC, because they often regulate the quality of service. Therefore, the CPUC may wish to consider a case-by-case analysis to identify for these smaller carriers what incentives and mechanisms should be used to effectively and efficiently encourage improvements in their backup capacity and contingency planning.

4.6 Feasibility of the Use of Zero Greenhouse Gas Emission Fuel Cell Systems for Back-Up Power Systems Located in Telecommunications Service Provider Facilities (Issue 5)

4.6.1 Background Information

Recent field trials have shown that fuel-cell systems can technically supply power of sufficient amounts and quality to power a CO facility. These systems use natural gas as primary fuel which is reacted and converted to hydrogen and carbon dioxide. The hydrogen is then introduced along with oxygen from air inside the fuel cell where hydrogen is reacted with the oxygen to produce water and electrical energy.

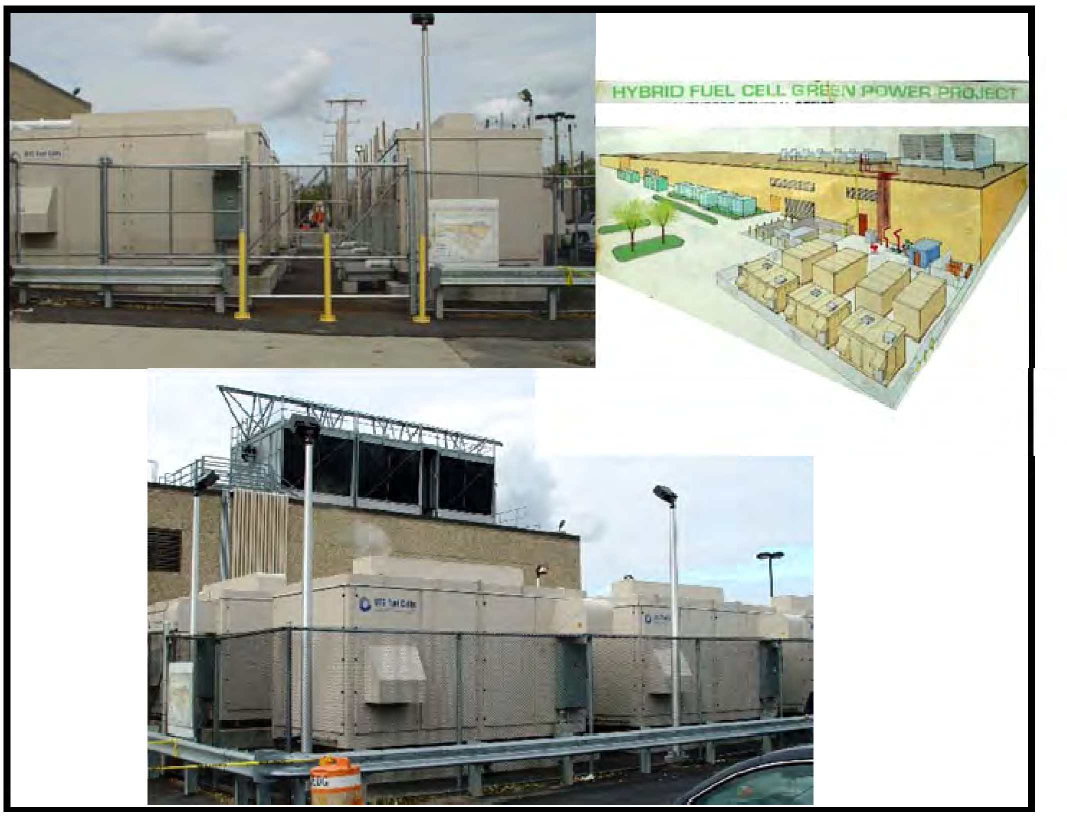

Figure 8. Fuel-Cell Installation at Central Office

Since AB2393 refers to "zero greenhouse gas emission", the investigation needs to consider the source of the hydrogen used in the fuel cell. Hydrogen is not found naturally and needs to be produced from natural gas, fossil fuels, or biomass materials that are converted to hydrogen (H_2) with greenhouse gas byproducts of carbon monoxide (CO) and carbon dioxide (CO_2). Hydrogen can be produced by electrolysis of water using electrical power generated by traditional power stations (fossil fuels). Such electrolysis methods displace the greenhouse gas formation to another location (i.e., coal-fired power station). A true zero-emission process would require the electric power for the electrolysis to be produced from a renewable source such as hydroelectric power, wind power or solar power. The industry infrastructure is not currently in place to accomplish this full zero-emission solution.

Therefore for this study, it is assumed that a "zero greenhouse gas emission fuel cell system" consists of a fuel cell located at the CO that uses bottled hydrogen (compressed gas). Sufficient storage shall be required to maintain 72 hours running capacity. The amount of hydrogen is large and will require considerable amount of infrastructure to ensure safety, security and physical space for such a large gas supply.

An economic comparison between the traditional diesel generator and a fuel-cell system can be completed with the proviso that the long history of diesel generators allows considerably more accurate information on capital costs and operational costs to be available. This is in marked contrast to the fuel-cell cost information, which contains much more conjecture and is therefore far less precise. Some of the factors to be considered include:

- Installed First Costs – including site preparation (architectural, structural, mechanical and electrical) and the basic capital cost of generator equipment & accessories.
- Installation Costs – covering labor & testing of system along with the associated planning and engineering necessary.
- Underground Storage Tank – base cost and monthly monitoring charges.
- Recurring Operational Expenses -– including the annual maintenance with replacements of oil, coolant and startup batteries along with the labor for monthly tests of the engine.
    - Includes Fuel Consumption and Average Repair Costs.
- Safety and Regulatory Compliance – includes monitoring charges, pollution control measures and required reporting to governmental agencies.

Several telecommunications providers have carried out trials for fuel-cell solutions. From these trials, a number of fundamental challenges have surfaced including capacity limitations and adequate space for fuel storage particularly at remote sites. However, the economic factors in terms of cost per kilowatt of energy and long ROI statistics have been the more difficult hurdle to surmount.

In the view of the several telecommunications providers who have shared their trial results, the existing:

> "*PEM[53] fuel-cell technology has not yet reached the point where cells can be made with the required energy density and capacity to power a CO location*."

Often comments were heard that existing fuel-cell solutions have limited capacities. The use of systems in the 5 kW range was mentioned as the more mature systems whereas typical telecom applications require capacities in the 30 kW (wireless cell site) to 1,000kW (CO facility).

Compliance issues are often cited for not considering fuel cell systems for remote terminal sites. Issues of the lack of available space and the amount of hydrogen fuel required to support a 30 kW site for 72 hours.

The surveyed telecommunications providers were also not optimistic on total cost for the systems with values cited from 3 to 15 times more per kW of capacity when compared with traditional diesel systems. Comments were also received to the effect that the ongoing operating expenses may be higher than diesel generators with fuel costs of the hydrogen being four (4) times more expensive that an equivalent gallon of diesel.

Based on data supplied by these telecommunications providers, a cost analysis was performed based on cost data supplied by service providers.

[53] Proton Polymer Electrolyte Membrane (PEM) fuel cells or also called Proton Exchange Membrane (PEM) fuel cells.

4.6.2 Financial Analysis

A comparison was made between the one-time and recurring costs associated with diesel generators and those provided for fuel cell solutions (see Appendix O for details). Cost figures were normalized, where applicable, to reflect the cost per kilowatt of power capacity. This analysis protocol enabled comparisons between systems of varying capacities.

Using all of the provided data, it is possible to derive and compare two main metrics associated with the diesel and fuel cell powering solutions: "Installed First Cost"and "Annual Recurring Expense". Both of these metrics are normalized on a "per kW" basis for comparative purposes.

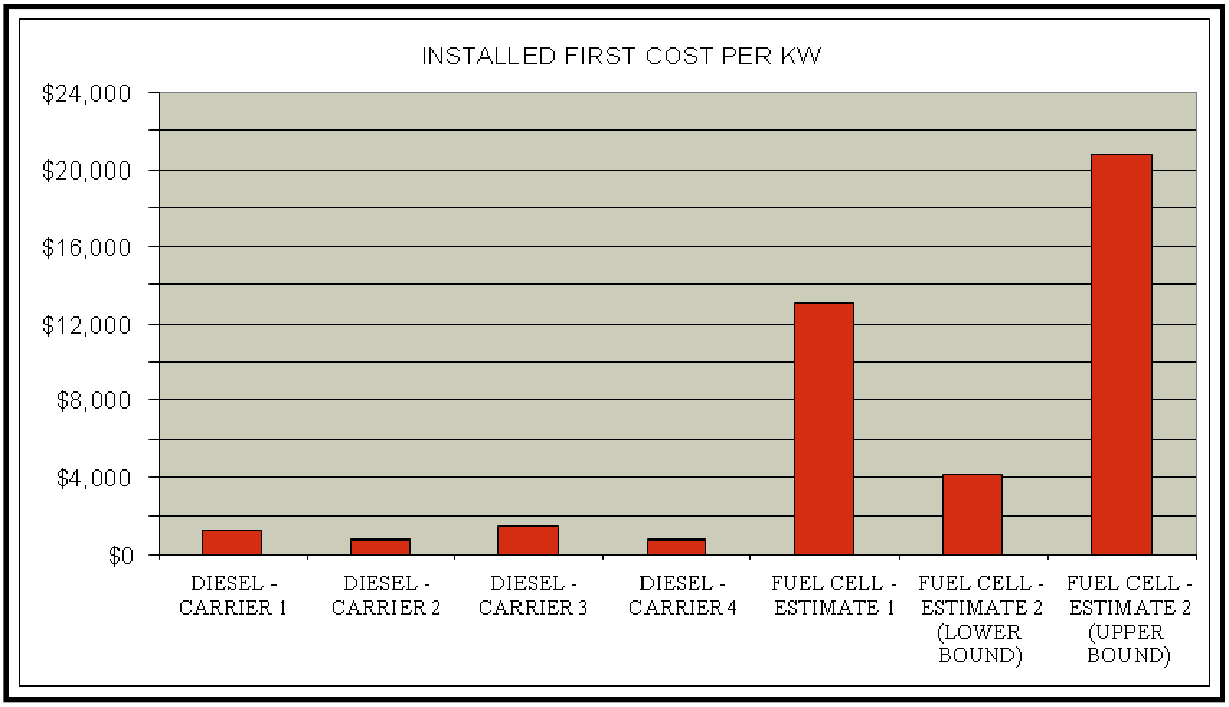

Figure 9. Installed First Cost per kW for Diesel and Fuel Cell Solutions

Figure 9 illustrates how all four diesel solutions involve cost per kW metrics that are less than $2,000 (ranging from close to $800 to roughly $1400 per kW of capacity), while the fuel-cell cost estimates are considerably higher and vary dramatically depending on which view of the responses is considered.

Even if we were to consider a 50% improvement in cost/performance scalability with fuel-cell production volumes, the fuel cell is many times more expensive to deploy in the near term.

Estimates of recurring operational expenses were also derived to compare the two solutions (diesel versus fuel-cell generator systems). These costs are shown in Figure 10 and Table 7 below and include cost components such as the following items:

- Annual maintenance
- Oil
- Coolant and battery replacement (when applicable)
- Labor for monthly tests

- Underground storage tank monitoring
- Cost of additional storage space (rental expenses)
- Safety compliance and pollution control measures
- Fuel consumption and average repair costs.

The results show substantially higher costs for fuel cell systems, based on today's solutions.

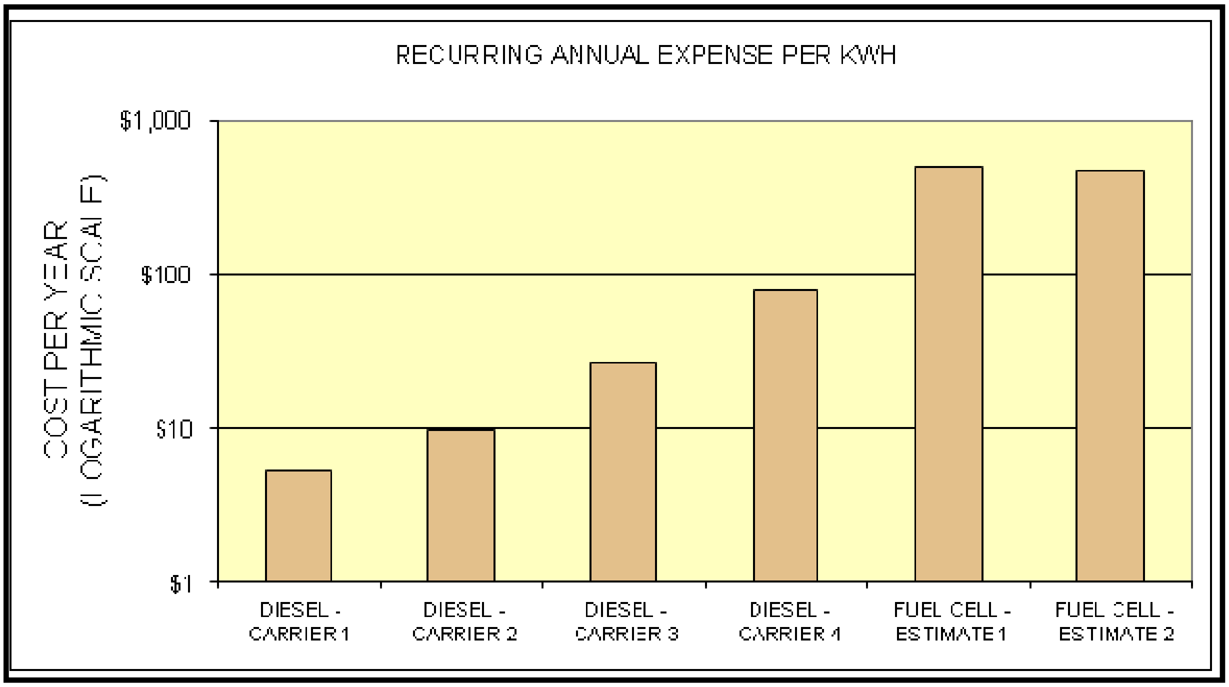

Figure 10. Estimated Annualized Expenses - Diesel Generator vs. Fuel-Cell Systems

Note: A logarithmic scale was used for this figure to better illustrate the differences in the cost metrics. See Table 7 below for the individual cost numbers calculated from the analysis.

Table 7. Annualized Expenses for Different Engine Generators

Engine Facility	Annualized Total Expense per kWH
Diesel – Carrier 1	$5.31
Diesel – Carrier 2	$9.78
Diesel – Carrier 3	$26.57
Diesel – Carrier 4	$79.20
Fuel Cell – Estimate 1	$503.61
Fuel Cell – Estimate 2	$472.54

Although there is considerable variation between the individual diesel generator cases (from $5 to $80), the annual costs for the fuel cell systems were at least six times greater than for diesel engines.

One of the fundamental reasons for the above results is the state of the fuel-cell technology today. Existing solutions have limited capacities; the use of fuel-cell systems in the 5kW range is mentioned as part of the carrier's trial information. However, most typical telecom applications require capacities in the 30kW (for wireless radio sites) to 1000kW (for landline COs).

Their unproven reliability leads telecom power engineers and network operations departments, who have the responsibility to maintain service, to be reluctant to rely on the new technology. At the field trial site, the retention of older engine/battery system as backup during initial trials of fuel-cell technology shows that network engineers are nervous about relying fully on a new technology.

Survey data gathered at the 2004 *IEEE Communications Quality& Reliability (CQR)* Conference reflect that the network engineers for telecommunication power see (i) criticality of the site in the architecture, and (ii) cost of backup power, as the two major factors that influence the engineering design and type of backup power used at a site. The reliability of commercial power is a secondary factor. This same survey also showed that, although there is interest in the newer alternate energy sources discussed above (solar, wind, fuel cell), the traditional batteries and diesel generators remain the most reliable sources of backup power for these SMEs who bear the responsibility of maintaining power to the telecom network (see Appendix M).

As the fuel-cell systems gain acceptance and broader use in all types of sizes and installations, the technical feasibility issues may be resolved. If the relative cost to the service provider can be reduced through technical improvements in fuel-cell production, governmental research grants to encourage alternate energy development or significant increases in the cost of current AC utility power costs, then fuel-cell systems may become more economically attractive.

Currently there are a few demonstration projects which show that some of the capacity and storage problems can be solved. However, the high initial capital costs will limit widespread use of fuel-cell systems in telecommunications networks over the near future (i.e., the next 5-10 years).

4.6.3 List of Available Options

At present, the system of diesel generator and battery backup at the central office is viewed as more reliable and efficient, and has better economics than zero-emission fuel-cell systems.

Without external grants or incentives, the high initial expenditure of fuel-cell systems with associated hydrogen storage needs, the economic business case and return-on-investment calculations are not attractive.

The CPUC can consider:

1. Encouraging use of clean diesel in engines as much as possible to reduce harmful emissions.
2. Encouraging field trials of alternate energy. The CPUC may also be able to use its influence to help facilitate field trials of alternate energy including fuel cell, solar and wind sources. However, such actions may be beyond the immediate scope of the CPUC mandates and would need to be done in concert with other state and federal government agencies (e.g., DOE, EPA, and DHS.

5 OUTSTANDING ISSUES

This section identifies backup power and emergency notification system issues either outside the scope or not fully addressed by this study.

5.1 FCC Order – Implications and Implementation

The consequences of full implementation of FCC Order 07-177 and other federal rules adopted on these subject matters will have a direct impact on the telecommunications service providers in California as well as nationwide. Those rules will also affect the financial impact analysis and outcome of any additional CPUC initiated rules. For example, if the FCC mandates certain rules to enhance the backup power on the network side, then the telecom service providers in California will have to follow the FCC rules and absorb the additional cost as "part of doing business". Thus, the financial impact analysis required by AB 2393 to implement Public Utilities Code §2892.1, must take into consideration any final FCC rules.

Ongoing proceedings at the FCC regarding the standardization of the Emergency Notification Systems, may also alter the CD's investigation pursuant to the implementation of Public Utilities Code § 2872.5. It may be premature for the CD to do a full cost/benefit analysis of that topic given all the uncertainties involved.

This study also recognized that in addition to the FCC, other national standard bodies are investigating the possible effects of notification systems on the performance of the telecommunications network. For example, ATIS is a United States based body that is committed to rapidly developing and promoting technical and operations standards for the communications and related information technologies industry worldwide using a pragmatic, flexible and open approach. ATIS's Network Inter-Operability Committee (NIOC) is addressing an issue entitled "Emergency Notification Systems Jeopardize Network Reliability". The committee has not yet released recommendations, but has publicly released some guidance and is working with the carriers on a national basis to address this issue. It would seem prudent to allow ATIS to continue its work without subrogating to any state initiated standards.

5.2 Massive Events

It should be realized that current communications architectures cannot easily sustain normal telecommunications services during abnormally massive events such as a Katrina-type (e.g., Category 4 or 5) hurricane direct hit on a major city, a Richter Level 9.5 earthquake in California, a massive cyber attack of the networks, or a nuclear event. The widespread and massive destructive nature of such incidents results in the physical loss of many COs and multiple remote sites. As a result, communications will be severely disrupted.

For such massive incidents, recovery and restoration plans will be critical to manage the rebuilding of telecommunications networks. These plans may involve extensive deployment of mobile cell tower sites for rapid re-establishment of telecom services and links to the rest of the country and the world. In these events with large scale and widespread destruction of property and infrastructure, the temporary recovery and restoration plans may be very different from traditional telecom services and also different from the best solutions for long-term re-building of a telecommunications network. The discussion of detailed plans for these recovery and restoration efforts is beyond the scope of this report.

5.3 Fuel Cells and Other Alternative Energy Sources

New and emerging technologies can develop in a discontinuous manner with long slow growth intervals followed by occasional sharp jumps as technology advances. The economic viability of a particular technology can be influenced greatly by business economics and political initiatives. The impact of factors like rising costs of raw materials, initiatives to reduce effects of global warming, governmental initiatives and strategic business decisions can often combine to create opportunities for new technology to make large leaps in product development.

High energy density batteries such as lithium-based cells, zero-emission fuel cell systems and renewable resources of wind and solar power, are all examples of solutions that have potential to create significant technical shifts in energy production and distribution. A full analysis of the economic outlook of these alternate energy systems is beyond the immediate scope of this study.

6 CONCLUSIONS & SUMMARY OF POSSIBLE OPTIONS

6.1 Issue #1 – Backup Power at Customer Premises

From the technical review and cost analysis performed in this investigation, the following options are provided for the consideration of the CPUC:

1. Battery lifetime at Customer Premises

   The choice of an acceptable or desirable battery lifetime can not be set independently of consideration of the service contract and maintenance agreement between the telecommunications service provider and customer. One of the more effective options for CPUC may be to help educate the customer to the pros and cons of backup battery ownership, care, and maintenance; so as to help the customer ensure the maximum lifetime is achieved for the battery at their premises. With these provisos, minimum battery life before replacement should be at least 3 years in the mild climate of California.

2. Battery backup reserve time at Customer Premises:

   - No minimum backup reserve at customer premises is required at this time: Such an option could be justified by pointing to the current practices and contingency plans by service providers as adequate to provide emergency telecommunications services in the large majority of power outage situations
   - Set a required minimum backup reserve at customer premises of 4 hours of emergency usage use or standby time. This time is for the telephone being available for emergency use, not 4 hours of talk time.
   - Select a design minimum of 8 hrs backup as the desired level for telephony at the customer premises for broadband services. That is a minimum of 8 hrs of the phone being available for emergency use or standby time. Based on current cited loads, these 8 hours of standby time will equate to 4-6 hours of talk time[54]. The 8-hr value at the customer premises can be considered as matching the recent FCC requirement of Order 07-177 for 8 hours reserve time to be present at Remote Terminals (RTs).

   If the 4- or 8-hr criterion is selected, the CPUC should also allow for mitigating circumstances that provides an exemption to the 4- or 8-hr requirement. In this case, the CPUC should require that any such mitigating circumstances be documented by service provider with their contingency plans for their customers. Examples of acceptable possible mitigation reasons could include (i) documented high economic burden to provider and to customer when they need to replace with, or add, high-capacity battery backup, or (ii) documented unacceptable increase in loading of toxic or hazardous materials (e.g., lithium, cadmium or lead in batteries) in residence or building – possible compliance conflicts with EPA or OSHA rules.

3. Require that a battery monitor and status system be present at the customer premises with options for:

[54] The quantitative relationship between standby time and talk time can be significantly affected by operational factors of the network, component device choices within the set-top-box, backup battery age and quality, and other factors. Reader may refer to Section 4.2.1.3 for more detailed discussion of talk time versus standby time.

- an audio signal with variable volume control,
- a static or blinking light system to indicate battery status and low battery, and
- a service for text or voice message being automatically sent from battery monitoring system to device.

4. Encourage the offering of optional services by service providers for disabled or other disadvantaged Californians with:

    - possible low-priced optional service for additional battery capacity, and/or

    - low cost backup basic service as additional service to customer (e.g., cell phone wireless service for emergency backup if their wireline service goes down).

5. Encourage customers and service providers to use low-energy using equipment with energy-saving sleep, idle and standby operational modes.

6. Expand the customer education outreach and initiatives using the CPUC's "Consumer Education Information" website (http://www.calphoneinfo.com/) and other education means (e.g., bill inserts, brochures, website links, with selected items from the suggestions provided in Section 4.2.3.5.)

6.2 Issue #2 – Emergency Notification

1. The results of the commission's investigation suggest that standardized notification systems or protocols should not be required. Furthermore, this investigation suggests considering the recommendations of the carriers outlined during the proceedings to allow national standards in the area of mass wireless notification to unfold fully before considering CPUC actions. To standardize is in effect mandating the requirements of the systems being used by the various municipalities, counties and universities within the State of California.

2. The State of California OES should consider hosting a workshop to draft an optional set of minimum and model criteria for notification systems. This is not a set of standards, but rather an effort by the State to leverage the procurement and operations experiences of users within the State, and pass that information along to others. At the individual discretion of the various institutions with notification systems, this set of optional criteria could be utilized during their Request for Quote (RFQ) procurement process and implementation of notification systems. Such criteria should consider the needs of persons with disabilities, delivery of TTY (teletypewriter) messages and operational guidelines for the notification systems.

3. The State of California should consider promoting more communications between the carriers, end users (local notification system initiators), and vendors. The State of California may wish to request that the predominant local carriers (i.e., AT&T and Verizon) work with the end users/system owners, and vendors to provide a single point of contact, knowledgeable in the aspects of notification systems, to (i) work with the originators of emergency notification messages to educate them on the carriers concerns, and (ii) work with the notification system vendors, and alerting agencies, to develop a mutually agreeable set of guidelines for system installation and operation in order to minimize any impacts on the network.

4. Public education campaigns must be undertaken by a coalition of public safety, emergency management, private sector, and volunteer organizations to inform the public of the existence of the emergency notification system and how it will function. The CPUC can help to encourage the aggressive outreach to inform people of the need to register their non-traditional communication devices, such as TTYs, internet phones, wireless phones, and pagers with their local alerting entity.

5. The carriers have adopted a position in the area of mass wireless notification to allow national standards unfold, and to follow the lead of the FCC. The investigation suggests that the CPUC may wish to consider following those suggestions or at least allow these federal efforts to fully unfold before considering initiating further CPUC actions in this area.

6. While it is possible, the investigation did not find evidence that the random activation of notification systems caused congestion sufficient to hinder emergency communications. Other activities (such as mass dialing of E-9-1-1 during a catastrophic event) are more of a hindrance. Furthermore, through an education process, end users could be made aware that they may need to throttle back their system in order to lessen any impacts on the carrier's network infrastructure. The CPUC may wish to encourage communications between the upstream service provider and end user/alert initiator occurs regularly.

6.3 Issue #3 – Backup Power at Network Sites

The current backup reserve capacity and design criteria used for RT and CO facilities have proven adequate for most circumstances (>95% of power outages). The large majority of customers in California are served by providers who comply with the NRIC Best practices. The costs to harden network facilities further with increased fuel supplies at CO sites would require larger fuel tanks with commensurate environmental safeguards and hazard reduction protocols. The additional costs of such increased fuel capacity are far greater than the alternate approach of having an efficient fuel delivery schedule and contingency plans in case of an emergency.

By a similar reasoning, the cost of permanently adding battery capacity at a remote terminal is far higher then having a contingency plan for delivery of new batteries or portable generators to critical sites in the case of a long term power outage or emergency. The probability of the additional battery capacity being needed over the lifetime of the cabinet or the lifetime of the battery is small.

Therefore, this review suggests that industry design standards are adequate for emergency planning:

1. 72 hours fuel storage at the central office facilities, and
2. 4 hours (minimum) of backup reserve capacity at remote terminals with an objective of 8 hours at critical sites.

If the CPUC decides to require minimum backup times, they should also allow for mitigating circumstances that may prevent achieving the desired objectives. Regulatory compliance conflicts can easily arise with EPA rules, local fire codes, hazardous materials loadings and building safety rules. Many remote terminals may be located in restricted right-of-ways, prohibitions in lease agreements, have limited floor loadings on roof tops, or have other restrictions that limits the adding of heavy batteries with toxic compounds to the site. In addition, a wireless company may have flexibility at antenna sites that may entail boosting power of adjacent RT sites to enhance coverage area or having roaming agreements with other carriers. For a CATV company or telephone company, acceptable contingency plans may entail rapid response repair crews that can be dispatched for rapid restoration of service or some other emergency response plan to re-route traffic and maintain service.

The CPUC can consider require that any such mitigating circumstances be documented by service provider and for the service provider to show that an emergency plan is in place to augment the backup powering capacity at these affected sites. The CPUC should strongly consider providing flexibility to service providers to allow for software engineering and network re-configuration as a response to emergency. For example, a provider could reconfigure the network and flow of calls in the virtual switch (PTSN) world rather than force an engineering solution of hardening all the site nodes. Physically hardening all the site nodes with additional capacity can be expensive with duplication of costs for batteries, duplicate circuits and generators.

6.4 Issue #4 – Compliance to NRIC Best Practices

The level of participation and responsiveness of service providers to information requests on NRIC Best Practices was excellent. Generally, providers have high implementation rates (90% or above) of the NRIC-VII Backup Power Best Practices. Small LECs, as a single group, were <u>lower</u> than those for the other service providers. The difficulty that smaller LECs have seems to be rooted in the capital costs associated with additional batteries, generators and other backup hardware.

1. Encourage small LECS to seriously consider implementing the NRIC-VII Best Practices so the statistically significant gap in the implementation of Best Practices between them and the larger LECs will narrow.
2. Encourage all service providers in California to continue participating at:
    - FCC-sponsored forums for Best Practices (e.g., the CSRIC Focus Group on Best Practices when it is activated) or
    - Other industry-sponsored forums involving with the review and implementation of Best Practices (e.g., the ATIS NRSC).

The industry group noted above as *Small LECs* above fall under an exemption to the FCC recommendation described in Section 3 for back up power (in CO 24 hrs and 8 hrs for remote) for utilities. The FCC exempted smaller carriers because of the financial burden it might impose on them.

The high capital costs of implementing NRIC Best Practices were cited as the main hurdle by the *Small LEC* industry group that provided the response to the CPUC questionnaires. Since the majority of these smaller carriers reported as an industry group and not as individual companies, it is not possible to provide a definitive gap analysis of how difficult or costly it would be for these various small companies to meet the critical backup power requirements of the NRIC Best Practices and the proposed FCC criteria of Order 07-177. The CPUC may wish to consider a case-by-case analysis to identify for these smaller carriers what incentives and mechanisms should be used to effectively and efficiently encourage improvements in their backup capacity and contingency planning.

6.5 Issue #5 – Fuel Cell Backup Generators

A system of diesel generator and batteries is more efficient and economic at present. Without external grants or incentives, the high initial expenditure of zero-emission fuel-cell systems with associated hydrogen storage needs, the economic business case and return-on-investment calculations are not attractive.

1. The CPUC can consider encouraging use of clean diesel in these backup generators to help reduce the harmful emissions.
2. The CPUC may also be able to use its influence to encourage programs of rebates and grants that may be able to help facilitate field trials of alternate energy including fuel cell, solar and wind sources. However, such actions may be beyond the immediate scope of the CPUC mandates and would need to be done in concert with other state and federal government agencies (e.g., DOE, EPA, and DHS).

7 Acronyms

AAPC	American Association of Paging Carriers
AB	Assembly Bill
AC	Alternating Current
ADAD	Automatic Dialing Announcing Devices
ALJ	Administrative Law Judge
ATIS	Alliance for Telecommunications Industry Solutions
BBU	Broadband Unit or Battery Backup Unit
CAP	Common Alerting Protocol
CATV	Cable Television
CD	Communications Division
CEV	Controlled Environmental Vault
CLEC	Competitive Local Exchange Carrier
CMRS	Commercial Mobile Radio Service
CMS	Commercial Mobile Service
CMSAAC	Commercial Mobile Service Alert Advisory Committee
CMTS	Cable Modem Termination System
CO	Central Office
COLT	Cells-On-Light-Truck
COW	Cell-On-Wheels
CP	Customer Premises
CPE	Customer Premises Equipment
CPUC	California Public Utilities Commission
CQR	Communications Quality and Reliability
CSID	Consumer Service and Information Division
CSRIC	Communications Security, Reliability and Interoperability Council

CTIA	Cellular Telecommunications Industry Association
CTU	Certificated Telecommunications Utilities
DAS	Distributed Antenna System
DC	Direct Current
DGS	Department of General Services
DHS	Department of Homeland Security
DisabRA	Disability Rights Advocates
DLC	Digital Loop Carrier
DOE	Department of Energy
DSL	Digital Subscriber Line
EA	Economic Area
EAS	Emergency Alert System
ENS	Emergency Notification System
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
FAQ	Frequently Asked Questions
FCC	Federal Communications Commission
FDH	Fiber Distribution Hub
FDT	Fiber Distribution Terminals
FEMA	Federal Emergency Management Agency
FiOS	Fiber Optic System (Verizon)
FNPRM	Further Notice of Proposed Rulemaking
FTE	Full-Time-Equivalent
FTTB	Fiber-To-The-Building
FTTC	Fiber-To-The-Curb
FTTH	Fiber-To-The-Home
FTTP	Fiber-To-The-Premises

FTTx	Fiber-To-The-x (Node/Curb/Home/Premises)
GOS	Grade of Service
GR	Generic Requirements
HAC	Hearing Aid Compatible
HVAC	Heating, Ventilation, Air-Conditioning
IEEE	Institute of Electrical and Electronics Engineers
IFC	Installed First Cost
ILEC	Incumbent Local Exchange Carrier
IP	Internet Protocol
IPAWS	Integrated Public Alert and Warning System
ITU	International Telecommunication Union
ITU-T	ITU Telecommunication Standardization Sector
LATA	Local Access Transport Area
LSSGR	LATA Switching System Generic Requirements
LEC	Local Exchange Carriers
LION	Lithium-Ion
LMP	Lithium Metal Polymer
MEA	Metropolitan Economic Area
MSC	Mobile Switching Center
MSO	Main Switching office (for CATV)
MSRC	Media Security and Reliability Council
NA	Not Applicable
NEBS	Network Equipment Building Systems
NENA	National Emergency Number Association
NERC	North American Electric Reliability Council
NGN	Next Generation Network
NiCad	Nickel Cadmium

NID	Network Interface Device
NiMH	Nickel Metal Hydride
NIOC	Network Inter-Operability Committee
NOAA	National Oceanic and Atmospheric Administration
NOC	Network Operations Center
NPRM	Notice of Proposed Rulemaking
NRIC	Network Reliability Interoperability Council
NRSC	Network Reliability Steering Committee
OES	Office of Emergency Services
OIR	Order Instituting Rulemaking
ONT	Optical Network Terminal
ONU	Optical Network Unit
OSHA	Occupational Safety & Health Administration
OSP	Outside Plant
OSS	Operations Support System
PC	Personal Computer
PEM	Polymer Electrolyte Membrane or Proton Exchange Membrane Fuel Cells
PD&G	Pacific Gas and Electric
PON	Passive Optical Network
POTS	Plain Old Telephone Service
PSAP	Public Safety Answering Point
PSHSB	Public Safety and Homeland Security Bureau
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RFQ	Request For Quote
ROI	Return-On-Investment
RT	Remote Terminal
SAIDI	System Average Interruption Duration Index

SAIFI	System Average Interruption Frequency Index
SCE	Southern California Edison
SIT	Special Information Tone
SME	Subject Matter Expert
SMS	Service Message Service
SOCAL	South California
SPOC	Single Point of Contact
STB	Set-Top-Box
TCO	Total Cost of Ownership
TTY	Teletypewriter
UPS	Uninterruptible Power Supply
VoIP	Voice over Internet Protocol
VRLA	Valve Regulated Lead Acid
WARN	Warning, Alert, and Response Network

Appendix A: Order Instituting Rulemaking to Implement AB 2393

ALJ/JPO/sid **Mailed 4/17/2007**

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Rulemaking on the Commission's Own Motion into Reliability Standards for Telecommunications Emergency Backup Power Systems and Emergency Notification Systems Pursuant to Assembly Bill 2393.	FILED PUBLIC UTILITIES COMMISSION APRIL 12, 2007 SAN FRANCISCO, CALIFORNIA RULEMAKING 07-04-015

**ORDER INSTITUTING RULEMAKING
TO IMPLEMENT ASSEMBLY BILL 2393**

Summary

With this decision, the Commission initiates a rulemaking addressing standards for telecommunications backup power systems and emergency notification systems pursuant to Assembly Bill (AB) 2393 (Ch. 776, Stats 2006).

AB 2393

AB 2393 added §§ 776, 2872.5 and 2892.1 to the Public Utilities Code.[55] A copy is included as Attachment A.

A central battery system was deployed by telecommunications providers in the 1920s to improve network operations, performance and reliability. As a result, batteries and generators located in the provider's central office were able to power both the central office and the customer's telephone in the event of a power outage assuming the telephone system is otherwise intact. The same continues to be true today for customers receiving landline service from a facilities-based provider of telephony services (telephony provider) through copper wires. However, newer communications transmission technologies,

[55] All section references are to the Public Utilities Code.

including fiber optic and coaxial cable, may require distributed backup power systems, both in the network and at the customer's premise, in order to have this capability.

Section 776 [AB 2393(1)] requires the Commission to consider the need for performance reliability standards, and to develop and implement performance reliability standards for backup power systems installed on the property of residential and small commercial customers by a facilities-based provider of telephony services, if the benefits of the standards exceed the costs. In any event, the Commission must provide a report to the legislature on the results of this investigation by January 1, 2008. Any standards are to include: minimum operating life, minimum time period in which a telephone system with a charged backup power system will provide the customer with sufficient electricity for emergency usage, and a means to warn the customer when the backup system's charge is low or when the system can no longer hold a charge. In developing any such standards, the Commission is to consider current best practices and the technical feasibility of establishing battery backup requirements. We note that AB 2393 and § 776 do not define "small commercial customer." Thus, one of our tasks is to establish a definition.

Automatic dialing-announcing devices are used in emergency notification systems by law enforcement agencies, fire protection agencies, public health agencies, public environmental health agencies, city or county emergency services planning agencies, and private for-profit agencies operating under contract with, and at the direction of, one or more of these agencies. These are automatic devices that store phone numbers and disseminate a prerecorded message to those phone numbers in the event of an emergency.

Section 2872.5 [AB 2393(2)] requires the Commission, in consultation with the Office of Emergency Services (OES) and the Department of General Services (DGS), to determine whether standardized notification systems and protocols should be used by entities that are authorized to use automatic dialing devices to facilitate notification of affected members of the public in the event of local emergencies.[56] The Commission is not to establish standards for notification systems or protocols unless the benefits of the standards or protocols exceed the costs. The Commission is also required to provide any recommendations it may have for funding notification systems and any statutory modifications needed to facilitate notification of affected members of the public during local emergencies. In any event, the Commission must provide a report to the legislature on the results of this investigation by January 1, 2008.

[56] Our staff has been in contact with the staff of OES and DGS regarding this rulemaking, and we look forward to their continued participation.

As noted above, providers of telecommunications service generally install backup power systems on their property so that their systems can operate when the electric utility serving the property has a power outage. The backup power systems are designed to enable the telecommunications networks to function and customers to contact a public safety answering point (PSAP) operator during an electrical outage. These backup power systems are often batteries supplemented by diesel-powered electric generators, which recharge the batteries. In addition to telephony providers' own motivation to ensure network reliability and operational efficiencies, minimizing communications service disruptions is widely beneficial for public safety and economic sustainability.

Section 2892.1 [AB 2393(3)] requires the Commission, in consultation with OES and DGS, to determine the need for such backup power systems not located on the customer's premises and to determine performance criteria. The Commission is also to determine whether the best practices recommended by the Network Reliability and Interoperability Council in December 2005 (Best Practices) for backup power systems have been implemented by providers of telecommunications service.[57]

If the Commission determines it is in the public interest, it is required to develop performance reliability standards for such backup power systems and implement the standards if the benefits exceed the costs. In developing such standards, the Commission is to consider current best practices and technical feasibility for establishing battery backup requirements.

In addition to the above, the Commission is required to determine the feasibility of the use of zero greenhouse gas emission fuel cell systems to replace diesel generators for such backup power systems.[58] In any event, the Commission must provide a report to the legislature on the results of this investigation by January 1, 2008.

Section 2892.1(a) provides that for the purposes of § 2892.1, "telecommunications service" means voice communication provided by a telephone corporation as defined in § 234, voice communications provided by a provider of satellite telephone services, voice communications provided by a provider of mobile telephony service as defined in § 2890.2, and voice communications provided by a facilities-based provider of voice communications utilizing voice over Internet Protocol or any successor protocol.

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[57] Network Reliability and Interoperability Council (NRIC) VII, Focus Group 1C, "Analysis of the Effectiveness of Best Practices Aimed at E911 and Public Safety, F Report," December 2005. http:/www.nric.org/meetings/docs/meeting_20051216/FG1C_Dec%2005_Final%20Report.pdf . We note that best practices no. 7-7-5204 on p.59 recommends that backup power systems should be located on site when appropriate.

58 Section 42801.1 of the California Health and Safety Code defines greenhouse gas as including carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

As noted above, the Commission is required to report to the Legislature on the above results of each investigation before January 1, 2008, and complete this proceeding within 18 months of AB 2393's effective date, i.e., June 30, 2008.

Backup Power Systems Installed on the Property of Residential and Small Commercial Customers -- Plan of Action

Section 776 addresses backup power systems installed on the property of residential and small commercial customers by telephony providers. The first step in the investigation will be to determine the telephony providers' current practices regarding backup power systems, including the feasibility of establishing such systems where they do not exist. The second step will be to obtain the telephony providers' and other interested parties' recommendations for reliability standards and the associated costs and benefits.

To this end, the Commission's Communications Division (CD) is directed to convene a technical workshop of subject matter experts to inform the Commission on this matter. The workshop to discuss "back up power installed on the property of residential and small commercial customers" will be held June 5, 2007. CD will provide timely notice on the Commission's Calendar and to the service list.

The outcome of the workshop will be an informational request that will seek more detailed information, concerns and issues related to backup power systems on the property of residential and small commercial customers. The request will direct respondents to provide recommendations along with associated implementation costs and benefits. While the bill concerns itself with only backup power, a cost/benefit analysis should be viewed holistically. For example, there is no customer benefit if power is maintained/restored but the lines are flooded under water.

The request will be sent to all facilities-based telephony providers and other interested parties. Upon receipt of the responses to the request, CD will compile the information into a report that:

(a) Identifies the concerns and issues that the Commission must address, including current best practices and the technical feasibility of establishing battery backup requirements;

(b) Identifies recommendations presented by the parties and their level of support;

(c) Identifies a recommended course of action, as well as any other viable options;

(d) Discusses the costs and benefits of implementing the recommended course of action;

(e) Proposes a definition of small businesses for the purpose of this investigation; and

(f) Identifies any concerns or issues that remain to be addressed.

The draft report will be sent to the parties for comment. Upon receipt of the comments, CD, in consultation with the assigned Commissioner, will prepare a revised draft report, which will be provided to the parties for comment.[59] A proposed decision, which adopts a final report, then will be prepared.

Emergency Notification Systems -- Plan of Action

Section 2872.5 addresses standardized notification systems and protocols for emergency notification systems. The first step in the investigation will be, in consultation with OES and DGS, to determine the standards and protocols currently in use by those entities that operate such systems. The second step will be to obtain the operating entities' and other interested parties' recommendations for standards and protocols, and the associated costs and benefits.

To this end, CD is directed to convene a technical workshop of subject matter experts to inform the Commission on this matter. The workshop to discuss "emergency notification systems" will be held June 19, 2007. CD will provide timely notice on the Commission's Calendar and to the service list.

The outcome of the workshop will be an informational request that will seek more detailed information, concerns and issues that must be addressed to establish emergency notification systems. The request will direct respondents to provide recommendations along with associated implementation costs and benefits.

The request will be sent to all facilities-based telephony providers, users of emergency notification systems (such as law enforcement agencies, fire protection agencies, public health agencies, public environmental health agencies, city or county emergency services planning agencies), and other interested parties. Upon receipt of the responses to the request, CD will compile the information into a report that:

1. Identifies the concerns and issues that the Commission must address, including funding of notification systems and any necessary statutory modifications needed to facilitate such notification;
2. Identifies recommendations presented and their level of support;
3. Identifies a recommended course of action, as well as any other viable options;
4. Discusses the costs and benefits of implementing the recommended course of action; and
5. Identifies any concerns or issues that remain to be addressed.

[59] For any or all of these three workshop topics, CD may evaluate a gradation of possibilities with varying costs and benefits. Option A, for example, may have some benefits but relatively high costs. Option B may be the opposite with several other options falling in between. All possibilities may be feasible, and CD will specify its recommended options in accordance with the requirements of §§ 776, 2872.5 and 2892.1.

The draft report will be sent to the parties for comment. Upon receipt of the comments, CD, in consultation with the assigned Commissioner, will prepare a revised draft report, which will be provided to the parties for comment.[60] A proposed decision, which adopts a final report, then will be prepared.

Backup Power Systems Not Installed on the Customer's Premises -- Plan of Action

Section 2892.1 addresses backup power systems not located on the customer's premises. The first step in the investigation will be to determine the telecommunications service providers' current standards and practices applicable to their backup power systems. The second step will be to obtain the telecommunications service providers' and other interested parties' recommendations for reliability standards, and the associated costs and benefits.

To this end, CD is directed to convene a technical workshop of subject matter experts to inform the Commission in this matter. The workshop to discuss "backup power systems not installed on the customer's premises" will be held June 6, 2007. CD will provide timely notice on the Commission's Calendar and to the service list.

The outcome of the workshop will be an informational request that will seek more detailed information, concerns and issues related to backup power systems that are not installed on the customer's premises. The request will direct respondents to provide recommendations along with associated implementation costs and benefits.

The request will be sent to all telecommunications service providers and other interested parties. Upon receipt of the responses to the request, CD will compile the information into a report that:

1. Identifies the concerns and issues that the Commission must address, including whether the best practices have been implemented, and an assessment of the feasibility of zero greenhouse gas emission fuel cell systems to replace diesel generators for such backup power systems;
2. Identifies recommendations presented and their level of support;
3. Identifies a recommended course of action, as well as any other viable options;
4. Discusses the costs and benefits of implementing the recommended course of action; and
5. Identifies any concerns or issues that remain to be addressed.

The draft report will be sent to the parties for comment. Upon receipt of the comments, CD, in consultation with the assigned Commissioner, will prepare a revised draft report, which will be provided to the parties for comment.[61] A proposed decision, which adopts a final report, then will be prepared.

[60] As explained in greater detail in footnote 59, CD may evaluate a gradation of possibilities, and it will specify its recommended options in accordance with the requirements of §§ 776, 2872.5 and 2892.1.

Existing Standards or Protocols

It is possible that there are existing standards or protocols addressing the matters covered by AB 2393. Therefore, we ask the respondents to provide information on any relevant existing state or federal standards or protocols, including citations, as well as any state or federal action that gives the recommendations of standard-setting agencies the force of law.

Respondents

For purposes of this proceeding, all California certificated telephony providers, users of emergency notification systems, and providers of telecommunications service (as defined in § 2892.1.(a)) are respondents.

Service List

The Executive Director shall serve copies of the rulemaking on respondents to this proceeding.

While we have attempted to identify and serve this rulemaking on all respondents, we may have missed some. Therefore, we ask those receiving this rulemaking to share it with any respondents who may not have been served.

We invite broad participation in this proceeding. Those who seek party status, including respondents, or wish to monitor this proceeding may do so by informing the Commission's Administrative Law Judge (ALJ) Process Office (process_office@cpuc.ca.gov) of his or her intent to participate and providing the following information:

a. Name and organization represented, if any
b. Address
c. Telephone number
d. E-mail address
e. Assignment to the appearance, state service, or information only category.

In order to be included on the initial service list of this proceeding, parties should so inform the ALJ Process Office no later than April 30, 2007.

While all respondents identified in the OIR will be bound by the outcome of this proceeding, only those who notify us of their wish to be on the service list will be accorded service by others until final rules are proposed and/or a final decision issued.

The initial service list will be posted on the Commission's website at www.cpuc.ca.gov and will be updated periodically. Parties should use the website service list for service of all filings.

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[61] As explained in greater detail in footnote 59, CD may evaluate a gradation of possibilities, and it will specify its recommended options in accordance with the requirements of §§ 776, 2872.5 and 2892.1.

All filings in this proceeding may be made electronically according to Rule 1.10 of the Commission's Rules of Practice and Procedure (Rules). Consistent with those rules, a hard copy of all pleadings shall be concurrently served on the assigned ALJ.

Jurisdiction

AB 2393 addresses matters related to the reliability of a wide variety of telecommunications services during an emergency, and directs the Commission to undertake the tasks specified therein. Yet the Commission's jurisdiction regarding telecommunications rates and services is subject to limitations depending on the type of telecommunications services being provided.[62]

In the course of this rulemaking, the Commission may identify the need for standards in an area that is not within the Commission's jurisdiction. In such a case, the Commission may recommend state or federal legislation or the adoption of an appropriate standard by the state or federal agency with the necessary jurisdiction. We will invite parties' comments on when jurisdictional issues dictate use of these alternate measures, if any are necessary.

The Commission requests the full cooperation of all respondents and interested parties with CD in carrying out its tasks as described herein.

The participation of a provider of a communications service will not constitute an admission of jurisdiction. Any participating party, however, shall provide information requested by the Commission.

Preliminary Scoping Memo

This rulemaking is instituted for the purpose of implementing AB 2393, as described herein.

This rulemaking is preliminarily determined to be a quasi-legislative proceeding, as that term is defined in Rule 1.3(d) of the Rules. It is preliminarily determined that this proceeding shall be conducted through a written record, and hearings are not necessary.

Respondents and other interested parties are invited to participate in workshops and comment opportunities, as described above.

Rule 6.2 provides that comments may be filed on an Order Instituting Rulemaking addressing the category, need for hearings, issues, or schedule. In particular, we invite comments on how information for this investigation may be best obtained and whether workshops are needed. Comments shall be filed no later than May 4, 2007.

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[62] See, e.g., In re Vonage Holdings Corp., 19 F.C.C.R. 22404, 22424 at ¶ 31 (preempting state regulation of VoIP service offered by Vonage); Minnesota Public Utilities Comm'n v. Federal Communications Comm'n, 2007 U.S. App. LEXIS 6448 (8th Cir. 2007) (recognizing that the FCC decision in Vonage precludes state regulation to the same extent for other "services 'having basic characteristics similar to DigitalVoice service'") (quoting id. at 22424, ¶ 32).

Pursuant to Rule 17.1(a)(2), Notices of Intent to claim compensation shall be filed no later than June 4, 2007.

The schedule is as follows:

Rulemaking Issued	April 12, 2007
Request to be placed on service list	April 30, 2007
Comments on the rulemaking	May 4, 2007
Workshop scope/agendas mailed	May 25, 2007
Notices of Intent to claim compensation filed	June 4, 2007
Workshop—§ 776	June 5, 2007
Workshop—§ 2892.1	June 6, 2007
Workshop—§ 2872.5	June 19, 2007
Informational requests mailed	July 13, 2007
Responses to informational requests filed	August 15, 2007
CD draft report mailed[63]	October 17, 2007
Comments on draft report filed	November 6, 2007
Reply comments on draft report filed	November 21, 2007
CD revised draft report mailed	December 11, 2007
Comments on revised draft report filed	December 21, 2007
Commission's report to the Legislature	December 31, 2007
Reply comments on revised draft report filed	January 14, 2008
Proposed decision mailed	April 11, 2008
Proposed decision on Commission's Agenda	May 2008

Exempt from Public Review

Pursuant to Rule 14.7, no public review or comment is required for an Order Instituting Rulemaking.

IT IS ORDERED that:

1. A rulemaking is instituted for the purpose of addressing standards for telecommunications backup power systems and emergency notification systems pursuant to Assembly Bill 2393.
2. This rulemaking is preliminarily determined to be a quasi-legislative proceeding, as that term is defined in Rule 1.3(d) of the Commission's Rules of Practice and Procedure.
3. All California certificated telephony providers, users of emergency notification systems, and providers of telecommunications service (as defined in Public Utilities Code Section 2892.1.(a)) are respondents to this rulemaking.

[63] CD's draft report will be a single document addressing §§ 776, 2872.5 and 2892.1. All reports, comments and reply comments are to be filed and served on all parties.

4. The temporary service list for this proceeding shall include the respondents, the Office of Emergency Services, and the Department of General Services.
5. The schedule is as set forth herein.
6. Those who seek party status or wish to monitor this proceeding shall do so by informing the Commission's Administrative Law Judge (ALJ) Process Office (process_office@cpuc.ca.gov) of his or her intent to participate and providing the following information:
    a. Name and organization represented, if any
    b. Address
    c. Telephone number
    d. E-mail address
    e. Assignment to the appearance, state service, or information only category.

In order to be included on the initial service list of this proceeding, parties shall so inform the ALJ Process Office no later than April 30, 2007.

7. The assigned Commissioner and/or the assigned ALJ shall have ongoing oversight of the service list and may institute changes to the list or the rules governing it, as needed.
8. The assigned Commissioner and/or the assigned ALJ may modify the process and schedule established herein as necessary.

This order is effective today.

Dated April 12, 2007, at San Francisco, California.

MICHAEL R. PEEVEY
President
DIAN M. GRUENEICH
JOHN A. BOHN
RACHELLE B. CHONG
TIMOTHY ALAN SIMON
Commissioners

R0704015 Attachment A - Assembly Bill 2393

Appendix B: Description of Telecom Powering Architectures

This appendix describes telecommunications powering architectures (both current and emerging) in terms of the main network architectures currently being used by communications providers (wireline, wireless, and CATV). It serves as a "mini tutorial" for the reader who is not familiar with the major node sites in the current/emerging telecommunications networks including:

- Central offices and major switching centers,
- Remote terminals and cross-connect locations in the outside plant, and
- Residential and small commercial customer premises.

Current Telecom Powering Architectures

The CO battery system was originally deployed by telecommunications providers in the 1920s to improve network operations, performance and reliability. As a result, the combination of flooded lead-acid batteries and diesel generators located in the telecommunications service provider's CO were able to power both the CO and the customer's telephone in the event of a power outage assuming the telephone system is otherwise intact. This initial system was both a telecommunications service and a DC power distribution network from the CO to the customer premises. The same configuration continues to be true today for many customers with basic landline telephone service delivered from a facilities-based provider of telephony services through copper wire pairs.

As the electromechanical network evolved into electronically-switched networks, and now into packet-switched networks over fiber-optic cables to meet the enhanced service demands, the power needs of network components required remote powering (e.g., AC power with DC battery backup) of telecommunications nodes at CEV, huts, and cabinet sites. These remote sites obtain primary power from the local utility AC grid and also contain multiple strings of batteries (e.g., Valve Regulated Lead Acid — VRLA) for backup reserve power.

Wireline

The original analog phone system depended on hard-wired connections to customers' phones that were powered from the CO. The CO was powered with dual-feed commercial AC power, which was rectified to provide -52V DC to operate the phone system. Since no interruption in service was tolerated, large flooded lead-acid batteries were placed in parallel with the rectifiers so that DC power was continuously available, even if commercial AC failed.

Central Office

The primary power to operate the CO is provided from the utility electric power grid from a local public utility. The supplied AC power is converted to DC power for telecommunications service across copper pairs through banks of rectifiers. These AC/DC rectifiers also help control and ensure the quality (low noise and minimize voltage sags or disruptions) of the delivered DC power.

Since reliable service was, and remains, the paramount objective for network operators, a combination of engine alternators were also installed in the CO. Thus, if commercial AC failed, the batteries would seamlessly assume the load and the engines would begin their starting sequences. Within several minutes, the engines will usually support the full load of essential telecommunications services. If the engines failed (5% failure is a historical average), then the batteries will still fully support the load for up to 8 hours depending on their engineered reserve time (usual range is between 3 and 8 hours). The problem generator would then be repaired or a backup mobile generator can be delivered to the office. The CO batteries are recharged when AC is restored or as the engine generator operates.

The traditional telecom plant voltage is -52V DC, which is 2.17V DC per battery round cell. This float voltage was primarily determined by the concentration of acid in the battery, which was chosen to provide optimum battery life and reliability, while having a storage system with moderate energy density.

The AC power is passed through AC/DC rectifiers that are typically sized to provide 100, 200, or 400 amperes of current at -52V DC. The batteries were sized to provide 210 amperes for 8 hours or 1,680 Ah (Ampere-hour). These large individual round cells weigh approximately 350 pounds and have long expected lives of between 15 and 30 years. Within large COs, multiple strings of batteries (up to 12) are configured in parallel to make up a power plant that can typically deploy 1,680Ah or in some cases up to 3,500 Ah cells. Smaller COs can have two half-sized strings of batteries for ease of maintenance with 840 Ah capacity cells.

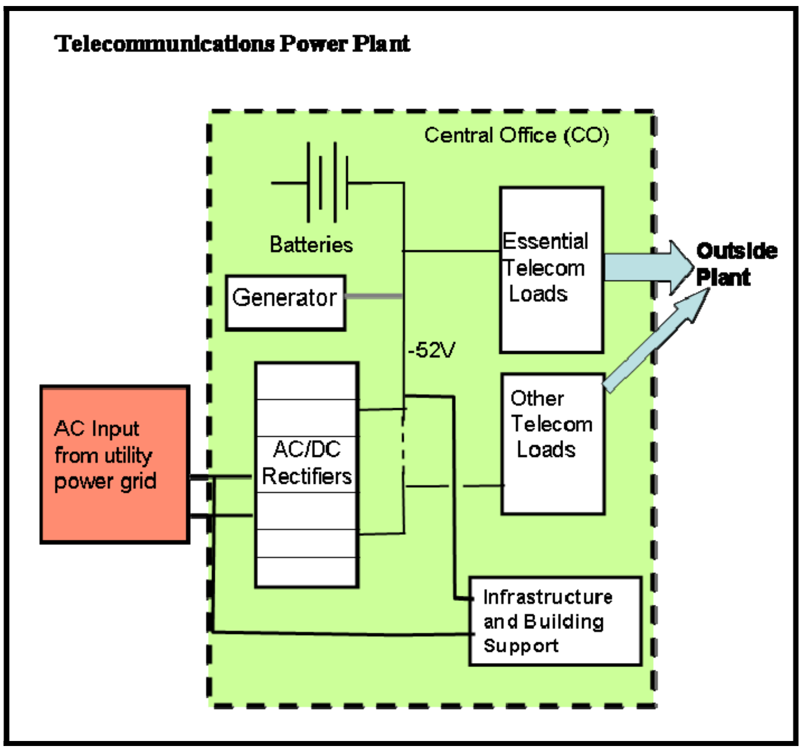

Figure 11. Current Telecom Powering Architecture

The overall reliability of the PSTN network is dependent on the quality and reliability of these batteries and generators. The objective for total downtime per customer PSTN line is not to exceed[64]:

- 53 min/yr (or 99.99% availability) for the distribution link from the CO to the Network Interface Device (NID) on the wall of the customer premises, and
- 315 min/yr (99.94%) for the end-to-end (i.e., NID-to-NID) customer connection.

64 "Telcordia Notes on the Networks" Telcordia Special Report SR-2275, Issue 4, October, 2000, pages 4-43.

A power failure or disruption is only one point of possible failure in the distribution loop. The risk analysis behind these availability numbers needs to include probabilities for cable cuts, shorted pairs, procedural problems and human errors. Therefore the percent availability assumed for the power supply and backup power within the distribution section is greater than 99.99%.

This centralized powering scheme has helped to provide the U.S. with one of the most reliable telecommunications networks in the world. For delivery of POTS, the centralized 52V DC powering scheme using small gauge copper wires to deliver signal and power is one of the most energy efficient schemes available. It is designed and engineered to deliver voice or data with minimum power usage and is therefore very energy efficient; however, it is not flexible and not easily reconfigured.

Outside Plant

The Outside Plant (OSP) comprises all telecommunications facilities not housed in the CO (i.e., all facilities and components from the first manhole to the NID on the wall of the customer premises. OSP power systems requirements are mainly based on the performance objectives and operation demands of its CO counterpart. COs contain the large digital switches and large, heavy flooded lead-acid cells that operate as multiple 24-cell strings connected in parallel providing a float voltage of 52.08V DC and having sufficient capacity to provide from 3 to 8 hours of backup and emergency power.

The OSP nodes and remote terminals are locally powered from the AC utility power grid with power interface units located within the cabinet or closure where switch-mode rectifiers convert AC grid power into DC power for telecommunications. The OSP voltage is designed to be higher than the CO at 54-54.5V DC since the traditional VRLA batteries used in remote and exposed environments require different electrochemistry and a more concentrated sulfuric acid electrolyte for stability and functional performance reasons. The open circuit voltages are 0.09 V higher and 24 cells/string are required for an additional 2.2 V in plant voltage.

VRLA batteries have been traditionally used as the backup power source for the OSP remote sites such as huts, CEVs (Controlled Environmental Vaults), and cabinets. The OSP telecom nodes are generally not equipped with engines on site, but some portable natural gas or gasoline-powered engines are made available for emergency and backup situations. The batteries are maintained on float and are recharged with high-quality, well-regulated rectifiers that operate at the fixed plant voltage. The rectifiers located in OSP locations often employ temperature compensation protocols in their control and management circuits to ameliorate the effects of diurnal temperature variations and climate swings throughout the year in these less controlled OSP sites. The VRLA batteries or more recently NiCad (Nickel Cadmium) and NiMH (Nickel Metal Hydride) batteries have been the backup power sources of choice within the OSP environments.

A variety of operational and environmental factors also need to be factored into the battery choices for these OSP locations. A wide range of climates and locales for OSP enclosures and equipment place environmental, thermal, and pollution stresses on the network equipment including the power interface components and the batteries. For example, battery performance and reliability are particularly dependent on average temperature, and the telecommunications load at a specific site can vary greatly. The normal aging of the battery that decreases capacity is factored into the engineering design for the power reserve of the site

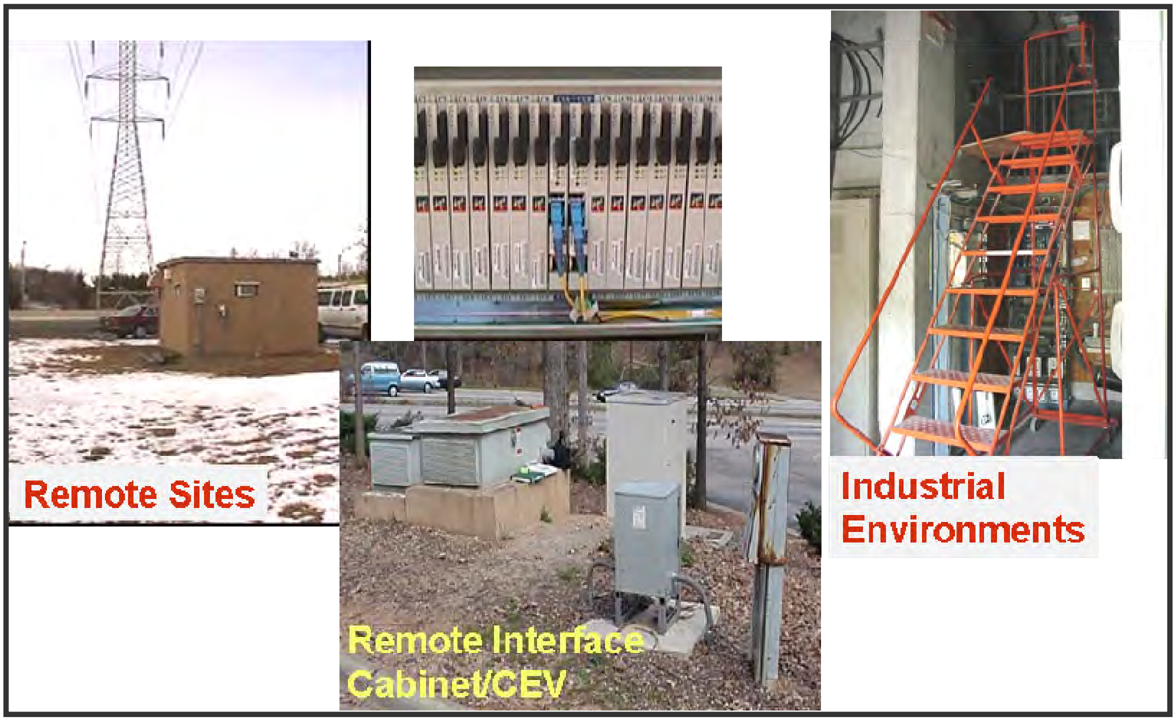

Figure 12. Typical OSP Equipment Locales

Customer Premises

Traditional POTS service does not require any powering at the customer premises since the landline telephone obtained power through the copper wires from the central office. The current array of customer premises equipment usually requires utility AC powering in part or in full to operate. For instance,

- Caller ID boxes – powered through copper wires but also needs small batteries that may last more than a year.
- Cordless handsets – battery in handset that lasts few days but will be inoperable since the base station which charges batteries and transmits wireless signal requires constant AC power.
- Intelligent phones, STBs, modems, fax machines and computers all require AC power.
- Personal Computers (PCs) and associated peripherals for the new services all require AC power for operation.

Wireless

Power management is critical for wireless systems since the ability to connect (i.e., coverage) to the wireless service requires:

- A wireless signal of sufficient power to reach the customer's device (cell phone, PC wireless modem) from the nearest broadcast transmitting antenna,
- The transmitted signal from the customer's device to be of sufficient power to continuously reach the receiver component of the nearest antenna, and

- Sufficient electrical power (battery or AC grid) for the remote antenna site (cell site) to operate and transmit and receive signals between itself and the customer's device, the local base station and the nearest Mobile Switching Center (MSC).

The antenna site may be co-located with telecommunications and/or power facilities on utility poles, towers or located on rooftops or bell towers to maximize geographic coverage for power used. Associated with most antenna sites will be a utility AC power feed for antenna operation and the associated equipment located in a separate closure on the pole or hut adjacent to the tower. Each of these wireless sites can be considered similar to the wireline OSP remote site that requires utility AC power feed with rectifiers for DC powered devices and a need for backup power.

Figure 13. Wireless Sites on Top of Buildings

If required, the wireless systems used similar VRLA type batteries for providing power backup of between 2-4 hours of backup and emergency power. There is greater variability in backup power capacity at wireless sites since historically the FCC, state Public Utilities Commissions (PUCs), and other regulatory authorities have not routinely required extensive power backup and operational reserve time for wireless services. Wireless systems were not necessarily required to meet the same availability and reliability rules and regulations as a traditional telecom wireline provider delivering E-911 Service.

The need for backup power for wireless systems is reduced because their architecture may allow for possible re-configuration of the coverage zone for a specific antenna through (i) remotely or automatically modifying the emitting power of the transmitter, or (ii) expanding effective coverage through joint roaming agreements with other wireless companies in times of emergency or high traffic congestion. Shared roaming agreements can be developed that would allow different companies to use each other's antenna coverage zones to enhance and expand the coverage for all contracted users.

The connection from wireless networks to the PSTN, the Internet, and other public networks will usually occur at, or through, the COs or major OSP nodes (huts, CEVs) facilities of the traditional telecommunications providers. Therefore, the wireless providers are "piggybacked" onto the power protection and backup systems in place with those service providers and that were described in the previous section covering wireline systems.

Cable Television (CATV)

CATV is traditionally a Hybrid-Fiber-Coaxial (HFC) architecture with a series of central-powered nodes serving 300 to 600 customers. The original CATV systems were designed as localized broadcast systems with a headend station powered from the AC utility grid. The headend station serves several functions:

- Receives multiple satellite signal feeds
- Uses couplers to combine satellite signals with local produced content (local television programming and possibly Internet and telephony service feeds)
- Supplies mixed combined signals over optical fiber cable to local nodes
- Can distribute AC power to local distribution nodes.

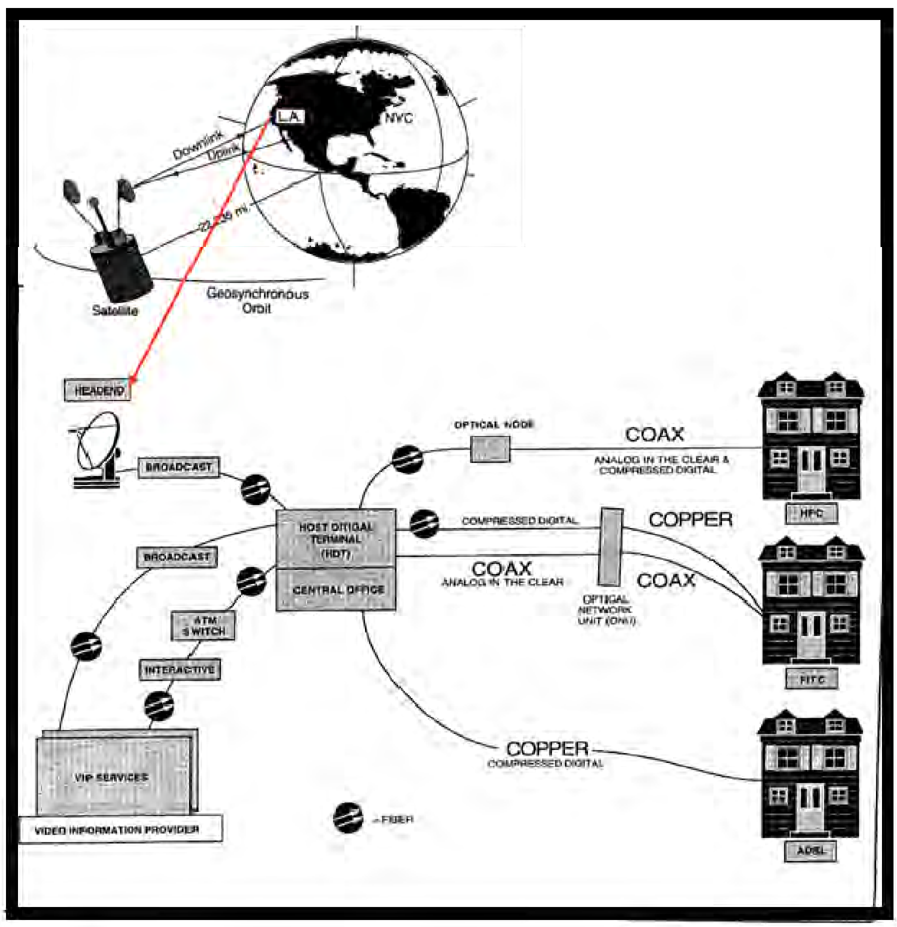

Figure 14. CATV Network Architecture and HFC Broadband Platform

Many powering schemes were used for these initial HFC networks with the preference being for dispersed powering schemes where utility AC power is fed directly to the optical power nodes and then, in turn, distributed over coaxial cables to amplifiers located between the power node and the customer residence. VRLA batteries provide the power backup at the optical nodes with a small number of sites using small natural gas or gasoline generators for extended reserve capability. Experiments using centralized powering using a 3-phase 480V system with hybrid power/fiber distribution cable in the 1990s did not prove cost effective and encountered regulatory and work practice issues.

The general powering schemes are a cascade topology with AC power feed to the optical nodes from which 60-100V AC power is distributed or localized to the active elements of the HFC network – primarily amplifiers. The optical node cabinets can contain electrical transformers, rectifiers, distribution network elements, control circuits, and monitor devices for the amplifiers and active coaxial taps.

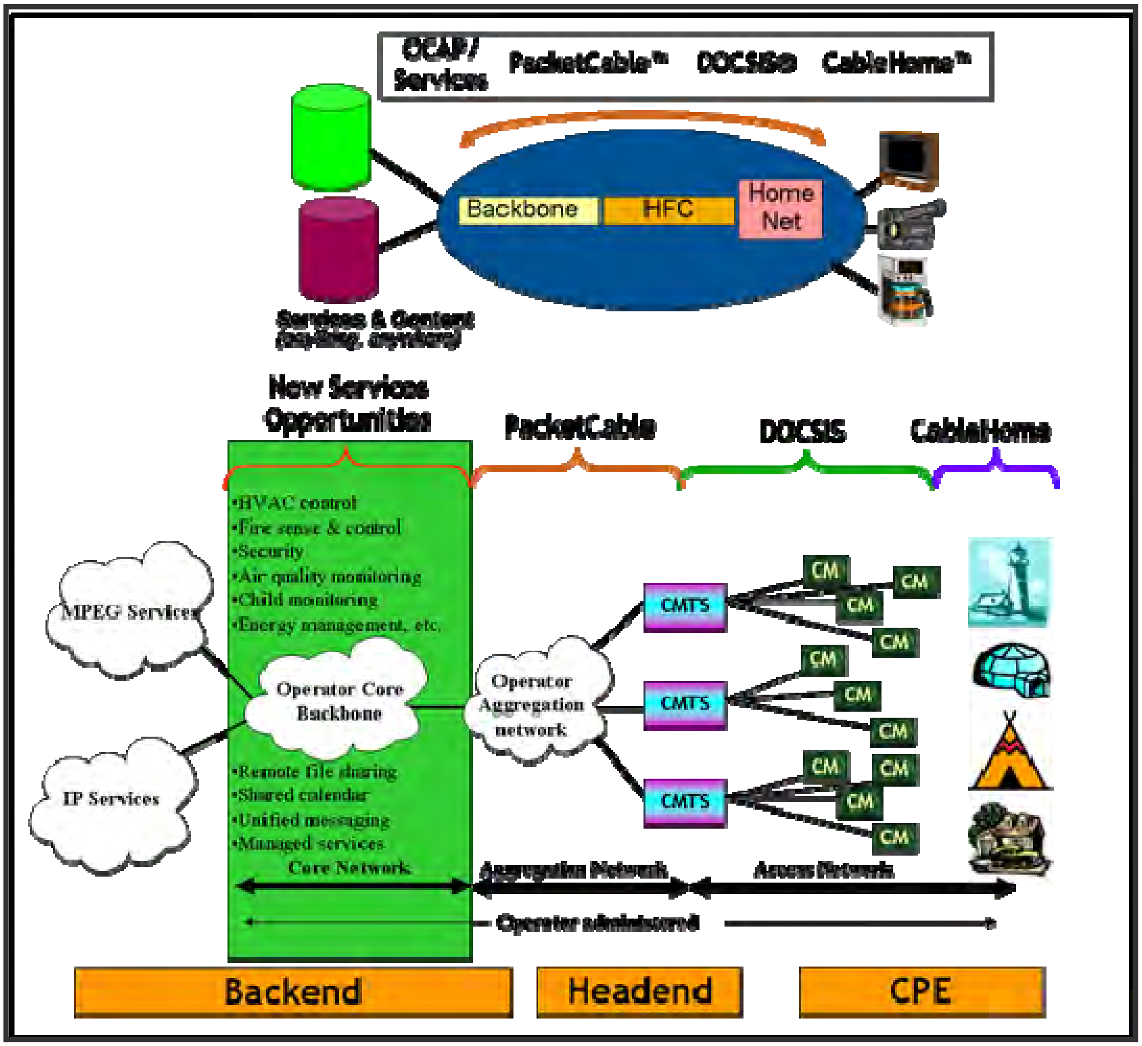

Figure 15. CATV Reference System Architecture

Long cascades of power amplifiers require considerable power and could become a risk point (a single point of failure). Therefore, most HFC networks limited the number of serial amplifiers from node to customer to 1-2 units or preferably have no active components between node and customer premises

(CP). Without significant battery backup or a generator, utility power loss to the optical node will interrupt service to a wide service area quickly.

There was a tacit understanding that traditional CATV television services would probably disappear when there is a power outage. If the power was out at your house, the television and the STB would not operate. Therefore, there was no need to have extensive backup facilities to keep broadcasting a CATV signal to 600 homes that had no operating TV set. As CATV companies move to expand their service offerings to include the full array of triple play telecommunications services (voice, data and video), they are putting powering schemes similar to those provided by the traditional telecommunications service providers in place. These include back up power plants (battery plant and generators) at the headend[65] locations with batteries at some remote sites.

When CATV systems initially expanded their service offering to include Internet and telephony, the connection to the PSTN and the Internet was usually made through the facilities of a telecommunication providers or Internet Service Provider (ISP). The connection to the public networks usually occurred at, or through, data centers, COs or major OSP nodes (huts, CEVs) facilities of the traditional telecommunications and ISP providers. Therefore in these initial networks, the CATV providers benefited from the CO power protection and backup systems described earlier.
Most of the larger current CATV providers have implemented powering architectures similar to those provided by the traditional telecommunications service providers (including backup battery plant and generators located at the headend).

Emerging Telecom Powering Architectures

The powering architectures of the wireline, wireless, and CATV were all initially designed for single purposes.

- Traditional POTS architecture was designed and engineered to deliver voice with minimum power usage and is therefore very energy efficient; however, it is not flexible and easily reconfigured. High reliability and availability (>99.9%) was expected and demanded and in general has been delivered.
- Wireless service was initially a luxury for those who needed or wanted continuous on-demand connectivity at all times. High reliability or quality-of-service (QoS) was not expected.
- CATV systems were provided as an alternative to over-air broadcast television to meet specific local needs or provide a wider choice to the community for television programs and access.

As the PSTN has evolved from the electromechanical world into electronically-switched and packet-switched networks over fiber cables to meet the enhanced service needs and demands, the power architectures were modified to meet enhanced service performance rather than energy efficiency requirements. Wireless services have become ubiquitous with concomitant higher voice and video QoS expected. Wireless and CATV providers are now seen as competitive providers to the traditional telephony network providers with the expectation of the same high reliability for telephony and the full array of telecommunications services.

To introduce greater flexibility and operational efficacy into the traditional telephone network, it proved beneficial to introduce switching and cross-connection capabilities at numerous nodes distributed across

[65] A *CATV headend* is the facility at a local cable TV office that originates and communicates cable TV services to subscribers.

the local loop. This re-designed network allowed for easier physical re-configuration of circuits within the local loop and permitted more rapid expansion to new customers in growth areas as well as the expansion of new services to customers. The spreading of DLC cabinets enabled improved service to customers. These basic networks with central feeds from the CO to remote node sites have formed the backbone of telephony networks down to the present.

These same DLC cabinet sites are being used now to supply xDSL and IPTV based services to customers. DSL remains the most popular access technology, with close to 68% of the world's 313 million broadband subscribers connecting via DSL, 22 percent of subscribers using cable, and just over 10 percent using FTTx. Over eight (8) million people worldwide are now connected to IPTV services with just over one (1) million IPTV subscribers in the USA.

All communications are now assumed to be two-way with significant levels of upstream and downstream traffic for Internet messaging, file exchange, secure business transactions, video and voice broadcast messaging. Power use is increasing and becoming more localized and distributed across the network. The cumulative power used to run PCs, televisions, and other communications devices at all the customer premises far exceed the power needed to run the COs.

To meet the increased power demands at the OSP remote sites and the CP locations, powering schemes are changing to match the needs of the high-speed, high-performance services rather than low-energy, high-reliability POTS, and CATV broadcast services.

Most, if not all, service providers are designing and deploying new network architectures to enable them to offer the full array of telecommunications capabilities either now or in the near future. Some of the more widely advertised include:

- Verizon (FiOS) = Fiber to the Home (FTTP) architecture with utility powering supplied at home by, and at cost to, the customer.
    - FiOS TV + FiOS Voice + FiOS Internet Service
- “AT&T U-verse” vs. “Classic AT&T Services” = system using Fiber-to-the-Node (FTTN), Fiber-to-the-Curb (FTTC), or Fiber-to-the-Home (FTTH) architectures. FTTN and FTTC systems use copper wires over the last 3,000 feet to the customer.
    - Cable TV + Voice (Telephone) + High-Speed Internet
- Cox (Bundled Services) = services delivered over HFC network
    - Digital Cable + Digital Voice (Telephone) + High-Speed Internet
- Comcast (Bundled Services) = services delivered over HFC network
    - Digital Cable + Digital Voice (Telephone) + High-Speed Internet.

Eight (8) basic network architectures can be described based on transmission media as shown below in Figure 16 with the assumption that over time, telecommunications schemes #1-2-3 with major copper segments will slowly be replaced by fiber-fed schemes 4-5-6, which are expected to dominate the telecommunications in the future. The fate of these copper segments is not clear at the moment since they offer potential for backup communications and delivery of backup power, although the economic and technical feasibility of either use seems limited once FTTH architectures become universal.

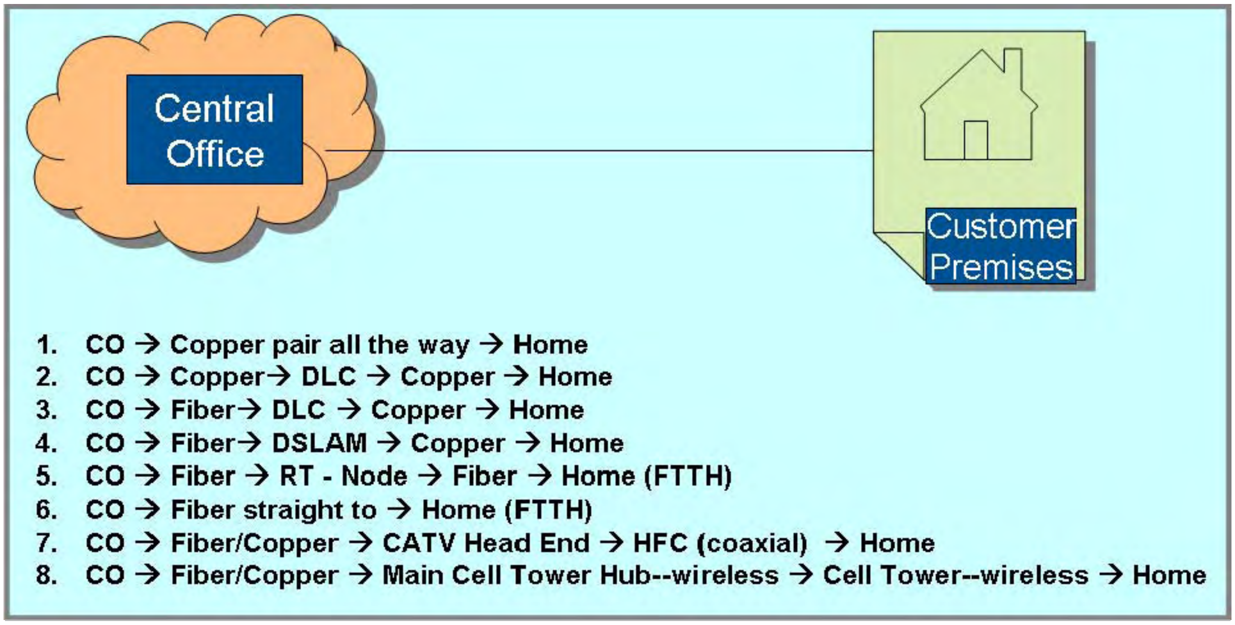

Figure 16. Basic Network Architectures

Wireline

Central Office

The growing transformation of the network to packet based technologies, has placed more of an increased economic burden on facility builders and telecommunications carriers as they expend capital to construct the broadband networks. Although the traditional power architecture with central power rooms, large round-cell batteries and 200-400 ampere rectifiers remain the architecture used to deliver modern FTTx, xDSL and other new broadband services, other more distributed or localized power schemes are being trialed. Operators are beginning to consider the combinations of traditional DC rectifiers and flooded cells with alternative non-lead battery systems where smaller DC rectifiers are distributed over individual equipment bays and rooms with localized battery backup.

Such designs have the potential to increase revenue generating potential while reducing costs associated with DC distribution, decrease floor loading, and remove the toxic lead from their facilities. However, a full economic and operational analysis remains to be completed to ascertain if system performance of these distributed or localized power schemes will provide their fully-promised economic advantage.

There are significant shifts in energy use occurring within the CO environment as well as between the CO and OSP facilities. Figure 17 shows the energy distribution within a typical urban CO. The energy delivered from the utility grid is split 60% for DC power plant and 40% for building infrastructure (HVAC - Heating, Ventilation, Air-Conditioning), internal office functions and air dryers for cable plant.

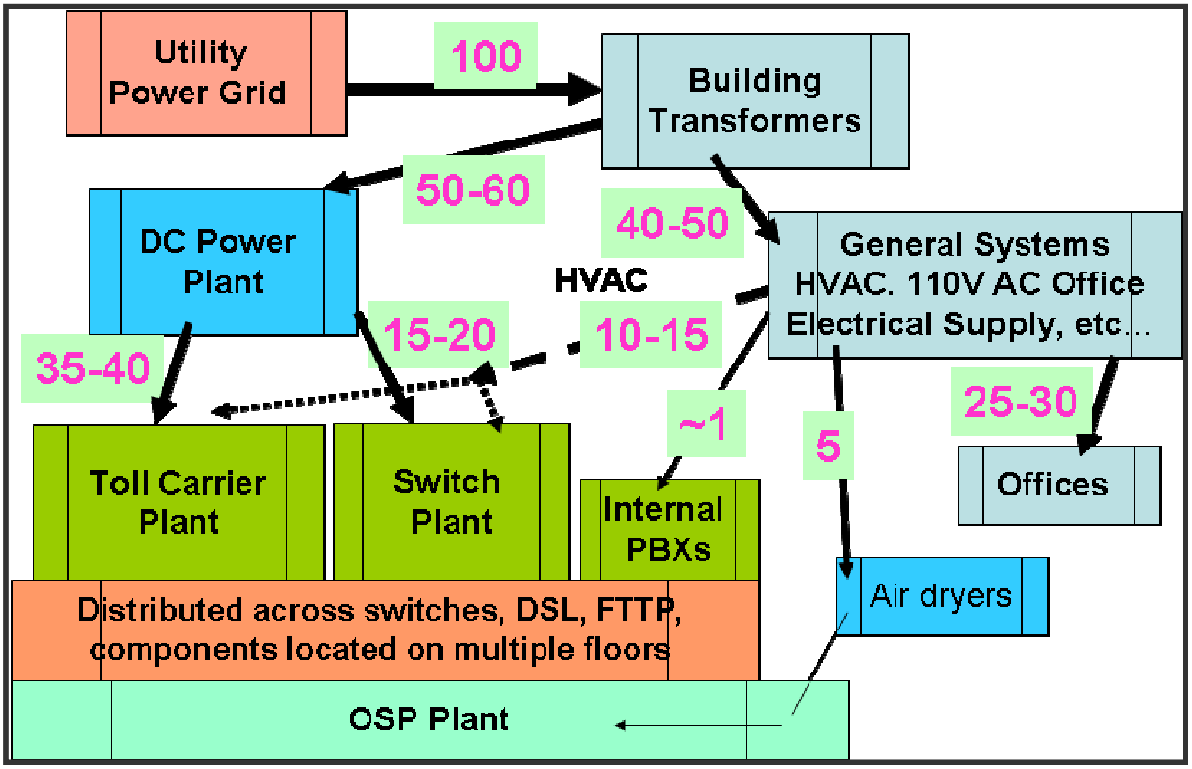

Figure 17. Schematic of Energy Flows within the Central Office

The numbers in Figure 17 reflect the current wireline architecture with modern electronic switches feeding service into the local loop, toll services between other COs and the support functions for the operation of the CO. Without considering distributed or localized power schemes, there are significant shifts expected as new network equipment is deployed in COs and OSP since the heat load or heat dissipation from data storage and network communications equipment has dramatically increased over the last 15 years.

Retirement and consolidation of older channel banks and equipment racks with complex and inefficient cabling connections will initially create transition challenges, such as the need for supplementary cooling fans shown in the Figure 18. Using newer equipment with high-heat densities overwhelmed the HVAC system of the older CO building infrastructure and necessitated local fan cooling to prevent overheating and equipment failures[66]. Figure 18 illustrates the trends in the CO facility as building designs, HVAC system, and equipment cabinet/rack configurations catch up to the new equipment being installed. The older traditional plug-in units in tall racks within narrow aisles are still very prevalent in many offices. Currently the older plant is co-located with newer switch, DSLAM and fiber equipment. It is expected that the COs of the future will take on the character of data centers and computer server rooms with substantial HVAC systems to dissipate heat loads and maintain optimum environmental conditions for the equipment.

[66] Overheating of devices accounts for ~50% of equipment failures in telecommunications equipment.

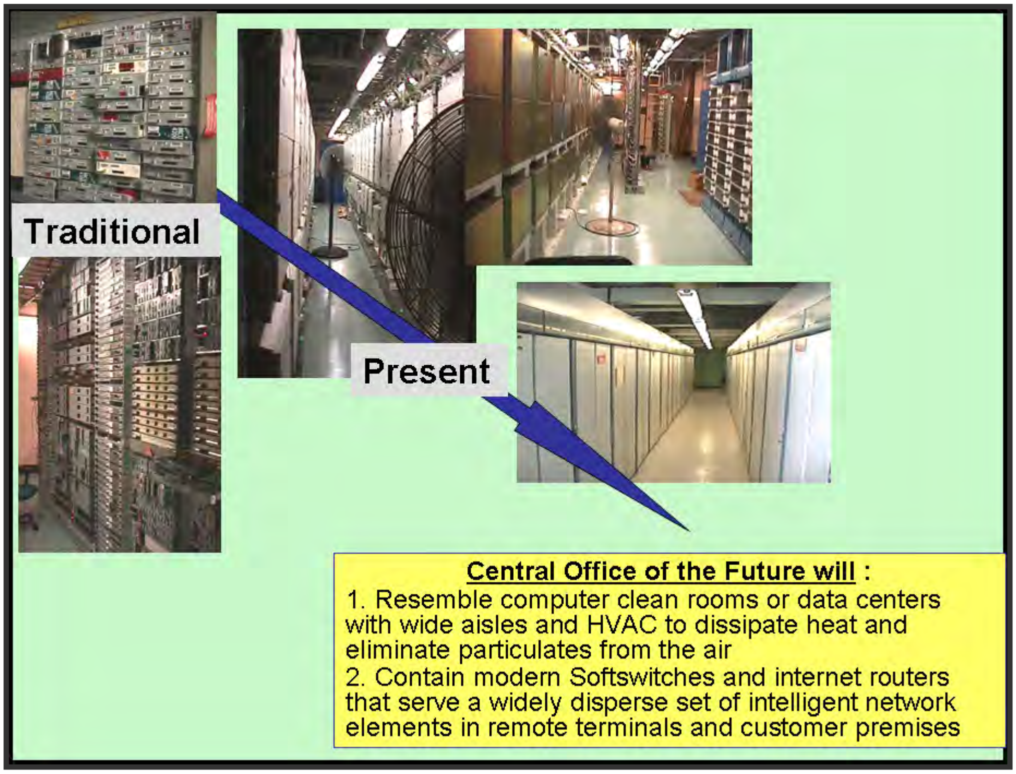

Figure 18. Evolution of the Central Office

The CO of the future will more resemble computer clean rooms or data centers with wide aisles and significant amounts of HVAC to help dissipate heat and eliminate contaminating particulates from the ambient air. These COs are expected to contain modern switches (e.g., softswitches), DSLAM equipment, and Internet routers that will serve a widely disperse set of intelligent network elements located in remote terminals and at customer premises.

Figure 19 below illustrates the scope of modern telecommunications network architectures that are currently deployed to varying levels across the country. This schematic includes most of the broadband architectures. An IPTV or ADSL system can be considered a system with a remote DSLAM (DSL Access Multiplexer) with an integrated analog terminal adapter and is equivalent to the ONU architecture shown in Figure 19.

The amount of total energy (watts from the utility power feed) needed to operate the CO will increase to provide for the more complex switches (e.g., Class 5 or softswitch), FTTx optoelectronic systems, xDSL modules, VoIP and Internet routers as well as video delivery equipment. In addition, the percentage distribution of energy use within the office will initially shift more towards the HVAC and building infrastructure to help ensure that all this more complex, high-energy-density equipment operates efficiently and reliably.

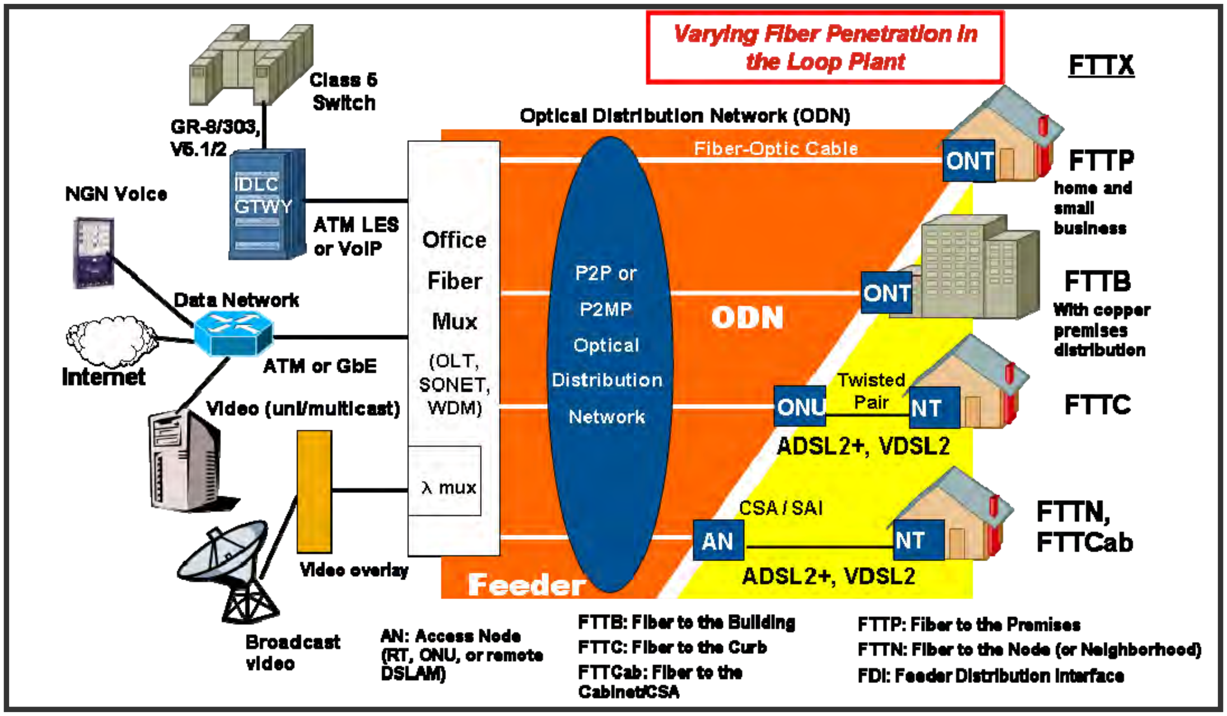

Figure 19. Fiber Access Architecture – Current and Future

There is also a matching trend to require even more power in the OSP and CPE facilities, since the complexity and power of the network equipment deployed in these sites also follows the pattern with communication equipment. Specifically, higher speed and greater performance capabilities that require enhanced remote monitoring and control functions.

Distributed Powering Schemes in CO Facilities

Within most of the CO facilities in the U.S., a centralized powering scheme has been used where a central AC power feed from the utility grid is distributed from a central power room (or rooms) to various communications switch, toll services and distribution equipment within the building. This distribution is through rectifiers with some additional AC-powered circuits feed through converters. The power is distributed with large diameter copper cables (1/0 AWG up to 750kcmil) over a few hundred yards. An alternate architecture is to have AC power fed directly to smaller segments such as racks or aisles of equipment, where the rectification to DC power is completed locally to the equipment. Each of these local sites will have its own rectifier and battery backup.

There may be benefits to such schemes in terms of (i) reduced size and cost of cabling, and (ii) some redundancies built into the architecture, so that a reduced number of individual customers will be impacted by a single rectifier or battery failure. However, in terms of AC power utility grid outages or disturbances, the impact to all the facility will occur independently of the use of such distributed-power schemes. Therefore for this report, such distributed powering schemes inside the CO facility will not be explored any further.

Outside Plant

The powering schemes in the outside plant are changing rapidly in response to the new network architectures. Figure 20 is a schematic of the current and emerging powering architectures, which involve power feeds to multiple points in the telecommunications network. The red solid lines in Figure 20 represent the various AC power links with the telecommunications links shown as blue dashed lines. The telecommunications network and facilities are shown on the left third of the figure with the utility power supply facilities and lines on the right third. In the middle third are the various customers who are served and supported by both these network architectures – residential, business, industry and government. This powering system and the multiple links that it entails show a complex architecture that requires active monitoring, management, and control to help ensure continuity of service.

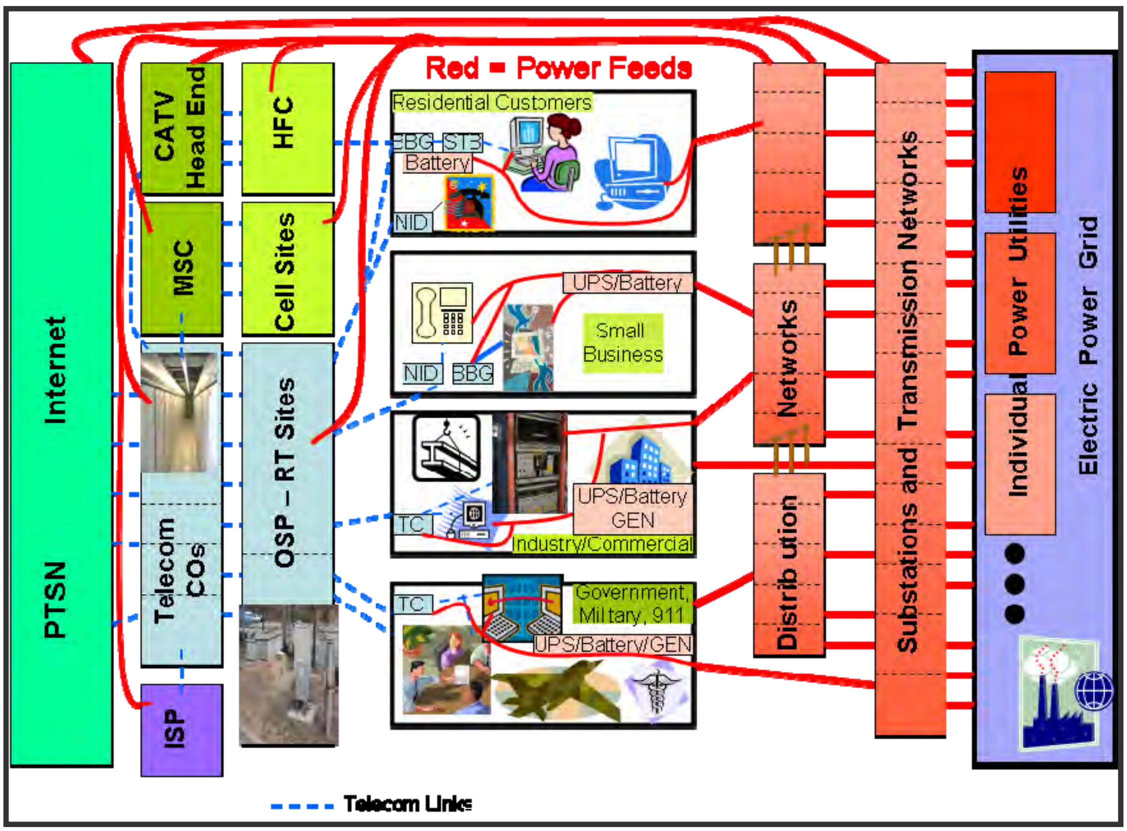

Figure 20. Emerging Telecom Powering Architecture

Modern OSP remote nodes are fiber feed nodes with significant equipment loads of optical or opto-electronic equipment. These sites have primary AC utility power feeds and battery backup for at least 8 hours of backup for essential services (e.g., basic telephony, 911, alarm circuit services).

Telcordia documents TR-NWT-000406 entitled *"DC Bulk Power System for Confined Locations,"* and GR-57 (DLC Systems) provide guidelines used for sizing battery plants including a recommended backup time of 8 hours (minimum) at a fixed call rate. With changing demands for constant connectivity and service expectations the power sizing for OSP facilities may require significantly greater back up power/battery reserve capacity in the OSP sites. To meet these increased backup power needs at remote terminals (cabinets, huts, etc.), alternative battery systems are being deployed and considered such as:

- Nickel Cadmium (NiCad)
- Nickel Metal Hydride (NiMH)
- Nickel Zinc (NiZn)
- Lithium-Ion (LION).

These battery systems have increased energy densities in terms Amp-hr per floor space (square footage), per volume (cubic feet), and per weight (lbs). The network paradigm shift to broadband communication requires battery systems that (i) can provide such improved volumetric and gravimetric energy density, and (ii) have the thermal stability, service life, and cost of ownership attributes that will match the harsh environments found in OSP sites. It has been a significant business challenge to find energy storage systems with all these characteristics to offset the considerable costs associated with the fundamental change in communication philosophy.

Although, the power distribution scheme or configuration has not changed greatly, the individual battery components and power demands have increased significantly to accommodate the more complex and high-functional performance equipment now located in these closures and huts.

Customer Premises

For FTTx systems, the powering architecture close to the customer premises is considerably different and entails a significant increased risk during utility power outages.

For the FTTB (Fiber-To-The-Building) and FTTC (Fiber-To-The-Curb) systems shown in Figure 19, the bulk and reserve power units can be usually contained within an enclosure that is maintained in close proximity to the subscribers, or the architecture can include:

- Miniaturized UPS style chargers which can float charge small capacity VRLA batteries, and
- Power load equipment inside the premises.

Multi-dwelling apartment buildings or a small community of homes are examples where the main power control and utility feed is usually located in a sizable closure from which the customer's batteries are monitored and charged. The batteries can be located on the customer premises or nearby in garages, attics or closets of individual customers.

For FTTH and FTTP systems, the powering scheme requires a utility power feed supplied from the customer premises to operate the communications load equipment consisting of multi-function access cards which can provide video, data, and voice signals to subscribers along with the necessary monitoring and control circuitry. The power monitoring and control system along with battery backup are necessarily all located on the customer premises (garages, closets or attics usually). This powering scheme is fully localized with utility back-feeds from the customer AC service, which is in marked contrast to the traditional centralized powering scheme from the CO.

In these "triple play" circumstances where all telecommunications services are delivered over the optical-fiber line to the CP, telephony can only be maintained for a significant amount of time during a power outage if the video and data services are dropped. The high-power demand of the video and data services requires that these services are shed in emergency times so to obtain adequate telephony reserve time from the battery. Retaining the video and data services would either require large battery reserves (4-6 times) to maintain 4-8 hours of operational time or the customer accepting a much reduced operational reserve time.

The lifetime of batteries in the customer premises varies with its location in the subscriber based system. Depending upon the configuration of the residence, the batteries may be installed a cool basement or may be installed in a warmer garage or a hot attic. Table 8 shows the temperature variations possible for different locations around the typical house. Batteries installed in warmer locations will be able to provide greater reserve energy. However, they will have shorter lifetimes (i.e., need replacing more often) than the batteries installed cooler locations of the building[67].

Table 8. Customer Premises Battery Temperatures

Possible Battery/Power System Locations (*)	Battery Temperature for an Outside Air Temperature of		
	20 – 30 F	60-70F	90-100F
Outside NID	25-35F	70-80F	110-120F
Garage - attached	50-60F	70-80F	100-115F
Garage - detached	40-50F	75-85F	110-120F
Utility Room	50-60F	55-65F	65-75F
Basement - Crawl space	35-50F	45-55F	55-65F
Basement - Finished	55-65F	55-65F	55-65F
Kitchen	75-80F	65-75F	75-85F
Living Room	65-75F	65-75F	70-80F
Closet	55-65F	75-85F	110-115F
Attic	40-50F	90-95F	135-145F

(*) Assumes a house with little landscaping (e.g., trees) to mitigate solar loading or weather effects

Some small business customers, or those residential customers with a particular need or desire, can install a UPS to maintain operation of all their CPE equipment. However, as shall be discussed later, such actions may not ensure telecommunications service unless (i) sufficient power backup is present at both the CO and RT sites, and (ii) the network and powering architecture is amenable to supplying Internet, TV, and telephony services during a power outage.

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[67] Reference data for above Table:

- "*Roof Temperature Histories in matched Attics in Mississippi and Wisconsin*", U.S. Dept. of Agriculture – Forest Service - Research paper J.E. Winandy, H.M. Barnes and C.A. Hatfield, http://www.fpl.fs.fed.us/documnts/frlrp/fplrp589.pdf
- "*Monitored Energy Use Characteristics of Florida Residence: Demonstration of a Research Monitoring protocol, Data Acquisition System and Associated Analysis Methods*", Florida Solar Energy Center (FSEC) Research Paper FSEC-RR-158-91, by D.S. Parker.
- "*Field Temperatures in the Outside Plant*", International Wire and Cable Symposium, IWCS – 39th Conference, page 335 of Preprint (1990) by T.N. Bowmer, R.J. Miner and R.L. Coker.
- "*Extending the Life of Polyethylene Wire Insulation Outside Plant*", International Wire and Cable Symposium, IWCS – 40th Conference, page 476 of Preprint (1991) by T.N. Bowmer and J.N. D'Amico.

Wireless

The powering schemes for emerging wireless services remains the same as outlined above. In contrast to telephony, where the shift from traditional metallic copper pairs to glass optical fiber is a fundamental paradigm shift, there is no elemental technology shift in the current emerging or future planned wireless systems.

The advances in wireless architecture are directed at optimizing the components within their network architecture to maximize and expand the quality, coverage area, and speed of their wireless signal. For example, newer digital signal processors and analog radio components are being deployed, which offer higher performance and lower power consumption. The objectives are to improve the compression and decompression algorithms to reformat and manage audio, video and data in real time. The operational efficiencies gained by such device deployments will have the side benefit of extending the available reserve time without increasing battery size or capacity.

As noted earlier, the emerging wireless trends are aimed at virtual or software re-configurations of their signals, coverage areas, and cooperation between carriers using new processor systems and software-centered updates rather than any re-architecture of their physical or powering networks.

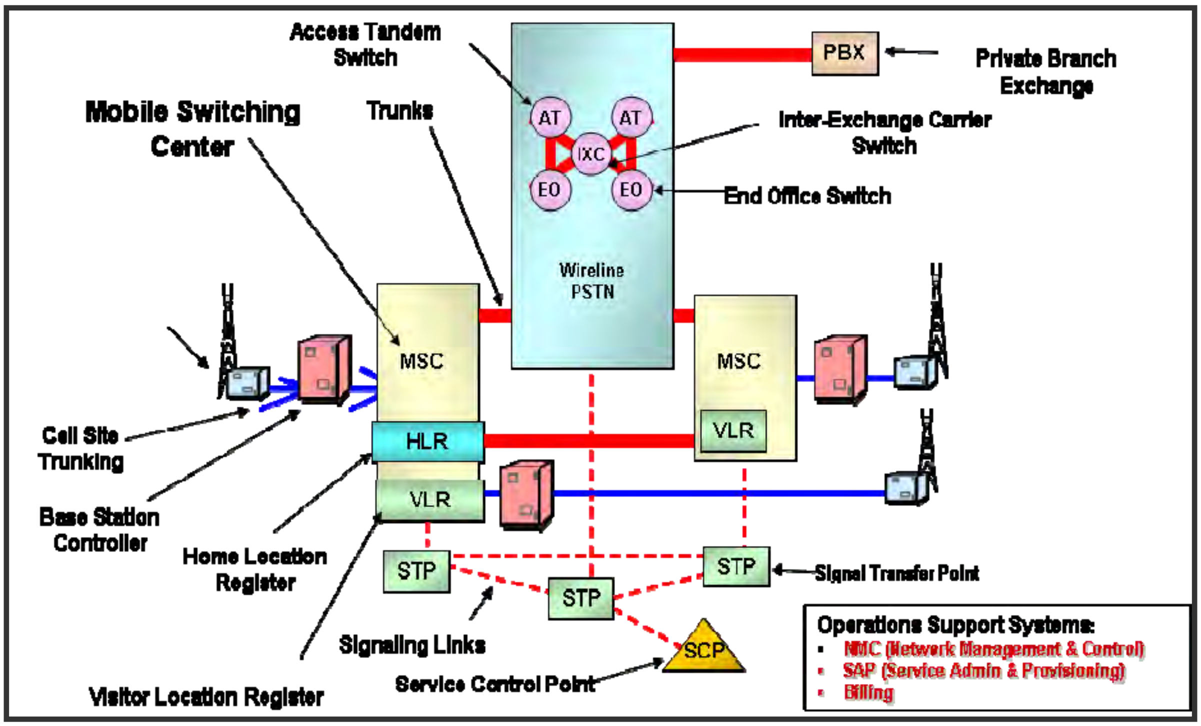

Figure 21. Wireless Networks

The technical challenges and innovations required to achieve these optimizations within the wireless facilities and components should not be minimized. If these changes are successful, then the improved quality and speed of delivery of broadband services over the wireless platform will further accelerate the current trends in making the "anytime, anywhere" communications promise a reality.

As wireless service becomes more widespread, the regulatory agencies (e.g., FCC and local PUCs) may become more involved and focused on the technical details and service performance metrics of the networks and services. One possible regulatory change that may affect future wireless network architecture and powering aspects, in particular, is in recent FCC actions based on emergency response analysis to Hurricane Katrina. Increased levels of battery reserve power have been mandated by recent FCC Order 07-177 to increase battery or power backup time to at least 8 hours at all wireless sites which would include the OSP and cell tower locations. See Appendices H and I for details of the FCC order.

The new regulations require:

- A minimum of 24 hours reserve power at COs, MSCs, and CATV headends that provide telephony services, as well as
- A minimum of 8 hours reserve power at remote sites including wireless towers.

As noted above, current and future planned wireless architectures use software re-configurations of their signals, coverage areas and cooperation (roaming agreements) between carriers to manage their networks during emergencies and events of high-traffic congestion. Many wireless providers use mobile cell sites and mobile power generators to provider flexible power backup and additional network facilities rather than have fixed battery backup facilities.

Figure 22. Mobile Cell Sites

Wireless and CATV networks share a common feature of using the local CLEC or ILEC as part of their backup powering plans. However, there are many differences based on history of their development. Wireless carriers are still building optimum networks while the individual network components are evolving rapidly with different power, range and software advances being made each month. The CATV networks have been around for many decades and have evolved considerably to meet the new service desires and needs of its customers.

Cable Television

Similar to wireless networks, the CATV networks are seeking operational efficiencies through:

- Virtual or software related re-configurations of their signal formats,
- Distribution means, and
- More intelligent STBs to help monitor and control the delivery of services to their customers.

In general, the HFC networks of CATV systems have been modernized and simplified to prepare for offering "triple play" services. Amplifier cascades have been eliminated and therefore powering has become simplified with nodes of power at headend, power node, and CPE.

The current STBs are already powered through AC utility power connection from the customer. Therefore, no fundamental change to the powering architecture was needed to expand service to include telephony and Internet/data services. New STBs allow for additional battery backup reserve time to help maintain the required and expected basic telephony and E-911 services. These changes will occur within a "Black Box" of the STB and do not involve a fundamental network architecture modification. However, as noted above for wireless providers, the technical challenges, innovations, and investment required is not trivial to change the interface circuits and communications protocols between STB, the CATV headend, and power node.

As the bundled service offerings (CATV-Internet-telephony) from a Cox Cable or Comcast type CATV company evolve within the regulatory environment (FCC and local PUCs), new backup powering capacity may be required at the CPs. If necessary, the backup power would be limited to telephony services only.

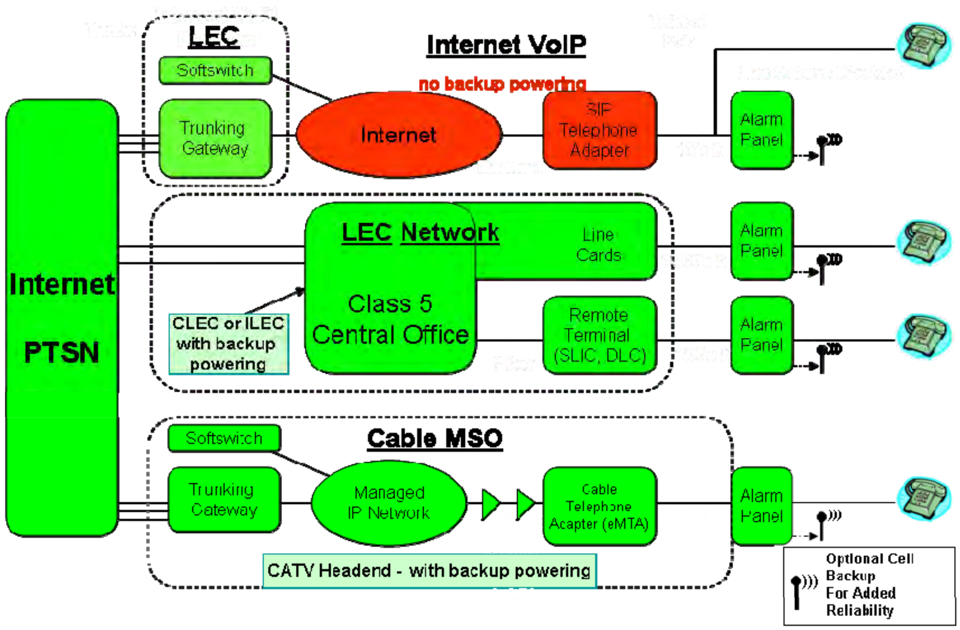

Figure 23. Cable TV Main Switching Office (MSO) Powering Scheme Networks

(Cable MSO Powering - Compared to LEC, Internet VoIP)

Figure 23 above shows the current powering schemes favored for current CATV voice networks, where the CATV headend has the equivalent backup power system of a traditional telecommunications LEC network. These CATV voice networks are called "MFVNs" (Managed Facility Voice Networks) which are defined as "*A dedicated physical network spanning from the end user to the PSTN (Public Telephone Switched Network) that is owned and operated by a single voice service provider who is responsible for all aspects of service quality and reliability*". They are typically based on a combination of a PacketCable home voice adapter, with a HFC physical structure, using advanced IP protocol networks and PacketCable voice servers and systems.

Future Telecom Powering Architectures

The above discussions cover the traditional and emerging telecom networks and their powering structures. Figure 24 illustrates that the trend away from circuit-based networks (traditional POTS) leads to a multiple array of packet-switched solutions and services.

The assumption is that the traditional telecommunications companies will evolve or migrate to a FTTB, FTTH or FTTP architecture where optical fiber cable runs most of the way from CO equipment to side (to the NID) or inside (to the CPE) of the customer residence.

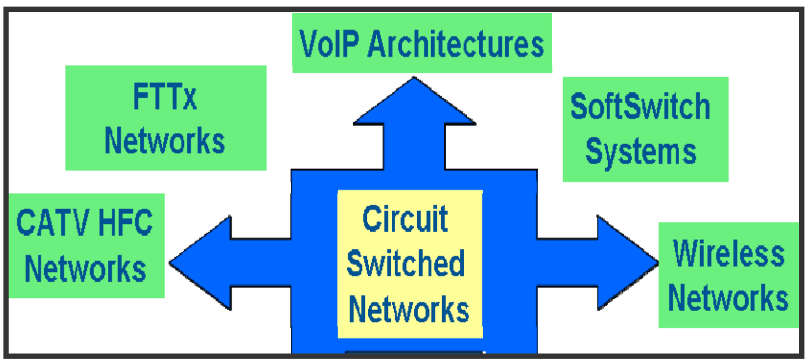

Figure 24. Evolution from Circuit-Switched Networks

Wireless service will expand coverage and service offerings through more efficient processors and improved software-related reconfigurations. Their physical network and fundamental powering architecture will not significantly change for the foreseeable future.

CATV will improve telephony and Internet/data service offerings through improvements in signal processor and distribution protocols at their headends and within their STBs, and not by changing the basic physical networks and powering schemes.

As the new transmission architectures (e.g., wireless and FTTP) and system components (e.g., Class 5 switches and digital signal processors) develop, there will be:

- Significant increases in the total power required to provide telecommunications services to an individual customer
- More distributed or localized powering schemes implemented across the networks
- Possibly reduced availability for some telephony-Internet/data-video services.

This section explores the consequences for powering architectures of this trend in terms of the three (3) industry segments – wireline, wireless, and CATV networks.

Wireline

The assumption is that the traditional telecommunications companies will evolve or migrate to a FTTB, FTTH or FTTP architecture where optical fiber cable runs all the way from CO equipment to side (to the NID) or inside (to the CPE) of the customer residence.

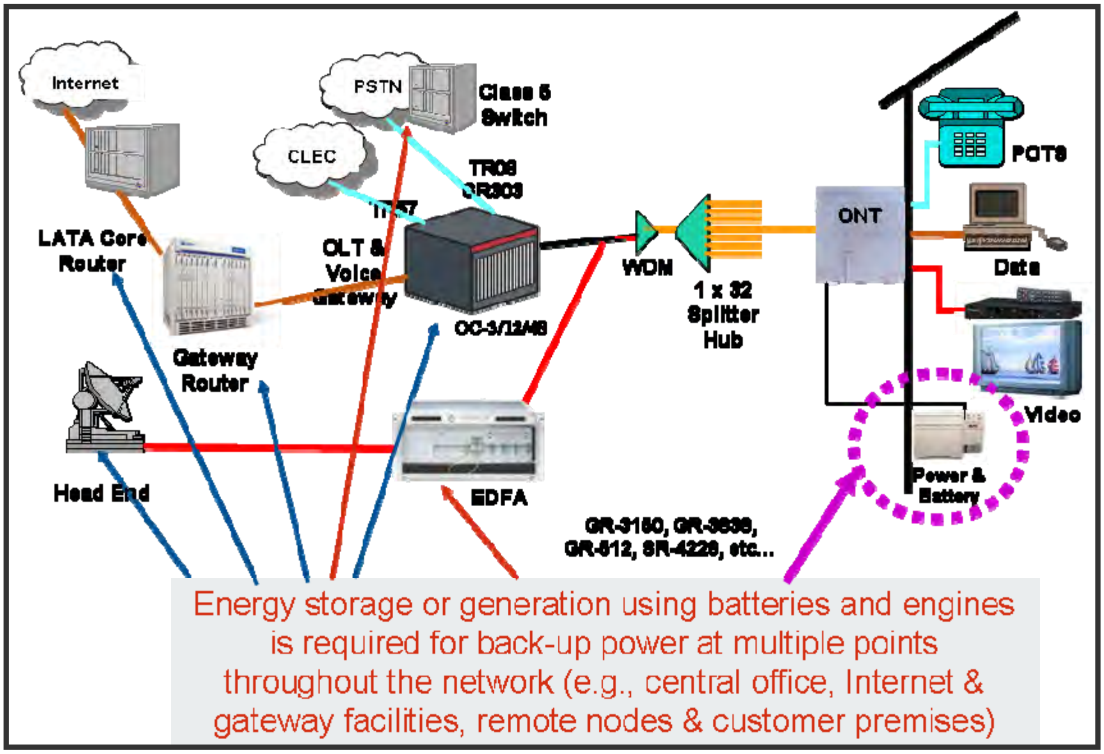

Figure 25. FTTP Reference Architecture: Powering Scheme

A possible future architecture shown in Figure 25 envisions numerous AC-powered devices supplied from the utility power grid and residing at various possible facilities located within the CO building and in the outside plant nodes such as cabinets, huts and CEVs. All these locations will require batteries and possibly engines to help ensure continuity of services.

The more complex router, switch, gateway type equipment at the CO and intermediate OSP sites will be more efficient in power use, but will require more watts of power to operate since their functional performance levels are higher.

The delivery of traditional POTS service over a copper pair through a RJ-11 jack would consume 1-2 watts all delivered from the CO powering scheme. In contrast, the basic telecommunications service of the future shall be expected to include many items at the CP that use substantial power when in active use and in standby modes. For example:

1. Telephony over a number of handsets, mostly cordless with caller ID and other intelligent services and displays built into the handset or its base station

a. Add between 3 and 4 Watts for cordless phone and ~1 watt on standby

b. Add between 8-12 Watts for intelligent base station with multiple cordless phones, clock, radio and answering machine capability and ~2-4 watts on standby

2. Modem or STB for Internet Connection and Data Services

   a. Add between 12 to 25 watts for analog or digital STB for satellite or CATV type reception which is only reduced by 5-10% when in the standby mode

3. Entertainment and Television Services

   a. Analog TV use 70 to 100 watts when in active use and 4-6 watts on standby

   b. Digital TV use 150 to 200 watts when in active use and 7-10 watts on standby

   c. VCR/DVD use 16 to 20 watts when in active use and 4-6 watts on standby

   d. Game Consoles use 8 to 12 watts when in active use and 1-2 watts on standby

   e. Stereos use anywhere from 6 to 50 watts depending on size and power and 2-9 watts on standby

4. Data Services

   a. PC use 90 to 150 watts when in active use and 2-4 watts on standby

   b. Printers use 250 to 400 watts when in active use and 2-4 watts on standby

   c. FAX/copiers use 100 to 150 watts when in active use and 2-4 watts on standby.

The end result is that power budget for telecommunications services per customer is expected to rise significantly in the future. Part of this will be directly seen (and paid) by the service provider but the majority will be provided by the customer through their power utility bill.

Table 9 provides the typical energy in kilowatts used in the major telecommunications nodes of the current network and estimates of the total consumption at these nodes in 3 to 5 years time.

Table 9. Energy Use at Individual Telecom Nodes

Location	**Typical Energy Use in Kilowatts**	
	Currently	By 2010 - 2012
CO	250 to 2,000	250 to 2,500
CEV or Hut	5 to 40	10 to 50
RT Node (Cabinet)	0.5 to 3	2 to 4
Cell Tower Node	0.5 to 1.5	0.75 to 1.5
CP/CPE	0.004 to 0.010	0.008 to 0.030

The CO switch and router equipment will become more energy efficient per customer but will consume more energy to deliver the enhanced services. More power will be consumed at the OSP nodes and in the network equipment at the NID or STB components inside the customer premises. The overage power budget for the provider to deliver network service is expected to increase by 5-10% over the next five (5) years.

However, the increase in power use inside the customer residence for telecommunications services will rise more significantly since the improved high-speed services will encourage additional use of communications, Internet, television equipment and their many associated peripherals. A conservative estimate would suggest that a minimum of 30-40% increase in power usage associated with telecommunication services can be expected.

The power used in OSP (cabinets, huts, amplifiers, CPE) has reached 15-20% of the telecom power budget for the network. However, it is expected to raise to ~25% in the Next Generation Network (NGN) architectures, which are based primarily on FTTx type networks.

The consequences of meeting these network power needs are explored below in terms of the wireline services with an examination of the advantages and disadvantages of various alternate powering and backup schemes.

Central Office

Although the traditional power architecture with central power rooms and 200-400 AMP rectifiers will remain the prime powering scheme to deliver power around the CO, we expect to see other more distributed or localized power schemes being deployed and evaluated in the future.

Network power engineers responsible for the CO and network operations are conservative and are very focused on meeting or exceeding the high level of availability of the telephony service they provide. Changes to powering architecture will be slow and incremental as no change will be allowed unless the resulting system matches or exceeds the present network reliability.

As the costs of space planning, HVAC, handling and disposal costs of lead (Pb) based battery systems and other factors associated with the power schemes are fully articulated, the economics of alternate powering schemes may become more attractive and acceptable. There are a variety of power related technologies that are proposed including:

- Lithium-Ion (LION) batteries
- Distributed or localized power schemes
- Fuel-cell engines as primary and backup generators
- Use of solar- and wind-generated power sources
- Cogeneration and micro-turbine units for CO building infrastructure.

These new technologies are expected to expand as economics drives the concerns and as familiarity with the technologies reduce reliability concerns.

Distributed or localized power systems schemes make use of modern, compact, and modular DC power systems, which couple miniaturized high-energy-density DC rectifiers with gravimetrically and volumetrically dense battery systems. The conventional centralized DC power plants consist of three to five 100 to 400 ampere paralleled-linear and/or switch-mode rectifiers powering the toll, switch, and battery plants. In contrast, the distributed or localized DC power systems are installed in racks or frames, and power the toll and switch plants from only a few feet away. This design increases revenue generating potential, while reducing costs associated with DC power distribution because of (i) decreased floor loading requirements for the large round-cell batteries, and (ii) reduced inventory of toxic materials (e.g., acids and lead compounds) in the facilities. A full economic analysis must be performed to determine if specific distributed or localized power scheme for a particular CO will provide a significant return on the capital and labor investment.

High-energy-density batteries (e.g., lithium-based systems) are being considered for use in a decentralized power scheme where the batteries are close to the switch and toll load equipment. The concept is recommended by some power designers and engineers since it can cut down costs for power distribution. In addition, the intrinsic monitoring and control intelligence necessary for these batteries provides opportunities to achieve management and process savings. In this scenario, the conventional round-cell (lead) batteries will be replaced by higher energy density lithium batteries which can provide the necessary emergency power, but in less volume and with less weight.

A key issue for the use of high-density battery in a distributed or localized power scheme across the CO is their compliance with fire spread and hazard, heat dissipation, and float voltage requirements. Through compliance to traditional NEBS (Network Equipment Building Systems – GR-63) requirements the CO equipment will not spread fire 50 mm beyond its confines. The cell voltage of the lithium battery requires that they be maintained at a higher string float voltage than conventional lead-acid batteries. The float voltage set point in the CO is set at 52V DC to match the electrochemistry of the flooded lead-acid strings. Lithium batteries could be undercharged at this float voltage range and lack the necessary capacity needed of the application. Since the whole plant operates in the conventional float voltage window, it is critical to ensure that attempts to increase the plant voltage do not cause other equipment in the plant to malfunction. These are a few of the architecture and compatibility issues that would need to be addressed before distributed or localized powering architectures can be widely used.

It is important to consider that the traditional powering schemes are a holistic system with battery set and float voltages matched to rectifier controls and loading features. Any change to the centralized powering scheme and movement to alternate battery or primary power configuration will need to consider these interactions.

Outside Plant

As noted above, the OSP provides challenges and opportunities as powering needs for the new telecommunication services escalate and as the networks move toward full optical networks. The OSP may provide the best opportunity for the successful deployment of lithium batteries. Traditional battery technologies have not always lived up to end-user expectations in OSP deployments. The environment in the OSP is much harsher than that found in the CO. The batteries in the OSP receive less attention and maintenance due to their remote location and are deployed in geographical locations where the climate and contaminants can vary greatly.

As the future telecommunication networks expand it is assumed that FTTB and FTTH architectures will generally bypass the OSP node as the place that requires substantial utility power or battery backup power. Passive optical networks (PONs) will utilize these OSP nodes simply as passive cross-connect points in the network.

In the interim, the OSP nodes will continue to provide power connection and backup for all the DLC, xDSL, and older traditional copper pair networks. The “interim” is expected to be considerable number of years since the economic drivers to remove working equipment will not be attractive given the high initial capital costs for new equipment.

Customer Premises

The powering architecture at the customer premise will change the most as the future wireline plant converts into a fiber-fed architecture (see Figure 26). The network telecommunications equipment at the customer premises will be reduced to an optical network unit or terminal (ONU or ONT) and broadband router (possible both units combined into one box – a broadband gateway). This unit is powered by utility AC power provided directly by the customer. Battery backup will be chiefly designed to match the ONT function of supporting basic telephony service for up to 8 hours in the case of an emergency.

For FTTH/FTTP systems, all CPE and network interface equipment at the NID or in the STB obtains their primary power feed from the customer's utility AC power feed.

There is a wide range of ONT or ONU products providing the network interface function where the telephony signal is decoupled from the incoming optical signal, and then the remaining data, video, Internet, and television communications are passed onto the STB, Broadband Home Router or Broadband Gateway device. For reference and illustration, photographs of some of these ONT devices are included in Figure 26.

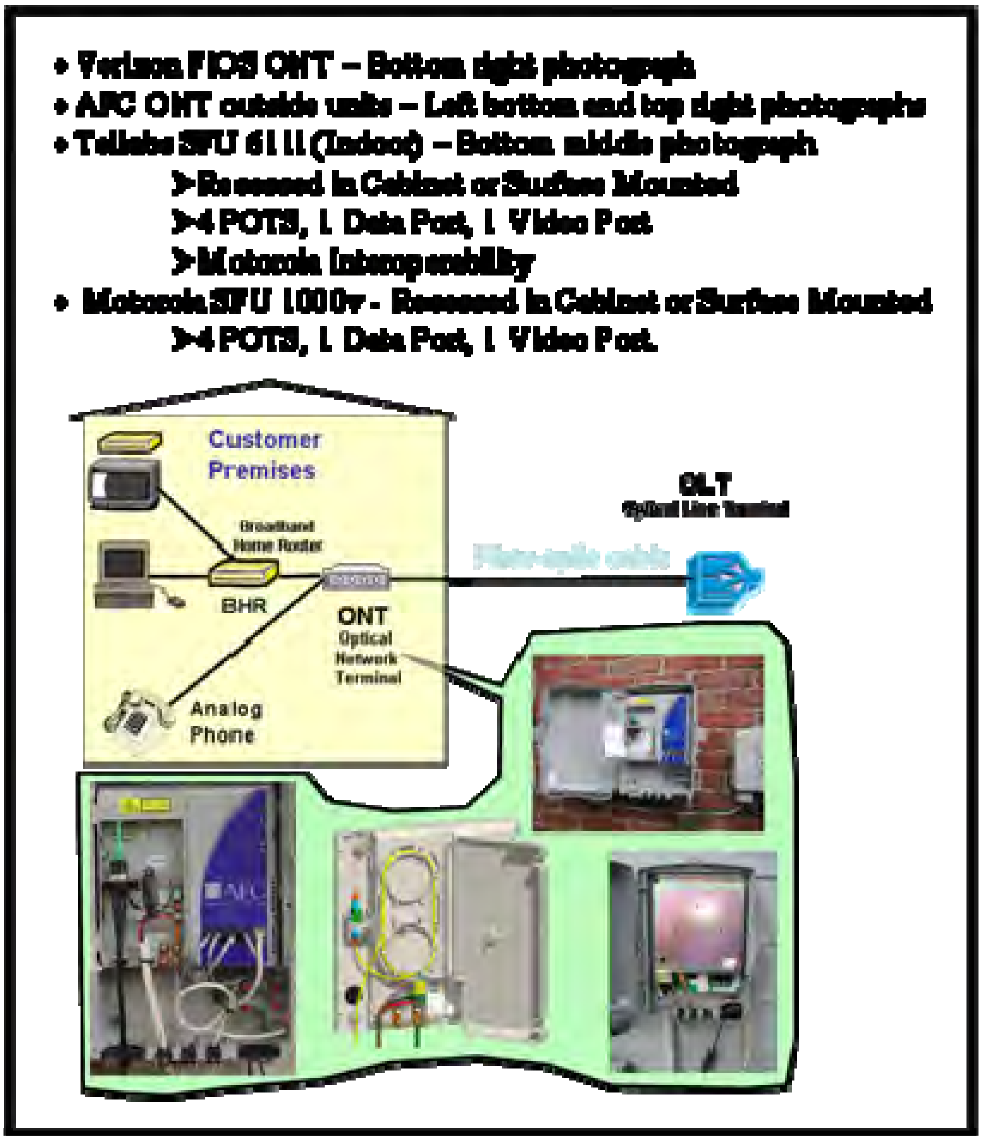

Figure 26. Customer Premises FTTP/FTTH Architecture

The ONT (Optical Network Terminal) is at the heart of fiber-optic broadband services. It provides connection for the optical-fiber line, the existing household phone system, and an Ethernet jack for

Internet access. Typically, the ONT is mounted on the exterior of the house, adjacent to the existing telephone network interface.

For multi-dwelling units and small business customers, the ONT units are in telecommunications closets or in individual offices or rooms. These ONTs are then connected together at Fiber Distribution Hubs (FDHs) and Fiber Distribution Terminals (FDTs) before exiting the building and joining the OSP plant back to the CO facility. Current architectures with these FDHs and FDTs as being passive devices within a passive optical network (PON) that extends from the ONT at the customer all the way back to the CO (as shown in Figure 27).

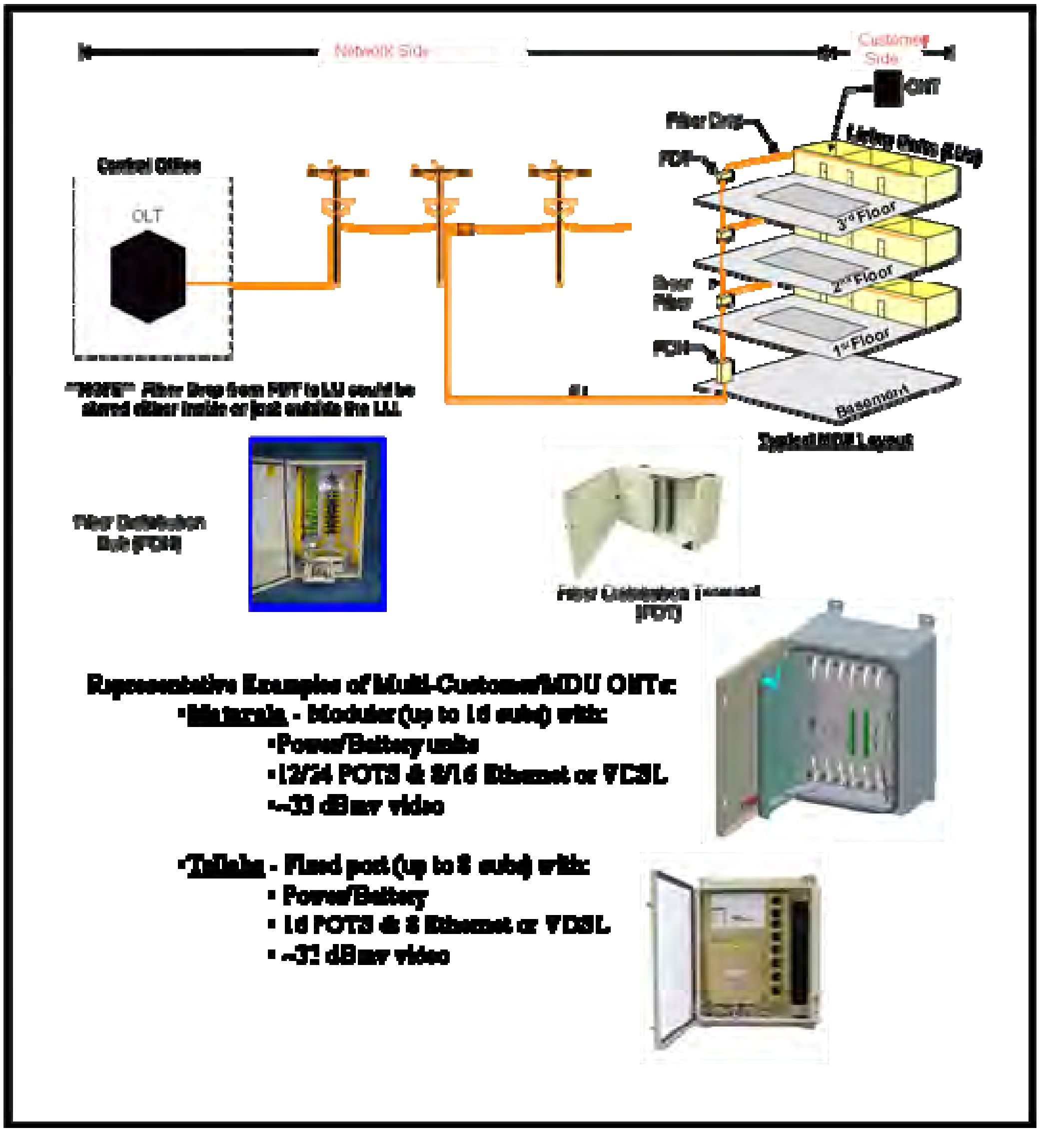

Figure 27. Small Business or Multi-Dwelling Unit (MDU) Architecture

All these ONU interfaces at the home or business require some level of battery backup and associated power backup schemes. For example, the Verizon FiOS Power Supply and Battery Backup system in Figure 28 has a battery backup unit on top that is necessary to keep phone service operable in the event of a utility AC power outage. This example shows a typical installation with the power supply mounted inside the garage or utility room. The power management unit includes an attached battery backup unit and a variety of status and alarm LED lights. The battery is claimed to provide 8-10 hours of telephony in a power failure with a recommendation to replace the battery once a year at a cost of $20-25.

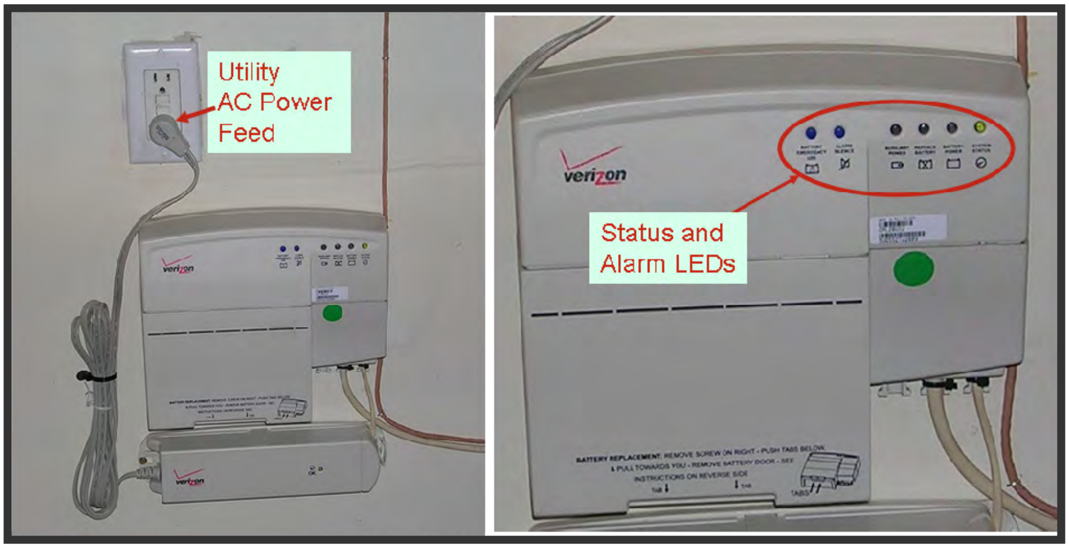

Figure 28. Power Supply and Battery Backup – Verizon FiOS

Driven by concerns and questions from regulatory bodies and industry forums such as the ITU Telecommunication Standardization Sector (ITU-T), service providers are exploring technical solutions and similar trade-offs to enhance backup battery duration. Protocols are being developed and deployed where customer-specific configuration of backup capabilities is possible. This approach allows an operator (or possibly customer, in future) to customize the backup time for each service to match their needs and desires.

For a given power reserve capacity in the battery, each customer location may have different allocation of backup time for telephony, for Internet/data, and for Video services. One may even elect to trade-off the ability to receive calls and other service functionalities, if this would enable an extended ability to make emergency outgoing call.

Wireless

Wireless service will expand coverage and service offerings through more efficient processors and improved software-related reconfigurations. Their physical network and fundamental powering architecture illustrated in Figure 29 are not expected to be significantly changed for the foreseeable future.

The advances in wireless architecture are directed at optimizing the components within their network architecture to improve the quality and maximize the coverage area of the wireless connection. For example, newer digital signal processors and analog radio components are being deployed, which offer higher performance and lower power consumption. The objectives are to (i) improve the compression and decompression algorithms, and (ii) reformat and manage audio, video and data in real time. The operational efficiencies gained by such device deployments will have a side benefit of extending the available reserve time without increasing battery size or capacity.

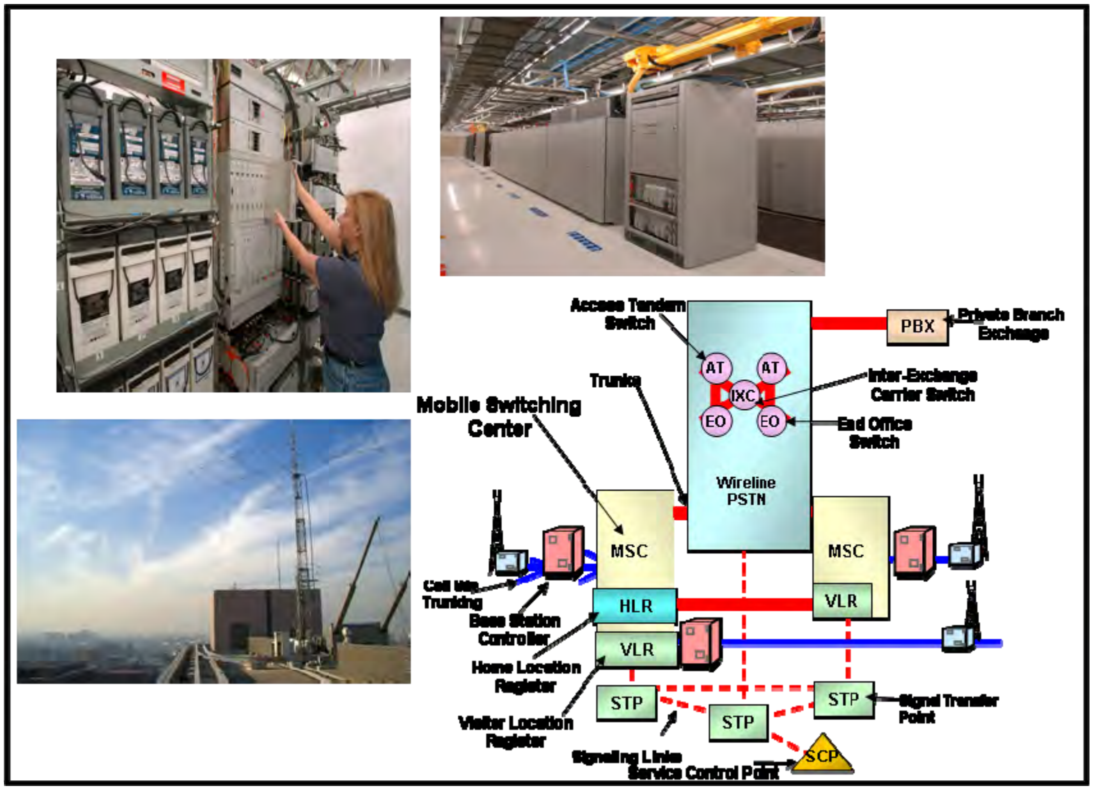

Figure 29. Wireless Architecture

- Mobile Switching Center (MSC) with backup diesel generator system and batteries similar to a CO.
- Individual cell sites, some with on-site emergency generators but most designed with 4-8 hr VRLA battery backup. Additional or replacement backup services are also provided with portable backup generators
    - ➢ Other Backup - COW (Cell-On-Wheels) & COLT (Cell-On-Light-Truck).

As customers come to rely solely on wireless service as main communications link, regulatory agencies (e.g., FCC and State PUCs) may well desire to help manage the essential public utility service and become more involved on the technical details and service performance metrics. One recent example is the FCC actions under order 07-177 for mandating increased levels of battery reserve power at MSC and cell sites.

Cable Television (CATV)

Similar to wireless networks, the CATV network are seeking operational efficiencies mainly through (i) virtual or software related re-configurations of their signal formats, (ii) more efficient distribution means, and (iii) more intelligent STBs to help monitor and control the delivery of services to their customers. In general, the HFC networks of CATV systems have been modernized and simplified to prepare for offering “triple play” services. Amplifier cascades have been eliminated and therefore powering has become simplified with nodes of power at headend, power node, and CPE.

Future Backup Battery Choices

In the foregoing discussions, the increasing importance of backup batteries in the remote terminal and CP sites is evident. Batteries have been identified by the Environmental Protection Agency (EPA) as the largest source of mercury, cadmium and lead to the solid-waste stream during the last decade. Although most of this lead comes from vehicular lead-acid storage batteries, any sales bans, environmental taxes or other governmental actions are likely to increase the cost and burden on batteries in general and on telecommunications backup batteries in particular.

A necessary consequence of widespread FTTx deployment, coupled with regulations and expectations concerning connectivity during a utility AC power outage, will be large investments in lead-acid and other types of batteries to support telecommunications services.

The technologies of alternative batteries have their own problems including (i) hazardous cadmium in NiCad batteries, and (ii) immature support infrastructure and experience for Lithium-based and Nickel-Zinc-based energy storage systems. One can consider the recent well-publicized laptop fires that caused large scale recalls of lithium-based batteries and restrictions for airline travel. It is reasonable to assume that battery systems that contain toxic or hazardous materials like lead (Pb) or cadmium (Cd) will be subject to tighter and tighter controls, sales restrictions, and higher disposal costs in the future.

There are a variety of battery and energy storage choices available to the industry and the consumer to reduce power dependencies of communications architectures. It is sufficient to note that the battery and energy storage choices will become critical to attaining the mutual goals of extending broadband telecommunications services to the widest possible customer base, while reducing power dependencies of the telecommunications architecture and its susceptibility to loss of AC utility power supply.

The distinct battery needs for the telecommunications providers (ILECs/CLECs and CATV) are for:

1. Start-up and support for the diesel generator backup powering systems provided at the telecom central offices, CATV headends and wireless MSC facilities.
2. Local powering at hubs within the local loop.
    a. CEV or hut sites that may serve 100s to 1,000s homes.
    b. Cabinet sites that may serve 10s to 100s homes.
    c. Pedestals or small closures that may serve up to 12 homes.

3. Backup within customer premises equipment and gateway units (ONU/ONT/STB) to provide continuous telephony service.

Whatever backup storage device or alternate power generator equipment technology is used, telecommunications providers and end-users (customers) will need to evaluate the functional performance, reliability, safety and end-of-life disposal characteristics of the products.

Appendix C: Workshops – Scope, Agenda and Timelines

STATE OF CALIFORNIA ARNOLD SCHWARZENEGGER, *Governor*

PUBLIC UTILITIES COMMISSION

505 VAN NESS AVENUE

SAN FRANCISCO, CA 94102-3298

May 21, 2007

To: All Interested Parties in Order Instituting Rulemaking (R.) 07-04-015

In this letter, the Communications Division (CD) lays out the scope, agenda and procedures for conducting three technical workshops of subject matter experts, as directed by R.07-04-015.

Pursuant to Assembly Bill (AB) 2393 (Ch. 776, Stats. 2006), the Commission initiated this Rulemaking to investigate current practices for telecommunications back-up power systems and emergency notification systems. The Commission will adopt performance standards for these systems only if technically feasible and the benefits exceed the costs. The Commission is required to provide a report to the Legislature on the results of its investigation before January 1, 2008.

To this end, technical workshops will be held in the Commission's Auditorium, at 505 Van Ness Avenue, in San Francisco, as follows:

- 9 am to 3:30 pm – June 5, 2007
  Back-up Power Installed on the Property of Residential and Small Commercial Customers
- 10 am to 4:30 pm – June 6, 2007
  Back-up Power Systems Not Installed on the Customer's Premises
- 10 am to 4:30 pm – June 19, 2007
  Emergency Notification Systems.

The workshops will be available via video webcast at: http://www.californiaadmin.com/cgi-bin/cpuc.cgi and via telephone at 1-866-687-1443, when prompted, enter the participant pass code – 737358. The workshops will also be transcribed and transcriptions will be made available to interested parties.

The 1st sub-Appendix of this Appendix C outlines the agenda for these workshops. **The 2nd sub-Appendix** sets forth workshop questions. Please respond to the 2nd Appendix workshop questions by May 31, 2007 with copy to the proceeding service list.[68] [69] Electronic service is

[68] The service list is available at http://www.cpuc.ca.gov/published/service_lists/R0704015_75408.htm .

[69] Information indicated to be proprietary and confidential will be restricted from public disclosure pursuant to Public Utilities Code Section 583 and General Order 66-C available at www.cpuc.ca.gov/published/Graphics/644.pdf.

encouraged. Consistent with Commission rules, a hard copy must be provided concurrently to Assigned Administrative Law Judge Jeffrey P. O'Donnell. An additional hard copy is requested to be provided to Simin Litkouhi of the CD staff.

Please include in your responses the names of technical experts and legal representatives, who will attend the workshop(s) in person, and identify the name of your technical presenter. Please indicate if you intend to make a presentation.

The Commission invites broad participation in this proceeding and will provide specialized accommodation for requests received by May 29, 2007.

WORKSHOP SCOPE

June 5, 2007 from 9:00 am to 3:30 pm in the Commission Auditorium Back-up Power Systems Installed on the Property of Residential and Small Commercial Customers

The Commission is to consider the need for performance reliability standards if the benefits exceed the costs and if technically feasible to develop and implement performance reliability standards for back-up power systems installed on the property of residential and small commercial customers. Consideration of standards will address: minimum operating life, minimum time period in which a telephone system with a charged back-up power system will provide the customer with sufficient electricity for emergency usage, and a means to warn the customer when the back-up system's charge is low or when the system can no longer hold a charge.

The purpose of this workshop is to receive a broad overview of:

- How back-up power currently is provided to residential and small commercial customers,
- Concerns and issues related to back-up power systems on the property of residential and small commercial customers, and
- Definition(s) of "small commercial customer" for the purpose of this investigation.

The outcome of this workshop will be an informational request that will seek more detailed information, that:

(a) Clarifies the nature of existing back-up power systems;

(b) Identifies current best practices;

(c) Provides details on any relevant existing state or federal standards or protocols, as well as any state or federal action that gives the recommendations of standard-setting agencies the force of law;

(d) Addresses the concerns and issues that the Commission must consider, including the costs, benefits, and technical feasibility of establishing battery back-up requirements;

(e) Identifies recommendations presented by the parties and their level of support;

(f) Assesses whether any jurisdictional issues prevent the Commission from pursuing certain recommendations;

(g) Identifies a recommended course of action, as well as any other viable options;

(h) Discusses the costs and benefits of implementing the recommended course of action;

(i) Proposes a definition of small businesses for the purpose of this investigation; and

(j) Identifies any concerns or issues that remain to be addressed.

June 6, 2007 from 10:00 am to 4:30 pm in the Commission Auditorium Back-up Power Systems not installed on the Customer's Premises

Telecommunications service providers generally install back-up power on their property so their networks can operate in an electrical outage.[70] In addition to ensuring network reliability and operational efficiencies, minimizing communications service disruptions is widely beneficial for public safety and economic sustainability. In consultation with the Governor's Office of Emergency Services (OES) and the California Department of General Services (DGS), the Commission will determine whether the benefits exceed the costs and if it is technically feasible for the Commission to develop and implement performance reliability criteria back-up power systems that are not installed on customers' premises.

As these back-up systems are often batteries supplemented by diesel-powered electric generators that recharge the batteries, the Commission is also to determine the feasibility of replacing diesel generators with zero greenhouse gas emission fuel cell systems.

The purpose of this workshop is to receive a broad overview of:

- How back-up power not installed on customers' premises currently is provided,
- Concerns and issues related to back-up power systems that are not installed on customers' premises, and
- The feasibility of replacing diesel generators with zero greenhouse gas emission fuel cell systems.

The outcome of the workshop will be an informational request that will seek more detailed information, that:

Clarifies the nature of existing back-up power systems;

1. Identifies current best practices;
2. Provides details on any relevant existing state or federal standards or protocols, as well as any state or federal action that gives the recommendations of standard-setting agencies the force of law;
3. Addresses the concerns and issues that the Commission must consider, including the costs, benefits, and technical feasibility of establishing back-up requirements and an assessment of

70 Within the AB 2393 legislation, "telecommunications service" means voice communication provided by a telephone corporation as defined in Public Utilities Code § 234, voice communications provided by a provider of satellite telephone services, voice communications provided by a provider of mobile telephony service as defined in Public Utilities Code § 2890.2, and voice communications provided by a facilities-based provider of voice communications utilizing Voice over Internet Protocol (VoIP) or any successor protocol.

the feasibility of zero greenhouse gas emission fuel cell systems to replace diesel generators for such back-up power systems;

4. Identifies recommendations presented and their level of support;
5. Assesses whether any jurisdictional issues prevent the Commission from pursuing certain recommendations;
6. Identifies a recommended course of action, as well as any other viable options;
7. Discusses the costs and benefits of implementing the recommended course of action; and
8. Identifies any concerns or issues that remain to be addressed.

June 19, 2007 from 10:00 am to 4:30 pm in the Commission Auditorium Emergency Notification Systems

Automatic notification devices are used in emergency notification systems by law enforcement agencies, fire protection agencies, public health agencies, public environmental health agencies, city or county emergency services planning agencies, and private for-profit agencies operating under contract with, and at the direction of, one or more of these agencies. These are automatic devices that store phone devices and disseminate a prerecorded voice and text message to those phone numbers in the event of an emergency. In consultation with OES and DGS, the Commission will (i) determine the standards and protocols currently in use by those entities that operate such systems and (ii) obtain and consider the operating entities' and other interested parties' recommendations for improving emergency notification systems, which shall include an assessment of the costs and benefits of requiring standards and protocols for these systems.

The purpose of this workshop is to receive a broad overview of:

- Concerns and issues related to emergency notification systems, including funding and statutory modifications needed to facilitate such notification:

The outcome of the workshop will be an informational request that will seek more detailed information, of the concerns and issues that must be addressed to establish emergency notification systems, that:

1. Clarifies the nature of existing emergency notification systems;
2. Identifies current best practices;
3. Provides details on any relevant existing state or federal standards or protocols, as well as any state or federal action that gives the recommendations of standard-setting agencies the force of law;
4. Identifies the policy concerns and issues that the Commission must address, including funding of emergency notification systems and any necessary statutory modifications needed to facilitate such notification;
5. Assesses whether any jurisdictional issues prevent the Commission from pursuing certain recommendations;
6. Identifies recommendations presented and their level of support;
7. Identifies a recommended course of action, as well as any other viable options;
8. Discusses the costs and benefits of implementing the recommended course of action; and
9. Identifies any concerns or issues that remain to be addressed.

For further information about these workshops, contact CD staff:

- Simin Litkouhi at (415) 703-1865 or sim@cpuc.ca.gov
- Phyllis White at (415) 703-1955 or prw@cpuc.ca.gov

Very Truly Yours,

John M. Leutza, Director

Communications Division

1st **SUB-APPENDIX OF CPUC ANNOUNCEMENT**
WORKSHOP AGENDAS

Tuesday, June 5, 2007

Back-up Power Systems at Residential & Small Commercial Customer Premises

9:00 – 9:05	Welcome & acknowledgement of other officials -	Simin Litkouhi, CPUC
9:05 – 9:15	Opening Remarks -	Commissioner Simon
9:15 – 12:00	10 min presentations by Stakeholders & Interested Parties with 5 min Q&A	
12:00- 1:00		Lunch Break
1:00 – 3:15	- 10 min presentations by Stakeholders & Interested Parties with 5 min Q&A	
3:15 – 3:30	Closing Remarks -	Simin Litkouhi, CPUC

Wednesday, June 6, 2007

Back-up Power Systems not installed on the Customer's Premises

10:00 – 10:05	Welcome & acknowledgement of other officials -	Simin Litkouhi, CPUC
10:05 – 10:15	Opening Remarks -	Commissioner Simon
10:15 – 12:00	- 10 min presentations by Stakeholders & Interested Parties with 5 min Q&A	
12:00- 1:00		Lunch Break
1:00 – 4:15	- 10 min presentations by Stakeholders & Interested Parties with 5 min Q&A	
4:15 – 4:30	Closing Remarks	Simin Litkouhi

Tuesday, June 19, 2007

Emergency Notification Systems

10:00 – 10:05	Welcome & acknowledgement of other officials	Simin Litkouhi, CPUC
10:05 – 10:15	Opening Remarks -	Commissioner Simon
10:15 – 12:00	- 10 min presentations by Stakeholders & Interested Parties with 5 min Q&A	
12:00- 1:00		Lunch Break
1:00 – 4:15	- 10 min presentations by Stakeholders & Interested Parties with 5 min Q&A	
4:15 – 4:30	Closing Remarks	Simin Litkouhi

2nd SUB-**APPENDIX OF CPUC ANNOUNCEMENT**

Workshop Questions

Back-up Power Systems at Residential & Small Commercial Customer Premises

(June 5, 2007 Workshop)

1. Please identify the nature of your business and your interest in this workshop.
2. For providers of "voice" communications that require back-up battery at the customer premise what underlying technology (e.g., copper wires, fiber-optic cable, coaxial cable, wireless, satellite, etc.) is currently used? Are you planning to introduce any new technologies in the next five years?
3. Currently, do you have Best Practices/Requirements/Specifications for back-up power systems at residential and small commercial customer premises? If so, please provide a broad overview of these Best Practices.
4. For non-facilities-based service providers offering voice telephony services/applications (and the related terminal equipment) who is responsible for the power back-up systems at the residential and small commercial customer premises?
    - If you do not consider yourself responsible for the battery back-up systems, what specific agreement do you have between the facilities-based provider and the customer to assure availability of back-up power during emergency situations?
5. Currently, are you involved with any federal, state, local government and/or industry standard bodies in requirements/standards development activities regarding the back-up power systems at residential and small commercial customer premises for emergency situations?
    - If yes, please provide a broad overview of your involvement.
6. Back-up battery and associated equipment at the customer premise details:
    - Who is responsible for procuring/replacing the back-up power system (the service provider, customer, etc.)?
    - What is the minimum operating life of the back-up battery?
    - What is the minimum time period for which a telephone system with a charged back-up power system can provide the customer with sufficient electricity for emergency usage (stand by time, actual call time, etc.)?
    - How long does it take to recharge a fully discharged battery after utility power is restored?
    - What is the means of providing alarms (e.g., indicator lights, audible signals, vibration signal from pager, etc.) to the customer on the status of the back-up power unit?
    - Are there special alarming considerations for the population with disabilities?
    - Are components with shorter lifetimes (e.g., batteries) readily available from local retail stores or do they require special purchase from qualified suppliers?
    - Can the battery withstand environment stress, such as water damage, fire, mild/modest earthquakes, etc.
7. As a telephony service provider, if you are responsible for back-up power systems at the residential and small commercial customer premises:
    (i) Do you have monitoring and alarming systems for those back-up power systems so that you can determine if they are fully charged or working properly? If so, please describe them.
    (ii) How many centers across the state are you using to monitor the back-up power systems?

(iii) Do you currently (or are you planning to) charge customers for monitoring and alarming services associated with back-up power system?

8. Have you done or are you aware of any cost/benefit analysis related to the issue of back-up power systems at the residential and small commercial customer premises?
   - If yes, please share such a study (or aspects of the study).
9. For manufactures of back-up batteries and associated units:
   - What are the different battery types that are currently available for use at customer locations?
   - What are the emerging battery technologies that will potentially be available commercially (at retail locations) in the next five years?
10. What are other significant challenges being faced today in the operation and management of these back-up power systems at residential and small commercial customer premises?
11. Are there any other regulations, such as from the FCC, EPA, etc that service providers are required to comply with that CPUC should take into consideration in the context of this proceeding?

Back-up Power Systems Not Installed on the Customer's Premises

(June 6, 2007 Workshop)

1. Please identify the nature of your business and your interest in this workshop.
2. For providers of "voice" communications that require back-up battery at the customer premise what underlying technology (e.g., copper wires, fiber-optic cable, coaxial cable, wireless, satellite, etc.) is currently used? Are you planning to introduce any new technologies in the next five years?
3. Currently, do you have best practices/requirements/specifications for back-up power systems on your network? Please identify where in your network the back-up power systems are located, such as Central Office, Digital Loop Carrier systems, Remote Switches/Digital Terminals, Cable Headends, etc.
   - If you have such best practices/requirements/specifications, provide a broad overview of these Best Practices?
   - Are you willing to share detailed best practices/requirements/specifications (or relevant aspects of them) with the CPUC as part of the follow-on information request?
4. Have you implemented your best practices/requirements/specifications consistently across the State of California? As an example does every Central Office or Headend installation have back up power or have you done a "per site" analysis to determine what needs to be implemented?
5. To what extent have you implemented the best practices recommended by the FCC-sponsored Network Reliability and Interoperability Council (NRIC) published in December 2005?
6. What type of energy storage technologies are you currently using for back-up power systems not installed at the customer's premises? (e.g., Nickel Cadmium [NiCad], Lithium Metal Polymer [LMP] valve regulated lead acid [VRLA], etc.)
7. What type of energy generation technologies are you currently using for back-up power systems not installed at the customer's premises? (e.g., diesel generator, propane generator, fuel cells, solar, wind, etc.)
8. What future technologies do you envision for the back-up power systems (either energy storage and energy generation) not installed at customer's premises?
9. Currently, are you involved with any federal, state, local government and/or industry standard bodies in requirements/standards development activities regarding the back-up power systems not installed on customer premises?

- If yes, please, provide a broad overview of your involvement.

10. Have you done (or are you aware of) any assessment regarding the feasibility of using zero greenhouse gas emission fuel cell systems to replace diesel generators for back-up power systems not installed on customer's premises? Do you have any cost/benefit analysis related to that issue? If yes, please, share such a study (or aspects of the study).
    - Other energy generator systems could include solar, wind, and bio-diesel (not zero emission).
    - Other storage systems could include batteries, flywheels, etc.
11. For manufactures of back-up power equipment:
    - What are the emerging battery technologies that will potentially be available commercially (at retail locations) in the next five years?
    - Are you involved in standard setting bodies? If so, please summarize your involvement?
12. What are other significant challenges being faced today in the operation and management of these back-up power systems at network sites?
13. Are there any other regulations, such as from the FCC, EPA, etc that service providers are required to comply with that CPUC should take into consideration?

Emergency Notification Systems

(June 19, 2007 Workshop)

1. Please, identify the nature of your business and your interest in this workshop.
2. As a stakeholder in emergency notification systems, besides responding to common threats (e.g., fire, earthquake, flooding, and local attacks/shootings) what do you view is the purpose of emergency notification systems?

STANDARDS

3. Are you involved with government or industry standards setting bodies on any aspects of standards for notification systems? (A representative sample of industry bodies involved in this subject includes, but is not limited to: ITU-T, ATIS, CTIA, 3GPP, OASIS, COMCARE, etc.).
    - If you are involved in standards, please summarize your involvement.
4. Besides the Common Alerting Protocol (CAP), do you know of other efforts to provide an open, non-proprietary digital message format for all types of alerts and notifications? If so, please describe them
5. Please describe any standards, requirements and/or objectives you have for emergency notification systems?
6. What are the issues, pros and cons, for standardizing Warning Messages? (e.g., benefits of machine-readable Warning Messages for information integration with other sources, decision making, automated translation, easy dissemination, building situational awareness during a crisis; ensuring the recipient understands the message, etc.)
7. What are the issues, pros and cons, related to standardizing the features, parameters and capabilities of notification systems?
8. Identify any other relevant issue(s) that should be addressed in order to properly consider standardization of emergency notification systems and protocols? (e.g., interoperability of hazard-warning technologies, challenges of implementing multi-lingual warnings across a set of different technologies, localizing the warning message, establishing alerting procedures, implementing a user interface for emergency message generation, and using a template for structuring upstream data to support situational awareness for emergency managers.)

TECHNOLOGY

9. Is there a way to distribute warnings consistently over all available means of communications? Do the different application level protocols allow for a diverse and extensible array of multimedia messages or are standards needed to enable these capabilities?
10. What technologies or applications are available for geographically targeting messaging?
11. For persons who use cell phones and the Internet as their primary means of communication, how can you ensure that the right warning messages get to the right people irrespective of their location or end user device?
12. How should emergency information sharing and data exchange be facilitated and coordinated between local, state, tribal, national and industry organizations that provide emergency response and management services?
13. How do existing emergency notification systems take into account the communications needs of people with disabilities who use non-standard methods of communication in? What improvement is needed?
    - What standards or protocols should be adopted for emergency notification systems?

EMERGENCY NOTIFICATION SYSTEM USER PERSPECTIVE

14. What is your experience as a user of notification system(s) in the following areas:
    - System availability, capacity, performance and reliability
    - Available capabilities
    - Security
    - Shortfalls/areas of improvement
15. Do you see the need for standards? If so, in what specific areas?
16. How do you ensure the privacy of the persons on the notification lists?

COST/BENEFITS

17. Have you done or are you aware of any assessment regarding the standardization of emergency notification systems and protocols? Do you have any cost/benefit analysis related to that issue? If yes, please, share the study (or aspects of the study).

Appendix D: List of Informational Requests

INFORMATIONAL REQUEST 1

(Follow-up to Workshop held on June 5, 2007)

Section 776 [AB 2393(1)]:

Back-up Power Systems Installed on the Property of Residential and Small Commercial Customers

These informational requests are intended to provide parties and those who are interested in this proceeding an additional opportunity to comment on issues concerning back-up power systems on residential and small commercial customer properties. While response to these informational requests is voluntary, we encourage parties to respond as fully as possible in order to facilitate the Commission in its consideration of whether to develop performance reliability standards for these back-up power systems.

Instructions for Responding to this Informational Request

Please respond to this Informational Request questions by July 20, 2007 with copy to the proceeding service list.[71] Electronic service is encouraged. Consistent with Commission rules, a hard copy must be provided concurrently to Assigned Administrative Law Judge Jeffrey P. O'Donnell. An additional hard copy is requested to be provided to Simin Litkouhi of the CD staff.

Handling of Responders' Proprietary Information

Information indicated to be proprietary and confidential will be restricted from public disclosure pursuant to Public Utilities Code Section 583 and General Order 66-C available at: www.cpuc.ca.gov/published/Graphics/644.pdf .

Introduction

The Commission is to consider the need for performance reliability standards if the benefits exceed the costs and if technically feasible to develop and implement performance reliability standards for back-up power systems installed on the property of residential and small commercial customers. Consideration of standards will address: minimum operating life, minimum time period in which a telephone system with a charged back-up power system will provide the customer with sufficient electricity for emergency usage, and a means to warn the customer when the back-up system's charge is low or when the system can no longer hold a charge.

The purpose of the related workshop (held on June 5, 2007) was to receive a broad overview of:

- How back-up power currently is provided to residential and small commercial customers,
- Concerns and issues related to back-up power systems on the property of residential and small commercial customers, and
- Definition(s) of "small commercial customer" for the purpose of this investigation.

[71] The service list is available at: http://www.cpuc.ca.gov/published/service_lists/R0704015_75408.htm .

The outcome of the June 5, 2007 workshop is this voluntary informational request, which seeks more detailed information to:

a. Clarify the nature of existing back-up power systems

b. Identify current Best Practices

c. Provide details on any relevant existing state or federal standards or protocols, as well as any state or federal action that gives the recommendations of standard-setting agencies the force of law

d. Address the concerns and issues that the Commission must consider, including the costs, benefits, and technical feasibility of establishing battery back-up requirements

e. Identify recommendations presented by the parties and their level of support

f. Assess whether any jurisdictional issues prevent the Commission from pursuing certain recommendations

g. Identify a recommended course of action, as well as any other viable options

h. Discuss the costs and benefits of implementing the recommended course of action

i. Propose a definition of small businesses for the purpose of this investigation

j. Identify any concerns or issues that remain to be addressed.

<u>Questions</u>

Category A: Participation in Related CPUC Activities

1. Did you participate at the CPUC Workshop on "Back-up Power Systems Installed on the Property of Residential and Small Commercial Customers" that was held on June 5, 2007 in San Francisco, California?
    a. If yes, do you have any additional input or comments on the presentations and discussions that took place there?
    b. If not, you may view the corresponding Workshop webcast at http://www.californiaadmin.com/cgi-bin/cpuc.cgi . This may be useful to do prior to answering some questions in this informational request.

2. Did you have a written response to the related CPUC questions mailed before the above workshop[72]?
    a. If yes, do you have any additional comments or clarifications to make regarding your earlier response?
    b. If you did not respond to the CPUC questions mailed before the workshop, and would like to respond to those questions, you may provide such response now, and/or respond to the questions in this informational request?

[72] Workshop questions at http://www.cpuc.ca.gov/static/hottopics/2telco/r0704015workshopnotification.pdf

Category B: Trends and Future Technologies

3. What trends and emerging technologies do your company or your battery supplier company(ies) envision for the back-up power supply at the residential and small commercial customer premises?
    a. Please provide examples of such technologies that you have considered but not adopted.
    b. Please elaborate on the pros and cons of such technologies as seen from your company's perspective.
4. At the ITU-T Standards Organization[73] an issue was recently introduced regarding alternative back-up power conservation modes at the Optical Network Terminal (ONT). The issue addresses methods for dramatically reducing battery drain that could extend ONT back-up power beyond a few hours to a period of several days.
    a. Please provide any comments/remarks about the methods mentioned (e.g., power shedding and "sleep mode") to extend back-up battery operation.
    b. If you are aware of any similar activities in any other Standards/Professional Organizations or your battery supplier company(ies) please describe them.

Category C: Consumer Awareness & Education

5. If you offer IP telephony, to the extent you do so, do you educate your customers about the nature of IP telephony and the fact that if the power goes out, voice service will go out unless the consumer has a back-up source of power, such as a charged battery? How do you educate them? Where is this information contained (e.g., script for installation personnel, customer installation booklet, customer representative script, instruction manual)?

6. For back-up power systems installed at residential and small commercial customer premises, do you educate the consumer (e.g., leave-behind informational brochures, manuals, a quick demo during installation, Internet-based information sites, etc.) on battery alarms and replacement?
    a. Please provide specific examples of such material.
    b. Can you provide demo equipment of your customer premises back-up power systems to the CPUC that will be used for educational and public display purposes during the coming weeks? (NOTE: It refers to the equipment shown at the workshop on June 5, 2007 either in viewgraphs or on carry-on displays).
    c. What are your current or future plans to educate consumers with special needs (e.g., deaf, disabled, visually impaired) regarding options available to extend the life of the battery in their homes?
    d. Please propose generic consumer information that could be posted on "California's Consumer Education Information" website (http://www.calphoneinfo.com/) regarding the battery back-up systems at residential and small commercial customer premises (e.g., choices the consumers can make about technologies providing telephone service during emergencies, back-up power equipment in their homes, service provider vs. customer responsibilities for maintaining back–up power at customer premises, etc.).

[73] May 11, 2007 Interim Meeting of the ITU-T Study Group 15, Working Party (WP) 1, Question 2, Working Document LF18 titled "ONT Back-up Power Considerations".

Category D: Best Practices

7. If you are able and willing to do so, please provide your company's documented Best Practices for back-up power systems at residential and small commercial customer premises. (Please indicate if such information should be treated as proprietary or if it could be shared with the public.)

8. Do you know any governmental agency, non-governmental organization, company, or any other entity that has or is drafting Best Practices for back-up power systems at residential and small commercial customer premises?
    a. If yes, please provide references.
    b. If not, please indicate the appropriate entity (e.g., agency, organization) that should develop such Best Practices.

Category E: Definitions

9. Regarding the working definition for "small commercial/business customer" that was adopted for this information request[74]:
    a. Do you believe this is an appropriate definition for the Order Instituting Rulemaking (OIR) to implement Assembly Bill (AB) 2393?
    b. If not, what definition would you propose and what is your rationale?

10. If your company or organization has a definition for the term "emergency usage", what is it?
    a. How does that definition apply to the OIR to implement AB 2393?
    b. If not, do you want to propose a definition for "emergency usage" that should apply to this OIR to implement AB 2393?

Category F: Back-up Power Systems Standards/Requirements/Objectives

11. If you are a Service Provider procuring the back-up power system at residential and small commercial customer premises, what assumptions are used by your company regarding grid power outages (e.g., length of outages and Quality-of-Grid-Power supplied)?

12. Please provide your current performance reliability standards/requirements/ objectives for back-up power systems installed on the property of residential and small commercial customers. What suggestions do you have regarding those standards/requirements/objectives that should be proposed as part of this OIR for the legislature to address, including:
    a. Minimum operating life
    b. Minimum time period in which a telephone system with a charged back-up power system will provide the customer with sufficient electricity for emergency usage
    c. A means to warn the customer when the back-up system's charge is low or when the system can no longer hold a charge?

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[74] For the purposes of responding to the informational request, "small business customer" is defined as a business customer with no more than five access lines, none of which belongs to a larger entity (http://www.cpuc.ca.gov/EFILE/RULINGS/69259.htm).

Category G: Concerns or Issues

13. Please comment on any health, safety, environmental, and liability issues regarding the ownership of back-up power systems at residential and small commercial customer premises that have not already been discussed.

14. Please identify any other concerns or issues that should be addressed in order to properly consider back-up power systems at residential and small commercial customer premises?

Category H: Cost/Benefit Analysis

15. Whether or not you are responsible or not for back-up power systems at the residential and small commercial customer premises, if you have done any cost/benefit analysis related to that issue, please provide copies of any studies you have, whether prepared by you or others. (Please indicate if such information should be treated as proprietary.)

Additional Information Needed for Cost/Benefit Analysis:

This section highlights some of the information required to conduct cost/benefit analyses for back-up power systems installed at residential and small commercial customer premises.

Inquiries:

I. Describe the current processes, methods, and procedures used to provide customer premises back-up power for non-traditional access services, such as FTTx:

   a. How is the back-up power solution provisioned? What does it consist of?

   b. Are components with shorter lifetimes (e.g., batteries) readily available from local hardware or supermarket stores or do they require special purchase from qualified suppliers?

   c. How is the proper functioning of the back-up power system tested/monitored? List tasks, level of resources (e.g., FTE personnel) devoted to this activity, frequency of tests performed. Is it proactive or reactive?

   d. What repair and/or maintenance activities are performed?

   e. What tasks, if any, is the responsibility of the end user? For example in the case of a smoke alarm, is the homeowner expected to test the back-up power on a regular basis?

   f. If end user performs a maintenance operation incorrectly or fails to do required action, does that impair any service or warranty obligations?

   g. Which, if any, of these tasks are automated (under the control of an Operations Support System [OSS])? If not, why? What would prevent a carrier from mechanizing testing and monitoring activities?

II. Provide data or statistics on the number of back-up power incidents, both forecasted as well as actual reported problems per month (minimal time window is three years; please indicate the time window reported).

III. What is the estimated cost (per incident) of a "truck roll" to a customer location to diagnose and repair a back-up power system issue?

IV. What are other challenges being faced today in the management of these back-up power systems at residential and small commercial customer premises?

V. The following data items (pertaining to incidence of power outages in your network in California) may provide valuable insights to the CPUC to get a sense of the scale of the implications of back-up power solutions:

a. Has your telecommunications network experienced outage incidences in the past three years?

b. What is the average number of outages and duration by geographic locations?

c. Please provide totals segregated by:

i. Type of incident (e.g., power grid problems, weather-related issues [earthquakes, storms, floods, ice], other causes [vandalism], etc.)

ii. Number of affected users per outage

iii. Average outage duration and 90% upper quantile

iv. Specific geographic area (or statewide).

d. If available, please provide data on power outage :

i. Outage = complete loss of service with number of times and durations

ii. Cumulative indexes such as SAIDI (System Average Interruption Duration Index) or SAIFI (System Average Interruption Frequency Index) values.

VI. Potential costs associated with the adoption of performance and reliability standards for customer premises back-up power systems may include:

a. Incremental cost of proposed power solutions relative to existing systems being deployed.

i. Estimated cost of premises uninterruptible power supply (UPS) units with various functional configurations:

- Reserve duration levels (e.g., 2 through x hours)
- Visual signals, audible signals, transmission of signal data to management system
- Alarm set (operating on battery, battery missing, replace battery, low battery)
- Other.

b. Cost of retrofitting existing deployments with new conforming standard equipment (not only the cost of the units, but also the effort to dispatch a technician to replace the unit).

c. Efforts devoted to the planning, testing, procurement overhead of new solutions.

VII. Potential costs associated with the operational aspects of installing, operating, and monitoring back-up power systems at the residential and small commercial business customer may include:

a. What are the average loaded labor rates associated with personnel involved in the following operational functions:

i. Customer care

ii. Outside plant technician

iii. Dispatcher

iv. Field-craft supervisor

v. Network Operations Center (NOC) technicians.

b. What is the estimated level of effort in Full-Time-Equivalents (FTEs) required to conduct the necessary planning and testing in preparation for such a deployment?

INFORMATIONAL REQUEST 2

(Follow-up to Workshop held on June 6, 2007)

Section 2892.1 [AB 2393(3)]:

Back-up Power Systems Not Installed on the Customer's Premises

These informational requests are intended to provide parties and those who are interested in this proceeding an additional opportunity to comment on issues concerning back-up power systems not installed on customer premises. While response to these informational requests are voluntary, we encourage parties to respond as fully as possible in order to facilitate the Commission in its analysis of the costs and benefits and technical feasibility of developing and implementing performance reliability criteria for such back-up power systems.

Instructions for Responding to this Informational Request

Please respond to this Informational Request questions by July 20, 2007 with copy to the proceeding service list.[75] Electronic service is encouraged. Consistent with Commission rules, a hard copy must be provided concurrently to Assigned Administrative Law Judge Jeffrey P. O'Donnell. An additional hard copy is requested to be provided to Simin Litkouhi of the CD staff.

Handling of Responders' Proprietary Information

Information indicated to be proprietary and confidential will be restricted from public disclosure pursuant to Public Utilities Code Section 583 and General Order 66-C available at: www.cpuc.ca.gov/published/Graphics/644.pdf .

CPUC Participation at FCC on the Proceedings under the WARN Act

CPUC is actively following the FCC proceedings under the WARN act and will study the findings and recommendations of the independent panel reviewing the Impact of Hurricane Katrina on Communications Networks for applicability to this proceeding.

Introduction

Telecommunications service providers generally install back-up power on their property so their networks can operate in an electrical outage.[76] In addition to ensuring network reliability and operational efficiencies, minimizing communications service disruptions is widely beneficial for public safety and economic sustainability. In consultation with the Governor's OES and the California DGS, the Commission will determine whether the benefits exceed the costs and if it is technically feasible for the Commission to develop and implement performance reliability criteria back-up power systems that are not installed on customers' premises.

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[75] The service list is available at: http://www.cpuc.ca.gov/published/service_lists/R0704015_75408.htm .

[76] Within the AB 2393 legislation, "telecommunications service" means voice communication provided by a telephone corporation as defined in Public Utilities Code § 234, voice communications provided by a provider of satellite telephone services, voice communications provided by a provider of mobile telephony service as defined in Public Utilities Code § 2890.2, and voice communications provided by a facilities-based provider of voice communications utilizing Voice over Internet Protocol (VoIP) or any successor protocol.

As these back-up systems are often batteries supplemented by diesel-powered electric generators that recharge the batteries, the Commission is also to determine the feasibility of replacing diesel generators with zero greenhouse gas emission fuel cell systems.

The purpose of the related workshop (held on June 6, 2007) was to receive a broad overview of:

- How back-up power not installed on customers' premises currently is provided,
- Concerns and issues related to back-up power systems that are not installed on customers' premises, and
- The feasibility of replacing diesel generators with zero greenhouse gas emission fuel cell systems.

The outcome of the workshop is this informational request, which seeks more detailed information, to:

a. Clarify the nature of existing back-up power systems
b. Identify current best practices
c. Provide details on any relevant existing state or federal standards or protocols, as well as any state or federal action that gives the recommendations of standard-setting agencies the force of law
d. Address the concerns and issues that the Commission must consider, including the costs, benefits, and technical feasibility of establishing back-up requirements and an assessment of the feasibility of zero greenhouse gas emission fuel cell systems to replace diesel generators for such back-up power systems
e. Identify recommendations presented and their level of support
f. Assess whether any jurisdictional issues prevent the Commission from pursuing certain recommendations
g. Identify a recommended course of action, as well as any other viable options
h. Discuss the costs and benefits of implementing the recommended course of action
i. Identify any concerns or issues that remain to be addressed.

Questions

Category A: Participation in Related CPUC Activities

1. Did you participate at the CPUC Workshop on "Back-up Power Systems Not Installed on the Customer's Premises" that was held on June 6, 2007 in San Francisco, California?
    a. If yes, do you have any additional input or comments on the presentations and discussions that took place there?
    b. If not, you may view the corresponding workshop webcast at http://www.californiaadmin.com/cgi-bin/cpuc.cgi . This may be useful to do prior to answering some questions in this Informational Request.
2. Did you submit a written response to the related CPUC questions mailed before the above Workshop?
    a. If yes, do you have any additional comments or clarifications to make regarding your earlier response?

b. If you did not respond to the CPUC questions mailed before the workshop, and would like to respond to those questions, you may provide such response now, and/or respond to the questions in this Informational Request?

Category B: Trends and Future Technologies

3. For the trends and emerging technologies that your company or your battery supplier company(ies) envision for the back-up power supply not installed on customer premises:
    a. Please provide some information about studies, forums/standards organizations addressing such technologies?
    b. If you have considered but not adopted (or partially adopted) such technologies can you elaborate on the pros and cons as seen from your perspective? [NOTE: To the extent that you have already commented on this issue, there is no need to provide the same information. If you have additional comments on this issue, please respond].

Category C: Best Practices

4. Please provide any Best Practices for back-up power systems not installed on customer premises as part of this rulemaking process? Please indicate if such information should be treated as proprietary or if it could be shared with the public.
5. As a facility based service provider to what extent have you adopted and followed the Network Reliability and Interoperability Council – VII (NRIC – VII, www.nric.org) best practices:
    a. All of them
    b. Most of them
    c. Some of them
    d. None of them
6. Do you know of any governmental agency, non-governmental organization, company, or any other entity that has or is drafting Best Practices for back-up power systems not installed on customer premises?
    a. If yes please provide references
    b. If not, please indicate the appropriate entity (e.g., agency, organization) that in your view should develop such Best Practices.

Category D: Back-up Power Systems Standards/Requirements/Objectives

7. Given that recent FCC rules on back-up power (FCC 07-107, 47 C.F.R. 12.1, 12.2, and 12.3 released on June 8, 2007) require that telecom service "providers must have an emergency back-up power source for all assets that are normally powered from local AC commercial including those inside central offices, cell cites, remote switches digital loop carrier system remote terminals":
    a. What percentages of the above mentioned assets in your company in the California have back-up power systems currently?
    b. What plans do you have to comply with the above FCC rules (e.g., timeline for 100% compliance per asset category mentioned above)?
    c. What factors are hindering you from 100% compliance currently?
    d. What actions/measures are you taking to overcome those factors?

8. Please provide your company's performance reliability standards/requirements/ objectives for back-up power systems not installed on customer premises. What suggestion do you have for reliability standards/requirements/objectives that should be proposed as part of this OIR to the California legislature to address:
   a. Cell sites
   b. Remote switches, and
   c. Digital loop carrier system remote terminals
9. For the base station backhaul interconnection what percentage of base station outages is attributed to:
   a. Loss of power of the CLEC/ILEC backhaul network segment?
   b. Loss of the CLEC/ILEC backhaul segment due to other reasons (e.g., cable dig-ups)?

Category E: Concerns or Issues

10. For current and emerging technologies of back-up power systems, please comment on any health, safety, environmental, and liability issues regarding the ownership of back-up power systems not installed on customer premises that have not already been discussed?
11. Please identify your company's concerns or issues that should be addressed in order to properly consider back-up power systems not installed on the customer's premises?

Category F: Cost/Benefit Analysis

12. Please provide any data relating to back-up power system outages (e.g., FCC-reportable outages) that you are willing to share with CPUC as part of this rulemaking process.
13. Regardless of your position on replacing existing diesel generators being used in telecom central offices with zero-greenhouse-gas-emission fuel cell systems, if you have any cost/benefit analysis related to that issue, please provide copies of any such studies you have, whether prepared by you or others. (Please indicate if such information should be treated as proprietary).

<u>Additional Information Needed for Cost/Benefit Analysis:</u>

This section highlights some of the information required to conduct <u>cost/benefit analyses for replacing existing diesel generators being used in telecom central offices with zero-greenhouse-gas-emission fuel-cell systems</u>. The evaluation of diesel generators vs. zero-emission-fuel cells would center on comparing the Total Cost of Ownership (TCO) for each of the alternatives over a study horizon (several years covering the life of the systems). Two distinct cases need to be considered:

(1) An existing diesel generator (in operation) is replaced by a fuel-cell system, and
(2) A new central office location is being deployed and a choice between the two needs to be made.

In order to establish a baseline, the following type of information is required. Please provide any available information in support of developing the baseline.

Inquiries:

I. Describe a typical (representative) diesel generator system currently used to support the network's back-up power needs.
   a. Size, capacity, configuration.

II. What is the Installed First Cost (IFC) of such representative diesel generator system for a central office site?
   a. How is this total first cost broken down into its components?
      - Site preparation, planning and engineering, equipment capital investment (for a given capacity size), installation labor, testing and cutover activity

III. What are the ongoing operational expenses associated with such a representative system?
   a. How much effort is devoted to operate and maintain diesel generators? (e.g., Full time equivalents, average loaded salary rates of associated staff)
      - What activities are carried out as part of the ongoing operation and maintenance?
   b. What is the level and expense of fuel consumption, on average? (e.g., x gallons of fuel annually at a cost of $y)
      - What is the estimated cost of parts and labor associated with repairs to (a representative) diesel generator unit?
   c. What costs and savings are possible by switching to more environmentally friendly fuels (bio-diesel, low sulfur diesel)?

IV. What is the cost of measures related to safety and security for the operation of diesel generators?
   a. OSHA (Occupational Safety & Health Administration) compliance costs
   b. Pollution control measures
   c. Any other costs?

A similar set of data is required for a zero-emission fuel-cell system in order to conduct the financial comparisons. The fuel cells will be evaluated against newer and improved diesel generators that are designed to run on more environmentally friendly fuels or designed to run with lower emissions. However, given that fuel-cell systems are not considered mature technology (at least in the telecom space), there may be additional considerations to factor in, such as:

- The cost of training personnel in the operation and maintenance of these systems
- Technology in early stages of maturity tends to correspond to higher costs – as deployment volumes increase, costs decrease
- Cost of built-in redundancy in back-up system to help maintain and ensure the expected high reliability for telecommunications network
- Benefits and savings of possible back-feeding power into the grid from fuel-cell system when it is not required to power telecommunications services.

Please provide any available information for the zero-emission fuel-cell systems for the items mentioned above.

INFORMATIONAL REQUEST 3

(Follow-up to Workshop held on June 19, 2007)

Section 2872.5 [AB 2393(2)]: Emergency Notification Systems

These informational requests are intended to provide parties and those who are interested in this proceeding an additional opportunity to comment on issues concerning emergency notification systems. While response to these informational requests are voluntary, we encourage parties to respond as fully as possible in order to facilitate the Commission in its review of current standards and protocols regarding emergency notification systems and proposals for improving such systems.

Instructions for Responding to this Informational Request

Please respond to this Informational Request questions by July 20, 2007 with copy to the proceeding service list.[77] Electronic service is encouraged. Consistent with Commission rules, a hard copy must be provided concurrently to Assigned Administrative Law Judge Jeffrey P. O'Donnell. An additional hard copy is requested to be provided to Simin Litkouhi of the CD staff.

Handling of Responders' Proprietary Information

Information indicated to be proprietary and confidential will be restricted from public disclosure pursuant to Public Utilities Code Section 583 and General Order 66-C available at: www.cpuc.ca.gov/published/Graphics/644.pdf .

CPUC Participation at FCC on the Proceedings under the WARN Act

CPUC is actively following the FCC proceedings under the WARN act and will study the findings and recommendations of the independent panel reviewing the Impact of Hurricane Katrina on Communications Networks for applicability to this proceeding.

Introduction

Automatic notification devices are used in emergency notification systems by law enforcement agencies, fire protection agencies, public health agencies, public environmental health agencies, city or county emergency services planning agencies, and private for-profit agencies operating under contract with, and at the direction of, one or more of these agencies. These are automatic devices that store phone numbers and disseminate a prerecorded voice and text message to those phone numbers in the event of an emergency. In consultation with OES and DGS, the Commission will (i) determine the standards and protocols currently in use by those entities that operate such systems and (ii) obtain and consider the operating entities' and other interested parties' recommendations for improving emergency notification systems, which shall include an assessment of the costs and benefits of requiring standards and protocols for these systems.

The purpose of related workshop (held on June 19, 2007) was to receive a broad overview of:

- Concerns and issues related to emergency notification systems, including funding and statutory modifications needed to facilitate such notification:

[77] The service list is available at: http://www.cpuc.ca.gov/published/service_lists/R0704015_75408.htm .

The outcome of the workshop is this voluntary informational request, which seeks more detailed information of the concerns and issues that must be addressed to establish emergency notification systems. The information is needed to:

a. Clarify the nature of existing emergency notification systems
b. Identify current best practices
c. Provide details on any relevant existing state or federal standards or protocols, as well as any state or federal action that gives the recommendations of standard-setting agencies the force of law
d. Identify the policy concerns and issues that the Commission must address, including funding of emergency notification systems and any necessary statutory modifications needed to facilitate such notification
e. Assess whether any jurisdictional issues prevent the Commission from pursuing certain recommendations
f. Identify recommendations presented and their level of support
g. Identify a recommended course of action, as well as any other viable options
h. Discuss the costs and benefits of implementing the recommended course of action
i. Identify any concerns or issues that remain to be addressed.

Questions

Category A: Participation in Related CPUC Activities

1. Did you participate at the CPUC Workshop on "Emergency Notification Systems" that was held on June 19, 2007 in San Francisco California?
    a. If yes, do you have any additional input or comments on the presentations and discussions that took place there?
    b. If not, you may view the corresponding workshop webcast at http://www.californiaadmin.com/cgi-bin/cpuc.cgi . This may be useful to do prior to answering some questions in this Informational Request.
2. Did you submit a written response to the related CPUC questions mailed before the above Workshop[78]?
    a. If yes, do you have any additional comments or clarifications to make regarding your earlier response?
    b. If you did not respond to the CPUC questions mailed before the workshop, and would like to respond to those questions, you may provide such response now, and/or respond to the questions in this Informational Request?
3. During the workshop some comments were made that use of cell phones as a response to an emergency notification message may cause call blockage to the wireless service providers' facilities.
    (a) Please provide specific examples of such occurrences?
    (b) Please provide the number of such occurrences in California during the last three years?

[78] Workshop questions at http://www.cpuc.ca.gov/static/hottopics/2telco/r0704015workshopnotification.pdf

Category B: For Telephone Service Providers

4. If the CAP is adopted, will your company create a gateway for notification systems to connect to the Public Switched Telephone Network (PSTN) and its Internet services?
5. Is there a need for a common gateway at the PSTN, Internet, and wireless level, on some type of geographic basis, at which local notifications systems can interconnect, either to receive emergency alerts or send emergency alerts? Why or why not?
6. Please expand on your interactions with local agencies and notification systems vendors, what has worked, and what hasn't, regarding their implementation, operation, and relevant (real) examples of any incidents in which your network was drastically affected by call volume.
7. What do you, as a local service provider, recommend to automatic dialing notification system vendors regarding how to efficiently work with you? Do you have a single point of contact that such notification system vendors can call prior to testing their service?
8. During the workshop, a statement was made that "Autodialer users should be required to work with network providers to establish efficient interconnections". Could you, as a service provider, provide clarification on what is meant by the term "efficient interconnections"? Additionally, please provide any best practice regarding "efficient interconnection" that your company shares with the users of notification/autodialer systems.
9. Have you, as a local service provider providing service to a variety of local agencies with notifications systems, established any type of FAQs or best practices defining how either the local agency or notification system user can work with you? If yes, please provide these to the Commission.
10. What approach would you suggest for the facilitation, coordination and cooperation between the notification system users and service providers?
    - Would you recommend the use of some type of forum at which emergency notification system users and telecommunication service providers operating in the State of California could exchange information and point of contact information for testing purposes? Is there an existing forum or industry body that could facilitate such interaction? (Some representative forums may include the Association of Public-Safety Communications Officials, COMCARE[79], telecommunications standards organizations, business continuity or disaster recovery organizations).
11. If the FCC's CMSAAC, which is specifically charged with the task of developing (and recommending to the FCC) technical standards and protocols for the voluntary transmission of emergency alerts by CMS providers, finishes its task, what's next? If you are a mobile phone company, do you expect that your company will offer some type of gateway service based on the adopted protocols?
12. States such as Virginia and Louisiana recently initiated programs with notification system vendors for state wide systems. Louisiana's is a limited pilot program through December 2007, and is a DHS WARN pilot project using CAP and supported by the vendor MyStateUSA[80]. In March, 2007, Virginia approved a single vendor as the state appointed

[79] http://www.comcare.org/
[80] See DHS presentation from 2006, http://2006.xmlconference.org/proceedings/212/slides-overview.pdf and Louisiana press release http://www.ohsep.louisiana.gov/newsrelated/statewideeas32207.htm

notification vendor for Virginia communities[81]. The award allows Virginia cities, towns, and counties to purchase the system at pre-negotiated prices. Given that AT&T and Verizon operate in these states, how will you deal with the myriad of interconnection issues with these notification systems being initiated on a state wide basis? Is there anything you, as a service provider, is doing with notification system vendors in these states that could be shared with CPUC?

Category C: For Specific Companies

For Verizon:

13. We noticed since June 2003, Verizon has been offering a Dialogic notification system for federal agencies in the Washington DC area via WITS2001[82]. WITS2001 is the Washington Interagency Telecommunications System contract between Verizon & GSA serving Federal agencies in the National Capital Region. For system capabilities and solutions, see the WITS2001 Brochure.
    - How can Verizon leverage its experience offering a notification system in the Washington DC area to better work with local notification system vendors and local agencies that already have systems in place?
    - How does Verizon coordinate with mass dialing from these Verizon supported systems?
    - Could such coordination parameters be adopted for other notification system providers as well?
14. During your workshop presentation, Verizon cited an example in which Santa Barbara notified Verizon prior to testing a notification system. Could you provide additional details on the nature of the Santa Barbara system test, and how did Santa Barbara know whom to contact at Verizon?

For NTI:

15. During your presentation at the CPUC workshop on June 19, 2007, Miami Dade County was cited as a recent example in which you worked with the local telephone company. Could you provide additional details on what transpired with the local telephone company, what type of information was exchanged, were tests conducted, who is the customer and telephone service provider point of contacts?
16. Please provide additional information on your performance criteria, including Service Level Agreements (SLAs). How were these parameters derived, and have they been verified under load conditions?

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[81] REVERSE 911®, announced in March 2007 that it was approved as the state appointed notification vendor for Virginia communities as a result of a new contract award from The Commonwealth of Virginia Information Technologies Agency (VITA). The award allows cities, towns, and counties to purchase the REVERSE 911® system at pre-negotiated pricing. The state-approved contract provides exclusive pricing for Virginia agencies without the steps of individual bidding processes.

[82] http://www22.verizon.com/enterprisesolutions/Default/VerizonBusiness.jsp?industry=federal&filePath=/Anonymous/Federal/CC_WITS2001.html

Category D: For Vendors of Notification Systems

17. If CAP is adopted as a standard protocol, will your emergency notification system support this protocol?
18. What do you, as a notification system vendor, recommend to your customers as to how to interconnect and work with local telecommunication service providers? Do you have best practices or FAQs?
19. Have you, as a notifications system vendor, established any type of FAQs or best practices defining how either the customer local agency should operate the system in a way that interconnects to the local network in a non-disruptive fashion? If yes, please provide them to us.
20. Is there a need for best practices that define procedures in how a notification system should connect to a local service provider?
21. Are there states that provide best practices in the area of emergency notification solutions, for example, the State of Connecticut was cited as a possible example during the workshop?
22. What would you suggest for the facilitation, coordination, and cooperation between the notification system users and service providers?
    - Would you recommend the use of some type of forum at which emergency notification system vendors and telecommunication service providers operating in the State of California could exchange information and point of contact information for testing purposes? Is there an existing forum or industry body that could facilitate such interaction?
23. Could you provide a list of your emergency notification system customers in the State of California and a point of contact for each?

Category E: Questions for Local Users

Note: Examples of local users include counties, municipalities, schools, etc. currently using a notification system.

24. Please expand on your interactions with telecommunications service providers in California - how do you work with the local telecommunications provider to ensure your system interfaces with the service provider with high quality and low disruption to the network?
25. How and where do you typically connect to the service provider? Is there a need for a common gateway at the PSTN, Internet, and wireless level, on some type of geographic basis, at which local notification systems can interconnect, either to receive emergency alerts or send emergency alerts?
26. Are you satisfied with the system's performance?
27. To what extent did the notification system meet your expectations as a local user, as described to you by the vendor (in the areas of GIS performance, system availability, reliability, delivery capacity)? How it did not meet those expectations?
28. How well did the system meet your needs in actual emergencies?
29. If you have ever overloaded the system with a large delivery request of notifications, how did the system perform?
30. How do you ensure the privacy of the contact information?

31. How do you secure the system? Is access to it controlled and, if so, how?
32. As a local user what is your opinion based on the operational use of your system, regarding standardization? What, if any, aspects of the notification system should be standardized?

Category F: Related to Section 2875 of the California Public Utilities Code

Section 2875[83] of the California Public Utilities Code states:

> "No person shall connect any automatic dialing-announcing service to any telephone line without first making written application to the telephone corporation within whose service area telephone calls through the use of such device are proposed to be placed. In such application, the person shall provide information as to the type of automatic dialing-announcing device proposed to be connected, the time of day such telephone calls are proposed to be placed using such device, the anticipated number of calls proposed to be placed during the specified calling period, the average length of a completed call, and such additional information as the corporation or the commission may require. Upon receiving such an application for service, the corporation shall review the furnished information and, if it appears that calling patterns would create a traffic overload condition or the service would be detrimental to the services of other customers of the corporation, it may deny the application or modify the application and grant the application as so modified."

33. As a vendor or a public entity using an emergency notification system, have you ever made a written application to the telephone corporation pursuant to Section 2875 of the California Public Utilities Code prior to implementing your system? If so, please provide feedback on the results of such an application?
34. As a local telephone corporation, have you ever received applications from vendors or end users of emergency notification systems Section 2875 of the California Public Utilities Code? If so, please provide feedback regarding the nature of such applications? For any of those applications did your network experience traffic issues or overloads? When and why?
35. As a local telephone corporation, what, if any procedures have you put in place to facilitate applications from vendors or end users of emergency notification systems pursuant to Section 2875 of the California Public Utilities Code?

Category G: General Questions

36. Please discuss whether you believe there is a need for additional education for consumers on these issues, and if so, what type? Are entities with emergency notification services providing their end users, including those with special needs, enough information on how to enroll and take advantage of the notification system?
37. Identify any policy concerns and issues that the Commission must address, such as funding of emergency notification systems, any necessary statutory modifications needed to facilitate such notification, etc.
38. Are you aware of any jurisdictional issues that prevent the Commission from pursuing certain recommendations?

[83] http://www.leginfo.ca.gov/cgi-bin/waisgate?WAISdocID=01436612864+1+0+0&WAISaction=retrieve

Category H: Cost/Benefit Analysis

39. What major factors could you suggest that need to be taken into consideration in any cost/benefit analysis study regarding the standardization of emergency notification systems and protocols?
40. Regardless of your position on the standardization of emergency notification systems and protocols, if you have done any cost/benefit analysis related to that issue, please provide a copy of your analysis.
41. What tangible benefits do you expect will materialize as a result of standardizing notification systems and protocols?

Appendix E: CPUC Questionnaire

NRIC Power-Related Best Practices: CPUC Questionnaire Description

The CD followed-up the informational requests with additional questions aimed at collecting statistical information on the implementation of the FCC Network Reliability Interoperability Council (NRIC) Power-related Best Practices and to assess the effectiveness and costs to implement those Best Practices.[84] There are 98 Best Practices related to Power for all segments of the telecom industry (wireline, wireless, cable, satellite, and equipment providers).

The CPUC questionnaire, which was provided in a spreadsheet form, referenced all 98 Best Practices. 52 of them (highlighted in yellow and blue colors in the CPUC spreadsheet below appear to be related to backup power systems. From those 52 Best Practices, 28 (highlighted in blue in the CPUC spreadsheet below appear to address generator deployment.

The first column (**Column A**) of the spreadsheet contains the NRIC Best Practice identifying number as given in www.nric.org . **Column B** gives a summary description of the Best Practice. **Column C** provides a source(s) for the recommendation as stated in www.nric.org . Columns D through G are to be filled by the respondents.

In **Column D**, companies are asked to rate the effectiveness of the recommendation in enhancing network reliability and preventing or reducing outages. A scale of 1 to 5 is used with the following interpretation:

5	The practice is definitely effective in preventing or reducing outages based, for example, on quantifiable measurements and experience
4	Based on intuitive opinions or anecdotal evidence, the practice is effective in preventing or reducing outages
3	The practice is somewhat, or moderately, effective in preventing or reducing outages
2	The practice is only slightly effective in preventing or reducing outages
1	The practice is basically ineffective in preventing or reducing outages
0	The company does not know the effectiveness of the practice

Column E deals with the company's implementation of each NRIC Best Practice related to power. A company is asked to indicate whether the best practice is implemented (Y), not implemented (N), is under consideration (C), or zero (0) if the company does not know whether the practice has been considered or implemented at this stage.

Column F asks each company to rate the cost to implement a practice,. The choices are Very Low (VL), Low (L), Moderate (M), High (H), Very High (VH), and Zero (0). A Very Low rating suggests that there is essentially no additional cost above the normal costs of doing business for implementing the Best

[84] The NRIC website (www.nric.org) has a link to the FCC website (https://www.fcc.gov/nors/outage/bestpractice/BestPractice.cfm) for the Best Practices mentioned in AB 2393.

Practice. A Very High rating suggests major capital or operating expenditures will be required. A zero (0) rating suggests that the company does not know the relative cost to implement the Best Practice.

Column G is for any comments by the respondent. For example, if the particular Best Practice does not apply to a particular segment of the industry (e.g., wireless), then the company might comment that the Best Practice is Non-Applicable (NA).

NOTE: In the www.nric.gov website, 98 Best Practices are related to Power for all segments of the telecom industry (wireline, wireless, cable, satellite, and equipment providers). 52 of them (highlighted in yellow and blue colors in the CPUC corresponding spreadsheet) appear to be related to backup power systems. From those 52 Best Practices, 28 (highlighted in blue) appear to address generator deployment.

NRIC Best Practices: Numbering Format

Each NRIC Best Practice has a unique number that follows the numbering format:

X - Y - Z # # #

Where:

X = the current, or most recent, NRIC Council (e.g., 7 for NRIC-VII, which was chartered in 2004-05)

Y = the NRIC Council in which the Best Practice was last edited (i.e., 7 for the NRIC-VII work)

Z = 0-4 for Network Reliability (including Disaster Recovery & Public Safety)

= 5 for Physical Security

= 8 for Cyber Security

 # # # = any digits, where every Best Practice has a unique Z # # #.

CPUC Questionnaire in Spreadsheet Format

Industry Role(s):

Keyword(s): Power 98 Best Practices are found.

Company Name:

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-6-0761	Network Operators and Service Providers should conduct periodic verification of the office synchronization plan and the diversity of timing links, power feeds and alarms.	Best Practice recommended by the NRSC Timing Outage Task Force Report - March 6, 2002	-	-	-	
7-6-5131	Network Operators should provide appropriate security for emergency mobile trailers (both pre- and post-deployment) in order to protect against a coordinated terrorist attack on emergency communications capabilities.		-	-	-	
7-6-5133	Network Operators should protect the identity of locations where emergency mobile trailers and equipment are stored.		-	-	-	
7-6-5210	Network Operators, Service Providers and Property Managers should discourage use of Emergency Power Off (EPO) switches between the primary battery supplies and the main power distribution board. EPO switches are not recommended for use in traditional -48V DC battery plants.		-	-	-	
7-6-5231	Network Operators, Service Providers, Equipment Suppliers and Property Managers should develop documentation for the restoration of power for areas of critical infrastructure including such things as contact information, escalation procedures, restoration steps and alternate means of communication. This documentation should be maintained both on-site and at centralized control centers.		-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-0464	Network Operators and local municipalities should cooperate on zoning issues that affect reliability of communication networks serving the public good (e.g., noise from emergency backup power generators, aesthetics of tower placement, public safety and health concerns).		-	-	-	
7-7-0492	Network Operators should provide back-up power (e.g., some combination of batteries, generator, fuel cells) at cell sites and remote equipment locations, consistent with the site specific constraints, criticality of the site, the expected load and reliability of primary power.		-	-	-	
7-7-0493	Network Operators and Property Managers should consider placing fixed power generators at cell sites, where feasible.		-	-	-	
7-7-0494	Network Operators and Property Managers should consider including a provision in cell-site contracts for back-up power.		-	-	-	
7-7-0495	Network Operators and Property Managers should consider pre-arranging contact information and access to restoral information with local power companies.		-	-	-	
7-7-0496	Network Operators and Property Managers should consider storing their portable generators at critical sites that are not otherwise equipped with stationary generators.		-	-	-	
7-7-0497	Network Operators and Property Managers should consider connecting the power load to portable generators where they are stored, and configuring them for auto-engage in the event of a failover.		-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-0498	Network Operators and Property Managers should consider alternative measures for cooling network equipment facilities (e.g., powering HVAC on generator, deploying mobile HVAC units) in the event of a power outage.		-	-	-	
7-7-0499	Network Operators and Service Providers should consider ensuring that the back-haul facility equipment located at the cell site is provided with backup power duration is equal to that provided for the other equipment at the cell site.		-	-	-	
7-7-0543	Service Providers should establish agreements with Property Managers for both regular and emergency power.		-	-	-	
7-7-0549	Network Operators should develop an engineering design for critical network elements and inter-office facilities that addresses diversity, and utilize management systems to provision, track and maintain that inter-office and intra-office diversity.		-	-	-	
7-7-0622	Network Operators, Service Providers, and Property Managers should use ANSI T1.311-1998 Standard for Telecommunications Environmental Protection, DC Power Systems for key equipment locations (e.g., routers, central office switches, and other critical network elements) to reduce fires associated with DC power equipment.	For ANSI T1.311 1998 go to : https://www.atis.org/atis/docstore/search.asp?order_by=document_number&committee=2. Scroll down to T1.311, click, then follow prompts.	-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-0623	Network Operators and Service Providers using Valve Regulated Lead Acid (VRLA) batteries should perform annual maintenance by performing a discharge test or by using an ohmic test instrument.	The aging properties of these batteries can lead to thermal runaway that may cause a fire. See SR-NWT-001307	-	-	-	
7-7-0624	Network Operators, Service Providers, and Property Managers are encouraged to establish case history files, by equipment category for rectifiers, to facilitate decisions to replace such equipment with more efficient equipment based on failure trends.		-	-	-	
7-7-0625	Network Operators, Service Providers and Property Managers should consider placing electric utility transformers external to buildings.		-	-	-	
7-7-0627	Network Operators, Service Providers and Property Managers should exercise, service, and calibrate AC circuit breakers per manufacturers' recommendations.		-	-	-	
7-7-0634	Network Operators, Service Providers and Property Managers together with the Power Company and other tenants in the location, should verify that aerial power lines are not in conflict with hazards that could produce a loss of service during high winds or icy conditions.		-	-	-	
7-7-0635	Network Operators, Service Providers, and Property Managers should ensure that AC surge protection is provided at the power service entrance to minimize the effects caused by lightning or extremely high voltages.	TR-NWT-001011 "Generic Requirements for Surge Protection Devices"	-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-0644	Network Operators, Service Providers, and Property Managers should use over-current protection devices and fusing.		-	-	-	
7-7-0648	Network Operators, Service Providers and Property Managers should ensure certified inspection of boilers & fuel storage units.		-	-	-	
7-7-0650	Network Operators, Service Providers and Property Managers should place strong emphasis on human activities related to the operation of power systems (e.g., maintenance procedures, alarm system operation, response procedures, and training) for operations personnel.		-	-	-	
7-7-0651	Network Operators, Service Providers and Property Managers should consider providing diversity within power supply and distribution systems so that single point failures (SPOF) are not catastrophic. For large battery plants in critical offices, consider providing dual AC feeds (odd/even power service cabinets for rectifiers). Transfer switches should be listed to a UL standard for Transfer Switch Equipment. When transfer breaker systems are used, they must be mechanically and electrically interlocked.		-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-0652	Network Operators, Service Providers, Equipment Suppliers and Property Managers should adhere to the following applicable power engineering design standards; Telcordia GR-513-CORE (Power - LSSGR section 13), Telcordia GR-63-CORE (NEBS), Telcordia GR-295-CORE (Isolated Ground Planes), Telcordia GR-1089-CORE (Electromagnetic Compatibility), and ANSI T1.311 (DC power Systems).		-	-	-	
7-7-0653	Network Operators, Service Providers and Property Managers should retain complete authority about when to transfer from the electric utility and operate standby generators.		-	-	-	
7-7-0654	Network Operators, Service Providers and Property Managers should not normally enter into power curtailment or load sharing contracts with electric utilities.		-	-	-	
7-7-0655	Network Operators, Service Providers and Property Managers should coordinate hurricane and other disaster restoration work with electrical and other utilities as appropriate.		-	-	-	
7-7-0656	Network Operators and Service Providers should establish a general requirement for power conditioning, monitoring and protection for sensitive equipment.		-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-0657	Network Operators, Service Providers and Property Managers should design standby generator systems for fully automatic operation and for ease of manual operation, when required.		-	-	-	
7-7-0658	Network Operators, Service Providers and Property Managers should maintain adequate fuel on-site and have a well-defined re-supply plan. Generator life support systems (e.g., radiator fan, oil cooler fan, water transfer pumps, fuel pumps, engine start battery chargers) should be on the essential AC bus of the generator they serve.		-	-	-	
7-7-0660	Network Operators, Service Providers and Property Managers should have a plan that is periodically verified for providing portable generators to offices with and without stationary engines.		-	-	-	
7-7-0662	Network Operators, Service Providers and Property Managers should exercise power generators on a routine schedule in accordance with manufacturer's specifications. For example, a monthly 1 hour engine run on load, and a 5 hour annual run.		-	-	-	
7-7-0663	Network Operators, Service Providers and Property Managers should coordinate scheduled power generator tests with all building occupants to avoid interruptions.		-	-	-	
7-7-0664	Network Operators, Service Providers and Equipment Suppliers should provide indicating type control fuses on the front of the power panels, including smaller distribution panels.		-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-0665	Network Operators, Service Providers and Property Managers should provide and maintain accurate single line drawings of AC switch equipment on-site.		-	-	-	
7-7-0667	Network Operators, Service Providers and Property Managers should keep circuit breaker racking/ratchet tools, spare fuses, fuse pullers, etc. readily available.		-	-	-	
7-7-0668	Network Operators, Service Providers and Equipment Suppliers and Property Managers should clearly label the equipment served by each circuit breaker and fuse.		-	-	-	
7-7-0669	Network Operators, Service Providers, and Property Managers should develop and/or provide appropriate emergency procedures for AC transfer.		-	-	-	
7-7-0671	Network Operators, Service Providers and Property Managers should design and implement a preventive maintenance and inspection program for electrical systems.		-	-	-	
7-7-0672	Network Operators and Service Providers should provide a minimum of 3 hours battery reserve for central offices equipped with fully automatic standby systems.		-	-	-	
7-7-0673	Network Operators and Service Providers should provide temperature compensation on the rectifiers (or some method to detect/prevent thermal runaway), when valve regulated batteries are used.		-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-0674	Network Operators, Service Providers and Property Managers should initiate or continue a modernization program to ensure that outdated power equipment is phased out of plant. They should consider the capabilities of smart controllers, local and remote monitoring, and alarm systems when updating their power equipment. Power monitors and smart controllers should be integrated into engineering and operational strategies.		-	-	-	
7-7-0675	Network Operators, Service Providers and Property Managers should, for new installations, consider using multiple small battery plants in place of single very large plants, and consider using multiple battery strings in each plant.		-	-	-	
7-7-0676	Network Operators and Service Providers should not use low voltage disconnects or battery disconnects at central office battery plants.		-	-	-	
7-7-0677	Network Operators, Service Providers and Property Managers should only use rectifier sequence controllers where necessary to limit load on the backup power generator.		-	-	-	
7-7-0679	Network Operators, Service Providers and Equipment Suppliers should provide diverse power feeds for all redundant links (e.g., SS7, BITS clocks) and any components identified as critical single points of failure (SPOF) in transport and operations of the network.		-	-	-	
7-7-0680	Network Operators, Service Providers, Equipment Suppliers and Property Managers should provide protective covers on vulnerable circuit breakers which power critical equipment.		-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-0681	Network Operators, Equipment Suppliers and Property Managers should ensure that fuses and breakers meet quality Level III reliability per Technical Reference (SR-332), Reliability Prediction Procedure for Electronic Equipment.		-	-	-	
7-7-0682	Network Operators, Service Providers, Equipment Suppliers and Property Managers should ensure that power wire, cable, and signaling cables used in communications locations meet NEBS.		-	-	-	
7-7-0683	Network Operators, Service Providers and Equipment Suppliers should not mix DC power cables, AC power cables and telecommunications cables wherever possible.		-	-	-	
7-7-0684	Network Operators, Service Providers and Property Managers should verify DC fusing levels throughout the power supply and distribution system, especially at the main primary distribution board, to ensure that fuses and breakers are not loaded at more than 80% of their rated ampacity. Diode OR'ed arrangements require additional special overcurrent protection considerations. In addition, protector size should never exceed cable ampacity.		-	-	-	
7-7-0685	Network Operators should have detailed methods and procedures to identify protection required around energized DC buses.		-	-	-	
7-7-0689	Network Operators and Service Providers should provide a separate battery discharge alarm for all critical infrastructure facilities, and where feasible, periodically (e.g., every 15 minutes) repeat the alarm as long as the condition exists.		-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-0690	Network Operators and Property Managers should consider providing power alarm redundancy so that no single point alarm system failure will lead to a network power outage.		-	-	-	
7-7-0692	Network Operators, Service Providers and Equipment Suppliers should consider using fail-safe, normally closed contacts that open for an alarm, for critical alarms produced by single contacts (one on one).		-	-	-	
7-7-0693	Network Operators, Service Providers and Property Managers should emphasize the use of Methods Of Procedures (MOPs), vendor monitoring, and performing work on in-service equipment during low traffic periods.		-	-	-	
7-7-0694	Network Operators and Service Providers should check for current flow in cables with AC/DC clamp-on ammeters before removing the associated fuses or opening the circuits during removal projects.		-	-	-	
7-7-0695	Network Operators, Service Providers and Property Managers should develop and test plans to address situations where normal power backup does not work (e.g., commercial AC power fails, the standby generator fails to start, automatic transfer switch fails).		-	-	-	
7-7-0696	Network Operators, Service Providers and Property Managers should use infrared thermography to check power connections and cabling in central offices when trouble shooting, during installation test and acceptance, and every 5 years.		-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-0697	Network Operators, Service Providers and Equipment Suppliers should employ an Ask Yourself program as part of core training and daily operations. This initiative is intended to reinforce the responsibility every employee has to ensure flawless network service. (See Reference/Comments for additional details). Employees should stop and resolve problems when they can't answer yes to any of the following questions listed in reference column	1) Do I know why I'm doing this work? 2) Have I identified and notified everybody who will be directly affected by this work? 3) Can I prevent or control a service interruption? 4) Is this the right time to do this work? Am I trained and qualified to do this work? 5) Are work orders, MOPs, and supporting documentation current and error-free? 6) Do I have everything I need to quickly restore service if something goes wrong? 7) Have I walked through the procedure?	-	-	-	
7-7-0699	Network Operators, Service Providers, Equipment Suppliers and Property Managers should design standby systems (e.g., power) to withstand harsh environmental conditions.		-	-	-	
7-7-0700	Network Operators, Service Providers and Equipment Suppliers should consider the need for power expertise/power teams.		-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-0701	Network Operators, Service Providers and Property Managers should provide security for portable generators.		-	-	-	
7-7-0702	Network Operators and Service Providers should minimize dependence on equipment requiring AC power feeds in favor of DC-powered components.		-	-	-	
7-7-0703	Network Operators and Service Providers and Property Managers should secure remote power maintenance systems to prevent unauthorized use.		-	-	-	
7-7-0760	Network Operators and Service Providers should maintain records that accurately track the diversity of internal wiring for office synchronization, including timing leads and power.	Best Practice recommended by the NRSC Timing Outage Task Force Report - March 6, 2002	-	-	-	
7-7-0773	Network Operators, Service Providers and Property Managers should perform annual capacity evaluation of power equipment, and perform periodic scheduled maintenance, including power alarm testing.		-	-	-	
7-7-0774	Network Operators, Service Providers and Equipment Suppliers should provide warning signs to indicate precautions to be taken when powering on circuits that require special procedures.		-	-	-	
7-7-0819	For the deployment of Residential Internet Access Service, Network Operators should provide backup power for broadband network equipment when economically and technically practical.		-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-1028	Network Operators, Service Providers and Property Managers should engage in preventative maintenance programs for network site support systems including emergency power generators, UPS, DC plant (including batteries), HVAC units, and fire suppression systems.		-	-	-	
7-7-1029	Network Operators and Service Providers should periodically review their portable power generator needs to address changes to the business.		-	-	-	
7-7-1033	Network Operators should develop a strategy for deployment of emergency mobile assets such as Cell on Wheels (COW), cellular repeaters, Switch on Wheels (SOWs), transportable satellite terminals, microwave equipment, power generators, HVAC units, etc. for emergency use or service augmentation for planned events (e.g., National Special Security Event (NSSE)).		-	-	-	
7-7-1067	Network Operators, Service Providers and Property Managers should consider, in preparation for predicted natural events, placing standby generators on line and verifying proper operation of all subsystems (e.g., ice, snow, flood, hurricanes).		-	-	-	
7-7-5041	Network Operators, Service Providers, Equipment Suppliers and Property Managers should establish and implement policies and procedures to secure and restrict access to power, environmental, security, and fire protection systems.	Examples of power and environmental systems: HVAC, standby emergency power, generators, UPS.	-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-5042	Network Operators, Service Providers and Property Managers should establish and implement policies and procedures to secure and restrict access to fuel supplies.		-	-	-	
7-7-5058	**Back-up Power:** Network Operators, Service Providers, Equipment Suppliers and Property Managers should ensure that all critical infrastructure facilities, including the security equipment, devices and appliances protecting it, are supported by backup power systems (e.g., batteries, generators, fuel cells).	Some local regulations and building codes may influence the options available.	-	-	-	
7-7-5076	Network Operators and Service Providers should ensure and periodically review intra-office diversity of critical resources including power, timing source and signaling leads (e.g., SS7). Examples of NE (Network Equipment) diversity within the SS7 System are provided in reference column.	Consider where the CCS links traverse D4 channels banks. The D4 channel bank are often shelves in bays. The first level of diversity is that the CCS links are on different interfaces to different D4 channel banks, the channel banks aggregate link (DS-1) connects to diverse M13 multiplexes or DCS frames, continuing through the multiplexing levels across diverse transport paths.	-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-5197	Network Operators, Service Providers, and Property Managers should periodically inspect, or test as appropriate, the grounding systems in critical network facilities. Cross reference to NRIC Best Practice 0636 (verify grounding arrangements).	1) GR-1089 Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment, Telcordia, Oct 31, 2002. 2) National Electric Code, NEC-AAC, 2008, http://www.nfpa.org/codes/NFPA_Codes_and_Standards	-	-	-	
7-7-5203	Network Operators, Service Providers, and Property Managers should develop, maintain and administer a comprehensive program to sustain a reliable power infrastructure.		-	-	-	
7-7-5204	Service Providers, Network Operators and Property Managers should ensure availability of emergency/backup power (e.g., batteries, generators, fuel cells) to maintain critical communications services during times of commercial power failures, including natural and manmade occurrences (e.g., earthquakes, floods, fires, power brown/black outs, terrorism). The emergency/backup power generators should be located onsite, when appropriate.		-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-5206	Network Operators, Service Providers and Property Managers should maintain sufficient fuel supplies for emergency/backup power generators running at full load to allow for contracted refueling.	See NRIC BP 0658.	-	-	-	
7-7-5207	Network Operators, Service Providers and Property Managers should take appropriate precautions to ensure that fuel supplies and alternate sources of power are available for critical installations in the event of major disruptions in a geographic area (e.g., hurricane, earthquake, pipeline disruption). Consider contingency contracts in advance with clear terms and conditions (e.g., Delivery time commitments, T&Cs).	See NRIC BP 0658.	-	-	-	
7-7-5208	Network Operators, Service Providers, Equipment Suppliers and Property Managers should ensure that electrical work (e.g., AC and high current DC power distribution) is performed by qualified technicians.		-	-	-	
7-7-5209	Network Operators, Service Providers and Property Managers should restrict access to the AC transfer switch housing area, ensure that scheduled maintenance of the transfer switch is performed, and ensure that spare parts are available.		-	-	-	
7-7-5211	Network Operators, Service Providers and Property Managers should disable power equipment features that allow switching off of power equipment from a remote location (i.e. dial up modem). During severe service conditions, such features may be activated to allow a degree of remote control.		-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-5212	Network Operators, Service Providers and Property Managers should consider placing generator sets and fuel supplies for critical sites within a secured area to prevent unauthorized access, reduce the likelihood of damage and/or theft, and to provide protection from explosions and weather.		-	-	-	
7-7-5213	Network Operators, Service Providers and Property Managers should, where feasible, place fuel tanks in a secured and protected area. Access to fill pipes, fuel lines, vents, manways, etc. should be restricted (e.g., containment by fencing, walls, buildings, buried) to reduce the possibility of unauthorized access.		-	-	-	
7-7-5214	Network Operators, Service Providers and Property Managers should consider placing all power and network equipment in a location to increase reliability in case of disaster (e.g., floods, broken water mains, fuel spillage). In storm surge areas, consider placing all power related equipment above the highest predicted or recorded storm surge levels.		-	-	-	
7-7-5216	Network Operators, Service Providers and Property Managers should consider providing secure pre-constructed exterior wall pathways for mobile generator connections or tap box connections.		-	-	-	
7-7-5229	Network Operators, Service Providers and Property Managers should have controlled access to comprehensive facility cabling documentation (e.g., equipment installation plans, network connections, power, grounding and bonding) and keep a backup copy of this documentation at a secured off-site location.		-	-	-	

Number	Description	Reference	Effectiveness Rating (1-5) ("0" Don't know)	Has been implemented? (Y=Yes, N=No, C= Is under consideration) ("0" Don't know)	Relative Cost to Implement (VL, L, M, H, VH) ("0" Don't know)	Comments (e.g., NA for non-applicable)
7-7-5232	Network Operators, Service Providers, and Property Managers should test fuel reserves used for standby or backup power for contamination at least once a year or after any event (e.g., earth tremor, flood) that could compromise the integrity of the tank housing, fill pipe or supply pipe.	These tests should include inspection for water, sediment, organic contaminates, and any other items that may inhibit the peak performance of the standby/backup generator.	-	-	-	
7-7-5241	Network Operators, Service Providers and Equipment Suppliers should consider placing access and facility alarm points to critical or sensitive areas on backup power.		-	-	-	
7-7-5275	Network Operators, Service Providers and Equipment Suppliers should consider backup power capabilities for Command and Control (Crisis Teams) so that communications and access to critical systems can be maintained in the event of a significant disruption to commercial power.	This could include, but is not limited to, moving crisis team personnel to locations where there exists long-term power backup, installing generator backup at certain critical sites, etc.	-	-	-	
7-7-5281	Network Operators, Service Providers and Property Managers with buildings serviced by more than one emergency generator, should design, install and maintain each generator as a stand alone unit that is not dependent on the operation of another generator for proper functioning, including fuel supply path.		-	-	-	

Appendix F: CPUC Questionnaire: Data Collection and Analysis

Data Collection Process

The questionnaires were distributed electronically to telecommunications service providers (wireline, wireless, and Cable TV Industry segments) on August 27, 2007. The original due-date for responses was September 7, 2007. This date was extended to September 14, 2007, to include as many responses as possible. Some questionnaires were returned at the end of September. Of the companies which received questionnaires, 11 responded. One response was received from a representative of 14 small LECs. This response reflected the collective views of those small carriers which did not provide separate responses. The 14 small LECs ranged in size from companies that serve as few as 300-to-1,000 customers to companies with 10,000 or more customers.

Table 10 depicts the final number of returned questionnaires.

Table 10. Final Number of Returned Questionnaires

Industry Segment	Number of Responses
Large LECs	2*
Small LECs	4
Wireless	3
Cable TV	2
Total	**11**

*NOTE: One Large LEC was also a wireless carrier.

Data Aggregation and Analysis Process

Best Practice Types

The analysis was limited to 52 NRIC-VII Best Practices associated with backup power. Of these 52 Best Practices, 28 were associated with generator deployment and were analyzed separately.

Response Values

The primary analysis was performed based on “average ratings” for each Best Practice with respect to “Implementation”, “Effectiveness”, and “Relative Cost”. In order to accomplish this, each response was assigned a numerical value. Respondents were asked to give responses on the effectiveness of a best practice with respect to a numeric scale as follows:

5 The practice is definitely effective in preventing or reducing outages based, for example, on quantifiable measurements and experience.
4 Based on intuitive opinions or anecdotal evidence, the practice is effective in preventing or reducing outages.
3 The practice is somewhat, or moderately, effective in preventing or reducing outages.
2 The practice is only slightly effective in preventing or reducing outages.

1 The recommendation is basically ineffective in preventing or reducing outages.

Table 11 shows the rating values assigned to each response requested by the questionnaire:

Table 11. Rating Values Assigned to Each Response in the Questionnaires

Response Value	Implementation	Effectiveness	Cost
1	No (N)	1	Very Low (VL)
2		2	Low (L)
3	Under Consideration (C)	3	Medium (M)
4		4	High (H)
5	Yes (Y)	5	Very High (VH)

Note: Responses with 0 ("Don't Know) were ignored in calculating the averages.

In some cases, a standard response was not provided in the questionnaire. Such cases were treated as follows:

- *NA, Outside Scope*: Not Applicable. These responses were ignored in calculating averages.
- *Blank*: These responses were ignored in calculating averages.
- *Implementation Yes Where Feasible or In Some Circumstances*: Given Implementation response value 4 and included in averages.
- *Cost Minimal*: Given Cost response value 1 and included in averages.
- *Cost Varies*: Given Cost response value 3 and included in averages.

In particular, several Cost responses were given as a range (e.g., "M to VH"). In such cases, the response value was set equal to the average of the response values for the extremes of the range. For example, the response "M to VH" was given the response value (3 + 5)/2 = 4. In this way, such responses were included in calculating averages.

Response Level

The level of participation and responsiveness of service providers to the information requests on NRIC Best Practices was excellent. The information supplied was also sufficiently detailed to permit a full statistical analysis.

Calculations of Averages

The average rating for a Best Practice was calculated without any weighting (i.e., each company's response had equal weight).

Table 12 below indicates the extent to which respondents completed the questionnaire for the purposes of calculating an average rating. The "Overall" column indicates the percentage (%) of responses that could be assigned a numerical rating (i.e., responses that were not "0, blank, or NA"). "Implementation" responses had the highest completion percentage while "Relative Cost" had the lowest. The Minimum and Maximum columns indicate to what degree the completion percentage varied from company; the Minimum (Maximum) column shows the lowest (highest) completion percentage among companies.

Completion of the "Implementation" column was not only the highest but also consistently high across companies. However, completion of the "Effectiveness" and "Relative Cost" columns varied greatly across companies. Four (4) respondents provided less than 15% of responses to Best Practices with respect to "Relative Cost", while one respondent provided less than 15% of responses to Best Practices with respect to "Effectiveness".

Table 12. Percentages Indicating Extent of Questionnaire Completeness

Response (Study Metrics)	Minimum	Maximum	Overall
Implementation	79%	100%	92%
Effectiveness	6%	100%	78%
Relative Cost	4%	100%	57%

Figure 30 below shows the distribution of numerical rating responses over Best Practices for each of the three study metrics (i.e., "Implementation", "Effectiveness", and "Relative Cost"). The figure shows that 33 Best Practices had an "Implementation" rating from all eleven (11) respondents (100% implementation), while only one (1) Best Practice had a 100% response with respect to "Effectiveness", and no Best Practices had a 100% response with respect to "Relative Cost". All Best Practices had a minimum of four (4) numerical rating responses. The average number of numerical responses per Best Practice were 10.1 (Implementation), 8.6 (Effectiveness), and 6.3 (Relative Cost).

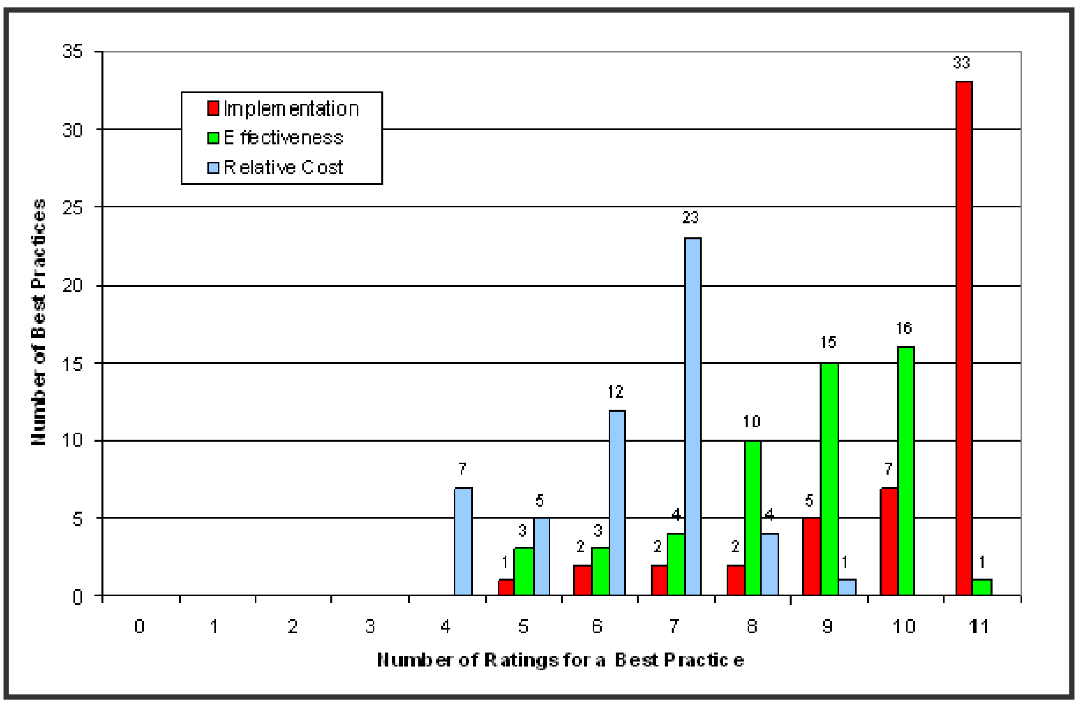


Figure 30. Distributions of Numerical Rating Responses per Best Practice

Composite graphs which simultaneously exhibit the average numerical ratings for “Effectiveness”, “Relative Cost”, and level of “Implementation” for each Best Practice were developed and are presented in the section below.

Findings: Observations and Recommendations

Overall Results

Figure 31 below summarizes all responses for each of the three (3) study metrics. The graph shows:

- The fraction of “Not Applicable” responses is minimal (on the order of 2% for each study metric). This indicates that the NRIC-VII Best Practices on backup power are in general considered applicable by the questionnaire responders.
- The fraction of “Blank" and “Don’t Know” responses is highest for “Relative Cost” and lowest for “Implementation”, with “Effectiveness” in the middle. This indicates that the responding service providers have less understanding of the cost of implementing the Best Practices than they do of their effectiveness or the extent of their implementation.
- The high fraction of “Yes” (scoring 5) responses for “Implementation” indicates that the Best Practices are extensively implemented by the service providers. The results are “Yes” (85%), “Partially Yes” (1%), “Under Consideration” (7%), and “No” (7%).
- A great majority of the Best Practices are considered effective to some degree (scoring of 3 or higher). Almost half (47%) of responses providing a numerical “Effectiveness” rating found them to be very effective (scoring 5).
- The “Relative Cost” of implementing these Best Practices is skewed toward the high end (almost 4 times as many responses above Moderate (scoring 3) as below. This indicates that, in general, respondents feel that these NRIC-VII Backup Power Best Practices are more costly to implement than other Best Practices.

Figure 31 below shows the distribution of all responses for each of the three response metrics. In general, they show that the effective response percentage (responses not including “Don’t Know”, “Not Applicable”, and “Blank”) was highest for Implementation (92%), lowest for “Relative Cost” (57%), and in the middle for “Effectiveness” (78%).

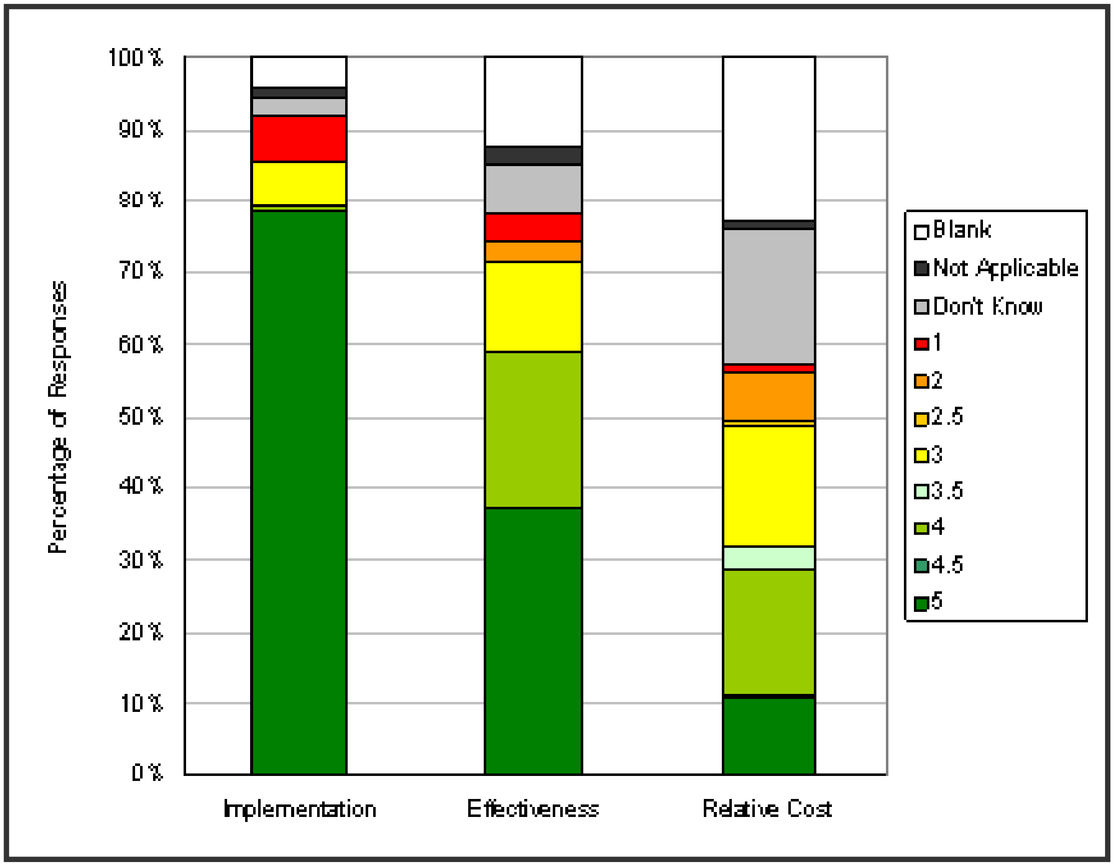


Figure 31. Distributions of Responses for the 52 “Backup Power” Best Practices

Figure 32 below show the distribution of Implementation results restricted to the 92% "Effective" responses. The results are "Yes" (85%), "Partially Yes" (1%), "Under Consideration" (7%), and "No" (7%).

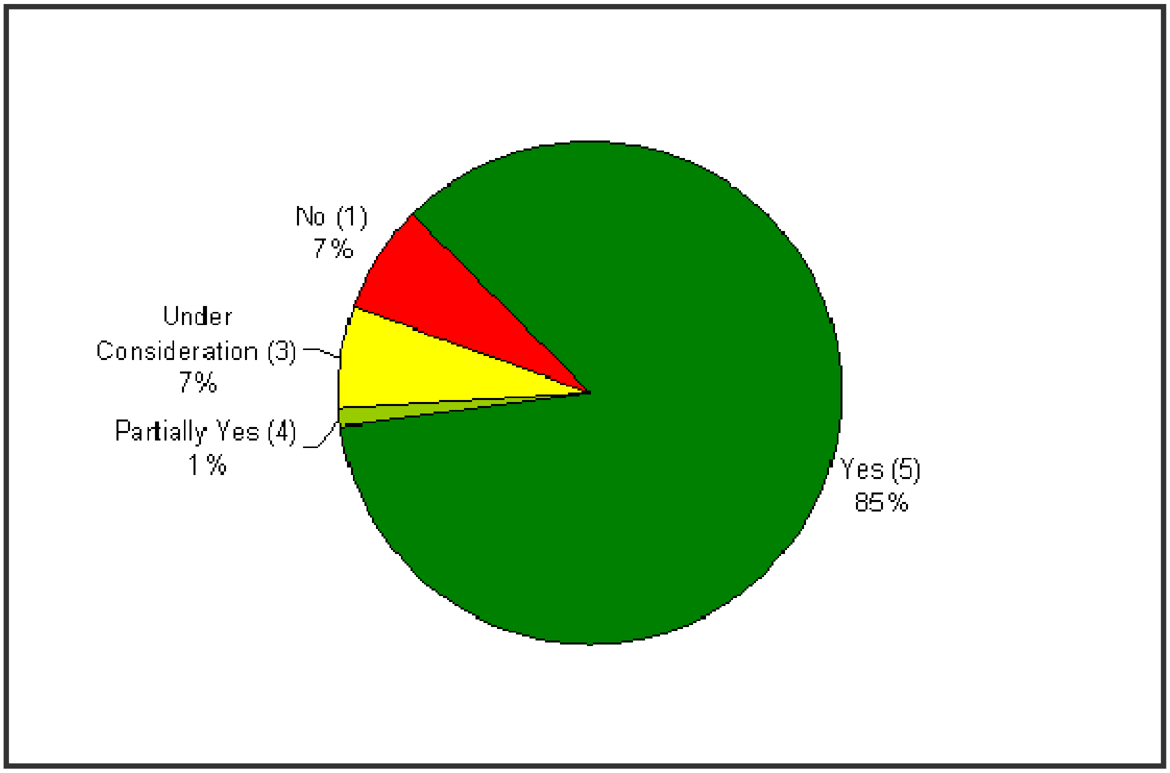


Figure 32. Distribution of Implementation Responses for the 52 "Backup Power" Best Practices
(Restricted to the 92% Effective Numerical Response Ratings)

Figure 33 below provides a similar analysis restricted to the NRIC-VII 28 Best Practices related to "Generator Deployment". In general, the conclusions above appear to hold as well if the analysis is restricted to this subset. Figure 33 below shows the distribution of all responses for each of the three response metrics and Figure 33 shows the distribution of Implementation responses among the 96% effective numerical responses for that metric. In particular, the Implementation results are "Yes" (84%), "Under Consideration" (7%), and "No" (9%) among effective numerical responses (those responses <u>excluding</u> "Don't Know", "Not Applicable", and "Blank").

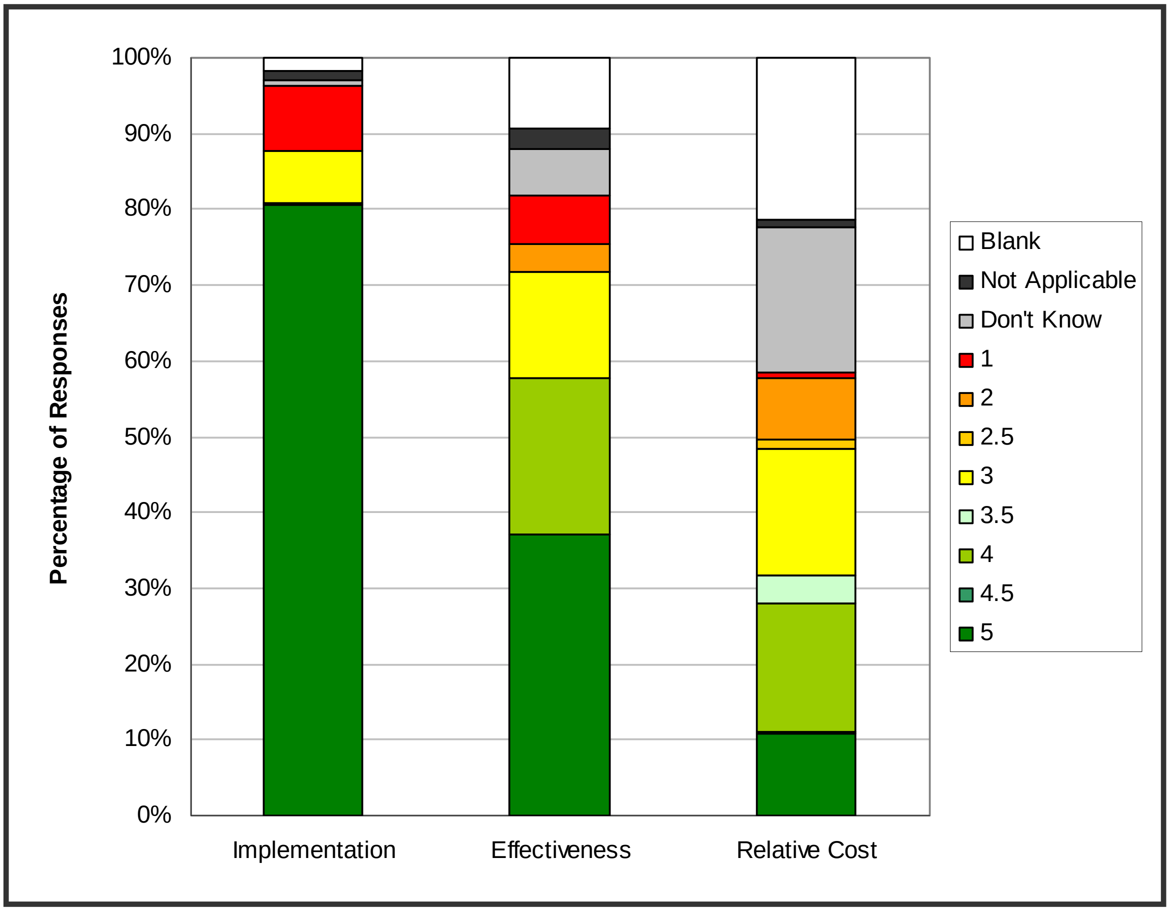


Figure 33. Distributions of Numerical Rating Responses per Best Practice for the 28 "<u>Generator Deployment</u>" Best Practices

Table 13 below provides an analysis of the distribution of "Implementation" averages over the Best Practices. The analysis is performed for:

- All 52 Best Practices,
- The subset of 28 Best Practices associated with "Generator Deployment", and
- The subset of the "Other" 24 Best Practices not associated with Generator Deployment.

The overall "Implementation" Best Practice average is 4.57. Considering the two subsets, the average for "Generator Deployment" Best Practices is slightly lower than for the other Best Practices (4.48 vs. 4.68); this difference is not statistically significant. Table 13 presents some example average "Implementation" ratings to aid in their interpretation. Thus, an average "Implementation" rating of 4.6 is approximately equal to 90% "Yes".

Table 13. Example Average Implementation Ratings

"Yes" Percentage	Implementation Average
100%	5.00
90%	4.60
80%	4.20
70%	3.80
60%	3.40
50%	3.00
40%	2.60
30%	2.20
20%	1.80
10%	1.40
0%	1.00

Figure 34 shows the cumulative percentage of Best Practices with respect to "Implementation" average. The dark blue line shows the results for all Best Practices. About 50% had an average of 5 (equivalent to 100% "Yes"). About 70% of Best Practices had an average of 4.6 or greater (equivalent to 90% "Yes"). About 10% of Best Practices had an average of 3.8 or less (equivalent to 70% "Yes"). The lowest average Implementation rating was 2.6 (equivalent to 40% "Yes"). The red and green lines show the results for Generator Deployment and Other Best Practices respectively. About 7% of Generator Deployment Best Practices have a 5 average while about 25% of Other Best Practices had a 5 average. However, the difference for averages greater than 4.6 (90% "Yes") is not as great (75% for "Other" versus 65% for "Generator Deployment" Best Practices). "Generator Deployment" Best Practices have a greater percentage of averages at the lower end (3.8 and below) (14%) versus "Other" Best Practices (4%).

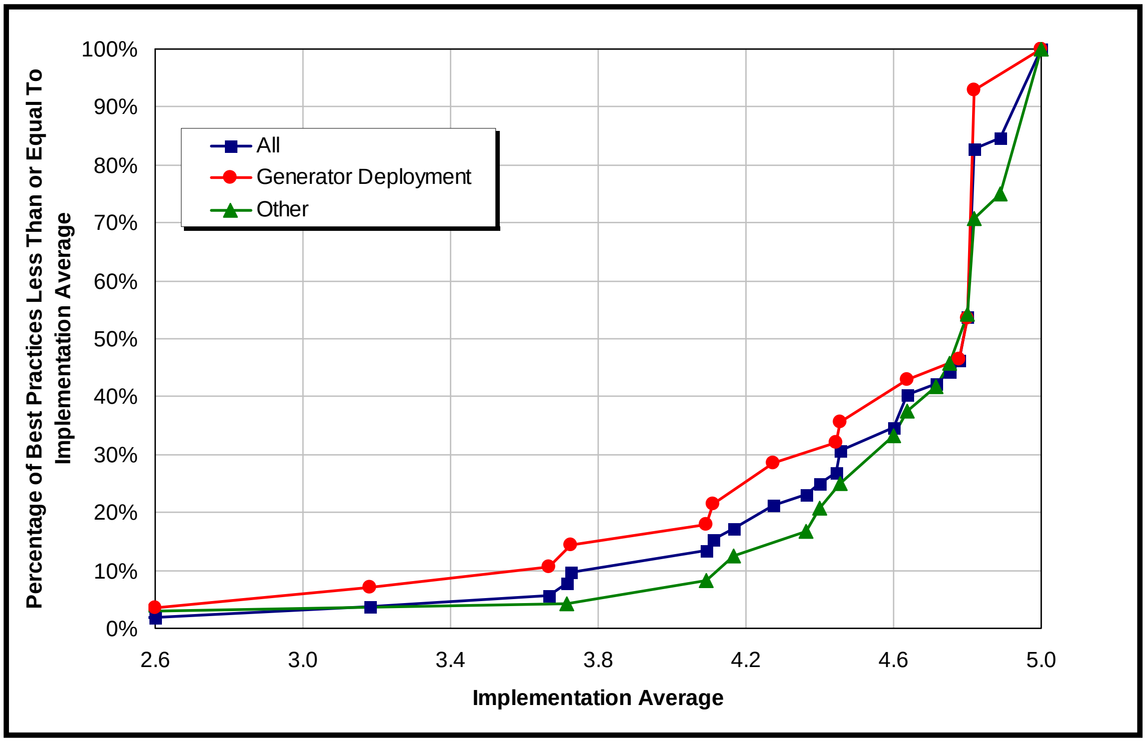


Figure 34. Cumulative Percentage of Best Practices with respect to Implementation Average

Implementation by Industry Segment

Table 14 summarizes the "Implementation" of Best Practices by industry segment. The Average Range values present the percentage of Best Practices for that industry segment with an "Implementation" average in that range; all Best Practices for which one or more Implementation ratings were included. For example, the CATV industry segment rated the Implementation of 50 Best Practices; two Best Practices were not rated by either CATV respondent. Of these 50 Best Practices:

- 88% (44 Best Practices) had an average rating of 5 (100% "Yes"),
- 6% (3 Best Practices) had an average rating greater than or equal to 4.2 and less than 4.6 (equivalent to percentage "Yes" in the 80s)
- 6% (3 Best Practices) had an average rating greater than or equal to 3.0 and less than 3.4 (equivalent to percentage "Yes" in the 50s)
- The overall average rating for these 50 Best Practices was 4.82.

Table 14 also notes that the number of Best Practices with 2 or more responses for the CATV segment was 39; thus, 11 of the averages were based on a single rating.

Three segments had overall ratings in the 90-100% "Yes" range (Large LEC, CATV, and Wireless in decreasing order) while the Small LEC segment had an overall rating in the 80-90% "Yes" range. The Small LEC segment had the lowest percentage of Best Practices with "Implementation" all "Yes" (29%), while the other segments had Best Practice percentages of 75% and higher; part of this disparity is likely a result of the generally high response compliance by this segment, resulting in the lesser likelihood of getting all respondents to have the same positive response. For example, 10 Best Practices that were rated 5 by the CATV segment were based on a single response, while all Small LEC averages based on at least two responses. The LEC segment also had the only Best Practice to which all respondents indicated that the Best Practices was not implemented. Statistical tests indicated that the average "Implementation" ratings by the Small LECs were lower than those for the other service providers treated as a single group.[85]

Table 14. Ratings Implementation of Best Practices by Industry Segment

Average Range		**Equivalent %**	**CATV**	**Small LEC**	**Large LEC**	**Wireless**
Equals 1		0%	0%	**2%**	0%	0%
Greater Than 1	Less Than 1.4	(0-10)%[86]	0%	0%	0%	0%
Greater Than or Equal to 1.4	Less Than 1.8	[10-20)%[87]	0%	0%	0%	0%
Greater Than or Equal to 1.8	Less Than 2.2	[20-30)%	0%	0%	0%	0%
Greater Than or Equal to 2.2	Less Than 2.6	[30-40)%	0%	**6%**	0%	0%
Greater Than or Equal to 2.6	Less Than 3.0	[40-50)%	0%	0%	0%	0%
Greater Than or Equal to 3.0	Less Than 3.4	[50-60)%	**6%**	**4%**	**2%**	**6%**
Greater Than or Equal to 3.4	Less Than 3.8	[60-70)%	0%	**15%**	0%	**2%**
Greater Than or Equal to 3.8	Less Than 4.2	[70-80)%	0%	**8%**	**2%**	**6%**
Greater Than or Equal to 4.2	Less Than 4.6	[80-90)%	**6%**	**37%**	0%	**2%**
Greater Than or Equal to 4.6	Less Than 5	[90-100)%	0%	0%	0%	**10%**
Equals 5		100%	**88%**	**29%**	**96%**	**75%**
		Average	4.82	4.20	4.94	4.76
Number of Best Practices with 2 or more responses			39	52	45	51
Number of Best Practices with 1 or more responses			50	52	52	51

85 Several statistical tests were performed. All indicated that this difference was significant at the .0001 level. This means that there is less than a 0.01% chance that the observed difference is the result of randomness or luck.

86 The notation (X-Y)% indicates the range of percentages greater than X and less than Y. Thus, (0-10)% indicates all equivalent percentages between 0 and 10% but not including 0% or 10%.

87 The notation [X-Y)% indicates the range of percentages greater than or equal to X and less than Y. Thus, [10-20)% indicates all equivalent percentages between 10 and 20% including 10% but not including 20%.

Statistical Summary of the Responses for Each Best Practice

The following pages of this section provide statistical summaries of the responses for each Best Practice.

The first three sub-sections summarize the results separately with respect to “Implementation”, “Effectiveness”, and “Relative Cost”.

The last sub-section summarizes average ratings for all three metrics combined into a single plot per Best Practice.

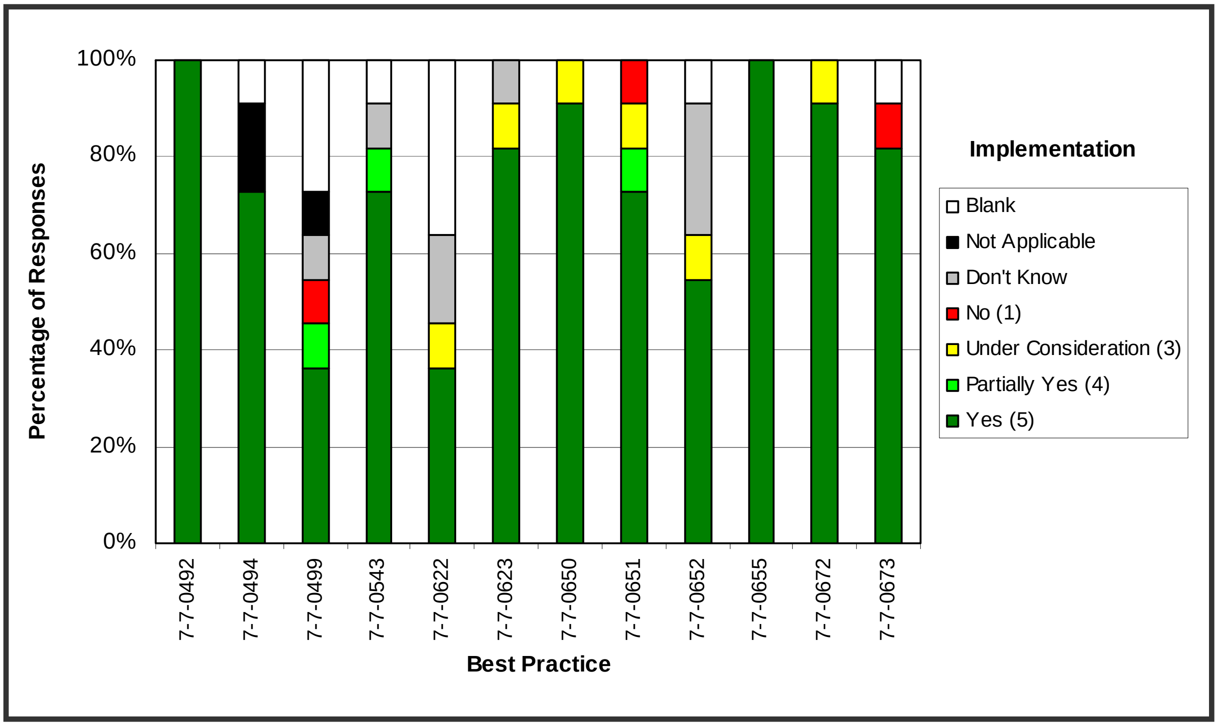
A high number for “Effectiveness” indicates that the respondents believed that this Best Practice was highly effective in preventing outages.

A high number for “Relative Cost” indicates that this Best Practice is very costly to implement (relative to other Best Practices).

A high number for “Implementation” indicates that this Best Practice is implemented extensively.

Implementation

The following two charts show the distribution of the "Backup Power" Best Practice responses with respect to "Implementation". Please see Appendix E for the wording of particular Best Practice number (7-7-####).



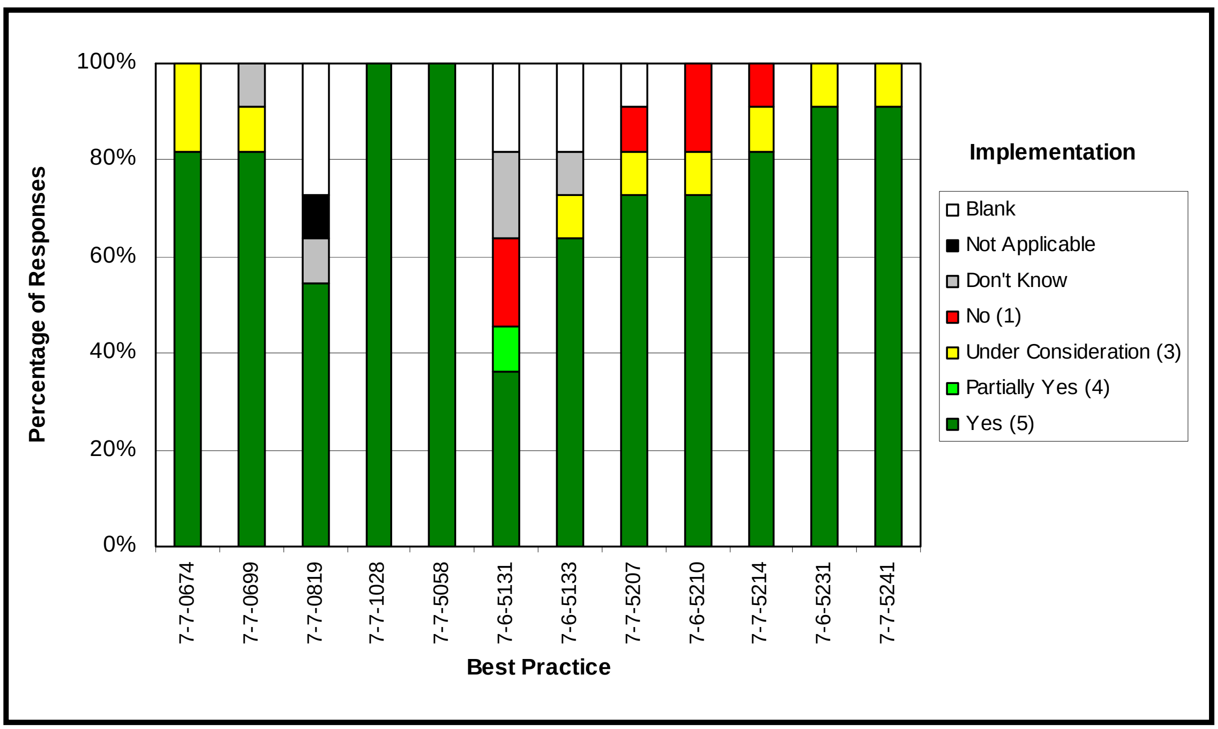
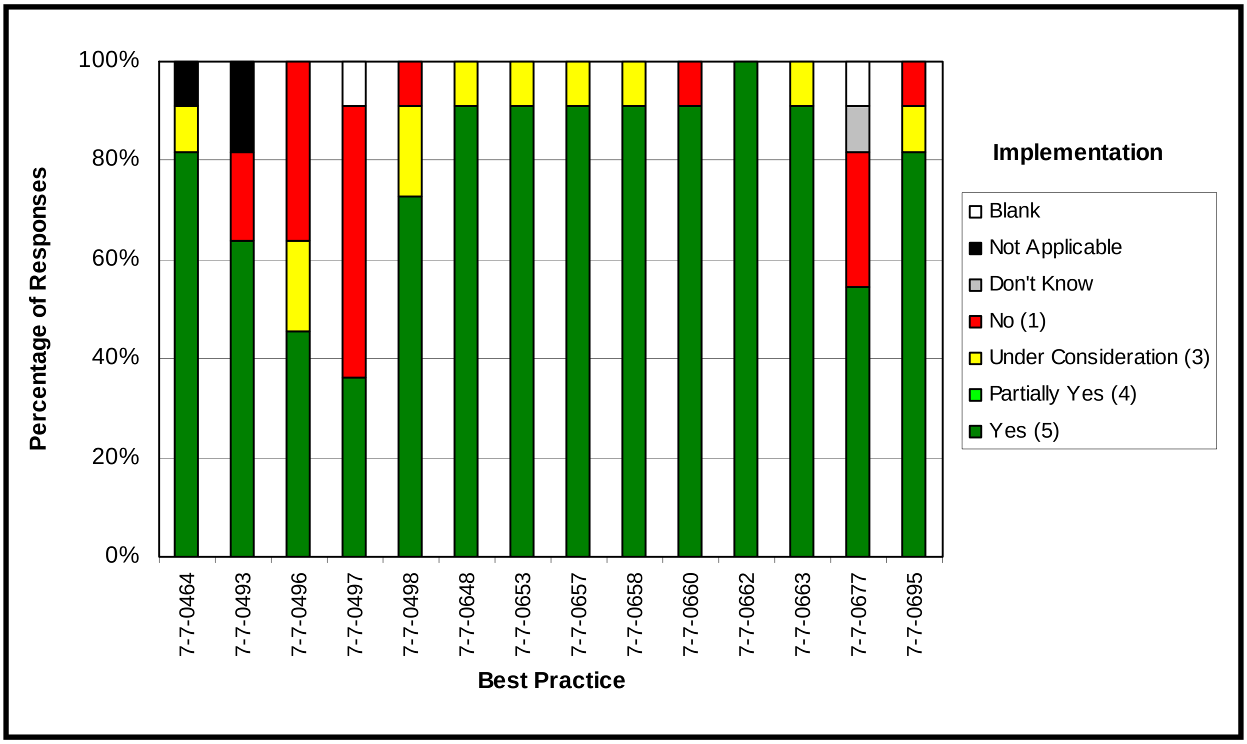


Figure 35. Distribution of "Backup Power" Best Practice Responses with Respect to "Implementation"

The following two charts show the distribution of the "Generator Deployment" Best Practice responses with respect to "Implementation".



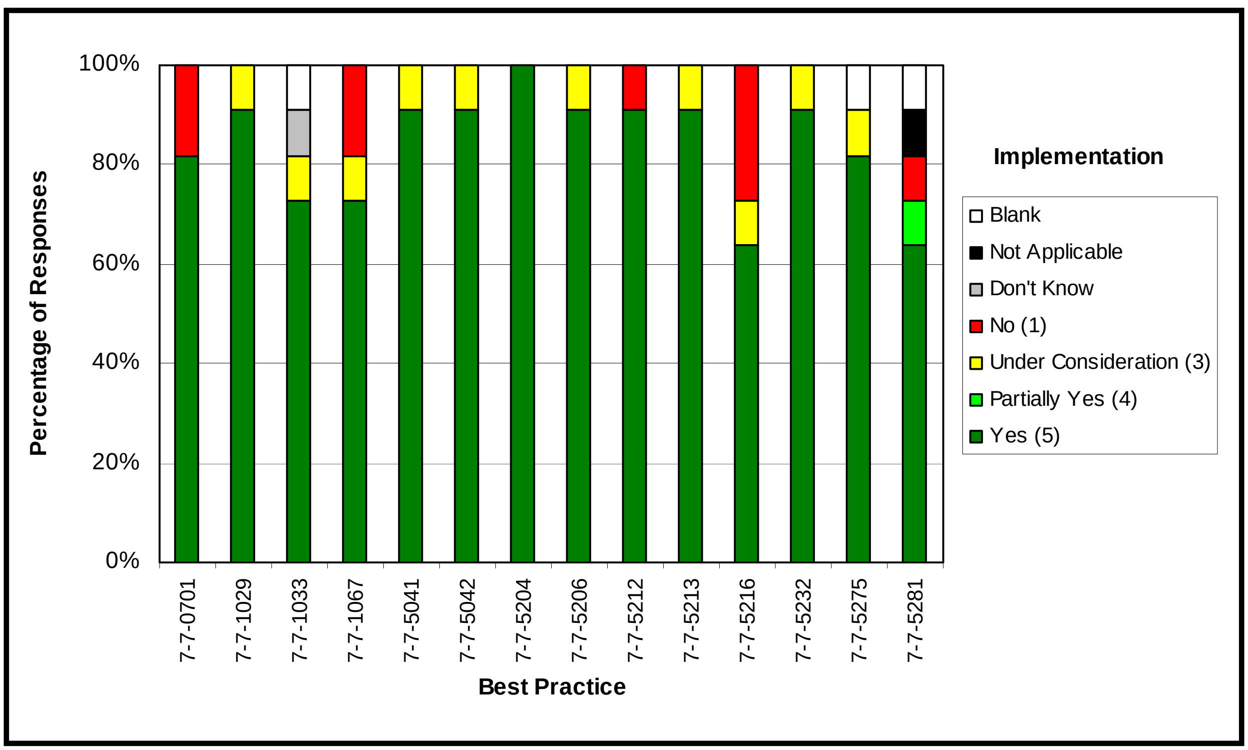
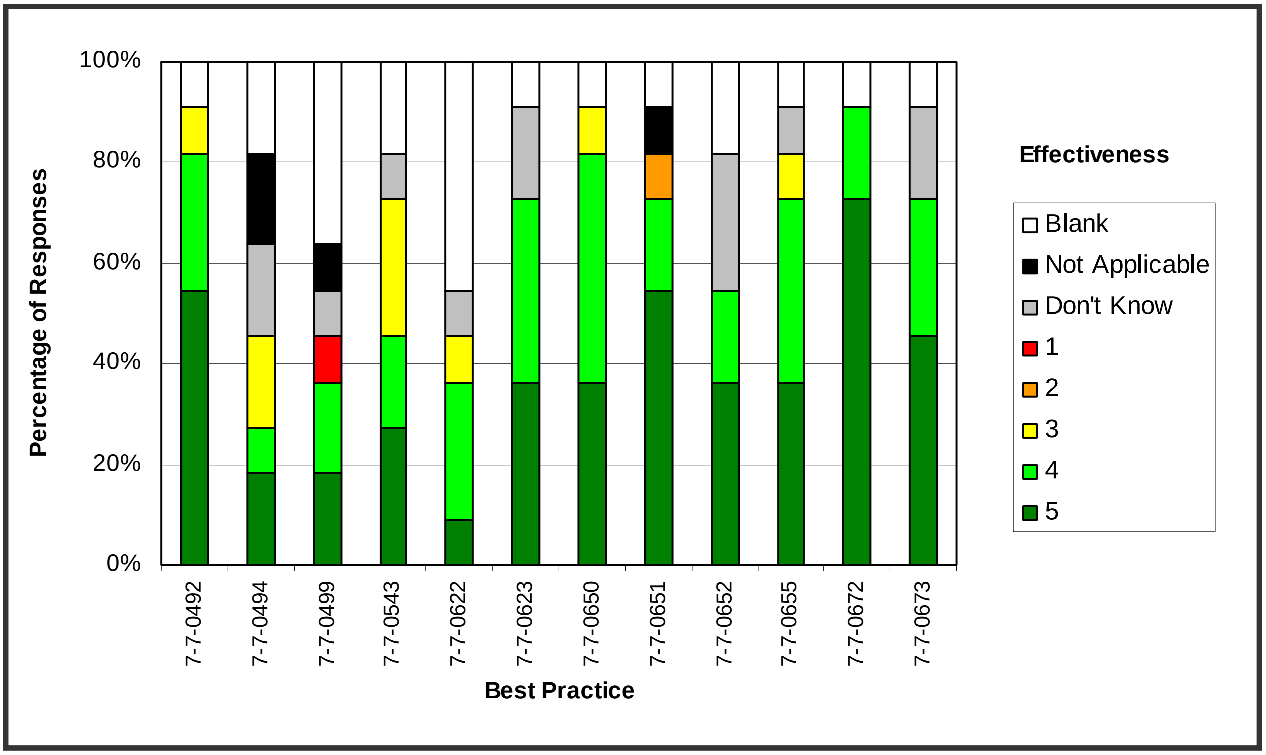


Figure 36. Distribution of "Generator Deployment" Best Practice Responses with Respect to "Implementation"

Effectiveness

The following two charts show the distribution of the "Backup Power" Best Practice responses with respect to "Effectiveness".



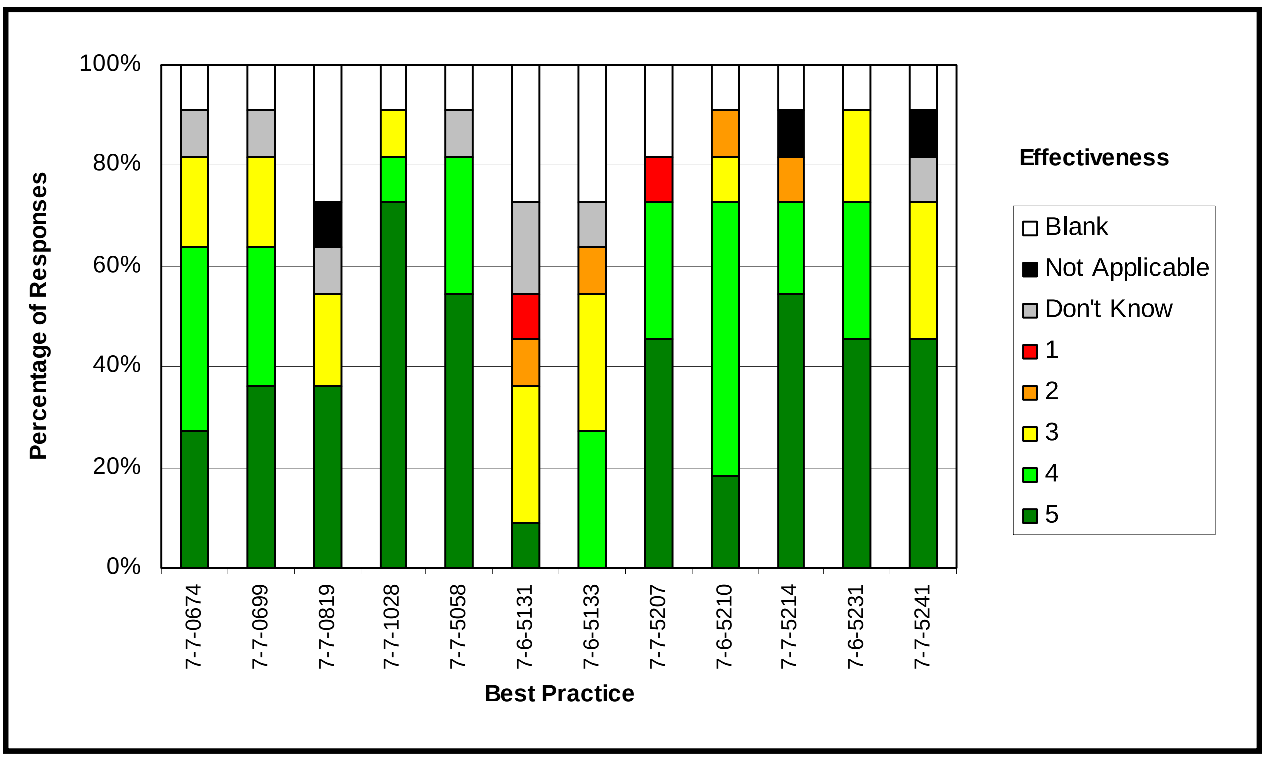
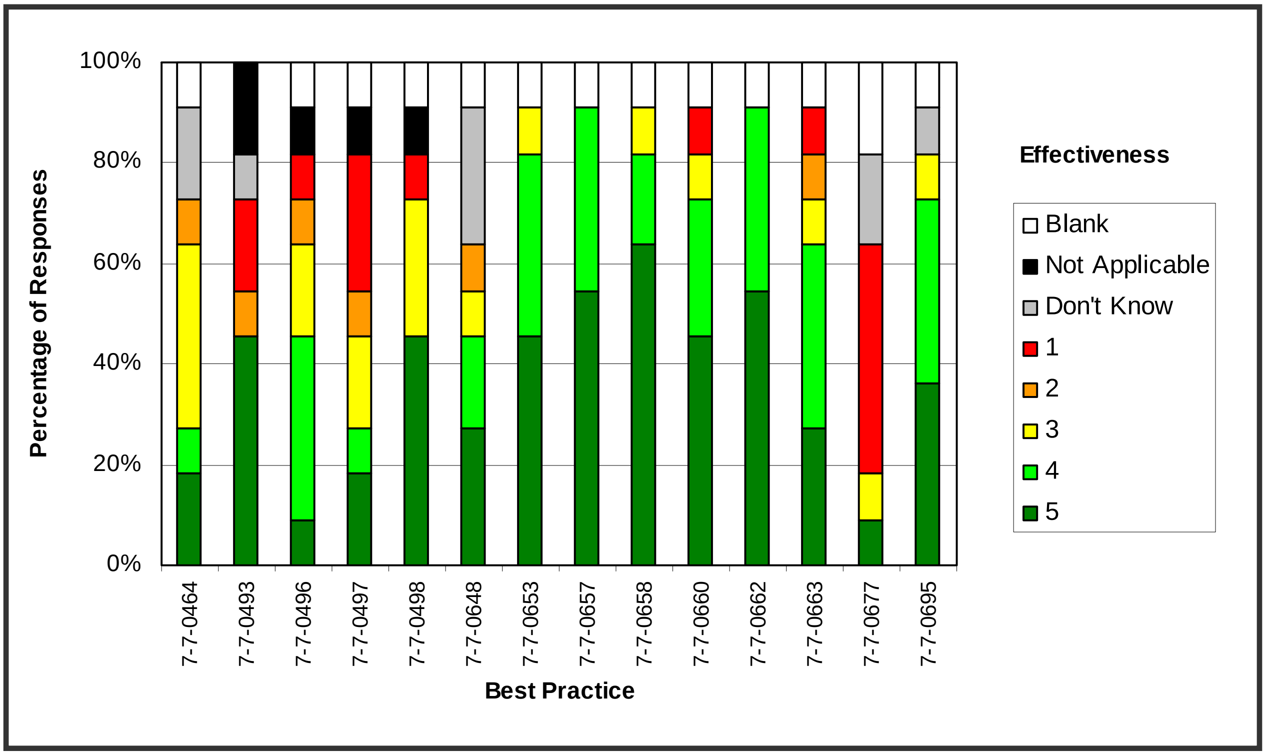


Figure 37. Distribution of "Backup Power" Best Practice Responses with Respect to "Effectiveness"

The following two charts show the distribution of the "Generator Deployment" Best Practice responses with respect to "Effectiveness".



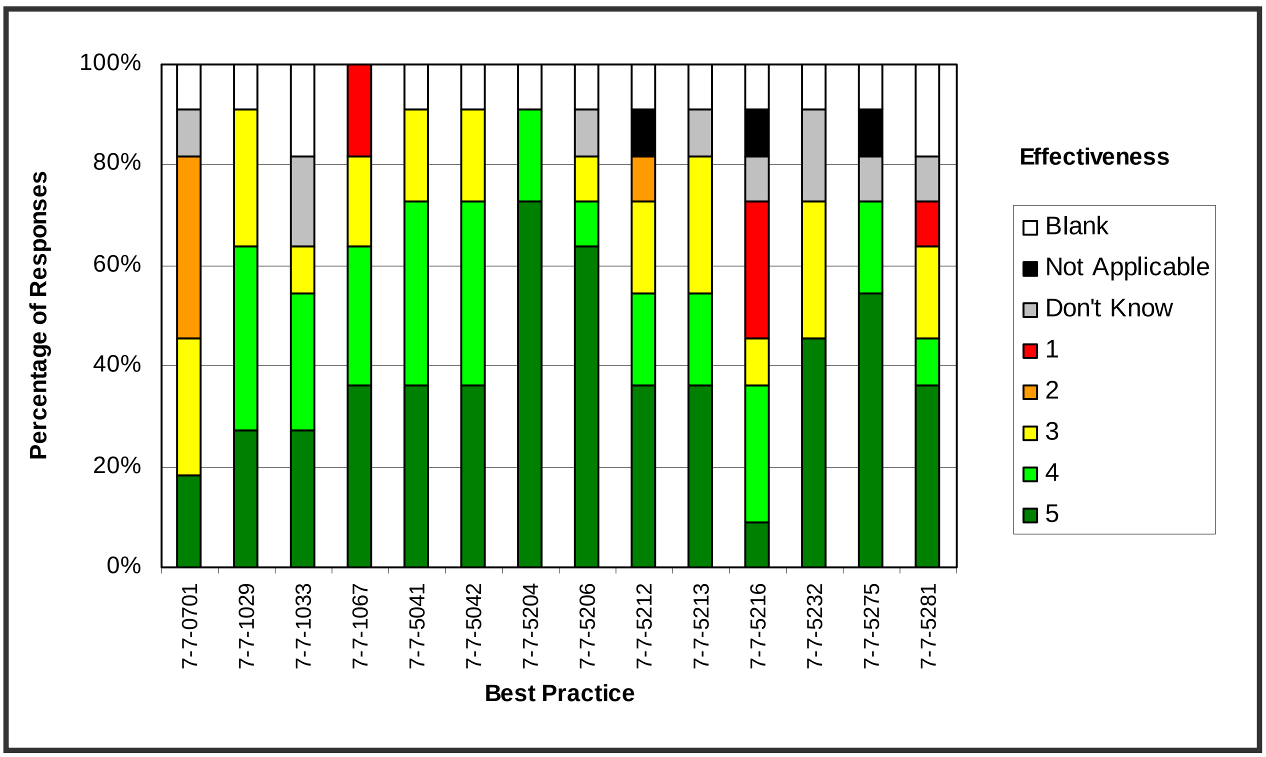
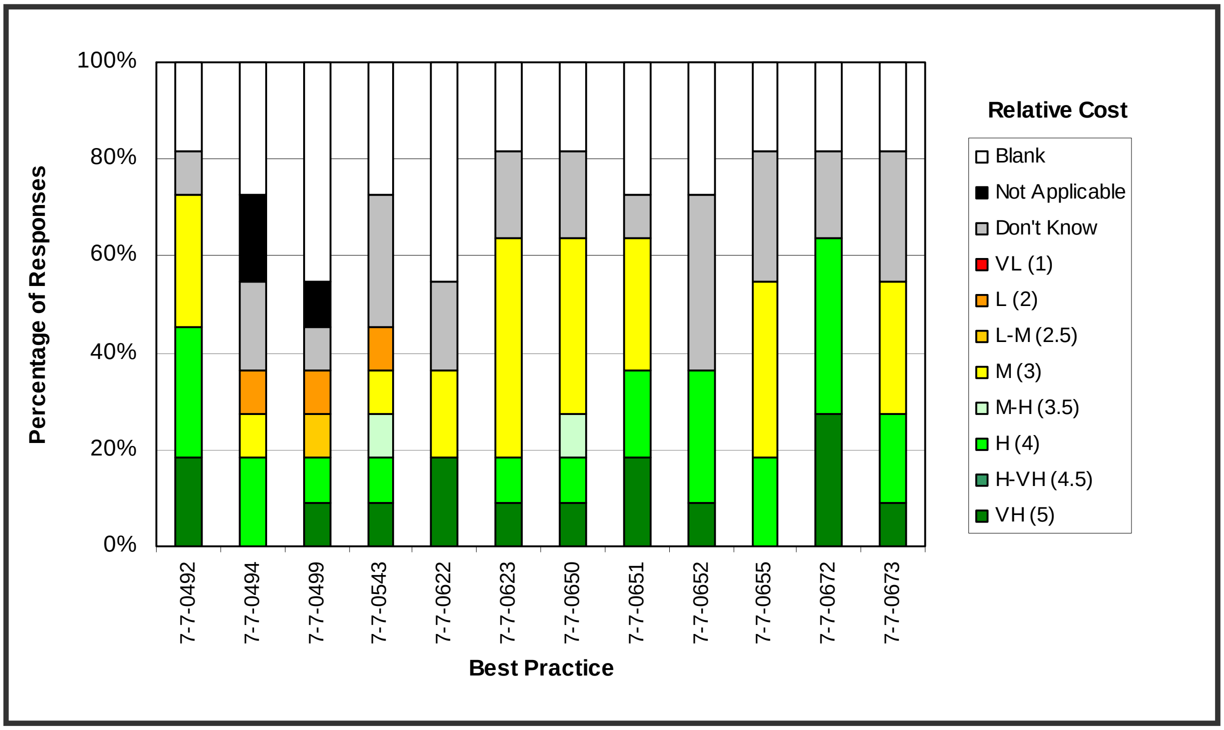


Figure 38. Distribution of "Generator Deployment" Best Practice Responses with Respect to "Effectiveness"

Relative Cost

The following two charts show the distribution of the "Backup Power" Best Practice responses with respect to "Relative Cost".



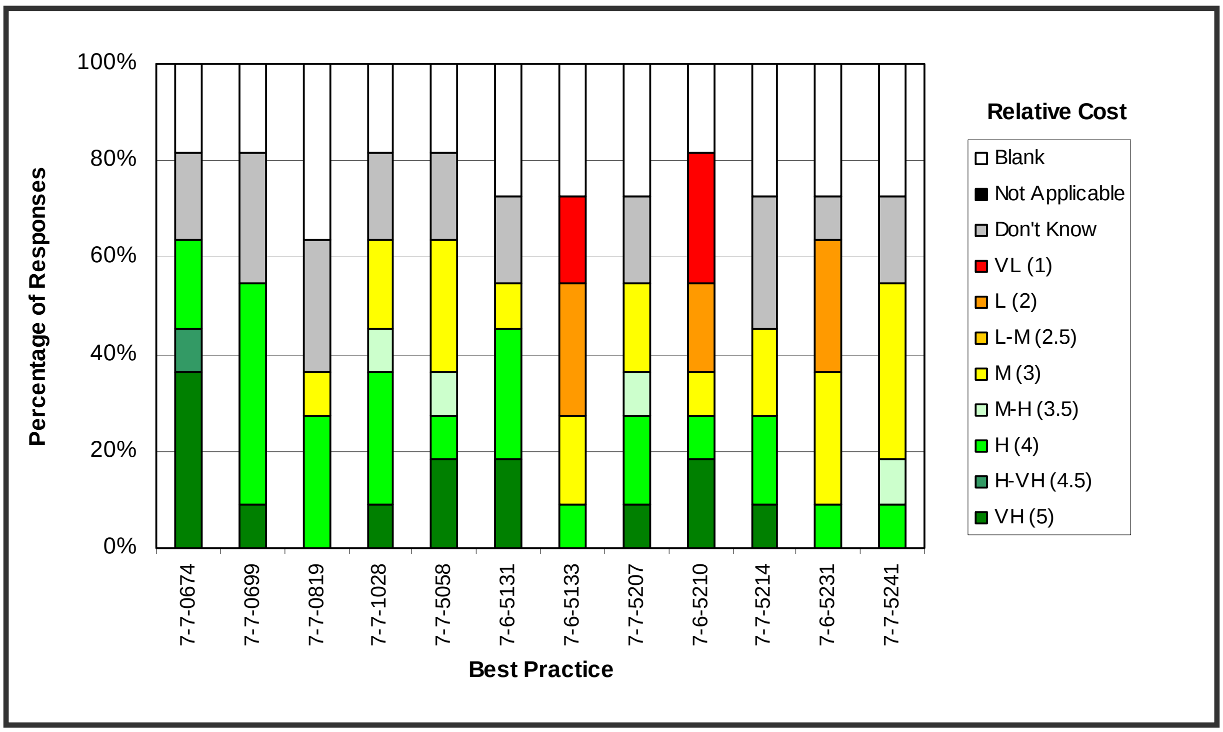
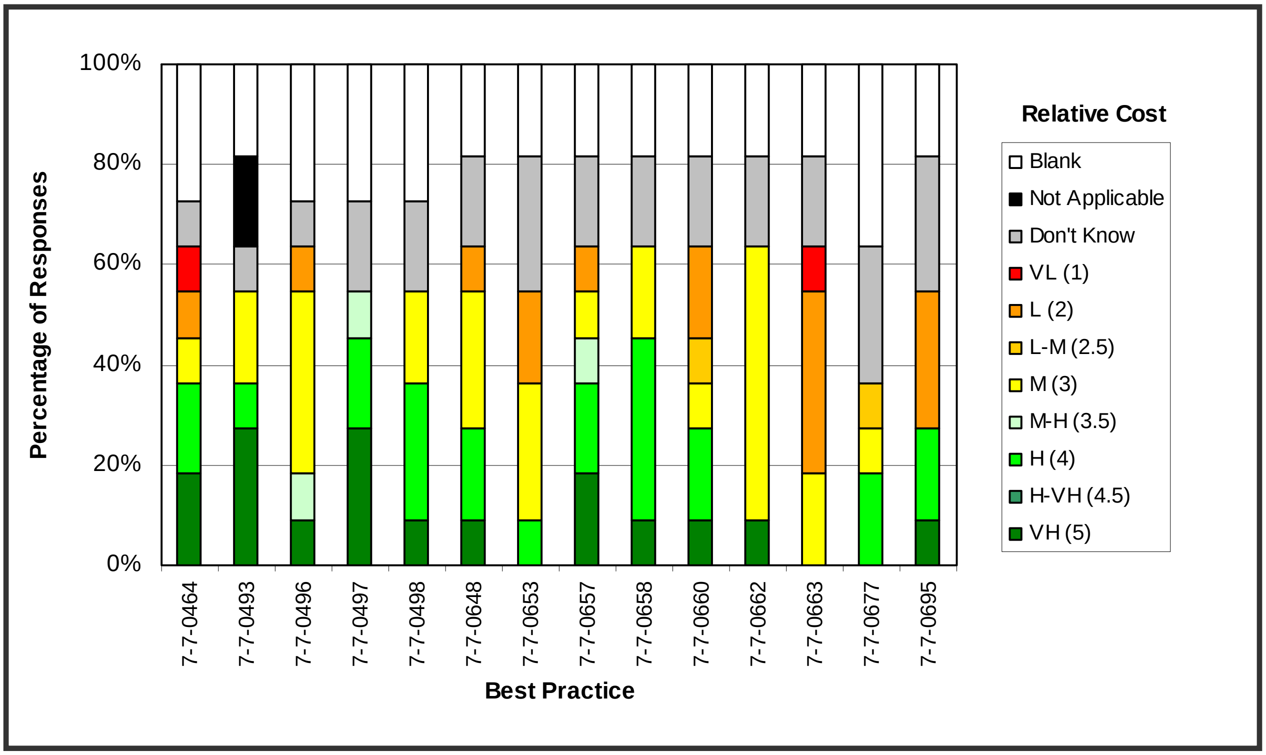


Figure 39. Distribution of "Backup Power" Best Practice Responses with Respect to "Cost"

The following two charts show the distribution of the "Generator Deployment" Best Practice responses with respect to "Relative Cost".



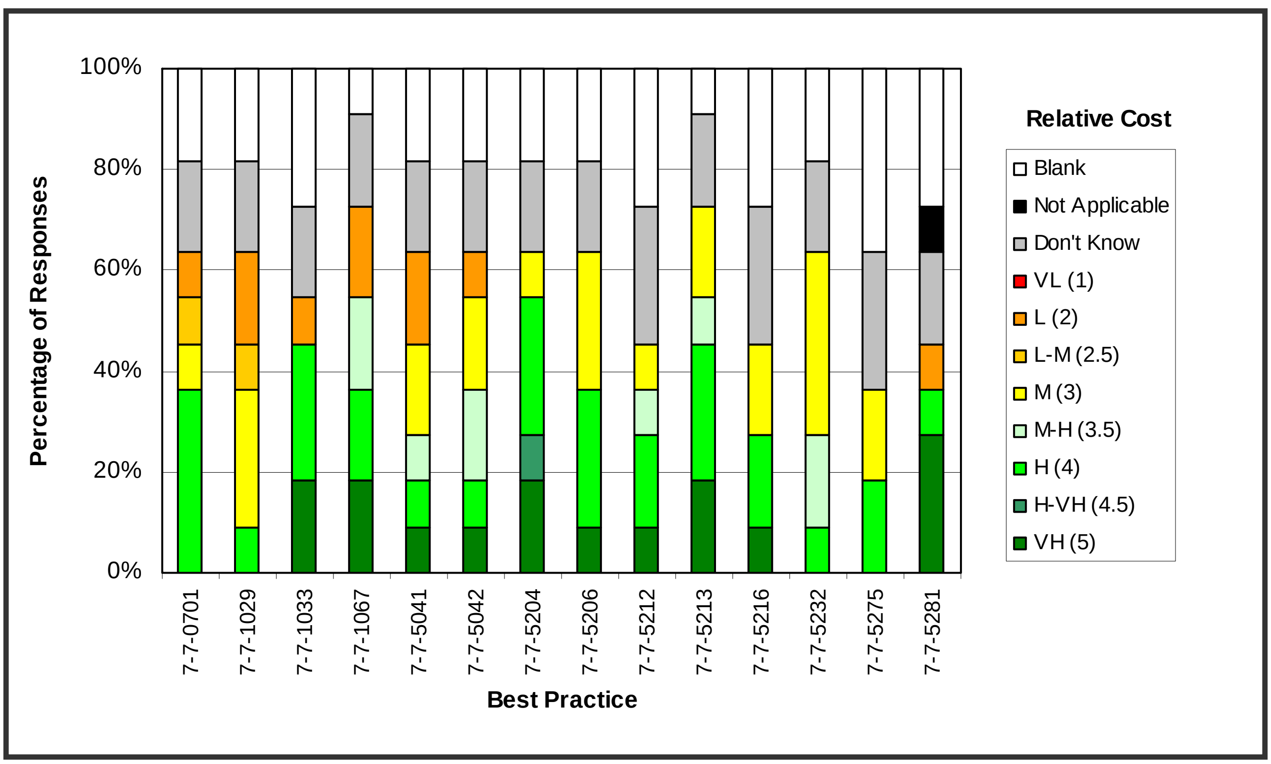


Figure 40. Distribution of "Generator Deployment" Best Practice Responses with Respect to "Relative Cost"

Average Ratings

The following page with two charts show the average rating of the "Backup Power" Best Practices in terms of "Effectiveness", "Implementation", and "Relative Cost". (see Appendix E for full listing of practices).

Response Key for Figures 41 and 42 (next four charts) below:

Implementation

Yes or Partially Yes = 5………..Under consideration = 3…..……..No = 1

Relative Cost

Very High = 5…….. High = 4…...Medium = 3…...Low = 2..…Very Low = 1

Effectiveness – in Preventing or Reducing Outages

Definitely Effective and Measurable = 5

Effective Based on Intuitive Opinions or Anecdotal Evidence = 4

Moderately Effective = 3

Slightly Effective = 2

Ineffective = 1

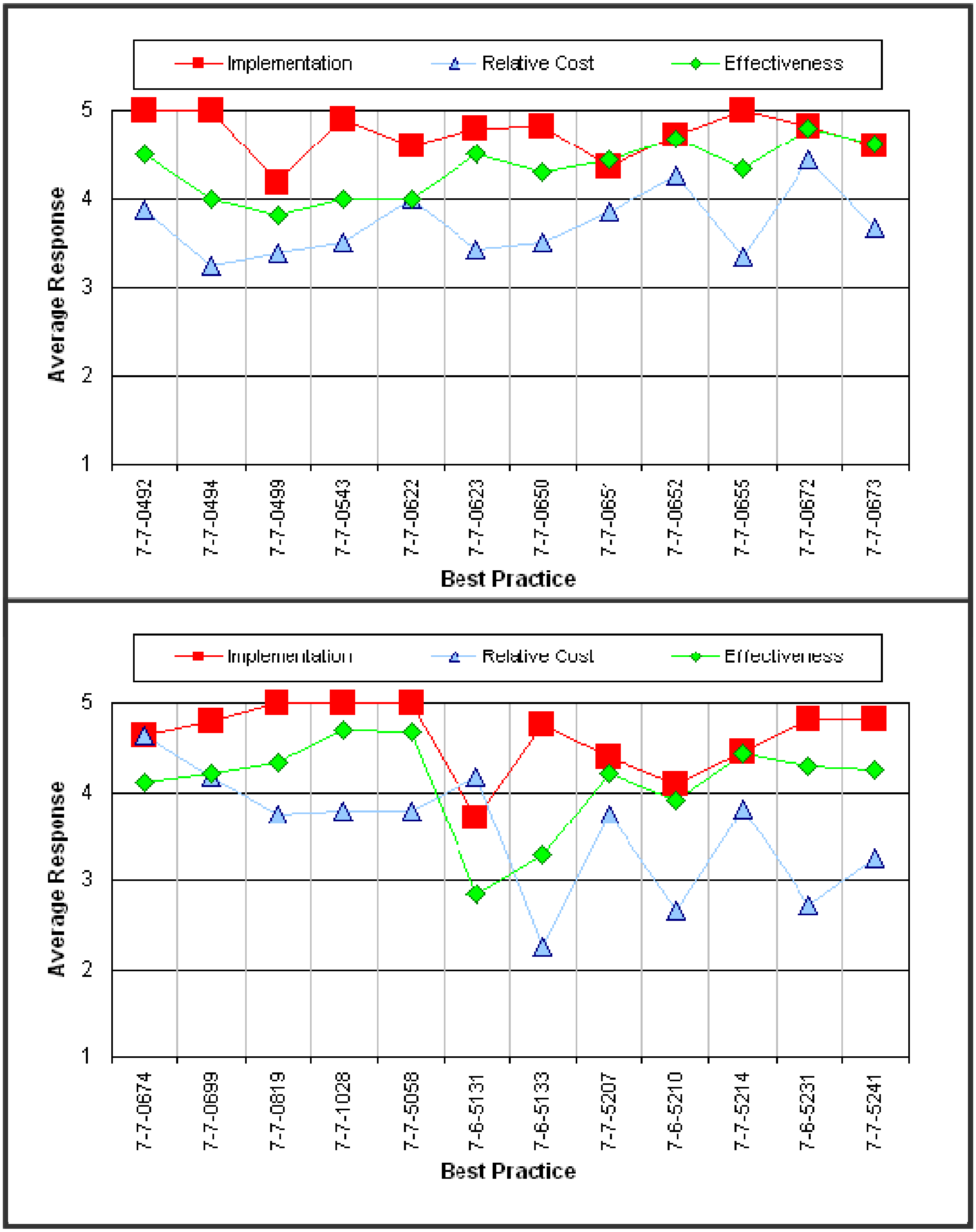


Figure 41. Average Rating of the "<u>Backup Power</u>" Best Practices in Terms of "Effectiveness", "Implementation", and "Relative Cost"

The following two charts show the average rating of the "Generator Deployment" Best Practices in terms of "Effectiveness", "Implementation", and "Relative Cost". (see Appendix E for full listing of practices).

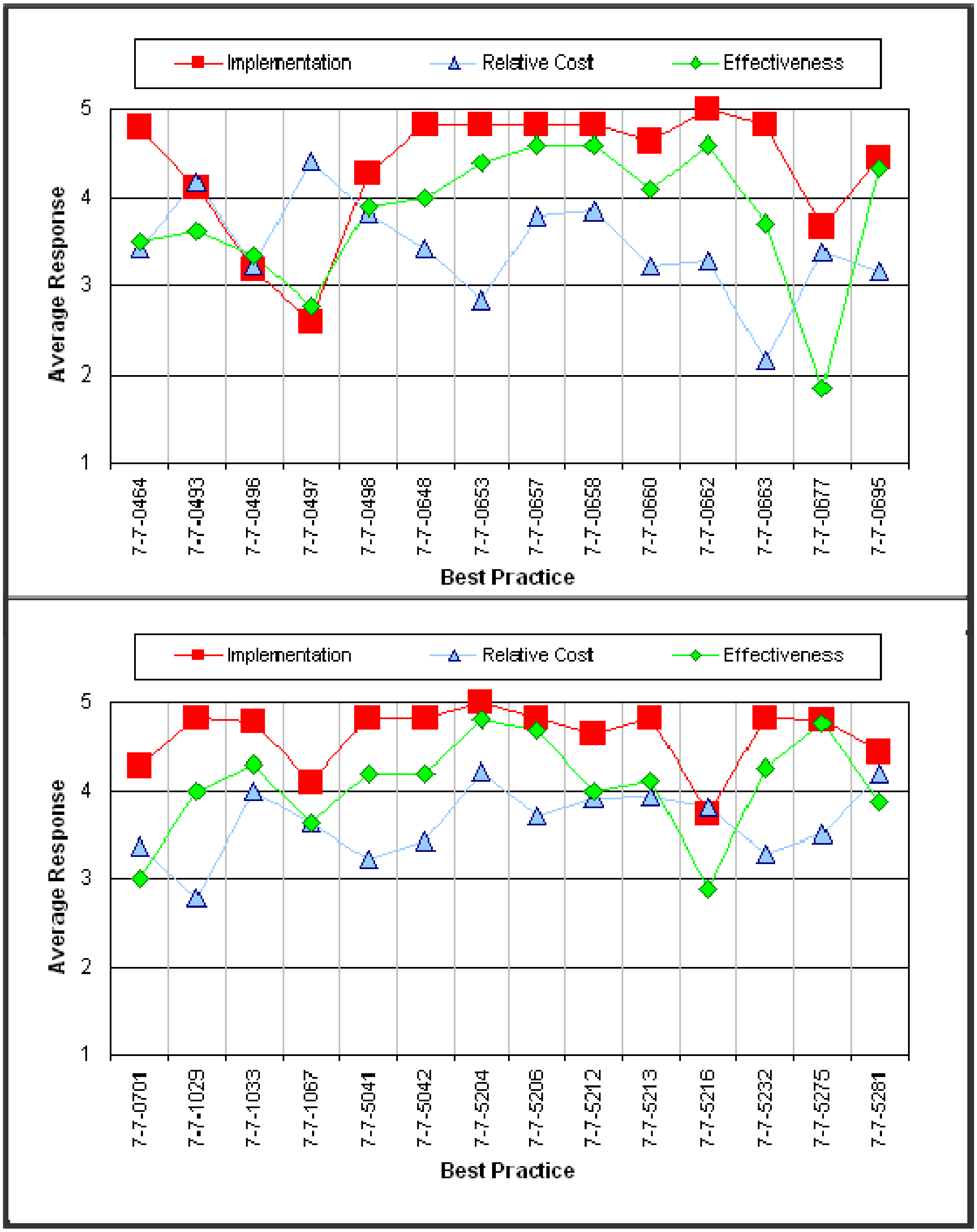


Figure 42. Average Rating of the "Generator Deployment" Best Practices in Terms of "Effectiveness", "Implementation", and "Relative Cost"

Methodology for Ranking Best Practices

Table 15 below provides a ranking of Best Practices with respect to “Implementation” versus “Effectiveness” and “Relative Cost”. Columns 2 through 4 present the average rating of each Best Practice with respect to “Implementation”, “Relative Cost”, and “Effectiveness”. Column 5 gives the “Effectiveness Cost Ratio” for each Best Practice, which was calculated as:

Effectiveness Cost Ratio = Effectiveness Average Rating / Relative Cost Average Rating.

Column 6 gives the “Implementation” rank for each Best Practice (where rank 1 has the highest “Implementation average” and rank 52 has the lowest “Implementation average”). Column 7 gives the rank of the “Effectiveness Cost Ratio” for each Best Practice (where rank 1 has the highest ratio and rank 52 has the lowest ratio). Column 8 is the difference in the rankings for a Best Practice using the following formula:

Rank Difference = Implementation Rank– Ratio Rank.

In this way, a high positive “Rank Difference” value identifies Best Practices, which have lower “Implementation averages” than might be expected given their “Effectiveness and Relative Cost averages”. Table 15 is sorted by “Difference” with high positive values at the top. As an example, consider Best Practice #7-6-5210 at the top of the table. This Best Practice has an Implementation average of 4.09 with rank 46.5 among Implementation average ratings.[88] This is one of the lowest Implementation averages among the 52 Best Practices. However, the Effectiveness Cost Ratio (1.463) is among the highest values (fourth best of all 52 Best Practices). Thus, one might expect that given the “Relative Cost” and “Effectiveness”, the “Implementation” ranking of Best Practice #7-6-5210 might be expected to be better than 46.5. This disparity is reflected in the “Rank Difference”:

Rank Difference = 46.5 – 4 = 42.5

These differences are presented as a guide in identifying those Best Practices where “Effectiveness” and “Relative Cost” indicate that the greatest benefit at the least cost might be achieved by increasing “Implementation”.

[88] Two Best Practices have the Implementation average 4.09. These values are the 46^{th} and 47^{th} highest Implementation averages among the 52 Best Practice Implementation averages. Thus, the average rank 46.5 was assigned to the Implementation rank for these two Best Practices.

Table 15. Ranking of Best Practices with Respect to Implementation versus Effectiveness and Relative Cost

Column 1	Columns 2 ---------------- 3 --------------- 4			Column 5	Columns 6 ------------------ 7 -------------- 8		
Best Practice	Average Rating			Effectiveness Cost Ratio	Rating Rank		
	Implementation	Relative Cost	Effectiveness		Implementation	Ratio	Difference
7-6-5210	4.09	2.67	3.90	1.463	46.5	4	42.5
7-7-0695	4.45	3.17	4.33	1.368	37.5	8	29.5
7-6-5133	4.75	2.25	3.29	1.460	30	5	25
7-7-0673	4.60	3.67	4.63	1.261	35.5	16	19.5
7-7-0660	4.64	3.21	4.10	1.276	33	15	18
7-7-5275	4.80	3.50	4.75	1.357	26.5	9	17.5
7-7-0623	4.80	3.43	4.50	1.313	26.5	10	16.5
7-7-0663	4.82	2.14	3.70	1.727	17	1	16
7-6-5231	4.82	2.71	4.30	1.584	17	2	15
7-7-0653	4.82	2.83	4.40	1.553	17	3	14
7-7-0496	3.18	3.21	3.33	1.037	51	38	13
7-7-5214	4.45	3.80	4.44	1.170	37.5	25	12.5
7-7-0651	4.36	3.86	4.44	1.152	41	29	12
7-7-0499	4.17	3.38	3.80	1.126	44	33	11
7-7-1029	4.82	2.79	4.00	1.436	17	6	11
7-7-5207	4.40	3.75	4.22	1.126	40	32	8
7-7-5241	4.82	3.25	4.25	1.308	17	11	6
7-7-5041	4.82	3.21	4.20	1.307	17	12	5
7-7-1067	4.09	3.63	3.64	1.003	46.5	43	3.5
7-7-5232	4.82	3.29	4.25	1.293	17	14	3
7-7-0498	4.27	3.83	3.89	1.014	42.5	41	1.5
7-7-0497	2.60	4.42	2.78	0.629	52	51	1
7-7-5206	4.82	3.71	4.67	1.256	17	17	0
7-6-5131	3.71	4.17	2.83	0.680	49	50	-1
7-7-5216	3.73	3.80	2.88	0.757	48	49	-1
7-7-0677	3.67	3.38	1.86	0.550	50	52	-2
7-7-0662	5.00	3.29	4.60	1.400	4.5	7	-2.5

Column 1	Columns 2 ---------------- 3	--------------- 4		Column 5	Columns 6 ------------------ 7	-------------- 8	
Best Practice	**Average Rating**			**Effectiveness Cost Ratio**	**Rating Rank**		
	Implementation	**Relative Cost**	**Effectiveness**		**Implementation**	**Ratio**	**Difference**
7-7-0493	4.11	4.17	3.63	0.870	45	48	-3
7-7-0652	4.71	4.25	4.67	1.098	31	34	-3
7-7-0701	4.27	3.36	3.00	0.894	42.5	46	-3.5
7-7-0650	4.82	3.50	4.30	1.229	17	21	-4
7-7-5042	4.82	3.43	4.20	1.225	17	22	-5
7-7-5281	4.44	4.20	3.88	0.923	39	45	-6
7-7-5212	4.64	3.90	4.00	1.026	33	39	-6
7-7-0657	4.82	3.79	4.60	1.215	17	23	-6
7-7-1033	4.78	4.00	4.29	1.071	29	36	-7
7-7-0658	4.82	3.86	4.60	1.193	17	24	-7
7-7-0622	4.60	4.00	4.00	1.000	35.5	44	-8.5
7-7-0655	5.00	3.33	4.33	1.300	4.5	13	-8.5
7-7-0648	4.82	3.43	4.00	1.167	17	26	-9
7-7-0464	4.80	3.43	3.50	1.021	26.5	40	-13.5
7-7-1028	5.00	3.79	4.70	1.242	4.5	18	-13.5
7-7-0674	4.64	4.64	4.11	0.885	33	47	-14
7-7-5058	5.00	3.79	4.67	1.233	4.5	19	-14.5
7-7-0699	4.80	4.17	4.22	1.013	26.5	42	-15.5
7-7-0494	5.00	3.25	4.00	1.231	4.5	20	-15.5
7-7-0672	4.82	4.43	4.80	1.084	17	35	-18
7-7-5213	4.82	3.94	4.11	1.044	17	37	-20
7-7-0543	4.89	3.50	4.00	1.143	9	30	-21
7-7-0492	5.00	3.88	4.50	1.161	4.5	27	-22.5
7-7-0819	5.00	3.75	4.33	1.156	4.5	28	-23.5
7-7-5204	5.00	4.21	4.80	1.139	4.5	31	-26.5

Appendix G: Site Visits

The CD arranged a number of site visits at telecom service provider services and customer premises to have a first hand look at the backup power systems and equipment deployed.

Typical Agenda of the Site Visit at a Telecom Service Provider

A number of large telecom companies hosted CD personnel at their Executive Briefing Center for a 30-60 minute presentation (see typical agenda below). At the conclusion of the presentation, there was a general tour of the Central Office or Headend office with emphasis on managing power on the telecommunications network. The tour usually lasted about 30-90 minutes.

A typical agenda included:

- The Wireline Network Overview
- The Wireless Network Overview
- Historical Background
- Issues Being Addressed at the Federal Level
- E-911 and its Relationship to Emergency Notification
- Emergency Notification Applications and Systems
- Customer Education / Consumer Awareness.

Highlights from the Central Office / Headend[89] Site Visits

Over many decades, the telecommunications industry has developed many redundant power systems for central offices. In the event of a power failure and/or the loss of individual pieces of power equipment, the communications facility will continue operations for hours. By that time, permanent restoration can be achieved. In particular:

- Telecom network equipment operates on Direct Current (DC) power, backed up by multiple strings of batteries and multiple-redundant Alternating Current (AC) to Direct Current (DC) rectifiers. The DC power is converted from the power grid which is backed up by a generator.
- In the case of a power failure, landline phones will continue to operate on battery power until the generator starts or the power grid is restored.
- Hours of battery reserve time are determined by whether a back-up generator has been installed at the Central Office or the Headend. The line size of the Central Office or the Headend, along with

[89] A C*able Headend* (or headend) is the facility at a local cable TV office that originates and communicates cable TV services and cable modem services to subscribers. When a cable company provides Internet access to subscribers, the headend includes the computer system and databases needed to provide Internet access. The most important component located at the headend is the cable modem termination system (CMTS), which sends and receives digital cable modem signals on a cable network and is necessary for providing Internet services to cable subscribers.

the presence of critical services and several other factors determines if an office has a generator installed or is served by a portable generator.

- Back-up generators typically have a minimum of 72 hours of diesel fuel.
- Portable generators may be dispatched to Central Offices / Headends to supplement batteries if travel is possible.
- As technology evolves, companies consider updating their equipment to more environmentally friendly and/or efficient models.
- If possible, a Central Office / Headend will have:
    - More than one connection to the power grid – if one cable is cut, the office can operate on the other power connection
    - Additional stationary generators
    - Call rerouting for other than local calls.

List of Companies Where the Site Visits Took Place

Following is a list of the companies (in an alphabetical order) whose facilities the Commissioner(s) and CD personnel visited as part of the AB 2393 related activities.

- AT&T
- Cox
- Comcast
- Frontier
- SureWest
- Verizon California
- Verizon Wireless.

Frontier and Verizon California site visits included tours of customer premises where they had installed battery backup systems for the offered telecommunications services.

Appendix H: Recent FCC Actions Related to AB 2393

The FCC has under consideration proceedings looking at both back-up power and emergency notifications systems the outcome of which may have a direct bearing on the CPUC investigation pursuant to AB 2393. Any federal rules adopted on these subject matters will have a direct impact on the telecommunications service providers in California as well as nationwide. Those rules will also impact the cost\ benefit analysis and outcome of any additional state rules. For example, if the FCC mandates certain rules to enhance the backup power on the network side, then the telecom service providers in California will have to follow the FCC rules and absorb the additional cost as "part of doing business". Thus, the cost/benefit analysis required by AB 2393 to implement Public Utilities Code §2892.1, must take into consideration any final FCC rules.

Ongoing proceedings at the FCC regarding the standardization of the Emergency Notification Systems, may also impact CD's investigation pursuant to the implementation of Public Utilities Code § 2872.5. It may be premature for CD to do a full cost/benefit analysis of that topic given all the uncertainties involved. There is a need to define a "reference case" (i.e., "a standardized approach") in order to determine the incremental impacts and associated costs of adopting different technologies for Emergency Notification Systems.

A review of the relevant FCC proceedings is set forth in Sections 3.6.1-3.6.4 below.

FCC Review of Backup Power

FCC activities on backup power are relevant to the part of the proceeding implementing Public Utilities Code § 2892.1 (but not § 776).

Summary of FCC Activities Related to Backup Power

Below is background information on the FCC activities related to backup power dating back to January 2006. It is important to understand the interactions between the FCC and the telecommunications service providers at the Federal level to be able to put things into perspective at the State level. Similar arguments were presented by the telecommunications service providers at the FCC and at the CPUC hearings/workshops/summits regarding backup power rules, recommendations, and practices. While these interactions took place a few months apart, the underlying issue is that the telecommunications service providers must address backup power for emerging network architectures. During the CPUC workshops and in the responses to the CPUC informational requests, the telecom service providers made a strong statement that they prefer to have one set of rules nationwide for backup power.

Thus, the FCC rules for backup power may become the "de facto" rules applicable to their networks in California. If that happens, then the telecommunications service providers in California will come far along in meeting the concerns raised in AB 2393 for backup power in the network (Public Utilities Code §2892.1). However, these FCC rules do not address backup power at residential and small commercial customer premises (i.e., the part of the proceeding implementing Public Utilities Code § 776 related issues.)

FCC Communications Security, Reliability and Interoperability Council

There is a possibility that, when FCC publishes the charter of the newly formed Communications Security, Reliability and Interoperability Council (CSRIC or Council), there may be a Focus Group on "backup power systems at the customer premises". Despite repeated calls to the FCC, it is not possible to confirm that such Focus Group may be established. Thus, at this point there is not an active Council or Focus Group that may address Best Practices for the part of the proceeding implementing Public Utilities Code § 776.

Given that CSRIC replaced NRIC, any update or addition to the NRIC best practices mentioned in AB 2393 (Public Utilities Code §2892.1) will be discussed in that newly established Council.

FCC Actions on Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks

Below is background information on the actions taken by the FCC thus far on the recommendations of the "Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks".

Excerpt from pages 1-3 of the FCC's Order on Reconsideration of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks FCC 07-177 http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07-117A1.pdf

II. Background

1) In January 2006, FCC Chairman Kevin J. Martin established the Katrina Panel pursuant to the Federal Advisory Committee Act, Public Law 92-463, as amended.[90] The mission of the Katrina Panel was to review the impact of Hurricane Katrina on communications infrastructure in the areas affected by the hurricane and to make recommendations to the FCC regarding ways to improve disaster preparedness, network reliability and communications among first responders such as police, fire fighters, and emergency medical personnel.[91] The Katrina Panel submitted its report on June 12, 2006.[92] The Katrina Panel's report described the impact of the worst natural disaster in the Nation's history, as well as the overall public and private response and recovery efforts. The FCC's goal is to take the lessons learned from that disaster and build upon them to promote more effective, efficient response and recovery efforts, as well as heightened readiness and preparedness.

2) The FCC issued a Notice of Proposed Rulemaking (*Notice*) on June 19, 2006 inviting comment on what actions the FCC should take to address the Katrina Panel's recommendations.[93] On July 26, 2006, the FCC issued a Public Notice asking commenters to address the applicability of the Katrina Panel's recommendations to all types of natural disasters (*e.g.*, earthquakes, tornadoes, hurricanes, forest fires) as well as other types of incidents (*e.g.*, terrorist attacks, influenza pandemic, industrial accidents).[94] The Public Notice also asked parties to address whether the Panel's recommendations are broad enough to take into account the diverse topography of our Nation, the susceptibility of a region to a particular type of disaster, and the multitude of

[90] 5 U.S.C. App. 2 (1988).
[91] *See* the Katrina Panel Charter *available at* http://www.fcc.gov/eb/hkip/HKIPCharter.pdf (last visited September 9, 2007); *see also* the Notice of Establishment of the FCC's Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks, 71 Fed. Reg. 933 (2006).
[92] Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks, *Report and Recommendations to the Federal Communications Commission*, June 12, 2006 (Katrina Panel Report).
[93] *Recommendations of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks*, Notice of Proposed Rulemaking, EB Docket No. 06-119, 21 FCC Rcd 7320 (2006) (*Notice*).
[94] *Recommendations of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks*, 21 FCC Rcd 8583 (2006) (*July 26 Public Notice*).

communications capabilities a region may possess.[95] The FCC received over 100 comments and reply comments in response to the *Notice*.

3) In June 2007, the FCC released the *Katrina Panel Order* directing the Public Safety and Homeland Security Bureau (PSHSB) to implement several of the recommendations made by the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks (Katrina Panel).[96] Among other things, the FCC adopted a rule requiring some communications providers to have emergency/backup power. The backup power rule adopted specifically states:

> Local exchange carriers (LECs), including ILECs and CLECs, and commercial mobile radio service (CMRS) providers must have an emergency backup power source for all assets that are normally powered from local AC commercial power, including those inside central offices, cell sites, remote switches and digital loop carrier system remote terminals. LECs and CMRS providers should maintain emergency backup power for a minimum of 24 hours for assets inside central offices and eight hours for cell sites, remote switches and digital loop carrier system remote terminals that are normally powered from local AC commercial power. LECs that meet the definition of a Class B company as set forth in Section 32.11(b) (2) of the Commission's rules and non-nationwide CMRS providers with no more than 500,000 subscribers are exempt from this rule.[97]

4) On August 2, 2007, the FCC released an Order that extended the effective date of Section 12.2 of the FCC's rules, the backup power rule adopted in the *Katrina Panel Order*, to October 9, 2007.[98] The FCC did so on its own motion in order to provide additional time to consider the issues raised by Cellular Telecommunication Industry Association (CTIA) in its Motion for Administrative Stay and to hear from other concerned parties on the issues raised in that motion.[99]

5) As indicated above, seven petitions were filed seeking reconsideration and/or clarification of the backup power rule adopted by the FCC in the *Katrina Panel Order*.[100] The petitioners assert that the FCC should rescind, modify and/or clarify the backup power rule adopted in the *Katrina Panel Order*. The FCC also received five timely comments to these petitions and several additional *ex parte* comments.

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[95] *Id.*
[96] *Katrina Panel Order*, 22 FCC Rcd 10541 (2007).
[97] 47 C.F.R. § 12.2.
[98] *Recommendations of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks*, Order, EB Docket No. 06-119, WC Docket No. 06-63, 22 FCC Rcd 14246 (*Delay Order*).
[99] *See* CTIA's Motion for Administrative Stay filed July 31, 2007; NextG's Request for Partial Stay of the Commission's Back Up Power Rule filed July 31, 2007 and Errata filed August 1, 2007; and PCIA's Comments in Support of Stay Requests filed August 2, 2007. *See also* CTIA's Motion for Administrative Stay filed September 24, 2007.
[100] As noted before, one of these petitions was subsequently withdrawn.

Latest FCC Rules on Backup Power (FCC 07-177)

Below are the latest FCC rules on backup power on the network side (i.e., "backup power systems not installed on the Customer's Premise" according to the AB 2393 terminology). They have not been published yet in the Federal Register.

Excerpt from pages 23 to 26 of the FCC's Order on Reconsideration of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks FCC 07-177 (see http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07-117A1.pdf

Part 12: Redundancy of Communications Systems

<u>§12.2 Backup Power</u>

(a) Except to the extent set forth in Section 12.2(b) and Section 12.2(c)(4) of the Commission's rules, local exchange carriers, including incumbent local exchange carriers and competitive local exchange carriers (collectively, LECs), and commercial mobile radio service (CMRS) providers, as defined in Section 20.9 of the Commission's rules, must have an emergency backup power source (*e.g.*, batteries, generators, fuel cells) for all assets necessary to maintain communications that are normally powered from local commercial power, including those assets located inside central offices, cell sites, remote switches and digital loop carrier system remote terminals. LECs and CMRS providers must maintain emergency backup power for a minimum of twenty-four hours for assets that are normally powered from local commercial power and located inside central offices, and eight hours for assets that are normally powered from local commercial power and at other locations, including cell sites, remote switches and digital loop carrier system remote terminals. Power sources satisfy this requirement if they were originally designed to provide the minimum backup power capacity level required herein and the provider has implemented reasonable methods and procedures to ensure that the power sources are regularly checked and replaced when they deteriorate. LECs that meet the definition of a Class B company as set forth in Section 32.11(b)(2) of the Commission's rules and non-nationwide CMRS providers with no more than 500,000 subscribers are exempt from this rule.

(b) LECs and CMRS providers are not required to comply with paragraph (a) for assets described above where the LEC or CMRS provider demonstrates, through the reporting requirement described below, that such compliance is precluded by:

(1) Federal, state, tribal or local law;

(2) Risk to safety of life or health; or

(3) Private legal obligation or agreement.

(c) Within six months of the effective date of this requirement, LECs and CMRS providers subject to this section must file reports with the Chief of the Public Safety & Homeland Security Bureau.

(1) Each report must list the following:

(i) Each asset that was designed to comply with the applicable backup power requirement as defined in paragraph (a);
(ii) Each asset where compliance with paragraph (a) is precluded due to risk to safety of life or health;
(iii) Each asset where compliance with paragraph (a) is precluded by a private legal obligation or agreement;

(iv) Each asset where compliance with paragraph (a) is precluded by Federal, state, tribal or local law; and

(v) Each asset that was designed with less than the emergency backup power capacity specified in paragraph (a) and that is not precluded from compliance under paragraph (b).

(2) Reports listing assets falling within the categories identified in paragraphs (c)(1)(ii) through (iv) must include a description of facts supporting the basis of the LEC's or CMRS provider's claim of preclusion from compliance. For example, claims that a LEC or CMRS provider cannot comply with this section due to a legal constraint must include the citation(s) to the relevant law(s) and, in order to demonstrate that it is precluded from compliance, the provider must show that the legal constraint prohibits the provider from compliance. Claims that a LEC or CMRS provider cannot comply with this section with respect to a particular asset due to a private legal obligation or agreement must include a description of the relevant terms of the obligation or agreement and the dates on which the relevant terms of the agreement became effective and are set to expire. Claims that a LEC or CMRS provider cannot comply with this section with respect to a particular asset due to risk to safety of life or health must include a description of the safety of life or health risk and facts that demonstrate a substantial risk of harm.

(3) For purposes of complying with the reporting requirements set forth in paragraphs (c)(1)(i) through (v), in cases where more than one asset necessary to maintain communications that are normally powered from local commercial power are located at a single site (*i.e.*, within one central office), the reporting entity may identify all of such assets by the name of the site.

(4) In cases where a LEC or CMRS provider identifies assets pursuant to paragraph (c)(1)(v), such LEC or CMRS provider must comply with the backup power requirement in paragraph (a) or, within 12 months from the effective date of this rule, file with the Commission a certified emergency backup power compliance plan. That plan must certify that and describe how the LEC or CMRS provider will provide emergency backup power to 100 percent of the area covered by any non-compliant asset in the event of a commercial power failure. For purposes of the plan, a provider may rely on on-site and/or portable backup power sources or other sources, as appropriate, sufficient for service coverage as follows: a minimum of 24 hours of service for assets inside central offices and eight hours for other assets, including cell sites, remote switches, and digital loop carrier system remote terminals. The emergency backup power compliance plans submitted are subject to Commission review.

(5) Reports submitted pursuant to this paragraph must be supported by an affidavit or declaration under penalty of perjury and signed and dated by a duly authorized representative of the LEC or CMRS provider with personal knowledge of the facts contained therein.

(6) Information filed with the Commission pursuant to subsection (c) of this rule shall be automatically afforded confidentiality in accordance with the Commission's rules.

(7) LECs that meet the definition of a Class B company as set forth in Section 32.11(b)(2) of the Commission's rules and non-nationwide CMRS providers with no more than 500,000 subscribers are exempt from this reporting requirement.

FCC Review of the Emergency Alert System

FCC activities on Emergency Alert System are relevant to the part of the proceeding implementing Public Utilities Code § 2872.5

In addition to the WARN Act requirements that dictates the Commercial Mobile Service Alert Advisory Committee (CMSAAC) develop and recommend technical standards and protocols to the Commission by October 12, 2007 (see Section 3.7.4 below), there is a parallel development underway at the FCC.

That parallel development is the Review of the Emergency Alert System, First Report and Order and Further Notice of Proposed Rulemaking, EB Docket No. 04-296, 20 FCC Rcd 18625 (2005). In a separate action on May 31, 2007, the Commission adopted a Second Report and Order and Further Notice of Proposed Rulemaking in the EAS preceding that addresses some of the Katrina Panel's recommendations. See FCC Takes Action To Further Strengthen Nation's Emergency Alert System, News Release, (May 31, 2007) ("EAS News Release").[101] This news release states "The Commission's Order promotes the development of fully digital Next Generation technologies and delivery systems that will better serve the American public. The Order requires EAS participants to accept messages using Common Alerting Protocol (CAP), the groundwork for Next Generation EAS delivery systems, no later than 180 days after FEMA announces its adoption of standards in each case.

The Commission has provided a news release but has not yet published its Order, in which the Commission is to "explore the technical and financial viability of expanding the EAS to other technologies, such as wireless services and the Internet." Until the EAS order is released, it is not known:

- What will be the impact of this parallel FCC EAS review on this work effort?
- Whether the FCC will issue guidance that may impact this work effort.

Excerpt from pages 33 to 34 of the FCC's Recommendations of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks
FCC 07-107
http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07-107A1.pdf

D. Emergency Communications to the Public

103. Revitalize and Publicize the Emergency Alert System. The Katrina Panel suggests a number of recommendations to revitalize and publicize the existing Emergency Alert System ("EAS"). To facilitate and complement the use of the existing EAS, the Katrina Panel recommends that the Commission should: (a) educate state and local officials about EAS, its benefits, and how it can be best utilized; (b) develop a program for educating the public about the EAS and promote community awareness of potential mechanisms for accessing those alerts sent during power outages or broadcast transmission failures; (c) move expeditiously to complete its proceeding to explore the technical and financial viability of expanding the EAS to other technologies, such as wireless services and the Internet, recognizing that changes to communications networks and equipment take time to implement; (d) consistent with proposed legislation, work with Congress and other appropriate federal departments and agencies to explore the technical and financial viability of establishing a comprehensive national warning system that complements existing systems and

[101] http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-273458A1.pdf

allows local officials to increase the penetration of warnings to the public as well as target, when necessary, alerts to a particular area; (e) work with the DHS and other appropriate federal agencies on pilot programs that would allow more immediate evaluation and testing of new notification technologies; and (f) work with the Department of Commerce to expand the distribution of certain critical non-weather emergency warnings over National Oceanic and Atmospheric Administration (NOAA) weather radios to supplement the EAS.[102]

104. We agree that we should encourage state, tribal and local governments to use EAS as a mechanism to deliver emergency alerts. Accordingly, we direct PSHSB to engage in outreach efforts to educate state, tribal and local governments about the EAS. In addition, we direct PSHSB to take steps to educate the public about EAS. We also note that PSHSB has coordinated with DHS on EAS issues, including issues related to the development of a state-of-the-art public alert and warning system. We direct PSHSB to continue those efforts.

105. Finally, on the issue of expanding the scope of EAS to include new technologies, as the Katrina Panel acknowledges, this issue is already the subject of our ongoing EAS rulemaking proceeding.[103] In addition, pursuant to the recently enacted WARN Act,[104] the Commission established an advisory committee -- the Commercial Mobile Service Alert Advisory Committee – to develop and recommend technical standards and protocols by which commercial mobile service (CMS) providers may voluntarily transmit emergency alerts. The Committee has a diverse membership, including over forty representatives from the wireless and broadcast industries, public safety, equipment manufacturers, organizations representing people with disabilities and the elderly, FEMA and NOAA. Thus far, the Committee has held three full Committee meetings and a number of informal working group meetings. The Commission expects that the Committee will meet its statutory deadline of submitting recommendations to the Commission by October 12, 2007.

FCC Summit on Network Surge Management

FCC activities on Network Surge Management are relevant to the part of the proceeding implementing Public Utilities Code § 2872.5.

The Federal Communications Commission's Public Safety and Homeland Security Bureau (PSHSB) held a Summit on Communications Network Surge Management in Emergencies on September 25, 2007. The Summit examined how communications networks are managed during mass emergency situations, as well as what the public can do to help ensure that they are able to effectively use their wireless commercial devices during such incidents. As part of this summit there was a roundtable discussion to examine the wireless carriers' ability to increase capacity remotely, at the scene of an incident, as well as the actions the public can take to help ensure their effective use of commercial wireless devises in emergencies.

Moderator: Jeffery Goldthorp Chief of FCC Communications Systems Analysis Division, PSHSB

Panelists:

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[102] Katrina Panel Report at 40.

[103] Review of the Emergency Alert System, First Report and Order and Further Notice of Proposed Rulemaking, EB Docket No. 04-296, 20 FCC Rcd 18625 (2005). We note that, in a separate action on May 31, 2007, the Commission adopted a Second Report and Order and Further Notice of Proposed Rulemaking in the EAS proceeding that addresses some of the Katrina Panel's recommendations. See FCC Takes Action To Further Strengthen Nation's Emergency Alert System, News Release, May 31, 2007 ("EAS News Release").

[104] The Warn Act establishes a framework by which commercial mobile service providers may voluntarily transmit emergency alerts.

Jim Bugel, AT&T
Greg Roark, Carolina West Wireless
Libby Beaty, National Assoc. of Telecommunication Officers and Advisors
Lise Hamlin, Resource Center for Deaf and Hard of Hearing Persons
Randy Ames, Sprint
Diane Wesche, Verizon Wireless.

The panelists at this summit expressed similar positions on the issue potential network to the positions heard during the CPUC Workshops.

Commercial Mobile Service Alert Advisory Committee (CMSAAC)

The Warning, Alert and Response Network Act (WARN Act) is relevant to the part of the proceeding implementing Public Utilities Code § 2872.5. The FCC established the Commercial Mobile Service Alert Committee (CMSAAC) pursuant to Section 603 of the WARN Act. The purpose of CMSAAC was to develop recommendations on technical standards and protocols to facilitate the ability of commercial mobile service providers to transmit emergency alerts to their subscribers to the extent such providers elect to do so.

Background information on the WARN Act

The WARN Act, which was enacted on October 13, 2006, requires that the FCC establishes a Committee to develop and recommend technical standards and protocols for the voluntary transmission of emergency alerts by Commercial Mobile Service (CMS) providers within one year from the date of enactment (i.e., October 12, 2007). The Committee must develop and submit to the Commission recommendations:

- For protocols, technical capabilities, and technical procedures through which electing CMS providers receive, verify, and transmit alerts to subscribers;
- For the establishment of technical standards for the priority transmission of alerts by electing CMS providers to subscribers;
- For relevant technical standards for devices and equipment and technologies used by electing CMS providers to transmit emergency alerts to subscribers;
- For the technical capability to transmit emergency alerts by electing CMS providers to subscribers in languages in addition to English, to the extent practicable and feasible;
- Under which electing CMS providers may offer subscribers the capability of preventing the subscriber's device from receiving emergency alerts, or classes of such alerts, (other than an alert issued by the President), consistent with section 602(b)(2)(E) of the WARN Act;
- For a process under which CMS providers can elect to transmit emergency alerts if—
  - Not all of the devices or equipment used by such provider are capable of receiving such alerts; or
  - The provider cannot offer such alerts throughout the entirety of its service area; and
- As otherwise necessary to enable electing CMS providers to transmit emergency alerts to subscribers.[105]

[105] WARN Act § 603(c).

Background information on the CMSAAC

Pursuant to Section 603 of the WARN Act, the FCC established CMSAAC, which was enacted on October 13, 2006. CMSAAC's mission is to develop recommendations on technical standards and protocols to facilitate the ability of CMS providers to voluntarily transmit emergency alerts to their subscribers. The Committee must develop and submit its recommendations to the Commission within one year of the enactment of the WARN Act.

The FCC Commercial Mobile Service Alert Advisory Committee (CMSAAC) held a total of six (6) meetings during which it received progress reports from the internal working groups and presentations from interested parties. At their last meeting on October 3, 2007, CMSAAC approved a set of recommendations and submitted them on October 12, 2007.

The CMSAAC report was publicly released on December 14, 2007, "Commercial Mobile Alert Service Architecture and Requirements".

On December 14, 2007, the FCC released the Notice of Proposed Rulemaking (NPRM) surrounding the creation of a Commercial Mobile Alert System (CMAS). In that NPRM, the FCC initiated a rulemaking to implement the WARN Act requirement that the FCC adopt technical standards, protocols, procedures, and other technical requirements recommended by an advisory committee (CSMAAC), which will enable commercial mobile service alerting capability for CMRS providers that voluntarily elect to transmit emergency alerts.

The NPRM report[106] can be found at the FCC's website http://www.fcc.gov/headlines2007.html under the date of December 14, 2007.

The FCC seeks comment on whether the recommended standards, if implemented:

- Will satisfy the requirements of the WARN Act
- Will meet the goal of ensuring a robust, reliable and effective mobile alert system
- Will allow alerts to be initiated at appropriate levels of government
- Can be implemented with current and/or future technologies.

The FCC also invites alternative proposals if they sufficiently detail how the proposal will meet WARN Act requirements.

Appendix I: FCC 07-177, Order on Reconsideration

[106] Microsoft Word version: http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07-214A1.doc
Adobe Acrobat (.pdf) version: http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07-214A1.pdf

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Recommendations of the Independent Panel	)	EB Docket No. 06-119
Reviewing the Impact of Hurricane Katrina on	)	WC Docket No. 06-63
Communications Networks	)	
	)	

ORDER ON RECONSIDERATION

Adopted: October 2, 2007 **Released: October 4, 2007**

By the Commission:

I. INTRODUCTION

1. In this Order, we consider six petitions for reconsideration and/or clarification (Petitions)[107] of the Order that adopted Section 12.2 of the Commission's rules which requires that certain local exchange carriers (LECs), including incumbent LECs (ILECs) and competitive LECs (CLECs), and commercial mobile radio service (CMRS) providers have an emergency backup power source for all assets that are normally powered from local AC commercial power.[108] For the reasons set forth below, we grant in part and deny in part the Petitions. We modify Section 12.2 to address several meritorious issues raised in the Petitions. This modification will facilitate carrier compliance and reduce the burden on LECs and CMRS providers, while continuing to further important homeland security and public safety goals.

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[107] *See* Petition for Clarification or, Alternatively, Reconsideration filed by The American Association of Paging Carriers (AAPC) on August 10, 2007 (AAPC Petition); Petition for Reconsideration filed by the DAS Forum on August 10, 2007 (DAS Forum Petition); Petition for Clarification and Reconsideration filed by MetroPCS Communications, Inc. (MetroPCS) on August 10, 2007 (MetroPCS Petition); Petition for Clarification or Reconsideration filed by NextG Networks, Inc. (NextG) on August 10, 2007 (NextG Petition); Petition for Reconsideration filed by PCIA – The Wireless Infrastructure Association (PCIA) on August 10, 2007 (PCIA Petition); and Petition for Clarification and/or Reconsideration filed by The United States Telecom Association on August 10,2007 (USTelecom Petition). *See also Petitions for Reconsideration and Clarification of Action in Rulemaking Proceeding*, Public Notice, Report No. 2827 (rel. Aug. 14, 2007). CTIA also filed a Petition for Reconsideration but withdrew its Petition on September 28, 2007. *See* Petition for Reconsideration filed by CTIA – The Wireless Association® (CTIA) on August 10, 2007 (CTIA Petition).

[108] *Recommendations of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks*, Order, 22 FCC Rcd 10541 (2007) (*Katrina Panel Order*). *See also* 47 C.F.R. § 12.2.

II. BACKGROUND

2. In January 2006, Chairman Kevin J. Martin established the Katrina Panel pursuant to the Federal Advisory Committee Act, Public Law 92-463, as amended.[109] The mission of the Katrina Panel was to review the impact of Hurricane Katrina on communications infrastructure in the areas affected by the hurricane and to make recommendations to the Commission regarding ways to improve disaster preparedness, network reliability and communications among first responders such as police, fire fighters, and emergency medical personnel.[110] The Katrina Panel submitted its report on June 12, 2006.[111] The Katrina Panel's report described the impact of the worst natural disaster in the Nation's history, as well as the overall public and private response and recovery efforts. The Commission's goal is to take the lessons learned from that disaster and build upon them to promote more effective, efficient response and recovery efforts, as well as heightened readiness and preparedness.

3. The Commission issued a Notice of Proposed Rulemaking (*Notice*) on June 19, 2006 inviting comment on what actions the Commission should take to address the Katrina Panel's recommendations.[112] On July 26, 2006, the Commission issued a Public Notice asking commenters to address the applicability of the Katrina Panel's recommendations to all types of natural disasters (*e.g.*, earthquakes, tornadoes, hurricanes, forest fires) as well as other types of incidents (*e.g.*, terrorist attacks, influenza pandemic, industrial accidents).[113] The Public Notice also asked parties to address whether the Panel's recommendations are broad enough to take into account the diverse topography of our Nation, the susceptibility of a region to a particular type of disaster, and the multitude of communications capabilities a region may possess.[114] The Commission received over 100 comments and reply comments in response to the *Notice*.

4. In June 2007, the Commission released the *Katrina Panel Order* directing the Public Safety and Homeland Security Bureau (PSHSB) to implement several of the recommendations made by the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks (Katrina Panel).[115] Among other things, the Commission adopted a rule requiring some communications providers to have emergency/backup power. The backup power rule adopted specifically states:

> Local exchange carriers (LECs), including incumbent LECs (ILECs) and competitive LECs (CLECs), and commercial mobile radio service (CMRS) providers must have an emergency backup power source for all assets that are normally powered from local AC commercial power, including those inside central offices, cell sites, remote switches and digital loop carrier system remote terminals. LECs and CMRS providers should maintain emergency backup

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[109] 5 U.S.C. App. 2 (1988).

[110] *See* the Katrina Panel Charter *available at* http://www.fcc.gov/eb/hkip/HKIPCharter.pdf (last visited September 9, 2007); *see also* the Notice of Establishment of the Commission's Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks, 71 Fed. Reg. 933 (2006).

[111] Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks, *Report and Recommendations to the Federal Communications Commission*, June 12, 2006 (Katrina Panel Report).

[112] *Recommendations of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks*, Notice of Proposed Rulemaking, EB Docket No. 06-119, 21 FCC Rcd 7320 (2006) (*Notice*).

[113] *Recommendations of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks*, 21 FCC Rcd 8583 (2006) (*July 26 Public Notice*).

[114] *Id.*

[115] *Katrina Panel Order*, 22 FCC Rcd 10541 (2007).

> power for a minimum of 24 hours for assets inside central offices and eight hours for cell sites, remote switches and digital loop carrier system remote terminals that are normally powered from local AC commercial power. LECs that meet the definition of a Class B company as set forth in Section 32.11(b)(2) of the Commission's rules and non-nationwide CMRS providers with no more than 500,000 subscribers are exempt from this rule.[116]

5. On August 2, 2007, the Commission released an Order that extended the effective date of Section 12.2 of the Commission's rules, the backup power rule adopted in the *Katrina Panel Order*, to October 9, 2007.[117] The Commission did so on its own motion in order to provide additional time to consider the issues raised by CTIA in its Motion for Administrative Stay and to hear from other concerned parties on the issues raised in that motion.[118]

6. As indicated above, seven petitions were filed seeking reconsideration and/or clarification of the backup power rule adopted by the Commission in the *Katrina Panel Order*.[119] The petitioners assert that the Commission should rescind, modify and/or clarify the backup power rule adopted in the *Katrina Panel Order*. The Commission also received five timely comments to these petitions and several additional *ex parte* comments.

III. DISCUSSION

7. Petitioners argue that the Commission should rescind or substantially modify the backup power rule.[120] Among other things, several petitioners assert that the rule should be modified to implement the Network Reliability and Interoperability Council (NRIC) best practice as recommended by the Katrina Panel and that the Commission should clarify that the rule applies only to assets directly related to the provision of critical communications services.[121] Finally, some petitioners argue that, if the Commission wants to pursue implementation of a backup power rule, it should issue a Notice of Inquiry or Notice of Proposed Rulemaking.[122]

8. <u>Administrative Procedure Act (APA) Notice and Comment</u>. Several petitioners contend that the Commission's adoption of the backup power rule violated the Administrative Procedure Act (APA)[123] by failing to provide adequate notice that it was considering the adoption of that rule and failing to provide opportunity to comment.[124] They argue that the *Notice* was too general to adequately support the backup power rule ultimately adopted and that the final rule deviates too sharply from the initial proposals to satisfy the notice and comment requirements.[125] Petitioners

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[116] 47 C.F.R. § 12.2.
[117] *Recommendations of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks*, Order, EB Docket No. 06-119, WC Docket No. 06-63, 22 FCC Rcd 14246 (*Delay Order*).
[118] *See* CTIA's Motion for Administrative Stay filed July 31, 2007; NextG's Request for Partial Stay of the Commission's Back Up Power Rule filed July 31, 2007 and Errata filed August 1, 2007; and PCIA's Comments in Support of Stay Requests filed August 2, 2007. *See also* CTIA's Motion for Administrative Stay filed September 24, 2007.
[119] As noted before, one of these petitions was subsequently withdrawn.
[120] *See, e.g.*, AAPC Petition at 1-5; PCIA Petition at 8, 19-20; T-Mobile September 4, 2007 Comments in Support of Petitions for Reconsideration (T-Mobile Reply) at 16-18; USTelecom Petition at 1-13.
[121] *See, e.g.*, USTelecom Petition at 3.
[122] *See, e.g.*, PCIA Petition at 5.
[123] *See* 5 U.S.C. § 553(b) (APA requirements relating to notice).
[124] *See, e.g.*, PCIA Petition at 3-4, 15-19; T-Mobile Reply at 8; USTelecom Petition at 9-13.
[125] *Id*.

contend that the *Notice* never discussed the backup power issue in terms of a potential mandate and only asked how the Commission could best encourage implementation of the Katrina Panel's backup power recommendation that the Commission encourage the implementation of *NRIC VII Recommendation 7-7-5204*.[126] Petitioners also assert that the *Notice* did not suggest that the physical scope of the backup power recommendation might extend to all cell sites other remote assets or that the Commission intended to select a specific durational requirement for emergency power, let alone an eight- or twenty-four hour standard.[127]

9. Section 553(b) and (c) of the APA requires agencies to give public notice of a proposed rule making that includes "either the terms or substance of the proposed rule or a description of the subjects and issues involved" and to give interested parties an opportunity to submit comments on the proposal.[128] The notice "need not specify every precise proposal which [the agency] may ultimately adopt as a rule"; it need only "be sufficient to fairly apprise interested parties of the issues involved."[129] In particular, the APA's notice requirements are satisfied where the final rule is a "logical outgrowth" of the actions proposed.[130]

10. In this instance, the Commission provided adequate notice in compliance with the APA regarding the backup power rule. The Katrina Panel Report repeatedly stated that the lack of adequate backup power for communications facilities was a critical problem after Katrina that caused communications network interruptions and hampered recovery efforts.[131] These findings provided the context for the Report's recommendation that the Commission encourage the NRIC best practice that states: "[s]ervice providers, network operators and property managers should ensure availability of emergency/backup power (*e.g.*, batteries, generators, fuel cells) to maintain critical communications services during times of commercial power failures . . . ."[132] In the *Notice*, the Commission noted that the Katrina Panel observed significant challenges to maintenance and restoration of communications services after Hurricane Katrina, due in part to problems with access to key resources such as power and/or generator fuel.[133] The Commission also noted that the Katrina Panel recommended that the Commission encourage the implementation of certain NRIC best practices intended to promote the reliability and resiliency

[126] *See, e.g.,* T-Mobile Reply at 5; USTelecom Petition at 9-13.
[127] *See, e.g.,* MetroPCS Petition at 6-7; PCIA Petition at 3-4, 15-19; T-Mobile Reply at 5, 8; US Telecom Petition at 9-13.
[128] *See* 5 U.S.C. § 553(b), (c).
[129] *Nuvio Corp. v. FCC,* 473 F.3d 302, 310 (D.C. Cir. 2006) (internal quotations omitted).
[130] *Public Service Commission of the District of Columbia v. FCC*, 906 F.2d 713, 717 (D.C. Cir. 1990).
[131] *See* Katrina Panel Report at i ("lack of power and/or fuel" was one of the "three main problems that caused the majority of communications network interruptions"); *id.* at 5-6 ("[T]he duration of power outages far outlasted most generator fuel reserves, leading to the failure of otherwise functional infrastructure."); *id.* at 9 ("In general, cellular/PCS base stations were not destroyed by Katrina, although some antennas required adjustment after the storm. Rather, the majority of the adverse effects and outages encountered by wireless providers were due to a lack of commercial power or a lack of transport connectivity to the wireless switch . . . ."); *id.* at 14 ("While the communications industry has generally been diligent in deploying backup batteries and generators and ensuring that these systems have one to two days of fuel or charge, not all locations had them installed. Where generators were installed and operational, the fuel was generally exhausted prior to restoration of power."); *id.* at 17 ("Backup generators and batteries were not present at all facilities. Where they were deployed, most provided only enough power to operate particular communications facilities for 24-48 hours – generally a sufficient period of time to permit the restoration of commercial power in most situations, but not enough for a catastrophe like Hurricane Katrina.").
[132] *Id.* at 39.
[133] *Notice*, 21 FCC Rcd at 7323.

of the 911 and E911 architecture, including a recommendation that service providers and network operators should "ensure" availability of emergency backup power capabilities (located on-site, when appropriate).[134] The Commission sought comment on how the Commission can best encourage implementation of these recommendations consistent with our statutory authority and jurisdiction and welcomed further suggestions on measures that could be taken to strengthen 911 and E911 infrastructure and architecture.[135] The Commission also invited "broad comment on the Independent Panel's recommendations and on the measures the Commission should take to address the problems identified" and to build upon the lessons learned from Hurricane Katrina and promote greater resiliency and reliability of communications infrastructure, heightened readiness and preparedness, and more effective, efficient response and recovery efforts, in the future.[136]

11. Further, in the *Notice*, the Commission sought comment on whether it should rely on voluntary consensus recommendations or whether it should rely on other measures for enhancing readiness and promoting more effective response efforts.[137] The *Notice* also invited comment on whether the Katrina Panel's observations warranted additional measures or steps beyond the report's specific recommendations and welcomed suggestions and recommendations of different actions or additional measures beyond the Katrina Panel's recommendations.[138] In its report and recommendations, the Katrina Panel found that the lack of power and/or fuel was one of three main problems that caused the majority of communications network interruptions and significant impediments to the recovery effort in the aftermath of Hurricane Katrina.[139] The Katrina Panel Report also noted that during and after the hurricane, the power needed to support the communications networks was generally unavailable throughout the region and that backup batteries and generators were required for communications systems to continue to operate.[140] The Katrina Panel further noted that "the majority of the adverse effects and outages encountered by wireless providers were due to a lack of commercial power or a lack of transport connectivity to the wireless switch."[141] Additionally, the Katrina Panel Report stated that "[w]ireless providers cited security for their personnel, access and fuel as the most pressing needs and problems affecting restoration of wireless service" and that the loss of power in the wireline telephone network also had a huge impact on the ability of public safety systems to function.[142] The Katrina Panel noted that electric utility networks had a high rate of survivability following Hurricane Katrina due, in part, to the fact that they were built with significant onsite backup

[134] *Id*. at 7326. *See also* Katrina Panel Report at 39 (recommending that, in order to ensure a more robust E911 service, the FCC should encourage the implementation of the following NRIC best practice:

> Service providers, network operators and property managers should ensure availability of emergency/backup power (*e.g.*, batteries, generators, fuel cells) to maintain critical communications services during times of commercial power failures, including natural and manmade occurrences (*e.g.*, earthquakes, floods, fires, power brown/blackouts, terrorism). The emergency/backup power generators should be located onsite, when appropriate. *See NRIC VII Recommendation 7-7-5204*.)

[135] *Id.*
[136] *Id*. at 7320, 7322.
[137] *Id* at 7322.
[138] *Id.*
[139] Katrina Panel Report at i, 13, 17-18 (problems with maintaining and restoring power for communications infrastructure significantly affected the recover process).
[140] *Id*. at 14.
[141] *Id.* at 9.
[142] *Id*. at 7, 9.

power supplies (batteries and generators).[143] Although the Katrina Panel found that "the communications industry has generally been diligent in deploying backup batteries and generators and ensuring that these systems have one to two days of fuel or charge," it also noted that not all locations had such backup batteries or generators installed and that, because all locations were not able to exercise and test the backup equipment in any systemic fashion, some generators and batteries did not function during the crisis.[144] Although the power outages during and after Hurricane Katrina were exceptionally long, the Panel's observations clearly emphasized the importance of power supply to resiliency of communications networks.

12. Taken together, the questions raised in the *Notice* as well as the Katrina Panel Report's findings regarding the lack of emergency power were sufficient to put interested parties on notice that the Commission was considering how to address the lack of emergency backup power, including through the possible adoption of an emergency backup power rule. Specifically, the *Notice* sought comment on how the Commission could best encourage implementation of various NRIC best practices, including ensuring the availability of emergency backup power.[145] Even if that language were not read to propose a mandatory rule, the *Notice* still gave ample notice that this was a possibility. The *Notice* specifically inquired about "whether [the Commission] should rely on voluntary consensus recommendations, as advocated by the [Katrina] Panel, or whether [it] should rely on *other measures* for enhancing readiness and promoting more effective response efforts,"[146] a line of inquiry that the Commission reiterated in the *July 26 Public Notice*.[147] Moreover, the D.C. Circuit has held that the ultimate adoption of a mandatory rule can constitute the logical outgrowth of a voluntary standard.[148] Thus, because parties could have anticipated that the rule ultimately adopted was "possible," it is considered a "logical outgrowth" of the original proposal, and there is no violation of the APA's notice requirements.[149]

13. Indeed, we note that the National Emergency Number Association (NENA) did propose a backup power requirement in response to the *Notice*.[150] In addition, St. Tammany Parish Communications District 1 told the Commission that "[v]oluntary consensus measures have fallen short many times" and that "it is imperative that [wireline] and wireless telephone providers be required to demonstrate they have adequate backup procedures in place."[151] Carriers also commented on the importance of having backup power. CTIA observed that wireless carriers "must ensure network reliability and reliance" and that, to do so, they "provision their cell sites

[143] *Id.* at 12.
[144] *Id.* at 14, 17-18.
[145] *Notice*, 21 FCC Rcd at 7326 ¶ 16 (emphasis added).
[146] *Notice*, 21 FCC Rcd at 7322 ¶ 7 (emphasis added).
[147] *July 26 Public Notice*, 21 FCC Rcd at 8583; *see also* Separate Statement of Commissioner Copps ("I am especially pleased that we seek comment on whether voluntary implementation is enough or whether we need to consider other measures.").
[148] *See New York v. EPA*, 413 F.3d 3, 44 (D.C. Cir. 2005) (EPA's adoption of certain mandatory environmental requirements following earlier proposal of a "menu of alternatives" approach by which state governments would be allowed to choose any or all of these requirements, was a "readily foreseeable outcome[] that could result from the proposal" and thus was the logical outgrowth of that proposal).
[149] *See Northeast Maryland Waste Disposal Authority v. EPA*, 358 F.3d 936, 951 (D.C. Cir. 2004) (discussing APA notice requirements and the "logical outgrowth" test).
[150] *See* NENA's August 7, 2006 comments in response to the *Notice* at 6. *Cf. Rybachek v. EPA*, 904 F.2d 1276, 1288 (9th Cir. 1990) (finding that final rule was "logical outgrowth" of earlier proposal where agency issued NPRM mentioning only the possibility of case-by-case imposition of environmental requirements but issued final rule mandating these requirements after public comments recommended mandates).
[151] Comments of St. Tammany Parish Communications District 1, at 1-2.

and switches with batteries to power them when electrical grids fail" and "maintain permanent generators at all of the switches and critical cell sites, as well as an inventory of backup power generators to recharge the batteries during extended commercial power failures."[152] USTA likewise gave examples of telephone companies that had already deployed backup power capabilities that enabled their cell networks to remain in operation for several days after a loss of main power.[153] In light of these comments, we do not find credible the argument that the *Notice* failed to apprise parties that the Commission would address the issue of backup power in this proceeding.

14. Petitioners' argument that the Commission did not give adequate notice that it might select a specific durational requirement for emergency power, such as twenty-four or eight hours, also lacks merit. Had we adopted a general backup power requirement that did not require a minimum amount of backup power, we would have risked creating an illogical and meaningless requirement that would have allowed providers to have only one minute of backup power. Thus, parties should have realized that an emergency backup power mandate would inevitably include a specific durational requirement.

15. Statutory Authority. PCIA asserts that Section 1 of the Communications Act, the statutory authority upon which the Commission adopted the backup power rule, is patently inadequate statutory authority.[154] PCIA contends that Section 1 of the Communications Act, as amended, (the "Act")[155] is only a general grant of jurisdiction that, absent other specific authority, does not authorize the Commission to impose requirements to maintain backup power at cell sites.[156] PCIA argues that the Commission's ancillary authority under Section 1 of the Act does not empower it to act where such action would be "ancillary to nothing."[157]

16. The Commission's Section 1 ancillary jurisdiction covers circumstances where: (1) the Commission's general jurisdictional grant under Title I covers the subject of the regulations, and (2) the regulations are reasonably ancillary to the Commission's effective performance of its statutorily mandated responsibilities.[158] This two-part test for ancillary jurisdiction was

[152] CTIA–The Wireless Association Comments ("CTIA Comments") at 8.
[153] Comments of the United States Telecom Association at 5-6.
[154] PCIA Petition at 15-16.
[155] 47 U.S.C. § 151.
[156] PCIA Petition at 15-16 (citing *Am. Library Ass'n v. FCC,* 406 F.3d 689 and *Motion Picture Assn of America, Inc. v. FCC,* 309 F.3d 796).
[157] PCIA Petition at 15 (citing *Am. Library Ass'n,* 406 F.3d at 702 and *United States v. Southwestern Cable Co.*, 392 US 157, 178 (1968)). PCIA further states that it "agrees with CTIA that the Commission's reliance on only Section 1 is an insufficient statutory basis to sustain the new regulation," citing the CTIA July 31, 2007 Motion for Stay at 8-11. CTIA also states that Section 1, standing alone, is not the type of clear expression of Congressional intent that is necessary to impose such a heavy obligation on the wireless industry and, indeed, this would be particularly anomalous in the context of CMRS, which since its inception has been largely deregulated at the federal level (citing *Nat'l Ass'n of State Util. Consumer Advocates v. FCC,* 457 F.3d 1238, 1245 (11th Cir. 2006) (describing the "the pro-competitive, deregulatory framework for [wireless service providers] prescribed by Congress.") (quotation omitted)). *See* CTIA's July 31, 2007 Motion for Stay at 10-11. Finally, CTIA asserts that, even in cases in which the Commission has relied on Section 1 in addition to other provisions of Title I of the Act, such as Section 4(i), 47 U.S.C. § 154(i), to adopt regulations pursuant to its ancillary authority, the courts have routinely rejected such efforts. *See* CTIA's July 31, 2007 Motion for Stay at 9-11.
[158] *United States v. Southwestern Cable Co.*, 392 U.S. 157, 177-78 (1968) (*Southwestern Cable*) (upholding the FCC regulatory authority over cable television).

developed by the Supreme Court in *Southwestern Cable*.[159]

17. To fulfill the first prong of the ancillary jurisdiction test, the subject of the regulation must be covered by the Commission's general grant of jurisdiction under Title I of the Communications Act, which encompasses "all interstate and foreign Communication by wire or radio."[160] In the instant rule making, this first prong of the ancillary jurisdiction test is met because the backup power rule adopted by the Commission in the *Katrina Panel Order* pertains to the provisioning of "interstate and foreign commerce in communication by wire and radio."[161] The second prong of the ancillary jurisdiction test requires that the subject of the regulation must be reasonably ancillary to the Commission's effective performance of its statutorily mandated responsibilities.[162] It cannot seriously be disputed that the backup power requirement is "reasonably ancillary to the effective performance" of the Commission's responsibilities to promote public safety. Section 1 itself makes clear that one of the Commission's missions is to "make available [a] wire and radio communication service with adequate facilities for the purpose of *promoting safety of life and property* through the use of wire and radio communications." 47 U.S.C. § 151 (emphasis added). Section 1 thus requires the Commission to "consider public safety" and to "take into account its *duty* to protect the public." *Nuvio Corp. v. FCC*, 473 F.3d 302, 307 (2006); *see also id.* at 311 (Kavanaugh, J., concurring) ("the FCC possesses statutory authority to address the public safety threat by banning providers from selling voice services until the providers can ensure adequate 911 connections"). And as this Court has recognized, it is well "within the Commission's statutory authority" to " 'make such rules and regulations as may be necessary in the execution' " of its section 1 responsibilities."[163] Section 303(r) also provides ample authority to support the Commission's action here. Section 303(r) provides that the Commission may "[m]ake such rules and regulations as may be necessary to carry out the provisions of this Act.[164]

18. The presence of a backup power source installed by all local exchange carriers (LECs), including incumbent LECs (ILECs) and competitive LECs (CLECs), as well as commercial mobile radio service (CMRS) providers for all assets that are normally powered from local commercial power including those inside central offices, cell sites, remote switches and digital loop carrier system remote terminals will facilitate communication for the purposes of national defense and the promotion of "safety of life and property" during emergencies. Communications networks cannot operate without a power source. The Commission must therefore be mindful of an adequate power supply, particularly in emergencies, if it is to discharge its core responsibilities under Section 1 of the Communications Act to regulate communications for the promotion of national defense, public safety and the protection of property. If commercially supplied power is incapacitated, the communications network will also fail. The backup power rule adopted by the Commission is a short-term attempt to sustain communication in a severe emergency for the purposes of promoting the Commission's salient purpose pursuant to Section 1 to regulate interstate communications by wire and radio.

19. PCIA's reliance on the broadcast flag ruling by the U.S. Court of Appeals for the District of

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[159] *Id.* This test was subsequently applied by the Supreme Court in *United States v. Midwest Video Corp.,* 406 U.S. 649 (1972) *(Midwest Video I)* and *United States v. Midwest Video Corp.,* 440 U.S. 689 (1979) *(Midwest Video II).*
[160] *Southwestern Cable,* 392 U.S. at 167. *See also Am. Library Ass'n,* 406 F.3d at 693.
[161] 47 U.S.C. § 151.
[162] *Southwestern Cable*, 392 U.S. at 178.
[163] *Rural Telephone Coalition v. FCC,* 838 F.2d 1307, 1315 (D.C. Cir. 1988) (quoting 47 U.S.C. § 154(i)).
[164] 47 U.S.C. § 303(r). *See also* 47 U.S.C. § 332.

Columbia (Court) is misplaced. In that case, the Court found that the Commission had not satisfied the second prong of the ancillary jurisdiction test because the restriction on recording digital television programs that were transmitted by cable or over-the-air broadcast exceeded the Commission's authority to regulate the transmission of communications by wire and radio given that the restriction pertained to a regulation imposed outside the course of the act of transmitting the communication.[165] In this case, by contrast, backup power is necessary for the communication to be transmitted at all.

20. Arguments Regarding Lack of Record Support, Consideration of Important Factors or Reasoned Basis for Rule. Petitioners contend that the backup power rule is arbitrary and capricious because the Commission failed to explain why a mandatory obligation including an inflexible minimum 8 or 24 hour period was necessary and why it rejected less restrictive alternatives to the rule, such as a voluntary best practices regime as recommended by the Katrina Panel.[166] Several petitioners also allege that the Commission failed to consider the impact of the rule, failed to consider important aspects of the very problem it sought to redress, and failed to explain why present carrier preparedness plans are inadequate.[167] Additionally, several petitioners argue that the backup power rule adopted lacks record support.

21. Petitioners argue that there is no record evidence to support the backup power mandate in general, or the eight or 24-hour minimum in particular.[168] Some petitioners note that the comments described in the Order when discussing the backup power rule do not concern CMRS providers at all, do not suggest any mandatory minimum standard, or have nothing to do with backup power.[169] However, the rule adopted by the Commission enjoyed strong factual support. First, as described *supra* at ¶ 11, the Katrina Panel repeatedly emphasized the importance of power supply to resiliency of communications networks. Further, it noted that backup generators and batteries were not present at all facilities.[170] Additionally, the Katrina Panel Report stated that power for radio base stations and battery/chargers for portable radio devices are carefully planned for public safety systems; however, "generators are typically designed to keep base stations operating for 24 to 48 hours."[171] This language, along with the Katrina Panel's recognition that 24-48 hours is generally a sufficient time to permit the restoration of power in most situations,[172] clearly provides support for requiring LECs and CMRS providers to maintain backup power for a minimum of 24 hours for assets located inside central offices. The 24 hour requirement imposes relatively less burden while still generally providing sufficient time for restoration of commercial power or for carriers to allocate additional power sources. Further, the Commission recognized the burdens of ensuring longer durations of backup power at other locations, which have subsequently been detailed by petitioners, and reasonably required only 8 hours of backup power

[165] *Am. Library Ass'n*, 406 F.3d at 703-704.
[166] *See, e.g*. PCIA Petition at 6; September 4, 2007 Comments of Sprint Nextel (Sprint Nextel Reply) at 4; USTelecom Petition at 3, 10-12.
[167] *See, e.g*. NextG Petition at 2-13; T-Mobile Reply at 8; USTelecom Petition at 2-3, 7-13.
[168] *See, e.g.*, MetroPCS Petition at ii, 4, 6-7; PCIA Petition at 15-18; USTelecom Petition at 9-13.
[169] *See, e.g.*, DAS Forum Petition at 5-7; Sprint Nextel Reply at 2-3; USTelecom at 12 (noting that NENA's comments addressed only wireline providers central offices and did not discuss any specific time frame for backup power and that St. Tammany Parsh's comments discussed only backup procedures and made no mention of backup power.).
[170] Katrina Panel Report at 17.
[171] *Id*. at 7. NENA further states that its representative on the Katrina Panel urged that wireless sites should include generators with a minimum of five days fuel supply and backup battery systems rated for a minimum of eight hours. *See* NENA's September 11, 2007 Comments at 1-3.
[172] *Id*. at 17.

for such locations, including, but not limited to, cell sites, remote switches and digital loop carrier system remote terminals.[173] This will provide at least eight hours for commercial power restoration or carrier actions to obtain additional backup power sources.[174]

22. Additionally, the Katrina Panel's recommendation was that the Commission encourage the implementation of the NRIC VII Recommendation 7-7-5204. That recommendation states that "[s]ervice providers, network operators and property managers should ensure availability of emergency/backup power. . ." The terms "service providers" and "network operators" clearly include CMRS providers. In the *Katrina Panel Order*, the Commission noted that NENA recommended that "the FCC or state commissions, as appropriate, require all telephone central offices to have an emergency backup power source."[175] NENA states that, in its comments in the Katrina Panel Docket, it chose to mention telephone central offices as emblematic, not exhaustive, of critical switching points in wire and wireless networks, and it also endorsed the broader scope of NRIC Recommendation 7-7-5204.[176]

23. The Commission determined that a mandatory backup power requirement would be in the public interest. Although several carriers described their backup power plans, the Katrina Panel Report made clear the importance of backup power for resilient communications and restoration of communications services that have been disrupted. The report further made clear that, although many carriers do have backup power or backup power plans, not all locations have backup power. The Katrina Panel also noted that because those communications providers did not necessarily test and exercise their backup power sources in a systematic fashion, generators and batteries might not function during the crisis.[177] Imposing a backup power rule would ensure that more communications assets have backup power and that providers ensure the availability of this power. Access to communications technologies during times of emergency is critical to the public, public safety personnel, hospitals, and schools, among others. Therefore, because the benefits of ensuring resilient communications during times of crises are so great, the Commission determined that a backup power rule was in the public interest. Moreover, it is important that both LEC and CMRS providers have backup power, because the public, public safety personnel, and hospitals, among others, rely heavily on both types of providers. In fact, many Americans now rely on only a wireless phone and public safety entities, hospitals and others are increasingly relying on wireless technologies.[178] As the Katrina Panel Report and commenters note, lack of commercial power was one of the main causes of wireless outages during Hurricane Katrina,

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[173] 47 C.F.R. § 12.2.

[174] In the US Telecom Petition and a Verizon Wireless *Ex Parte*, both providers reported that the majority of their remote sites have backup power. *See* USTelecom Petition at 2,8 (noting that the vast majority of all network remote terminals have onsite backup battery power typically designed to an eight hour engineering standard, although the actual life of the battery at any point in time depends on numerous factors and some remote terminals are too small to support a battery); Verizon Wireless *Ex Parte* filed September 4, 2007 (stating that Verizon Wireless' internal design standard is for eight hours or more of backup power (generators, batteries or both) at every cell site where possible, that the majority of its cell sites have on-site generators or batteries capable of providing backup power for much longer than eight hours, that only a small percentage of sites have only batteries that will not last for eight hours, and that only a handful of sites have no on-site backup power at all).

[175] *Katrina Panel Order*, 22 FCC Rcd at 10565 ¶ 76; NENA Comments at 6.

[176] NENA's September 11, 2007 Comments at 1-3.

[177] *Id.* at 14, 17-18.

[178] *See, e.g.*, *Implementation of Section 6002(B) of the Omnibus Budget Reconciliation Act of 1993, Eleventh Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services*, 21 FCC Rcd 10947, 11010, ¶ 158 (2006) ("In the last three years alone, the total mobile telephone subscriber base has increased 50 percent.").

access to fuel was one of the wireless providers' most pressing needs during that catastrophe, and it is important that both wireless and wireline carriers ensure network reliability and resiliency by provisioning their sites with back up power.[179]

24. Petitioners also allege that the Commission failed to consider burdens and important matters, some of which affect the ability of carriers to comply with the rule. They contend that legal impediments, including contractual obligations and inconsistency with federal, state and local environmental, safety, building and zoning laws will make compliance with the rule difficult, if not impossible and could result in preemption issues regarding state and local laws.[180] Petitioners note that carriers have site leases with contractual obligations that regulate the placement, installation and operation of power sources.[181] Additionally, petitioners assert that compliance with the backup power rule could result in threats to public health and safety. For instance, petitioners state that the installation of a generator and its combustible fuel on the roof of a school or public building, where many transmitters are located, may pose a risk to public health and safety even when in compliance with law.[182] Further, petitioners assert that the Commission failed to properly consider the length of time it would reasonably take for providers to comply with the rule. They contend that compliance will take a significant amount of time and the time allowed by the *Katrina Panel Order* is insufficient, because providers must obtain permits, do site inspections, conduct structural engineering analysis, renegotiate leases, obtain permits, ensure compliance with legal requirements, evaluate backup power needs, and order and install the necessary equipment.[183] Petitioners also assert that compliance will take time because thousands of "non-critical" sites do not have backup power and many of the sites that do have backup power do not have the amount required.[184] As discussed in greater detail below, petitioners also argue that physical and other practical limitations make it difficult or impossible to comply with the backup power rule. Finally, petitioners argue that the Commission did not adequately consider the economic burden the rule will impose.[185]

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[179] *See, supra* ¶¶ 11, 13.

[180] *See, e.g.*, DAS Forum Petition at 6-7, 10; MetroPCS Petition at ii, 8-12; PCIA Petition at 9; T-Mobile Reply at 9.

[181] Petitioners state that, in order to comply with the rule, carriers would be required to maintain a large number of battery and fuel-powered generators at cell sites. Because these power systems contain lead, sulfuric acid, oils and flammable liquids, they are subject to a host of federal, state, and local environmental and safety laws that strictly limit their placement and use. They note that, at a multi-carrier site, compliance with the rule could require the addition of several thousand pounds of additional weight, which would implicate local building code limitations. Petitioners note that placement and operation of diesel generators raises environmental issues and implicate federal and state environmental laws are implicated by the rule. They state that state and local government laws and ordinances require permits before installing new diesel generators and issuance of such permits can be delayed while authorities negotiate to address concerns re: noise pollution, ventilation, fuel leakage, etc. Petitioners argue that site leases that contractually limit the placement of such equipment will have to be renegotiated prior to installation. *See, e.g., id.*

[182] *See, e.g.*, DAS Forum at 9; MetroPCS Petition at 8-9; T-Mobile Reply at 10. Because several petitioners refer to the CTIA Petition, we note that CTIA also noted that a rooftop location could expose the equipment to lightning or other weather conditions that could compromise the equipment, making it more susceptible to fuel leakage and fire; that the location of such equipment in a church steeple may not provide adequate ventilation; and that pollutants emitted by diesel generators have been identified as leading contributors to a variety of environmental and health problems. *See* CTIA Petition at 18-19.

[183] *See, e.g.*, PCIA Petition at 5, 10; T-Mobile Reply at 7, 9, 11-12; USTelecom at 8; Verizon Wireless *Ex Parte* at 2-3.

[184] *Id*.

[185] *See, e.g.*, MetroPCS Petition at 5, 13; NextG Petition at 2-3, 10-15; PCIA Petition at 5; Sprint Nextel Reply at 3-4.

25. We find that Petitioners' arguments regarding legal impediments and threat to public health and safety to be compelling and modify Section 12.2 to state that LECs and CMRS providers are not required to meet the backup power requirement if they demonstrate, through the reporting requirement described below, that such compliance is precluded by: (1) federal, state, tribal or local law; (2) risk to safety of life or health; or (3) private legal obligation or agreement. With respect to private legal obligations or agreements, LECs and CMRS providers should make efforts to revise agreements to enable rule compliance where possible, for example through renegotiations or renewals. Obviously, the Commission will disapprove of attempts to circumvent the rule through private agreements. We believe such exemptions are warranted because those impediments create a substantial burden for LECs and CMRS providers to overcome in order to comply with the rule that in some cases may be insurmountable. In the case of risk to safety of life or health, such an exemption is obviously in the public interest. As noted, *supra* at ¶ 7, some petitioners assert that the Commission should clarify that the backup power rule applies only to assets directly related to the provision of critical communications services.[186] We agree that the requirement should be clarified to apply only to assets necessary to the provision of communications services and modify the rule accordingly. We decline, however to limit the rule to "critical" communications services, because, although that term was included in the NRIC best practice recommended by the Katrina Panel, it is not well defined and we believe, for public safety and public interest reasons, all assets necessary to the provision of communications services should have backup power. We also agree with AT&T that on-site power sources satisfy the requirement of this rule if such sources were originally designed to provide the minimum backup power capacity level required herein and the provider has implemented reasonable methods and procedures to ensure that batteries are regularly checked and replaced when they deteriorate.[187] Finally, we find that the requirement should not be limited to assets normally powered from local "AC" commercial power. Regardless of the type of commercial power used, assets necessary to maintain communications should have backup power and be as reliable and resilient as possible. We also note that the NRIC best practice recommended by the Katrina Panel did not limit its recommendation in this way. Accordingly, we delete the reference to "AC" in the rule.

26. While today we address concerns raised by LECs and CMRS providers regarding their obligation to ensure emergency backup power, given the importance of backup power reserves during times of emergency, we will seek information regarding the extent to which LECs and CMRS providers are in compliance with this rule. Accordingly, we also modify Section 12.2 of our rules to require LECs and CMRS providers to file reports with the Commission that identify the following information: (1) an inventory listing of each asset that was designed to comply with the backup power mandate; (2) an inventory listing of each asset where compliance is precluded due to risk to safety or life or health; (3) an inventory listing of each asset where compliance is precluded by private legal obligation or agreement; (4) an inventory listing of each asset where compliance is precluded by Federal, state, tribal or local law; and (5) an inventory listing of each asset designed with less than the required emergency backup power capacity and that is not otherwise precluded from compliance for one of the three reasons identified in paragraph 25,

[186] *See, e.g.,* MetroPCS Petition at 13; NENA September 11, 2007, Comments at 3; NextG Petition at 17; Sprint Nextel Reply at 2; USTelecom Petition at 3.

[187] AT&T *Ex Parte* Notice filed September 27, 2007; *see also* Verizon Wireless *Ex Parte* filed September 4, 2007 (noting that batteries begin to deteriorate the minute they are installed and, although Verizon Wireless has methods and procedures in place that insure that batteries are regularly checked and replaced when they deteriorate, it cannot guarantee that every battery designed to provide 8 hours of backup power will actually do so).

above.[188] LECs and CMRS providers must file these reports within six months of the effective date of this requirement, and must include a description of facts supporting the basis of the LEC's or CMRS provider's claim of preclusion from compliance. For example, claims that a LEC or CMRS provider cannot comply with the backup power mandate due to a legal constraint must include the citation(s) to the relevant laws and, in order to be deemed precluded from compliance, the law or other legal constraint must prohibit the LEC or CMRS provider from complying with the backup power requirement. The mere need to obtain a permit or other approval will not be deemed to preclude compliance with the backup power requirement. Claims that a LEC or CMRS provider cannot comply with the backup power mandate with respect to a particular asset due to a private legal obligation or agreement must include the relevant terms of the obligation or agreement and the dates on which the relevant terms of the agreement became effective and are scheduled to expire. Claims that a LEC or CMRS provider cannot comply with the backup power mandate with respect to a particular asset due to risk to safety of life or health must include a description of the particular public safety risk and sufficient facts to demonstrate substantial risk of harm. We direct the PSHSB to develop an appropriate auditing program to ensure that carriers' exclusion filings are reasonable and accurate.

27. LECs or CMRS providers identifying assets designed with less than the required emergency backup power capacity and not otherwise precluded from compliance for one of the three reasons listed above must comply with the backup power requirement or file, within 12 months from the effective date of the rule, a certified emergency backup power compliance plan that is subject to Commission review. That plan must describe how, in the event of a commercial power failure, the LEC or CMRS provider intends to provide emergency backup power to 100 percent of the area covered by any non-compliant asset, relying on on-site and/or portable backup power sources or other sources as appropriate. The emergency backup power must be sufficient for service coverage as follows: a minimum 24 hours of emergency backup power for assets inside central offices and eight hours for other assets such as cell sites, remote switches, and digital loop carrier system remote terminals. The provider must be able to ensure backup power is available for 100 percent of the area covered by any non-compliant asset pursuant to the emergency backup power compliance plan on the date that the plan is filed. All reports and plans required by Section 12.2 of the Commission's rules will be automatically afforded confidentiality, because the information in those reports and plans is sensitive, for both national security and/or commercial reasons. This reporting requirement should not be burdensome in light of many LEC and CMRS provider arguments that they already have business continuity plans that address the issue of backup power and in light of the fact that the plan is not due until 12 months after the effective date of the modified rule which will require Office of Management and Budget approval before going into effect. In any event such burdens are outweighed by the importance of having backup power for communications assets.

28. Petitioners argue that the Commission failed to consider the length of time it would reasonably take for CLECs and CMRS providers to comply with the rule and that it will take significant time to evaluate backup power needs, conduct structural engineering analyses, renegotiate leases if needed, prepare necessary applications for permits and other authorizations, ensure compliance with all applicable building codes and environmental regulations, coordinate with counsel, architects, construction personnel and government officials, order and receive the necessary

[188] LECs that meet the definition of a Class B company as set forth in Section 32.11(b)(2) of the Commission's rules and non-nationwide CMRS providers with no more than 500,000 subscribers are exempt from the rule and the reporting requirements in paragraphs 26-27.

equipment, and properly install the backup power source.[189] We note that the *Katrina Panel Order* was released on June 8, 2007, almost four months ago, and LECs and CMRS providers have known of the backup power requirement since that time. Further, the modified backup power rule adopted herein will not go into effect until OMB approves the new information collection, giving providers additional time to come into compliance. To the extent LECs and CMRS providers identify non-compliant assets, they will receive even more time to file emergency backup power compliance plans. In addition, the modifications to the rule mitigate these concerns by exempting assets from compliance when precluded by law, private legal obligation or agreement, or risk to safety of life or health and by allowing an emergency backup power compliance plan in cases where assets do not comply with the 8-24 hour rule and are not subject to the exceptions. As such, we believe that it will be feasible for providers to comply with the rule.

29. Several petitioners argue that compliance with the backup power rule is burdensome due to physical and other practical limitations, that the required space might not be available at many sites, and that providers may be forced to modify structures containing cell transmitters or to build new structures.[190] They assert, for example, that roofs and floors need to be designed to support the weight of power sources, that many rooftop cell sites were not engineered with the additional weight requirements made necessary by the backup power rule, and that many of those structures may simply not be able to physically support the weight of additional batteries or a generator.[191] Petitioners also argue that there is not enough space at many cell sites to add additional backup power sources and note that cell transmitters are often placed in locations with limited room, such as building rooftops, church steeples and inside buildings.[192] USTelecom notes that some remote terminals are physically too small to support a backup battery or a battery over a certain size.[193] T-Mobile reports that, in the case of liquid propane-fueled generators, Occupational Safety and Health Administration requirements mandate a 10-foot radius clearance between the liquid propane fuel tank and its ignition source.[194] T-Mobile argues that this could substantially increase the amount of space needed to install a backup power source.[195]

30. We are not convinced that LECs and CMRS providers should be excused from having emergency backup power solely because they have chosen to place their assets at locations with limited weight or space capacities. The ultimate goal of this rule is to ensure that carriers have sufficient emergency backup power, particularly during times of emergencies. We recognize that, in order

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[189] *See, supra* n183. Some petitioners also note that the rule will result in an increased demand for batteries and generators that might cause a production strain and limit the timely availability of these resources. However, they have provided no proof in support of these assertions and for the reasons stated in this paragraph, we believe providers will have adequate time to comply with the rule. Moreover, rule modifications we adopt today will decrease the amount of backup power sources that will need to be installed.

[190] *See, e.g.*, DAS Forum Petition at 9, 4-5; MetroPCS Petition at ii, 9-13; T-Mobile Reply at 11; USTelecom Petition at 2; Verizon Wireless *Ex Parte* filed September 4, 2007 at 2-3.

[191] *Id*.

[192] *Id.* PCIA asserts that the backup power rule is at odds with federal efforts to limit the physical presence of cell sites and the policy of promoting collocation. PCIA Petition at 8-10; *see also* T-Mobile Reply at 10-11. While we recognize the desire to collocate and the flexibility afforded by collocation, the goal of ensuring reliable and resilient communications outweighs any benefits afforded by collocation. Further, the backup power rule, particularly as amended in this Order on Reconsideration, does not necessarily prevent collocation.

[193] USTelecom Petition at 2, 8.

[194] T-Mobile Reply at 11; see also PCIA Petition at 9 (stating that fire codes require safety zones around propane and diesel tanks).

[195] *Id*.

to comply with the rule, some carriers may have to modify sites to accommodate additional equipment or, in some cases, find other, more suitable, locations for their assets. We believe, however, that any such burdens are far outweighed by the ultimate goal of this rule. For similar reasons, we also reject the notion that carriers should be excused from complying with the rule for vague "practical" reasons. Having said this, however, a carrier could be excused from the rule to the extent that the carrier can demonstrate that an asset with purported physical constraints fall into one of the three exceptions listed above. Additionally, where assets do not comply with the 8-24 hour rule and are not subject to the exceptions, we now allow an emergency backup power compliance plan.

31. Although petitioners argue that the economic burden that the backup power rule will impose is substantial, the record before the Commission showed that several carriers have already deployed back-power power capabilities, some of which allow them to remain in operation for several days in the event of a loss of main power.[196] In any event, we find that the benefits of ensuring sufficient emergency backup power, especially in times of crisis involving possible loss of life or injury, outweighs the fact that carriers may have to spend resources, perhaps even significant resources, to comply with the rule.[197] Petitioners assert that compliance may be costly; however, the record does not show that it is "cost-prohibitive" for carriers. Moreover, the rule modifications, including new exemptions described above and the provision that providers file an emergency backup power compliance plan to ensure 100 percent coverage in areas covered by non-compliant assets, will decrease any economic burden substantially. Finally, we find that the goal of ensuring that carriers' networks have sufficient emergency backup power outweighs the economic burden described by petitioners and particularly the reduced economic burden in light of the rule modifications adopted herein. The need for backup power in the event of emergencies has been made abundantly clear by recent events, and the cost of failing to have such power may be measured in lives lost.

32. Some Petitioners argue that, contrary to the ultimate goal of protecting the provision of services, the backup power rule will not advance, but will actually risk undermining, carriers' emergency preparedness goals and efforts to achieve important business continuity and disaster recovery goals.[198] Petitioners contend that the rule deprives carriers of the flexibility necessary to make intelligent and efficient plans for network resiliency as well as giving carriers the flexibility to respond to disasters in real time while remaining in compliance with the Commissions rules.[199] Petitioners assert that, by diverting manpower and resources away from more appropriate efforts to tailor emergency communications plans, and by denying carriers the ability to move resources away from areas not impacted to those that have been impacted, the rule undermines rather than

[196] *See, supra* ¶ 13. *See also* T-Mobile Reply at 7 (T-Mobile already provides varying degrees of backup power at 95 percent of its cell sites, most have less than 8 hours of power but some have more than 8 hours).

[197] Although its petition has been withdrawn several commenters reference the CTIA Petition, and we note that CTIA asserted that the reasons the Commission gave for encouraging but not requiring other Katrina Panel recommendations apply with equal force to the backup power issue. For instance, like the implementation of diverse 911 circuits, CTIA contends that mandatory minimum backup power is "cost-prohibitive in certain cases." CTIA Petition at 24, n.33; *see also Katrina Panel Order*, 22 FCC Rcd at 10564-65 ¶ 75. However, the costs of implementing diverse 911 circuits are often shouldered by PSAPs which depend on limited sources of public funding and do not have the financial resources of commercial companies.

[198] *See, e.g.*, MetroPCS Petition at 13; PCIA Petition at 8, 19-20; USTelecom Petition at 1-3, 7-9.

[199] *See, e.g.*, MetroPCS Petition at ii, 6-7, 13; PCIA Petition at 8, 19-20; Sprint Nextel Reply at 2-3; USTelecom Petition at 2, 7.

promotes the important goal of public safety.[200]

33. We recognize that carriers need some level of flexibility in the design and deployment of their networks. This need, however, must be balanced with the critical goal of ensuring that communications networks has sufficient backup power, particularly during times of disaster. The modifications we make today strike a fair and equitable balance of these two interests. The modified rule we adopt today will ensure that LECs, including ILECs and CLECs, as well as CMRS providers maintain sufficient level of emergency backup power for assets that are necessary to maintain communications and that are normally maintained by commercial power. At the same time, the modifications adopted herein provide some level flexibility, both in terms of the exceptions provided and the requirements for submission of an emergency backup power compliance plan in cases where providers are not compliant. Moreover, inclusion of on-site back up power does not preclude the ability of carriers to maintain strategic stores of fuel, batteries or other backup equipment in other localities as a further layer of redundancy. Petitioners argue that enforcement could also lead to the termination or disruption of wireless cell sites, threatening the availability of service, including E-911 service.[201] Petitioners further contend that carriers may have little choice but to shut down or move certain transmitters rather than risk operating in violation of the new rule or endangering public health and safety.[202] NENA disagrees and contends that these arguments suggest that cellular providers should be immune from any disruptive regulatory discipline.[203] We believe that the exemptions now provided along with the requirement to develop an emergency backup power compliance plan in cases where assets do not comply with the 8-24 hour rule and are not subject to the exceptions described herein will mitigate these concerns.

34. Paging Carriers. The American Association of Paging Carriers (AAPC) argues that the Commission did not intend to apply the backup power rule to paging carriers and should so clarify. Alternatively, AAPC asserts that, if the Commission did intend for this rule to apply to paging carriers, the Commission should reconsider and exclude paging carriers[204] or instead adopt the Katrina Panel's actual recommendation on this issue, as set forth in the Katrina Panel Report. The backup power rule adopted in the *Katrina Panel Order* requires commercial mobile radio service (CMRS) providers to have emergency backup power. CMRS providers that have no more than 500,000 subscribers are exempt from this rule. Therefore, paging carriers that are CMRS providers with more than 500,000 subscribers must comply with the rule. Paging services are a critical part of emergency response. Many first responders, hospitals and critical infrastructure providers rely on paging services during emergencies.[205] Therefore, it is critical that these

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[200] *Id*.
[201] *See, e.g.* MetroPCS Petition at ii, 4, 8-13; PCIA Petition at 6, 12; NextG Petition at 1-3, 13-19.
[202] *Id*.
[203] NENA takes issue with the claim that forced shutdown of non-compliant sites will threaten public safety. NENA asserts this argument suggests that cellular providers should be immune from any disruptive regulatory discipline because so many 911 callers use wireless phones. NENA notes that wireless carriers made an analogous argument in 1993, during the early consideration of 911 caller location rules, suggesting that cellular telephony, of itself, was such a boon to 911 access that precise caller location should not be required. NENA Comments filed September 11, 2007 at 3.
[204] AAPC argues that the rule should not apply to entities defined by Section 20.9(1) and (6) of the rules, or to Narrowband PCS licenses as defined by Section 24.5 of the rules. AAPC Petition at 4. As noted herein, we find that the rule should apply to CMRS providers, as defined in Section 20.9 of the Commission's rules.
[205] *See, e.g.,* Testimony of Bruce Deer, American Association of Paging Carriers before the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks, Meeting Transcript at 123 (March 5, 2006)("And we realize that today, still, with all of the advent of all of the communications methods of electronic

services be available during crises. Backup power at paging carrier facilities will help ensure the availability of these services. The importance of paging services is further demonstrated by the fact that paging carriers participate in the Commercial Mobile Service Alert Advisory Committee and are subject to the Commission's Part 4 outage reporting rules. For these reasons and those set forth below, we modify Section 12.2 to clarify that the rule applies to CMRS providers, *as defined in Section 20.9 of the Commission's rules*.

35. AAPC argues that the Commission intended to exclude paging carriers from this backup power rule. AAPC asserts that the *Katrina Panel Order* bases the CMRS classification in Section 12.2 on a definition developed for the *E-911 Proceeding*[206] and, because paging carriers do not provide E-911 service, the inference is that the Commission intended to exclude paging carriers from this rule. The parts of the *Katrina Panel Order* cited by AAPC, however, do not define CMRS providers, but instead provide an exemption for non-nationwide CMRS providers with no more than 500,000 subscribers. In a footnote, the Commission merely stated that this exemption is based on the Tier III CMRS definition. AAPC contends that the etymology of the backup power rule supports a finding that the Commission intended to exclude paging carriers and to apply the rule only to entities that are required to provide E-911 service as defined in Section 20.18 of the Commission's rules.[207] AAPC notes that the Katrina Panel made its backup power recommendation "in order to ensure a more robust E-911 service" and that, when requesting public comment on this recommendation, the Commission explained that the Panel "recommends that the Commission encourage the implementation of certain NRIC best practices intended to promote the reliability and resiliency of the 911 and E911 architecture."[208] However, the backup power rule includes no such limitations and, in the *Notice*, the Commission specifically sought comment on whether the Katrina Panel's observations warranted additional measures or steps beyond the report's specific recommendations and welcomed suggestions and recommendations regarding additional measures or actions beyond the Panel's recommendations.[209] The Commission also sought comment on whether it should rely on voluntary consensus recommendations, as advocated by the Katrina Panel, or whether it should rely on other measures for enhancing readiness and promoting more effective response efforts. Further, AAPC argues that the deliberate use of the term "cell sites" in the rule supports the conclusion that the Commission did not intend that the rule apply to paging carriers because paging carriers do not operate cell sites in their networks.[210] The reference to cell sites, however, is only one example of an asset that is normally powered from local commercial power and the assets identified in the

forms that hospitals still use predominantly pagers for emergency communications to reach their doctors and their emerging medical staffs."); Testimony of Vincent Kelly, President and Chief Executive Officer, USA Mobility before the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks, Meeting Transcript at 132 ("[P]aging devices continue to play a critical role for first responders and are still used extensively by policy [sic] officers, fire fighters, rescue workers. In addition, hospitals and health care clinics a well as government agencies rely heavily on paging services.")

[206] AAPC Petition at 2. In support of this assertion, AAPC cites the *Katrina Panel Order* at ¶ 78 & n. 103, Appendix C (Final Regulatory Flexibility Analysis) at ¶ 27 & nn. 59-60, citing *Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems (Order to Stay)*, CC Docket No. 97-102, 17 FCC Rcd 14841, 14848 & ¶ 22 (2002) (the "*E-911 Proceeding*")."

[207] AAPC Petition *at* 3-4.

[208] *Notice*, 21 FCC Rcd 7320, 7326 ¶ 16; Katrina Panel Report at 39.

[209] *Notice*, 21 FCC Rcd at 7320-7323.

[210] AAPC Petition at 4.

rule are not an exhaustive list.[211]

36. AAPC requests, in the event that the Commission did intend to apply the backup power rule to paging carriers, that the rule be modified to ensure that it does not apply to paging carriers. AAPC argues that it is unreasonable to lump paging networks together with other types of CMRS networks for purposes of this rule without considering the particular engineering and cost characteristics of paging networks themselves. Although AAPC argues that applying the requirement to all paging base stations and terminals would be particularly troubling for paging carriers,[212] the burden will be mitigated by the rule modifications adopted herein. Additionally, the burden for paging carriers would not necessarily be any more onerous for paging carriers than for other CMRS providers. Paging providers use a variety of facilities to provide coverage which are, in most cases not that different from the facilities of other CMRS providers. The fill-in facilities employed by paging providers are similar in size and power requirements as those used by other CMRS providers. In many instances, paging providers use high-powered transmitters that are located in multiple transmitter sites. While there may be challenges to overcome such as space, zoning and structural limitations for these facilities, they are no more onerous than those faced by other CMRS providers. In addition, the backup power rule might be less burdensome for paging carriers than for other CMRS providers, because the number of fill-in paging sites that paging carriers deploy is likely less than the more extensive deployment of assets required by other CMRS providers. AAPC asserts that the Commission should define CMRS as those services that are identified in Section 20.18(a) of the Commission's rules, as it did for purposes of Section 605(a) of the WARN Act, where the Commission defined the statutory phrase "commercial mobile service."[213] That definition, however was limited to Section 605(a) of the WARN Act and was done for specific purposes of that section of the Act that are not relevant to the backup power rule.[214] Further, the membership of the Commercial Mobile Service Alert Advisory Committee established pursuant to the WARN Act includes paging carriers. In light of these factors, we decline to modify the rule as suggested by AAPC, and clarify that paging carriers are required to comply.

37. <u>Distributed Antenna System (DAS) Nodes and other non-traditional sites</u>. NextG, MetroPCS and other petitioners ask the Commission to clarify that DAS Nodes and other "non-traditional" sites,

[211] The rule states, in part, that LECs and CMRS providers must have an emergency backup power source for all assets that are normally powered from local commercial power, including those inside central offices, cell sites, remote switches and digital loop carrier system remote terminals. 47 C.F.R. § 12.2.

[212] AAPC notes that, unlike cellular and broadband PCS networks, paging networks make substantial use of simulcasting and "fill-in" transmitters to assure adequate signal penetration in buildings and to cover terrain-shielded areas. AAPC states that, in emergency conditions, not all base stations are usually required to maintain an acceptable level of service. According to AAPC, the design of paging networks involve engineering and cost trade-offs that do not fit neatly into a matrix that the Commission can or should promulgate into law. AAPC acknowledges that paging carriers typically do have backup power sources for their critical base station sites, but they may not have backup power at all sites. AAPC Petition at 4-5.

[213] AAPC Petition at 3, *citing Implementation of a Grant Program for Remote Community Alert Systems Pursuant to Section 605(a) of the Warning, Alert, and Response Network (WARN) Act*, Declaratory Ruling, *PS Docket No. 07-8,* 21 FCC Rcd 7214 (2007).

[214] The reasons this definition was adopted for Section 605(a) included: (1) because including current MSS offerings in the definition of "commercial mobile service" could render meaningless the grant program of Section 605(a), we cannot equate "commercial mobile service" with the Commission's definition of CMRS; (2) defining "commercial mobile service" to include only carriers that are obligated to provide E911 service focuses limited resources on communities that need them most: namely, those communities that have no access to wireless E911 service. *See Id*.

such as cellular repeater sites, micro-cell and pico-cell locations, electric poles, light poles, and flagpoles, are not "cell sites" as the term is used in the Commission's new backup power rule.[215] In the alternative, these petitioners request that the Commission reconsider and amend the rule to eliminate the backup power requirement for DAS Nodes and other "non-traditional" sites.[216] Other petitioners make similar arguments for "non-traditional" sites and emphasize the burden of complying with the backup power rule due to physical constraints and economic resources.[217] NextG explains that it provides telecommunications services to wireless carriers via a network architecture that uses fiber-optic cable and small antennas mounted in the public rights-of-way on infrastructure such as utility poles, street lights and traffic signal poles. NextG argues that DAS Nodes should not be treated as a cell site because the DAS Node does not include some of the features typically associated with a cell site. The antenna is not associated with a base station or network switching equipment at the DAS Node site.[218] NextG and MetroPCS maintain that even if the Commission does treat the DAS Node as a cell site this equipment should be exempt from the backup power rule because it is "technologically, financially, and politically infeasible" to install eight hours of backup power.[219] DAS Forum argues that the impact due to the loss of power to a portion of a DAS network is far less than the loss of power to a traditional cell site because the balance of the DAS network continues to function when one node is damaged.[220]

38. We decline to exempt DAS Nodes or other sites from the emergency backup power rule.[221] Rather, we believe that to the extent these systems are necessary to provide communications services, they should be treated similarly to other types of assets that are subject to the rule. We note that many of the arguments made by petitioners are similar to the physical constraint arguments raised by other parties. As we stated earlier, we see no reason why LECs and CMRS providers who choose to place assets at locations with limited physical capacities should generally be excused from compliance with the rule. We realize that many providers have begun to use DAS and other small antenna systems as part of their communications networks. That fact alone, however, is far outweighed by the need to ensure a reliable communications network. To the extent petitioners raise concerns regarding legal impediments, private agreement constraints and safety risk issues, we note that the modifications to the rule we make today should address those concerns. DAS Forum and PCIA argue that the backup power rule will adversely impact the public interest and Commission policy goals, because the increased expense of compliance will prevent wireless carriers from further deploying their networks in this manner and that this will decrease capacity, coverage and reliability and affect emergency communications and wireless E911 coverage.[222] Petitioners have not presented sufficient evidence that the backup power rule will prevent wireless carriers from deploying their networks, particularly in light of the reduced burden of compliance that will result from the rule modifications we adopt in this Order on Reconsideration. Moreover, as noted above, the Commission finds that the benefits of ensuring backup power for communications assets outweighs any economic burden that LECs

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[215] *See, e.g.,* NextG Petition at 8-10, DAS Forum Petition at 3-4, MetroPCS Petition at 12-13, and Independent Telephone and Telecommunications Alliance August 30, 2007 Comments (ITTA Reply) at 1-4.
[216] *See, e.g.*, NextG Petition at 1-3. *See also id*.
[217] *See, e.g.*, MetroPCS Petition at ii; 12-13.
[218] NextG Petition at 1, 8.
[219] NextG Petition at 2-3, 10-13; MetroPCS also argues that compliance would be burdensome, impractical and, in many instances impossible – particularly at remote sites, where MetroPCS claims that it will be forced to discontinue services in some instances. MetroPCS Petition at 4, 8-13.
[220] DAS Forum Petition at 3-5.
[221] We also again clarify that the list in the rule is not exhaustive and the inclusion of the term "cell sites" does not limit the rule's applicability.
[222] *See, e.g.*, DAS Forum Petition at 3; NextG Petition at 2-4, 10-17.

and CMRS providers may incur as a result of this rule.

IV. CONCLUSION

39. For the reason stated above, we deny petitioners' requests that we rescind Section 12.2 of the Commission's rules, but find that the petitioners have presented an adequate basis for modifying this backup power rule as detailed above and in Appendix B (of this Order).

V. PROCEDURAL MATTERS

40. Supplemental Final Regulatory Flexibility Analysis. As required by Section 603 of the Regulatory Flexibility Act (RFA), 5 U.S.C. § 604, the Commission has prepared a Supplemental Final Regulatory Flexibility Analysis of the possible impact of the rule changes contained in this Order on Reconsideration on small entities. The Supplemental Final Regulatory Flexibility Act analysis is set forth in Appendix C of this order, *infra*. The Commission's Consumer & Government Affairs Bureau, Reference Information Center, will send a copy of this Order, including the Supplemental Final Regulatory Flexibility Act Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

41. Final Paperwork Reduction Act of 1995 Analysis. This Order on Reconsideration contains new information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. It will be submitted to the Office of Management and Budget ("OMB") for review under Section 3507(d) of the PRA. OMB, the general public, and other Federal agencies are invited to comment on the new or modified information collection requirements contained in this proceeding. In addition, we note that pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4), we previously sought specific comment on how the Commission might "further reduce the information collection burden for small business concerns with fewer than 25 employees." In this present document, we have assessed the effects of requiring LECs and CMRS providers to have back-up power or emergency back-up power compliance plans and to file reports regarding compliance with these requirements as set forth in Section 12.2 of our rules. We have specifically exempt LECs that meet the definition of a Class B company set forth in Section 32.11(b)(2) of our rules,[223] and non-nationwide CMRS providers with no more than 500,000 subscribers. We find that this imposes minimal regulation on small entities to the extent consistent with our goal of advancing our public safety mission.

42. Congressional Review Act Analysis. The Commission will send a copy of this Order on Reconsideration in a report to be sent to Congress and the Government Accountability Office pursuant to the Congressional Review Act, *see* 5 U.S.C. 801(a)(1)(A).

43. Alternative Formats. Alternative formats (computer diskette, large print, audio cassette, and Braille) are available to persons with disabilities by sending an e-mail to FCC504@fcc.gov or calling the Consumer and Governmental Affairs Bureau at (202) 418-0530, TTY (202) 418-0432.

VI. ORDERING CLAUSES

44. Accordingly, IT IS ORDERED, pursuant to Sections 1, 4(i)-(k), 4(o), 201, 218, 219, 301, 303(g), 303(j), 303(r), 332, 403, 405, 621(b)(3) and 621(d) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 154(i)-(k), 154(o), 201, 218, 219, 301, 303(g), 303(j), 303(r), 332,

[223] 47 C.F.R. § 32.11(b)(2).

403, 405, 541(b)(3), and 541(d), and Sections 1.3 and 1.106 of the Commission's rules, 47 C.F.R. §§ 1.3, 1.106, that this Order on Reconsideration in EB Docket No. 06-119 and WC Docket No. 06-63 IS ADOPTED.

45. IT IS FURTHER ORDERED, that the Petitions for Reconsideration filed by The American Association of Paging Carriers, the DAS Forum, MetroPCS Communications, Inc., NextG Networks, Inc., PCIA – The Wireless Infrastructure Association (PCIA), and The United States Telecom Association ARE GRANTED to the extent discussed above, and the remainder of those petitions ARE DENIED.

46. IT IS FURTHER ORDERED that Section 12.2 of the Commission's rules IS AMENDED as specified in Appendix B of this Order, and Section 12.2 shall be effective on the date of Federal Register notice announcing OMB approval of the information collection now contained in that rule.

47. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Order on Reconsideration, including the Supplemental Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch

Secretary

APPENDIX (A) of FCC Order

List of Petitions for Clarification and/or Reconsideration, Comments, and *Ex Parte* Comments

EB Docket No. 06-119
WC Docket No. 06-63

Petitions for Reconsideration

1. American Association of Paging Carriers
2. CTIA-The Wireless Association®[224]
3. The DAS Forum
4. MetroPCS Communications, Inc.
5. NextG Networks, Inc.
6. PCIA-The Wireless Infrastructure Association
7. United States Telecom Association

Timely Filed Comments Responding to Petitions for Reconsideration

1. BridgeCom International, Inc.; Broadview Networks, Inc.; Cavalier Telephone, LLC; DeltaCom, Inc.; Eureka Telecom, Inc. d/b/a InfoHighway Communications; IDT Corporation; Integra Telecom, Inc.; McLeodUSA Telecommunications Services, Inc.; Mpower Communications Corp.; Norlight Telecommunications, Inc.; Pacific Lightnet, Inc.; RCN Telecom Services, Inc.; RNK, Inc.; Talk America Holdings, Inc.; TDS Metrocom, LLC; U.S. TelePacific Corp. d/b/a TelePacific Telecommunications
2. Independent Telephone and Telecommunications Alliance
3. National Hydrogen Association
4. Sprint Nextel Corporation
5. T-Mobile USA, Inc.

Ex Parte Comments

1. AT&T Services, Inc.
2. Cellular South and Rural Cellular Corporation; Leap Wireless; MetroPCS Communications, Inc.; SunCom Wireless; and United States Cellular Corporation
3. CTIA-The Wireless Association®
4. CTIA-The Wireless Association® and United States Telecom Association
5. The DAS Forum
6. Embarq, United States Telecom Association, Verizon, and Windstream
7. The National Emergency Number Association
8. NextG Networks, Inc.
9. PCIA-The Wireless Infrastructure Association
10. United States Telecom Association
11. Verizon
12. Verizon Wireless

[224] CTIA withdrew this Petition on September 28, 2007.

APPENDIX (B) of FCC Order

Final Rule Changes

For the reasons discussed in the preamble, the Federal Communications Commission amends Part 12 of Chapter I of Title 47 of the Code of Federal Regulations (C.F.R.) as follows:

PART 12 – REDUNDANCY OF COMMUNICATIONS SYSTEMS

1. Section 12.2 is amended to read as follows:

§ 12.2 Backup Power.

(a) Except to the extent set forth in Section 12.2(b) and Section 12.2(c)(4) of the Commission's rules, local exchange carriers, including incumbent local exchange carriers and competitive local exchange carriers (collectively, LECs), and commercial mobile radio service (CMRS) providers, as defined in Section 20.9 of the Commission's rules, must have an emergency backup power source (*e.g.*, batteries, generators, fuel cells) for all assets necessary to maintain communications that are normally powered from local commercial power, including those assets located inside central offices, cell sites, remote switches and digital loop carrier system remote terminals. LECs and CMRS providers must maintain emergency backup power for a minimum of twenty-four hours for assets that are normally powered from local commercial power and located inside central offices, and eight hours for assets that are normally powered from local commercial power and at other locations, including cell sites, remote switches and digital loop carrier system remote terminals. Power sources satisfy this requirement if they were originally designed to provide the minimum backup power capacity level required herein and the provider has implemented reasonable methods and procedures to ensure that the power sources are regularly checked and replaced when they deteriorate. LECs that meet the definition of a Class B company as set forth in Section 32.11(b)(2) of the Commission’s rules and non-nationwide CMRS providers with no more than 500,000 subscribers are exempt from this rule.

(b) LECs and CMRS providers are not required to comply with paragraph (a) for assets described above where the LEC or CMRS provider demonstrates, through the reporting requirement described below, that such compliance is precluded by:

(1) Federal, state, tribal or local law;

(2) Risk to safety of life or health; or

(3) Private legal obligation or agreement.

(c) Within six months of the effective date of this requirement, LECs and CMRS providers subject to this section must file reports with the Chief of the Public Safety & Homeland Security Bureau.

(1) Each report must list the following:

(i) Each asset that was designed to comply with the applicable backup power requirement as defined in paragraph (a);

(ii) Each asset where compliance with paragraph (a) is precluded due to risk to safety of life or health;

(iii) Each asset where compliance with paragraph (a) is precluded by a private legal obligation or agreement;

(iv) Each asset where compliance with paragraph (a) is precluded by Federal, state, tribal or local law; and

(v) Each asset that was designed with less than the emergency backup power capacity specified in paragraph (a) and that is not precluded from compliance under paragraph (b).

(2) Reports listing assets falling within the categories identified in paragraphs (c)(1)(ii) through (iv) must include a description of facts supporting the basis of the LEC's or CMRS provider's claim of preclusion from compliance. For example, claims that a LEC or CMRS provider cannot comply with this section due to a legal constraint must include the citation(s) to the relevant law(s) and, in order to demonstrate that it is precluded from compliance, the provider must show that the legal constraint prohibits the provider from compliance. Claims that a LEC or CMRS provider cannot comply with this section with respect to a particular asset due to a private legal obligation or agreement must include a description of the relevant terms of the obligation or agreement and the dates on which the relevant terms of the agreement became effective and are set to expire. Claims that a LEC or CMRS provider cannot comply with this section with respect to a particular asset due to risk to safety of life or health must include a description of the safety of life or health risk and facts that demonstrate a substantial risk of harm.

(3) For purposes of complying with the reporting requirements set forth in paragraphs (c)(1)(i) through (v), in cases where more than one asset necessary to maintain communications that are normally powered from local commercial power are located at a single site (*i.e.*, within one central office), the reporting entity may identify all of such assets by the name of the site.

(4) In cases where a LEC or CMRS provider identifies assets pursuant to paragraph (c)(1)(v), such LEC or CMRS provider must comply with the backup power requirement in paragraph (a) or, within 12 months from the effective date of this rule, file with the Commission a certified emergency backup power compliance plan. That plan must certify that and describe how the LEC or CMRS provider will provide emergency backup power to 100 percent of the area covered by any non-compliant asset in the event of a commercial power failure. For purposes of the plan, a provider may rely on on-site and/or portable backup power sources or other sources, as appropriate, sufficient for service coverage as follows: a minimum of 24 hours of service for assets inside central offices and eight hours for other assets, including cell sites, remote switches, and digital loop carrier system

remote terminals. The emergency backup power compliance plans submitted are subject to Commission review.

(5) Reports submitted pursuant to this paragraph must be supported by an affidavit or declaration under penalty of perjury and signed and dated by a duly authorized representative of the LEC or CMRS provider with personal knowledge of the facts contained therein.

(6) Information filed with the Commission pursuant to subsection (c) of this rule shall be automatically afforded confidentiality in accordance with the Commission's rules.

(7) LECs that meet the definition of a Class B company as set forth in Section 32.11(b)(2) of the Commission's rules and non-nationwide CMRS providers with no more than 500,000 subscribers are exempt from this reporting requirement.

APPENDIX (C) of FCC Order

Supplemental Final Regulatory Flexibility Analysis

1) As required by the Regulatory Flexibility Act of 1980, as amended (RFA),[225] an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the Notice of Proposed Rulemaking *(Notice)* in EB Docket No. 06-119.[226] The Commission sought written public comment on the proposals in this docket, including comment on the IRFA. On June 8, 2007, the Commission released an Order in EB Docket No. 06-119 which included a Final Regulatory Flexibility Analysis (FRFA).[227] In this Order on Reconsideration, the Commission includes a Supplemental FRFA which conforms to the RFA.[228]

[225] *See* 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. §§ 601-12, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).
[226] *See* Recommendations of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks, *Notice of Proposed Rulemaking*, 21 FCC Rcd 7320, 7330, Appendix A (2006).
[227] *Recommendations of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks*, Order, 22 FCC Rcd 10541 (2007) (*Katrina Panel Order*).
[228] *See* 5 U.S.C. § 604.

A. Need for, and Objectives of, the Rules

2) In the Order released on June 8, 2007, the Commission adopted a rule requiring local exchange carriers (LECs), other than those that meet the definition of a Class B company as set forth in Section 32.11(b)(2) of the Commission's rules,[229] and commercial mobile radio service (CMRS) providers, other than non-nationwide CMRS providers with no more than 500,000 subscribers, to have an emergency backup power source for all assets that are normally powered from local AC commercial power, including those inside central offices, cell sites, remote switches and digital loop carrier system remote terminals. The Commission received seven petitions seeking reconsideration of this rule on various grounds, including the inability of carriers to comply with the rule due to legal constraints (*i.e.*, other Federal, state and local laws precluding compliance with the Commission's rule), constraints due to private legal obligation or agreement that precludes the ability of carriers to store additional backup equipment necessary to comply with the rule, risk to safety of life or health, physical constraints, and economic burden. In response to the petitions for reconsideration, the Commission amends its rule to exempt assets where the LEC or CMRS provider has demonstrated that it cannot comply with the rule due to federal, state, tribal or local law; risk to safety of life or health; or private legal obligation or agreement. The Commission also amended the rule to require LECs and CMRS providers to file reports that list each asset: (1) that was designed to comply with the applicable backup power requirement; (2) where compliance is precluded do to risk to safety of life or health; (3) where compliance is precluded by a private legal obligation or agreement; (4) where compliance is precluded by Federal, state, tribal or local law; and (5) that was designed with less than the required emergency backup power capacity and is not precluded from compliance for the reasons stated in (2), (3) or (4). For assets in category (5), LECs and CMRS providers must comply with the backup power requirements or file a certified emergency backup power compliance plan that certifies that the LEC or CMRS provider will ensure 100 percent coverage in each of the areas covered by any non-compliant asset. Further, the Commission clarifies that the rule applies only to assets that are necessary to the provision of communications services that are normally powered from local commercial power. Finally, the Commission clarified that that on-site power sources satisfy the requirement of this rule if such sources were originally designed to provide the minimum backup power capacity level required and the provider has implemented reasonable methods and procedures to ensure that batteries are regularly checked and replaced when they deteriorate.

3) Although the rule now requires that LECs and CMRS providers file a report, and in some circumstances a backup power compliance plan, the amendments to the rule significantly reduce the burden on LECs and CMRS providers by providing appropriate relief from the requirement that they have backup power sources for all assets normally powered by commercial power. As noted above, the modified rule exempts assets where compliance is precluded by risk to safety of life or health, private legal obligation or agreement, or federal, state, tribal or local law, and allows providers with non-compliant assets that are not otherwise exempt to file an emergency backup power plan.

[229] Section 32.11 provides that Class B companies are those companies that have annual revenues from regulated telecommunications operations that are less than the indexed revenue threshold. 47 C.F.R. § 32.11(b)(2). The Wireline Competition Bureau recently announced that the 2006 revenue threshold for Class A to Class B companies is $134 million. *Public Notice*, "Annual Adjustment of Revenue Thresholds," DA 07-1706 (WCB, April 12, 2007). Although Section 32.11, by its terms, applies only to ILECs, we are applying the same revenue categories to CLECs for the purpose of the exception to this requirement.

B. Summary of Significant Issues Raised by the Public

4) MetroPCS Communications, Inc. (MetroPCS) argues that the Commission's burden estimate in the FRFA regarding wireless carriers was based on mistakes of fact and that compliance is not feasible for MetroPCS, which qualifies as a non-nationwide provider with more than 500,000 subscribers.[230] MetroPCS asserts that the Commission erroneously concluded that the requirement will not create an undue burden because several communications providers reported in their comments that they already maintain emergency backup power.[231] MetroPCS contends that, while backup power at switch sites is common, no wireless service provider has reported that it routinely provides 8 hours of backup power at all remote sites.[232] As noted above, several petitioners argued that the Commission did not adequately consider the burden that the backup power rule would impose on LECs and CMRS providers.

C. Description and Estimate of the Number of Small Entities to Which the Rules Will Apply

5) The RFA directs agencies to provide a description of, and, where feasible, an estimate of, the number of small entities that may be affected by the rules adopted herein.[233] The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."[234] In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.[235] A "small business concern" is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).[236]

6) Nationwide, there are a total of approximately 22.4 million small businesses, according to SBA data.[237] A "small organization" is generally "any not-for-profit enterprise which is independently owned and operated and is not dominant in its field."[238] Nationwide, as of 2002, there were approximately 1.6 million small organizations.[239] The term "small governmental jurisdiction" is defined generally as "governments of cities, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand."[240] Census Bureau data for 2002 indicate that there were 87,525 local governmental jurisdictions

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[230] MetroPCS Petition for Clarification and Reconsideration at 7-8, citing FRFA ¶ 24 and n60.
[231] *See* FRFA, ¶ 24.
[232] MetroPCS Petition for Clarification and Reconsideration at 7-8. The American Association of Paging Carriers (AAPC) cites parts of the FRFA that are identical to sections in the *Katrina Panel Order* in support of its arguments that Section 12.2 of the Commission's rules should not apply to paging carriers. AAPC Petition for Clarification or, Alternatively, Reconsideration at 2, n1. Those arguments are fully addressed in the Order on Reconsideration.
[233] 5 U.S.C. § 604(a)(3).
[234] 5 U.S.C. § 601(6).
[235] 5 U.S.C. § 601(3) (incorporating by reference the definition of "small-business concern" in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register." 5 U.S.C. § 601(3).
[236] 15 U.S.C. § 632.
[237] *See* SBA, Programs and Services, SBA Pamphlet No. CO-0028, at page 40 (July 2002).
[238] 5 U.S.C. § 601(4).
[239] Independent Sector, The New Nonprofit Almanac & Desk Reference (2002).
[240] 5 U.S.C. § 601(5).

in the United States.[241] We estimate that, of this total, 84,377 entities were "small governmental jurisdictions."[242] Thus, we estimate that most governmental jurisdictions are small.

7) In the following paragraphs, the Commission further describes and estimates the number of small entity licensees that may be affected by the rules the Commission adopts in this Order. The rule changes affect LECs, including both incumbent LECs (ILECs) and competitive LECs (CLECs), and CMRS providers.

8) Since this Order applies to multiple services, this FRFA analyzes the number of small entities affected on a service-by-service basis. In the case of CMRS providers, when identifying small entities that could be affected by the Commission's new rules, this FRFA provides information that describes auctions results, including the number of small entities that were winning bidders. However, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily reflect the total number of small entities currently in a particular service. The Commission does not generally require that licensees later provide business size information, except in the context of an assignment or a transfer of control application that involves unjust enrichment issues.

9) *Cellular Licensees*. The SBA has developed a small business size standard for small businesses in the category "Cellular and Other Wireless Telecommunications."[243] Under that SBA category, a business is small if it has 1,500 or fewer employees.[244] For the census category of "Cellular and Other Wireless Telecommunications," Census Bureau data for 2002 show that there were 1,397 firms in this category that operated for the entire year.[245] Of this total, 1,378 firms had employment of 999 or fewer employees, and 19 firms had employment of 1,000 employees or more.[246] Thus, under this category and size standard, the majority of firms can be considered small.

10) *Broadband Personal Communications Service*. The broadband Personal Communications Service (PCS) spectrum is divided into six frequency blocks designated A through F, and the Commission has held auctions for each block. The Commission has created a small business size standard for Blocks C and F as an entity that has average gross revenues of less than $40 million in the three previous calendar years.[247] For Block F, an additional small business size standard for "very small business" was added and is defined as an entity that, together with its affiliates, has average gross revenues of not more than $15 million for the preceding three

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[241] U.S. Census Bureau, Statistical Abstract of the United States: 2006, Section 8, page 272, Table 415.

[242] We assume that the villages, school districts, and special districts are small, and total 48,558. *See* U.S. Census Bureau, Statistical Abstract of the United States: 2006, section 8, page 273, Table 417. For 2002, Census Bureau data indicate that the total number of county, municipal, and township governments nationwide was 38,967, of which 35,819 were small. *Id.*

[243] 13 C.F.R. § 121.201, North American Industry Classification System (NAICS) code 517212.

[244] *Id*.

[245] U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization," Table 5, NAICS code 517212 (issued Nov. 2005).

[246] *Id.* The census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with "1000 employees or more."

[247] *See* Amendment of Parts 20 and 24 of the Commission's Rules – Broadband PCS Competitive Bidding and the Commercial Mobile Radio Service Spectrum Cap, *Report and Order*, 11 FCC Rcd 7824, 7850-7852 ¶¶ 57-60 (1996); *see also* 47 C.F.R. § 24.720(b).

calendar years.[248] These small business size standards, in the context of broadband PCS auctions, have been approved by the SBA.[249] No small businesses within the SBA-approved small business size standards bid successfully for licenses in Blocks A and B. There were 90 winning bidders that qualified as small entities in the C Block auctions. A total of 93 "small" and "very small" business bidders won approximately 40 percent of the 1,479 licenses for Blocks D, E, and F.[250] On March 23, 1999, the Commission re-auctioned 155 C, D, E, and F Block licenses; there were 113 small business winning bidders.[251] On January 26, 2001, the Commission completed the auction of 422 C and F PCS licenses in Auction 35.[252] Of the 35 winning bidders in this auction, 29 qualified as "small" or "very small" businesses. Subsequent events concerning Auction 35, including judicial and agency determinations, resulted in a total of 163 C and F Block licenses being available for grant.

11) Specialized Mobile Radio. The Commission awards "small entity" bidding credits in auctions for Specialized Mobile Radio (SMR) geographic area licenses in the 800 MHz and 900 MHz bands to firms that had revenues of no more than $15 million in each of the three previous calendar years.[253] The Commission awards "very small entity" bidding credits to firms that had revenues of no more than $3 million in each of the three previous calendar years.[254] The SBA has approved these small business size standards for the 900 MHz Service.[255] The Commission has held auctions for geographic area licenses in the 800 MHz and 900 MHz bands. The 900 MHz SMR auction began on December 5, 1995, and closed on April 15, 1996. Sixty bidders claiming that they qualified as small businesses under the $15 million size standard won 263 geographic area licenses in the 900 MHz SMR band. The 800 MHz SMR auction for the upper 200 channels began on October 28, 1997, and was completed on December 8, 1997. Ten bidders claiming that they qualified as small businesses under the $15 million size standard won 38 geographic area licenses for the upper 200 channels in the 800 MHz SMR band.[256] A second auction for the 800 MHz band was held on January 10, 2002 and closed on January 17, 2002 and included 23 BEA licenses. One bidder claiming small business status won five licenses.[257]

12) The auction of the 1,050 800 MHz SMR geographic area licenses for the General Category channels began on August 16, 2000, and was completed on September 1, 2000. Eleven bidders won 108 geographic area licenses for the General Category channels in the 800 MHz

[248] *See* Amendment of Parts 20 and 24 of the Commission's Rules – Broadband PCS Competitive Bidding and the Commercial Mobile Radio Service Spectrum Cap, *Report and Order*, 11 FCC Rcd 7824, 7852 ¶ 60.
[249] *See* Letter to Amy Zoslov, Chief, Auctions and Industry Analysis Division, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, dated December 2, 1998.
[250] FCC News, "Broadband PCS, D, E and F Block Auction Closes," No. 71744 (rel. January 14, 1997).
[251] *See* "C, D, E, and F Block Broadband PCS Auction Closes," *Public Notice*, 14 FCC Rcd 6688 (WTB 1999).
[252] *See* "C and F Block Broadband PCS Auction Closes; Winning Bidders Announced," *Public Notice*, 16 FCC Rcd 2339 (2001).
[253] 47 C.F.R. § 90.814(b)(1).
[254] *Id*.
[255] *See* Letter to Thomas Sugrue, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, from Aida Alvarez, Administrator, Small Business Administration, dated August 10, 1999. The Commission notes that, although a request was also sent to the SBA requesting approval for the small business size standard for 800 MHz, approval is still pending.
[256] *See* "Correction to Public Notice DA 96-586 'FCC Announces Winning Bidders in the Auction of 1020 Licenses to Provide 900 MHz SMR in Major Trading Areas,'" *Public Notice*, 18 FCC Rcd 18367 (WTB 1996).
[257] *See* "Multi-Radio Service Auction Closes," *Public Notice*, 17 FCC Rcd 1446 (WTB 2002).

SMR band qualified as small businesses under the $15 million size standard. In an auction completed on December 5, 2000, a total of 2,800 Economic Area licenses in the lower 80 channels of the 800 MHz SMR service were sold. Of the 22 winning bidders, 19 claimed "small business" status and won 129 licenses. Thus, combining all three auctions, 40 winning bidders for geographic licenses in the 800 MHz SMR band claimed status as small business.

13) In addition, there are numerous incumbent site-by-site SMR licensees and licensees with extended implementation authorizations in the 800 and 900 MHz bands. The Commission does not know how many firms provide 800 MHz or 900 MHz geographic area SMR pursuant to extended implementation authorizations, nor how many of these providers have annual revenues of no more than $3 million or $15 million (the special small business size standards), or have no more than 1,500 employees (the generic SBA standard for wireless entities, discussed, *supra*). One firm has over $15 million in revenues. The Commission assumes, for purposes of this analysis, that all of the remaining existing extended implementation authorizations are held by small entities.

14) <u>Advanced Wireless Services</u>. In the *AWS-1 Report and Order*, the Commission adopted rules that affect applicants who wish to provide service in the 1710-1755 MHz and 2110-2155 MHz bands.[258] The *AWS-1 Report and Order* defines a "small business" as an entity with average annual gross revenues for the preceding three years not exceeding $40 million, and a "very small business" as an entity with average annual gross revenues for the preceding three years not exceeding $15 million. The *AWS-1 Report and Order* also provides small businesses with a bidding credit of 15 percent and very small businesses with a bidding credit of 25 percent.

15) <u>Incumbent Local Exchange Carriers (Incumbent LECs).</u> As noted above, a "small business" under the RFA is one that, *inter alia*, meets the pertinent small business size standard (*e.g*., a telephone communications business having 1,500 or fewer employees), and "is not dominant in its field of operation."[259] The SBA's Office of Advocacy contends that, for RFA purposes, small incumbent LECs are not dominant in their field of operation because any such dominance is not "national" in scope.[260] We have therefore included small incumbent local exchange carriers in this RFA analysis, although we emphasize that this RFA action has no effect on Commission analyses and determinations in other, non-RFA contexts. Neither the Commission nor the SBA has developed a small business size standard specifically for incumbent local exchange services. The appropriate size standard under SBA rules is for the category Wired Telecommunications Carriers. Under that size standard, such a business is small if it has 1,500 or fewer employees.[261] According to Commission data,[262] 1,307 carriers have reported that they are engaged in the provision of incumbent local exchange services.

[258] Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands, WT Docket No. 02-353, *Report and Order*, 18 FCC Rcd 25162 (2003) (*AWS-1 Report and Order*).
[259] 15 U.S.C. § 632.
[260] Letter from Jere W. Glover, Chief Counsel for Advocacy, SBA, to William E. Kennard, Chairman, FCC (May 27, 1999). The Small Business Act contains a definition of "small-business concern," which the RFA incorporates into its own definition of "small business." *See* 15 U.S.C. § 632(a) (Small Business Act); 5 U.S.C. § 601(3) (RFA). SBA regulations interpret "small business concern" to include the concept of dominance on a national basis. *See* 13 C.F.R. § 121.102(b).
[261] 13 C.F.R. § 121.201, NAICS code 517110.
[262] FCC, Wireline Competition Bureau, Industry Analysis and Technology Division, "Trends in Telephone Service" at Table 5.3, page 5-5 (Feb. 2007). This source uses data that are current as of October 20, 2005.

Of these 1,307 carriers, an estimated 1,019 have 1,500 or fewer employees and 288 have more than 1,500 employees. Consequently, the Commission estimates that most providers of incumbent local exchange service are small businesses that may be affected by our action.

16) *Competitive Local Exchange Carriers (Competitive LECs), Competitive Access Providers (CAPs), "Shared-Tenant Service Providers," and "Other Local Service Providers."* Neither the Commission nor the SBA has developed a small business size standard specifically for these service providers. The appropriate size standard under SBA rules is for the category Wired Telecommunications Carriers. Under that size standard, such a business is small if it has 1,500 or fewer employees.[263] According to Commission data,[264] 859 carriers have reported that they are engaged in the provision of either competitive access provider services or competitive local exchange carrier services. Of these 859 carriers, an estimated 741 have 1,500 or fewer employees and 118 have more than 1,500 employees. In addition, 16 carriers have reported that they are "Shared-Tenant Service Providers," and all 16 are estimated to have 1,500 or fewer employees. In addition, 44 carriers have reported that they are "Other Local Service Providers." Of the 44, an estimated 43 have 1,500 or fewer employees and one has more than 1,500 employees. Consequently, the Commission estimates that most providers of competitive local exchange service, competitive access providers, "Shared-Tenant Service Providers," and "Other Local Service Providers" are small entities that may be affected by our action.

17) *Cable and Other Program Distribution.* The Census Bureau defines this category as follows: "This industry comprises establishments primarily engaged as third-party distribution systems for broadcast programming. The establishments of this industry deliver visual, aural, or textual programming received from cable networks, local television stations, or radio networks to consumers via cable or direct-to-home satellite systems on a subscription or fee basis. These establishments do not generally originate programming material."[265] The SBA has developed a small business size standard for Cable and Other Program Distribution, which is: all such firms having $13.5 million or less in annual receipts.[266] According to Census Bureau data for 2002, there were a total of 1,191 firms in this category that operated for the entire year.[267] Of this total, 1,087 firms had annual receipts of under $10 million, and 43 firms had receipts of $10 million or more but less than $25 million.[268] Thus, under this size standard, the majority of firms can be considered small.

18) *Cable Companies and Systems.* The Commission has also developed its own small business size standards, for the purpose of cable rate regulation. Under the Commission's rules, a "small cable company" is one serving 400,000 or fewer subscribers, nationwide.[269] Industry data indicate that, of 1,076 cable operators nationwide, all but eleven are small under this size

[263] 13 C.F.R. § 121.201, NAICS code 517110.
[264] *Trends in Telephone Service*, Table 5.3.
[265] U.S. Census Bureau, 2002 NAICS Definitions, "517510 Cable and Other Program Distribution"; http://www.census.gov/epcd/naics02/def/NDEF517.HTM.
[266] 13 C.F.R. § 121.201, NAICS code 517510.

[267] U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, Table 4, Receipts Size of Firms for the United States: 2002, NAICS code 517510 (issued November 2005).
[268] *Id*. An additional 61 firms had annual receipts of $25 million or more.
[269] 47 C.F.R. § 76.901(e). The Commission determined that this size standard equates approximately to a size standard of $100 million or less in annual revenues. *Implementation of Sections of the 1992 Cable Act: Rate Regulation*, Sixth Report and Order and Eleventh Order on Reconsideration, 10 FCC Rcd 7393, 7408 (1995).

standard.[270] In addition, under the Commission's rules, a "small system" is a cable system serving 15,000 or fewer subscribers.[271] Industry data indicate that, of 7,208 systems nationwide, 6,139 systems have under 10,000 subscribers, and an additional 379 systems have 10,000-19,999 subscribers.[272] Thus, under this second size standard, most cable systems are small.

19) *Cable System Operators.* The Communications Act of 1934, as amended, also contains a size standard for small cable system operators, which is "a cable operator that, directly or through an affiliate, serves in the aggregate fewer than 1 percent of all subscribers in the United States and is not affiliated with any entity or entities whose gross annual revenues in the aggregate exceed $250,000,000."[273] The Commission has determined that an operator serving fewer than 677,000 subscribers shall be deemed a small operator, if its annual revenues, when combined with the total annual revenues of all its affiliates, do not exceed $250 million in the aggregate.[274] Industry data indicate that, of 1,076 cable operators nationwide, all but ten are small under this size standard.[275] We note that the Commission neither requests nor collects information on whether cable system operators are affiliated with entities whose gross annual revenues exceed $250 million,[276] and therefore we are unable to estimate more accurately the number of cable system operators that would qualify as small under this size standard.

20) *Paging*. The SBA has developed a small business size standard for the broad economic census category of "Paging."[277] Under this category, the SBA deems a wireless business to be small if it has 1,500 or fewer employees. Census Bureau data for 2002 show that there were 807 firms in this category that operated for the entire year.[278] Of this total, 804 firms had employment of 999 or fewer employees, and three firms had employment of 1,000 employees or more.[279] In addition, according to Commission data,[280] 365 carriers have reported that they are engaged in the provision of "Paging and Messaging Service." Of this total, we estimate that 360 have 1,500 or fewer employees, and five have more than 1,500 employees. Thus, in this category the majority of firms can be considered small.

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[270] These data are derived from: R.R. Bowker, *Broadcasting & Cable Yearbook 2006*, "Top 25 Cable/Satellite Operators," pages A-8 & C-2 (data current as of June 30, 2005); Warren Communications News, *Television & Cable Factbook 2006*, "Ownership of Cable Systems in the United States," pages D-1805 to D-1857.

[271] 47 C.F.R. § 76.901(c).

[272] Warren Communications News, *Television & Cable Factbook 2006*, "U.S. Cable Systems by Subscriber Size," page F-2 (data current as of Oct. 2005). The data do not include 718 systems for which classifying data were not available.

[273] 47 U.S.C. § 543(m)(2); *see* 47 C.F.R. § 76.901(f) & nn. 1-3.

[274] 47 C.F.R. § 76.901(f); *see* Public Notice, *FCC Announces New Subscriber Count for the Definition of Small Cable Operator*, DA 01-158 (Cable Services Bureau, Jan. 24, 2001).

[275] These data are derived from: R.R. Bowker, *Broadcasting & Cable Yearbook 2006*, "Top 25 Cable/Satellite Operators," pages A-8 & C-2 (data current as of June 30, 2005); Warren Communications News, *Television & Cable Factbook 2006*, "Ownership of Cable Systems in the United States," pages D-1805 to D-1857.

[276] The Commission does receive such information on a case-by-case basis if a cable operator appeals a local franchise authority's finding that the operator does not qualify as a small cable operator pursuant to § 76.901(f) of the Commission's rules. *See* 47 C.F.R. § 76.909(b).

[277] 13 C.F.R. § 121.201, NAICS code 517211.

[278] U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization," Table 5, NAICS code 517211 (issued Nov. 2005).

[279] *Id.* The census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with "1000 employees or more."

[280] *Trends in Telephone Service*, Table 5.3.

21) We also note that, in the Paging Second Report and Order, the Commission adopted a size standard for "small businesses" for purposes of determining their eligibility for special provisions such as bidding credits and installment payments.[281] In this context, a small business is an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding $15 million for the preceding three years.[282] The SBA has approved this definition.[283] An auction of Metropolitan Economic Area (MEA) licenses commenced on February 24, 2000, and closed on March 2, 2000. Of the 2,499 licenses auctioned, 985 were sold.[284] Fifty-seven companies claiming small business status won 440 licenses.[285] An auction of MEA and Economic Area (EA) licenses commenced on October 30, 2001, and closed on December 5, 2001. Of the 15,514 licenses auctioned, 5,323 were sold.[286] One hundred thirty-two companies claiming small business status purchased 3,724 licenses. A third auction, consisting of 8,874 licenses in each of 175 EAs and 1,328 licenses in all but three of the 51 MEAs commenced on May 13, 2003, and closed on May 28, 2003. Seventy-seven bidders claiming small or very small business status won 2,093 licenses. [287] We also note that, currently, there are approximately 74,000 Common Carrier Paging licenses.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities

22) *Backup Power Supply*. The Order on Reconsideration maintains the requirement that LECs and CMRS providers have an emergency backup power source for all assets necessary to maintain communications that are normally powered from local commercial power, including those inside central offices, cell sites, remote switches and digital loop carrier system remote terminals. Under this existing requirement, LECs and CMRS providers, as defined in Section 20.9 of the Commission's rules, must maintain emergency backup power for a minimum of 24 hours for assets inside central offices and eight hours for assets at other locations such as cell sites, remote switches and digital loop carrier system remote terminals that normally are powered from local commercial power.

23) In the Order on Reconsideration, the Commission clarifies that the assets subject to the rule are those necessary to ensure communications that are normally powered from local commercial power and that CMRS providers, including paging carriers, as defined in Section 20.9 of the Commission's rules, are subject to the rule. The Commission further exempts assets from the rule where LECs and CMRS providers can demonstrate that they can not comply with the rule due to constraints related to federal, state, tribal or local laws, risk to safety of life or health, or private legal obligations or agreements. LECs and CMRS providers must file a report with the Chief of the Public Safety & Homeland Security Bureau

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[281] Revision of Part 22 and Part 90 of the Commission's Rules to Facilitate Future Development of Paging Systems, *Second Report and Order*, 12 FCC Rcd 2732, 2811-2812, paras. 178-181 (Paging Second Report and Order); *see also* Revision of Part 22 and Part 90 of the Commission's Rules to Facilitate Future Development of Paging Systems, *Memorandum Opinion and Order on Reconsideration*, 14 FCC Rcd 10030, 10085-10088, paras. 98-107 (1999).
[282] Paging Second Report and Order, 12 FCC Rcd at 2811, para. 179.
[283] *See* Letter to Amy Zoslov, Chief, Auctions and Industry Analysis Division, Wireless Telecommunications Bureau, from Aida Alvarez, Administrator, Small Business Administration, dated December 2, 1998.
[284] *See* "929 and 931 MHz Paging Auction Closes," Public Notice, 15 FCC Rcd 4858 (WTB 2000).
[285] *Id.*.
[286] *See* "Lower and Upper Paging Band Auction Closes," Public Notice, 16 FCC Rcd 21821 (WTB 2002).
[287] *See* "Lower and Upper Paging Bands Auction Closes," Public Notice, 18 FCC Rcd 11154 (WTB 2003).

that identifies: (1) each asset that was designed to comply with the applicable backup power requirement; (2) each asset where compliance is precluded due to risk to safety of life or health, private legal obligation or agreements, or federal, state, tribal, or local law; and (3) each asset that was designed with less than the required emergency backup power capacity that is not precluded from compliance under (2). Our expectation is that this requirement will not create an undue additional burden, because the exemptions adopted in the Order on Reconsideration will substantially decrease the burden imposed on LECs and CMRS providers and several communications providers reported in their petitions for reconsideration and other filings that they already maintain some level of emergency backup power.[288] Additionally, the Order on Reconsideration also maintains the previously adopted exemption for LECs that meet the definition of a Class B company as set forth in Section 32.11(b)(2) of the Commission's rules, and for non-nationwide CMRS providers with no more than 500,000 subscribers. Further,, providers identifying assets designed with less than the required backup power capacity and not precluded form compliance for one of the three reasons listed above, must either comply with the backup power requirement or file an emergency backup power compliance plan that certifies that the service providers will ensure 100 percent coverage in each of the areas covered by any non-compliant asset. Filing this plan will presumably be less burdensome that implementing a backup power source for these assets in compliance with the rule. Many providers have also reported that they already have business continuity plans that address the issue of backup power. Finally, the Commission clarified that on-site power sources satisfy the this rule if such sources were originally designed to provide the minimum backup power capacity level required by the rule and the provider has implemented reasonable methods and procedures to ensure that batteries are regularly checked and replaced when they deteriorate. This too should lessen the burden on providers.

E. Steps Taken to Minimize the Significant Economic Impact on Small Entities, and Significant Alternatives Considered

24) The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include (among others) the following four alternatives: (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.[289]

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[288] *See* USTelecom Petition at 2,8 (noting that the vast majority of all network remote terminals have onsite backup battery power typically designed to an eight hour engineering standard, although the actual life of the battery at any point in time depends on numerous factors and some remote terminals are too small to support a battery); Verizon Wireless *Ex Parte* filed September 4, 2007 (stating that Verizon Wireless' internal design standard is for eight hours or more of backup power (generators, batteries or both) at every cell site where possible, that the majority of its cell sites have on-site generators or batteries capable of providing backup power for much longer than eight hours, that only a small percentage of sites have only batteries that will not last for eight hours, and that only a handful of sites have no on-site backup power at all). *See also* CTIA comments at 8 (observing that wireless carriers "must ensure network reliability and reliance" and that, to do so, they "provision their cell sites and switches with batteries to power them when electrical grids fail" and "maintain permanent generators at all of the switches and critical cell sites, as well as an inventory of backup power generators to recharge the batteries during extended commercial power failures).

[289] 5 U.S.C. § 603(c).

25) *Backup Power Supply*. The Order on Reconsideration does not disturb the previously-adopted exemptions from the requirement for LECs (both ILECs and CLECs) that meet the definition of a Class B company as set forth in Section 32.11(b)(2) of the Commission's rules and non-nationwide CMRS providers with no more than 500,000 subscribers.[290] Thus, for example, paging carriers that are non-nationwide CMRS providers and have no more than 500,000 subscribers will be exempt from this rule. The Order on Reconsideration also provides relief to LECs and CMRS providers subject to the rule for assets where they cannot comply with the rule due to legal and other constraints as described above. Finally, the Order on Reconsideration provides that, for non-compliant assets designed with less than the required emergency backup power capacity that are not otherwise exempt, LECs and CMRS providers must comply with the backup power requirement or submit an emergency backup power compliance plan.

Report to Congress: The Commission will send a copy of the Order, including this Supplemental FRFA, in a report to be sent to Congress and the Government Accountability Office pursuant to the Congressional Review Act.[291] In addition, the Commission will send a copy of the Order, including this Supplemental FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the Order and Supplemental FRFA (or summaries thereof) will also be published in the Federal Register.[292]

[290] Although this subscriber level is based on the Tier III CMRS definition, which is defined as non-nationwide CMRS providers with no more than 500,000 subscribers as of the end of 2001, we note that we are not exempting from this requirement those non-nationwide CMRS providers that have grown to exceed the 500,000 subscriber threshold since 2001 as we believe that such providers are at a size where they should be able to comply with the emergency backup power rule.

[291] *See* 5 U.S.C. § 801(a)(1)(A).

[292] *See* 5 U.S.C. § 604(b).

Appendix J: Texas PUC Rulemaking on Power Backup at Central Office Facilities

Source: http://www.puc.state.tx.us/rules/rulemake/34742/34742pub.doc

PROJECT NO. 34742

RULEMAKING PROCEEDING TO ADOPT A NEW PUC SUBST. R. §26.56, RELATING TO LOCATION IN FLOOD PLAINS AND EMERGENCY POWER FOR CERTIFICATED TELECOMMUNICATIONS UTILITIES' FACILITIES IN HURRICANE PRONE AREAS	**§ § § § § § § §**	**PUBLIC UTILITY COMMISSION OF TEXAS**

PROPOSAL FOR PUBLICATION OF NEW §26.56
AS APPROVED AT THE FEBRUARY 22, 2008 OPEN MEETING

The Public Utility Commission of Texas (commission) proposes new §26.56, relating to Central Office and Remote Facilities Reliability. The commission proposes this new rule in an effort to implement recommendations made by Project Number 32182, *PUC Investigation of Methods to Improve Electric and Telecommunications Infrastructure to Minimize Long Term Outages and Restoration Costs Associated with Gulf Coast Hurricanes* ("Hurricane Infrastructure Report"). The proposed new rule will implement recommendations made in the Hurricane Infrastructure Report. Specifically, the proposed new rule will establish minimum requirements for the construction of a central office or remote facility above the 100-year floodplain and for the installation of emergency power at a central office to ensure safe and reliable operation during power outages and severe flooding. Project Number 34742 is assigned to this proceeding.

Nara Srinivasa, Director of the Reliability and Licensing Section in the Infrastructure and Reliability Division, has determined that for each year of the first five-year period the proposed section is in effect there will be no fiscal implications for state or local government as a result of enforcing or administering the section.

Nara Srinivasa has determined that for each year of the first five years the proposed section is in effect the public benefit anticipated as a result of enforcing the section will be a more reliable telecommunication system that is better capable of responding to a natural disaster. There will be no adverse economic effect on small businesses or micro-businesses as a result of enforcing this section. Therefore, no regulatory flexibility analysis is required. There may be economic costs to persons who are required to comply with the proposed section. These costs are associated with providing emergency power at central offices and the potential extra design and acquisition costs associated with constructing central offices and remote facilities above the 100-year floodplain. Further, the costs associated with complying with this section are likely to vary from business to business and are difficult to ascertain. However, as explained in the

Hurricane Infrastructure Report, it is believed that the benefits accrued from implementing the proposed section will outweigh the costs.

Nara Srinivasa has also determined that for each year of the first five years the proposed section is in effect there should be no adverse effect on a local economy, and therefore no local employment impact statement is required under Administrative Procedure Act (APA), Texas Government Code §2001.022.

The commission staff will conduct a public hearing on this rulemaking, if requested, pursuant to the Administrative Procedure Act, Texas Government Code §2001.029 in Hearing Room Gee, located on the 7th floor of the William B. Travis Building, 1701 North Congress Avenue, Austin, Texas 78701, on Wednesday, April 30, 2008, at 9:30 a.m. The request for a public hearing must be received within 30 days after publication.

Comments on the proposed new section may be submitted to the Filing Clerk, Public Utility Commission of Texas, 1701 North Congress Avenue, P.O. Box 13326, Austin, Texas 78711-3326, within 30 days after publication. Sixteen copies of comments to the proposed amendment are required to be filed pursuant to §22.71(c) of this title. Reply comments may be submitted within 45 days after publication. Comments should be organized in a manner consistent with the organization of the proposed rule(s). The commission invites specific comments regarding the costs associated with, and benefits that will be gained by, implementation of the proposed section. The commission will consider the costs and benefits in deciding whether to adopt the section. All comments should refer to Project Number 34742.

This new section is proposed under the Public Utility Regulatory Act, Texas Utilities Code Annotated §14.002 (Vernon 2007 and Supp. 2007) (PURA), which provides the Public Utility Commission with the authority to make and enforce rules reasonably required in the exercise of its powers and jurisdiction; and specifically, PURA §14.001, which gives the commission the general power to regulate and supervise the business of each public utility; PURA §52.106, which grants the commission the authority to regulate rates, operations, and services of telecommunication utilities so that the services provided are adequate and efficient, and PURA §55.002, which grants the commission the authority to adopt just and reasonable standards, classifications, rules, or practices a telecommunication utility must follow in furnishing a service.

Cross Reference to Statutes: Public Utility Regulatory Act §§14.001, 14.002, 52.106, and 55.002.

§26.56. Central Office and Remote Facilities Reliability.

(a) **Purpose.** The purpose of this section is to establish minimum requirements for the construction of new central offices and remote facilities above the 100-year floodplain and for the installation of emergency power at all central offices located in coastal areas to ensure safe and reliable operation during power outages and severe flooding.

(b) **Application.** This section applies to all certificated telecommunications utilities (CTU) as defined by §26.5(36) of this title relating to Definitions.

(c) **Definitions.**

(1) **Central Office –** A switching unit in a telecommunications system that provides service to the general public and that has the necessary equipment and operating arrangements for terminating and interconnecting customer lines and trunks or trunks only.

(2) **Remote Facility** – remote switch, digital loop carrier, or pair gain devise.

(3) **Coastal Areas** – The areas located within the Hurricane Evacuation Zone Boundary as established by the Texas Department of Emergency Management.

(d) **Emergency power.** CTUs shall have each of its central offices located in coastal areas capable of full and complete normal operation for 72 hours after loss of the sources of electric utility provided electricity.

(e) **Construction.** For a new central office or remote facility that will be located in a 100-year floodplain, a CTU shall design and construct the central office or remote facility so that the electrically energized portions shall be not less than one foot above the 100-year floodplain. The CTU shall determine whether the location of the substation is in a 100-year floodplain using floodplain maps from the Federal Emergency Management Agency (FEMA). If FEMA maps are not available for the site of the central office or remote facility, the CTU shall use a Texas-registered Professional Engineer or a Professional Hydrologist as certified by the American Institute of Hydrology to determine the location of the floodplain.

(f) **Effective Date**. This section takes effect on January 1, 2010.

This agency hereby certifies that the proposal has been reviewed by legal counsel and found to be within the agency's legal authority to adopt.

ISSUED IN AUSTIN, TEXAS ON THE 22nd DAY OF FEBRUARY 2008 BY THE

PUBLIC UTILITY COMMISSION OF TEXAS

ADRIANA A. GONZALES

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Appendix K: Summary of NRSC Analysis of FCC-Reportable Outages for Central Office Power (1993-2004)

Reference: *"ATIS Network Reliability Steering Committee (NRSC) 2004 Annual Report."*

See NRSC (home page) website at: http://www.atis.org/nrsc/index.asp

Introduction

From January 1, 1993 until December 31, 2004, all FCC-reportable outages were accessible by the public. While service providers were required to make such reports for outages meeting various criteria, the vast majority of reports were made for outages that potentially affect 30,000 or more customers for 30 minutes or more.

During that 12-yr period, the ATIS Network Reliability Steering Committee (NRSC) was issuing quarterly and annual reports reviewing the health of the wireline telecommunications networks, as determined by statistical analysis of major outages reported by service providers to the FCC. The work of the NRSC has been a repeated cycle of analyzing data, identifying areas for focused study, and making recommendations to industry on how to improve network reliability.

The last such Annual Report was issued for the year 2004. That report provides an analysis of U.S. telecommunications network performance based on outage reports made by service providers to the FCC from January 1, 1993 through December 31, 2004. The analysis was intended to advise the various stakeholders of the telecommunications industry on the network reliability results that were observed during the previous year from a very special perspective.

While any individual company could analyze their own major outage events, only the NRSC could bring the industry together in a non-competitive setting to *objectively analyze* the macro outage data for the United States wireline telecommunications industry, and when necessary, *cooperatively bring to bear the industry's resources* when problems were identified. The statistical analysis techniques employed by the NRSC were objective methodologies that were developed and approved by the ANSI-accredited ATIS Standards Group on "Network Reliability and Performance."

The sections below are excerpts of the ATIS NRSC 2004 Annual Report and give a great insight on the "Central Office Power Outage" category. One of the major findings in that Annual Report was that:

> "In the 3-yr period from 2001-2004, CO Power outage frequency was 47% less than in the 1997-2001 peak period."

Central Office Power (1993-2004)

Performance by Outage Frequency

The analysis of the 12-yr FCC-reportable outage data provided the following observations:

- In 2004, CO Power outage frequency (10) was below the Baseline Level (15.2) for the third consecutive year; however, the difference from its Baseline Level is not statistically significant. In the 3-yr (2002-2004) period, the frequency of CO Power outages has been significantly less than in the preceding peak five (5) years 1997-2001 (10.7 versus 20.0 per year). CO Power outage frequency demonstrated statistically significant seasonality (65% of outages occur in the warmer half of the year). Out of all outages over the 12-year history, 10% were CO Power outages.

- In 2004, the median duration of CO Power outages reached its highest value for the 12-yr period (5.5 hours), significantly higher than their Baseline median (2.4 hours). The median duration over the 2003-04 period (3.9 hours) was significantly higher than the median for the 10-yr period from 1995-2004 (2.4 hours).

- In 2004, CO Power outages had their highest median customers potentially affected to date (111,800).

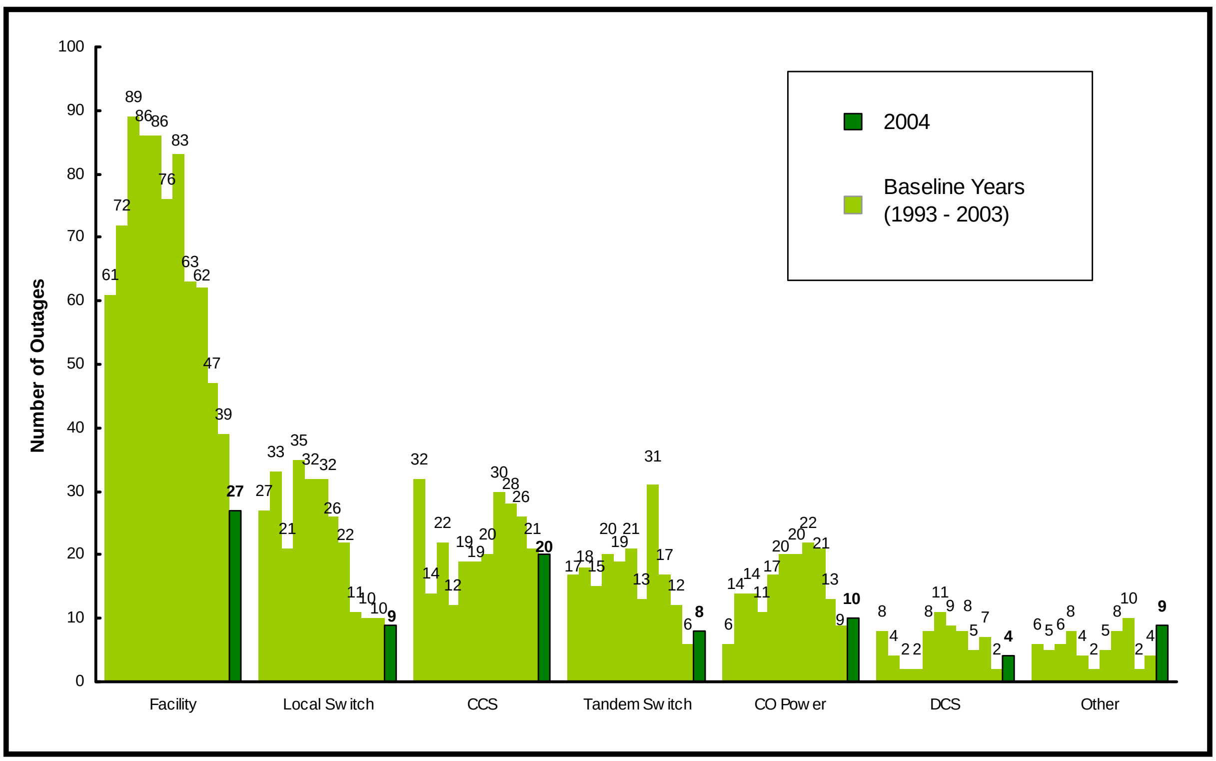


Figure 43. Number of FCC-Reportable Outages by Failure Category

The distribution of outages across CO Power subcategories showed that over the 12-yr history the major contributors were: DC Plant (30%), DC Distribution (25%), Other (20%), Standby Generator (14%), and Building AC (10%). In 2004, the number of CO Power outages attributed to DC Distribution dropped to its lowest level since 1993 (1); in the 2003-04 period, the frequency of DC Distribution outages was significantly lower than in the peak years from 1997 – 2002 (1.5 versus 5.0 per year). 2004 was the first year with no CO Power outages attributed to the Other subcategory, significantly lower than the average frequency in the preceding seven years from 1997-2003 (4.0 per year). 2004 had the most CO Power outages attributed to Standby Generator (3) since 2000; nevertheless, over the 2000-2004 period, the frequency of CO Power outages attributed to Standby Generator (1.5 per year) was significantly less than the frequency in its peak years 1998-2000 (4.7 per year).

The major contributors, by failure subcategory, to the CO Power aggregated outage index over the 12-yr history were: DC Plant (29%), Standby Generator (27%), DC Distribution (21%), and Other (14%). In 2004, the CO Power aggregated outage index attributed to Standby Generator had its second highest value in the 12-yr period (117); over the 2003-04 period, the aggregated outage index for Standby Generator outages has been significantly higher than in the 10-yr period from 1993-2002 (137 versus 30 per year).

Commercial and/or Back-Up Power Failure (38%) and Procedural Service Provider (33%) were the primary root cause categories among CO Power outages over the 12-yr history. However, when all three Procedural Error root causes were combined over the 12 years, Procedural Errors cause 49% of CO Power outages. In 2004, the number of outages attributed to Procedural Errors matched its lowest level in the 12-yr history (3); over the 2001-2004 period, the number of Procedural Error outages (3.7 per year) was significantly less than in the first nine years from 1993-2001 (8.3 per year). Over the 7-yr period from 1998-2004, the frequency of Commercial and/or Back-Up Power Failure outages decreased at the statistically significant rate of 15% annually.

With respect to the aggregated outage index, Commercial and/or Back-Up Power Failure was the dominant root cause category (49%) followed by Procedural Service Provider (24%) over the 12-yr history. All three Procedural Error root cause categories combined account for 38% of the CO Power aggregated outage index over the 12 years. In 2004 the aggregated outage index for Procedural Error outages reached its highest level since 1995 (84) although it was not significantly greater than its Baseline Level (67). The CO Power aggregated outage index attributed to Commercial and/or Back-Up Power Failure was significantly higher in the 1998-2004 period than in the first five years from 1003-1998 (138 versus 16 per year).

Performance by Aggregated Outage Index

Figure 44 shows the annual aggregated outage index for each failure category in the 12-yr period from 1993-2004.

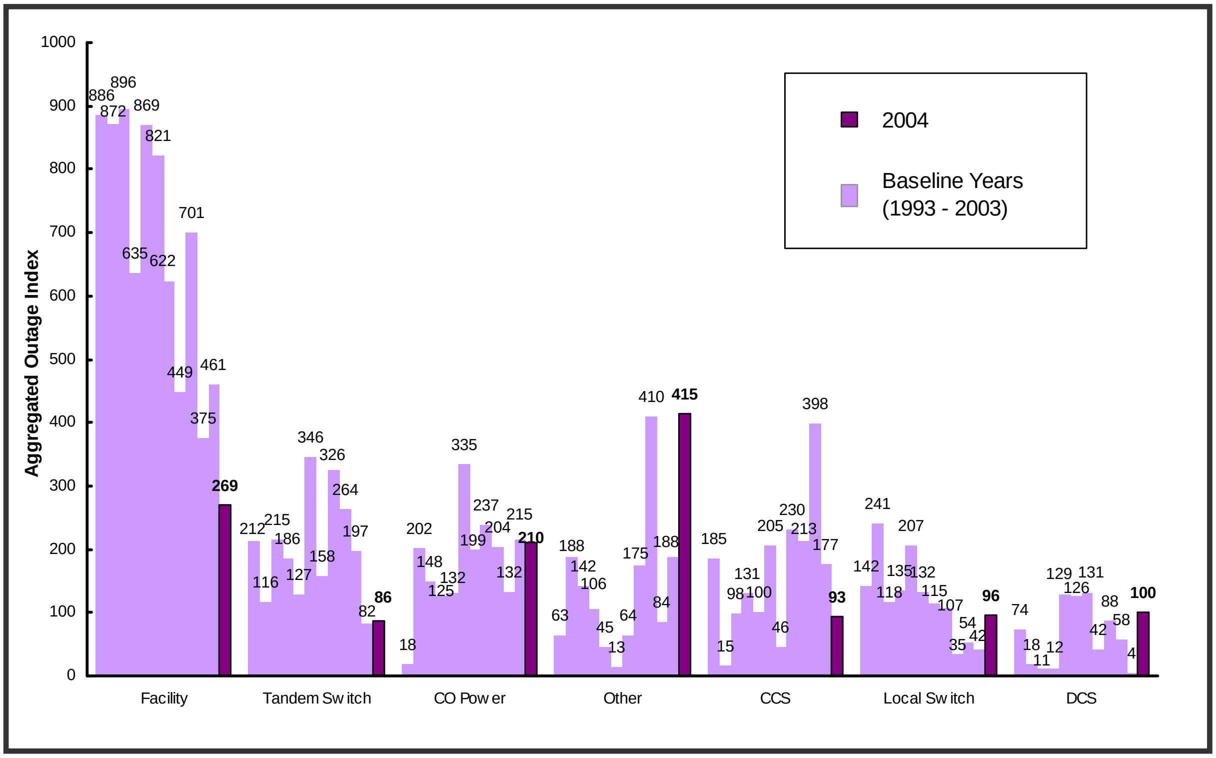


Figure 44. Annual Aggregated Outage Index by Failure Category

The analysis of the 12-yr FCC-reportable outage data provided the following observations:

- In 2004, CO Power aggregated outage index (210) was above its Baseline Level (177) for the sixth year out the last seven years (1998-2004 period); however, this difference was not statistically significant and there was no statistically significant overall trend. Over the 12-year history, CO Power outages accounted for 12% of the total aggregated outage index.

- In 2004, CO Power outages had their highest median outage index in the 12-yr history (22.1); outage indexes were significantly higher in 2004 than in the Baseline Years (4.3 median). Over the 2003-2004 period, CO Power outage indexes were significantly greater than over the initial 10-yr period from 1993-2002 (11.5 versus 4.2 median).

Appendix L: Statistical Analysis of FCC-Reportable Outages with "Power Failure" as Root Cause (2005 – 2007)

Reference: *"ATIS Network Reliability Steering Committee (NRSC) Quarterly Meeting held on February 26, 2008 in Washington, D.C."*[293]

Beginning in 2005, major changes to the outage reporting process were implemented by the FCC. New rules went into effect that fundamentally changed what outages would be reported, and how the data would be handled. The new rules expand outage reporting beyond the wireline segment to include the wireless, cable, paging, and satellite segments of the industry. The language in the new rules that was intended to protect outage data from potential abuse by enemies of the United States has been interpreted by the FCC as prohibiting access by the NRSC. Thus, the NRSC stopped issuing the quarterly and annual analysis reports on FCC-reportable outages. Instead, FCC officials give a high-level briefing of the analysis of those reportable outages to NRSC members during the NRSC quarterly meetings.

The latest NRSC quarterly meeting was held on February 26, 2008 in Washington, D.C. During that meeting, FCC gave a statistical analysis of the FCC-reportable outages in the last three years (2005-2007). Among the presented viewgraphs was Figure 45 below.

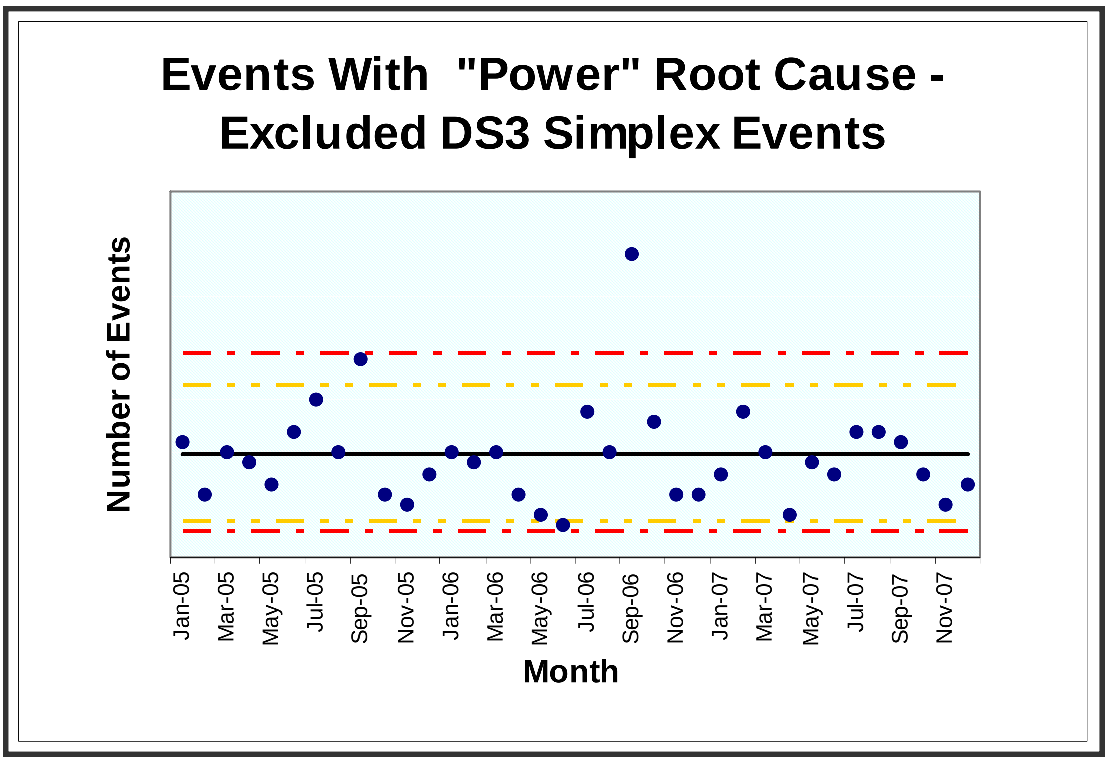


Figure 45. Number of FCC-Reportable Events with "Power" Failure as Root Cause (2005-07)

[293] See NRSC (home page) website at: http://www.atis.org/nrsc/index.asp

Figure 45 presents the monthly number of outages reported to FCC's NORS[294] that had a "Power" root cause in the last three years (2005-2007). The presentation excludes DS3 non-simplex outages, which did not cause loss of service.

The following text is a Telcordia interpretation of Figure 45:

The area between the dashed red (yellow) lines in Figure 45 describes the 99% (95%) confidence interval for a monthly observation assuming a baseline average denoted by the solid **black** line. Observations above the upper yellow and red lines are considered to be the result of some factor aside from random fluctuation about the mean. Most observations are between the yellow lines indicating that outages resulting from "Power" root causes have been in control over the last three years. A trend analysis over all three years indicates a slight decreasing trend that is not statistically significant. The two points that are above the yellow control limit both occurred in the month of September. This indicates the possibility that the data may contain a seasonality effect. Further analysis indicates the presence of a statistically significant seasonality effect. Power outage frequency is close to average in winter months (January, February, and March); the frequency in summer months is twice as great as it is in spring (April, May, and June) and fall months (October, November, and December).

[294] FCC's Network Outage Reporting System http://www.fcc.gov/oet/outage/nors_manual.pdf

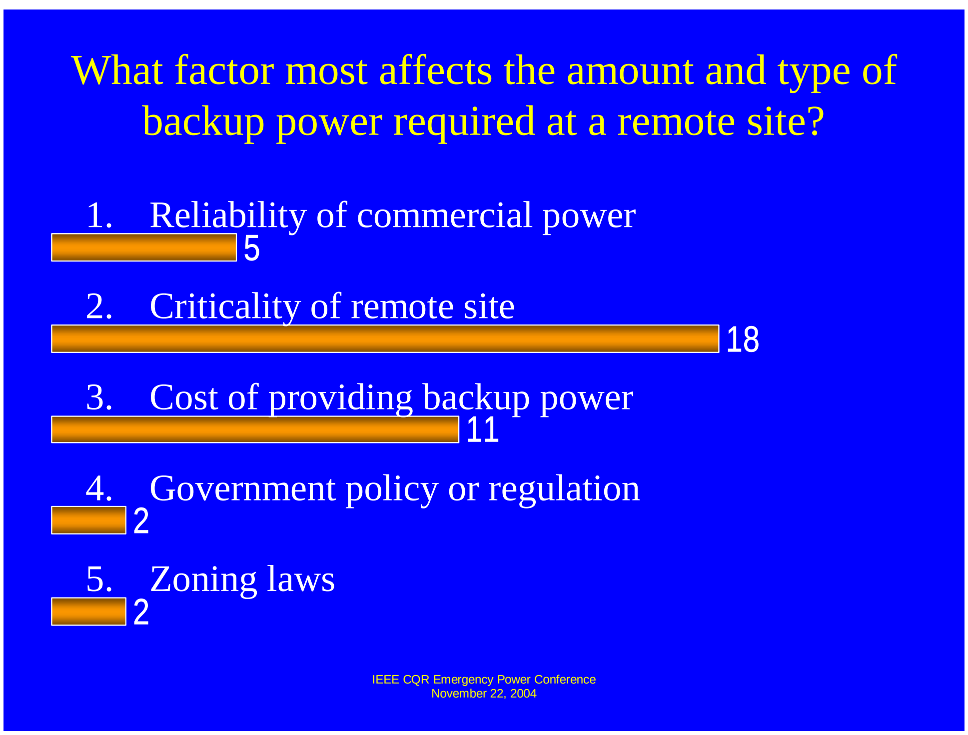
Appendix M: Group Survey Questions from the IEEE CQR Conference on Emergency Power Conference (Nov. 22, 2004)

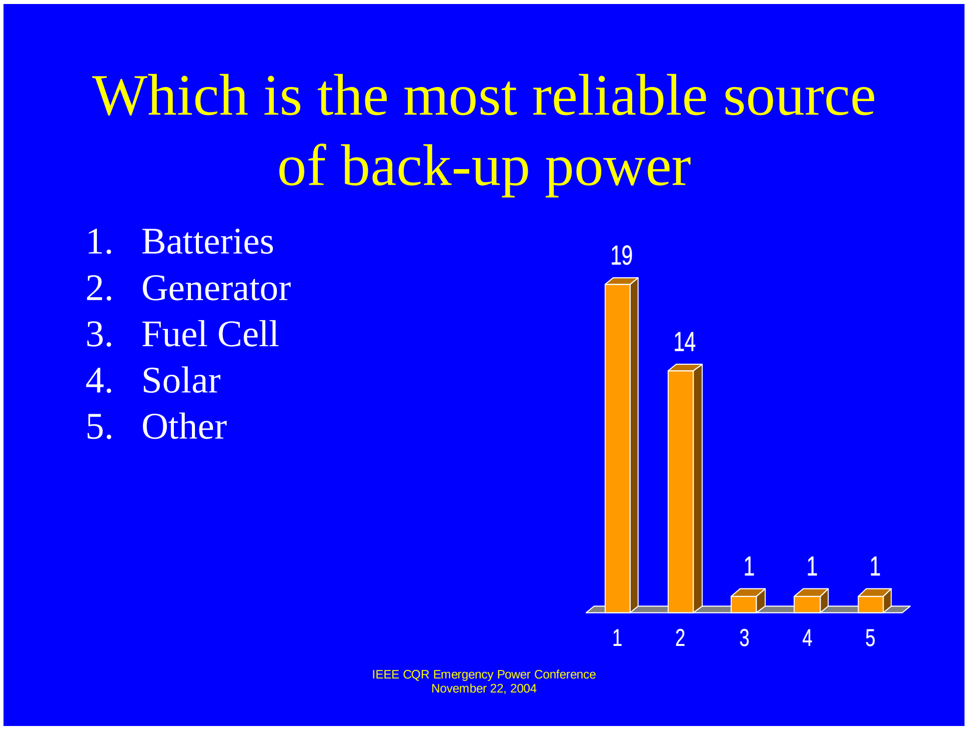
Reference: *"IEEE Communications Quality & Reliability (CQR) Conference on "Emergency Power" held on November 22, 2004.*

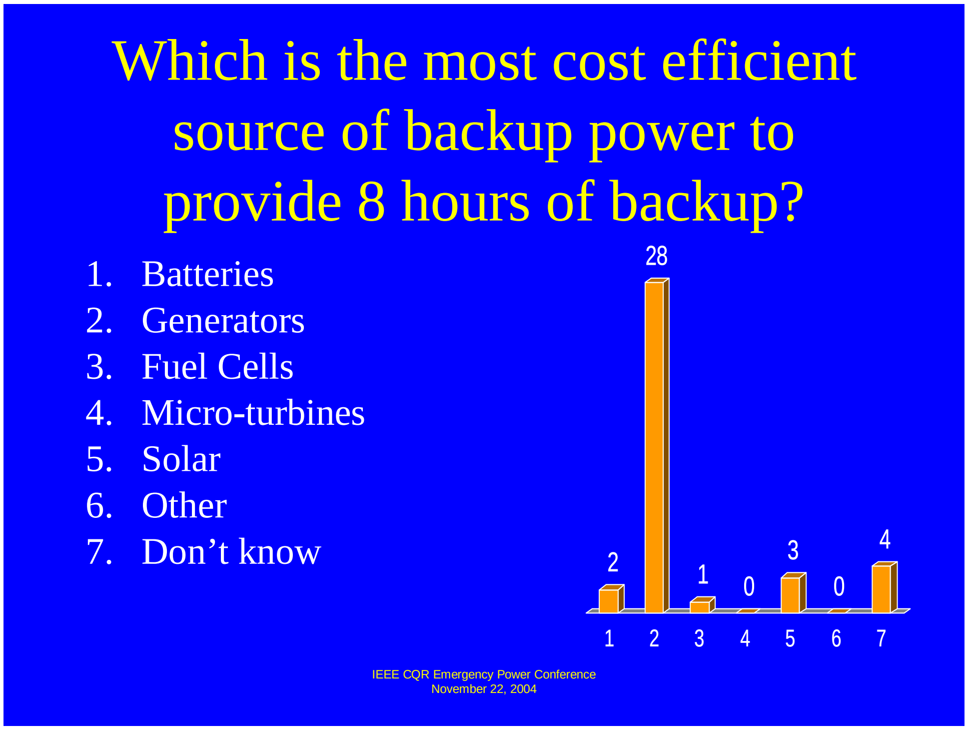
See IEEE CQR website at: **http://www.comsoc.org/~cqr/PowerConf.html**

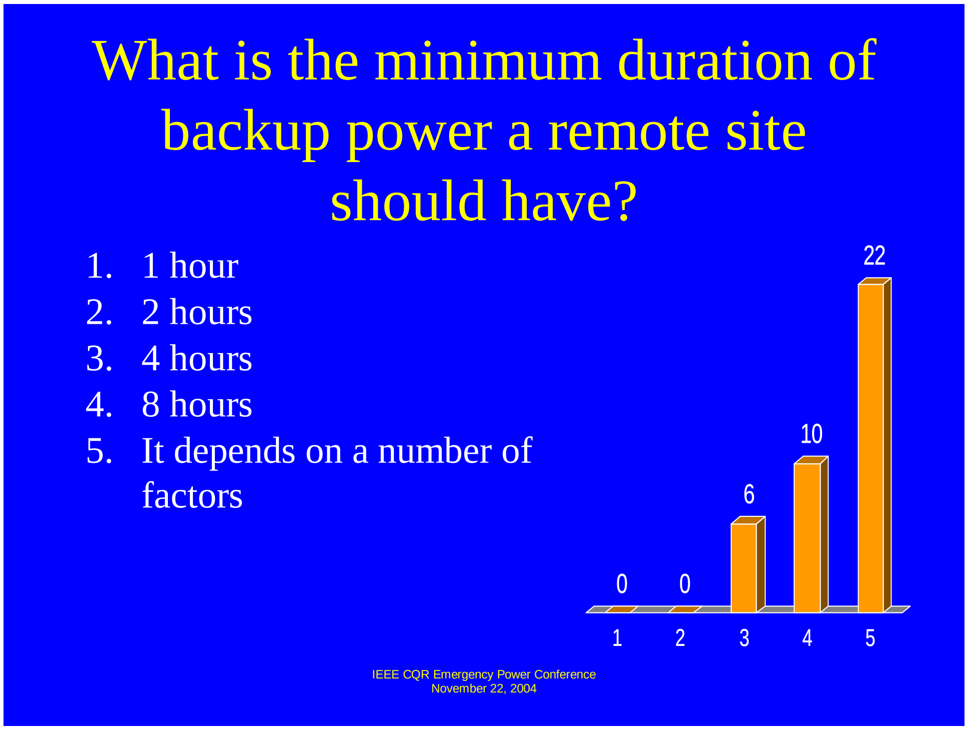
The IEEE Communications Quality & Reliability (CQR) Committee held a conference on "Emergency Power" at the Bell Labs Network Reliability and Security Office (NRSO) in Washington, DC on November 22, 2004. The goal of that conference was to identify and address the unique challenges of providing emergency power to remote sites. This workshop brought together 46 experts from the communications and electrical industries, as well as representatives from government and academia. The learning's from this workshop were studied by the NRIC-VII Power Task Group and incorporated into the Focus Group 3A's power recommendations.

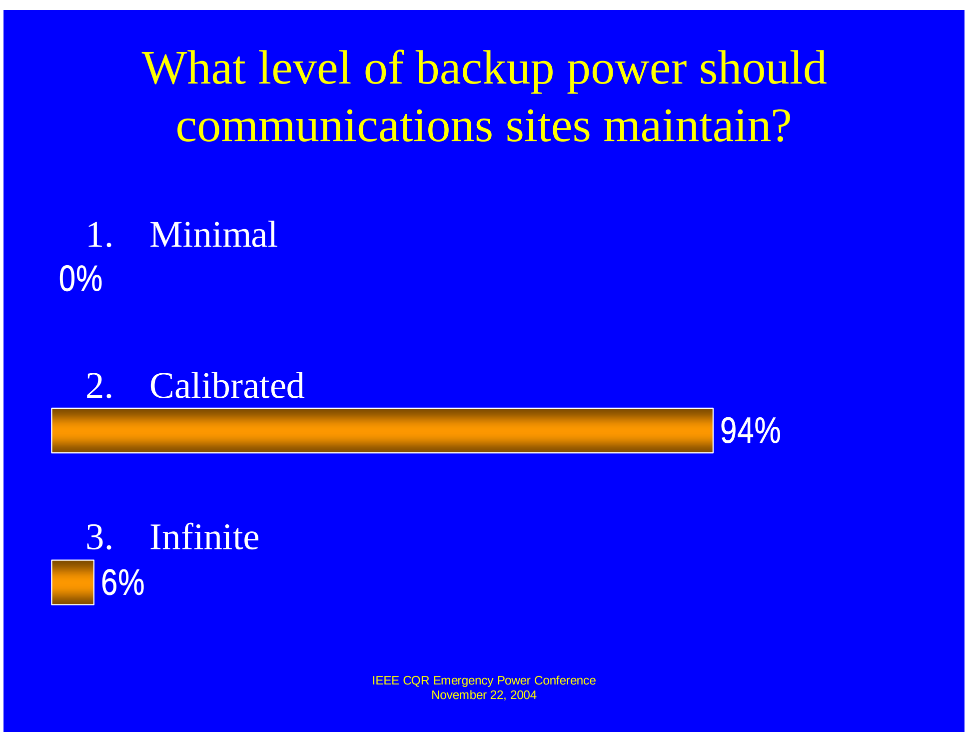
During that conference, the telecom industry power SMEs were given a list of survey questions. Those questions and answers give a great insight on how those SMEs think about backup power systems.




Which is the most reliable source of back-up power
1. Batteries
2. Generator
3. Fuel Cell
4. Solar
5. Other
19
14
1
1
1
1
2
3
4
5
IEEE CQR Emergency Power Conference
November 22, 2004


Which is the most cost efficient source of backup power to provide 8 hours of backup?
1. Batteries
2. Generators
3. Fuel Cells
4. Micro-turbines
5. Solar
6. Other
7. Don’t know
28
2
1
0
3
0
4
1
2
3
4
5
6
7
IEEE CQR Emergency Power Conference
November 22, 2004


What is the minimum duration of backup power a remote site should have?
1. 1 hour
2. 2 hours
3. 4 hours
4. 8 hours
5. It depends on a number of factors
0
0
6
10
22
1
2
3
4
5
IEEE CQR Emergency Power Conference
November 22, 2004


What level of backup power should communications sites maintain?
1. Minimal
0%
2. Calibrated
94%
3. Infinite
6%
IEEE CQR Emergency Power Conference
November 22, 2004

Appendix N: FCC Communications Security, Reliability & Interoperability Council (CSRIC)

The FCC published on the Federal Register the replacement of Network Reliability & Interoperability Council (NRIC). Below is the related text:

[Federal Register: April 4, 2007 (Volume 72, Number 64)]

[Notices]
Page 16362-16363]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
DOCID:fr04ap07-67]

FEDERAL COMMUNICATIONS COMMISSION

Federal Advisory Committee Act; Communications Security, Reliability and Interoperability Council

AGENCY: Federal Communications Commission.

ACTION: Notice of intent to establish.

SUMMARY: In accordance with the Federal Advisory Committee Act, the purpose of this notice is to announce that a Federal Advisory Committee, known as the ``Communications Security, Reliability and Interoperability Council'' (hereinafter the ``Council'') is being established.

ADDRESSES: Federal Communications Commission, Public Safety & Homeland Security Bureau, Attn: Lisa M. Fowlkes, 445 12th Street, SW., Room 7- C753, Washington, DC 20554.

FOR FURTHER INFORMATION CONTACT: Lisa M. Fowlkes, Federal Communications Commission, Public Safety & Homeland Security Bureau,
445 12th Street, SW., Room 7-C753, Washington, DC 20554. Telephone:
(202) 418-7452, e-mail: lisa.fowlkes@fcc.gov <mailto:lisa.fowlkes@fcc.gov>.

SUPPLEMENTARY INFORMATION: The Chairman of the Federal Communications Commission has determined that the establishment of the Council is necessary and in the public interest in connection with the performance of duties imposed on the Federal Communications Commission (``FCC'' or ``Commission'') by law. The Committee Management Secretariat, General Services Administration concurs with the establishment of the Council.
The purpose of the Council is to provide recommendations to the FCC to ensure optimal security, reliability and interoperability of communications systems, including telecommunications, media and public safety communications systems. This Council will replace the Network Reliability and Interoperability Council (NRIC) and the Media Security and Reliability Council (MSRC). The Council's duties will include: (1) Recommending to the FCC best practices to ensure the security, reliability, operability and interoperability of public safety communications systems; (2) evaluating ways to strengthen the collaboration between communication service providers and public safety agencies during emergencies; (3) recommending to the FCC ways to improve the Emergency Alert System (EAS), including best practices for EAS; (4) recommending to the FCC steps necessary to better prepare for shifts in communications usage patterns that likely would result from a pandemic flu outbreak; (5)

recommending to the FCC technologies and systems that can best facilitate the communication of emergency information to and from hospitals, schools, day care facilities and other facilities that provide vital public services; (6) developing and recommending to the FCC best practices to facilitate the communication of emergency information to the public, including people who do not speak English, individuals with disabilities, the elderly and people living in rural areas; (7) recommending to the FCC methods by which the communications industry can reliably and accurately measure the extent to which key best practices are implemented; (8) reviewing and recommending to the FCC updates of existing NRIC and MSRC best practices; (9) reviewing the deployment of Internet Protocol (IP) as a network protocol for critical next generation infrastructure, including emergency/first responder networks; and (10) reviewing and recommending to the FCC an implementation plan for the ``emergency communications internetwork'' advocated by NRIC VII, Focus Group 1D in its December 2005 Final Report.

Federal Communications Commission.
Marlene H. Dortch,
Secretary.
[FR Doc. E7-6254 Filed 4-3-07; 8:45 am]

BILLING CODE 6712-01-P

Appendix O: Financial Implications Assessment

This appendix describes the analysis conducted to assess the relevant financial impacts associated with two aspects of the Telecommunications Performance Reliability Standards Initiative:

- Backup power systems installed on customer premises, and
- Use of zero emission (fuel cell) systems as a replacement for diesel generators.

The assessment presents a number of observations based on available data sources and information provided by carrier companies. This analysis supports a number of the observations and recommendations established in the report.

Customer Premises Backup Power

Current Situation

The aggressive deployment of fiber access technologies for the delivery of advanced multi-play services poses a number of questions regarding the availability of voice services at the customer premises in the event of an electric utility service disruption. In the traditional Plan Old Telephone Service (POTS) delivery network, power for basic telephony service is provided by the central office (or remote switching facilities) through the copper access cable. Since FTTH technology relies on fiber optics as the access medium, other means of backup power are necessary.

The FTTH implementations currently being used by service providers make use of Battery Backup Units (BBUs) to provide several hours of backup power to the Optical Network Termination (ONT) at the customer premises. Most BBU implementations involve batteries with capacities of 7 Amp hours. The amount of backup power time available from such a device will depend on the consumption and usage characteristics of the ONT.

Table 16 shows typical run time specifications for commercially available BBU units.

Table 16. Typical Run Time Specifications for Commercially Available BBU Units

Load (Watts)	Run Time (Hrs)
4	16.0
6	10.0
7	9.0
10	6.5
15	4.5
24	2.0

Source: APC CP24U12 Product Family Technical Specifications

Broadband service providers in California provide backup at the customer residence. Reserve times of between 4 and 20 hours were typically cited during the CPUC Workshops and in subsequent submissions to the CPUC Questionnaires. Most service providers have indicated (and communicate to their customers) that "... service continues working for up to 8 hours." As part of the responses to the CPUC Information Request #1[295], one carrier stated that its solution supports one voice line of at least 4 hours of talk time during a power outage. There was ambiguity in responses and excerpts from advertising pages about whether the 8 hours was talk time or standby time or some combination.

The conclusions from these survey results is that actual battery backup time available to a specific customer will likely lie somewhere between 4 and 8 hours depending on the particular circumstances.

In order to evaluate the implications of establishing minimum performance standards for CPE backup power it is necessary to assess the tradeoffs between:

- The impact of electrical power outages in exposing customers to telephone service disruptions, and
- The costs associated with providing sufficient battery backup time in order to minimize customer exposure.

Assessing Exposure Risk

The impact of electric power outages on consumers is dictated by the severity of the event. This, in turn, is a function of the number of customers affected at different time intervals.

Using statistics available from published electric utility reliability reports for the State of California, a number of significant outage events have been profiled, including:

- Heat Wave
- Wind Storm
- Wild Fire
- Earthquake
- Flooding
- Human Error
- Lightning.

The main sources of information for power outage event data were:

- Pacific Gas & Electric Company (PG&E) Annual Electric Distribution Reliability Report, March 1, 2007
- Southern California Edison (SCE) 2006 Reliability Report filing

Even though there were no statistics available on the number of customers affected by telephone service disruptions during these events, the power outage data can be used to assess the impact on voice services in the future, as fiber to the home access becomes widespread.

The profiles presented in this section correspond to a representative sample of the most severe events reported over the last 10 years for each of the above event categories. For each event, the profile includes the year when the event occurred, a description of the incident, the power company reporting the event,

[295] See Appendix D

the statistics on the number of customers affected and the total number of customers served by the power company.

Assumptions

The outage data available from the reliability reports is generally segregated into specific, non-uniform time slots as shown in Table 17 below:

Table 17. Outage Data to Time Interval Conversation

Reported Outage Duration	Data Interval
0 to 1 hour	1 HOUR
1 to 5 hours (*)	4 HOURS
5 to 10 hours (*)	5 HOURS
10 to 15 hours	5 HOURS
15 to 20 hours	5 HOURS
20 to 24 hours	4 HOURS
1 and 2 days	24 HOURS
2 and 3 days	24 HOURS
3 and 4 days	24 HOURS
4 and 5 days	24 HOURS
Over 5 days	- -

This format is well suited for reporting purposes, but is not amenable to detailed statistical analysis. The non-uniform data intervals require an unbundling of the data for this analysis.

In order to better interpret this information in the context of battery backup power located at the customer premises, the 1-5 hr outage segment (*) and the 5-10 hr segment (*) were unbundled using the detailed hourly distributions available within some reports.[296] The reported value of all outages lasting from 1 to 5 hours can be distributed using the relationship shown in Figure 46. The analysis can then determine the number of outages associated with each hourly interval.

[296] Distribution assumptions were derived from sample hourly interval outage data from the South California Edison 2006 Reliability Report. No other company report contained hourly interval outage data.

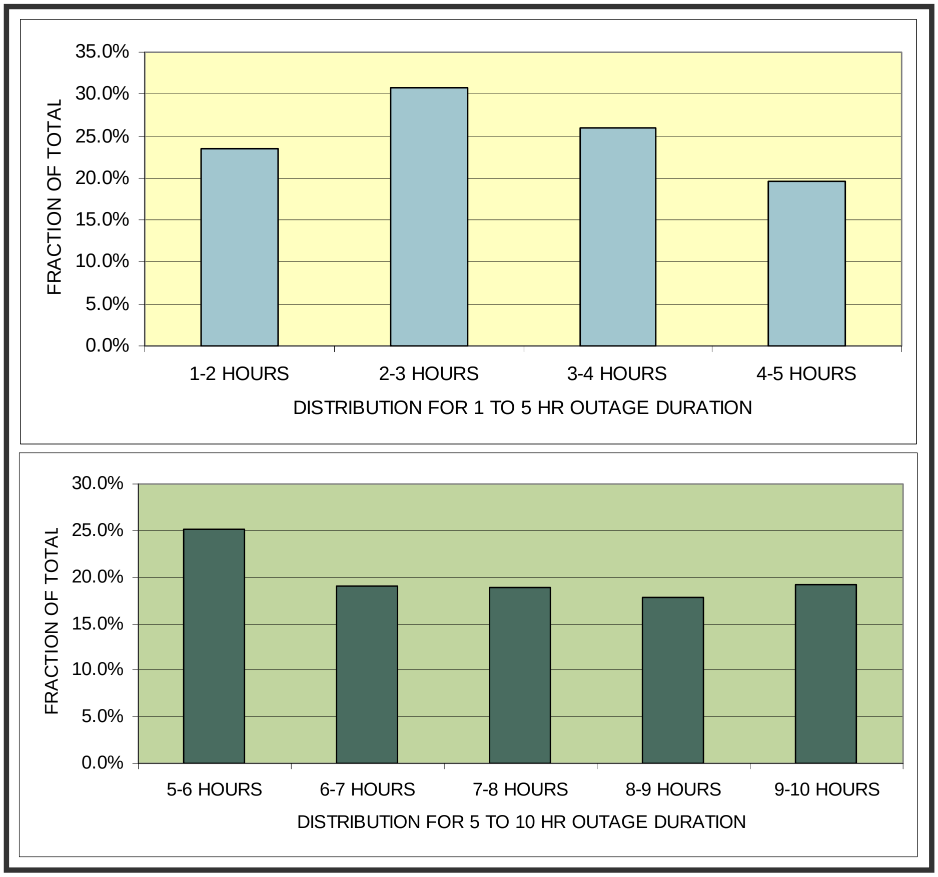


Figure 46. Hourly Outage Distribution for 1-5 and 5-10 hour Data Segments

All of the outage percentages shown are computed by dividing the number of customers affected by the total number of customers served by the utility company. For instance, during the "Flooding" event shown in Figure 51, there were 56,365 customers who lost power for 10 hours. In 1998 (the year this event occurred), PG&E had a total of 4.6M customer in the affected area. Therefore, the percentage of customers impacted for that time interval was 1.23%. In all cases, the term “customers” refers to "customer accounts" which will equate to households or businesses. PG&E had an estimated 4.6M customers in 1998, growing to 5.1M in 2006.

Since the combination of PG&E[297] and SCE[298] service territories covers central, northern and southern portions of California and includes the majority of households in California, the statistics used for this analysis were considered representative of the whole State.

The following seven (7) pages show the statistical breakdown of customers impacted over time for each of the outage events listed above.

[297] Home page for PG&E - www.pge.com
[298] Home page for SCE - www.sce.com .

Heat Wave

Year: 2006
Company: PG&E
Customer Base: 5.1M

Event Description: During July 2006 a severe and long lasting heat wave affected the PG&E service area. According to the report, in many locations three day average temperatures were the highest recorded in over 50 years. Consecutive days with maximum temperatures over 110F were recorded throughout the Central Valley and many coastal valleys reported consecutive days with maximum temperatures over 105F. An unusual feature of this heat wave was high night-time temperatures.

The outage duration profile for this event is presented in the following chart. It is important to understand what the various indicators in this graphic mean. The horizontal axis corresponds to the outage duration intervals, from 0 through 14 hours. All outages exceeding 14 hours in duration were aggregated into the last interval. The vertical axis shows the percentage of customers experiencing an outage of a given duration; in this case roughly 4.5% of all PG&E customers suffered an outage of up to 2 hours in duration.

The dotted lines correspond to the 4-hr and 8-hr outage duration thresholds. The term “exposure” used in the chart refers to the cumulative percentage of customers experiencing an outage longer than 4- and 8-hr in duration. The 4-hr exposure level is the sum of the percentages for outage interval durations of 6 hours and over. The 8-hr exposure level is the sum of the percentages for outage interval durations of 10 hours and over.

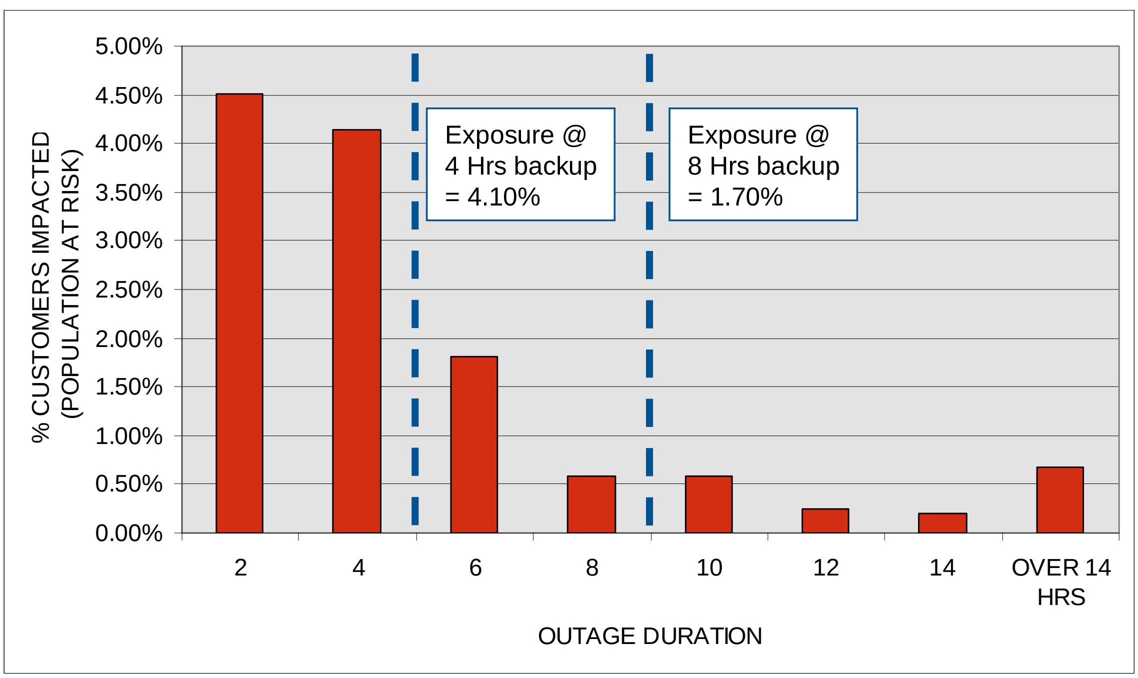


Figure 47. Event Profile: Heat Wave

During this Heat Wave incident, 4.1% of customers experienced over 4 hours of power disruption while 1.7% of the customers experienced outages lasting more than 8 hours.

Wind Storm

Year: 2003
Company: SCE
Customer Base: 4.5M
Event Description: One of the strongest Santa Ana windstorms in a decade roared into Southern California, blowing over trees, trucks, toppling numerous power poles, and delaying Metrolink rail service. This windstorm also knocked out power to thousands of people throughout the region.

The outage profile for this event is as follows:

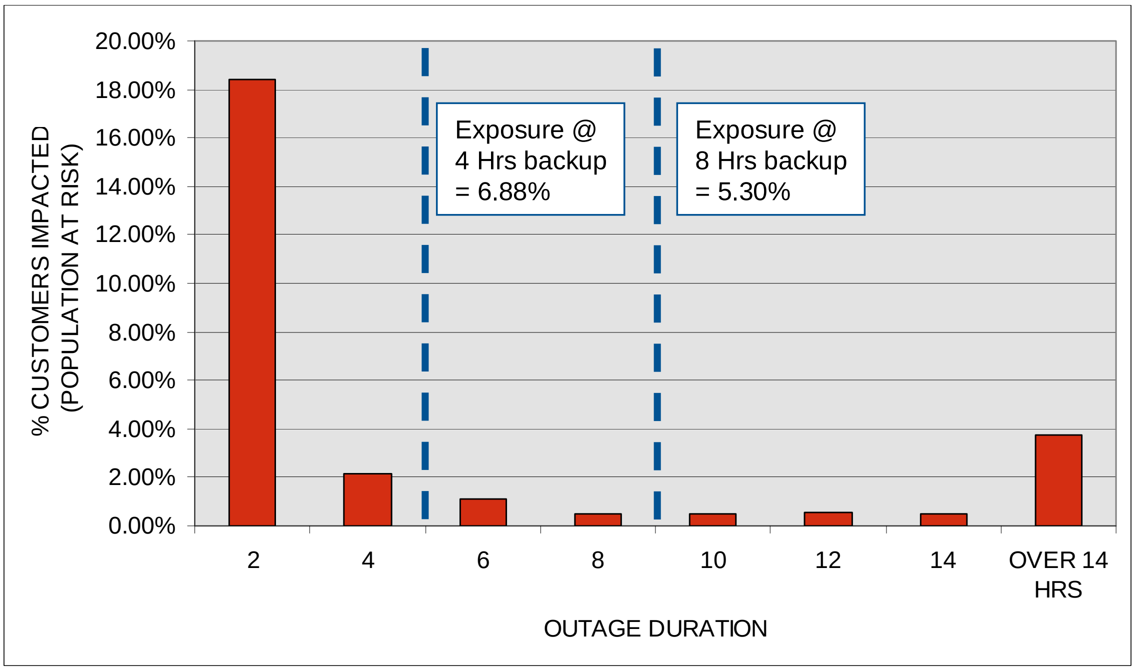


Figure 48. Event Profile: Wind Storm

During this incident, 5.3% of the customers experienced outages lasting more than 8 hours. 6.9% of customers experienced over 4 hours of power disruption.

This event had a relatively high proportion of outages lasting over 14 hours. Similar high percentages of extended outage duration was also observed in the case of large earthquakes or prolonged storm events.

Wild Fire

Year: 2003
Company: SCE
Customer Base: 4.5M
Event Description: Large wildfires broke out in southern California and especially San Bernardino County and just east of San Diego during late October 2003. Numerous fatalities and over 3500 structures were destroyed in the fires, several of which continued to burn at the end of the month. Dry conditions, Santa Ana winds and large amounts of available fuel (e.g., dead and dormant vegetation) combined to destroy over half a million acres in this outbreak.

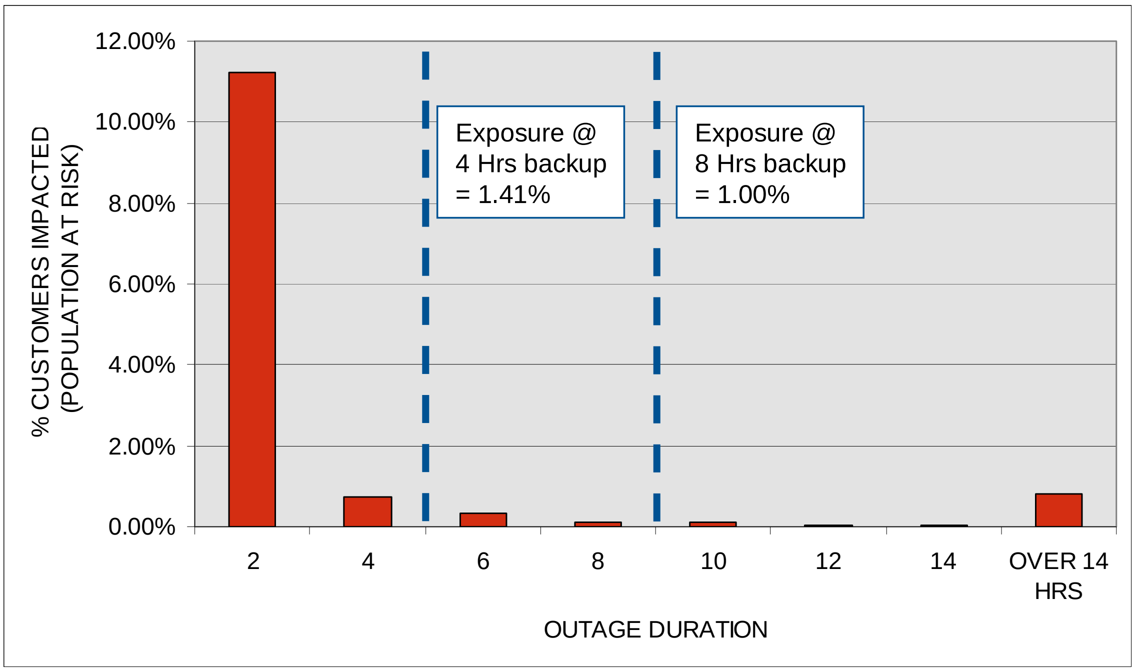


Figure 49. Event Profile: Wild Fire

During this incident, 1.0% of the customers experienced outages lasting more than 8 hours, while 1.4% of customers experienced over 4 hours of power disruption.

Earthquake

Year: 1994
Company: SCE
Customer Base: 4.1M
Event Description: The earthquake struck in the San Fernando Valley about 31 km (20 mi) northwest of downtown Los Angeles near the community of Northridge. Damage occurred up to 85 miles away, with the most damage in the west San Fernando Valley, and the cities of Santa Monica, Simi Valley and Santa Clartia. Numerous fires were caused by broken gas pipes caused by houses shifting off foundations or by unsecured water heaters falling over. As it is common in earthquakes, unreinforced masonry buildings and houses on steep slopes suffered damage.

The power outage profile for this event is as follows:

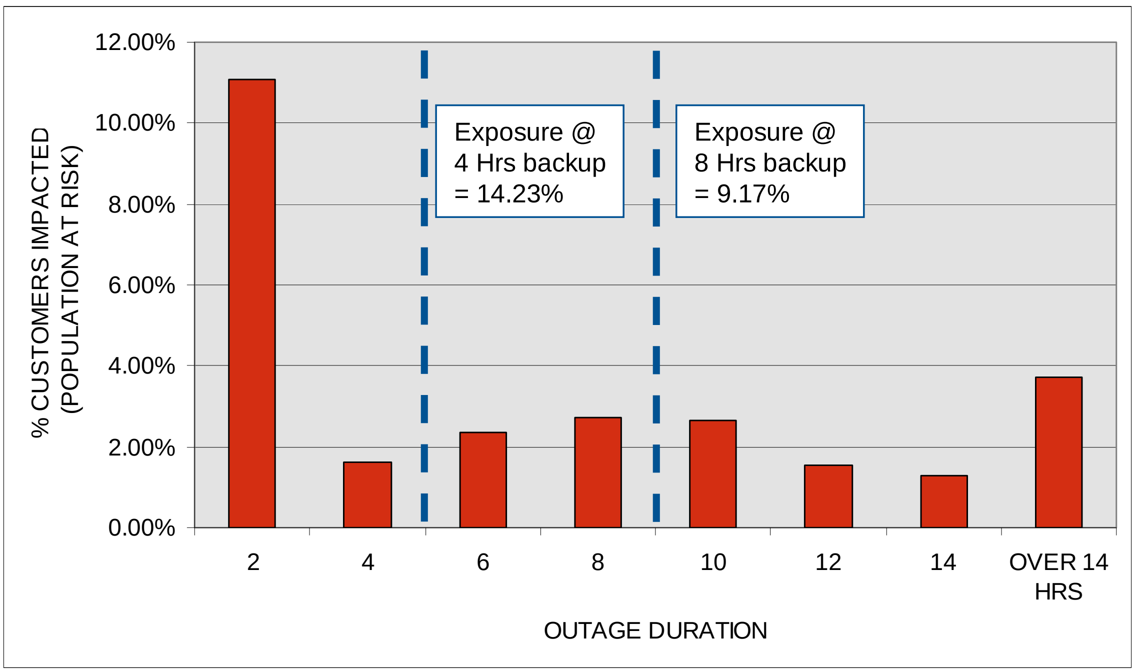


Figure 50. Event Profile: Earthquake

During this incident, 9.2% of the customers experienced outages lasting more than 8 hours; 14.2% of customers experienced over 4 hours of power disruption. This event had the highest proportion of outages lasting more than 14 hours within the set of available data.

Flooding (Storm)

Year: 1998
Company: PG&E
Customer Base: 4.6M
Event Description: A series of weather systems pounded northern and central California bringing heavy rains and periods of strong winds. Coastal and coastal mountain areas south of Cape Mendocino were hardest hit. Many service area weather stations reported between 10 and 20 inches of rain during the 12-day period. Widespread flooding resulted along rivers and streams from the Sacramento and Russian Rivers and south as a result of the heavy rains on February 3, and additional flooding occurred in the Bay Area and Central Coast areas on February 7 and 8. Gusty winds in excess of 50 mph were reported on February 1, 2 and 3. On February 3, a wind gust of 81 mph was reported along at Pigeon Point and many Central Coast stations reported gusts over 60 mph. Later that day a gust of 58 mph was reported at Bakersfield. Strong thunderstorms were reported on February 6 and 7, with a tornado spotted at Sunnyvale on February 7.

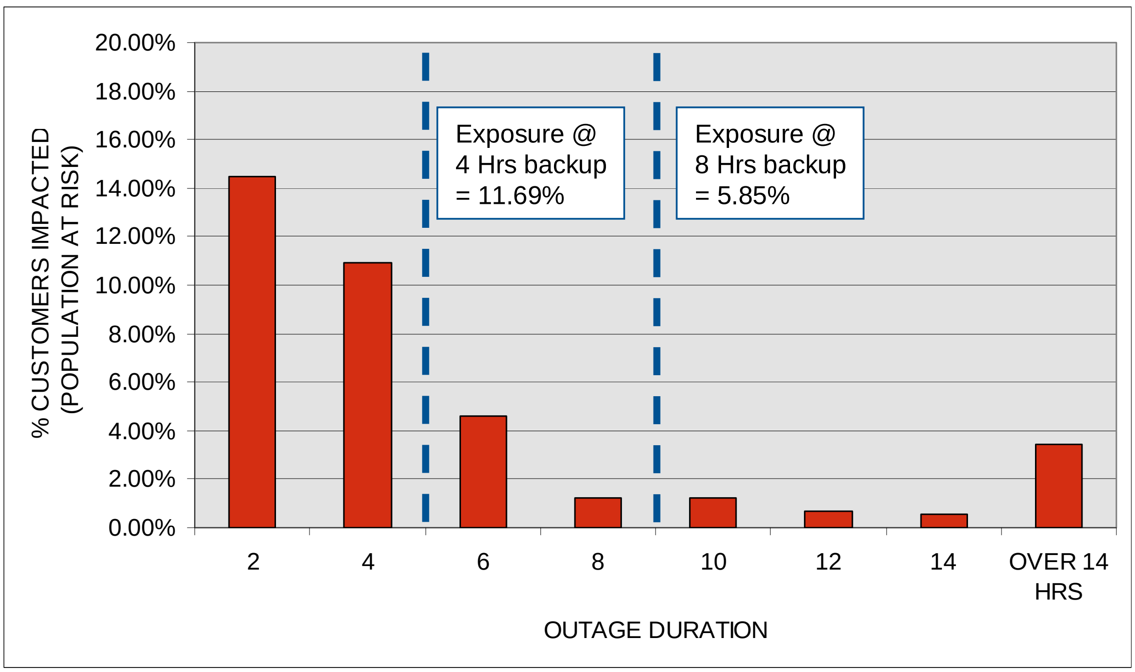


Figure 51. Event Profile: Flood

During this incident, 5.9% of the customers experienced outages lasting more than 8 hours; 11.7% of customers experienced over 4 hours of power disruption.

Human Error

Year: 1998
Company: PG&E
Customer Base: 4.6M
Event Description: San Francisco, Northern Peninsula Outage affecting San Francisco and San Mateo County on December 8, 1998. PG&E's internal investigation confirmed that the outage resulted when a construction crew working on an equipment upgrade project at the San Mateo Substation failed to follow established procedures and practices, and improperly removed temporary protective grounds. Separately, a transmission operator at the substation then energized the lines, but failed to engage the protective relays associated with the lines. Without the local protective system in place, the electric current was sent to ground, and the system took a half second to isolate the fault instead of the one-tenth of a second that would normally be required.

This delay resulted in a sharp drop in transmission line voltages, and the transmission system into San Francisco then experienced large power fluctuations. As designed, protective systems at other substations separated from the transmission system to make sure that the fluctuations did not extend to other parts of PG&E's system, and that no damage occurred to equipment in San Francisco's electric facilities that could have delayed restoration of operations.

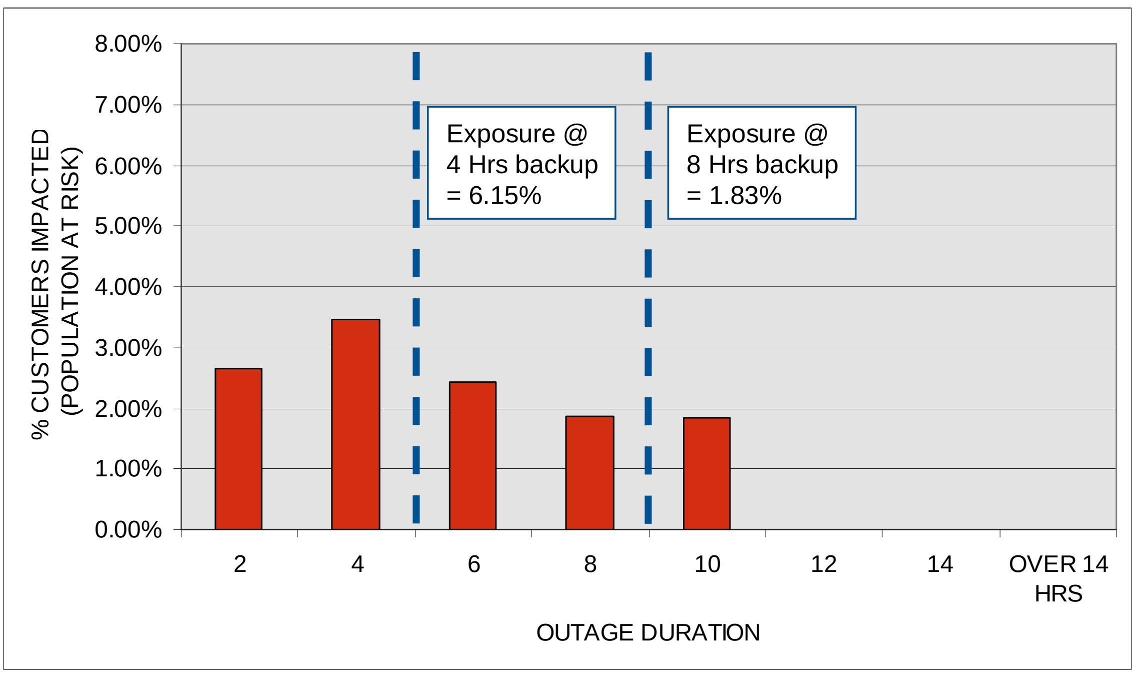


Figure 52. Event Profile: Human Error

During this incident, 1.8% of the customers experienced outages lasting more than 8 hours. 6.2% of customers experienced over 4 hours of power disruption.

This type of event with a localized root cause had a sharp cut off in outage duration beyond 10 hours.

Lightning Storm

Year: 2005
Company: SCE
Customer Base: 4.7M
Event Description: Interruptions that occurred on September 20, 2005, during a major event when more than 10% of SCE's customers were affected as a result of severe thunderstorms in the eastern portion of SCE's service area. These thunderstorms resulted in numerous lightning strikes to SCE's equipment, which alone caused 110 sustained and 337 momentary outages and affected approximately 507,000 SCE customers on this day.

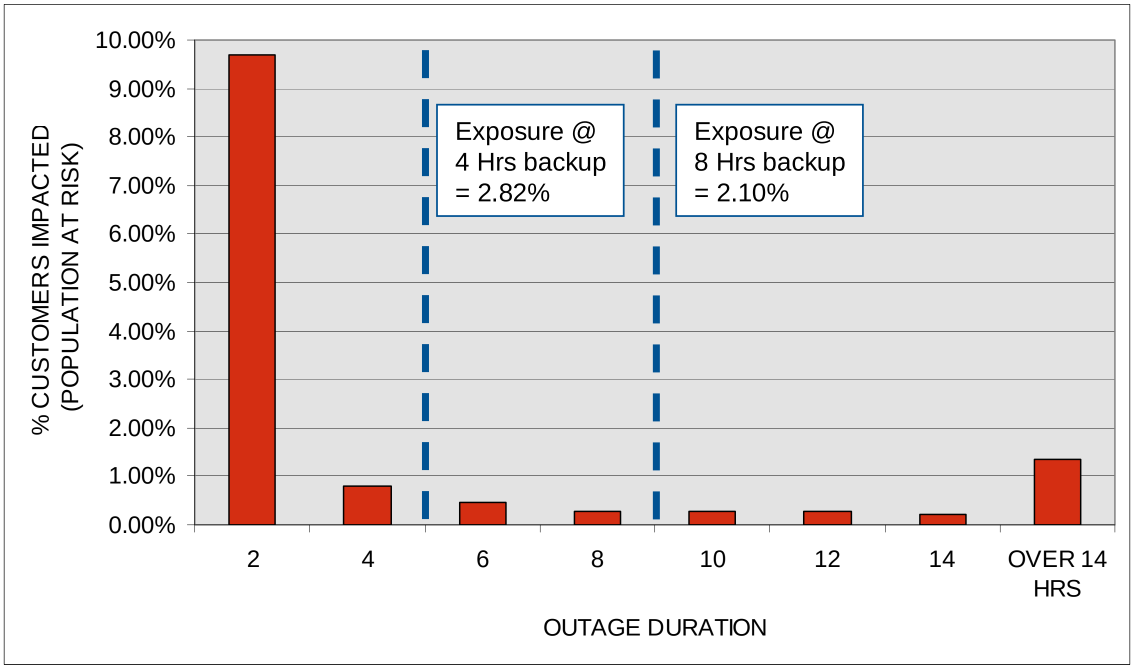


Figure 53. Event Profile: Lightning Storm

During this incident, 2.1% of the customers experienced outages lasting more than 8 hours. 2.8% of customers experienced over 4 hours of power disruption.

Observations

The previous set of statistics cover major events that have taken place over more than 10 years.

Based on this sample set of figures, the fraction of customers that would experience an outage longer than 8 hours during a major event is in the range of 1.0% to 9.1%, with an average (across the types of events listed before) of 3.9%. These figures provide an indication of the severity of these events in terms of customer impacts.

Historical data from PG&E indicates that in 6 of the last 10 years at least one major incident has taken place involving power outages affecting over 500,000 customers or 10% of the served customer base; two such major events occurred in each of the calendar years of 1998 and 2002. This provides an indication of the incidence of major outage events.

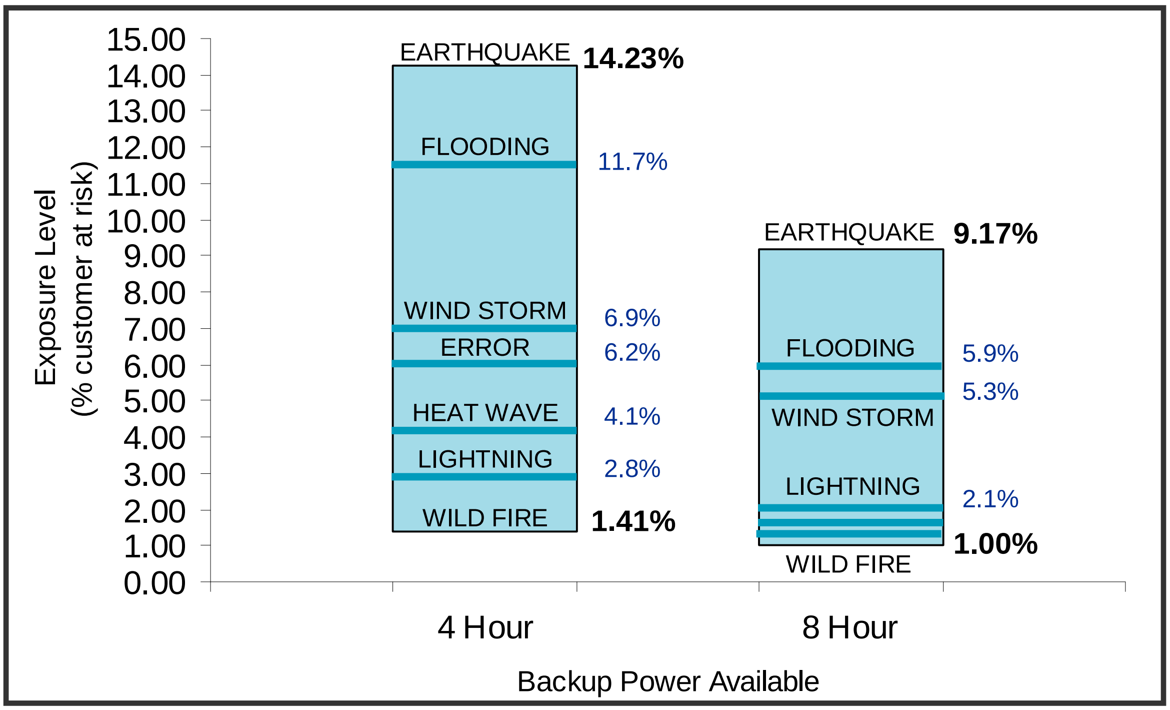


Figure 54. Outage Duration Thresholds for Representative Major Events[299]

Figure 54 provides the impact of power outage events in terms of percentage of the population exposed to the risk of losing telecom service for systems with battery backup of (i) 4 hours and (ii) 8 hours. Based on the statistical data from the power outage data, the percentage of a utility customers whose telephony service may be at risk can be calculated as a function of the battery backup present at the customer premises. The number of customers affected by power outages lasting over 4 hours in duration ranges

[299] The percentages shown on this chart are absolute values corresponding to each major event. For example, the percentage of customers experiencing an outage longer than 4 hours due to a major wind storm is estimated at 6.9% on average, while the average percentage of customers experiencing an outage of 4 hours or more in duration due to flooding is estimated at 11.7%. The numbers are not cumulative.

from 1.4% to 14.2% of the power utility's customer base, with an average of 6.8%. The corresponding percentage of customers impacted by power outages lasting more than 8 hours ranges from 1.0% to 9.1%, with an average of 3.9%. Therefore, the implementation of an 8-hr backup solution at the customer premises could reduce the potential exposure of users losing telephony (voice) service from 6.8% to 3.9% of customers, compared to a 4-hr backup power solution.

The addition of even more battery capacity to achieve 15-20 hours backup can be expected to further reduce the exposure risk from 3.9% to roughly 2.0% of customers, on average. Such extended power outages (greater than 14 hours) tend to be caused by large or state-wide incidents such as Santa Ana wind-storms, extensive flooding or large earthquakes where not only power is lost but widespread physical damage to telecommunications plant and customer equipment is likely.

To illustrate the use of Figure 3, consider a few scenarios. For example, if a major earthquake occurred and caused utility power to be lost for many days, 14.2% of the customers in the affected area will lose their telecommunications services if their FTTH system has 4 hours of battery backup. If their system has 8 hours of battery backup, the number of customers at risk of losing telecommunications service drops to 9.2%. An earthquake event may be localized to an area within a few miles of the epicenter or have levels of decreasing damage radiating out from the epicenter. At the epicenter, the percentage of affected customers would be higher than the average value calculated across all the customers of a particular utility company.

In contrast, high Santa Ana winds or flooding from heavy rains can cause a state-wide emergency that covers a much broader percentage of the state. In the case of a wind storm event causing an extended power outage, 6.9 % of the customers with 4-hr battery backup will eventually lose telecommunications service. For those systems with 8 hours of battery backup, the number of customers affected is only 5.3%.

Costing Considerations

In general, there are a number of considerations affecting the cost of adopting increased backup power solutions. These include:

- Higher battery capacity
    - In order to extend the available backup run time, larger size batteries and/or multiple batteries could be used at the ONT
- Costs to redesign the BBU for California deployments
    - In some instances, higher battery capacity will require the use of larger equipment housing units, which involve design efforts
    - Modification of internal circuitry may also be necessary to support the added capacity configurations
- Investment required to retrofit deployed units in the field
    - Truck rolls to involved in the dispatch of a technician to replace existing BBUs with extended capacity ones
    - Materials associated with the swapping of units at the customer premises
    - Conceivably, the replaced units could be employed somewhere else (outside of California), but since the unit has already been in use, warranty implications may come into play

- If the required power standards are not uniform at the national level, this may increase the efforts, time and expense of managing different implementation options for a communications service provider.

Commercially Available Options

If one considers the most prevalent ONT/BBU solutions commercially available at this time, the least disruptive option to extend backup battery power duration at the Customer Premises involves the use of external battery packs.

"Least disruptive" refers to avoiding the need to re-design the ONT/BBU devices being rolled out by service providers and/or retrofit the ones already deployed.

There are several alternatives for external battery packs, each with its own set of tradeoffs:

(i) Adding a basic External Battery Pack – some of the units being deployed by carriers have a port/connector for an external battery pack in addition to the battery unit included with the ONT. There are 7 Amp-hr external battery packs available which essentially double the backup capacity (from a typical 6.5 hours – assuming a 10W load – to 13 hours. The cost of this external pack is in the $15 to $20 range at the wholesale level (what a distributor or a carrier would pay) and $25-$30 retail (what a consumer would pay).

(ii) Adding a high-capacity External Battery Pack – there is another type of battery pack, which is compatible with some of the existing units and has a capacity of 20 Amp-hours. Such a unit would add about 18 hrs of backup power to the basic 6.5 hrs of the stand alone unit (total backup of over 24 hours, assuming a 10W load). The cost for such a device would be in the range of $45-$50 wholesale, $60-65 retail.

It should be noted that the cost of lead has spiked over the last few months, so the upper bounds of these ranges would be more representative.

NOTE: The above cost figures are incremental above and beyond the basic ONT unit, which cost in the order of $55-$60 per device (what carriers pay per unit).

Aside from the extra cost (and the larger size), the limitation of this option is that the battery is considered a specialty item and would not be readily available from a retailer such as Radio Shack. The unit would have to be ordered from a distributor

(iii) Using a battery pack that uses regular "D" cell alkaline batteries – some of the ONT units being deployed have a port intended to plug in a battery pack that uses regular "D" cell batteries. A total of 8 "D" cell batteries would be required to provide the required 12 volts. However, such a battery pack has not been produced to date.

Advantages: Uses regular batteries available everywhere. Inexpensive.

Disadvantages: This approach relies on disposable batteries – the customer may forget to replace them.

The following charts illustrate the incremental costs associated with the implementation of various capacity solutions at a given power load.

<u>Estimated cost profile for extended backup battery times – Carrier Perspective</u>

Assumptions:

- Average load of 10W, upper bound of wholesale price ranges are used
- Baseline cost of the ONT unit is $60 of which $45 is for the standard set-top-box plus $15 corresponding to the standard BBU with a 7 Ah battery.

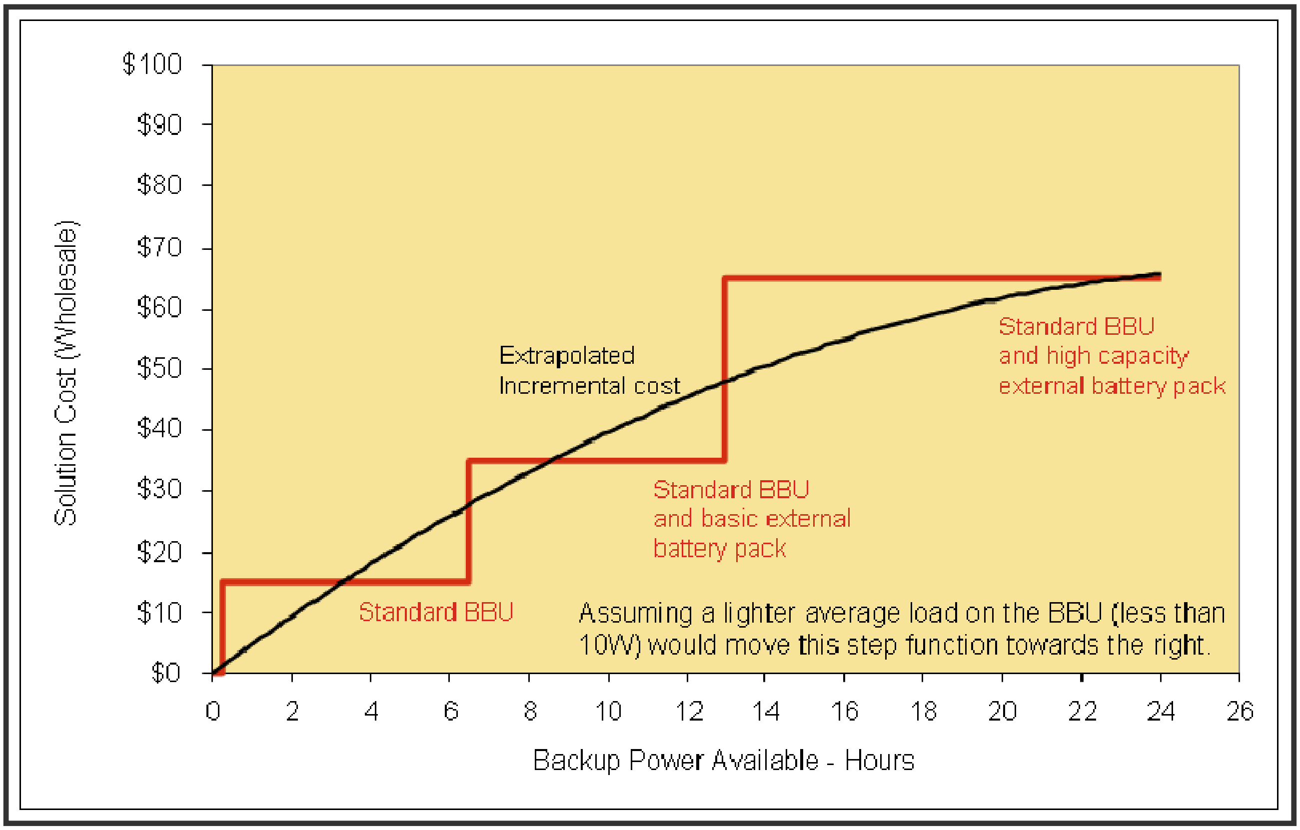


Figure 55. Extended Backup Power Cost Profile: Wholesale. 10W Average Load

The step functions represent the estimated additional one time costs (at wholesale prices) required to extend the capacity to the next level of backup protection based on commercially available options. The starting point in the curve corresponds to a stand alone ONT device with no BBU at an estimated wholesale cost of $45 per unit. This stand alone ONT would provide no backup power protection on its own; i.e., zero backup time = zero solution cost ($0).

The addition of a standard 7-Ah BBU involves an additional $15 per unit and provides 6.5 hours of backup power at the specified load (10W). The next step on the cost curve corresponds to the addition of a basic external battery pack as described in item (i) above. This would add another $20 per unit and extend the available backup power to 13 hours assuming the same constant load. Finally, to achieve backup durations of over 13 hours (at the same load), a high-capacity battery pack would be required at a further cost of $30 per unit.

The black solid line represents the aggregate incremental cost curve. Such a trend line corresponds to the estimated cost of adding extra battery capacity assuming availability of capacity extensions at any duration level (rather than a few discrete alternatives).

Cost curves are presented in the previous diagram are driven by wholesale pricing estimates - the Carrier's perspective. The following chart considers the consumer's perspective, that is, what would be the consumer cost assuming it would bear the expense of expanding backup power availability.

Estimated cost profile for extended backup battery times – Consumer Perspective

Assumptions:

- Average load of 10W, upper bound of retail price ranges are used
- Consumer pays for any additional capacity beyond the one provided by the standard unit

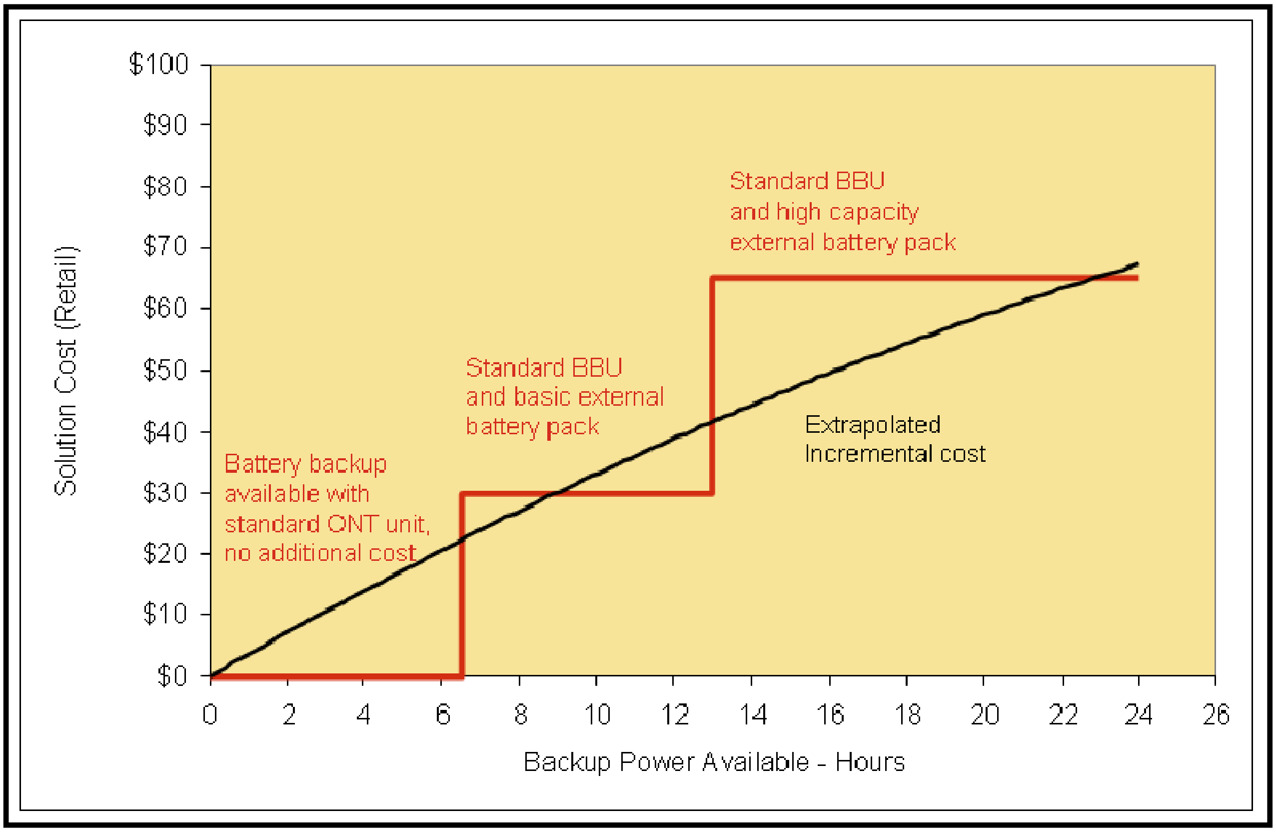


Figure 56. Extended Backup Power Cost Profile: Retail. 10W Average Load

In this case, the standard ONT+BBU device is provided by the carrier and provides the same 6.5 hours of backup power. Expanding backup power availability beyond these 6.5 hours involves the addition of a basic battery pack, providing an additional 7-Ah at an estimated retail cost of $30 per unit (delivering a total of 13 hours of backup at a load of 10W). The last capacity expansion considered was the use of a high capacity battery pack, extending the backup power beyond the 13 hours. This option represents an estimated added cost of $35 per unit above and beyond the cost of the basic battery pack.

The estimated battery run times for the 10W level are:

- 7 Ah battery 10 hours (up from 6.5 hours at a 10W load)
- 20 Ah battery 30 hours (up from 18 hours at a 10W load).

The next set of charts illustrates the impact of lower load levels on the ONT. In this case it is assumed that the average load is 6W rather than 10W. The previous cost curves are superimposed in the new graphs below to better show the expense and battery duration implications.

Estimated cost profile for extended backup battery times – Carrier Perspective

Assumptions:

- Average load of 6W, upper bound of wholesale price ranges are used
- Cost of the ONT unit is $60 of which $15 corresponds to the standard BBU (7 Ah battery)

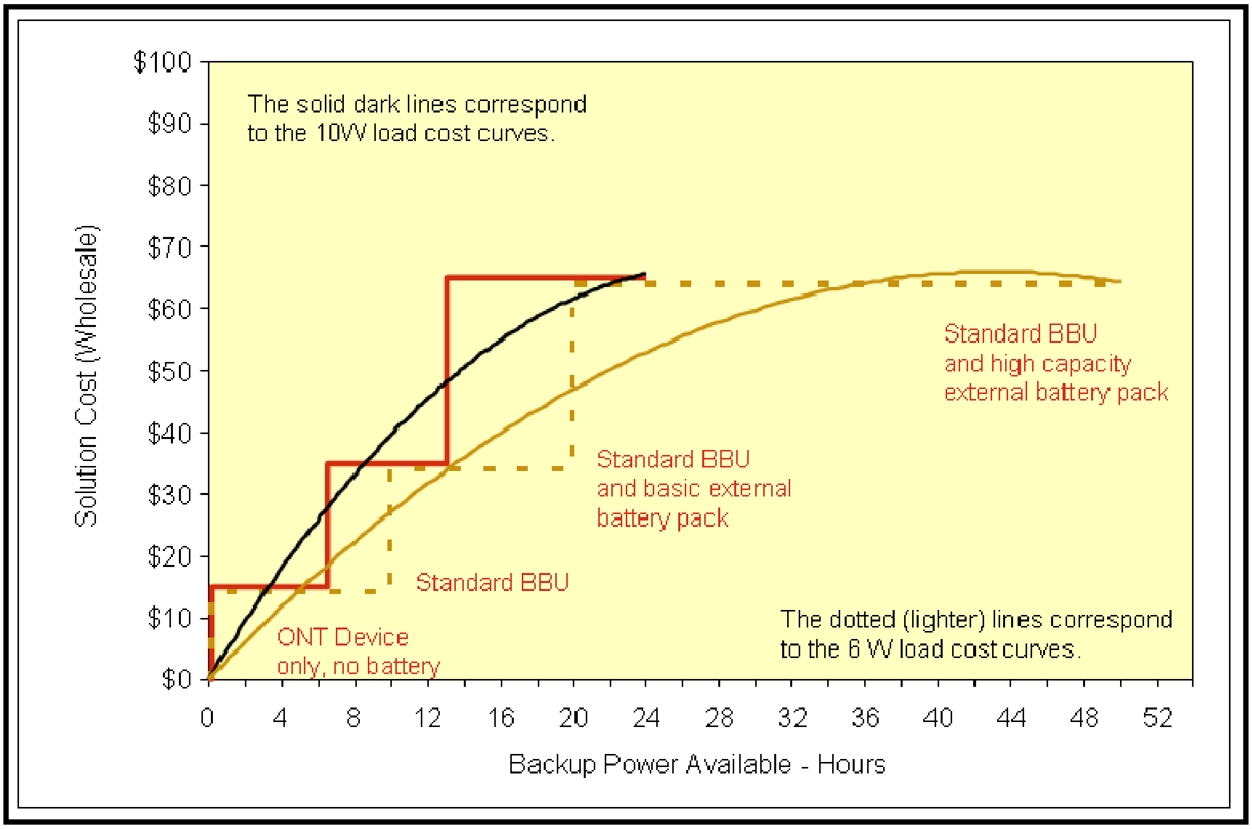


Figure 57. Extended Backup Power Cost Profile: Wholesale. 6W Average Load

The second step function illustrated in the diagram depicts the incremental wholesale costs assuming a lower load level, resulting in longer backup duration times. Both the new step cost function and the corresponding aggregated cost curve are shifted to the right. The implication is that a more conservative view of power consumption at the customer premises during a power outage translates to significantly longer backup availability and thus reduced incremental costs.

For instance, the use of the standard ONT/BBU device with a basic external battery pack would yield an estimated 20 hours of backup power at an average load of 6W.

The final set of cost curves illustrated on Figure 58 corresponds to the retail cost estimates for the 6W load case.

Estimated cost profile for extended backup battery times – Consumer Perspective

Assumptions:

- Average load of 6W, upper bound of retail price ranges are used
- Consumer pays for any additional capacity beyond the one provided by the standard unit

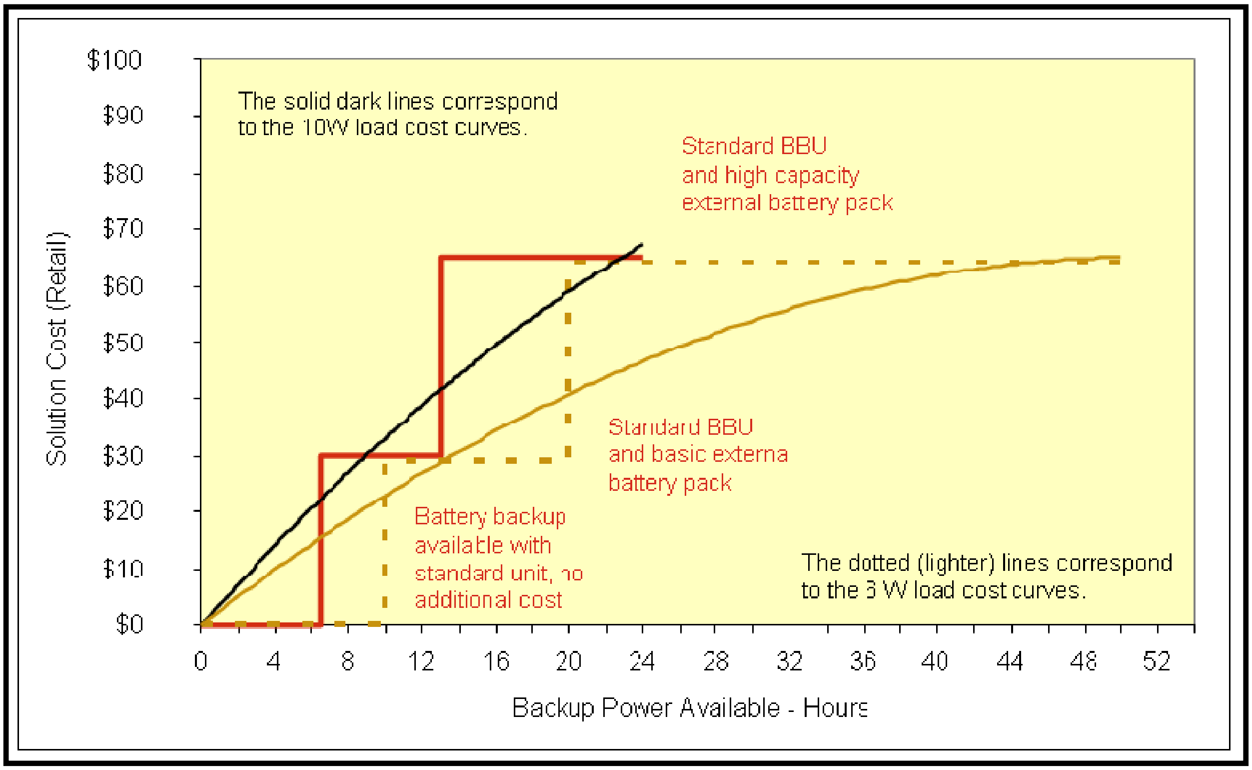


Figure 58. Extended Backup Power Cost Profile: Retail. 6W Average Load

The cost analysis was based on an anticipated telecom load to the battery of 10W in the event of an power outage. As discussed Section 4.2.1.3, energy is required to run (a) the customer premises interface equipment to monitor battery status and alarm systems, (b) signal the presence and status of the customer to the network, and (c) operate the telephony service. The value of 10W for this telecom load was representative of the higher loads reported for various current FTTH systems.

Through using the power conserving protocols discussed earlier in Sections 4.2.1.2 and 4.2.1.3), the load on the BBU may be significantly lower than the 10W considered above. If the load is reduced, the effect on the cost curves will be longer backup duration times for the same cost. The implication is that a more conservative view of power consumption at the customer premises during a power outage translates to significantly longer backup availability and thus reduced incremental costs. For instance, the use of the standard ONT/BBU device with no external expansion could yield an estimated 10 hours of backup power at an average load of 6W; i.e., a 50+% increase in backup time over the 10W case study.

Decreasing the load on the battery through using low-power-use standby modes and idle settings on customer equipment shall be more cost effective and permanent than simply adding extra batteries.

Use of Zero Emission Solutions for Network Power

The use of diesel-powered generators for the provision of backup power in the core telecommunications network has been in practice of a long time. As a result, a considerable level of information is available and was supplied by carriers on the costs associated with this solution. Cost components reported by carriers included:

- Installed First Costs
    - Site Preparation Including Architectural, Structural, Mechanical, and Electrical
    - Generator Equipment & Accessories
    - Installation Labor & Testing
    - Planning & Engineering
    - Underground Storage Tank
- Recurring Operational Expenses
    - Annual Maintenance
    - Oil Replacement
    - Coolant Replacement
    - Battery Replacement
    - Labor for monthly test for one hour
    - Monthly Underground Storage Tank monitoring
    - Safety compliance and pollution control measures
- Fuel Consumption and Average Repair Costs.

In contrast, the availability of relevant cost information for alternative fuel solutions is more elusive. Given that these are still considered emerging technologies, comparable solutions – having similar capacity and performance characteristics – may not be commercially available at this time. Therefore, in order to conduct a comparison of financial implications, an analysis was carried out based on existing solution data and extrapolating results as needed.

The most favorable economic comparison is when a complete conversion from a diesel generator to a fuel-cell system is studies since this will allow the economics of scale to help fuel cell systems.

Fuel-Cell Solutions

Several respondents, including Verizon Wireless and AT&T, have carried out trials using fuel cell solutions for network power backup. From these, a number of fundamental challenges have surfaced:

- Capacity: existing solutions have limited capacities – the use of fuel cell systems in the 5kW range is mentioned as part of the trial information; however, most typical telecom applications require capacities in the 30kW (for wireless radio sites) to 1000kW (for landline Central Offices). As pointed out by one of the respondents: "PEM[300] fuel-cell technology has not yet reached the

[300] Proton Exchange Membrane fuel cell

point where cells can be made with the required energy density and capacity to power a Central Office location."

- Storage: compliance issues arise for some cell site locations due to lack of available space; also solutions to store enough hydrogen to support a 30kW site for 72 hours are unavailable – the additional space required compared to traditional (diesel) solutions would represent a considerable incremental recurring cost.
- Cost per kW: one respondent estimates that the costs of these fuel cell systems – as they stand today – are anywhere from 3 to 15 times more per kW of capacity in terms of Installed First Costs. Ongoing operating expenses could also be higher:
  - The cost of hydrogen is 4 times more expensive that an equivalent gallon of diesel
  - Additional space requirements may add to the rental expenses in some instances.

With regards to other alternative power solutions, Verizon California has indicated the limited deployment of natural gas micro-turbines – however, no additional information has been provided (e.g., "cost of implementation and operations vs. diesel").

Since AB2393 refers to "zero greenhouse gas emission", this investigation needs to also consider the source of the hydrogen used in the fuel cell. Hydrogen is not found naturally and needs to be produced from natural gas, fossil fuels, or biomass materials that are converted to hydrogen (H_2) with greenhouse gas byproducts of carbon monoxide (CO) and carbon dioxide (CO_2). Hydrogen can be produced by electrolysis of water using electrical power generated by traditional power stations (fossil fuels). Such electrolysis methods displace the greenhouse gas formation to another location (i.e., coal-fired power station). A true zero-emission process would require the electric power for the electrolysis to be produced from a renewable source such as hydroelectric power, wind power or solar power. The industry infrastructure is not currently in place to accomplish this full zero-emission solution.

Therefore for this study, it is assumed that a "zero greenhouse gas emission fuel cell system" consists of a fuel cell located at the CO that uses bottled hydrogen (compressed gas). Sufficient storage shall be required to maintain 72 hours running capacity. The amount of hydrogen is large and will require considerable amount of infrastructure to ensure safety, security and physical space for such a large gas supply.

Representative Cost Comparison

A comparison was made between the one time and recurring costs associated with diesel generators and those provided for fuel cell solutions. Cost figures were normalized, where applicable, to reflect the cost per kilowatt of power capacity – this enables comparing systems of varying capacities.

Diesel Solution Costs

Table 18 shows the supplied data along with the computed normalized metric (cost per kW of capacity) for diesel power. The data contains costs provided by both landline operators as well as wireless carriers.

Table 18. Installed First Costs

	CARRIER 1	CARRIER 2	CARRIER 3	CARRIER 4	CARRIER 5
DIESEL					
SYSTEM CAPACITY (KW)	1000	750	500	1500	75
INSTALLED FIRST COSTS:					
Site Preparation Including Architectural, Structural, Mechanical and Electrical	$568,650	$5,000	$250,049	$500,000	$40,000
Generator Equipment & Accessories	$250,000	$470,000	$90,134	$350,000	$30,000
Installation Labor & Testing	$143,000	$105,000	$349,032	$150,000	$10,000
Planning & Engineering	$96,165	$15,000	$2,544	$150,000	$10,000
Underground Storage Tank	$170,000	INCLUDED	INCLUDED	$50,000	
TOTAL INVESTMENT	$1,227,815	$595,000	$691,759	$1,200,000	$90,000
COST PER KW OF CAPACITY	$1,228	$793	$1,384	$800	$1,200

Even though the data shows a large degree of variation with regards to any of the above cost elements, the total investment figures tend to be proportional to the diesel system capacity. Depending on the specifics of a given project, some of the cost components may be included as part of other line items, for instance, in the case of Carriers 2 and 3, the cost of underground storage tanks has been included in the generator equipment.

Table 19 below contains ongoing expense estimates as reported by respondents.

Table 19. Operational Annual Costs

ONGOING OPERATIONAL EXPENSES:					
(ANNUALIZED COSTS)					
Annual Maintenance	$1,200	$2,383	NO DATA PROVIDED	$10,000	$2,000
Oil Replacement	$72	$2,000			
Coolant Replacement	$100	INCLUDED			
Battery Replacement	$96				
Labor for monthly test for one hour	$444	INCLUDED			
Monthly Underground Storage Tank monitoring	$1,200				
Safety compliance and pollution control measures		$750		$2,500	$2,500
TOTAL ANNUAL EXPENSE PER SITE	$3,112	$5,133	N/A	$12,500	$4,500
FUEL CONSUMPTION:					
RATE [GALLONS/HR]	61			95	5
FUEL COST [$ PER GALLON]	$3.00	$2.89		$3.00	$3.00
USAGE [HRS PER MONTH]	1	760		8	8
STATEWIDE ESTIMATED EXPENSE			$1,380,000		
NUMBER OF DIESEL ENGINES IN USE			762	11	750
ANNUAL FUEL COST	$2,196	$2,200	$1,811	$27,360	$1,440
NORMALIZED ANNUAL FUEL COST PER KW	$2.20	$2.93	$3.62	$18.24	$19.20
ESTIMATED REPAIR COSTS:					
PARTS AND LABOR, PER INSTANCE	$4,000	$2,050	$9,161	NO DATA	NO DATA
[% OF INSTALLED FIRST COST]	0.33%	0.34%	1.32%	PROVIDED	PROVIDED

The average yearly expense per site metrics were computed based on the information supplied and fall within the range of $3,100 to $12,500 per site.

Data on annual fuel consumption was also provided – annual fuel expense was in the range of $2.20 to $19.20 per year per kW of capacity.

Average repair costs ranged from $2,050 to $9,160 per instance per site. These figures represent 0.33% to 1.32% of the Installed First Cost.

Fuel Cell Solution Costs

Detailed cost information associated with fuel cell solutions was provided by one carrier; others made statements regarding the relative level of expenditure of these solutions.

Since no comparable capacity fuel cell solutions are available, comparisons are based on a 1 kW system and compared to the normalized diesel costs per kW.

Table 20. Cost Comparisons per kWH

	RESPONSE A	RESPONSE B	RESPONSE C	RESPONSE D
FUEL CELL				
SYSTEM CAPACITY	1 kW fuel cell			
Unit price	$9,558	NO DATA PROVIDED	Fuel cell powered standby systems can cost anywhere from 3 to 15 times the $ per kW	solution cost 2-3 times the capital and the technology requires large lease space so lease costs increase
Installation	$3,500			
Total Equipment and Installation	$13,058			
SUPPLIES PER YEAR PER KW				
3 bottles $10 per month per bottle lease	$360	NO DATA PROVIDED	OPEX would be increased by at least the increased cost of fuel - hydrogen is about 4 times the price per equivalent	We will still have to conduct Preventive Maintenance, so we do not see large operational savings.
Hydrogen $25 per bottle	$75			
Total supplies	$435			
Additional lease space cost				$3,000 - $5,000 additional expense per year

Cost Metrics Comparison

Using all of the provided data it is possible to derive and compare two main metrics associated with the diesel and fuel cell powering solutions: “Installed First Cost” and “Annual Recurring Expense”. Both of these metrics are normalized on a “per kW” basis for comparative purposes. Refer to Figure 59.

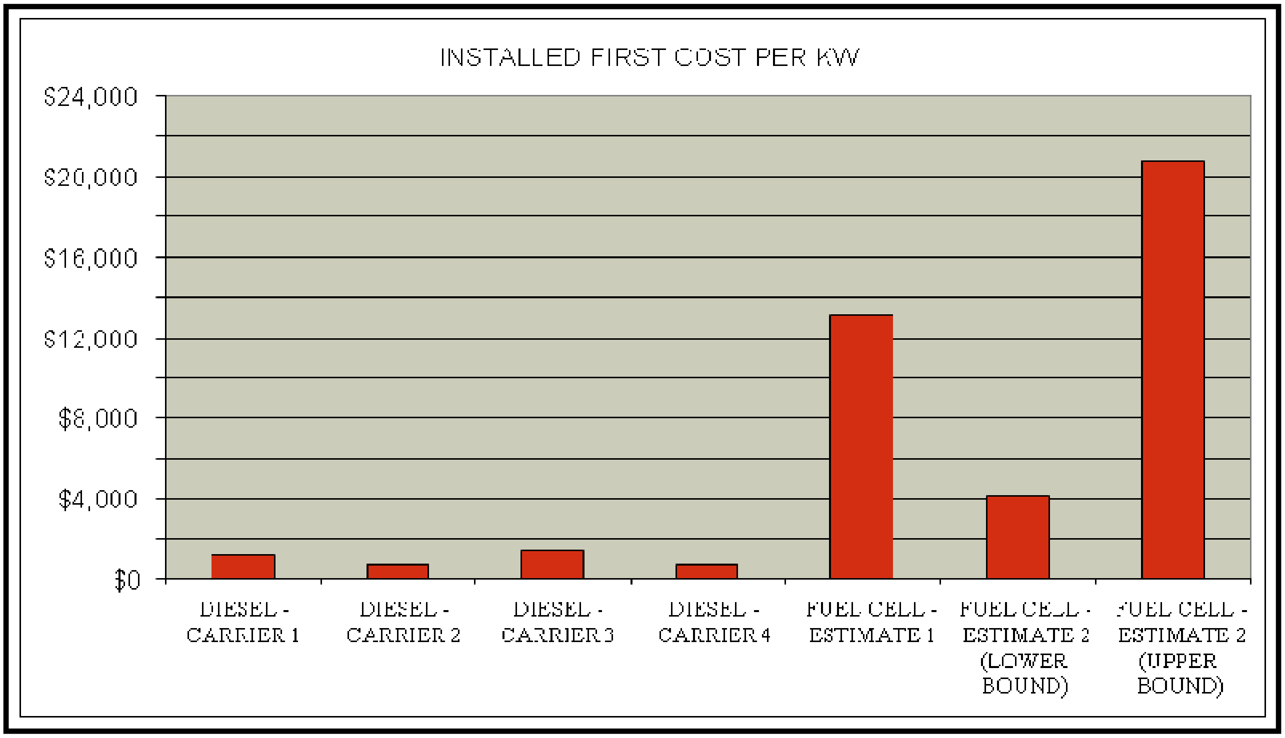


Figure 59. Installed First Cost per kW for Diesel and Fuel-Cell Solutions

The chart illustrates how all four diesel solutions involve cost per kW metrics that are less than $2,000 (ranging from close to $800 to roughly $1400 per kW of capacity) while the fuel cell cost estimates varies dramatically depending on which view of the responses is considered.

Even if we were to consider a 50% improvement in cost/performance scalability with fuel cell production volumes, in the near term, the fuel cell is many times more expensive to deploy.

In terms of recurring maintenance, the responses indicate minimal or no savings. Preventive maintenance will be carried out in both cases at roughly the same expense.

Assumptions employed in estimating the recurring expenses include the following:

- Fuel expenses are normalized per kW
- Assumed one repair expense per year
- Repair cost for fuel cell assumed to be proportional to diesel installed first costs
- Fuel cell annual expense also includes the cost of additional storage (space).

The estimated annual expenses are shown in Figure 60.

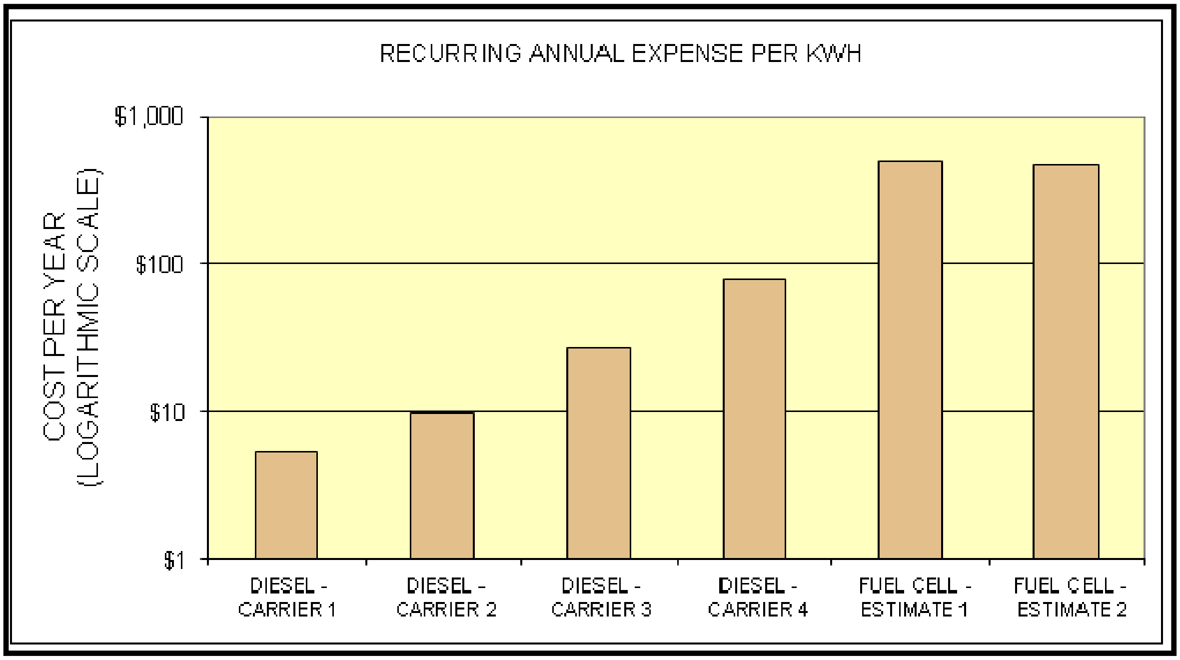


Figure 60. Recurring Annual Expense per kW for Diesel and Fuel-Cell Solutions

Note: A logarithmic scale was used for this figure to better illustrate the differences in the cost metrics. See Table 7 below for the individual cost numbers calculated from the analysis.

The difference between the Fuel Cell Estimate 1 and Estimate 2 lies in the lease expenses – one estimate is based on the upper bound of the cost range; the other is based on the lower bound of the cost range. Actual figures are listed below.

SOLUTIONS	ANNUALIZED TOTAL EXPENSE PER KWH
DIESEL - CARRIER 1	$5.31
DIESEL - CARRIER 2	$9.78
DIESEL - CARRIER 3	$26.57
DIESEL - CARRIER 4	$79.20
FUEL CELL - ESTIMATE 1	$503.61
FUEL CELL - ESTIMATE 2	$472.54

In situations such as this one, where the initial expenditure tends to be very high, grants could be used to stimulate this type of investment. Otherwise, there is no business case to justify the capital outlay.

At present, the system of diesel generator and battery backup at the central office is viewed as more reliable and efficient, and has better economics than zero-emission fuel-cell systems.

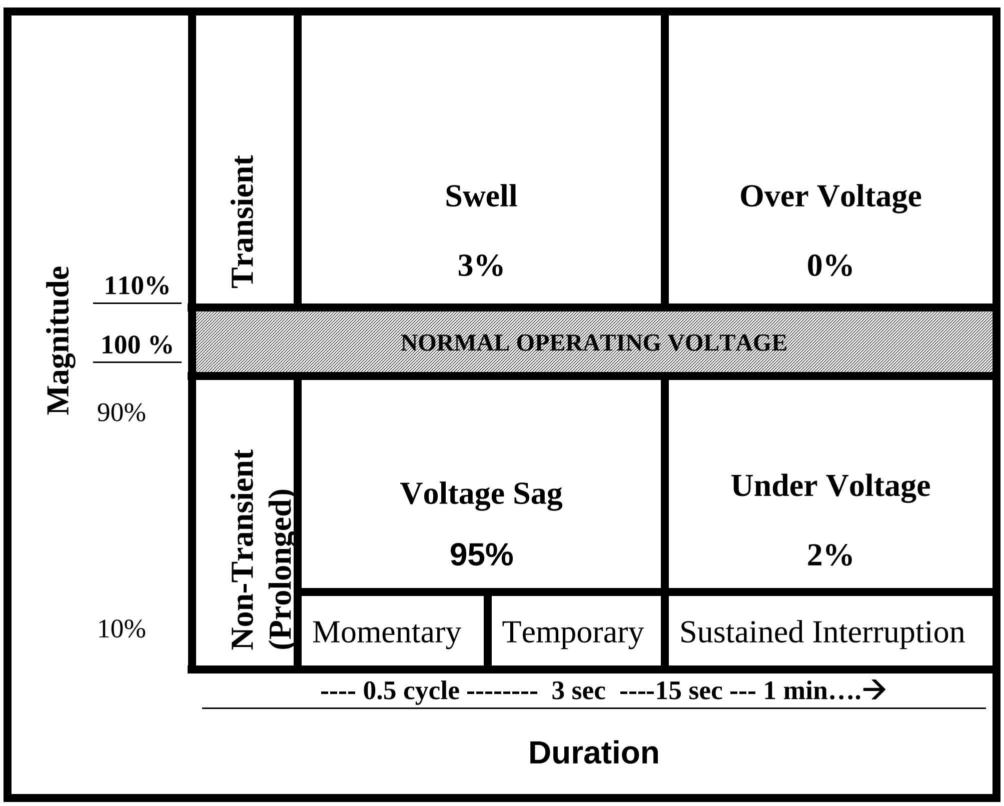
Without external grants or incentives, the high initial expenditure of fuel-cell systems with associated hydrogen storage needs, the economic business case and return-on-investment calculations are not attractive.

Appendix P: Power Outage and Telecommunications

This Appendix provides background on power quality delivered across the AC utility grid.

Quality of Utility Power

The protection strategies designed into telecommunications networks against AC power utility problems are primarily designed around minimizing effects of voltage sags that have historically resulted in 95% of the power-related outages.



{from I. Gyuk (DOE) - “The Power of Energy Storage”, *Power Quality*, March 2002 - [66].}

Figure 61. Power Interruption and Disturbance

Survey data [*“U.S. Commercial 120 Volt AC Power Quality: A Current Assessment”, Telcordia/Bellcore Proprietary Report (TM-NWT-022263) by A.L. Black December 1992*] collected in the 1990s at 235 sites across the U.S. showed an annual average of power supply incidents (fatal and non-fatal) of 1500+ events per site per year. Survey sites distribution was as follows:

- Residential (15%)
- Business (22%)
- Light industrial (27%)
- Heavy industrial (6%)
- Office/institutional (30%).

Analysis of the over 97,000 event record and incidents showed that:

- 50% were impulse or voltage spike lasting less than 2.5 seconds
- 25-30% were under-voltage sag problems lasting less than 2.5 seconds
- 15-20% were over-voltage surge lasting more than 2.5 seconds
- 5-10% were under-voltage problems lasting more 2.5 seconds
- 1-2% were classified as other – includes such items as frequency variations.

With variable power quality, typical telecommunications systems maintain the required high reliability through the use of voltage monitoring and control systems coupled with battery and diesel engine backup to minimize the impact of power disruption. Electrical protection is built into the network with solid state or spark-gap protectors coupled with breakers with time-sensitive automatic re-closing controls. This electrical protection system handles the vast majority of the above power quality perturbations preventing service impact. Of the 20 power outages that occur at an average central office in a year, over 50% last between 1 and 4 seconds, and 97% are less than 2 hours.

The correlation between outage probability and outage length was formalized in a 1978-1979 Bell system study [*NCS Technical Bulletin NCS-TIB-93-9 "Protection of Telecommunications Links from Physical Stress", June 1993]* where the following relationship was determined from review of power quality records from 26 data centers within the then Bell System.

Table 21. Power Outage versus Time Correlation

Percent Outage (Y%) = 18.19 log (Time in seconds) + 13.32

X = Outage Length (seconds)	Y = Percentage of All Outages lasting less than X seconds
0.01 sec	<< 1%
0.1 sec	< 1%
1 sec	~ 13%
10 sec	~ 30%
100 sec	~ 50%
1,000 sec ≈ 17 mins	~ 68%
10,0000 sec ≈ 2.8 hr	~ 85%
100,000 sec ≈ 21 hr	> 99%

The traditional backup powering schemes of the Bell System and the NRIC Best Practices are based on this and other similar electric power outage data and the analysis gathered over the years [see References 1-16 at end of Appendix].

Recent Power Outage Trends

The incidents of power outages that affect telecommunications facilities has been generally improving based on a review of the more recent significant outages reported through *Electric Information Administration* (EIA – www.eia.doe.gov) during 2006-2007 and the FCC-reportable outages from 1993 to 2004 through analysis of the Annual Reports of the *Network Reliability Steering Committee* (NRSC- www.nric.org and www.atis.org/nrsc).

After peak power trouble years during the 1997-2001 period, the power outage frequency affecting telecommunications facilities has decreased steadily both in terms of commercial utility power failures and backup power failures.

The larger impact power outage events or disturbances over the last four decades include the following instances provided for illustration rather than as a comprehensive list:

- Northeast Blackout 1965
- New York City Blackout 1977
- Western Inter-Tie Failure of 1996 that affected nine U.S. states and Mexico
- Ice Storm of 1998 damaging poles and transmission lines across Ontario, Quebec and the northeastern USA
- Substation Error in San Francisco during 1998
- The rolling blackouts that affected California during 2000 – 2001
- Collateral damage from Southern California Fires from 2003 to the present
- Northeast Blackout in August 2003 that spread across eight U.S. states and Ontario
- Numerous hurricanes and storms of varying strengths and plant damage effects
  - Isabel in 2003 covering nine northeastern U.S. States and Canada (Ontario & Quebec)
  - Hurricane Frances in 2004 over Florida
  - Hurricane Katrina in August 2005 damaging New Orleans LA, Florida and Gulf Coast
  - Hurricane Andrew that hit Dade County (Florida) in 1992 and traveled across 1,500 square miles of Florida, out over the Gulf of Mexico and then back onto USA land in Gulf Coast (Florida and Louisiana and Mississippi).
  - 2006 storms in Philadelphia, St. Louis and areas through the middle of the country
  - 2007 Storms damaging plant in Oklahoma, Missouri, Michigan and Texas.

All these events and other storms and incidents are all learning opportunities from which individual utility companies, industry groups (e.g., ATIS, EPRI, NERC) and governmental agencies (e.g., NCS, DOE, FCC, NRSC) have gleaned lessons for improvements in operational procedures, maintenance priorities, engineering design and emergency response planning.

The measurement and reporting of outage data and quality metrics both by the telecommunications providers to the FCC and electric power supply companies to the NERC has (i) helped propel quality improvements, and (ii) has at least in part been responsible for the 2002-2007 general improvements in average outage statistics noted above. These past events are very important as guideposts for regulatory action, and for developing industry best practices.

Although the average trend is for less incidents to occur, those individual incidents that do occur do have a tendency to have larger impacts owing to the complex interdependencies between not only the telecommunications and power supply sectors but also to the interconnections between all the critical infrastructures of the country. All governmental agencies and business operations rely more heavily than ever on communications technologies for daily operations. The transportation sector requires electricity and communications to (i) pump gasoline and fuels, and (ii) manage traffic signals and video monitor freeway traffic. Internet commerce has bloomed and relies on the telecommunications network not only to take orders and relay instructions to their warehouses in the U.S. and overseas, but also to monitor and manage the on-time delivery of products. Industries and businesses have embraced just-in-time inventory, Internet sales, billing and other practices that are heavily dependent on reliable telecommunications networks.

References:

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2. *NRSC (Network Reliability Steering Committee) Annual Report 2004*, prepared by ATIS (Alliance for Telecommunications Industry Solution) and NRSC (Network Reliability Steering Committee) http://www.atis.org/nrsc, May 1999.
3. *Vulnerability Assessment of the Operations Support (OSS) Infrastructure of the Public Telephone Network,* prepared by Telcordia for NCS (National Communications System) under Contract DCA100-03-C-4016, May 2005.
4. *Critical Infrastructure Protection – The Electricity Sector*, presentation by the North American Electric Reliability Council (NAERC) at the *Emergency Power Conference* in November 2004.
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6. GR-513 , *LSSGR (LATA Switching System Generic Requirements) – Section 13 Power*, Telcordia Generic Requirements (GR) document, September 1995.
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8. *Communications Vulnerabilities and Mitigations in Wind Power SCADA Systems*, by W.J. Young, J.E. Stamp, J.D. Dillinger and M.A. Rumsey, presentation at the *American Wind Energy Association WINDPOWER 20003 Conference* (Austin TX), May 19, 2003.
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10. *"U.S. Commercial 120 Volt AC Power Quality: A Current Assessment"*, Telcordia/Bellcore Proprietary Report (TM-NWT-022263) by A.L. Black December 1992.
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    b. 2006 – Disturbance Index – Public - Energy Information Administration, www.eia.doe.gov
13. *Dirty Power and Its Effect on Bandwidth*, by D. McCarty, Page 10, *OSP (Outside Plant) Magazine*, June 2007.
14. *What power Quality Can You Expect From Your Utility,* M. McGranaghan (EPRI)), page 20, *EC&M Magazine*, June 2003.
15. *The Effect of Solar Flares and Magnetic Storms on Telecommunications Service,* by D. Barr, Vol.4, No.1, *Technical Notes from the Office of the Manager* – National Communications System (NCS) – Feb. 1997.
16. *Advanced Power Sources for Emergency Telecommunications Applications*, by I. Bloom, presentation at *Emergency Power Conference* (Washington DC Nov. 2004).

Appendix Q: Workshop Responses on Definitions

1. Small Business Customer

In a revised ruling, filed on 06-19-07[301], the Assigned Commissioner (Timothy A. Simon) proposed that for the purposes of responding to CPUC's Informational Request 1, the following working definition was adopted and used:

> "***Small business customer***" is defined as a business customer with no more than five access lines, none of which belongs to a larger entity."

In pursuit of a lasting definition, the following question (Category E: Question #9) was included in Informational Request 1:

> "Regarding the working definition for "small commercial/business customer" that was adopted for this information request[302]:
>
> a. Do you believe this is an appropriate definition for the Order Instituting Rulemaking (OIR) to implement Assembly Bill (AB) 2393?
> b. If not, what definition would you propose and what is your rationale?"

In their responses to Question 9 of the Information Request 1, industry expressed the following positions:

AT&T: AT&T responded as following to the above questions:

a. AT&T responded "No" to the interim definition (see footnote) for "small commercial/business customer" proposed by the ALJ for the purposes of responding to the CPUC informational request.

b. The FCC requires carriers to fill out FCC Form 477- Local Competition Report twice a year for the purpose of determining competition in the Local marketplace. The FCC historically measured small business lines on FCC Form 477, and in that context defined "used for residential and small business service" as those switched access lines that connect to customer locations for which the reporting carrier bills fewer than four (4) voice-grade equivalent lines used for local exchange service. AT&T supports this definition because it establishes a consistent, federal standard.

Comcast: Comcast responded that "it supports the working definition of small business described at the workshop."

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301 http://www.cpuc.ca.gov/EFILE/RULINGS/69259.htm .

302 For the purposes of responding to the informational request, "small business customer" is defined as a business customer with no more than five access lines, none of which belongs to a larger entity (http://www.cpuc.ca.gov/EFILE/RULINGS/69259.htm).

2. Definition of Emergency Usage

The problem placed in front of the CD was to find a definition of "emergency usage" that will be widely accepted. To research this question, the following question (Category E: Question #10) was included in Informational Request 1:

> "If your company or organization has a definition for the term "emergency usage", what is it?
> a. How does that definition apply to the OIR to implement AB 2393?
> b. If not, do you want to propose a definition for "emergency usage" that should apply to this OIR to implement AB 2393?

In their responses to Question 10 of the Information Request 1, industry expressed the following positions:

Cox: Cox proposes the following definition for "emergency usage:"

> "A situation requiring an immediate response from public safety, law enforcement or media emergency personnel, contacted via a PSAP[303] by means of dialing 911, which is available during a non-catastrophic commercial power outage."

AT&T: AT&T proposes that "emergency usage," as that term refers to the types of telephone calls to be made during an emergency, should include only health and safety related telephone calls.

SureWest: SureWest believes the definition for the term "emergency usage" is a 911 call or similar emergency use of the phone to contact police, medical or fire departments.

Verizon: This Rulemaking should be concerned with a customer's ability to make a 911 call during an emergency.

Given that the industry responses are in basic agreement that usage involves E-911 calls, any of the above definitions is acceptable. The definition proposed by Cox seemed to have a better legal and technical wording that the other responses and it may be a better candidate for adoption among the other responses.

[303] Public Safety Answering Point

Appendix R: Workshop Responses on Consumer Awareness and Education

Based on the information received, one of the benefits will be that important information could be posted on the "California's Consumer Education Information" website (http://www.calphoneinfo.com/) regarding the battery back-up systems at residential and small commercial customer premises (e.g., choices the consumers can make about technologies providing telephone service during emergencies, back-up power equipment in their homes, service provider vs. customer responsibilities for maintaining back–up power at customer premises, etc.).

Problem Definition: How and to what degree do you educate the consumer (i.e., residential and small commercial customers) on what happens to his/her telecommunications service in case of a power outage? (*Note:* We address the case of emerging network technologies that require backup source of power to be installed at the customer premises)?

Background Information: The topic of "Consumer Awareness and Education" on issues discussed in the AB 2393 was addressed at the Pre-workshop questions, the Workshop presentations on June 5, 2007, and the responses to CPUC Information Request 1. The following pages contain highlights and a summary list of the comments made during those proceedings.

1) Summary of Remarks Made at the June 5, 2007 Workshop

- How should we educate the hearing-impaired customer on cases like the ability to:
  - Change the BBU settings for the defaults to continue battery backup to the data ports.
  - Depress the BBU emergency use button ("blue button") and get that one more hour of phone use.
- There are extensive leave-behind brochures left with the customer with requests for them to review the documentation, plus it is available on websites.
- Big, thick manuals with detailed information inside may not be effective without some kind of quick start kind of manuals, which highlight features like the FiOS "blue button".
- The service providers should make sure that they give adequate information to consumers who might have a medical condition (and thus need to have phone connectivity) about options that they would have to extend the life of the battery in their home if they need emergency phone service beyond 8 hours in a major emergency.
- One approach to educate the consumer is to have some industry-provided voluntary plans about how they expect to do that.
- Since it is very early in the deployment cycle of the backup batteries at the customer premises, the service providers have not seen a lot of these replacements. However, this will become a major consumer issue that customers need clear information about potential backup power choices.
- The consumer education material should made clear that, by choosing voice services based on certain emerging technologies the consumer need to:
  - Take the responsibility for their own devices at customer premises
  - Understand when they're using devices that need backup power

- ➢ Take responsibility for the battery backup devices (if they are in a situation where their service provider is not taking on that responsibility.)

- Solicit industry participation on drafting the actual text that will be posted on the www.calphoneinfo.com .
  - ➢ The industry, in a partnering arrangement, will volunteer the first draft of the text,
  - ➢ Pass the draft text to Acting Director of Consumer Service and Information Division (CSID)
  - ➢ Commission will take the "care-taker" position of the proposed text and post it on the website.
- May be, having an audible ringing on battery backups should not be considered as given.
- When the backup battery at the customer premises is not supported by the service provider after the initial installation, the "uninformed client" may be frustrated in trying to troubleshoot a loss of service problem during a power outage.

2) Responses to Informational Request 1: ***People with Disability - Special Needs***

DisabRA, in its response to CPUC's Information Request #1, stated that it is extremely important for all service providers to do substantial outreach to consumers regarding the nature of telecom services provided via those emerging technologies. Based on DisabRA's experience, most consumers with such telecom service are unaware that if the power goes out, their voice service will not function unless they have a backup power source (e.g., a charged battery). Even if consumers know there is a need for backup power with such network technologies, they are unlikely to know:

- Where the backup power source is located at the customer premises,
- How long the battery will last, how to change the battery,
- When to change the battery, and
- Where to get a new battery.

To meet the special needs of people with disabilities, DisabRA suggested that there must be substantial public education on these issues. It also stated that:

- It is imperative that all educational materials that are distributed to consumers be made available in accessible formats, such as Braille or large print.
- If informational materials regarding back-up power are provided on a website, the provider must ensure that the website is accessible to blind people who use screen reading software.
- If information is generally provided orally upon installation, service providers must ensure that written materials are distributed upon installation for people who are deaf or hard of hearing.
- If there is a demonstration during installation, appropriate efforts must be made to convey the information to blind people.
- It has developed a general guide on accessible communications for utilities, which will be helpful to service providers as they develop their consumer education materials for telecom services based on these emerging network architectures.

3) Industry Positions:

In their responses to the Information Request #1, industry expressed the following positions:

Cox: Cox complies with the FCC's 2005 decision issued in its IP-enabled Services proceeding (FCC 05-116). This decision requires customer disclosure concerning battery back-up systems at the customer premise. Such information is provided to consumers in many different formats, including:

(a) in advertising and marketing materials, including product brochures and Cox's website;

(b) during the sales process;

(c) via a sticker to be placed on the telephone modem; and

(d) in welcome information.

Below is a sample of the language that Cox may use during the sales process:

> *"During installation, you will receive network equipment provided by Cox for your phone service. Please be advised that this equipment has a battery backup that will operate for up to 8 hours in case of power outage. E-911 service will be available during this time unless the equipment has been disconnected or tampered with. It is also very important that you contact Cox before the equipment is moved, either within your home or to another residence. This makes sure that E911 can locate you in case of emergency".*

AT&T: AT&T objects that, pursuant to Public Utilities Code section 776(a), non-facilities-based IP Telephony is not within the scope of this proceeding. Without waiving that objection, AT&T responds that it currently offers non-facilities-based IP Telephony to residential and small business customers through its suite of AT&T CallVantage products. AT&T informs the customer that their IP Telephony service will not work in the event of a power outage. In general, AT&T's recommendation is that the customer should always have an alternative means of accessing traditional wireline services from their home or travel locations. AT&T provides information about service outages in its Subscriber Agreement (https://www.callvantage.att.com/cvterms) and in the section of its website that addresses 911 service (http://www.usa.att.com/callvantage/911/index.jsp). The scripts provided to AT&T customer service representatives for their conversations with customers also cover service outages.

Small LECs: The Small LECs do not generally offer services that require individualized backup power on customer premises. To the extent that the Small LECs do offer these types of services, the need for backup power is explained to customers. The Small LECs have different ways of monitoring and replacing the batteries used to supply backup power on customer premises.

SureWest: SureWest Response: SureWest does not offer IP telephony at this time. If and when this type of service is offered, SureWest would offer battery back-up as an option to the customer.

Verizon: Verizon's voice over Internet Protocol product is called VoiceWing and is an over the top service. As detailed below, Verizon's VoiceWing website informs customers in numerous ways that VoiceWing will not work during a power outage and offers an option to select a back-up phone number for incoming calls, where calls are routed in case of a power outage. See (https://www22.verizon.com/CustomerHelp/CGI-BIN/SmartHelp.asp). See original comments for additional information.

Comcast: Comcast educates the customer on the purpose of the back up battery in the eMTA. In addition, a welcome kit as well as a CD is left with the customer who has information on the operation of the eMTA.x.

4) Generic Information for CPUC's "Consumer Education Information" Website

Topic: Battery Backup Systems at Residential and Small Commercial Customer Premises

- Choices the consumers can make about technologies providing telephone service during power outages
- List and description of backup power equipment at the customer premises
- Service provider vs. customer responsibilities for maintaining backup power at customer premises
  - Three types of ownership regarding the backup power equipment (Cable Companies, AT&T, and Verizon)
- Battery replacement information: Where is this information contained (e.g., script for installation personnel, customer installation booklet, customer representative script, instruction manual)?
- A plan to address the "tsounami" of service calls in 3-5 years when the first wave of batteries will need replacement. (i.e., a descriptive and illustrative guide for the consumer to make the right decision at that time depending on what battery products are in the markets – technologies, price ranges, compatibility, supply stores, etc.
- Helpful "Customer Checklists" tailored for people with special needs
  - Example: The "Verizon FioS TV Checklist"; they may add a specific item about the backup power)

5) Examples of Currently Used Text

CPUC is taking a leadership role to update the www.calphoneinfo.com website. The links (URLs) below demonstrate actions by the CPUC in the areas of telephone use in emergencies and during a power outage. For the reader's convenience, we also include the corresponding text from the website below.

Example FAQ: Will My Phone Work In A Power Outage?

http://www.calphoneinfo.ca.gov/070905_phonepower.htm

"Due to ongoing changes in technology, it is important to know the potential impact of a power outage on your telephone service. Depending on the type of phone service you have, you may or may not have service in the event of a commercial power failure. You should contact your service provider as soon as possible for information about the ability of your service to work during a power outage.

It is IMPORTANT to be aware of the following:

Traditional Telephone Service: during a power outage, your telephone service will still be operational. However, if you have telephone equipment that requires you to plug it into an electrical outlet in order to make and/or receive calls such as a cordless phone, it may not work during a power outage. This may limit your ability to make phone calls from your home during such an event.

Voice over Internet Protocol (VoIP): if you have VoIP service, depending on whether you have a back-up battery, you may not have phone service when there is a loss of power. As the provision of a back-up battery varies from service provider to service provider, it is important that you contact your provider to determine how your service may be affected.

Cable Phone Services: most cable phone service providers supply customers with back-up batteries that last up to 8 hours during a commercial power failure. Those that provide batteries often monitor the battery's life and alert users when and how to replace the existing battery. Since practices differ between providers, it is important that you ask your provider if your phone service would be interrupted when an outage occurs and what your responsibility is to assure you have functional backup power.

Fiber-to-the-Premises (FTTP): if you have phone service over a FTTP connection, your phone service will not be functional during a power outage unless you have a back-up battery in your home. Again, it is important that you contact your provider to determine how your service may be affected and what your responsibility is to assure your service is operational in a power outage."

Example FAQ: Telephone Use in Emergencies

http://www.calphoneinfo.ca.gov/phoneuseinemergencies.htm

Your telephone can be a life-saving tool in emergencies. You can call 911 and other emergency services and receive calls and text messages alerting you of emergencies or child abductions. But when there is an emergency, we all need to remember to avoid using our phones for non-emergencies so that the systems will remain open to handle the emergency calls, including the ones the fire department, police, and other emergency services must make to respond to the emergency.

Regardless of which phone company you subscribe to or if you use a wireless or wired phone, no system is designed to handle everyone's call if we all try to use our phones at the same time. Also, emergencies like earthquakes, storms and fires can disable telephone towers and lines.

Do not call 911 to repeat or verify emergency announcements and avoid all but the shortest calls or text messages to check in with your loved ones. Instead, turn on your television or radio or talk to your neighbors for news on the emergency or to verify whether your area should be evacuated. Portable radios, TVs, and batteries for them, can be purchased for very little money and should be a part of your emergency kit.

Some cities and counties in California have emergency systems which will contact residents to alert them about an emergency. **Click here** for a partial list of cities and counties in California whose emergency notification systems are capable of sending text-based messages to alternative communication devices. This list is merely a guide and is not intended to provide information about the way in which these systems are actually being utilized. Also since cities and counties may change their systems or procedures, you should contact yours directly to find out more information on what yours offers.

Upon request, you can receive California Highway Patrol alerts of child abductions. If you would like more information about this free service or want to subscribe, click on this link: child abductions.

Disabled Consumers

If you are a person with a disability who cannot access television or radio announcements, you should continue to use your phone or computer to get more information, but try to limit your calls or the length of the conversation or text message to help keep the phone lines open. Remember that the phone lines may be out of order and plan ahead. We suggest you contact a friend or relative who lives near you who will keep you informed about the emergency and come to your aid, if necessary.

People with disabilities should also know that many telephone emergency notification systems are capable of sending text-based messages to communication devices, such as TTYs, pagers, cell phones, and personal digital assistants (PDAs). You should check whether your city uses such a system. If so, you must register with the city so that it has the contact information for your communication device. Unless you register, it is unlikely you will receive an emergency notification.

Limited English speaker

Of course, if you are a person who does not understand English, and do not have access to a radio or TV station which speaks your language, you should continue to use your phone or computer to get more information. But remember that the phone lines may be out of order and plan ahead. We suggest you contact a friend or relative who can translate information from television or radio. Establishing a pre-arranged "buddy list" of people in your neighborhood that would be willing to come to your aid and provide you with up to date media reports will be helpful and reduce your dependency on completing network phone calls.

Limited English speakers with Internet access can use free text translation websites such as **Google**.

6) Examples from Service Providers

Below is a sample of the language that Cox may use during the sales process:

> "During installation, you will receive network equipment provided by Cox for your phone service. Please be advised that this equipment has a battery backup that will operate for up to 8 hours in case of power outage. e911 service will be available during this time unless the equipment has been disconnected or tampered with. It is also very important that you contact Cox before the equipment is moved, either within your home or to another residence. This makes sure that e911 can locate you in case of emergency."

If Cox and the other service providers "volunteer" similar text to the above one for the difference frequently asked questions (FAQs), then CPUC may take the lead to tailor text for the www.calphoneinfo.com website.

7) Samples of Possible Answers for FAQ

- **Why the backup battery was installed?**
  Answer: Backup batteries are primarily provided for basic and emergency telecommunications services to 911, hospitals, police, fire and other critical services.

- **How long can telephones operate under backup power?**
  Answer: It depends. An old style wireline phone with no AC power connection will operate during a power outage since the service is backed up at both the CO with generator and RT with batteries. A cordless phone will lose service immediately the AC power is lost from the charger/base-station unit. An intelligent phone (multi-line) that runs off AC power may keep operating on main line with help

from an internal battery. The only way to be sure is disconnect the phone and test if one has service and how long it is kept. It is best to test when AC power is available and other phone lines are available in the house. Checking when a power outage has occurred is too late.

- **During power outages can they call E-911 if no backup power system is present?**

  Answer: The capability and limitations of whatever telecommunications service provided to a customer should be clearly explained at several times in the business process – (a) during advertising and marketing, (b) at time of purchase, and (c) at time of installation. Generic consumer information should be posted on the service provider's website and the "California's Consumer Education Information" website (http://www.calphoneinfo.com/) regarding the battery back-up systems at residential and small commercial customer premises. The information would include the possible choices the consumers can make about technologies providing telephone service during emergencies, back-up power equipment in their homes, service provider vs. customer responsibilities for maintaining back–up power at customer premises, etc.).

- **What the maintenance requirements are for such backup power systems?**
  Answer: Service providers will often provide a guarantee (maybe 1 year) however; the customer is usually responsible for maintaining the battery. Some providers will often assistance (for a fee) in monitoring battery performance remotely and alerting the customer of low battery condition. Batteries will require replacement probably every 3 to 4 years (on average). The customer needs to have a means to test the battery which is usually the status light on the BBU. The customer can replace the battery themselves or in these early deployment days, service provider may offer this as a service either free or for a service charge.

- **What are the potential risks from such backup power systems?**
  Answer: There are thermal runaway and fire risks for some battery technologies and related environmental hazard during any cleanup from a release of battery components. Lead acid batteries may malfunction and experience thermal runaway with release of acid electrolyte. Lithium based batteries can experience fires as documented in the press and in the latest Department of Transportation rules concerning carrying of laptop batteries on airlines. These risks are minimized with the use of quality batteries and the use of battery make/model specified by the service provider. Often the electronics in a set-top-box or broadband power backup unit (BBE) are designed for a particular battery type and model. Substitutions with a different battery can compromised the backup capacity in terms of hours of use as well as the safety of the battery system.

- **Where to find information to Frequently Asked Questions (FAQs) regarding these backup batteries?**
  Answer: The information should be available in number of places and provided to the customer a number of times including – (a) service provider help line, (b) service agreement and product literature, (c) service provider's web page, and (d) the battery manufacturer's website. The customer should be provided this information in bill inserts, at time of purchase, and at time of installation.

- **Who to contact for information?**
  Answer: The consumer should first try the service provider help desk or website. The service provider should be able to remotely test the battery through a live operator or through an automated system. The information should be available in number of places and provided to the customer a number of times including – (a) service provider help line, (b) service agreement and product literature, (c) service provider's web page, and (d) the battery manufacturer's website. The customer should be provided this information in bill inserts, at time of purchase, and at time of installation.

- **Can I obtain additional backup capacity?**
  Answer: The consumer may purchase additional batteries to enhance their backup capability, different high-capacity batteries or a UPS system. These options may be available from the service provider as options at the time of purchase and installation of the service. However, a UPS and different batteries may require different power interface electronics or hardware. The CPUC may wish to consider requiring a feature in any backup power unit so as to accept connection of additional power.

- **How can I extend backup capacity?**
  Answer: The consumer can decrease load on the battery by making sure all devices are in standby, idle or automatic turn-off modes to conserve energy or devices with Energy-Star ratings. To further enhance the capacity the battery should be located where it shall not experience excessive diurnal temperature fluctuations or be exposed to cold outside winter temperatures.