STATE OF CALIFORNIA ARNOLD SCHWARZENEGGER, *Governor*

PUBLIC UTILITIES COMMISSION
505 VAN NESS AVENUE
SAN FRANCISCO, CA 94102-3298

May 3, 2004

Agenda ID #3523and 3524
Ratesetting

TO: PARTIES OF RECORD IN APPLICATION 01-02-024 ET AL.

RE: NOTICE OF AVAILABILITY OF PROPOSED DECISION AND ALTERNATE PROPOSED DECISION IN ESTABLISHING REVISED UNBUNDLED NETWORK ELEMENT RATES FOR PACIFIC BELL TELEPHONE COMPANY DBA SBC CALIFORNIA

Consistent with Rule 2.3(b) of the Commission’s Rules of Practice and Procedure, I am issuing this Notice of Availability of the above-referenced proposed decision and alternate decision. The proposed decision was issued by Administrative Law Judge (ALJ) Duda on May 3, 2004 and the alternate decision was issued by Commissioner Wood on the same day. An Internet link to these documents was sent via e-mail to all the parties on the service list who provided an e-mail address to the Commission. An electronic copy of these documents can be viewed and downloaded at the Commission’s Website (www.cpuc.ca.gov).

Any recipient of this Notice of Availability who is not receiving service by electronic mail in this proceeding may request a paper copy of the above documents from the Commission's Central Files Office, at (415) 703-2045; e-mail cen@cpuc.ca.gov.

This is the proposed decision of ALJ Duda, previously designated as the principal hearing officer in this proceeding and the alternate decision of Commissioner Wood. They will not appear on the Commission’s agenda for at least 30 days after the date they are mailed. This matter was categorized as ratesetting and is subject to Pub. Util. Code § 1701.3(c). Pursuant to Resolution ALJ-180, a Ratesetting Deliberative Meeting (RDM) to consider this matter may be held upon the request of any Commissioner. If that occurs, the Commission will prepare and mail an agenda for the RDM 10 days before hand. When an RDM is held, there is a related ex parte communications prohibition period.

When the Commission acts on the proposed decision or alternate decision, it may adopt all or part of these decisions as written, amend or modify them, or set them aside and prepare its own decision. Only when the Commission acts does the decision become binding on the parties.

Parties to the proceeding may file separate comments on the draft decision and alternate decision, as provided in Article 19 of the Commission's "Rules of Practice and Procedure." These rules are accessible on the Commission's website at http://www.cpuc.ca.gov. Pursuant to Rule 77.3 opening comments shall not exceed 25 pages, and reply comments shall not exceed 10 pages.

Consistent with the service procedures in this proceeding, parties should send separate comments on the proposed and alternate decisions in electronic form to those appearances and the state service list that provided an electronic mail address to the Commission, including ALJ Duda at dot@cpuc.ca.gov. and Commissioner Wood's advisor Jonathan Lakritz at jol@cpuc.ca.gov. Service by U.S. mail is optional, except that hard copies should be served separately on ALJ Duda and Commissioner Wood, and for that purpose I suggest hand delivery, overnight mail or other expeditious methods of service. In addition, if there is no electronic address available, the electronic mail is returned to the sender, or the recipient informs the sender of an inability to open the document, the sender shall immediately arrange for alternate service (regular U.S. mail shall be the default, unless another means – such as overnight delivery is mutually agreed upon). The current service list for this proceeding is available on the Commission's Web page, www.cpuc.ca.gov.

/s/ ANGELA K. MINKIN
Angela K. Minkin, Chief
Administrative Law Judge

ANG:avs

Attachment

Decision **PROPOSED DECISION OF ALJ DUDA (Mailed 5/3/2004)**

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Joint Application of AT&T Communications of California, Inc. (U 5002 C) and WorldCom, Inc. for the Commission to Reexamine the Recurring Costs and Prices of Unbundled Switching in Its First Annual Review of Unbundled Network Element Costs Pursuant to Ordering Paragraph 11 of D.99-11-050.	Application 01-02-024 (Filed February 21, 2001)
Application of AT&T Communications of California, Inc. (U 5002 C) and WorldCom, Inc. for the Commission to Reexamine the Recurring Costs and Prices of Unbundled Loops in Its First Annual Review of Unbundled Network Element Costs Pursuant to Ordering Paragraph 11 of D.99-11-050.	Application 01-02-035 (Filed February 28, 2001)
Application of The Telephone Connection Local Services, LLC (U 5522 C) for the Commission to Reexamine the Recurring Costs and Prices of the DS-3 Entrance Facility Without Equipment in Its Second Annual Review of Unbundled Network Element Costs Pursuant to Ordering Paragraph 11 of D.99-11-050.	Application 02-02-031 (Filed February 28, 2002)

Application of AT&T Communications of California, Inc. (U 5002 C) and WorldCom, Inc. for the Commission to Reexamine the Recurring Costs and Prices of Unbundled Interoffice Transmission Facilities and Signaling Networks and Call-Related Databases in Its Second Annual Review of Unbundled Network Element Costs Pursuant to Ordering Paragraph 11 of D.99-11-050.	Application 02-02-032 (Filed February 28, 2002)
Application of Pacific Bell Telephone Company (U 1001 C) for the Commission to Reexamine the Costs and Prices of the Expanded Interconnection Service Cross-Connect Network Element in the Second Annual Review of Unbundled Network Element Costs Pursuant to Ordering Paragraph 11 of D.99-11-050.	Application 02-02-034 (Filed February 28, 2002)
Application of XO California, Inc. (U 5553 C) for the Commission to Reexamine the Recurring Costs of DS1 and DS3 Unbundled Network Element Loops in Its Second Annual Review of Unbundled Network Element Costs Pursuant to Ordering Paragraph 11 of D.99-11-050.	Application 02-03-002 (Filed March 1, 2002)

OPINION ESTABLISHING REVISED UNBUNDLED NETWORK ELEMENT RATES FOR PACIFIC BELL TELEPHONE COMPANY DBA SBC CALIFORNIA

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OPINION ESTABLISHING REVISED UNBUNDLED NETWORK ELEMENT RATES FOR PACIFIC BELL TELEPHONE COMPANY DBA SBC CALIFORNIA

I. Summary

This proceeding, known as the "UNE Reexamination," was initiated following formal requests by carriers interconnected with Pacific Bell Telephone Company d/b/a SBC California (hereinafter SBC-CA)[1] for the Commission to reexamine certain prices that SBC-CA charges competitors who purchase "unbundled network elements" (UNEs).[2] By purchasing UNEs, competitors are able to use portions of SBC-CA's network to offer competitive local exchange services.

In this decision, the Commission adopts updated and final rates for the following UNEs: loops (including deaveraged rates for 2-wire, DS-1 and DS-3 loops), switching, dedicated transport, signaling system 7 (SS7) links, and the DS-3 entrance facility without equipment.[3] The newly adopted rates for the most frequently discussed UNEs are:

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[1] To avoid confusion, we will generally refer to Pacific Bell Telephone Company (Pacific) as SBC-CA because much of the record in this case references "SBC Pacific" and "SBC California" rather than Pacific. We will refer to the parent company of SBC-CA as simply, "SBC."

[2] *See* Appendix D for a glossary of all acronyms used in this order.

[3] *See* Appendix A for a complete list of the rates adopted in this order.

Table 1

Adopted UNE Rates

UNE	Adopted Rate[4]
Average 2-wire Loop	$12.92
Average DS-1 Loop	$45.75
Average DS-3 Loop	$432.76
2-wire port	$2.64
UNE-Platform[5]	$16.90

The rates in today's order replace interim rates for loops and switching that were set in Decision (D.) 02-05-042.[6] The rates in today's order for other UNEs, namely dedicated transport, SS7 links, and the DS-3 entrance facility without equipment, replace rates originally adopted in D.99-11-050.

In adopting today's rates, the Commission considered two divergent cost models offered by the parties to this proceeding. SBC-CA proposed updated UNE rates based on a series of cost models that it has developed for use in the 13 states in which its parent corporation, SBC, operates. AT&T Communications of California, Inc. (AT&T) and WorldCom, Inc. (WorldCom) (hereinafter referred to as "Joint Applicants" or "JA") proposed updated UNE rates based on the latest version of the HAI Model, known as HM 5.3. The proposals of the parties

4 These rates include a 21% shared and common cost markup, as adopted in D.02-09-049.

5 UNE-Platform (UNE-P) refers to the combination of a 2-wire loop, 2-wire port, and switching UNEs.

6 All of SBC-CA's UNE rates were further adjusted by D.03-07-023, which implemented an adjustment to SBC-CA's shared and common cost markup.

differed greatly from each other and from the interim UNE rates currently in place as seen in the table below.[7]

Table 2

Comparison of Proposals

UNE	SBC-CA Proposal	JA Proposal	Interim Rate[8]
Average 2-wire Loop	$23.86	$5.24	$9.82
2-wire Port	$3.13	$1.28	$0.83
Switching Usage	$3.34	$1.57	$3.28
UNE-P	$30.33	$8.09	$13.93

After careful review of the competing cost models filed by SBC-CA and JA, the Commission finds that it cannot rely on either model alone to set UNE rates because of flaws in both models. The principal flaws with SBC-CA's models are that they rely too heavily on SBC-CA's embedded network configuration and costs and that we are not able to modify many of its inputs to overcome this flaw. The principal flaws with HM 5.3 are that we did not agree with certain of its input assumptions, particularly those related to clustering of customers into distribution areas, certain labor inputs, and the interoffice transport network. We were unable to modify these particular input assumptions.

It was not possible, given the time constraints and the resources required by this proceeding, to fix all of the flaws identified in either model. Because both models were flawed, we could not rely on either model by itself to establish UNE

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[7] For a complete comparison of the SBC-CA and JA UNE rate proposals, *see* Appendix B.

[8] Interim rates initially adopted in D.02-05-042 and modified by D.03-07-023.

rates. To the extent possible, the Commission has modified both models to run with common inputs. As we modified these models and their inputs to resolve the many disputes and to bring the models in line with Commission precedent, federal requirements, and additional rationale we develop herein, we found that the resulting cost outputs of the models converged. In a few cases, the results converged to the point of becoming nearly the same. The degree of this convergence provides us additional confidence that the rates we adopt today are valid results, given our charge in this proceeding.

Based on our observation that the divergent model results converged as we corrected them, we determine that reasonable UNE rates lie within the zone created by the two models' results. The Commission adopts the midpoint of this range for the final UNE rate.

Some of the key modeling inputs used for the Commission's model runs include a 9.9% cost of capital, asset lives based on those adopted by the Federal Communications Commission (FCC), and a 51.6% copper distribution fill factor. The Commission's model runs include several inputs and assumptions proposed by SBC-CA, including plant mix, labor rates, Lucent and Nortel switch vendor assumptions, and a 12,000-foot crossover point. Furthermore, today's order adopts a flat-rate structure for the switching UNE wherein all switching costs are incorporated into one flat monthly port price, as proposed by JA.

As set forth in D.02-05-042, SBC-CA must adjust, or "true up" the interim rates it charged for its UNEs to the new rates adopted in this order. In other words, SBC-CA must calculate whether the previous interim rates were higher or lower than these newly adopted rates, and whether it has over or under-collected the appropriate revenues for any UNEs it sold at interim rates.

Finally, this order modifies the annual nomination process originally established in D.99-11-050 to suspend further review of SBC-CA's UNEs until February 2007.

II. Background

Over a decade ago, the Commission initiated a rulemaking and investigation to determine the costs for the basic network functions of Pacific Bell (now SBC-CA) and GTE of California (now Verizon) in order to set "unbundled" prices for competitors to purchase access to these network functions. (*See* Rulemaking (R.) 93-04-003 and Investigation (I.) 93-04-002 to Govern Open Access to Bottleneck Services and Establish a Framework for Network Architecture Development of Dominant Carrier Networks, hereinafter "OANAD proceeding.") After passage of the Telecommunications Act of 1996, the terminology shifted from the "basic network functions" defined in the original rulemaking to "network elements" as defined by the Federal Communications Commission (FCC). (47 C.F.R. Section 51.5.) Network elements are now commonly referred to as "unbundled network elements," or UNEs.

In D.99-11-050, the Commission set prices for UNEs offered by Pacific. The prices were based on costs developed using the Total Element Long Run Incremental Cost (TELRIC) methodology, as set forth by the FCC in 1996.[9] In D.99-11-050, the Commission recognized that the TELRIC costs adopted by the Commission in 1998 (D.98-02-106) and used to set prices in D.99-11-050 were

[9] *In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996* (CC Docket No. 96-98); First Report and Order, FCC No. 96-325, 11 FCC Rcd 15499, (rel. Aug. 8, 1996) ("First Report and Order").

"based largely on data that has not been updated since 1994," and "there is evidence that some of these costs may be changing rapidly."[10]

Accordingly, the Commission established a process in D.99-11-050 that invited carriers with interconnection agreements with Pacific to annually nominate up to two UNEs for consideration of their costs by the Commission. The decision required that a party nominating a UNE for review must include a summary of evidence demonstrating a cost change of at least 20% (up or down) from the costs approved in D.98-02-106 for the UNE to be eligible for nomination.

A. 2001 UNE Nominations

This proceeding, known as the "UNE Reexamination," was initiated following formal requests by carriers to review particular UNEs according to the process established in D.99-11-050. In February 2001, the Commission received nominations for review of four UNEs. In a June 2001 scoping memo, the Assigned Commissioner and ALJ found sufficient justification to accept two of the four UNE nominations, namely the requests to review unbundled switching contained in A.01-02-024 and unbundled loops in A.01-02-035. The scoping memo set a schedule for Pacific to file updated switching and loop cost studies, and specified that competing cost models from other parties would not be allowed. A July 2001 ruling by the Assigned Commissioner and ALJ reiterated that competing models would not be considered as long as Pacific's cost filing met three criteria. Specifically, Pacific's cost filing must allow parties to: reasonably understand how costs are derived, replicate Pacific's calculations, and to modify inputs and assumptions.

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[10] D.99-11-050, *mimeo.*, p. 168.

Controversy ensued regarding whether Pacific's filing met the three criteria set forth in the July 2001 ruling. In August 2001, Joint Applicants filed a motion for interim UNE rate relief, arguing for interim reductions to unbundled loop and switching rates due to delays caused by alleged inadequacies in Pacific's cost filings. In response to the motion, the Assigned Commissioner and ALJ ruled that interim relief appeared justified, but only after further filings addressing the exact amount and nature of interim UNE rate reductions.

In D.02-05-042, the Commission found that interim UNE rates for unbundled loops and switching were warranted. The Commission adopted an interim loop discount of 15.1% from Pacific's then current basic 2-wire loop price. For unbundled switching, the Commission adopted an interim rate discount of 69% for local switching and 79% for tandem switching based on rates proposed for Pacific's affiliate, SBC Ameritech, in Illinois. The interim rates are subject to adjustment, either up or down, from the effective date of D.02-05-042 until final rates are adopted. The UNE Reexamination proceeding remained open for the Commission to review new cost study filings to set final rates for unbundled loops and switching.

B. 2002 UNE Nominations

In February and March 2002, the Commission received four additional nominations for review of specific UNEs. In a June 2002 scoping memo, the Assigned Commissioner and ALJ found sufficient justification for review of DS-3 Loops (Application (A.) 02-03-002), the DS-3 Entrance Facility without Equipment (A.02-02-031), Dedicated Transport and SS7 Links (A.02-02-032). Review of the UNEs in these applications was consolidated with the ongoing 2001 UNE Reexamination and a schedule was set for the 2001/2002 UNE

Reexamination to allow the filing of cost studies for permanent UNE rates for all of the UNEs under review.

SBC-CA and Joint Applicants filed competing cost models on October 18, 2002.[11] On the same date, the United States Department of Defense and all other Federal Executive Agencies (DOD/FEA) filed an opening declaration by its witness Richard Lee on the issue of depreciation. The Commission held a Technical Workshop in December 2002 to allow parties to present an overview of their proposed cost models and to allow staff and parties to ask questions of key cost modeling experts. Reply comments on the cost model filings were filed on February 7, 2003[12] by the Communications Workers of America District 9 (CWA), DOD/FEA, Joint Applicants, the Office of Ratepayer Advocates/The Utility Reform Network (ORA/TURN), Pac-West Telecomm Inc. (PacWest), SBC-CA, XO California, Inc. (XO), and Z-Tel Communications Inc. (Z-Tel).[13] Rebuttal comments were filed on March 12 by CWA, DOD/FEA, Joint Applicants, ORA/TURN, PacWest, SBC-CA, and XO.[14]

In an April 4 ruling, the ALJ determined that five factual disputes in the parties' filings required evidentiary hearings, which were held on April 14 through 17, and continued on June 24. The hearings were limited to issues surrounding Integrated Digital Loop Carrier (IDLC) systems, specific features of

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[11] Joint Applicants filed notices of errata to their cost model and opening supporting materials on 11/6/02, 12/13/02, and 1/21/03.

[12] This and subsequent dates are 2003 unless otherwise noted.

[13] SBC-CA filed errata to its reply comments on 2/10/03 and a second errata on 2/26/03. Z-Tel filed an errata on 2/18/03, and TURN filed an errata 2/18/03.

[14] Errata to rebuttal comments were filed by Joint Applicants on 3/28/03 and 4/11/03, and by SBC-CA on 5/1/03.

Siemens switches, SBC-CA's contract for installation of digital loop carrier equipment, and aspects of SBC-CA's switching contracts with regard to capacity, and feature hardware and software. In addition to the evidentiary hearing limited to these five disputed issues, the ALJ and Commission staff determined that an additional technical workshop was required to facilitate understanding of the highly complex loop, switching, and interoffice facility cost models. The ALJ and staff facilitated this workshop on June 24 through 26.

Parties filed briefs on the five hearing topics on August 1. Reply briefs were filed on August 22 and the case was deemed submitted.

In a September 15 ruling, the ALJ set aside submission and requested supplemental briefing on the FCC's newly released "Triennial Review Order,"[15] which clarified rules for setting UNE costs using the TELRIC methodology. Supplemental briefs were filed by Joint Applicants, Covad Communications Company (Covad), Sage Telecom, Inc. (Sage), Tri-M Communications (Tri-M), and Anew Telecommunications d/b/a Call America (filing jointly), DOD/FEA, and SBC-CA on September 25. Supplemental reply briefs were filed on October 6 by Joint Applicants, Covad, DOD/FEA, and SBC-CA.[16] The case was deemed submitted on October 6.

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[15] *In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers* (CC Docket No. 01-338); *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996* (CC Docket No. 96-98), Report and Order and Order on Remand and Further Notice of Proposed Rulemaking, FCC 03-36, 18 FCC Rcd 16978 (Rel. Aug. 21, 2003) ("Triennial Review Order" or "TRO").

[16] On October 10, JA filed an errata to its October 6 supplemental reply brief. SBC-CA opposed this errata, and on October 20, JA filed a notice of correction to its errata.

After the submittal of the case in late 2003, the ALJ found it necessary to solicit further information from the parties to clarify their positions. The parties provided information via electronic mail and created a comparison exhibit at the ALJ's request. This information and exhibit were included in the record through an ALJ ruling and the submission date for the case was revised to December 5.[17]

On April 15, 2004, Sage filed a notice of withdrawal indicating that it was withdrawing as a party to these proceedings, in their entirety.

III. Applicable Standards

A. The Consensus Costing Principles

During the first years of the Commission's efforts to cost "basic network functions," the precursors to UNEs, the Commission adopted a set of "Consensus Costing Principles" (CCPs) that had been negotiated and agreed to by AT&T, MCI and SBC-CA and others for use in those early cost proceedings.[18] (*See* D.95-12-016, Appendix C.) According to JA, the CCPs in large part foreshadowed the FCC's TELRIC principles and are largely based on the concept of determining incremental costs that reflect the entire quantity of the output provided. (JA, 10/18/02, p. 4.) Additional critical concepts incorporated in the CCPs include:

- Principle No. 1: Long run implies a period long enough that all costs are variable.
- Principle No. 2: Cost causation is a key concept in incremental costing.

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[17] *See* "ALJ Ruling Reopening the Record to Accept Additional Exhibits," April 1, 2004.

[18] The CCPs were developed to support the Total Service Long Run Incremental Cost (TSLRIC) methodology, which derives costs based on services offered rather than network elements. The principles are also considered applicable to TELRIC analyses.

- Principle No. 3: The increment being studied shall be the entire quantity of the service provided, not some small increase in demand.
- Principle No. 6: Technology used in a long run incremental cost study should be the least-cost, most efficient technology that is currently available for purchase. This principle assumes that a TSLRIC analysis should be based on the existing or planned location of switching and outside plant facilities using the least-cost, most efficient technology.
- Principle No. 7: Costs shall be forward looking.

B. The TELRIC Standard

The Telecommunications Act of 1996 (the Act) requires incumbent local exchange carriers (ILECs) such as SBC-CA to interconnect with any requesting telecommunications carrier at rates, terms and conditions that are just, reasonable, and nondiscriminatory, and in accordance with Section 252 of the Act. (Section 251(c)(2).) Section 252(d) of the Act sets the pricing standard for interconnection and network element charges and states that when state commissions determine a just and reasonable rate for purposes of Section 251(c)(2), the rate shall be "based on the cost (determined without reference to a rate of return or other rate-based proceeding) of providing the interconnection or network element," it shall be nondiscriminatory, and it may include a reasonable profit.

Following the passage of the Act, the FCC set forth the applicable costing standard to implement the Act in its August 1996 First Report and Order. Federal regulations provide that state commissions shall comply with the FCC's forward-looking economic cost-based pricing methodology when setting UNE rates for incumbent LECs such as SBC-CA. (47 C.F.R. Sec. 51.503(b)(1).) Generally, the FCC's forward-looking economic cost of a UNE equals the sum of

1) the TELRIC of the element, and 2) a reasonable allocation of forward-looking common costs. (47 C.F.R. Sec. 51.505(a).) The TELRIC of an element is "the forward-looking cost over the long run of the total quantity of the facilities and functions that are directly attributable to, or reasonably identifiable as incremental to, such element, calculated taking as a given the incumbent LEC's provision of other elements." (47 C.F.R. Sec. 51.505(b).) In providing further guidance on the concept of "forward-looking economic cost," the FCC specifies that the TELRIC of an element "should be measured based on the use of the most efficient telecommunications technology currently available and the lowest cost network configuration, given the existing location of the incumbent LEC's wire centers." (47 C.F.R. Sec. 51.505(b)(1).)

Finally, the FCC regulations specify that "embedded costs" and "retail costs" shall not be considered when calculating the forward-looking economic cost of a UNE. (47 C.F.R. Sec. 51.505(d).) "Embedded costs" are defined as "costs that the incumbent LEC incurred in the past that are recorded in the incumbent LEC's books of accounts." (47 C.F.R. 51.505(d)(1).) "Retail costs include the costs of marketing, billing, collection, and other costs associated with offering retail telecommunications services to subscribers who are not telecommunications carriers…" (47 C.F.R. 51.505(d)(2).)

C. Supreme Court Review of TELRIC Standard

The FCC's TELRIC methodology has been upheld by the U.S. Supreme Court following challenges to the methodology from ILECs. (*Verizon Communications Inc. v. FCC*, 122 S.Ct. 1646 (2002).) ILECs argued that the TELRIC methodology resulted in costs that are too low because it is based on a "hypothetical" and "most efficient" network rather than the incumbent's actual network. The Supreme Court rejected this argument and stated that:

> As for an embedded-cost methodology, the problem with a method that relies in any part on historical cost, the cost the incumbents say they actually incur in leasing network elements, is that it will pass on to lessees the difference between most-efficient cost and embedded cost. Any such cost difference is inefficiency, whether caused by poor management resulting in higher operating costs or poor investment strategies that have inflated capital and depreciation. If leased elements were priced according to embedded costs, the incumbents could pass these inefficiencies to competitors in need of their wholesale elements, and to that extent defeat the competitive purpose of forcing efficient choices on all carriers whether incumbents or entrants. The upshot would be higher retail prices consumers would have to pay. (*Verizon*, 122 S.Ct. at 1673.) (Citations and footnotes omitted.)

D. Recent Updates to TELRIC

The FCC's recent Triennial Review Order (TRO) provided additional clarification on depreciation lives and cost of capital, which are key inputs in a TELRIC modeling exercise. We address the specific clarifications from the TRO in the sections below that address depreciation and cost of capital.

E. Commission Cost Modeling Criteria

In a June 2002 Scoping Memo, the Assigned Commissioner and Administrative Law Judge established the criteria for any cost models or studies filed in this proceeding. The Scoping Memo clarified that any cost models or studies must allow parties to:

1. Reasonably understand how costs are derived by:
    a. Providing access to all interested parties to the model and all underlying data, formulae, computations, software, engineering assumptions, and outputs; and
    b. Allowing interested parties to examine and modify the critical assumptions and engineering principles.

2. Generally replicate the cost model or cost study calculations; and

3. Propose changes in inputs and assumptions in order to modify the costs produced.[19]

In Section V.C below, we shall discuss whether the models filed adhered to these criteria.

F. Burden of Proof

As part of its implementation of the Act, the FCC adopted regulations that provide that the ILEC bears the burden of proving that the UNE rates it proposes do not exceed forward-looking economic cost. (47 C.F.R. 51.505(e).) In adopting these regulations, the FCC recognized there was asymmetric access to cost data because ILECs have greater access to cost information necessary to calculate incremental costs of providing UNEs. Therefore, in this proceeding, SBC-CA has the burden to demonstrate that the rates it proposes do not exceed forward-looking economic cost for each UNE.

The other parties that have presented proposals for TELRIC costs or inputs to cost models, bear the burden of persuading the Commission that their proposals are reasonable given the FCC's TELRIC standards and the Commission's CCPs.

IV. Overview of Cost Models

In order to establish the forward-looking incremental cost of SBC-CA's UNEs, in compliance with the CCPs and TELRIC guidelines described above, SBC-CA and Joint Applicants each offered a separate cost model. The Commission has typically relied on cost models to estimate the costs to construct

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[19] *Scoping Memo for Consolidated 2001/2002 UNE Reexamination for Pacific Bell Telephone Company*, 6/12/02, p. 16.

a forward-looking local exchange network. This allows the Commission to take a holistic view of the costs to construct a network as an integrated system, with all of the economies of scale and efficiencies derived from modeling an entire network's operations rather than a review of the cost of a piece of equipment in isolation.

A. HM 5.3

Joint Applicants offer the HAI Model, Version 5. 3 (HM 5.3), which they describe as a "bottom-up economic-engineering costing model" that models the local exchange network, assuming existing wire centers, and allows the user to change more than 2100 inputs and assumptions. (JA/Mercer Declaration (Decl.), 10/18/02, p. 12.) HM 5.3 begins with information provided by SBC-CA on the location of its business and residential customers, then constructs a network to serve the identified locations using granular information as to service demand, network component capacities and costs, and expenses. (*Id.*, p. 12.) Through this process, HM 5.3 estimates the investments required for each component of the network, and the costs associated with the investments using what Joint Applicants contend are conservative assumptions regarding applicable costs. These costs include capital carrying costs, plant-specific costs, general support and overhead costs. HM 5.3 assigns these costs to UNEs according to the manner in which these UNEs use different network components, then determines a cost per unit for each UNE. In this manner, HM 5.3 calculates the forward-looking costs that SBC-CA would incur to provide "plain old telephone service" (POTS), as well as various narrowband, wideband, and broadband loops and broadband interoffice circuits. (*Id.*, p. 11.)

JA contend that a key asset of HM 5.3 is that it deals with UNEs associated with all of the components of the local exchange network, and thereby recognizes the relationships and synergies between the different components of the network. (*Id*., p. 7.) JA contend that HM 5.3 is improved over HM 2.2.2 (evaluated in the prior OANAD proceeding) and HM 5.2a (used in the interim phase).

One of the key differences between HM 5.3 and earlier HM models is the customer location process. According to Joint Applicants, HM 5.3 models the cost of efficient outside plant based on existing customer locations. (JA/Murray Decl., 10/18/02, para. 51.) One of the inputs to HM 5.3 is a customer location database prepared by a third-party vendor, Taylor Nelson Sofres (TNS). TNS created the database by taking SBC-CA's current customer address information and "geocoding" the precise location of these customers by assigning each a longitude and latitude. Once geocoded, TNS grouped these current customers into logical serving areas, or "clusters." JA contends that through this geocoding and clustering process, HM 5.3 resolves earlier concerns over customer locations in previous HM versions. (JA/Mercer, 10/18/02, p. 9.) The Commission had been concerned that HM 2.2.2 did not fairly estimate costs in low-density areas. JA contends that HM 5.3 is improved over HM 2.2.2 because it identifies the location and size of population clusters, thereby deploying plant to the places where customers are located. (*Id*., p. 32.)

JA claim that HM 5.3 complies with the Commission's CCPs and the FCC's TELRIC costing standards in several ways. First, in compliance with CCP 3 and TELRIC, HM 5.3 models the total demand for network elements from both SBC-CA and other sources, including competitors that lease UNEs. According to JA, HM 5.3 captures all economies of scale and scope in the provisioning of retail services, UNEs, universal service, and interconnection services. (JA/Murray 10/18/02, para. 37.) HM 5.3 assumes a network that can accommodate both current and reasonably foreseeable demand by assuming a "substantial amount of 'growth' spare available to serve future demand…" (JA, 10/18/02, p. 13.)

Second, JA state that HM 5.3 complies with TELRIC principles because it assumes the least-cost, most efficient technology that is available for purchase by SBC-CA. For example, HM 5.3 uses information from SBC-CA's actual vendor contracts to develop appropriate switching and cable price inputs.

Third, JA contend that HM 5.3 is a forward-looking approach in compliance with CCP 6 and TELRIC rules that models the lowest cost network configuration given SBC-CA's current wire centers because it uses SBC-CA's own customer location data in developing the most efficient network configuration to serve this demand. While Joint Applicants admit that HM 5.3 does not use actual outside-plant routes as alluded to by CCP 6, they contend that the FCC's TELRIC rules, issued after the Commission's CCPs, do not require the use of actual plant routes and only constrain cost models to the use of existing wire center locations. (JA/Murray Decl., 3/12/03, pp. 14-15.)

Fourth, JA maintain that HM 5.3 uses inputs and assumptions that reflect long-run costs, as required by the CCPs and TELRIC, because it reflects "efficient choices that SBC-CA would make today, if it were to build its network from scratch, constrained only by its existing wire center locations." (JA, 10/18/02, p. 16) JA's witness Murray explains that HM 5.3 does not treat any of SBC-CA's existing facilities as fixed other than the location of existing wire centers. (JA/Murray, 10/18/02, p. 14.)

B. SBC-CA Models

SBC-CA proposes costs for the UNEs under review in this proceeding based on a cost study process that uses SBC-CA's actual network and current vendor prices as its foundation. (SBC-CA, 10/18/02, p. 2.) The SBC-CA Models are comprised of separate, stand-alone modules that derive UNE rates for loops, switching, and interoffice transport. According to SBC-CA, the investment and network characteristics that are modeled are based on the actual network in place and necessary to serve SBC-CA's customers, modified where needed to incorporate forward-looking technology. (SBC-CA/Sneed Decl., 10/18/02, p. 4.) SBC-CA then uses cost factors to convert investments into annual costs. These "annual cost factors" are based on the costs that SBC-CA actually incurs. (*Id.*, p. 4.) SBC-CA asserts that its set of models "reflect where we really can put our network and the costs of that network, and they reflect the actual customer demands we have to be ready to serve." (SBC-CA, 10/18/02, p. 2.)

SBC-CA contends that it is appropriate to use actual, recent SBC-CA cost data as an indicator of forward-looking costs because this information reflects the rational decisions made by SBC-CA personnel to deploy an efficient network in California, suited to California's unique demographics and geography. (SBC-CA/Sneed, 10/18/02, p. 5.) SBC-CA maintains that the past decisions of the company reflect the decisions that SBC-CA would make going forward to run an efficient network over the long run. (SBC-CA, 3/12/03, p. 7.)

SBC-CA claims that its decision to model its actual network is a proper interpretation of TELRIC because in a long run analysis, all facilities and characteristics may be variable, but replacement or change is only assumed where it is shown efficient to do so. (*Id.*, p. 8.) Furthermore, SBC-CA contends that because SBC-CA has been subject to both state and federal price cap regulation for many years, as well as increased competition, it has every incentive to act efficiently. SBC-CA states that:

> To the extent that an existing network asset or characteristic represents the long run, efficient choice, retaining it is

> perfectly consistent with a TELRIC study and most closely complies with the Commission's [CCPs].
>
> [SBC-CA] determined that the existing characteristics embodied in its cost studies meet that test and complied with the CCPs…. Thus, [SBC-CA's] studies are manifestly forward-looking and long run. (*Id.*, pp. 8-9.) (Footnotes omitted.)

To counter claims that it has presented an embedded cost study, SBC-CA explains that its studies "use a network design that appropriately considers certain physical characteristics of SBC-CA's existing network, because those characteristics represent the most sensible measurement of the physical characteristics of a forward-looking network capable of serving current demand at existing customer locations and facility routes." (*Id.*, p. 9, footnote omitted.) SBC-CA maintains that its studies reconstruct SBC-CA's entire network using forward-looking technology resulting in a "functional network" capable of providing UNEs. SBC-CA contends its approach is fully compliant with CCP 6, which requires that a cost analysis be based on the existing or planned location of switching and outside plant facilities. (*Id.*, p. 11.)

V. Both HM 5.3 and the SBC-CA Models Are Flawed

In comments, workshops, and hearings during the course of this proceeding, Joint Applicants and SBC-CA have lobbed numerous criticisms at each other regarding alleged flaws in HM 5.3 and the SBC-CA Models. These criticisms can be quickly summarized.

The essential criticism of the HM 5.3 model is that it ignores generally accepted engineering and network design standards to instantly construct a brand new, fully functioning network at a single moment in time. Through the use of unrealistic and unsupported inputs, SBC-CA contends that HM 5.3 drastically understates the size of the network, minimizes the costs to maintain it, and lacks the capability to provide all the services that are provided over SBC-CA's network today.

Specifically, SBC-CA contends that HM 5.3 does not adequately represent customer locations, does not comport with how an engineer designs plant, and relies too heavily on subjective judgment for the prices of purchasing and installing network facilities. (SBC-CA/Tardiff Decl., 2/7/03, p. 4.) SBC-CA asserts that HM 5.3 does not account for all the costs required to build and maintain the network. According to SBC-CA, HM 5.3 fails to account for the substantial costs that carriers incur to accommodate growth and respond to demand changes. As a result, SBC-CA maintains that HM 5.3 provides a "static view" of a network that assumes a level of efficiency that no real carrier can achieve and does not reflect how real-world telecommunications firms operate. Moreover, SBC-CA contends that HM 5.3 fails the cost modeling criteria set forth in the June 2002 Scoping Memo. In particular, SBC-CA alleges that it was not given sufficient access to the intricacies of the customer location process used in HM 5.3. Moreover, SBC-CA claims that HM 5.3 relies on unrealistic labor assumptions to construct a non-functional network that cannot handle all of SBC-CA's customer demand.

In contrast, JA contend that SBC-CA's cost models are deeply flawed and do not adhere to TELRIC standards because they rely almost exclusively on embedded data from SBC-CA's legacy network rather than forward-looking network configurations. Further, JA maintain that the SBC-CA Models do not meet the Commission's cost study criteria and do not permit ready adjustment to eliminate these inherent flaws.

JA allege that SBC-CA's models suffer from structural flaws stemming from a basic misconception of the purpose of competition. JA claim that:

> The purpose of local competition is not to ensure that [SBC-CA] is "made whole," or somehow recovers every penny it spends no matter how foolishly. Rather, one of the purposes of competition is to force entrenched incumbents such as [SBC-CA] to become more efficient. In a competitive market, there is no guarantee that a company will recover every dollar it spends. That lack of a guarantee is exactly what forces companies to spend wisely and operate efficiently. (JA, 2/7/03, p. 43.)

JA argue that, in some ways, forward-looking costs *over*compensate incumbent carriers because much of the investment in the network to provide UNEs was incurred years ago and the loop plant has long since been fully depreciated. According to JA, "SBC-CA does not incur any incremental investment cost to allow competitors to use that loop plant. Nonetheless, under TELRIC, [SBC-CA] is entitled to recover investment costs for such loop plant as if [SBC-CA] had to install it all over again." (JA, 2/7/03, p. 41.)

We find that both models are flawed and do not allow us sufficient flexibility to modify inputs and test various outcomes. HM 5.3 uses a customer location database as an input, and this database is built on a set of assumptions we do not necessarily agree with and are unable to modify. In addition, HM 5.3 contains myriad inputs that are at the low end of what we consider reasonable. While we can modify most of these inputs, we were not able to modify all input assumptions to our satisfaction, particularly those related to labor costs. We are also not able to modify the interoffice transport module of HM 5.3 to overcome the criticisms that it underestimates demand for interoffice transport, may not adequately incorporate optical interface equipment, and is insensitive to demand changes. If we could modify HM 5.3's labor inputs and interoffice inputs for demand and equipment, these changes would increase cost inputs in HM 5.3.

Therefore, given these areas that we cannot modify, we find that HM 5.3 under-estimates forward-looking UNE costs.

In contrast, the SBC-CA models contain numerous inputs based entirely on the characteristics of SBC-CA's current network operations. SBC-CA claims that it should only model a change from its current network where it is shown efficient to make a change. SBC-CA's approach essentially challenges other parties to prove that its embedded network is not forward-looking. However, this claim runs counter to FCC requirements that an incumbent LEC bears the burden of proving that its costs do not exceed forward-looking levels. (*See* 47 C.F.R. 51.505(e).) By using the current network as the starting point, SBC-CA's models run contrary to the definition of TELRIC. These inputs, which include loop investment and design characteristics, expense levels, and labor inputs, have not been sufficiently justified as forward-looking. Some of these inputs can be modified to what we consider forward-looking levels, but many cannot. The inputs we are unable to modify include SBC-CA's loop length assumptions, loop cabling inputs, numerous inputs embedded in annual cost factors such as structure sharing percentages and labor installation assumptions, and SBC-CA's assumed link between utilization levels and maintenance expenses. Further, we are unable to modify SBC-CA's expense assumptions to remove potential shared and common costs, and expenses related to unregulated services, affiliate transactions, retiree costs, and Project Pronto. Finally, we are unable to modify demand assumptions and other factor inputs in SBC-CA's interoffice transport model. Most of the input modifications that we would make to SBC-CA's models would decrease input assumptions from historical levels to what we consider forward-looking. Therefore, we find that the SBC-CA models over-estimate forward looking UNE costs.

Thus, although we have undertaken the time-consuming and exhaustive task of modifying many of the inputs used in both models to levels that we conclude are reasonable, we are unable to modify key structural elements of both models. In short, while we can modify and test portions of both models, and see how these changes affect model outputs, we cannot rely on either model in its entirety. Nevertheless, we can run both models with our preferred inputs and use the results to create a "zone" of reasonable UNE rates. After running both models with our chosen inputs and finding that the results from the models converge to a much narrower range, we determine that reasonable UNE rates lie somewhere within the zone created by the two models' results. It would not be reasonable to use either endpoint of this zone to set UNE rates because of the flaws in both models that cannot be corrected and which are discussed in detail in the sections that follow. On the other hand, we conclude that reasonable UNE rates lie between these two endpoints, and we adopt the midpoint of the zone for our new, permanent UNE rates because the midpoint reasonably mitigates the flaws in both models. Thus, while we cannot rely on the results of either model to produce reasonable or accurate UNE rates, the results of HM 5.3 set the lower boundary for our rate zone, and the results of the SBC-CA models set the upper boundary.

In the pages that follow, we will describe in further detail the key flaws that we found with HM 5.3 and the SBC-CA models. We will focus our discussion on the major structural flaws identified by the parties, and our conclusions regarding these alleged flaws based on our own staff analysis of the two models. For the most part, this discussion will pertain to those portions of the models that are not easily changed by modifying the inputs. In a separate section, we will discuss the various disputes over modeling inputs and which inputs we have chosen to use in our own modeling runs that set the endpoints for our ratesetting zone.

A. Flaws in the SBC-CA Models

Fundamentally, Joint Applicants and other parties contend that the SBC-CA Models fail the TELRIC standards set by the FCC. (*See* JA, 2/7/03, p. 40, ORA/TURN, 2/7/03, p. 9.) The TELRIC methodology is intended to replicate the pricing that would occur in a competitive market if an existing firm had to match the prices offered by a new entrant who would build facilities using the lowest-cost, most efficient technology and network configuration available, assuming the location of existing wire centers. (47 C.F.R. Section 51.505(b).) The FCC TELRIC regulations, as upheld by the U.S. Supreme Court, explicitly state that embedded, or historical, costs shall not be considered when calculating forward-looking UNE costs. (47 C.F.R. Section 51.505(d).)

Generally, we agree with the criticism that SBC-CA's models rely too heavily on SBC-CA's embedded network, both for network configuration and costs. JA contend, and our own analysis shows, that SBC-CA's cost models are replete with embedded inputs and assumptions that are not readily modified to reflect forward-looking costs or configurations. We will discuss in detail in Sections V.A.1, and V.A.3-5 below examples of the embedded network assumptions that we found. In addition, TELRIC requires the calculation of the forward-looking cost over the long run of the *total* quantity of the facilities and functions attributable to a UNE. (47 C.F.R. Section 51.505(b).) JA claim that SBC-CA's studies "fail to put the 'T' in TELRIC." (JA, 2/7/03, p. 48.) Indeed, SBC-CA admits that "we don't develop a TELRIC on a total basis." (Workshop Transcript (TR.), 12/5/02, p. 408.) We found that in some portions of SBC-CA's models, particularly the model for interoffice transport, it was either difficult or impossible to determine and/or modify the total quantity of the facilities or functions upon which the cost modeling was based, as required by TELRIC.[20]

As we will discuss below, the SBC-CA models merely replicate to a great extent SBC-CA's existing architecture based on historical network design. Overall, we found that we could not make meaningful modifications to many of the SBC-CA model inputs because we could not extract individual inputs from aggregated data, or compare and verify inputs to public information. This prevented us from modifying many of SBC-CA's embedded cost and configuration assumptions, such as loop input assumptions in SBC-CA's loop module known as "LoopCAT", demand assumptions in SBC-CA's interoffice model, and expenses calculated by annual cost factors.[21] Although we could modify some of SBC-CA's model inputs, we eventually came to many "dead-ends" and found that we were unable to modify important model inputs to our satisfaction.

As a result, SBC-CA's models estimate the cost to rebuild the network SBC-CA has in place today, with some changes for forward-looking technology, but not necessarily with the lowest cost network configuration. In short, we conclude that the SBC-CA models do not meet the FCC's TELRIC standard and the structural problems inherent in the models do not allow sufficient modification to overcome these flaws. We will now discuss the specific problems that we encountered in each of the SBC-CA models.

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[20] *See* Section V.A.3 below.

[21] *See* Sections V.A.1.a, V.A.3, and V.A.4 below for a detailed discussion of these input problems.

1. LoopCAT Flaws

In reviewing SBC-CA's LoopCAT module, we found we agreed with many of the parties' criticisms that it does not conform to TELRIC requirements to reflect forward-looking costs based, in part, on the lowest cost network configuration. Below, we discuss these criticisms, which principally relate to LoopCAT's reliance on embedded network data, its design point calculation, and additional modeling characteristics that we were unable to modify relating to multiple dwelling units, maintenance expenses, and model integration.

a. Reliance on Embedded Network Data

There is no dispute that LoopCAT relies extensively, if not exclusively, on costs and facilities derived from SBC-CA's current network. SBC-CA's witness Sneed gives an overview of SBC-CA modeling approach and describes how "[t]he investments and network characteristics are based on the actual network in place necessary to serve [SBC-CA's] customers, modified where needed to incorporate forward-looking technology." (SBC-CA/Sneed Decl., 10/18/02, p. 4.) Sneed describes how LoopCAT uses annual cost factors to convert investments into annual costs. As Sneed states, "These factors are based on the costs that [SBC-CA] actually incurs, as these are the best indicator of the forward-looking costs that will be experienced in a network serving California." (*Id.* pp. 4-5.)

JA criticize LoopCAT's reliance on embedded data, including outside feeder plant routes, plant mix, unit costs of construction, cable sizing, fill factors, and installation costs. According to JA:

> The use of embedded data ensures that [SBC-CA] will not model an efficient network, as prescribed by TELRIC, but rather will propose substantially inflated costs. For example, [SBC-CA's] reliance on embedded data for unit costs of construction ignores the economies of scale inherent in the

> TELRIC "total demand" approach, thereby significantly overstating costs. Similarly, [SBC-CA's] reliance on embedded data causes the inclusion of many undersized pieces of equipment in the network, rather than recognizing that today's demand can be served by far fewer, larger sizes of cable, DLC terminals and FDIs. Thus, again, [SBC-CA] ignores economies of scale that would be inherent in a TELRIC-compliant calculation. (JA, 2/7/03, p. 72.) (Footnotes omitted.)

For example, JA and ORA/TURN contend that LoopCAT's embedded cabling characteristics reflect an aggregation of incremental loop construction over many years, rather than a forward-looking design with cable sized to meet total demand. JA claim that LoopCAT models two 100-pair cables where an engineer would place one 200-pair cable at a lower cost if she were rebuilding the network today to serve current demand. (JA/Donovan-Pitkin-Turner Decl., 2/7/03, para. 25-27.) Thus, JA claim that LoopCAT fails to reflect the fact that today's demand can be served more efficiently and with greater economy of scale through the use of larger equipment. (*Id.*)

Similarly, ORA/TURN's witness Roycroft explains that engineering cost models typically use cable sizing guidelines to identify the capacity of cables needed to provide an efficient network design and a reasonable level of spare capacity. LoopCAT, however, does not use cable sizing conventions that would permit the model to optimize the design of its network. (ORA/TURN/Roycroft Decl., 2/7/03, p. 27-29.) Instead, LoopCAT relies on a mix of embedded outside plant design and hypothetical plant design, neither of which reflect forward-looking approaches. Roycroft alleges that even though users can adjust LoopCAT's fill factors, this will not modify the inventory of cables deployed and one is asked to assume that SBC-CA's existing network cabling reflects optimum design. (*Id.*, p. 29.) In other words, LoopCAT is structurally incapable of modeling an efficient, forward-looking network and users cannot modify the model's assumptions to alter fundamental design assumptions. (ORA/TURN, 2/7/03, p. 8.) ORA/TURN contend that:

> [SBC-CA] is attempting to turn the world on its head by claiming that a cost model that is based on embedded costs is a forward looking model, and urging the Commission to reject the [HM 5.3] model because it does not employ an embedded costing approach specifically rejected by the FCC. (ORA/TURN, 3/12/03, p. 5.)

Moreover, JA contend that SBC-CA's annual cost factors, or "linear loading factors," which are used throughout LoopCAT to calculate investment costs to engineer, furnish, and install (EF&I) loop facilities, violate TELRIC because they are based on installation activities related to SBC-CA's embedded equipment and embedded network design, and they cannot be properly audited. (JA, 2/7/03, p. 77.) According to JA:

> …it is impossible to identify the costs associated with a particular piece of equipment because the linear loading factor is a purported average relationship between embedded installation cost and embedded material cost derived from overly broad categories of equipment. (*Id.*, pp. 77-78.) (Footnote omitted.)

JA maintain that loading factors based on historic data can be problematic because the relationship between material investment and installation activities from historic data may not reflect forward-looking practices. (JA/Donovan-Pitkin-Turner, 2/7/03, paras. 97-98.) Moreover, loading factors can distort installation cost differences based on material prices. In other words, loading factors can make it appear that installation costs rise as material prices rise. (*Id.* para. 100.)

Our review of LoopCAT confirms that it contains embedded data that SBC-CA derived from its current network experience and it is not possible to modify many aspects of LoopCAT to test forward-looking assumptions or differing network configurations.

First, we find that LoopCAT uses embedded cabling characteristics rather than cable sizing conventions. As ORA/TURN point out, the inventory of cables is a fixed input built on the assumption that existing cabling is optimal. SBC-CA has not met its burden of proving that its existing cable inventory, which reflects incremental growth in the network over many years, is optimal if the network were rebuilt today to meet current demand and reasonably foreseeable growth.

We agree with ORA/TURN and the Joint Applicants that the FCC has made clear it rejects embedded cost approaches to modeling. In defining TELRIC, the FCC spoke of "designing more efficient network configurations" and a forward-looking cost methodology wherein a "reconstructed local network will employ the most efficient technology." (First Report and Order, para. 685.) In the FCC's brief defending TELRIC to the Supreme Court, the FCC stated:

> The incumbents appear to be proposing a methodology based on "actual" cost in today's market, of duplicating "actual" existing networks in all physical particulars – or stated different, the "application of up-to-date prices to out-of-date properties." Economists, including those upon whom the incumbents rely, uniformly agree that such a measurement is "economically meaningless." The FCC considered, but rejected, such an approach as "essentially an embedded [*i.e.*, historical] cost methodology," which would produce "prices for interconnection and unbundled network elements that reflect inefficient or obsolete network design and technology." (Reply Brief of the Petitioners United States and the FCC, *Verizon v. FCC*, July 2001, pp. 6-7, (citations omitted); as cited by ORA/TURN/Roycroft, 3/12/03, p. 9.).)

We find that LoopCAT's reliance on embedded cable characteristics, and the users inability to modify this information because it is embedded in the "preprocessor" files to LoopCAT, renders the model incapable of adequately estimating forward-looking costs and directly contradicts FCC guidance that TELRIC should assume reconstruction of the network, based on existing wire centers, in a least-cost configuration.

Second, we find that LoopCAT's extensive use of factors prevents us from making meaningful modifications to LoopCAT to test varying input assumptions. Specifically, we could not extract individual inputs from LoopCAT's aggregated annual cost and linear loading factors, or compare and verify individual inputs to public information. While SBC-CA's filings and workpapers traced input costs to SBC-CA's internal accounting codes, we could not match this internal accounting data to SBC-CA's publicly available cost data, *i.e.* ARMIS[22] filings. Thus, we are asked to rely on SBC-CA's historical accounting information without any ability to compare it to public information to verify its reasonableness.

In certain cases, the aggregation of inputs into factors, which are used liberally throughout LoopCAT, means we are not able to dissect the various factors into component pieces to isolate, for example, installation times, crew sizes, or material prices. Hence, we cannot fully understand how SBC-CA derived its investments costs or make meaningful modifications to these factors. For example, LoopCAT uses EF&I factors for pole, conduit, and cable installation which are critical elements in modeling the loop network. Indeed, SBC criticizes HM 5.3 for its various inputs relating to pole, conduit, and cable installation.

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[22] ARMIS refers to the FCC's "Automated Reporting Management Information System" that was initiated in 1987 for collecting financial and operational data from the largest carriers and is described further at http://www.fcc.gov/wcb/armis.

Despite criticizing the HM 5.3 model inputs, SBC cannot show how the inputs in LoopCAT compare to those in HM 5.3, particularly for installation times, crew sizes, and material prices. Ultimately, we are asked to accept the factors that SBC-CA has created from its actual data, without knowing the assumptions embedded in them. Further, without knowing the assumptions embedded in the factors, we cannot test the sensitivity of the model with a changed input.

Another example where we disagreed with SBC-CA's input assumptions involves structure sharing percentages.[23] Specifically, we wanted to modify LoopCAT's structure- sharing percentages to match those used by the FCC in its Universal Service Inputs Order.[24] We found that it was not possible to isolate and modify the structure sharing rates that SBC-CA had built into its loading factors for conduit and cable investment. Despite criticism of its input assumptions, SBC-CA states that:

> [SBC-CA's] structure sharing factors capture the efficient amount of structure sharing taking place in [SBC-CA] California's network today. [SBC-CA] properly assumes that the current rate of facilities sharing will continue into the future and be equivalent to the rate of sharing in a forward-looking environment." (SBC-CA, 3/12/03, p. 40.)

Noticeably absent from this rebuttal is any indication of how to determine the structure sharing percentages that are embedded in SBC-CA's models. Essentially, we are asked to accept LoopCAT's structure sharing percentages without knowing what they are, or being able to modify them.

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[23] "Structure sharing" generally refers to the percentage of poles and conduit that are shared with other utilities, or between different portions of SBC-CA's network.

[24] *See Federal-State Joint Board on Universal Service* (CC Docket No. 96-45), Tenth Report and Order, FCC 99-304, 14 Rcd 20156, (rel. Nov. 2, 1999) ("Inputs Order").

Even though SBC-CA faced criticism from other parties for its failure to identify key input assumptions,[25] it did not provide assistance in its rebuttal comments to decipher its various factors and inputs. Instead, it repeated its assertions that its input assumptions regarding network characteristics represent the most sensible measure of forward-looking network characteristics. (SBC-CA, 3/12/03, p. 9. *See* also *Id*., p. 40 and 42.) SBC-CA makes this assertion without delving into an explanation of how to decipher its input assumptions to identify crew size, installation time, or material prices. Consequently, we cannot compare, for example, installation crew sizes in the model to what SBC-CA uses today because the data is too aggregated and SBC-CA does not offer information on current practices. Thus, the SBC-CA data has been aggregated to such an extent that we are unable to isolate discrete inputs and determine their validity.

SBC-CA argues that the Commission should accept its modeling approach based on actual costs and factors because its current network is forward-looking. SBC-CA claims that because it has been operating under incentive regulation for over ten years, it has a strong incentive to make economically efficient choices throughout its network, such as in the amounts of spare capacity in its network. (SBC-CA/Tardiff, 2/7/03, p. 9.) SBC-CA contends that when designing a forward-looking network, it is far better to use a model that reflects actual customer locations, actual cable placements, actual employee needs and work times, and the actual size and capacity of the network. (SBC-CA, 2/7/03, p. 7.)

We do not find this argument convincing for several reasons. First, as we have just described, the parties and Commission staff were unable to decipher

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[25] *See e.g.*, JA, 2/7/03, p. 26-27, and 29; JA/Declaration of Donovan/Pitkin/Turner, 2/7/03, p. 65-67.

the SBC-CA's various factors to understand what SBC-CA used for its "actual" inputs. Although SBC-CA heavily criticized the inputs in HM 5.3 regarding installation times, crew sizes, and material prices, we cannot compare the HM 5.3 inputs to what SBC-CA assumed for these same items because they are aggregated into cost factors. This means that we cannot test the sensitivity of the model with a changed input and we cannot compare or replace SBC-CA's inputs with other public information.

Second, we find it too simplistic for SBC-CA to assert that the current network has already achieved all efficiencies that are possible, particularly when it did not provide examples so that we can compare actual install times or material costs from its current operations with those built into the SBC-CA models. SBC-CA aggregates current network information into large bundles of inputs and then claims that these input bundles must be correct because they are based on actuals. SBC-CA's witness Tardiff makes high-level comparisons between SBC-CA's current operating costs and HM 5.3 results to attempt to show that SBC-CA's current costs are far different from what HM 5.3 has modeled. (SBC-CA/Tardiff, 2/7/03, p. 19.) We find these comparisons meaningless because we cannot make direct comparisons between SBC-CA's inputs and those used in HM 5.3.

b. LoopCAT's Network Configuration

Furthermore, we find that LoopCAT's loop network configuration is not forward-looking because it combines existing feeder lengths with an approximated loop distribution length. SBC-CA claims that "actual lengths of loops in the networks are used to calculate Loop TELRICs," because loop information is pulled from SBC-CA's Loop Engineering Information System (LEIS) database containing 17 million records, and "LEIS captures the true distances between a customer's premises and Pacific Bells' central offices…" (SBC-CA, Smallwood, 10/18/02, p. 10.) We agree with ORA/TURN and JA that SBC-CA's claim that loop lengths are based on actual distances is misleading. In actuality, LoopCAT does not model loops equivalent to actual loop lengths that exist today, but approximates one distribution loop length for each distribution area based on an engineering concept known as the "design point." Essentially, LoopCAT assumes all loops in a distribution area are one-half the length of the longest distribution loop segment that might be built in the next twenty years.

SBC-CA does not explain in its opening comments how it uses the design point to estimate loop lengths. It was only after JA criticized the design point estimation technique, that SBC-CA explained the design point concept with the following brief explanation:

> [SBC-CA] estimates its distribution length based on the actual design point information that is contained in its database. The design point reflects the longest possible distribution length in a distribution area. [SBC-CA] makes the reasonable assumption that customers will be distributed throughout a distribution area, and based on that assumption, uses half of the design point length as an estimate of the average distribution length in the area. (SBC-CA/Smallwood, 3/12/03, pp. 66-67.)

At technical workshops in June 2003, SBC-CA further explained the design point and how it was used to approximate loop lengths. In response to questions from Commission staff during the workshops, SBC-CA's witness Smallwood explained that loop lengths in LoopCAT were estimated based on adding actual feeder lengths and one-half of the design point distance. (Workshop Tr., 6/26/03, p. 809.) SBC-CA's loop planning guidelines define design point as "The longest loop in any plant segment, expressed in feet from the CO." (SBC-CA Errata, 5/1/03, , LROPP guidelines, p. 103.) These same guidelines explain up front that "[p]lans should be based on growth expectations for the next 20 years." (*Id.*, p. 3.) SBC-CA witness McNeill clarified that the "design point is that existing *or potential* customer location in the distribution area that's the furthest away from the serving-area interface." (Workshop Tr., 6/26/03, p. 811, emphasis added.) According to McNeill, potential customer locations are projected by SBC-CA engineers based on building permits or discussions with planning commissions and developers. (Workshop Tr., 6/26/03, p. 812.) McNeill hypothesized that 75% of the loops used in the design point calculation are actual customers, and 25% are potential customers. (Workshop Tr., 6/26/03, p. 838.) In other words, LoopCAT assumes all loops in each distribution area are the same length-- *i.e.* one half of the maximum projected loop distribution segment--based on a twenty-year growth forecast of the longest potential loop. Thus, LoopCAT models all customers in a given distribution area as if they are all exactly the same distance from the central office, and does not employ any weighting or other criteria to assume a varied distribution of loop lengths.

There are three major problems with SBC-CA's use of the design point to calculate loop lengths. First, the use of the design point means that loop lengths in LoopCAT are not based exclusively on actual loop lengths, but on an undisclosed engineer's view of possible future loop lengths based on a twenty-year growth forecast. We find that a forecast period of twenty years is too long for the purposes of this TELRIC costing exercise and is not reasonable. A twenty-year forecast cannot be construed as "reasonably foreseeable short term growth," which is the standard the FCC has used in its own modeling efforts. (Inputs Order, para. 200.)[26]

Second, we agree with JA that LoopCAT may not correctly determine cable gauge because its calculations are not based on the longest loop served, but on half that distance. (JA/Donovan-Pitkin-Turner, 2/7/03, p. 38, n. 45.) Because the cable gauge is based on an average length that will be shorter than the length of some actual loops, the cable might not provide adequate service to customers with loops longer than the average. A related criticism is that because LoopCAT uses embedded locations and distances for remote terminals, coupled with a hypothetical "design point" distribution length, the model does not have any logic to recognize that some loops exceed the 18,000 foot restriction on copper length for forward-looking loops. Loops that have copper lengths exceeding 18,000 feet will not work without additional equipment such as load coils, which have not been incorporated into the model. (JA, 2/7/03, p. 74.) Indeed, JA claim, and SBC-CA does not dispute, that approximately 100,000 of the loops modeled in LoopCAT will not operate within SBC-CA's own design principles because they are longer than 18,000 feet. (*Id.*, JA 2/7, p. 74; *see also* Workshop Tr., 6/26/03, p. 819.)

Finally, we are unable to modify the design point in LoopCAT because we have no record-based information on actual loop lengths, and it is uncertain how we would determine the portion of the design point distance that is based on potential future customers. The design point distance and loop length

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[26] As we discuss in Section V.B.7 below, we recognize that the FCC uses its Synthesis Model for universal service purposes, but it also relies on it for cross-state comparisons

Footnote continued on next page

calculations are part of the "preprocessor" to LoopCAT, which Commission staff is not able to run or modify on its own. In other words, even though we disagree with SBC-CA's design point calculation, we cannot run our own version to eliminate the portion of the loop based on "potential" customers and use only the loop lengths of actual customers today.

As a result, we find that SBC-CA's use of the design point to calculate loop lengths results in a loop network design that is not forward-looking and does not use the lowest-cost network configuration.

c. Modeling of Multiple Dwelling Units

We find that LoopCAT does not mirror a forward-looking network because it does not attempt to model multiple dwelling units (MDUs). We agree with JA that LoopCAT inappropriately inflates costs for residential loops by installing network interface device (NID) and drop equipment to terminate six lines for every residence served by SBC-CA in California, rather than modeling the appropriate premise termination equipment for multiple-dwelling units that make up a large percentage of households served in California. By not including the appropriate equipment for MDUs, the SBC-CA model inflates loop costs by assuming each residence requires termination for six lines and that each customer account requires a separate drop. (JA, 2/7/03, p. 17.)

d. The Linkage of Fill Factors and Maintenance Expenses

An important feature of calculating total loop cost is the "fill factor," or utilization level that is assumed. Fill factors are discussed in greater detail in the

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of forward looking UNE costs. Thus, we find it reasonable to look to the FCC's Synthesis Model and the Inputs Order for guidance on some modeling inputs.

Modeling Inputs Section VI.E below. For now, we note that JA and XO contend that SBC-CA's models inappropriately link fill factors and maintenance expenses, such that whenever a higher fill factor is assumed in the model, maintenance expenses automatically increase as well. (JA/Donovan-Pitkin-Turner,2/7/03, pp. 208-09.) XO contends the linkage of fill factors and maintenance expenses is a structural flaw in SBC-CA's model that cannot be easily removed because the only way to eliminate this feature requires access to SBC-CA's "Preprocessor" program. (XO, 2/7/03, p. 10 and, p. 28.)

In Section VI.E.8 below, we determine it is not appropriate to link fill factors and maintenance expenses and evaluate why that is the case. We agree that this is a flaw in SBC-CA's model that we cannot overcome. We have run the SBC-CA models with various fill levels, and we do not know how to de-link fill factors and maintenance expenses. Therefore, we do not have confidence that the results from our modeling runs with higher fill levels are reasonable, because the higher fill automatically produces higher maintenance expenses.

e. Integration of Loop Studies

JA contend that SBC-CA's cost models are not integrated for 2-wire, DS-1, and DSL loops. Instead, SBC-CA's models calculate costs for these loops on a stand-alone basis. JA contend that this lack of integration distorts costs, and violates TELRIC and CCPs 8 and 9 which require consistent treatment of costs across all services and elements. By artificially segmenting its cost studies for basic loops, DS-1 loops and DS-3 loops, SBC-CA ignores the efficiencies of sharing facilities that TELRIC requires. (JA, 2/7/03, p. 76.) For example, JA contend that 2-wire loops and DS-1 loops share the same structure, such as poles, conduits, and trenches. Similarly, 2-wire loops, DS-1 loops, and DSL loops share the same DLC systems, and all services share the same central office facilities. (*Id.*, pp. 75-76.)

We find that SBC-CA's failure to integrate all of its services in its cost studies overstates forward-looking cost by ignoring the fact that several services share much of the same network infrastructure. Through this failure, SBC-CA's models do not reflect the full effect of the economies of scope and scale within SBC-CA's network. We agree with JA that SBC-CA's failure to integrate its various loop models and capture the network effects of this total demand inflates true per unit cost of these UNEs and is an impermissible departure from TELRIC principles.

2. SICAT Flaws

Joint Applicants criticize SBC-CA's switching investment cost module known as "SICAT," contending it is not forward-looking because it uses a short run approach to determine the amount of switching investment. Specifically, JA contend SICAT is based on average purchases over a five year period (1998 through 2002), which, in most cases, involves the higher cost to add a growth line to an existing switch. (JA/Ankum Decl., 2/7/03, para. 112-117.) According to JA, the SICAT model produces a higher short run average cost for switching investment, which is then applied to the capacity to serve the entire network. In this fashion, SICAT overstates long run switching costs. (JA, 2/7/03, p. 42.)

In addition, JA contend that SICAT is not based on California specific switching information, but is instead based predominantly on switching cost investments from the other states in which SBC-CA operates. (*Id.*, pp. 87-88.) Specifically, SICAT develops per line costs based on recent purchases in other states. Thus, in JA's view, SICAT is not sufficiently based on California demand nor does it attempt to identify the number or type of switches necessary to serve

California. (JA/Ankum, 2/7/03, paras. 11 and 121-127.) Given SICAT's short term purchasing period and its use of information from other states, JA maintain that SICAT does not model a network designed to meet total demand, but simply calculates a per-line average cost of switches based on non-California data and then improperly uses that average to calculate switch investment.

We find that these two principle disputes with SICAT can be addressed by modifying SICAT inputs. Principally, in our runs of SICAT we have changed the input assumptions regarding the percentage of new and growth lines that are purchased over the modeling period. This should address JA's concern that SICAT uses too high a percentage of higher priced growth lines. We are less concerned that SICAT is not based exclusively on California switching information. Our own review shows that SICAT contains a mix of California switching data and pricing information from SBC's multi-state switching contract. In persuading the Commission to reexamine UNE switching rates, JA argued that the multi-state switching contract allows SBC-CA to obtain a better price for its switching purchases than if SBC-CA negotiated and purchased for its California network alone. (Application 01-02-024, 2/21/01, p. 8.) We find this a reasonable assumption and we are not persuaded that SICAT is fatally flawed because it incorporates some non-California switching information.

3. Transport and High Capacity Loop Study Flaws

SBC-CA uses the "SBC Program for Interoffice and Circuit Equipment" (SPICE) to identify UNE rates for dedicated transport and SS7 links. JA claim that SPICE violates TELRIC because it relies entirely on SBC-CA's embedded network rather than a forward-looking one, and is not constructed based on a determination of total network demand. (JA, 2/7/03, p. 98.) Rather, SPICE determines investment based on a database of the existing circuits in SBC-CA's current network without demonstrating that this embedded network reflects the total demand for each service and all UNEs supported by the network. (*Id.*)

As a result, JA maintain that SPICE produces flawed results because it proposes costs significantly higher than the prior OANAD rates, without sufficient explanation or justification, during a period of productivity gains in telecommunications technology. (*Id.*, p. 94.) Further, JA contend that SPICE limits the ability of the parties to propose changes to inputs and assumptions in order to modify costs. For example, there is no way to ensure the SPICE model has considered all possible routes that could be the "least-cost" path or to modify the structure sharing assumptions embedded in SPICE. (*Id.*, pp. 96-97.)

SBC-CA responds that SPICE is based on the SBC-CA's current total network demand for interoffice transport circuits, and SPICE assumes that a forward-looking interoffice network would mirror SBC-CA's existing network. (SBC-CA, 3/12/03, p. 74.) SBC-CA counters JAs' allegations that costs are declining for interoffice transport by noting that per circuit investments have actually increased slightly from 1998 to 2001. (*Id.*, p. 75.) SBC-CA contends that the "least cost path function" in SPICE reconfigures circuit paths to choose the least cost route. (*Id.*)

We agree with JA that SPICE does not meet TELRIC requirements. In our own review of SPICE, we were unable to determine the level of demand that it is designed to serve so that we could vary it and check the model's sensitivity. Essentially, to borrow a phrase coined by JA, SPICE "fails to put the 'T' in TELRIC." At the technical workshops, SBC-CA's witness Cass was questioned extensively on how one could determine the total investment modeled in SPICE and the apportionment of that investment based on demand for certain services. Cass admitted that the SPICE model is not based on total investment.

(Workshop Tr., 12/5/02, pp. 439-441.) Cass stated that it was not possible to pull a total investment figure out of SPICE without making demand assumptions because SPICE starts with the network in place today to serve all SBC-CA customers and calculates a per unit "node investment." (*Id.*, 12/5/02, pp. 437-439.) Cass responded that the only way to determine total investment was to make assumptions about demand. (*Id.*, p. 438.) Commission staff also inquired how to segment the interoffice demand between voice services and other advanced and unregulated services that use the interoffice network. SBC-CA's witness stated that it was not possible to segment demand in this manner. (Workshop Tr., 6/24/03, pp. 557-558.) We find it unreasonable that we cannot determine the total investment modeled by SPICE or the demand SPICE is intended to serve.

Essentially, SBC-CA asserts that its embedded network is *a priori* a forward-looking efficient network. (JA/Mercer-Murphy Decl., 2/7/03, para. 7.) When describing inputs to the SPICE model, SBC-CA states that actual data is used "because the facilities utilization of an efficient firm today is the best estimate available of the facilities utilization that an efficient firm will have in the forward-looking environment." (SBC-CA/Cass Decl., 10/18/02, p. 11.) In other words, SBC-CA claims that the characteristics of its existing network, including its current utilization level and the demand it is designed to serve, are automatically forward-looking, without giving us the ability to know what that demand level might be. We do not accept the unsupported assertion that SBC-CA's current network is automatically forward-looking, particularly when we cannot determine the demand SPICE serves in order to test differing assumptions.

Finally, we agree with JA that SPICE contains other inputs that are difficult to understand or modify. For example, SPICE uses historic structure sharing levels that it does not identify and that cannot be modified. (JA/Mercer-Murphy, 2/7/02, para. 21-23.) In addition, SPICE uses pole and conduit factors derived from SBC-CA's embedded network that correlate cable investment and structure investment (*i.e.* the more expensive the cable, the more expensive the structure) without evidence to support this correlation. (*Id.*, para. 24-26, and 27.) Further, EF&I factors in SPICE are based on historical network data without showing a direct causal relationship between equipment costs and installation costs. In other words, SBC-CA's EF&I factors assume that more expensive equipment is automatically more expensive to install. (*Id.*, para. 78.) We find these characteristics of SPICE are problematic. Similar to our discussion of the flaws in LoopCAT, we find that the use of factors in SPICE aggregates inputs into bundles that we cannot dissect in order to understand the underlying inputs, compare them to other public information or the inputs SBC-CA criticizes in HM 5.3, or test the effect of different input assumptions.

One area of SBC's SPICE model that we were able to modify was its fiber fill factor. In our models runs of SPICE, we have incorporated an 85% fiber fill factor, as proposed by JA. (*Id.*, p. 43.) JA contend that SBC's default fiber fill factors in SPICE are not forward-looking because they are based on current utilization levels, which are far below the 90% fiber fill level used by the FCC in its modeling and below the levels modeled in other SBC states. (*Id.*, pp. 41-43.) We will incorporate an 85% fiber fill factor into our runs of SPICE, noting that the FCC modeled an even higher fill level as forward-looking.

4. Annual Cost Factors and Expenses

As we have already discussed, SBC-CA uses Annual Cost Factors (ACFs) to convert the investments in its models into annual costs and expenses. In simplest terms, ACFs are ratios of capital costs and operating expenses per dollar of plant investment, built on the assumption that capital costs and expenses have a direct relationship with investments. (SBC-CA/Cohen, 10/18/02, p. 2.) There are four types of ACFs in SBC-CA's cost studies: 1) capital cost factors, 2) operating expense factors, 3) investment factors, and 4) inflation factors. JA and other parties provide numerous criticisms of the ACFs and expense calculations in the SBC-CA models, which we now describe.

a. Auditing and Modifying ACFs

JA criticize SBC-CA's cost model for its use of ACFs to calculate the expense portion of UNE costs. JA claim that these ACFs contain numerous computational errors and incorrectly assume that SBC-CA's 2001 ARMIS expense data, on which the ACFs are based, is efficient and forward-looking. (JA, 2/7/03, p. 101.) JA allege that SBC-CA failed to make forward-looking adjustments to its historical expense data to reflect future savings from potential technological innovations and cost savings from corporate mergers. (*Id.*, p. 105.)

XO joins JA in describing numerous criticisms of SBC-CA's modeling factors. As an example, XO claims that SBC-CA's building expense factor is exceptionally high and shows a 120% increase from 1999 to 2001, while ARMIS data does not show an acceleration of investment in buildings by SBC-CA. (XO, 2/7/03, p. 37.) JA contend that SBC-CA inappropriately assumes that all of its embedded building space for central offices and other buildings should be assigned to UNEs and ignores its OANAD admission that forward-looking central office buildings require less space than SBC-CA's historical building requirements. (JA/Brand-Menko, 2/7/03, pp. 48-49.) SBC-CA also ignores the fact that much of SBC-CA's embedded central office space is being paid for as part of collocation charges. (*Id.,* p. 48.)

Generally, SBC-CA responds that it is reasonable to assume that its baseline current expense and investment data reflect those of an efficient provider given the discipline imposed on SBC-CA by regulatory, shareholder, and competitive pressures. (SBC-CA, 3/12/03, p. 28.) Thus, any adjustments to current expenses would be speculative. Further, SBC-CA maintains that with regard to land and buildings, it cannot assume a constant stream of collocation revenue in the future, so it would be inappropriate to include this in the model. (SBC-CA/Makarewicz, 3/12/03, p. 23.)

Both models use factors to estimate expense levels based on investments. We do not find the fact that SBC-CA used a factor approach is, by itself, a flaw. We are not as troubled by SBC-CA's use of embedded ARMIS data to calculate expenses as we are by the fact that the factors do not allow us to isolate and understand individual input assumptions, or compare and verify inputs to public information such as ARMIS, or the inputs that SBC-CA criticizes in HM 5.3. Once again, as in LoopCAT and SPICE, we find ourselves having to rely on SBC-CA's aggregation of its historical accounting information into factors without understanding individual input assumptions. For example, XO and JA both raise serious doubts about SBC-CA's land and building expense factor. We find it reasonable to adjust historical land and building expenses to incorporate forward-looking space requirements and an allocation of revenues from collocation. However, we were unable to make these adjustments to SBC-CA's land and building expense factor because we could not compare SBC-CA's internal accounting information to publicly available ARMIS data to aid in these adjustments. Therefore, we reiterate our finding that the ACFs SBC-CA uses to estimate expenses cannot be disaggregated to understand the underlying inputs, to compare them to other public information, or to modify them to test the effect of different assumptions.

b. Shared and Common Costs

JA and XO maintain that because SBC-CA has abandoned the methodology used to derive costs in the prior OANAD proceeding, the newly derived costs are not coordinated with the prior cost study. In particular, certain expense categories from the prior OANAD proceeding are now used to develop SBC-CA's annual cost factors, even though these same expense categories were used to derive the 21% shared and common cost mark-up percentage in the prior OANAD proceeding. (JA/Brand-Menko, 2/7/03, pp. 40-44.) According to JA, SBC-CA's witness Cohen confirmed that no adjustments were made to SBC-CA's ACFs to remove shared and common costs. (*Id.*, p. 42.) Thus, JA and XO contend that SBC-CA's current cost studies include some portion of shared and common costs, and therefore, double counting occurs when the 21% shared and common cost markup is added to these new UNE costs. (JA, 2/7/03, p. 53; XO, 2/7/03, p. 42.) XO contends that if the Commission employs SBC-CA's cost models to set UNE prices, it cannot use the existing 21% shared and common cost markup, but must undertake a review of the markup separately. (XO, 2/7/03, p. 46.)

In response, SBC-CA confirmed that "[SBC-CA] employed its standard approach for deriving ACFs without explicitly analyzing revised [shared and common] costs because those are not at issue in this proceeding." (SBC-CA/Makarewicz, 3/12/03, p. 22.) SBC-CA maintains that no parties have done an analysis to confirm that shared and common costs are included in

SBC-CA's ACFs. SBC-CA contends it is equally possible that costs not recovered by the shared and common cost markup were inadvertently excluded from the ACF analysis and are not recovered anywhere. (*Id.*)

We agree with JA and XO that there is reason to be concerned whether the current cost studies, which use a different methodology than the prior OANAD cost studies, may incorporate shared and common expenses that are already accounted for in the 21% markup. There is no dispute that SBC-CA has used a different cost methodology in this proceeding as compared to the prior OANAD proceeding, and SBC-CA confirms that it did not attempt to reconcile the shared and common costs currently collected through the 21% markup with the direct UNE costs calculated through the ACF study it proposes here. A lack of analysis and hard evidence of double-counting does not mean that the potential for it does not exist. During a deposition, SBC-CA witness Smallwood testified that SBC-CA's multi-state cost study was designed to comply with FCC directives and recover as much of a UNE's direct incremental cost as possible to reduce common costs. JA are correct that this is a different approach than was used in the prior OANAD proceeding, where the Commission noted that the OANAD treatment of shared and common costs was contrary to the FCC directive. (JA/Murray Decl., 10/18/02, pp. 34-35, citing D.98-02-206, *mimeo.,* at 18, n. 24.) This means that SBC-CA's proposed UNE costs may now categorize some costs as direct UNE costs that had been considered shared and common costs when the 21% markup was determined in the prior OANAD proceeding. Smallwood admits that SBC-CA made no adjustments to the annual cost factors in its new cost studies to recognize costs that are included in the existing shared and common cost markup. (XO, 2/7/03, p. 42.) Thus, it is reasonable to conclude that SBC-CA's ACFs contain some portion of shared and common costs.

XO contends that if the Commission adds a 21% markup to the UNE costs resulting from SBC-CA's models, it should either adjust the ACFs to mitigate the impact of this double counting, or undertake a new markup calculation. We have stated several times that we would not review the 21% markup in this limited proceeding.[27] If we were to make any adjustments to SBC-CA's ACFs to remove shared and common costs, they would be highly speculative. We find that this is yet another area of the SBC-CA models that we are not able to modify to our satisfaction in order to derive reasonable UNE costs.

[27] We note that JA filed a separate application, A.04-03-031, on March 12, 2004 nominating the shared and common cost markup for review in 2004.

c. Elimination of Other Expenses

Moreover, JA contend that SBC-CA has not eliminated certain expenses from its ACF cost study such as i) non-regulated expenses unrelated to UNEs, ii) affiliate transaction expenses, iii) DSL-related Project Pronto[28] expenses, and iv) annual amortization of post-retirement benefits, known as the "Transitional Benefit Obligation" (TBO).[29] JA maintain that all of these expenses are inappropriate to include in a study of forward-looking recurring UNE costs because they are either not current operating costs or are costs related to unregulated activities. (JA, 2/7/03, p. 104.)

i. Non-regulated Expenses

JA contend that SBC-CA included investments and expenses related to its non-regulated activities when it developed its ACFs. These non-regulated activities include services related to customer premise equipment, inside wire maintenance plants, and billing and processing of third-party customer bill payments. (JA/Brand-Menko, 2/7/03, pp. 25-26.) According to JA, it verified that these unregulated expenses are included by comparing ARMIS reports for regulated and unregulated expenses with the inputs used in SBC-CA's ACF cost study. (*Id.*)

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[28] Project Pronto refers to SBC-CA's capital expenditures to add loop plant, circuit equipment, and other facilities to provision advanced data services like DSL, which are provided by SBC-CA's unregulated affiliate, SBC Advanced Services Inc. (ASI).

[29] TBO refers to the accrual for post-retirement benefit expenses for SBC-CA's retirees. Effective in 1991, the rules for accounting for post-retirement benefits changed due to Statement of Financial Accounting Standards (SFAS) No. 106 Employers Accounting for Post-retirement Benefits Other than Pensions. SBC-CA adopted SFAS 106 for regulatory purposes on January 1, 1993. The TBO was established to account for the anticipated future retiree medical costs already earned as of that date, but not yet paid. (*See* SBC-CA/Cohen Declaration, 3/12/03, p. 15.)

SBC-CA responds that it appropriately relied on total expenses and investments when calculating per unit expense factors. (SBC-CA/Makarewicz, 3/12/03, p. 9.) For example, SBC-CA claims that its cable maintenance cost per unit will remain the same regardless of what service is using the cable. SBC-CA provides the analogy of a salesperson that has a company car that is used both for business (regulated) and personal (non-regulated) purposes. SBC-CA reasons as follows:

> Accurate per mile maintenance expenses for the vehicle are calculated using data for its entire use rather than the "arbitrary" distinction between business use and personal use. Likewise, it is appropriate for [SBC-CA] to use total account balances for plant expenses and investments to calculate its ACFs, and to apply the same ACFs to measure the costs for any services/elements whose provisioning relies on plant investment and expense. (*Id.*, p. 10.)

We disagree with SBC-CA's reasoning. We doubt that the company in SBC-CA's example, which issues a car for business use, would happily pay higher maintenance costs if the salesperson used the company car for excessive personal use. Likewise, we do not agree that expenses SBC-CA incurs for its unregulated businesses, such as inside wire maintenance, or billing services to third parties, should be considered when determining the expenses related to its UNE operations. SBC-CA admits that it has included expenses related to unregulated activities in developing its ACFs. We have no way to adjust the ACFs to remove these inappropriate expenses.

ii. Affiliate Transaction Expenses

JA contend that SBC-CA inappropriately includes expenses related to transactions with its affiliated companies in its ACFs, both for services sold by SBC-CA to its affiliates, and for purchases SBC-CA made from its affiliates. JA note that expenses related to affiliate transactions have increased four-fold since the merger of Pacific Telesis and SBC Communications in 1997. (JA/Brand-Menko, 2/7/03, pp. 28-30.) JA maintain that expenses related to providing services to SBC affiliates should not be attributed to California UNEs. (*Id.*, p. 32.) Further, costs for services purchased from affiliates need to be adjusted to forward-looking levels because SBC-CA pays for what it purchases from affiliates at "fully distributed cost" which is an embedded cost methodology. (*Id.* p. 34.)

SBC-CA does not deny that expenses related to affiliate transactions are included in its 2001 expense information that was used to develop its ACFs. SBC-CA contends no adjustment is needed for services purchased from affiliates, such as payroll processing, procurement, fleet operations, and information technology, because SBC-CA pays the lower of fully distributed cost or fair market value for its purchases. (SBC-CA/Henrichs, 3/12/03, p. 15.) SBC-CA does not respond to the JA argument that expenses for items sold to affiliates are not related to provisioning UNEs. We find that it would be unreasonable for SBC-CA's ACFs to include expenses related to services SBC-CA has performed on behalf of its affiliates and which do not relate to the provisioning of UNEs. SBC-CA has not met its burden of proof to assure us that these costs have been adequately removed from its ACFs. Further, we have no means of adjusting SBC-CA's ACF cost study to make this adjustment.

iii. Project Pronto Expenses

With regard to Project Pronto, JA and XO claim that SBC-CA's ACFs include a portion of Project Pronto costs incurred in 2001 that relate to development of SBC-CA's broadband network. These costs are not required for provisioning of UNEs. (JA/Brand-Menko, 2/7/03, p. 58-62; XO, 2/7/03, p. 17.) According to JA and XO, Project Pronto is a major technological upgrade, and

SBC-CA is incurring higher than normal costs in the early years of this upgrade, with the expectation of cost savings later. JA admit that a portion of Project Pronto costs are for overall network efficiency and should be included in ACFs, but they contend this amount is overstated because SBC-CA made no adjustment to 2001 expense levels to acknowledge high start-up expenses and account for future cost reductions from Project Pronto. (JA/Brand-Menko, 2/7/03, para. 125.) XO contends that expense data that SBC-CA uses in its cost studies reflects those early years of Project Pronto implementation, but fail to consider future Project Pronto savings. JA claim that Project Pronto costs are inextricably melded into SBC-CA's 2001 expense information, and SBC-CA admits it cannot identify separate Project Pronto costs.

SBC-CA does not deny that 2001 expenses used for ACFs include Project Pronto expenses, and that it cannot separate these costs from the expenses it used for its ACFs. Rather, SBC-CA makes the argument that the same equipment used for Project Pronto can also provide voice service. Thus, expense levels for this equipment are the same whether it serves voice or DSL service. (SBC-CA/Makarewicz, 3/12/03, p. 18.) On the charge that future Project Pronto savings are not incorporated, SBC-CA says that it has already incorporated Project Pronto savings by modeling fiber loop plant and lower maintenance factors associated with fiber. (*Id.*, pp. 17-20.)

We find that SBC-CA has not met its burden to show that Project Pronto expenses were appropriately accounted for when developing its ACFs. SBC-CA admits it cannot separate Project Pronto expenses from its total 2001 expense information used to develop ACFs. We agree with JA that some Project Pronto costs likely contribute to overall network efficiency, but not necessarily all of them. SBC-CA offers us no ability to allocate the expenses between its voice and broadband services. We do not agree with SBC-CA's apparent assumption that all Project Pronto costs should be allocated to UNEs. SBC-CA argues that future efficiencies for Project Pronto are accounted for in its models through lower fiber maintenance ACFs. We do not find this argument convincing because without an allocation of Project Pronto expenses between voice and broadband services, we cannot be assured that SBC-CA's fiber maintenance expenses wouldn't actually be lower if some were properly attributed to the broadband network. Thus, SBC-CA has not met its burden of justifying these expenses as forward-looking. We are unable to adjust ACFs to remove potentially inflated Project Pronto expenses.

iv. Transition Benefit Obligation (TBO) Expenses

This particular debate is about an accrual for an accounting change that took place over a decade ago. As SBC-CA explains, the TBO accrual is a "liability for future retiree medical costs already earned by current and former employees [as of 1/1/93] but not yet paid…." (SBC-CA/Cohen, 3/12/03, p. 15.) In other words, it is an amortization of expenses SBC-CA would have shown on its books long ago if SFAS No. 106 had been in effect prior to 1/1/93.

JA contend that the TBO represents the amortization of an embedded cost resulting from past activities that are not forward-looking. The TBO that was recorded in 1993 has nothing to do with the costs of an efficient carrier today. (JA/Brand-Menko, 2/7/03, pp. 44-47.) SBC-CA contends these are forward looking expenses that are appropriately treated as shared and common costs. According to SBC-CA, it removed some TBO expenses from its ACF study, but it admits that the proper amount should have been almost three times what it actually removed. (SBC-CA/Cohen, 3/12/03, pp. 19-20.) JA contend that

SBC-CA should have removed over $80 million, and the amount SBC-CA admits removing is far below this. (JA/Brand-Menko, 2/7/03, p. 46.)

We agree with JA that this particular TBO accrual is not a current operations cost, since it is essentially catching up for failing to account for this expense when it was incurred. TBO costs should not be included in SBC-CA's ACFs. From the meager record on this issue, we have no idea what the amount is that should be removed from SBC-CA's ACF calculations, because it appears that SBC-CA's TBO amortization for the 1993 accounting change may be included with the accruals it makes today for current employees. In addition, we are not reviewing the shared and common cost markup in this proceeding so we will not address whether TBO costs are appropriate to include in the shared and common cost markup. What we do know is that SBC-CA admits the amount it removed was understated.

In summary, we have found several problems with SBC-CA's ACF cost study. We agree with JA and XO that in an ideal world, SBC-CA's cost model expense calculations need to be revised to remove the expenses described above. When we tried to make these adjustments ourselves, we found it was not possible given the current record to isolate and remove expenses for non-regulated operations, affiliate transactions, Project Pronto, and the TBO.

d. Inflation and Productivity

Finally, JA protest SBC-CA's inflation adjustments to its operating expenses and capital investments. SBC-CA incorporated inflation into its cost modeling using an inflation factor for capital investments based on the Telephone Plant Index (TPI), and an inflation factor for its operating expenses based on the Consumer Price Index-W (CPI-W).[30] (SBC-CA/Cohen, 10/18/02, p. 17.)

JA criticize SBC-CA's inflation adjustments based on the TPI and CPI-W as neither specific to SBC-CA nor closely related to the types of costs SBC-CA experiences. (JA, 2/7/03, p. 103.) Further, JA contend that SBC-CA has failed to reflect future productivity improvements and expense savings from such sources as technological innovation and mergers. According to JA, there is extensive regulatory precedent for the concept that inflation should not be incorporated into a cost study unless there is a corresponding offset for productivity. (JA/Brand-Menko, 2/7/03, pp. 86-88.) Specifically, JA note that this Commission's own "New Regulatory Framework" (NRF) decision incorporates both inflation and productivity adjustments to rates. (*Id.*, p. 87, citing D.89-10-031.) JA contend there is significant evidence that any inflation SBC-CA experiences in its costs will be offset by productivity estimates that exceed inflation. (*Id.*, pp. 93-95.) According to JA's witness Flappan, BLS data for similar telephone utilities shows that worker productivity has exceeded inflation price increases by 3.8% per year on average from 1996 through 2000. When productivity exceeds inflation, costs per labor hour decrease even if nominal wages increase. (JA/Flappan, 2/7/03, p. 30.) Thus, Flappan contends it is unreasonable to assume inflation in labor costs without corresponding adjustments for productivity. (*Id.*) JA recommend that the Commission either incorporate a negative inflation factor, based on their conclusion that

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30 According to SBC-CA, the TPI is obtained from C.A. Turner Utility Reports. (SBC-CA/Cohen, 10/18/02, p. 6.) The CPI-W is defined as the Consumer Price Index for Urban Wage Earners and Clerical Workers. (SBC-CA/Cohen, 3/12, p. 29.)

productivity will exceed inflation on a forward-looking basis, or inflation factors should be removed entirely because SBC-CA did not include any productivity assumptions.

Similarly, XO criticizes SBC-CA's inflation assumptions, noting that SBC-CA's actual operating expense data indicates expenses have fallen rather than risen in line with retail prices in the overall economy. (XO, 2/7/03, p. 9, and 19.) XO objects to SBC-CA's assumption that as telecommunications equipment prices decrease, operating expenses rise. XO says this assumption is contradicted by SBC-CA's actual operating expense data per access line that indicates 4.2% per year declines from 1996-2000. (*Id*., p. 19.)

SBC-CA responds that its use of the TPI and the CPI-W are appropriate as inflation factors because they conservatively estimate the inflation SBC-CA will face in its costs. SBC-CA justifies using the CPI-W by stating that it measures inflation in wages, which are a large portion of SBC-CA's expenses. (SBC-CA/Cohen, 3/12/03, p. 29.) Further, SBC-CA disputes JA's contention that it has left productivity out of its cost studies. SBC-CA contends that it has incorporated productivity in its cost studies by assuming placement of only new technology and applying maintenance factors associated with forward-looking technology. SBC-CA also contends that by using its latest expense data for its operating expense factors, it has already incorporated the latest gains in personnel productivity. (*Id*., p. 33.)

We agree with JA and XO that it is improper to include inflation adjustments in the expense data, without a corresponding adjustment for productivity. We do not agree with SBC-CA's assertion that it has already factored in productivity simply by using forward-looking technology and by using SBC-CA's 2001 expense information. Investment in equipment of the latest technology does not by itself account for all the productivity gains that the company could achieve in the future. Similarly, the use of 2001 expenses, by definition, does not include future productivity potential. Rather, we find merit in Flappan's arguments regarding productivity. Flappan provides BLS data indicating that worker productivity has exceeded inflation price increases for several years. (JA/Flappan, 2/7/03, p. 30.) We do not find it reasonable that SBC-CA has included inflation price increases in its labor rates, but no corresponding productivity assumptions. As JA have pointed out, other states faced with this same issue, namely Texas, Missouri, and Kansas, have removed the inflation increases under the assumption that productivity offsets inflation. (*Id.*, p. 29.) As in other states, we will make the conservative assumption that productivity will at least equal inflation even though it has actually outstripped it according to recent BLS data.

Therefore, in our runs of the SBC-CA models, we have removed the inflation component of SBC-CA's capital and operating expense factors, which essentially means that we assume inflation and productivity offset each other. This is consistent with the Commission's assumptions regarding inflation and productivity in our NRF decisions.

5. Summary of SBC-CA Modeling Flaws

In conclusion, SBC-CA's LoopCAT model relies too extensively on embedded data that we are unable to modify to our satisfaction. This information includes cabling requirements, loop length forecasts, structure sharing assumptions, and labor installation times and crew sizes which are embedded in various factors. LoopCAT's extensive use of annual cost factors, or "linear loading factors," prevents us from making meaningful modifications to LoopCAT to test varying input assumptions because we cannot extract individual inputs from LoopCAT's aggregated factors, or compare and verify individual inputs to public information.

For switching costs, the flaws noted by JA are not fatal because SBC-CA's SICAT model can be modified through input modifications. On the other hand, we find that interoffice rates calculated by SBC-CA's SPICE model are not based on total demand and we are unable to make modifications to the SPICE model to remove embedded network assumptions. With regard to expenses, we cannot modify the SBC-CA models sufficiently to remove several categories of expenses. Further, SBC-CA's ACFs are based on historical information that is aggregated into bundles that we cannot dissect in order to understand the underlying inputs, compare them to other public information or the inputs SBC-CA criticizes in HM 5.3, or test the effect of different input assumptions.

Overall, our inability to modify SBC-CA's models in these areas leads us to conclude that the SBC-CA models do not comply with TELRIC because they are merely rebuilding the network that exists today, with some technology upgrades, rather than building a forward-looking network configuration.

B. Flaws in the HM 5.3 Model

Overall, SBC-CA criticizes HM 5.3 as understating SBC-CA's forward-looking cost of providing UNE's because it does not reasonably estimate the quantities or prices of network facilities to build a competing local exchange network. SBC-CA alleges that HM 5.3 is "results-driven" and "manipulated to produce the lowest UNE cost estimates possible." (SBC-CA, 2/7/03, p. 11.) Moreover, SBC-CA claims that HM 5.3 does not overcome the flaws the Commission found with its predecessor, HM 2.2.2, namely the earlier model's faulty representation of distribution plant in low-density areas. Thus, SBC-CA claims that despite its new customer location and clustering process, HM 5.3

models an inadequate amount of loop plant. (SBC-CA/Tardiff, 2/7/03, pp. 70-71.)

SBC-CA's criticisms of HM 5.3 can be grouped into seven categories. Essentially, SBC-CA contends that HM 5.3: 1) ignores accepted engineering and network design standards, 2) is based on a flawed customer location process, 3) relies excessively on unverifiable "expert judgment," 4) ignores actual demand in its switching and interoffice models and would be unable to provision high speed services, 5) does not provision enough spare capacity, 6) includes unrealistically low expense levels, and 7) fails to provide a test of validity. SBC-CA alleges that as a result of these flaws, HM 5.3 produces a network that is unrealistic and unreasonable because it has far less outside plant than SBC-CA's actual network today (*i.e.* fewer distribution areas, less distribution pairs, less fiber equipment, less trunks, and less interoffice network equipment). (SBC-CA, 2/7/03, p. 20.)

We will address each of these criticisms in turn. As an overview, we find merit to some of SBC-CA's criticisms of HM 5.3, but not all of them. We find that many of SBC-CA's criticisms can be addressed by input modifications to the model. Where we can modify inputs, we do not agree that SBC-CA's criticisms are insurmountable. Although SBC-CA is critical of inputs relating to engineering and design standards, spare capacity, and expense levels, these are all inputs that we can modify. However, this is not true in other areas. While we do not agree with SBC-CA that the entire customer location process is flawed, neither do we agree with all of the assumptions built into the HM 5.3 geocoding and customer location process. We find that it is not possible to modify this area of HM 5.3 and test various scenarios. In addition, we agree with SBC-CA that many of the "expert judgments" used as inputs to HM 5.3 are questionable, and appear biased to produce low results. We have found that many of these expert judgments can be replaced with assumptions and inputs used by SBC-CA in its own model. But this is not the case in one important area--labor costs. We explain this more fully below. Finally, we find that we cannot overcome criticisms of the HM 5.3 Transport module that it underestimates demand for interoffice transport, may not adequately incorporate optical interface equipment for the provisioning of high capacity services, and is insensitive to demand changes. We now turn to a detailed review of our findings with regard to HM 5.3.

1. Engineering and Design Standards

In general, SBC-CA maintains that HM 5.3 is incapable of producing accurate TELRIC estimates because it ignores widely accepted engineering and network design standards, and instead relies upon a series of erroneous engineering assumptions, unrealistic input values, and inappropriate estimating methodologies. As a result, HM 5.3 understates the amount of facilities required to provide service. According to SBC-CA, HM 5.3's principal flaw is its assumption that a brand new fully functioning, optimal network could be instantly constructed at a single moment in time. (SBC-CA, 2/7/03, p. 13.) SBC-CA maintains that HM 5.3 is based on a fiction that a competitive firm could enter and instantly size and build all of its facilities to accommodate a known snapshot of demand, when in reality, networks are built and have evolved over time to accommodate demand as it grows and shifts. (SBC-CA/Tardiff, 3/12/03, p. 17.) By building an abstract network divorced from reality, SBC-CA maintains that HM 5.3 focuses only on existing lines and does not account for vacant parcels of land or vacant homes. Therefore, HM 5.3 does not build to the "ultimate demand" that a real-world carrier would serve. (SBC-CA, 2/7/03,

p. 40.) In addition, SBC-CA contends that this assumption of an instantaneous network fails to match the other assumptions in HM 5.3, particularly the relatively long depreciation lives and a low cost of capital assumed by JA. (SBC-CA/Tardiff, 2/7/03, p. 15.)

Further, SBC-CA criticizes the "right angle routing" that HM 5.3 uses to connect customer locations. Rather than connecting customer locations by a straight line of the shortest-distance, or "as the crow flys," HM 5.3 assumes that customer connections form the two sides of a right triangle, hence the term "right angle" routing. (JA/Mercer, 10/18/02, Attachment RAM-4, p. 36, n. 33.) SBC-CA contends that this routing assumption constructs an outside plant design that is purely hypothetical and fails to reflect SBC-CA's operating realities, where carriers cannot ignore geographic impediments and man-made obstacles such as rivers, lakes, mountains, rights-of-way, and easements. (SBC-CA, 2/7/03, p. 13.) According to SBC-CA, "right angle routing" causes HM 5.3 to understate the amount of plant necessary to serve customers by ignoring real and man-made obstacles. (SBC-CA, 2/7/03, p. 48; SBC-CA/Murphy 2/7/03, p. 53.)

On the whole, SBC-CA alleges that HM 5.3 designs a hypothetical network that only satisfies existing demand at existing locations, excludes the real-world costs of fluctuations in demand from customer growth and churn, and results in a model that produces unrealistic investment levels compared with SBC-CA's actuals. SBC-CA contrasts HM 5.3 results to SBC-CA actual operating results and highlights the following:

- HM 5.3 calculates total investment of $9 billion, but SBC-CA spent $9.6 billion just on plant additions from 1998 to 2001 (SBC-CA 2/7/03, p. 7.)

- HM 5.3 assumes a network that can be maintained for $.7 billion, while SBC-CA spent $2.7 billion on maintenance in 2001. (*Id.*)
- HM 5.3 models 32 million distribution pair while SBC-CA has almost double this number in its actual network. (*Id.*, p. 20.)
- HM 5.3 creates a network with 11,661 distribution areas whereas SBC-CA has more than 5 times this number in its serving area. (*Id.*)

We find that SBC-CA's criticisms of HM 5.3 principally highlight questionable inputs that JA have used in HM 5.3, but we do not agree that HM 5.3 violates TELRIC requirements overall. SBC-CA takes issue with how HM 5.3 applies TELRIC to build a network instantaneously to meet current demand. While we agree that it may be unrealistic to assume a network can be constructed overnight, we find that HM 5.3 for the most part follows well-established TELRIC guidance and SBC-CA's criticisms center largely around quarrels with the inputs that are used in the model. We can modify many of the inputs and assumptions in HM 5.3 to address these criticisms. For example, we can ensure that the assumed fill factors provide reasonable spare capacity for growth, we can assume that a carrier will incur a higher cost to install sufficient switching investments because it cannot buy all the lines it will need at the steeply discounted "new" switch price, and we can change labor rates and task times to reflect more realistic equipment installation assumptions and expenses.

We agree with JA that based on established TELRIC rules, HM 5.3 should not build to "ultimate demand." (JA/Donovan, 3/12/03, paras. 191-194.) In its own modeling for federal universal service purposes, the FCC has stated that model inputs should reflect current demand, which it defines to include a "reasonable amount of excess capacity to accommodate short term growth." (Inputs Order, para. 190.) The FCC has explicitly rejected the notion of modeling based on "ultimate demand," because it is highly speculative (*Id*., para. 201). The FCC stated that "correctly forecasting ultimate demand is a speculative exercise, especially because of rapid technological advances in telecommunications." (*Id.,* para. 200.) JA claim that HM 5.3 includes extra pairs to accommodate additional lines, maintenance and administrative needs, and therefore provides the same level of service as SBC-CA's current network. (JA, 3/12/03, p. 46.) We find that if we run HM 5.3 with an appropriate number of pairs per household and using appropriate fill factors, HM 5.3 accounts for a reasonable level of growth, and sizes the network to provide appropriate service quality and reach potential customers. As the FCC has stated, predicting ultimate demand is a speculative exercise, particularly in today's environment of rapidly changing technologies and demand levels, which SBC-CA acknowledges. (*See e.g.,* SBC-CA, 3/12/03, p. 70, n. 278.)

We do not agree with SBC-CA that the right-angle routing used by HM 5.3 necessarily understates loop plant. SBC-CA relies on the opinion of its expert witness that outside plant is underestimated in HM 5.3, but it has not provided empirical evidence that its actual route distances are greater than those modeled by HM 5.3, or any comparison of the distances modeled in the SBC-CA Models to those in HM 5.3. JA contend that right-angle routing conservatively overestimates loop plant because it uses right-angle rather than straight line connections. It is logical that loop lengths based on right-angle connections will be longer than straight line connections because mathematically, the two sides of a right triangle, when added together, are longer than its hypotenuse. Thus, we find that the right-angle routing used in HM 5.3 is reasonable. Although right angles may not match SBC-CA's actual network routes, it is more realistic to assume right angles than to assume a carrier could build all routes along straight lines.

Indeed, the loops SBC-CA models in LoopCAT do not follow existing routes either for the distribution portion of the loop. We have more confidence in the loop lengths modeled by HM 5.3, which begin with actual customer locations and use right-angles to connect customers within a cluster, than we have in SBC-CA's LoopCAT which is based on half of the longest distribution loop segment that might be built in the next twenty years. Neither model follows existing routes or places all loop facilities in today's locations, and HM 5.3 makes conservative right-angle assumptions to connect existing customers rather than assuming all loops in a distribution area are one length.

SBC-CA argues that CCP 6 requires the modeling of SBC-CA's "existing or planned" outside plant facilities. Yet, the language SBC-CA quotes has been superseded by the FCC's TELRIC requirements adopted in 1996, describes assumptions for a TSLRIC analysis, and is contradicted by CCP 7 which mandates that costs be forward-looking and "shall not reflect a company's embedded base of facilities." (D.95-12-016, Appendix C, p. 5.) While we agree that the use of SBC-CA's actual right-of-way and plant routes would be a superior modeling technique, neither model has been able to achieve this level of reality. SBC-CA's LoopCAT does not follow CCP 6 either. While SBC-CA models existing feeder routes, this is not true for the distribution portion of the network where SBC-CA has used the design point to approximate distribution loop lengths. Further, the FCC's TELRIC rules, which issued after the Commission's CCP's, do not mandate the use of existing outside plant routes, and specifically allow a "reconstructed local network." (First Report and Order, para. 685.) Therefore, we find that although JA's simplifying assumption of right-angle routing is not based on today's outside plant routes, it most likely increases costs in the model by using a longer route than if customers were connected by straight lines.

We do not agree with SBC-CA that HM 5.3 is automatically flawed because its proposed costs are lower than SBC-CA actual costs. SBC-CA makes generic statements that the characteristics of its current network best reflect an efficient forward-looking network because SBC-CA has years of experience running a network and has been operating under incentive regulation designed to make its network competitive. SBC-CA actual costs may not be forward-looking, may be skewed by unusual one-time expenses from that year, or may simply reflect the cost of running a network based on embedded choices that a new carrier would not make. In many ways, we consider SBC-CA's comparisons of model results to its actual network experience irrelevant because its actual costs may not be forward-looking. Further, we find these comparisons less useful because they are often made at a very aggregate level and do not allow us to compare discrete modeling results in an "apples to apples" fashion.

SBC-CA's attempt to argue that HM 5.3 results are unrealistic when compared to SBC-CA's current operations appears to echo the unsuccessful arguments that ILECs presented to the U.S. Supreme Court. The Supreme Court recognized that "the problem with a method that relies in any part on historical cost, the cost incumbents say they actually incur, is that it will pass on to lessees the difference between most-efficient cost and embedded cost." (*Verizon*, 122 S. Ct. at 1673.) The court flatly rejected the idea of basing UNE costs on costs from SBC-CA's network today.

While SBC-CA criticizes numerous inputs to the HM 5.3 model as highly unrealistic and biased too low, it does not provide specifics on what a more realistic input should be given its own network experience. SBC-CA's main response is that the Commission should use its model instead, rather than amend the inputs in HM 5.3. For example, SBC-CA's witness McNeil criticizes HM 5.3 for what he considers unrealistic assumptions about how fast a crew can place and splice fiber and cable, but he does not provide actual placement and splicing times, only the vague suggestion that the crew size should be larger. (SBC-CA/McNeil, 2/7/03, pp. 46-50.) In contrast, JA witness Donovan defends his input assumptions, and notes that his estimates are actually higher than data from SBC-CA's job cost estimate database. (JA/Donovan, 3/12/03, pp. 24-30.)

A second example involves DLC installation costs. While SBC-CA criticizes HM 5.3's DLC cost assumptions, it cannot justify its own inputs in this area. SBC-CA's witness Palmer states that estimates of DLC installation costs by JA are too low because they are based on Project Pronto estimates and "[t]here is absolutely no relationship between the actual costs incurred today by SBC-CA California to install this equipment and the high-level estimates used in 1999 for business case purposes." (SBC-CA/Palmer, 3/12/03, p. 13.) When questioned at the hearings about SBC-CA's actual DLC installation costs, neither Palmer nor SBC-CA's other loop witness, Ms. Bash, could provide an answer or explain how SBC-CA knew that JA's DLC installation assumptions were too low if they did not know SBC-CA's actual costs. (Hearing Tr., 4/15/03, pp. 572-575.) Later, at a continuation hearing, Bash provided information on actual SBC-CA DLC installations from a sample she chose of 8 installations. (Proprietary Hearing Exhibit (PHE) 109.) SBC-CA admits that the actual costs from Bash's sample are lower than the factors for DLC installation used in LoopCAT. (SBC-CA, 8/1/03, p. 21.) A further sample of 50 installations chosen by SBC-CA and JA also indicates costs from actual DLC installations that are lower than the DLC installation factors used by SBC-CA in its own model. (JA, 8/1/03, Exhibits C-4, C-5.) We give little weight to criticisms of HM 5.3 assumptions when witnesses are unable to provide specifics from SBC-CA's own experiences or explain why modeling inputs differ from actual costs.[31]

2. Loop Modeling and Customer Location

HM 5.3 uses detailed customer location information supplied by SBC-CA to identify SBC-CA's current customer locations and cluster them into distribution areas. This is the foundation for the network that HM 5.3 models

[31] *See* Section VI.D for a complete discussion of the DLC inputs used in the Commission's model runs.

and is used to determine the lengths of facilities' routes, how much feeder plant is needed, and the types and amounts of copper cable and support structure. (SBC-CA/Tardiff, 2/7/03, p. 17.) Essentially, SBC-CA contends there are numerous flaws with the geocoding process and customer location database used as an input to HM 5.3, and these flaws violate the Commission's cost modeling criteria and result in loop costs that are too low and loop plant that is not constructed using standard engineering practices.

To understand SBC-CA's criticisms, it is helpful to review the geocoding and clustering process used in HM 5.3. (*See* JA/Mercer Decl., 10/18/02, Attachment RAM-4, Model Description, Section 5.2 - 5.3.) JA contracted with an outside vendor, TNS, to take SBC-CA's customer location data and "geocode" it by assigning each customer location a precise longitude and latitude. Where SBC-CA's data was incomplete or unreliable, "surrogate" geocoded locations were assigned. TNS then used its proprietary algorithms to group these geocoded customer locations into logical serving areas, or "clusters," based on the category of service appropriate for that customer. The clustering algorithm imposed three critical engineering restrictions to ensure that 1) no point in the cluster may be more than 17,000 feet from the center of the cluster, 2) no cluster may exceed 6451 lines,[32] and 3) no point in the cluster may be farther than two miles from its nearest neighbor in the cluster. (*Id.*, RAM-4, section 5.3.2.)

The clustering process produces irregularly shaped groupings of customers in each wire center that JA term "convex hulls," or "clusters." TNS then determines the "centroid" of the cluster, which is the midpoint of the line

[32] The limitation of 6,541 lines is based on a maximum underground vault, or "CEV" sized to hold 8,064 lines, of which 20% is reserved for growth.

connecting the two farthest points in the cluster. (*Id.,* RAM-4, Section 4.5, n. 26.) HM 5.3 uses the cluster centroid as the location for the feeder termination, or serving area interface (SAI). In addition, TNS calculates a "strand distance" which is a measurement of the route mileage required to connect all customer locations to each other. The strand distance is based on a "minimum spanning tree" (MST) theory and assumes "right-angle" routing between customer points. (*Id.*, RAM-4, Section 8.4, n. 47.)

Next, TNS takes the convex hull clusters and transforms each into a rectangle of the same total area as the original convex hull, so that a distribution network can be laid out over the cluster. JA describe this as "rectangularization." Finally, TNS uses demographic data to assign demographic characteristics such as terrain, housing profiles, and line density zone characteristics, to the clusters. (*Id.*, RAM-4, Section 6.1.)

The customer location database input is now complete and ready to be input to HM 5.3. HM 5.3 takes the rectangular clusters in the database and subdivides them into lots of equal sizes in order to lay out a distribution network over the cluster to reach each of the lots, which are uniformly dispersed over the area of the cluster. (*Id.*, RAM-4, Section 8.1.) HM 5.3 compares the total distance of this distribution network to the "MST" strand distance, or route mileage, calculated by TNS and allows the user to adjust the route mileage to this MST distance when calculating the cost of the distribution network. (*Id.*, RAM-4, Section 8.4.)

SBC-CA contends that the customer location database resulting from the TNS geocoding process is a black box that cannot be verified because JA have not provided the proprietary source code used by TNS for the geocoding and clustering process. SBC-CA also contends that the clustering process produces distribution areas that are too large and do not represent actual customer locations in SBC-CA's serving area. (SBC-CA/Dippon, 2/7/03, pp. 4-5.) We now describe and discuss these criticisms.

a. Transparency of the Clustering Process

SBC-CA charges that the TNS customer location database and clustering process is not sufficiently open because it does not allow parties access to the database's underlying data, calculations, and assumptions. This inhibits SBC-CA's ability to examine and modify HM 5.3 customer location engineering principles. According to SBC-CA, JA never provided access to the source code of the algorithm used by TNS to cluster SBC-CA's customer information data. Without the source code, SBC-CA claims it cannot review, test, or modify how the model clusters customer locations. (SBC-CA, 2/7/03, p. 30.) SBC-CA's witness Dippon claims that the clustering description provided by JA does not match what TNS appears to have done. (SBC-CA/Dippon, 2/7/03, pp. 27-30.)

In response, JA contend that SBC-CA was given everything it needed to review, understand, and test the TNS clustering process. (JA, 3/12/03, p. 51.) We agree with JA that it provided reasonable access to its clustering process since SBC-CA's witness Dippon was able to run his own clustering scenario where he reduced the maximum lines in the cluster from 6,451 to 1,800. (SBC-CA/Dippon, 2/7/03, p. 42.) While the clustering algorithm was performed by TNS as an outside input to HM 5.3, it is comparable to SBC-CA's preprocessing of its loop records before they were input to LoopCAT. In other words, both parties had to "preprocess" vast amounts of data to prepare it for input to the actual UNE cost models, and there are aspects of both the TNS and the LoopCAT preprocessing work that outside parties and Commission staff are not able to replicate or scrutinize for various reasons. Nevertheless, JA did describe the TNS clustering process in some detail in its filings and through discussions with SBC-CA, and SBC-CA was evidently provided enough information to be able to run its own version to test a different set of clustering criteria.

Nevertheless, we can sympathize with SBC-CA's frustration at not being able to examine every detail of the TNS process as Commission staff have spent much time reviewing this area. JA's description of the geocoding and clustering process is far from clear and overly laden with technical terminology that is difficult to wade through. Indeed, "rectangularize," "centroid," and "convex hull" are not common words. Ultimately, Commission staff found itself unable to run its own version of the TNS clustering process to see the effects of different assumptions because it would have required extensive computer equipment that the Commission does not have available. In this regard, SBC-CA was able to accomplish what we couldn't. We recognize that neither HM 5.3 nor SBC-CA's models allowed us the ability to fully understand or replicate their preprocessing steps, and therefore, both models have aspects that could be considered "black boxes."

b. Accuracy of Customer Locations

Despite his lack of access to the clustering algorithm source code, SBC-CA's witness Dippon identified several errors in the clustering process that cause the clusters to bear no resemblance to real world customer groupings or actual customer locations in SBC-CA's serving area. (SBC-CA, 2/7/03, p. 31; SBC-CA/Dippon, 2/7/03, pp. 2-3.) Dippon lists numerous examples where the clustering process places customers or equipment in locations SBC-CA contends do not match reality. For example, Dippon takes issue with how TNS determined the cluster "centroid," which HM 5.3 uses to locate the Serving Area

Interface (SAI) equipment. (SBC-CA/Dippon, 2/7/03, p. 36.) Second, Dippon describes how the clustering "clumps" customers in downtown areas into unrealistic high-rise buildings. For example, HM 5.3 produces a 1,020-story building and understates the amount of distribution plant to serve such a tall building. (SBC-CA, 2/7/03, p. 47.) Third, SBC-CA again raises the criticism that when constructing a real world network, geographic impediments and man-made obstructions must be considered.

We find these criticisms are somewhat ironic given SBC-CA's modeling approach that does not locate customers at all, assumes they are all uniformly dispersed in a ring around the central office, and makes no effort to model high-density customer locations or multiple dwelling units. Both models have made many simplifying assumptions in order to model a network. Some of these assumptions are more far-fetched than others. We agree with JA's assessment that HM 5.3 is not an engineering model, but a cost model that locates current customers and determines the cost of plant to reach those customers, plus room for reasonable growth, without determining the actual locations where plant will be placed.

We find that the clustering assumptions that form the basis of HM 5.3 are no worse than the loop input assumptions used by SBC-CA in its preprocessor, including SBC-CA's approximated loop length based on a "design point." In fact, we find the HM 5.3 model more reasonable in its loop design because it is based on actual customer locations and designs plant based on the realities of where customers are grouped today. SBC-CA's model presumes that all of the customer groupings in its network today are forward-looking and efficient, and does not allow the user to regroup customers into more logical groupings. Then, SBC-CA models loop plant to serve these existing groupings based on the "design point" concept and its resulting approximation of loop length. In contrast, HM 5.3 starts by locating all customers where they are today, and recognizes dense groupings of customers given the high proportion of multiple dwelling units in California.[33] We find that HM 5.3 provides a more granular approach to designing a distribution network than SBC-CA. Therefore, SBC-CA's criticisms that customer locations are not accurate rings hollow, particularly when its own model does not accurately locate customers either.

With regard to SBC-CA's specific criticisms, JA counter that HM 5.3 may not reflect the physical realities of SBC-CA's network, but it is not intended to mimic the exact locations of SBC-CA's plant. Indeed, SBC-CA's model does not do this, and neither does the FCC's Synthesis Model. (JA, 3/12/03, p. 53**,** JA/Murray, 3/12/03, p. 13.) We agree with JA that TELRIC allows reconstruction of the network using existing wire centers, and does not require a model to use existing facility routes. In defining TELRIC, the FCC rejected cost approaches based entirely on a new network design or based entirely on existing network design. (First Report and Order, paras. 683 and 684.) Instead, the FCC found that a cost methodology that was based on the most efficient technology deployed in the incumbent LEC's current wire center locations "encourages facilities-based competition to the extent that new entrants, *by designing more efficient network configurations*, are able to provide the same service at a lower cost than the incumbent LEC." (*Id.*, para. 685.) (Emphasis added.) The FCC

[33] We note that similar to the SBC-CA models, HM 5.3 can also be criticized for how it handles multiple dwelling units. Although HM 5.3 clusters customers based on current population density characteristics, it does not necessarily model sufficient equipment to serve high density locations. This is discussed in detail in Section VI.E.7 where we address the fill factor for premises termination equipment.

therefore concluded that "the forward-looking pricing methodology for interconnection and unbundled network elements should be based on costs that assume that wire centers will be placed at the incumbent LEC's current wire center locations, but that the *reconstructed local network* will employ the most efficient technology for reasonably foreseeable capacity requirements." (*Id.*) (Emphasis added.)

We acknowledge that certain elements of the real-world network are fixed, such as terrain, roads, and customer locations. Nevertheless, a TELRIC model recognizes that the design of the current network may not represent the most efficient, forward-looking design because it may reflect choices made at a time when different technology options existed or when a different cost structure for equipment and labor drove decision-making. Fundamental to TELRIC cost modeling is the understanding that it is not merely an engineering cost estimate for actual re-construction of the existing network. Rather, a TELRIC model estimates costs based on the location of existing wire centers coupled with forward-looking network assumptions that in the aggregate are reasonable.[34]

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[34] The FCC has itself noted, in the context of its own cost modeling for universal service purposes, that:

> We do not agree, as some parties have argued, that the models' outside plant design parameters should be verified by comparing the design of the model networks in specific locations to the design of incumbent LECs' existing plant in those locations in all cases. While we recognize that certain factors such as terrain, road networks, and customer locations are fixed, the design of the existing networks under these conditions may not represent the least-cost, most efficient design in some cases…. Existing incumbent LEC plant is not likely to reflect forward-looking technology or design choices. (*In the Matter of Federal-State Joint Board on Universal Service* (CC Docket No. 96-45), *Forward-Looking Mechanism for High Cost Support for Non-Rural LECs* (CC Docket No. 97-160), Fifth Report & Order, para. 66. (rel. Oct. 28, 1998).)

Thus, we do not agree with SBC-CA that it is necessary for HM 5.3 to locate outside plant, such as SAI's, in the exact location that they are today.

Regarding clumping of customers into unrealistic high rise buildings, JA explain that HM 5.3 had to make simplifying assumptions about customers with the same address where it did not know the square footage "footprint" of the building. In other words, when HM 5.3 sees a high concentration of lines at one address, it does not know if this is a large shopping mall or a high-rise building. The model has been set up to treat many lines at one address as a high-rise, but only includes distribution cable to serve 50 floors recognizing that buildings seldom exceed this height. HM 5.3 includes this 50 floors of distribution cable even though such intra-building cable may not be part of the local exchange network, but property of the building owner. Therefore, JA admit that a 1,020 story building is unrealistic, but it is simply a result of simplifying modeling assumptions where HM 5.3 does not know the exact building square footage. Further, HM 5.3 conservatively overestimates costs by including distribution cable to serve these high-rises. (Workshop Tr., 6/25/03,pp. 658-661. *See also* JA/Mercer, 3/12/03, paras. 186-190.)

JA state that the criticisms levied by SBC-CA, if corrected, would only serve to lower the cost estimates produced by HM 5.3 by modeling the network with greater exactitude. (JA, 3/12/03, p. 54.) We find that HM 5.3 approach is reasonable in that it determines a logical customer cluster and builds plant to reach customers in that cluster. While the routes to build plant may not match SBC-CA's existing routes and may inadvertently hit a geographic or man-made obstacle, the right angle routing assumed throughout, rather than straight line routes, attempts to accommodate for this and is more realistic than assuming a network would follow straight line routes.

Therefore, we find that the method used by HM 5.3 to model customer locations and the costs of reconstructing SBC-CA's network, given its existing wire centers, falls reasonably within TELRIC guidelines and uses logical assumptions. Again, we do not agree with all of the inputs used in HM 5.3, but the concept of creating customer groupings based on today's actual customer locations, and calculating the cost of building a distribution network to connect them is reasonable, even if the reconstructed network does not follow today's exact outside plant routes.

c. Sensitivity to Clustering Changes

SBC-CA contends that the clustering process is flawed because when HM 5.3 is re-run after re-clustering the customer location data into smaller clusters, the results show minimal impacts on total loop cost estimates. (SBC-CA, 2/7/03, p. 37.) Specifically, SBC-CA's witness Dippon ran a scenario of HM 5.3 where he reduced the cluster sizes from a maximum of 6,451 lines per cluster to 1,800, thereby increasing the number of clusters in HM 5.3 by 200 %. (SBC-CA/Dippon, 2/7/03, p. 43.) Dippon's run with smaller cluster sizes resulted in only a slight decrease in loop cost. Dippon contends this result is illogical because if cluster sizes are reduced such that HM 5.3 has to build a network to reach more clusters of smaller size, loop costs should rise. (*Id.* p. 44.)

In response, JA maintain that the results of Dippon's "1,800 run" are not illogical when one considers the tradeoff between feeder and distribution costs that results from creating a network with more clusters that serve a smaller number of lines per cluster. As JA's witness Mercer explains, Dippon's "1,800 run" shows an increase in feeder investment to penetrate more deeply into the network and closer to customers, offset by a decrease in distribution investment because smaller cables are less expensive. (JA/Mercer, 3/12/03, pp. 24-25.) JA witness Donovan contends that Dippon's "1,800 run" shows that HM 5.3 is operating correctly by installing more feeder and DLC equipment to serve a larger number of smaller clusters, offset by less investment in distribution cable. (JA/Donovan, 3/12/03, pp. 52-53.)

We find JA's explanation on this point reasonable and we do not agree with SBC-CA that Dippon's "1800 run" proves HM 5.3 is flawed. Nevertheless, we were unable to run our own clustering scenarios to examine differing model results. If we could have done this, we might have run a scenario somewhere between Dippon's "1,800 run" and the HM 5.3 default clustering which assumes a maximum of 6,451 lines. Therefore, we are not completely satisfied that HM 5.3 appropriately handles the tradeoff between feeder and distribution investment in all scenarios.

d. Cluster Size

SBC-CA contends that the abstract clustering algorithm used by TNS to create the customer location database ignores existing industry standards and creates unrealistic and inefficiently large clusters of 6,451 lines rather than a maximum of 1,800 lines. (SBC-CA, 2/7/03, p. 43, SBC-CA/McNeill, 2/7/03, p. 3.) According to SBC-CA, JA have abandoned prior modeling techniques that limited distribution areas (DAs) to between 200 to 600 households. (SBC-CA, 2/7/03, p. 43, n. 144.) According to SBC-CA, this results in DA's that are too large and no carrier has ever built a network like this. For comparison, SBC-CA states that its current network is comprised of over 60,000 DAs, whereas HM 5.3 produces only 7,679 main clusters for SBC-CA's entire California serving area. (SBC-CA/Murphy, 2/7/03, p. 39.)

According to SBC-CA, standard engineering principles recognize that because feeder facilities cost less per unit of length than distribution facilities, the objective is to minimize the size of the DA and achieve a reasonable fill of the feeder facilities. (SBC-CA/McNeil, 2/7/03, p. 16) Further, SBC-CA contends that HM 5.3 artificially lowers loop costs per line by assuming extraordinarily large underground controlled environmental vaults (CEVs) that spread the higher installation costs of a CEV over a larger number of lines. (SBC-CA/Tardiff, 2/7/03, p. 40-41.)

We are somewhat troubled by JA's assumption that distribution areas can be sized up to 6,451 lines, which is much larger than the distribution areas in SBC-CA's current network. As stated above, we would have preferred to run our own scenario with a smaller maximum line size per cluster. Nevertheless, JA show that incumbent carriers are currently purchasing equipment that will serve distribution areas as large or larger than those modeled in HM 5.3. (JA/Donovan, 3/12/03, paras. 97-100.) SBC-CA witness Murphy also confirms that equipment to serve up to 7,200 pairs is readily available. (SBC-CA/Murphy, 2/7/03, pp. 40-41.)

We do not entirely agree with SBC-CA's approach either. SBC-CA appears to advocate that clusters should serve a maximum of 1,800 lines, based on a guideline of serving 200 to 600 households. SBC-CA's principal criticism of large clusters seems to be that they differ from historic practices. SBC-CA models distribution areas to serve a maximum of 200 to 600 households based on standards that date back at least 25 years, before the advent of fiber optics and equipment sized to serve a greater concentration of lines. (JA, 3/12/03, p. 53; JA/Donovan, 3/12/03, paras. 90-96.) Furthermore, SBC-CA's witness McNeil admitted that SBC-CA currently attempts "to establish large footprints so that the remote terminal can serve as many DAs as possible." (SBC-CA/McNeil, 2/7/03, para. 30.) He goes on to state, "[I]t is efficient and cheaper to place as few remote terminals as possible." (*Id.*) For these reasons, it is reasonable to conclude that a forward-looking network configuration might recognize today's dense customer groupings and the availability of larger equipment in order to size DA's larger than SBC-CA has done in the past.

Nevertheless, we agree with SBC-CA that HM 5.3 might have relied on too many large DA configurations, more than it is reasonable to assume would happen in the real-world network. The clusters used as an input in HM 5.3 are also based on a maximum number of lines per cluster of 6,451, which is larger than the CEVs SBC-CA normally uses. While CEVs do exist large enough to accommodate this number of lines, we find it inappropriate to assume that all distribution areas could accommodate a CEV of that size.

We would have preferred to take a middle ground and rely on clustering assumptions that did not assume the largest equipment could automatically be placed everywhere. JA have adequately defended the use of distribution areas sized larger than SBC-CA's outdated guideline of a maximum of 200 to 600 households. But, neither is it reasonable to conclude that every DA could accommodate the equipment to serve 6,451 lines. Thus, our principal criticism with HM 5.3 in this area is that we cannot modify the clustering process ourselves to re-run it with a more moderately sized clustering assumption.[35]

e. Summary of Loop Modeling Criticism

Overall, we find that while we do not agree with all aspects of HM 5.3's customer location and loop modeling, it is no more a "black box" than SBC-CA's

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35 Of course, we could have asked JA to re-run its clusters with our assumptions, but this would have required a reopening of the record and an opportunity for all parties to comment on the new model runs. Given the other flaws we identified in HM 5.3 and the SBC-CA Models, we did not consider this a valuable use of time.

own preprocessor and input modeling assumptions related to the design point. HM 5.3 is based on a detailed examination of current customer locations, and makes simplifying assumptions not unlike the assumptions underlying SBC-CA's LoopCAT. As a result, although HM 5.3 starts with current customer location data, it does not model outside plant in the exact locations in which it exists today. We find that the method used by HM 5.3 to model customer locations and the costs of reconstructing SBC-CA's loop network falls reasonably within TELRIC guidelines, even if the reconstructed network does not follow today's exact outside plant routes.

Regarding the clustering process, we were unable to run our own sensitivity analyses to test HM 5.3's sensitivity with different clustering inputs. We would have preferred to test the results of different cluster sizes. At the same time, our inability to run sensitivity analyses of cluster sizes is not unlike our inability to run sensitivity of SBC-CA's preprocessor and design point assumptions. In other words, both models involved extensive preprocessing of data that, for various reasons, the Commission had to use as given. Thus, we find that both models contain aspects of their loop modeling that we were unable to modify to our satisfaction.

3. Expert Judgments

SBC-CA contends that HM 5.3 relies excessively on unsupported "expert judgment" for inputs that relate to such items as network design, install times for engineering and placement of cable, support structure, DLC equipment, labor loadings, and material costs. According to SBC-CA, many of the inputs to HM 5.3 are based on opinions with little or no analysis or backup documentation to support their derivation or reasonableness. In some cases, JA have selectively relied on vendor quote information to produce low UNE cost estimates, without revealing supporting documentation for these vendor quotes, or they have used information from around the country rather than using cost data supplied by SBC-CA. (SBC-CA, 2/7/03, pp. 32-33.) For example, JA have selected prices for switching based on extremely short run considerations, assuming that selected prices in a particular contract would somehow be available for all switching purchases. (SBC-CA/Tardiff, 3/12 /03, p. 13.)

We agree with SBC-CA that many of HM 5.3's inputs deserve a second look and may not be appropriate. HM 5.3 uses many inputs that are based on expert judgment (such as plant mix and structure sharing percentages), or derived from national data rather than California specific numbers (such as labor loading data). It is also true that HM 5.3 relies on vendor quotes that are not always documented.[36] In many areas throughout HM 5.3, we have been successful in modifying these inputs, and in most cases we have substituted inputs or data from SBC-CA's models instead.

Furthermore, SBC-CA criticizes the use of "expert judgments," but its own model relies on judgments of its engineers and other unnamed subject matter experts for its "design point" assumptions, ACFs, and inputs to its switching (SICAT) and interoffice (SPICE) models. Both HM 5.3 and the SBC-CA models rely heavily on expert judgments. While SBC-CA often criticized many of the HM 5.3 inputs, its reply and rebuttal comments did not provide an assessment based on SBC-CA's own experience of the correct value for many of these disputed inputs. In many cases, we find that SBC-CA offers its own model with

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[36] For example, the HM 5.3 "Inputs Portfolio" lists numerous investment inputs relating to line cards that are selected based on "vendor documentation." (*See* JA/Mercer, 10/18/02, RAM-5, p. 85-90.)

inputs so aggregated that we could not make "apples to apples" comparisons of the disputed inputs. Thus, we do not find that disputes over inputs selected through "expert judgment" are themselves a basis to abandon HM 5.3. Rather, the question is the reasonableness of the input assumptions themselves.

Finally, SBC-CA argues that HM 5.3 inputs do not match SBC-CA's actual costs. However, the Supreme Court dismissed comparisons of this sort, noting that costing methods that rely on historical costs can pass on inefficiencies caused by poor management or poor investment strategies. (*Verizon*, 122 S. Ct. 1646, 1673.) The Court further noted that:

> Contrary to assertions by some [incumbents], regulation does not and should not guarantee full recovery of their embedded costs. Such a guarantee would exceed the assurances that [the FCC] or the states have provided in the past. (*Verizon* at 1681.)

Although we find HM 5.3's use of expert judgment usually can be corrected with input changes, there were several instances where corrections were not possible. Notably, we wanted to use SBC-CA's hourly wage rate as an input rather than the lower rate assumed by JA. We were not able to change HM 5.3's labor rate assumptions in all instances because they were embedded with material and other assumptions such that we could not determine what portion of a total cost involved hourly labor. For example, many of HM 5.3's inputs include components for material costs, labor rates, task completion time, and crew size, which are joined into one input cost figure. Commission staff was unable to isolate hourly wages from this conglomeration of labor and material inputs in order to adjust hourly wage rates to SBC-CA levels, particularly for labor relating to terminal and splice investments, buried drop installation, and riser cable investment. Because we were not able to change labor rate assumptions in all places within HM 5.3, we find the model flawed in this area.

4. Switching, Interoffice Demand, and Provisioning High Speed Services

SBC-CA contends that the switching and interoffice portions of HM 5.3 do not accurately account for the actual demand generated by today's SBC-CA customers. On the switching side, HM 5.3 does not properly account for customers' peak period usage or the unique characteristics of individual switches in SBC-CA's California network. (SBC-CA, 2/7/03, p. 65.) On the interoffice side, HM 5.3 does not model the actual volume of trunk facilities ordered by SBC-CA customers, and therefore fails to construct an interoffice network with sufficient capacity to support the total demand handled by SBC-CA's network. (*Id.*, p. 64.) SBC-CA alleges that the transport and fiber fill factors proposed by JA are unrealistically high given actual carrier operating fill levels. (SBC-CA, 3/12/03, p. 76.)

In addition, SBC-CA contends that HM 5.3 models a network that would be unable to provision all of the high-speed services that are available today because it omits key electronic "optical interface" equipment necessary to connect DS-1 facilities to the interoffice network. (SBC-CA, 2/7/03, p. 66.) This omission underestimates the facilities and equipment needed to provision DS-1 and DS-3 loops. (*Id.*, p. 50.) Finally, SBC-CA contends that the HM 5.3 Transport module is flawed because it is insensitive to both the demand it considers and the costs for fiber cable and electronics, calling into question what the model optimizes when it is run with differing input assumptions. (SBC-CA/Tardiff, 3/12/03, p. 12.)

In response, JA maintain that HM 5.3 conservatively overestimates the number of trunks required in the switching and interoffice facilities (IOF) networks, and that the way in which HM 5.3 models demand is far superior to SBC-CA's SPICE model, which JA claim does not include all trunks and fails to incorporate demand data. (JA, 3/12/03, p. 70, n. 259.) According to JA, HM 5.3 models the known total amount of switched traffic carried by the SBC-CA network based on SBC-CA "dial equipment minutes" (DEM) traffic data and provides sufficient circuits to carry that traffic. Thus, in their opinion, HM 5.3 appropriately engineers a switching network to accommodate the requirements of a typical switch, its typical busy hour, and all required trunking. (*Id.*, p. 72; JA/Mercer, 3/12/03, paras. 80-82.) JA claim that if additional traffic for interconnection and switched access trunks were modeled in HM 5.3, any additional economies of scale would likely only lower the resulting per unit dedicated circuit UNE cost. (JA/Mercer, 3/12/03, para. 78.)

Further, JA contend that HM 5.3 does not ignore demand, it simply has not fully configured network components to serve high capacity services, such as OC-level service and DS-1 on fiber, because these UNEs are not at issue in this proceeding. (*Id.*, paras. 89-90.) Nevertheless, JA witness Mercer contends that HM 5.3 specifically provides fiber capacity for high capacity loops, even if it does not model the terminal equipment necessary for these services. (*Id.*, paras. 89-92.)

First, we agree with SBC-CA that HM 5.3 does not model the characteristics of individual switches. However, we do not consider this a flaw because we note that SBC-CA's SICAT model does not do this either. Indeed, both HM 5.3 and SICAT appear to have taken a similar modeling approach that looks at aggregate switching requirements. The models differ primarily in their input assumptions for the amount of new, growth, and replacement lines, and switch fill factors. On this issue, we find that SBC-CA's criticisms appear to hold HM 5.3 to standards higher than its own SICAT model.

Second, we agree with SBC-CA that HM 5.3 appears to underestimate demand on the interoffice network. JA admit that they did not configure the interoffice network to handle all high capacity demand, claiming that these costs are not at issue in this proceeding. Yet the FCC's definition of TELRIC describes the forward-looking cost over the long run of the total quantity of facilities and functions that are directly attributable to an element, "*taking as a given the incumbent LEC's provision of other elements*." (47 C.F.R. Section 51.505(b).) (Emphasis added.) We find that HM 5.3 does not include all of SBC-CA's current interoffice demand and therefore, does not model an interoffice network to accommodate all of SBC-CA's current interoffice traffic. Unfortunately, because of the flaws we have already noted with SBC-CA's SPICE model, it is unclear how we would modify HM 5.3 to remedy this flaw. We have already discussed how we are unable to determine the demand level that SBC-CA's SPICE model is designed to serve. Thus, we are unable to take SBC-CA inputs and place them into the HM 5.3 model.

Third, we cannot determine whether HM 5.3 adequately incorporates optical interface equipment. JA maintain that the IOF network modeled by HM 5.3 includes the cost of all equipment necessary for optical trunking and therefore, would function properly. (JA, 3/12/03, p. 75.) According to JA witness Mercer, "the model includes in each wire center investment for a digital cross connect system of sufficient capacity to meet the circuit requirements of that wire center." (JA/Mercer, 3/12/03, p. 76.) Mercer goes on to state, "It is possible, then, to use the Titan 5500 to replace the switch interface to the OC-48 [synchronous optical network (SONET)] ADMs used by the Model…" (*Id.*) Based on our own reading of Mercer's rebuttal, we find it unclear whether and to what extent DCS investment, or the Titan 5500, was incorporated in HM 5.3 and properly allocated between all the services that might use it. Thus, we find that HM 5.3 might not allow provisioning of the high capacity services SBC-CA provides today.

Finally, JA witness Mercer attempts to respond to criticism that the HM 5.3 Transport module is insensitive to demand. Mercer describes some minor modifications to HM 5.3 to address SBC-CA's concerns regarding understatement in certain interoffice equipment investment. (*Id.*, paras. 195-198.) Although Mercer provides these corrections to the Transport Module, it is not clear that he has entirely addressed the SBC-CA criticism. We do not find that JA have adequately addressed this criticism of how HM 5.3 derives its SONET ring structure and the resulting interoffice transport rates. Therefore, we are unwilling to rely solely on the results of HM 5.3 to establish interoffice transport rates.

5. Spare Capacity

SBC-CA contends that HM 5.3 does not model sufficient spare capacity and models a network that would require new orders to wait while new lines are installed. This could impact service quality and potentially lead to service disruptions. According to SBC-CA, although JA acknowledge that 1.5 to 2 pairs per living unit is the minimum design standard for distribution plant, HM 5.3 does not allocate this minimum number of cable pairs to each potential residence or business. (SBC-CA, 2/7/03, p. 41.) In addition, SBC-CA contends that HM 5.3 understates the cable lengths needed to serve potential demand by not designing plant to reach potential customer locations. (*Id.*, p. 42.)

We disagree with SBC-CA's contention that HM 5.3 is seriously flawed with regard to how it handles spare capacity. From our own review, we know that HM 5.3 allows the user to adjust inputs throughout in order to achieve varying levels of spare capacity. This is discussed at length in Section VI.E and VI.J.5 below where the various fill factor inputs are discussed which vary the amount of network investment for spare capacity. Essentially, SBC-CA's spare capacity arguments can be reduced to a dispute over whether the model should assume 1.5 to 2 loop pairs per living unit, as JA propose, or 2.25 pairs per living unit, as SBC-CA proposes. We will address this dispute in our fill factor discussion below. For now, we find that SBC-CA's position on spare capacity does not represent a fatal flaw in HM 5.3.

Furthermore, we do not agree with SBC-CA's argument that HM 5.3 underestimates cable length by not considering the loops required to serve future customers. We have already discussed why it is improper to model to "ultimate demand" given guidance from the FCC. We have concluded that the demand assumptions for loops in HM 5.3 accommodate a reasonably foreseeable level of growth. We have also discussed why SBC-CA's loop lengths unreasonably include ultimate demand and cannot be modified to counteract this. Therefore, we do not find that HM 5.3 is critically flawed on the issue of spare capacity. Rather, we find that HM 5.3 can be modified to incorporate varying assumptions for spare capacity, as needed.

6. Expenses

SBC-CA contends that HM 5.3's approach to calculating expenses is flawed and produces expenses that are only one-quarter of SBC-CA's current levels. (SBC-CA, 2/7/03, p. 73.) First, SBC-CA claims that HM 5.3 incorrectly uses expense to investment ratios, or "E/I" ratios, based on SBC-CA's current costs of network equipment, and uses these ratios with HM 5.3 investment levels that are considerably lower. (*Id.*, p. 73.) Second, SBC-CA criticizes HM 5.3's use of Verizon California as a benchmark for efficient operation in California based solely on its proposed lower expense levels, without exploring other factors that may explain the difference in expenses between the two companies. (*Id.*, p. 74.) SBC-CA notes that Verizon has a significantly higher investment per line than does SBC-CA, and that overall efficiency of a company is related to both investment and expense decisions. Looking at expenses in isolation, as JA have done, reveals little about overall company efficiency. (*Id.*) SBC-CA maintains that using Verizon as a benchmark for E/I ratios results in absurdly low expense levels in HM 5.3.

We find that HM 5.3's use of E/I ratios is reasonable, and not unlike the factors that SBC-CA uses in its own model. Indeed, both JA and SBC-CA have used a similar approach of adjusting investments to current cost before calculating ratios and applying them to estimate current expense levels. (JA/Brand-Menko, 10/18/02, p. 6; SBC-CA/Cohen 10/18/02, p. 5-6.)

We agree with SBC-CA that HM 5.3 improperly uses Verizon California as a benchmark for expense estimation purposes. SBC-CA has presented convincing arguments that JA have overlooked Verizon's higher investments per line and have overlooked other factors that could explain expense differences between the two companies. We prefer to use recent data from SBC-CA's reported ARMIS expenses to estimate forward-looking expenses. This was the starting point for HM 5.3's expenses before adjustments to benchmark expenses to Verizon. Therefore, we will back out these Verizon "benchmarking" adjustments from the HM 5.3 model.

7. Validation of HM 5.3 Results

SBC-CA criticizes HM 5.3 for not providing any internal or external demonstration of the validity of its cost estimates. (SBC-CA, 2/7/03, p. 24.) SBC-CA performs its own comparison of the investments and expenses produced by HM 5.3 to what SBC-CA currently incurs based on 2001 ARMIS data. SBC-CA maintains that the "sanity check" it performed shows HM 5.3 investments and expenses are only one-quarter of SBC-CA's current levels, and that HM 5.3 has not depicted loop routes of proper length, not accurately priced network components, nor included a sufficient amount of ongoing expenses to pay for the labor force needed to run the network. (SBC-CA/Tardiff 2/7/03, pp. 3-4, and 20.) SBC-CA claims that any deviation between HM 5.3 and reality implies inaccuracies in the model, not inefficiencies in the current network. (*Id.*, p. 23.)

Once again, JA contend that TELRIC calculations cannot be validated by comparison to a carrier's embedded costs. Thus, SBC-CA's "validation tests" are irrelevant. (JA/Klick, 3/12/03, p. 7.) According to JA, the FCC has already rejected cost methodologies that base forward-looking costs on the existing ILEC infrastructure, adjusted only for depreciation and inflation. (*Id.*, p. 7, citing First Report and Order, para. 683-685.) Further, JA allege that SBC-CA's ARMIS-based estimates of reproduction costs are overstated because they include Project Pronto costs for transitioning SBC-CA to a DSL-capable network. (JA/Klick, 3/12/03, p. 8.) Finally, JA point out that SBC-CA never did any "validation test" of its own model results, presumably because this type of analysis would be impossible given that SBC-CA's cost studies do not provide total investment or expense results to compare to ARMIS data. (*Id.*, pp. 4-5.)

We conclude that it would be unreasonable to reject the use of HM 5.3 merely because its results are lower than SBC-CA's current costs, as shown by comparisons to 2001 ARMIS data. We agree with JA that such comparisons are of limited value given that it is unclear to what extent we can rely on SBC-CA's current costs as forward-looking.[37] Much of SBC-CA's criticism of HM 5.3 involves the inputs that it uses. It makes more sense to vary these inputs to levels that we consider more appropriate before deciding which model to rely on.

Interestingly, ORA/TURN performed such an analysis for us. ORA/TURN's analysis by its witness Roycroft used the FCC's Synthesis Model (SynMod) to test for potential structural bias in both the HM 5.3 model and SBC-CA models.[38] Roycroft did a side-by-side comparison of HM 5.3, the SBC-CA models, and SynMod after applying a uniform platform of loop-related and general input values taken from SynMod. From this comparison, he concludes that HM 5.3 is forward-looking and not structurally biased because it produced higher costs than SynMod when both models were run with SynMod's default inputs. (ORA/TURN 2/7 p. 11; Roycroft Decl., 2/7/03, p. 63.) If HM 5.3 were biased, it would have generated lower costs than SynMod. Based on these

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[37] Indeed, SBC-CA contends that HM 5.3 has not depicted proper loop lengths, but it is unclear how SBC-CA can know this for sure since its own model does not use actual loop lengths and its data sources do not appear to provide this information.

[38] The FCC uses SynMod for universal service support purposes and for cross-state comparisons of forward-looking UNE costs. For example, the FCC used SynMod with its default input values to assess the reasonableness of UNE prices when considering SBC's 271 application in Kansas and Oklahoma in 2001 and California in 2002. (*See Joint Application of SBC Communications In., Southwestern Bell Telephone Company and Southwestern Bell Communications Services, Inc. d/b/a Southwestern Bell Long Distance for Provision of In-region, InterLATA Services in Kansas and Oklahoma* (CC Docket 00-217), Memorandum Opinion and Order, FCC 01-29, (rel. Jan. 21. 2001.), para. 83-84. ("Kansas 271"); *See also Application by SBC Communications Inc., Pacific Bell Telephone Company, and Southwestern Bell Services Inc., for Authorization to Provide In-Region InterLATA Services in California* (WC Docket 02-306), Memorandum Opinion and Order, FCC 02-330, (rel. Dec. 19, 2002), para. 64 ("SBC California 271 Order").

results, ORA/TURN suggests adjustment of HM 5.3 inputs to the default levels used in SynMod. (ORA/TURN/Roycroft, 2/7/03, p. 63.) SBC-CA opposes ORA/TURN's recommendation to use SynMod inputs to set UNE rates for SBC-CA because these inputs are five years old and are based on broad national averages. (SBC-CA/Tardiff, 3/12/03, p. 37.)

With regard to SBC-CA's models, Roycroft concludes they do not comply with forward-looking principles because when the SBC-CA models are run with similar inputs to HM 5.3 and SynMod, the SBC-CA models generate consistently higher costs than HM 5.3 or SynMod. Roycroft suggests this is because LoopCAT has fewer user-adjustable inputs and does not allow variation in cable sizing. (ORA/TURN, 2/7/03, p. 11.) Roycroft presumes it might be possible to alter LoopCAT to generate outputs more consistent with TELRIC principles, but the effort required to make such modifications would be large and is not necessary given the availability of other models. (ORA/TURN/Roycroft, 2/7/03, p. 54.) XO supports ORA/TURN's analysis and conclusion that the costs calculated by the SBC-CA models are clearly outliers and unreasonable. (XO, 3/12/03, p.3.)

JA also performed a sensitivity analysis of HM 5.3 to demonstrate that it was not structurally biased. JA changed eight categories of inputs in HM 5.3 to the values proposed by SBC-CA. This yielded a significantly higher loop rate, closer to the level proposed by SBC-CA and its models.[39] According to JA, this

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[39] JA witness Bryant modified 8 inputs which were 1) copper cable installed investment, 2) DLC equipment 3) protection block/NID 4) outside plant maintenance factors 5) depreciation rates 6) cost of capital 7) maximum copper cable distance, and 8) switch investment. (JA/Bryant, 3/12/03, p. 5.)

analysis refutes SBC-CA's claim that HM 5.3 is incapable of producing reasonable cost estimates.

We find that taken together, ORA/TURN's analysis using SynMod and JA's own sensitivity analysis varying eight inputs show that HM 5.3 is not structurally biased to produce unrealistically low results. The ORA/TURN analysis also corroborates our own findings that it is difficult to change many inputs within the SBC-CA models. We decline to adopt ORA/TURN's proposal to use all of SynMod's input values throughout HM 5.3 because we agree with SBC-CA that many of these inputs are dated or based on national averages.

Finally, we note that JA provided their own comparison of HM 5.3 with the FCC's Synthesis Model (SynMod). JA's witness Klick modified SynMod inputs to reflect HM 5.3 inputs, and then ran SynMod to estimate UNE rates in SBC-CA's territory. The results indicate SynMod loop investments 11% lower than those produced by HM 5.3. From these results, Klick concludes that HM 5.3 is an effective tool for estimating forward-looking costs because it produces similar investments and overall costs as SynMod, when run with comparable inputs. (JA/Klick, 10/18/02, pp. 14-15.) SBC-CA responds that Klick's analysis does not validate HM 5.3 because the similarity of outcomes of the two models, when run with the same inputs, merely shows that the inputs themselves are an important determinant of investment. SBC-CA contends HM 5.3's inputs are so low they produce invalid outputs for both models. (SBC-CA/Tardiff, 2/7/03, p. 35.)

Overall, we tend to agree with SBC-CA that Klick's analysis merely shows that HM 5.3 inputs provide very low results when input into SynMod. We agree with SBC-CA that the modeling inputs appear to be the more important drivers of model results. Therefore, we will not rely on or rule out either model based on these comparisons or validity tests provided by the various parties. Instead, we will turn to an analysis of the appropriate inputs to use in our model runs.

Finally, SBC-CA says numerous state and federal regulatory agencies have rejected HM 5.3 assumptions. (SBC-CA, 2/7/03, p. 76; SBC-CA/Tardiff, 3/12/03, p. 6-7.) SBC-CA cites to various decisions in other states that have found earlier iterations of the HAI model unreliable. Much of this criticism has been directed at the use of unidentified experts and unidentifiable sources to substantiate modeling assumptions and input choices. In response, JA cite to several states, including Arizona, Minnesota, Nevada, Colorado and West

Virginia, that have either adopted or used results from earlier versions of HM 5.3 to calculate UNE costs. (JA, 3/12/03, p. 74.)

Given our ability to modify many of the HM 5.3 inputs that SBC-CA contests, we are not troubled by this criticism. Moreover, the SBC-CA models that we are examining in this proceeding are of very recent vintage, and we do not believe they have been reviewed or adopted by any other states either. This proceeding may very well be the first time that this particular version of HM is compared directly with SBC-CA's newest models. Therefore, the findings of other state commissions that may have examined earlier versions of HM 5.3 or SBC-CA's models are of little value to us.

8. Summary of HM 5.3 Flaws

In summary, we find that HM 5.3 can be modified to overcome many of its alleged flaws. Specifically, the model can be modified to use different input and engineering design assumptions, spare capacity can be increased, and expense assumptions can be modified to increase expense levels. Nevertheless, we were unable to modify assumptions with regard to the customer location and clustering process and certain labor inputs in order to overcome all of the model's criticisms. In addition, we could not overcome criticisms of the HM 5.3 interoffice transport module that it underestimates demand, may not adequately incorporate optical interface equipment, and is insensitive to demand changes.

C. Adherence to Commission Modeling Criteria

It should come as no surprise after the extensive analysis described in the preceding sections that since we have found that both models are flawed, we do not consider either model to have adequately fulfilled the cost modeling criteria set forth in the June 2002 Scoping Memo. These criteria required that the cost studies and models allow the user to reasonably understand how costs are derived, generally replicate the model results, and modify inputs and assumptions. Without belaboring the point, we found that both HM 5.3 and the SBC-CA Models failed one or more of these criteria.

The principle failure of HM 5.3 was its use of a customer location database provided by a third party, TNS, as an input. We have already described how we would have preferred to cluster the geocoded customers into smaller distribution areas, but we were not able to perform these modifications ourselves. This criticism is mitigated by the fact that SBC-CA was able to modify the clustering and produce new HM 5.3 results. Nevertheless, we would have preferred to test various scenarios ourselves. Secondarily, HM 5.3 failed the modeling criteria because we were not able to modify all labor inputs. In our attempts to modify the HM 5.3 assumed labor rate to the level proposed by SBC-CA, we found that labor costs were embedded with other assumptions such that we were not able to disaggregate labor costs or assumptions and modify them alone.

With regard to the SBC-CA Models, we find that they failed the cost modeling criteria because we were not able to reasonably understand many of the input assumptions and we were not able to modify them. Specifically, we could not identify or make meaningful modifications to many of the SBC-CA model inputs because we could not extract individual inputs from aggregated data, or compare and verify inputs to public information. This was particularly evident with linear loading factors in LoopCAT and annual cost factors throughout the SBC-CA models. For example, we could not identify what structure sharing assumptions were embedded in the SBC-CA factors. Without knowing what structure sharing assumptions were used, it was impossible to modify them. Similarly, we could not segregate expenses for SBC-CA's unregulated ventures or Project Pronto expenditures from its calculations of per unit expense levels for UNEs.

On the subject of DLC installation costs, we were unable to understand the underlying assumptions SBC-CA made when creating factors in this area. JA contend that SBC-CA's witness appeared unable to explain how the factors relating to these costs were derived. (JA, 2/7/03, p. 32-33.) Our own review supported this allegation. Eventually, we delved into actual DLC installation costs to compare these to the factors. Again, SBC-CA's witness was unable to explain any linkage between actual costs and the factors used in the SBC-CA models. (Hearing Tr., 4/15/03, pp 573, 586.) Essentially, SBC-CA's witnesses were unable to support the modeling inputs adequately in this area. Finally, in the SPICE model, we were unable to determine how to modify it to test varying demand levels.

In sum, we found that both models failed one or more of our cost modeling criteria.

D. UNE Rates Derived from the Results of Both Models

The analysis above describes why we have concluded that both HM 5.3 and the SBC-CA Models contain flaws that we cannot correct completely. We are unwilling to rely solely on the results of either model.

The SBC-CA models contain many inputs and assumptions that we conclude are not forward-looking -- such as loop configuration, cable inventory, structure sharing percentages, ACFs, SPICE demand assumptions, potentially duplicative shared and common expenses, affiliate expenses, and Project Pronto expenses. We are unable to modify these inputs for a variety of reasons. In some cases, the inherent structure of SBC-CA's models aggregates these inputs with other information to the point that we cannot isolate inputs for modification. In other cases, the record convinces us that the inputs may be overstated or not specific to the provision of UNEs, but the record has not provided us with adequate information for a replacement number.

In contrast, even though we disagree with many of the input assumptions used in HM 5.3 – such as the cost of capital, the copper/fiber crossover point, structure sharing, plant mix, DLC costs, and switching assumptions – we can change many of these inputs and assumptions. In many areas, we have incorporated inputs from the SBC-CA models into HM 5.3, particularly in areas such as labor rates, plant mix, and switching investment information. Despite these efforts, we could not cure all of the flaws we found in HM 5.3. We find that we cannot perform sensitivity analyses on the clustering process that builds the initial estimates of outside plant, we cannot modify all inputs related to labor costs, and we cannot overcome flaws in the interoffice transport module that underestimate demand and may not adequately incorporate all necessary equipment.

Given the flaws of both models and our unwillingness to rely on either as the sole estimate of forward-looking UNE rates, we will instead use the two models to create a zone within which we will adopt new UNE rates. While this is a new approach we have not used before, our only alternative is to throw out both models and have the parties start over, or have the parties try to remedy the flaws we have noted in these models. Neither of these ideas is workable. Starting over with new models is far too time consuming and does not assure us that we would get any better results than those we have now. If we asked either or both parties to fix the flaws noted above, this too would take valuable time, might not produce good results, and would undoubtedly lead to further contention over the proposed remedies.

A far better solution, given the amount of time that has already passed in this proceeding, is for us to use both models as endpoints for our ratesetting exercise. We have run both models with common inputs, to the extent possible. The results of the HM 5.3 run generally give us a lower boundary for ratesetting purposes, and the SBC-CA model results generally give us a ceiling. In a few cases, such as rates for DS-1 ports and the DS-3 entrance facility without equipment, HM 5.3 actually results in a higher rate than the SBC-CA models.

While we cannot rely on the results of either model to produce reasonable or accurate UNE rates, we are confident that reasonable rates lie somewhere within the zone created by the two model results. We consider our HM 5.3 model run as a lower boundary for our rate zone because if we could change all the labor rates to our satisfaction, we are fairly confident that HM 5.3 rates would be higher. We view the SBC-CA model results as an upper boundary because if we could modify all inputs to desired levels, we are fairly confident that the SBC-CA model would produce lower rates. For example, we think the SBC-CA model contains expenses for items such as affiliates, unregulated ventures, Project Pronto, retiree costs, and shared and common costs that should be removed. Expenses in the SBC-CA models are also too high because of the linkage to fill factors. If we could modify SBC-CA's structure sharing assumptions to the inputs used by the FCC, this would most likely lower SBC-CA's results as well. Also, we think the loop configuration modeled by SBC-CA is not forward looking because it uses the design point concept and embedded cable inventories, which most likely overstates loop costs.

1. Rates Based on Midpoint of the Range

Using the results of both models as endpoints, we will take the midpoint of the range as the adopted rate for each UNE or sub-element of that UNE because the midpoint reasonably mitigates the flaws we have identified in both models that we are unable to correct. We conclude that this approach is reasonable given the enormous complexity of attempting to use either model and perfect its results. As the FCC has recognized in its recent rulemaking reviewing the TELRIC methodology, UNE cost proceedings are "extremely complex," involve conflicting cost models, and hundreds of inputs to those models supported by the testimony of expert witnesses. State pricing proceedings are thus "extremely complicated."[40]

Our use of both models to give us a range for UNE rates is also supported by the D.C. Circuit's discussion of the difficulty in pinpointing TELRIC rates with exactitude. In a 2001 decision upholding FCC findings that UNE rates in Kansas were cost-based, the D.C. Circuit concluded that ratemaking is not an exact science but involves a "zone of reasonableness." As part of its discussion, the court cited to a prior case where it stated:

> This argument, however, assumes that ratemaking is an exact science and that there is only one level at which a wholesale rate can be said to be just and reasonable…. However, there is no single cost-recovery rate, but a [wide] zone of reasonableness…. (*Sprint Communications Company v. FCC,* 274 F.3d 549, 555, (D.C. Circ. Dec. 28, 2001), citing Conway, 426 U.S. at 278.)

As a result, the court declined to find fault with the FCC "for approving the Kansas Commission's compromise resolution of an issue that the parties' behavior had left a muddle." (*Id.* at 559.)

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[40] *Review of the Commission's Rules Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers*, WC Docket No. 03-173, Notice of Proposed Rulemaking, FCC 03-224, (rel. Sept. 15, 2003) para. 6. ("TELRIC NPRM".)

Interestingly, as we modified the models to run with common inputs in line with Commission precedent, federal requirements, and the additional rationale developed from the record in this case, we found that the cost results of our model runs converged. The range created by our runs of both models is not that wide for many of the rates, particularly 2-wire loops, 2-wire ports, and the combination of UNEs for loop, port, and switching, also known as "UNE-Platform" (UNE-P). The degree of this convergence provides additional evidence of the validity of the rates we adopt today, particularly since the rates are the midpoints of a much-narrowed range.

Also, despite fierce criticisms of both models by the parties, we find that loop assumptions embedded in both models have surprising similarities. Earlier versions of the HM 5.3 model have been criticized by this Commission and others for assumptions regarding uniform dispersion of customers throughout the serving area. Indeed, HM 5.3 makes efforts to overcome this prior criticism by precisely locating today's customers through the geocoding process. However, after the geocoded customers are clustered into distribution areas, HM 5.3 does not use the geocoded locations to build a distribution network. Instead, the cluster is split into equal-sized lots and customers are uniformly distributed throughout the distribution area. Likewise, LoopCAT makes the simplifying assumption to approximate loop lengths based on the design point. As SBC-CA's witness Smallwood explains, "SBC-CA makes the reasonable assumption that customers will be distributed throughout a distribution area." (SBC-CA/Smallwood, 3/12/03, pp. 66-67.) By its own admission, SBC-CA is uniformly distributing customers throughout the serving area even though it has criticized prior versions of HM 5.3 for this same assumption.

Finally, we do not find that one model's set of assumptions is more accurate than the other. First, both models include a mixture of loop modeling assumptions that are somewhat reality-based and somewhat hypothetical. HM 5.3 uses today's customer locations, but clusters them differently than SBC-CA's existing network. LoopCAT uses some existing plant routes, but combines that information with estimates of future customer locations. By using the design point approximation technique, LoopCAT does not locate any customers where they are today. Second, HM 5.3 uses a minimum spanning tree theory to build plant to connect customers. By definition, any theory based on "minimums" would produce the lowest possible results. In contrast, LoopCAT uses embedded cable records that we find produce higher results than if cable-sizing guidelines were used to configure a rebuilt network. Third, HM 5.3 relies on the TNS customer location process and its clustering assumptions, while LoopCAT relies on SBC-CA's preprocessor and its assumptions regarding the design point. Both the TNS process and SBC-CA's preprocessor are presented to us as inputs that we cannot adjust, and we are asked to rely on the underlying assumptions without questioning or modifying them.

Therefore, we will rely on neither model to set SBC-CA's permanent UNE rates, but we will instead split the difference obtained after we run both models with our chosen inputs.

2. Description of "Endpoint" Model Runs

The compromise resolution we will use in this case is based on runs of the HM 5.3 and SBC-CA models where we have set as many inputs as possible at the same levels. The reasoning behind our chosen input levels is described at length in the Modeling Inputs Section VI below. Here, we will briefly summarize which inputs were used for the two model runs that we use as endpoints for our UNE ratesetting zone. The inputs that we varied for our run are the following:

Cost of Capital: We modified both models to use an input assumption of a 9.9% cost of capital. Also, we modified the tax rate in HM 5.3 to 40.75% to match the SBC-CA models.

Asset Lives: The SBC-CA models were adjusted to match the prescribed asset lives proposed by DOD/FEA and used in HM 5.3.

IDLC/UDLC: We adjusted both models to assume a configuration of 75% IDLC, and 25% UDLC.

Structure Sharing: In the HM 5.3 model, we used structure sharing levels from the FCC Inputs Order, and we assumed 55% sharing of the distribution and feeder network. In the SBC-CA models, we were not able to modify SBC-CA's proposed structure sharing percentages because we could not determine the percentages assumed by SBC-CA.

Plant Mix: We modified HM 5.3 to use SBC-CA's plant mix assumptions.

Labor Rates:

a) HM 5.3 is adjusted where possible to use the proprietary loaded labor rate from SBC-CA's models. This rate applies to *Copper and Fiber OSP Technician, Engineering Labor rate, and EF&I per hour*. Adjustments were made to labor rates for wire center terminal investment, customer premised fixed investment, pole labor, NID labor, copper cable manhole investment, fiber pullbox investment, and aerial drop placement.

b) Crew sizes in HM 5.3 were adjusted for cable placing and splicing, where possible, to add one person (*i.e.* a crew of 1 was increased to 2, a crew of 2 increased to 3).

c) There were no changes to the labor rates assumed in the SBC-CA models.

Fill Factors: In the SBC-CA models, achieved fill factors were adjusted to the levels in the table below. In HM 5.3, the relevant fill inputs (*e.g.* cable sizing factors for distribution plant) were adjusted to produce an achieved fill to match the following "achieved fill"[41] levels:

a) Loop

Copper Distribution	51.6%
Fiber Feeder	79.6%
Copper Feeder	76%
DLC Common Equipment	70%
DLC Plug-In Equipment	75%
Premises Termination	No adjustment from levels as filed
SAI	67.8%

b) Switching: We modified fill levels in the SBC-CA model to assume an 82% achieved fill for both analog and digital switches. HM 5.3 was modified to also achieve an 82% achieved fill for digital and analog switches.

Crossover Point: HM 5.3 was adjusted to assume a fiber/copper crossover point of 12,000 feet for analog loops. There were no changes to the crossover assumptions in the SBC-CA models.

DLC costs: SBC-CA's LoopCAT model was adjusted to lower the EF&I for DLC installation to the average levels shown from a recent sample of 50 SBC-CA DLC installations.[42] HM 5.3 does not use an EF&I factor, so instead, we used an average of actual Remote Terminal and CEV installation costs from the same sample of 50 SBC-CA installations.

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[41] Achieved fill is defined in Section VI.E.1 below.

[42] The actual DLC costs and resulting factors are proprietary to SBC-CA, but contained in JA, 8/1/03, Exhibit C-4, p. 1 and C-5, p. 1.

Pole Spacing: We modified HM 5.3 to assume pole spacing of 150 feet for all density zones of the distribution network. (*See* SBC-CA/'s McNeil, 2/7/03, p. 38.)

Drop Terminal Investment: We modified HM 5.3 to assume 85% buried drop terminals, and 15% aerial, to match those the percentages of buried and aerial drops in SBC-CA's models. (*See* SBC-CA/Tardiff, 2/7/03, p. 76.)

Cable Prices: We modified HM 5.3 to use copper and fiber cable prices used by the FCC, based on criticisms by SBC-CA witness Tardiff. (SBC-CA/Tardiff, 2/7/03, p. 39.) JA provided these cable prices in documents supporting HM 5.3. (*See* JA/Klick Declaration, 10/18/02, Attachment JCK-2 pp. 7-10.) The copper and fiber cable prices were not modified in the SBC-CA models.

Switch Vendors: We modified HM 5.3 to base the switching investment per line on a weighted average of Lucent and Nortel prices only. Siemens was removed from the switch vendor mix assumed in HM 5.3, as explained in Section VI.J.1 below. There were no changes to the SBC-CA models in this area.

New vs. Growth: We adjusted both models to assume 40% of lines are purchased at the "new" line price, and 60% at the "growth" line price. This matches the mix of new and growth lines that was used in the prior OANAD proceeding. (D.98-02-106, Conclusion of Law 32, *mimeo* at 104.) We also removed "other replacement costs" from SBC-CA's SICAT model.

Switch Rate Structure: We ran both models assuming a flat-rate for switching as proposed by JA. This means that 100% of switching costs are allocated to port and there are no usage rates.[43] We also calculated a usage-based rate for reciprocal compensation purposes, based on a 70%/30% split of traffic sensitive and non-traffic sensitive costs.

Other SICAT Changes: We deleted per month white page listing expenses from the port cost study, based on statements by SBC-CA witnesses Lundy and Silver that this should be removed. (SBC-CA/Lundy, 3/12/03 p. 46; SBC-CA/Silver, 3/12/03, p. 4.) Also, we adjusted the concentration rate of lines/trunk from 2:1 to 4:1 so that SICAT was consistent with LoopCAT.

Features: We modified the SBC-CA Model to include any identified feature hardware costs in the port rate. Using SBC-CA's support materials, we calculated total hardware costs for 9 features. We then assumed that an average customer would use 3 of these 9 features, so we added one third of this total cost to the port cost. There were no changes to HM 5.3 regarding feature costs.

Expenses: HM 5.3 was adjusted to remove the presumption that SBC-CA expenses would track those of Verizon California. In other words, we used SBC-CA's 2001 current E:I ratio without adjustments based on comparisons with Verizon. In the SBC-CA models, we removed the inflation adjustment to expenses, under the assumption that productivity increases offset inflation adjustments.

Interoffice Rates: We adjusted the fiber fill factor in SBC-CA's SPICE model to 85%, as proposed by JA. SBC-CA proposed fill factors for SPICE based on its current utilization levels, which SBC-CA contends are forward looking.

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[43] During the process of calculating a flat monthly port rate, both models exhibited extraneous investment of less than 10 cents, which was manually added to the port rate. (*See* Appendix A, note 1.)

SBC-CA's proposed fill factors are significantly below the levels used in HM 5.3 and used by the FCC in its own modeling. (JA/Mercer-Murphy, 2/7/03, paras. 68-72; *See also* Inputs Order, para. 208.)

Shared and Common Cost Markup: Both models include a 21% markup, as adopted in D.02-09-049.

Appendix A shows the results of our run of the SBC-CA Models and HM 5.3 with our chosen inputs, and the resulting average of these two model runs. The column in Appendix A showing the average of the SBC-CA and HM 5.3 Model runs indicates the permanent UNE rates for SBC-CA that we adopt in this order.

VI. Modeling Inputs

A. Asset Lives and Depreciation

The models rely on assumptions regarding the economic lives of the assets used to provision UNEs, that is, the rate at which these assets depreciate. These depreciation assumptions affect all of the UNE rates in the models.

1. SBC-CA Proposal

SBC-CA proposes minor changes to the asset lives adopted by the Commission in the prior OANAD proceeding. Essentially, SBC-CA's analysis on this topic supports the continued use of depreciation lives that mirror those it uses for financial reporting purposes. SBC-CA contends FCC rules require economic depreciation lives. (SBC-CA/Vanston, 10/18/02, p. 8.) SBC-CA proposes asset lives consistent with its external financial reporting, and claims that "financial lives are conservatively long from the perspectives of both technology obsolescence and competitive risk." (*Id.*, p. 9.) Moreover, in D.96-08-021, the Commission endorsed the use of economic lives that were the same as Pacific Bell's lives used for external financial reporting purposes. (*Id.*) While some state commissions rely on depreciation lives specified by the FCC, also known as "prescribed lives," the pace of competition and technology change in recent years makes a move to true economic lives imperative. (*Id.* p. 10.) FCC lives are inconsistent with economic reality because they were set at a time of minimal local competition and based heavily on the historical retirement pattern of assets. The FCC's reliance on retirement of assets as an indicator of asset life has resulted in prescribed lives that are too long and do not reflect the economic value of assets. (*Id.* p. 11.)

According to SBC-CA's witness Vanston, the network will transition from a primarily voice network to a full-service network based on fiber optics, advanced optical/electronic transmission equipment and packet switching and SBC-CA will have no choice but to make this transition because its competitors (*e.g.* cable television companies) are moving this same direction and making the existing network equipment obsolete. (*Id.*, pp. 4-5.) Specifically, outside plant will transition from copper to fiber distribution cable, digital loop carrier equipment in the local loop will be replaced with fiber-based systems, and switching will transition from circuit to packet switching. (*Id.*) Vanston forecasts the rate of technology substitution and the impact of competition to compute an average life for the assets involved. Based on these forecasts, Vanston recommends a one-year increase in the projected lives for circuit equipment and metallic cable, and no change to the projected lives for switching equipment and non-metallic cable.

Table 3

SBC-CA's Proposed Asset Lives

Asset	Current Depreciation Life	Proposed Depreciation Life
Switching Equipment	10	10
Circuit Equipment	8	9
Metallic Cable (All)	14	15
Non-Metallic Cable	20	20

(Source: SBC-CA/Vanston Declaration 10/18/02, p. 7)

2. DOD/FEA and Joint Applicant's Proposal

DOD/FEA explains that in 1996, the Commission adopted depreciation lives used by Pacific in preparing its financial books and these lives were shorter than the ones previously adopted by the Commission and the FCC. (DOD/FEA/Lee, 10/18/02, p. 3.) According to DOD/FEA's witness Richard Lee, events since 1996 require a change in the depreciation lives used in setting UNE prices. Specifically, in 1997, Pacific curtailed its video and hybrid fiber-coaxial initiatives and implemented DSL technology which allows the provision of broadband services over existing copper loops. These decisions have extended the economic lives of SBC-CA's plant investments. (*Id.* p. 4.) SBC-CA's response to competition has resulted in economic plant lives that are longer than those previously adopted by the Commission. For this reason, DOD/FEA recommend that the FCC's projection of asset lives should be used when revising SBC-CA's UNE prices.

In 1999, the FCC reviewed the ranges for these asset lives, updated them, and stated:

> These ranges can be relied upon by Federal and state regulatory commissions for determining the appropriate depreciation factors for use in establishing high cost support and interconnection and UNE prices.[44]

Lee states that the asset lives prescribed by the FCC are the result of its analysis of depreciation studies filed by carriers and are forward-looking because they are based on statistical studies requiring detailed analysis of each carrier's asset retirement patterns, plans, and current technological developments and trends. (DOD/FEA/Lee, 10/18/02, pp. 5-6.) Lee maintains that recent trends in depreciation reserve[45] levels in the industry and for SBC-CA provide empirical evidence that the assets lives prescribed by the FCC are reliable and forward-looking. Lee shows that the FCC's current depreciation parameters have allowed SBC-CA to generate a surplus in its depreciation reserve. (DOD/FEA/Lee, 10/18/02, p. 10.) Given this showing, DOD/FEA recommends that the Commission use the FCC's most recent depreciation parameters prescribed for SBC-CA in setting SBC-CA's UNE costs. According to Lee, several states have used FCC lives when setting UNE prices using TELRIC. From 1996

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[44] *1998 Biennial Regulatory Review-Review of Depreciation Requirements for Incumbent Local Exchange Carriers*, CC Docket 98-137, Report and Order, FCC 99-397, (Rel. Dec. 30, 1999) ("1999 Update"), para. 34.

[45] According to the Lee, "the depreciation reserve… is the accumulation of all past depreciation accruals net of plant retirements. As such, it represents the amount of a carrier's original investment that has already been returned to the carrier by its customers". (DOD/FEA/Lee, 10/18/02, p. 7.)

through 2002, 24 states have adopted the FCC lives in UNE proceedings. (*Id.*, pp. 14-19.)

Lee contends that economic lives for financial reporting purposes are not appropriate for TELRIC because financial reports are governed by the GAAP principle of "conservatism," which tends to understate net income in order to protect investors. (*Id.*, pp. 12-13.) In a TELRIC cost model, conservatism would use shorter asset lives to overstate depreciation expense, thereby inflating UNE costs.

Joint Applicants support DOD/FEA's proposal to use depreciation lives prescribed by the FCC. Joint Applicants criticize the depreciation lives proposed by SBC-CA because they are lives used for financial reporting purposes, which are significantly shorter than the lives prescribed by the FCC. (JA, 2/7/03, p. 57.) According to Joint Applicants, financial accounting lives are biased low, or shorter, so accountants can conservatively err on the side of overstating costs for financial reporting. The FCC expressly rejected the use of financial accounting lives for its cost model in the Universal Service proceeding. (*Id.* pp. 58-9, n. 185; citing the FCC's 1999 Update.) Joint Applicants also point out that the analysis of SBC-CA's witness Vanston has been rejected by the FCC in its 1999 Update Order (JA, 2/7/03, p. 60, n. 188.)

ORA/TURN join in support for the proposals of DOD/FEA. ORA/TURN claim that SBC-CA's witness Vanston implies that the current and expected level of competition in California justifies shorter depreciation lives for UNE assets without any empirical evidence or California specific market share data to support his conclusions. ORA/TURN note that while CLCs now serve 10% of U.S. access lines, only 3.2% of those lines use CLC facilities, indicating that facilities-based competition has made very limited progress. (ORA/TURN, 3/12/03, p. 13.)

SBC-CA responds that the lives proposed by DOD/FEA are outdated because they were adopted prior to the revolutionary changes the 1996 Act brought to the local telephone market, and these outdated lives fail to consider the risks of competition and technological change intrinsic to the telecommunications industry. (SBC-CA, 3/12/03, p. 21.) According to SBC-CA, the FCC's prescribed asset lives do not keep up with the pace of competition and technology. (*Id.* p. 23.)

3. Discussion

Mr. Lee's analysis is convincing and we find that the Commission should apply the depreciation lives adopted by the FCC in 1999. When the Commission last adopted depreciation lives in 1996, we did not have the benefit of the FCC's analysis on this topic. Since that time, the FCC conducted its detailed analysis of depreciation levels, and reviewed this again 1999. In 1999, the FCC specifically noted that these depreciation parameters could be used in UNE proceedings. Numerous states have used the FCC's guidance in their UNE proceedings. We will do the same.

We agree with JA that financial lives can be biased low to overstate expenses and protect investors, and these asset lives to do not match SBC-CA's actual experience as shown by the FCC's detailed review of asset lives. We disagree with SBC-CA that the FCC's analysis is outdated because although it originated in 1994, it was updated in 1999. As JA point out, SBC-CA has not sought reevaluation of these FCC approved depreciation lives. (JA, 3/12/03, p. 28.) Further, SBC-CA's central argument that increases in retail competition automatically translate into shorter depreciation lives is not supported by the outcome of the FCC's review. We agree with JA that the widespread deployment of DSL technology, which uses copper cable to provide high-speed internet service, illustrates that competition can actually lengthen the economic lives of some assets. (*Id.*, p. 29.) Thus, the FCC's asset life findings contradict Vanston's assumptions regarding rapid substitution of new technologies for existing ones.

We also note the inherent inconsistency between SBC-CA's positions on asset lives and positions it takes elsewhere in this case. SBC-CA's witness Tardiff discusses the "durability of facilities" and "the inherent characteristics of the telecommunications industry (particularly the fact that a large proportion of costs are for capital assets with relatively long economic lives)" as reasons why SBC-CA's modeling approach is valid and why the assumption in HM 5.3 that a network is built overnight is not reasonable. (SBC-CA/Tardiff, 3/12/03, p. 10 and p. 4, respectively.) On the other hand, he suggests asset lives that are shorter than assumed in HM 5.3, and a higher cost of capital because of the risk of obsolescence of equipment. These positions are internally inconsistent.

For all these reasons, we prefer to rely on the analysis of the FCC based on actual asset lives rather than speculation.

In the FCC's Triennial Review Order, the FCC clarified its views. In response to requests to clarify the depreciation component of TELRIC analyses, the FCC stated:

> We decline to adopt the incumbent LECs' suggestion that we mandate the use of financial lives in establishing depreciation expense under TELRIC. The incumbent LECs have not provided any empirical basis on which we could conclude that financial lives always will be more consistent with TELRIC than regulatory lives. Both financial lives and regulatory lives were developed for purposes other than, or in

> addition to, reflecting the actual useful life of an asset. [Footnote omitted] We cannot conclude on this record that one set of lives or the other more closely reflects the actual useful life of an asset that would be anticipated in a competitive market. Accordingly, state commissions continue to have discretion with respect to the asset lives they use in calculating depreciation expense. (TRO, para 688.)

Thus, our decision to use the FCC's prescribed asset lives is consistent with the TRO.

B. Cost of Capital

A critical input to a TELRIC cost model is the estimated cost of capital, which is the cost a firm will incur in raising funds in a competitive capital market. The cost of capital is usually expressed as a weighted average of the cost of equity and the cost of debt for the firm, or a proxy group of firms, with a similar risk profile and in the same line of business as the firm. Therefore, there are several key components used to calculate the weighted average cost of capital:

- Cost of equity –The Capital Asset Pricing Model (CAPM) and the Discounted Cash Flow (DCF) analysis technique are two quantitative financial models commonly used to estimate cost of equity, also called return on equity (ROE). These methods require assumptions regarding company growth rates, the premium that a stock of average risk commands over the risk free rate (market risk premium), the risk-free rate of return, and a measure of the risk of the company's stock (beta).
- Cost of debt – this involves estimates of the interest rates on long term, and perhaps short-term, debt instruments.
- Capital structure of the firm – this refers to the amount of debt and equity outstanding for the company, or proxy group.

- Proxy group – this key assumption involves the composition of the group of companies used as comparables to the ILEC's UNE business.

Federal regulations require that a "forward-looking cost of capital shall be used in calculating the [TELRIC] of an element." (47 C.F.R. 51.505(b)(2).)

In its recent Triennial Review Order, the FCC provides clarification on the cost of capital component of a TELRIC analysis. The FCC states that there are two types of risk that should be reflected in the cost of capital. First, a TELRIC-based cost of capital should reflect the risks of a competitive market. Specifically, the FCC says:

> Because the objective of TELRIC pricing is to replicate pricing in a competitive market, [footnote omitted] and prices in a competitive market would reflect the competitive risks associated with participating in such a market, we now clarify that states should establish a cost of capital that reflects the competitive risks associated with participating in the type of market that TELRIC assumes. The Commission specifically recognized that increased competition would lead to increased risk, which would warrant an increased cost of capital. (TRO, para. 681.) (Footnote omitted.)

Second, the FCC states that a TELRIC-based cost of capital should reflect any unique risks (above and beyond the competitive risks discussed above) associated with new services that might be provided over certain types of facilities. The TRO specifies that states may establish UNE-specific costs of capital to reflect in UNE prices any risk associated with new facilities that employ new technology and offer new services. (TRO, para. 683.) Nonetheless, the FCC leaves states the option to adopt a single cost of capital for all UNEs. (TRO, para. 684.)

Table 1 summarizes the parties' proposals for the appropriate cost of capital to incorporate into SBC-CA's UNE prices and compares it to the cost of capital incorporated into current UNE rates.

Table 4
Current and Proposed Cost of Capital

Current Cost of Capital	SBC-CA Proposal	Joint Applicants' Proposal	XO Proposal	Z-Tel Proposal	ORA/TURN Proposal
10.00%	12.19%	7.63%[46]	7.7%	6.6%	11.25%

While these proposals differ by 559 basis points,[47] the methods used by all parties are remarkably similar. SBC-CA and JA offered the most commentary concerning cost of capital. Both of these parties calculated a weighted average cost of capital based on their own unique assumptions regarding the cost of equity, cost of debt, and capital structure of the firm. We will discuss each of these components of the cost of capital calculation separately. But first we will give a brief overall description of each party's proposal.

1. SBC-CA Proposal

SBC-CA proposes a cost of capital of 12.19%, which is 219 basis points above the 10.0% cost of capital adopted by the Commission for use in the prior OANAD proceedings. SBC-CA's witness Avera used a group of seven LECs and estimated their average market-value capital structure, cost of equity, and cost of debt. The study incorporates a 13% rate of return on equity and a 7.18% cost of debt. His study incorporates a market value capitalization consisting of 86% common equity and 14% debt based on the average capital structure of the proxy

[46] JA initially proposed 7.70%. The proposal was corrected and updated to 7.51% on 2/7/03. JA submitted a final proposal of 7.63% based on the most recent financial information available at the time of rebuttal comments on 3/12/03.

[47] A basis point equals one one-hundredth of a percent.

group. Avera's analysis is based on data from year-end 1998. (SBC-CA/Avera, 10/18/02, Attachment WEA-1, Table 1.)

SBC-CA contends that investment risks associated with the telecommunications industry, and LECs specifically, have increased significantly since the Commission adopted a 10% cost of capital. Further, he contends changes in capital market conditions warrant the increased cost of capital. For example, changes in long-term bond rates have been modest and stock valuations for telecommunications firms have weakened. Avera concludes that investors are less willing to provide capital, which means higher borrowing costs. (SBC-CA/Avera 10/18/02, pp. 22-23.)

JA criticize SBC-CA's analysis for relying on financial data that is four years old, primarily from year end 1998 and first quarter 1999, which they contend is too stale to form a reasonable basis for estimating a forward-looking cost of capital. (JA/Murray, 2/7/03, p. 65.) JA's witness Murray notes that the stock market has declined sharply since SBC-CA's estimate of its market capitalization based on year-end 1998 financial data. There have been substantial changes in the proportions of debt and equity in market capital structures given declines in incumbent LEC stock prices. The average proportion of debt in the market capital structure has increased significantly since Avera's analysis. He fails to recognize that long-term debt costs have decreased significantly since his analysis. (*Id.* p. 66.) In addition, Murray contends Avera makes four serious methodological errors as well. We will discuss these in greater detail below, but essentially Murray criticizes Avera for averaging financial information across companies with disparate capital structures, using an inflated risk premium based on one academic study, relying on a purely market-based capital structure, and using unrealistic growth assumptions in the DCF model.

JA revises SBC-CA's estimates using more current information and shows that SBC-CA's analysis, when revised with current financial information, converges on JA's own proposed cost of capital of 7.7%. (*Id.*, p. 53.)

2. Joint Applicants' Proposal

JA's witness Murray proposes a cost of capital of 7.63%, which is 237 basis points below the 10.00% cost of capital adopted by the Commission in prior OANAD decisions for SBC-CA.[48] Murray's financial modeling of the cost of capital is based on a proxy group of SBC-CA, Verizon and BellSouth, and uses holding company level data for these three companies. Murray's financial analyses incorporate a 50/50 weighting of market and book capital structure, a return on equity of 9.92%, and a cost of debt based on forecasts of short and long-term interest rates. Short-term debt cost is 3.18% and long-term debt cost is 5.51%.

JA note the sharp interest rate declines since the current 10% cost of capital was adopted in the first triennial review of the Commission's New Regulatory Framework proceeding in 1994. According to JA, interest rates are at 40-year lows and these low interest rates reduce SBC-CA's debt costs and the opportunity cost of investing in equity, which reduces SBC-CA's cost of equity. Low debt costs encourage SBC-CA to take advantage of low-cost debt in its capital structure, which lowers its weighted average cost of capital. Murray argues SBC-CA is vastly different today than when the 10% rate was set in 1994

[48] According to Murray, a 10% cost of capital was originally adopted in the first triennial review of NRF (D.94-06-011), then adopted in the TSLRIC phase of OANAD (D.96-08-021, *mimeo.*, at 44.) In the TELRIC phase of OANAD, the Commission did not litigate cost of capital, but used the result from the TSLRIC phase. (JA/Murray, 10/18/02, p. 41.)

because it is subsidiary of SBC, a far larger company. Also, the legal and regulatory environment has changed given the passage of the 1996 Telecommunications Act, which opened local market to competition.

SBC-CA criticizes JA's cost of capital proposal for resting too much on trends in current interest rates and ignoring the risks that investors perceive for the local exchange telephone and UNE businesses. SBC-CA contends that JA approach their cost of capital estimate using traditional rate-case methods for a traditional utility, while ignoring the fact that operations and rates of telephone companies are no longer regulated like traditional utilities.

3. Proposals of XO, Z-Tel and ORA/TURN

XO supports the Joint Applicants' original proposal for a cost of capital of 7.70%, noting that SBC-CA's analysis uses financial data that is four years old. (XO/Montgomery Decl., 2/7/03, p. 24.) Similarly, Z-Tel criticizes SBC-CA's use of four-year-old data. When Z-Tel's witness Ford updates the SBC-CA analysis, he obtains an estimated cost of capital of 8%. Ford then makes revisions to SBC-CA's methodology and proposes a cost of capital below 7% based on SBC-CA's target capital structure. (Z-Tel/Ford Decl., 2/7/03, p. 32.)

ORA/TURN propose the Commission use the 11.25% cost of capital estimate established by the FCC because SBC-CA's analysis is outdated. Commenting on the age of the financial data in SBC-CA's filings, ORA/TURN state, "Unlike fine wines, cost of capital studies do not improve with age." (ORA/TURN/Roycroft, 2/7/03, p. 79.)

4. Discussion

Both SBC-CA and JA agree it is time to revise the 10% cost of capital set in 1994. We wholeheartedly concur. Financial conditions are vastly different today than they were in 1994, not to mention the legal and regulatory landscape after the passage of the 1996 Act and subsequent litigation. As Murray notes, the numerous mergers in the industry have created entirely different companies than the ones that existed when we last set a cost of capital for Pacific. Pacific is now SBC-CA with a new parent company, SBC, which has in turn merged with another former regional bell operating company (RBOC), Ameritech, to form one of the four remaining RBOCs. SBC is no longer one of seven RBOCs that existed in 1994, but rather one of the four surviving RBOCs. This change alone calls for a new evaluation of SBC-CA's cost of capital for its UNE line of business.

Despite the many pages of rhetoric on this topic, all parties essentially used the same financial modeling techniques, but with differing inputs and assumptions. We analyze each of their positions on the various components of the financial models below in order to determine the most reasonable inputs for financial modeling of the cost of capital. A summary of the financial modeling with the inputs we select is found in Section VI.B.4.f.

It is important to note that while we will review the financial modeling presented by the parties, particularly where it estimates the cost of equity, we will use judgment as well as the models to render our decision. As we stated in our order in 2002 where we established a return on equity for the four major energy utilities:

> In the final analysis, it is the application of informed judgment, not the precision of financial models, which is the key to selecting a specific ROE estimate. We affirmed this view in D.89-10-031, which established ROEs for GTE California, inc. and Pacific Bell, noting that we continue to view the financial models with considerable skepticism. (D.02-11-027, *mimeo.*, at p. 19.)

Finally, although the FCC's recent Triennial Review Order discusses the option to set unique costs of capital for each UNE, we will establish one cost of capital for all UNEs because we have no record to do otherwise.

We now turn to an examination of the inputs to the financial models used by the parties.

a. Proxy Group

A starting point for the quantitative analysis of SBC-CA's cost of capital is a reference or "proxy group" of companies. The proxy group is needed because there is no company purely in the business of selling UNEs that we could look at to see its cost of equity, cost of debt, and capital structure. Instead, it is logical to look to a group of companies in a similar line of business and determine the average capital structure, cost of equity, and cost of debt faced by those companies. Both SBC-CA and JA used a proxy group, but differed in the composition of that group.

SBC-CA used a proxy group of seven LECs and reviews financial data for this group of seven LECs from year-end 1998. (SBC-CA/Avera, 10/18/02, Attachment WEA-1, Tables 1 and 2.) JA used a proxy group of 3 companies, SBC, Verizon and BellSouth. JA's witness Murray notes that the group of seven LECs SBC-CA uses as a benchmark for capital structure has changed substantially since 1998 due to mergers and acquisitions involving SBC and Ameritech, GTE and Bell Atlantic, Qwest and US West, and Broadwing and Cincinnati Bell. (JA/Murray, 2/7/03, p. 56.) According to Murray, Qwest and Broadwing are no longer comparable to SBC and should be excluded from the group because they are much smaller, experiencing major financial difficulties, and investors perceive greater risk in these two companies.[49]

SBC-CA does not deny that the proxy group of seven companies Avera uses have changed substantially since 1998.[50] We agree with Murray that because of the mergers and acquisitions of several of these companies and other changes affecting their financial position and risk, the group of 7 companies used by SBC-CA is not appropriate. We will exclude Qwest and Broadwing because these companies are much smaller than SBC, they have both experienced major financial difficulties indicating higher risk levels, and they have negative earnings so they cannot be included in a DCF analysis. (JA/Murray, 2/7/03, p. 78.) We will, therefore, use the proxy group of 3 companies proposed by JA, namely SBC, Verizon and BellSouth.

b. Cost of Equity

Despite SBC-CA criticizing JA for using "traditional rate case methods," both SBC-CA and JA use fairly standard methodologies for estimating SBC-CA's cost of equity. Namely, they both use the CAPM and DCF methods to estimate cost of equity. The DCF method estimates the return that investors require on equity investments by assuming the market price of a stock equals the present value of all future dividends investors expect to receive. The CAPM model estimates investors' required return on a particular stock over the return required in the market in general.

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[49] Murray also excludes Qwest from her analysis because it pays no dividend and therefore cannot be used in a DCF analysis. (JA/Murray, 10/18/02, p. 54.)

[50] Indeed, when Avera updates his growth forecasts for his cost of equity calculation, he uses the group of 3 companies proposed by Murray. (*See* SBC-CA/Avera 2/7/03, WEA-1.)

SBC-CA's Avera obtains two estimates of the cost of equity using the DCF model and two using the CAPM model, then he averages the four results to arrive at his proposed cost of equity of 13.0%. Murray does essentially the same thing, except she derives only one estimate from each model. She then averages her DCF and CAPM results to arrive at her proposed cost of equity of 9.92%. The difference between these proposals derives from differing assumptions that underly the DCF and CAPM models. We will now discuss these.

i. DCF Analysis

DCF models attempt to replicate the market valuation process that investors use to determine the price they would be willing to pay for a share of a company's stock. (SBC-CA/Avera, 10/18/02, p. 10.) SBC-CA's witness Avera uses a simplified form of the DCF method known as the "constant growth" form, which depends on an assumption that long-term growth for the company will occur at a constant rate. Avera performs two separate DCF analyses, using 1999 constant growth assumptions of 9.6% and 11.6%, which results in a DCF cost of equity of 12.2% and 14.3%, respectively. (*Id.*, Attachment WEA-1, p. 19.)

JA contend that SBC-CA's DCF analysis makes the unrealistic assumption that a company can continue to grow forever at a faster rate than the overall economy. Instead, JA witness Murray uses a different "three-stage" DCF model that assumes three stages of company growth, in which a company's growth rate regresses toward the same growth rate as the overall economy in the long-run. (JA/Murray, 2/7/03, p. 77.) Murray contends this is a more realistic approach because extraordinary growth in the near term typically slows to a more stable level. (*Id.*) Murray's growth rates for her proxy group of 3 companies range from 3.77% to 6.7%, based on recent growth forecasts from I/B/E/S (now Thomson First Call) and forecasts of overall economic growth by the Federal

Reserve Bank of Philadelphia's Survey of Professional Forecasters. (JA/Murray, 10/18/02, p. 57-58; JA/Murray, 2/7/03, p. 59.) As a result, her average DCF cost of equity estimate is 9.97% (JA/Murray, 3/12/03, Exhibit TLM-REB 5.)

In reply to criticisms of his constant growth approach, Avera introduces a new methodology for calculating the growth rate used in the DCF formula, known as the "sustainable" or "b x r approach."[51] In other words, rather than updating his constant growth DCF method with more current data, he chooses a different approach to calculate the growth rate. Avera's new "b x r" approach results in growth rates ranging from 9.2% to 11.5**%**, and a cost of equity ranging from 13.1% to 14.6%. (SBC-CA/Avera, 2/7/03, p. 11 and WEA-1.)

SBC-CA criticizes Murray's three-stage DCF analysis for using growth estimates that SBC-CA believes are too low. (SBC-CA/Avera, 2/7/03, pp. 9-11.) Avera argues that current growth rates Murray uses are depressed and that "accelerating growth in excess of the economy as a whole is consistent with investors' long run view of telecommunications as one of the most dynamic segments of the economy." (*Id.*, p. 10.)

Murray contends that running the constant growth DCF with updated numbers gives almost the same results as her own 3 stage DCF analysis, and in fact, the 3 stage produces a higher cost of equity.[52] She criticizes Avera's new b x r "sustainable growth" method, which is based on an r-value for expected

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[51] According to Avera, in the "b x r" approach, the growth in book equity equals the product of the earnings retention ratio (b) and the expected earned rate of return on equity (r). (SBC-CA/Avera, 2/7/03, p. 11.)

[52] Murray's update of Avera's DCF analysis produces a cost of equity of 7.53%, 547 basis points lower than Avera's 13% cost of equity estimate based on 1999 data. (JA/Murray, 2/7/03, p. 58-9, JA/Murray 3/12/03, p. 54.)

rate of return ranging from 17.4-17.8% for SBC-CA, Verizon and BellSouth (JA/Murray, 3/12/03, p. 56.) Murray says these return estimates are not sustainable unless one believes these three companies will take over the majority of the US economy within the next 30 years. (*Id.*, p. 57.)

Z-Tel revises Avera's growth numbers in the DCF method with current Value Line and I/B/E/S growth estimates that range from 4% to 6.15%. These growth estimates produce DCF cost of equity estimates ranging from 7.6% to 9.8%. (Z-Tel, 2/7, p. 22.)

In reviewing these various DCF analyses, we are immediately struck by the outdated growth estimates used by Avera. The financial outlook for telecommunications firms today is without question vastly different from the outlook four years ago in the first quarter of 1999, the time frame of Avera's data. Therefore, we find that Avera's original DCF analysis is outdated and we will not rely on it. Second, we prefer Murray's three-stage DCF analysis rather than the constant growth DCF used by Avera. Murray's explanation of the three stage model with growth rates that converge upon the growth rate of the economy is more reasonable than assuming telecommunications firms will continuously grow at a faster rate than the whole economy. Further, the growth rates Murray uses are more reasonably based on recent analyst growth estimates.

Third, we agree with Murray's criticism that Avera's updated 9.2 to 11.5% growth rates based on his "b x r approach" are excessive to assume in a constant growth formula. We find Murray's long-term growth in the 5% range is more reasonable, as is her 3 stage DCF formula. We would have preferred to see Avera update his growth rates using the same source, rather than a new methodology. Indeed, we find it interesting that when Murray did in fact update Avera's own analysis, she achieved results using the constant growth DCF that are only a few basis points lower than her results with the 3 stage formula. (JA/Murray 2/7/03, p. 64.)

Therefore, we find JA's DCF result of 9.97% more reasonable than SBC-CA's DCF results of 14.3% and 12.2%. We will balance this information with the results of the CAPM analysis when determining the appropriate cost of equity.

ii. Market Risk Premium in CAPM

In the CAPM approach, the cost of equity is estimated based on three key inputs: 1) the risk-free interest rate, 2) the risk of a particular company or business relative to the risk of the market (beta),[53] and 3) estimates of the additional return investors require to forego the safety of no or low risk bonds and to bear the greater risk of common stock, also known as the "market risk premium."[54] SBC-CA provides two alternative versions of the CAPM based on two different estimates of the market risk premium. One CAPM study estimates an "expectational" cost of equity based on a forward-looking estimate of the market risk premium. The other CAPM analysis involves a historical view of the market risk premium. (SBC-CA/Avera 10/18/02, p. 16.)

For SBC-CA's "expectational" approach, SBC-CA witness Avera uses an estimated market risk premium of 6.47% over long term government bond

[53] Beta reflects the tendency of a stock's price to follow changes in the market. (SBC-CA/Avera, 10/18/02, p. 18) Betas are discussed further in Section VI.B.4.b.iv.

[54] The CAPM formula is:

Cost of equity = Risk free rate + (Market risk premium) x (Beta) yields.[55] Avera then adjusts this risk premium upwards to 9.1% because of declines in interest rates since the time of the 1992 study. Avera justifies this adjustment by claiming there is substantial evidence that equity risk premiums move inversely with interest rates, so that when interest rates are low, the premiums investors demand for equity rise. (SBC-CA/Avera 2/7/03, p. 5.) Avera then adjusts this required rate of return for the S&P 500 using the beta for his proxy group of companies. Avera averages the betas reported for the proxy group of seven LECs which is .83. (SBC-CA/Avera 10/18/02, Attachment WEA-1, Table 2, citing Value Line Investment Survey, April 1999.) This results in a cost of equity estimate of 13.35%.[56] Next, Avera performs a historical CAPM analysis using a risk premium of 7.5%.[57] Inserting the 7.5% risk premium into the CAPM formula results in a cost of equity of 12.03%.[58] On reply, Avera presents a new analysis of the market risk premium based on the S&P 500 that shows a 9.86% market risk premium. (SBC-CA/Avera 2/7/03, p. 13.)

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[55] This market risk premium is based on a study for firms in the S&P 500 Index by Harris & Marston (1992).

[56] The calculations are:

5.8% risk free rate + (9.1% x .83) = 13.35%

Avera claims that recent evidence supports this 13.35% estimate. He updates this portion of his analysis based on an update to the Harris & Marston 1992 study. The update shows an average equity risk premium of 7.14% which he adjusts upwards by 3.25% based on interest rate declines since the study period. This results in an equity risk premium of 10.1% and an implied cost of equity of 15.22%. (SBC-CA/Avera, 10/18/02, p. 25.)

[57] The 7.5% risk premium is based on Ibbotson Associates study of realized returns on the S&P 500 over the period 1926 through 1998. (SBC-CA/Avera, 10/18/02, Attachment WEA-1, p. 18.)

[58] The calculations are: 5.8% + (7.5% x .83) = 12.03%

JA criticize what they consider SBC-CA's inflated "expectational" estimate of the market risk premium. JA witness Murray maintains this market risk premium is out of line with other academic sources, and then inappropriately adjusted up another 2.53% based on changes in interest rates. (JA/Murray 2/7/03, p. 67.) Murray shows that Avera's source (Harris & Marston) has performed an updated analysis that decreases the prior estimate of the equity premium's sensitivity to interest rates. (*Id.*, p. 70.) Murray contends that Avera's risk premium calculations are outlandishly high compared to other sources he used such as DRI-WEFA, which predicts S&P 500 equity returns of 6% over the next 25 years, and the Survey of Professional Forecasters estimate for average returns of 7.47% over the next 10 years. (JA/Murray 3/12/03, p. 59.)

For her own analysis, Murray cites several academic studies that forecast equity premiums in the 3-4% range, which is lower than historical return levels. (JA/Murray, 10/18/02, p. 63). She also cites the historical equity premium data of Ibbotson Associates, which measured stock market returns from the 1926 through 2002 time period, indicating a historical premium of approximately 7.4%. (JA/Murray 2/7/03, p. 60.) She then constructs an average estimate of the market risk premium based on these 4 sources, which is 5.8% (JA/Murray 3/12/03, Exh. TLM-REB-5).

SBC-CA opposes Murray's CAPM analysis, and particularly her market risk premium of 5.8%, as "predicated solely on historical results," whereas forward-looking estimates of investor's required rates of return are higher.

XO criticizes Avera for using new DCF and CAPM methods in his reply declaration, rather than updating the four year old financial information inserted into the methods he originally used. (XO/Montgomery, 3/12/03, p. 5.)

Z-Tel criticizes the risk premium Avera uses based on Harris & Marston study. Z-Tel alleges that Harris & Marston study is flawed for several reasons, chiefly that it is limited to the 1982 through 1998 time frame when the market exhibited exceedingly high returns. (Z-Tel/Ford, 2/7/03, p. 24.) Instead, Z-tel proposes a risk premium of 5% based on historical market returns from 1970 through 2002.

SBC-CA criticizes the 1970 through 2002 time frame chosen by Z-Tel as biasing the risk premium down. SBC-CA says the most exhaustive and widely accepted study is published by Ibbotson Associates. Their *2002 Yearbook* indicates an average equity risk premium of 7% over long-term government bonds for 1926 through 2001. (SBC-CA/Avera 3/12/03, p. 16.)

Table 5
Market Risk Premium Proposals

SBC-CA Historical	SBC-CA Expectational	SBC-CA S&P 500	JA	XO	Z-Tel
7.5%	9.1%	9.86%	5.8%	5.8%	5%

We find no fault with SBC-CA's historical analysis, which uses a market risk premium of 7.5% based on the Ibbotson Study.

However, for its expectational analysis, SBC-CA makes a controversial "interest rate" adjustment to achieve a market risk premium of 9.1%. We do not agree with this interest rate adjustment. Harris & Marston have updated their assumptions regarding interest rate effects and it is not entirely clear that making this kind of adjustment to the equity risk premium is appropriate. Certainly, the results of Avera's "adjustment" are out of line with other measures of the equity risk premium cited by Murray. We are not convinced that it would be wise to add short-term interest rate volatility into the equity risk premium portion of the CAPM formula. Interest rate changes are accounted for in the cost of capital calculation through revisions to the risk-free rate, and through the cost of debt estimates used to weight debt given the firm's overall capital structure. In prior cost of capital reviews, the Commission has occasionally adjusted estimates of cost of equity for changes in interest rates after the analysis is complete, not by making an adjustment to the market risk premium and inputting this into the analysis. (*See* D.99-06-057, *mimeo.*, p. 49.)

Both SBC-CA and JA use the Ibbotson historical measure of equity risk premium, which we consider reasonable. We find that this 7.5% estimate is a very generous estimate of the market risk premium given the variety of studies with much lower findings, particularly those cited by JA's witness Murray. SBC-CA's proposal of a 9.86% market risk premium is based on a time period of 1982 to 1998 that is very short and therefore not reasonable. We could average the 7.5% with the lower estimates provided by Murray. We will refrain from doing that at this time because we prefer to take an optimistic approach that current stock market performance is only temporarily depressed and will rebound such that equity premiums will exhibit the historical rate of 7.5% found by Ibbotson.

iii. Risk Free Rate

SBC-CA proposes a risk free rate of 5.8% based on long-term government bond yields from March 1999. (SBC-CA/Avera, 10/18/02, Attachment WEA-1, p. 17.) Avera updates this risk-free rate to 4.92% based on 30 year Treasury bond yields reported by Moody's in January 2003. (SBC-CA/Avera, 2/7/03, Attachment WEA-2.)

JA propose a risk free rate of 4.73%, which is the yield to maturity on 10-year U.S. Treasury Notes. (JA/Murray 10/18/02, p. 64; JA/Murray 2/7/03, p. 64, n. 104.)

SBC-CA's original risk-free rate of 5.8% based on 30-year Treasury bond yields is quite outdated. Murray proposes we use the yield on 10-year Treasury notes. While this is a more current figure, we would prefer to use a risk-free rate based on a longer investment horizon to match the long-term risk premium analysis that is incorporated into this cost of capital analysis. Therefore, we will use Avera's updated 30 year Treasury bond yield figure of 4.92% for our calculations.

iv. Beta

SBC-CA's Avera used an average beta of 0.83 for his proxy group of seven ILECS, based on a Value Line Investment Survey from April 1999. (SBC-CA/Avera, 10/18/02, Attachment WEA-1, p. 18.) Avera performs an updated analysis using Value Line Investment Survey results from January 2003 for the 3 companies in Murray's proxy group. The average beta for this proxy group is .93 (SBC-CA/Avera 2/7/03, Attachment WEA-2).

JA's witness Murray alleges that Avera improperly uses a simple averaging of betas across companies with disparate capital structures. Companies face financial risks based on the amount of debt, or "leverage," in their capital structure and they face business risk from earnings fluctuations. The purpose of averaging betas for comparable companies is to measure their business risk, not the risk inherent in their capital structures. To remove the financial risk associated with the company's chosen leverage, the betas should be "unlevered" before they are averaged. Murray maintains it is preferable to determine SBC-CA's "unlevered beta," and then average the unlevered beta with other companies with comparable business risk. (JA/Murray 2/7/03, p. 65-6.)

For her own analysis, JA's Murray used a beta coefficient of .929, which is the "average relevered beta" of SBC-CA's stock, based on betas for her proxy group of companies.[59] (JA/Murray 10/18/02, pp. 65-66; and JA/Murray 3/12/03, Ex. 5.)

Z-Tel's witness Ford uses a beta coefficient of .59 in his calculations, which he obtained from the marketguide.com website.

59 Murray uses beta estimates from BARRA and Value Line. (JA/Murray, 10/18/02, p. 60.)

We will adopt Avera's updated beta coefficient of .93 because it is based on the same proxy group of three that we have used for other calculations and it is based on recent data for these companies. Murray's description of unlevering and relevering betas makes intuitive sense and results in almost the identical number. Therefore, we will opt to use Avera's updated estimate of .93. We note that using a beta of .93 is actually higher than SBC-CA's original proposed beta of .83. A higher beta means a relatively riskier investment where investors require a higher return on equity. So in this case, by using Avera's update, we are actually increasing the estimated cost of equity because we assume investors want a return closer to the market risk premium when they invest in the proxy group of companies.

v. CAPM Summary and Resulting Cost of Equity

SBC-CA proposed a 13% cost of equity, while JA had proposed 9.92%. We decline to use SBC-CA's inflated DCF results based on outdated 1999 growth estimates, and we also prefer SBC-CA's historical CAPM analysis using a 7.5% market risk premium rather than SBC-CA's controversial expectational market risk premium of 9.1. Similarly, we revised JA's inputs to the CAPM model, namely the market risk premium and the risk free rate. We find JA's DCF results more reliable than those proposed by SBC-CA.

Using CAPM, we apply the Ibbotson 7.5% market risk premium, multiply it by a beta of .93, and add this to our chosen risk free rate of 4.9% to obtain our cost of equity for SBC-CA. The calculation is:

(7.5% x .93) + 4.9 % = 11.88%.

As the Commission has previously stated, we will use judgment in setting the ROE, not purely the CAPM or DCF financial model results. We will adjust our own CAPM model results of 11.88% upwards by 12 basis points to 12%

because we recognize that interest rates are currently at historically low levels and bound to rise. This slight upward adjustment, which could really be characterized as "rounding," minimizes the effect of the lag time that is built into adjustments of the cost of capital. In other words, it will no doubt be quite awhile before the Commission reassesses SBC-CA's cost of capital, so this upward adjustment to cost of equity is warranted for that reason.

When setting the cost of equity, we prefer to give more weight to the CAPM model results, rather than the DCF model. The DCF model relies heavily on growth forecasts for telecommunications firms, which vary greatly depending on the source. This leads to a large disparity in DCF results depending on the time period and forecasters selected. Nevertheless, we note that our adopted cost of equity of 12% lies between the two DCF results obtained by the parties and is therefore reasonable.

c. Qualitative Risk Issues

In conjunction with Avera's quantitative analysis of SBC-CA's weighted average cost of capital, Avera provides a qualitative discussion of the risks SBC-CA faces in providing UNEs. Avera contends that SBC-CA faces competition from an ever expanding array of alternative carriers and technologies such as specialized fiber, wireless, and cable companies that offer a full array of broadband services. (SBC-CA/Avera, 10/18/02, pp. 17-18.) He contends that SBC-CA must invest in network architecture while it simultaneously faces the threat of high operating leverage, exposure to loss of profitable customers, and risk of rapid technological change. Avera says the rapid pace of technological change increases investors' risk perceptions for UNEs. (*Id.*, p. 31, citing a UBS Warburg study from 2002.)

He states that risks are magnified for UNEs because continued regulation of UNEs hampers SBC-CA's ability to respond in an increasingly volatile market. ILECs face a combination of competitive and regulatory uncertainty that exceeds the risk of other ILEC business segments. (*Id.*, pp. 4-6.) SBC-CA is obligated to install and maintain sufficient capacity to meet competitors' demand for interconnection and UNEs, but CLCs are free to drop off the network anytime. Thus, while there is volatility in demand for UNEs, SBC-CA is constrained by regulation from altering the price of UNEs. (*Id.*, p. 26.)

Plus, there is a risk under the current regulatory structure, that UNE prices will be set incorrectly, hurting SBC-CA's cash flow, and its ability to attract capital and its ability to develop alternative networks and new technologies. According to Avera, this combination of competitive and regulatory risks makes SBC-CA's cost of capital to provide UNEs higher than the cost of capital in SBC-CA's other business segments, particularly since SBC-CA, as a stand-alone provider of UNEs, would not have the advantages of diversification.

Avera compares his proposed return on equity of 13% to authorized rates of return for energy companies that are between 10.9 and 11.6 %.[60] Avera maintains that because this proceeding is not about determining the rate of return for a traditional utility but a forward-looking rate of return for a competitive telecommunications network, it is reasonable that SBC-CA proposes a return on equity higher than the one approved for the energy utilities. It is not reasonable that JA propose a return on equity of only 9.92%, lower than the one

[60] *See* D.02-11-027, which set the return on equity for Pacific Gas and Electric Company, Southern California Edison Company, Sierra Pacific Power Company, and San Diego Gas and Electric Company.

authorized for the energy companies. Moreover, Avera defends his proposal as consistent with the FCC's 11.25% cost of capital, which has been in place for several years.

In response, Murray has several criticisms of Avera's qualitative assessment of business risk. First, she says it is merely conjecture and ignores important context about SBC-CA's financial strength.[61] Murray contends that Avera's assumption of higher risks to provide UNEs cannot be substantiated with quantifiable analysis of actual capital costs faced by SBC-CA as a whole. (JA/Murray 2/7/03, p. 79.) Murray maintains that it is more prudent to rely on a quantitative analyses of capital costs, using current market data that incorporates the capital markets' assessment of all the qualitative considerations. Financial market participants have already incorporated qualitative considerations into the share price of the companies. (*Id.*, p. 78.)

Second, Murray says that the kinds of competitive and regulatory risks Avera describes are "company specific risks" which are diversifiable. Murray explains that the Commission has concluded in the past that when setting the cost of capital in a regulatory proceeding, the Commission "should give little weight to risks that are diversifiable." (*Id.*, p. 84, citing D.94-11-076, p. 31.) Third, Murray says Avera ignores provisions for universal service support and pricing flexibility, which mitigate SBC-CA's risks. (JA/Murray 2/7/03, p. 86) Fourth, Murray says Avera improperly focuses on retail rather than wholesale risks. Cost of capital should be based on risk associated with leasing UNEs at

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[61] Murray notes SBC-CA has been rated A+ for financial strength based on its high debt ratings from Moody's and Value Line. (JA/Murray 2/7/03, p. 79-80.)

wholesale, not competition for end-users of telephone service. (JA/Murray 3/12/03, p. 53.)

Fifth, Murray says that the cost of capital of 11.25% set by the FCC in 1990 is extremely stale. In 1996, the FCC found that an 11.25% cost of capital is much higher than the rate required to attract capital and earn a reasonable profit, and it determined it should begin a new proceeding to review the 11.25%. (*Id.,* p. 61.)[62] Finally, in contrast to Avera's position, Murray contends that the provision of UNEs is less, not more, risky than other operations of the SBC-CA holding company, such as DSL and long-distance concerns, that cause investors to demand a higher return for the company as a whole. Because her analysis focuses on holding company level financial data, which includes the capital costs for SBC-CA's unregulated business segments, she believes her analysis overstates the cost of capital for UNEs alone. (JA/Murray 10/18/02, p. 44, n. 44.)

XO agrees with Joint Applicants' position that UNEs are subject to less competitive threat than SBC-CA's other product lines because XO and other competitive carriers have no viable alternative to several of SBC-CA's UNEs. XO explains that it has strong incentives to obtain facilities from sources other than SBC-CA, but they are simply unavailable.

It is interesting that although SBC-CA argues that UNEs are a high-risk venture, it does not propose using a cost of capital greater than the one it calculates for the firm as a whole. We find that despite SBC-CA's lengthy qualitative discussion of the risks facing SBC-CA, Avera has not persuaded us that UNEs are more risky than SBC-CA's other unregulated ventures, which are subject to competitive markets, such as the long distance and DSL markets.

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[62] The FCC has not yet opened any such proceeding to review its 11.25% cost of capital.

SBC-CA's commentary on the relative risk of UNEs is not convincing. Avera admits that "investors… establish the forward-looking rate of return in the capital markets." (SBC-CA/Avera 3/12/03, p. 12.) This statement affirms that a valid approach to setting the cost of capital is to look at market returns and apply them using the traditional cost of capital financial modeling exercises that all parties have used. We have in fact done this, although we use our judgment in applying these models and relying on their results. We find that Avera's statements support the concept that the risk of UNEs is the same as that of the company at large, but not greater. We prefer to adhere to the quantitative financial modeling that the parties have offered to determine the cost of capital, tempered with a measure of judgment. It is reasonable to assume that markets have already figured the relative risk of all of SBC's operations, including UNEs, into the returns they require.

Avera maintains that because UNEs are regulated and competitive, they face regulatory risk greater than SBC-CA's other ventures. He argues that UNEs face a "double-whammy" of regulatory constraints and encroaching competitive pressures. We see it another way. The prices that SBC-CA charges for UNEs are regulated because SBC-CA is the only company that provides them. These prices are subject to regulatory risk, but little competitive risk.[63] SBC-CA argues for a higher cost of capital for UNEs because regulators might get it wrong and not apply the right price to UNEs. This is a circular argument. We are using our best information and judgment to set the correct UNE price through this order.

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[63] SBC-CA faces the competitive risk that another carrier will bypass SBC-CA's UNEs and build its own facilities. We find this risk fairly low since it has only occurred in quite limited markets.

It is inappropriate to assume we'll get it wrong and use a higher capital cost because of that assumption.

We agree that SBC-CA faces regulatory risks regarding the accuracy of its TELRIC pricing and business risks due to the potential for rapid technological change and competition for its retail customers. Yet, SBC-CA has not proven that these risks are greater than for SBC-CA's other business lines which face myriad competitive risks. Because we are not convinced that UNEs are riskier than SBC-CA's other ventures, we find that SBC-CA's cost of capital should equate to the cost of capital for SBC as a whole, not that it should be greater than the cost of capital for the entire firm. On balance, we think that the quantitative models capture investors' views of regulatory risks facing SBC-CA's UNE business and there is no need to increase our adopted cost of capital based on this qualitative information.

Regarding comparisons to the returns on equity set for energy utilities, we agree with Murray that these are not relevant due to the energy utilities' differing capital structures, financial conditions, and regulatory policies. As Murray points out, SBC-CA is in excellent financial health and enjoys an AA bond rating, unlike PG&E, which was in bankruptcy during the study period, and Edison, which has teetered on the brink with bonds rated well below investment grade. (JA/Murray 3/12/03, p. 60.) Nevertheless, we note that the return on equity incorporated into our analysis in this order is 12%, which is in fact slightly higher than the ROEs for the energy companies. We note that the ROE we use in our analysis for SBC-CA is higher than for the energy utilities, even though they have faced such great uncertainty and risk with the energy crisis and bankruptcy.

d. Cost of Debt

SBC-CA's Avera estimates the company's cost of debt at 7.18%, based on March 1999 yields on single and double-A corporate bonds as reported by Moody's. (SBC-CA/Avera, 10/18/02, Attachment WEA-1, p.20.) Avera contends that declining trends in short-term borrowing are not indicative of trends in utility capital costs, whereas long-term debt costs have remained largely constant. Avera cites Fall 2002 DRI (now Global Insight) long-term forecasts for double-A utility bonds anticipating an average yield of 7.2% for 2003 and 7.2 to 7.8% over the next 10 years. (SBC-CA/Avera 3/12/03, p. 4.)

Murray maintains that long-term debt costs have decreased since 1999, and forward-looking interest rates are even lower. Therefore, Murray uses the current interest rate on 30-year utility bonds to adjust Avera's analysis downward by 84 basis points to 6.34%. (JA/Murray 2/7/03, p. 61-2.) For her own analysis, Murray calculates forward-looking debt costs based on historical and forecasted interest rates for 3-month Treasury notes and 10-year Treasury bonds and assumes SBC-CA rolls over short and long-term debt. (JA/Murray 10/18/02, p. 66.) As a result, she estimates a short-term debt cost of 3.18% and a long-term debt cost of 5.51%. (JA/Murray 3/12/03, exh. 5.)

SBC-CA contends Murray's proposed long-term debt cost is too low because Standard & Poor's bond guide reports 7.12% as the yield to maturity on SBC-CA California's 30-year debt, rather than the lower figures cited by Murray. (SBC-CA/Avera 2/7/03, p. 18, n. 30.) Moreover, SBC-CA maintains Murray should not use short-term debt because UNEs are long-lived assets. (*Id.,* p. 24.)

Z-Tel criticizes Avera for using March 1999 debt rates. Z-Tel suggests using December 2002 yields of 10-year AA and A corporate bonds, which average 5.53%. (Z-Tel/Ford, 2/7/03, p. 21.) Avera criticizes Ford for understating the current corporate bond rates. His own citations show double A bond yields at 6.59% for January 2003, and long term forecasts for double A utility bonds at 7.2%. (SBC-CA/Avera 3/12/03, p. 14.)

We find it most reasonable to use in our analysis the current rate applicable for SBC-CA's long-term debt, which is the 7.12% long-term debt figures cited by SBC-CA from Standard & Poor's bond guide.

Murray's analysis includes short-term debt costs and rollover of short-term debt to long-term debt, at forecasted long-term interest rates. She also uses utility bond rates rather than corporate bond rates. We are not convinced that short-term debt costs have a place in a TELRIC-based cost of capital analysis. The Commission has typically excluded short-term debt when setting the cost of capital and return on equity for utilities. (*See* D.02-11-027, *mimeo.*, at p. 4.) Furthermore, because we have assumed longer-asset lives for UNEs, we will assume long-term financing to match the asset lives. SBC-CA has argued that this is a reasonable approach and we agree. Short-term rates are more volatile, as Murray herself has noted, and we prefer to base our analysis on the more stable long-term debt costs. Besides, we find Murray's rollover and forecast method not well documented or explained.

Similarly, we will not use Z-Tel's suggested debt costs based on 10-year debt instruments, because we think a 10-year horizon for debt is too short.

e. Capital Structure

SBC-CA's Avera calculates a capital structure for his proxy group of seven ILECs using the market values of common equity and debt outstanding for the group based on year-end 1998 data. This results in a proposed capital structure that is 86% equity and 14% long-term debt. Avera opposes use of short-term debt in the capital structure because he says UNEs are long-lived assets that are not properly matched with capital sources having a maturity of less than one year. (SBC-CA/Avera 2/7/03, p. 24.)

Avera contends that his capital structure based on market value is more forward-looking than a capital structure calculated using book values of debt and equity. Specifically, Avera says:

> "A market value capital structure is necessary because telephone companies are operating primarily in a competitive world, where investors focus on market value capital structures…. To be able to raise capital, telephone companies, like other competitive firms, must pay returns that are competitive at the current market prices of their securities, not the embedded book value of the mix of stock and bonds." (*Id.*, p. 20.)

Avera contends that a book value approach has been used for traditional utilities operating within the historical rate-of-return regulatory compact, but it is not appropriate for a competitive firm. Avera cites reports that telephone firms are increasing the equity in their capital structures in the face of mounting business risks. (*Id.*, pp. 22-23.) He cites a Value Line projection that the market value capital structure for SBC-CA will be 15.7% long-term debt and 84.3 % equity. (*Id.*, p. 25.)

Murray criticizes Avera for advocating a "forward-looking" market value capital structure based on outdated 1998 market values. Murray updates Avera's approach of a market value capital structure with more recent financial information for her proxy group and arrives at a capital structure that is 74% equity, 26% debt. (JA/Murray 2/7/03, p. 64.)

In addition, Murray criticizes Avera for relying on a purely market-based value of debt and equity that differs from SBC-CA's internal target capital structure. According to Murray, a market-valued capital structure can become obsolete due to dramatic swings in stock prices, which can make a company's market capitalization volatile. She notes that several of the companies in Avera's proxy group have substantially increased their debt levels in recent years, and indeed SBC, Verizon and BellSouth have increased debt in their market capital structures to an average of 23%. (JA/Murray 2/7/03, p. 57.) She contends it is better to use a capital structure based 50% on market values and 50% on book values, which is less sensitive to changes in market conditions (*Id*., p. 72). Moreover, Murray maintains that Avera improperly excludes short-term debt from the capital structure, although SBC's book capital structure shows much of its debt is short-term. (*Id.,* p. 75.) Compounding this problem, Avera uses long-term bonds (with maturities longer than 25 years) that have a higher interest rate. Murray contends that this long-term financing is inconsistent with the shorter economic lives proposed by SBC-CA for its assets.

For her own analysis, Murray calculates a capital structure for SBC-CA that is based on an average of book and market values of debt and equity. Murray's updated figures based on averaging book and market values are 57.45% equity, 24.87% long-term debt, and 17.68% short-term debt. (JA/Murray 3/12/03, Exh. 5.) She notes that the Commission has traditionally used a capital structure derived from book value. Other analysts use market capitalization, or a blend. Ibbotson Associates suggest that "[i]deally, a firm's target or optimal capital structure should be used in weighting the cost of equity and the cost of debt." (JA/Murray 10/18/02, p. 68, citing Ibbotson Associates, "Valuation Edition: 2002 Yearbook," at 14.) Murray cites studies that the market value of equity converges toward its book value. (*Id.,* p. 69.) Therefore, she uses what she describes as a conservative approach that favors the higher market value of equity by averaging it with book value. She explains that the results of her approach comport with SBC-CA's own internal target capital structure used in its capital budgeting process. (JA/Murray 3/12/03, p. 68).

Z-Tel proposes use of SBC-CA's target capital structure, which gives a greater weight to debt levels and includes short-term debt. (Z-Tel/Ford, 2/7/03, p. 21.) Ford cites two sources in support of the use of target capital structure over the firm's current capital structure for valuation purposes. (*Id.*, p. 29.)

We will not adopt the 84% equity and 16% debt capital structure proposed by SBC-CA because we do not find a capital structure to be forward-looking if it is based on market values from 1998.

We will adopt the approach advocated by Joint Applicants' witness Murray of averaging a market value and a book value capital structure for the proxy group. First, we find that using a capital structure based entirely on market value leads to too much volatility in the capital structure, especially given current financial markets. We will mitigate the volatility of a capital structure based purely on market values by using Murray's approach. We agree with Murray that using a 50/50 approach allows us to use information from the capital structure of the subsidiary SBC-CA, which may differ from the capital structure of its parent company, SBC. (JA/Murray 2/7/03, p. 74.)

Second, Murray and Ford provide a rational argument that the best predictor of target capital structure for a firm uses both market and book information when weighing the costs of debt and equity. (*Id.*, p. 74.) Murray indicates that her results comport with SBC-CA's internal capital structure goals, and we think this is a good secondary basis for using these results as opposed to a capital structure based purely on market value.

We do not agree with Murray that we should use any short-term debt in the capital structure. In our forward-looking analysis of a hypothetical competitive network, we will assume that all debt is long-term consistent with our assumptions regarding asset lives.

f. Summary of Weighted Average Cost of Capital

The results of our analysis are summarized in the table below. In short, we derive the capital structure for our analysis based on Murray's proposed 50/50 weighting of book and market values for her proxy group of firms, although we exclude Murray's use of short-term debt and will consider all debt as long-term. The 12% cost of equity that we use is based on our revisions to the parties' CAPM analysis, which resulted in an 11.88% cost of equity that we modified upwards by 12 basis points. The cost of debt that we use is based on SBC-CA's updated interest rates for corporate bonds. Altogether, these inputs result in a weighted average cost of capital for SBC-CA of 9.9%. Oddly enough, despite an intensive financial analysis, the results are only 10 basis points below the cost of capital adopted in the prior OANAD proceedings.

Table 6
Weighted Average Cost of Capital

Component	Percent of Total	Cost	Weighted Cost
Equity	57.00%	12.0%	6.84%
Debt	43.00%	7.12%	3.06%
	100%		9.90%

C. IDLC/UDLC

A key modeling input involves the technology choice for digital loop carrier electronics. Digital loop carriers (DLCs) are the electronics that connect fiber feeder cable to copper distribution cable, and which allow telecommunications services to pass from copper to fiber and back, and between the fiber feeder and the switch. (JA/Donovan-Pitkin-Turner, 2/7/03, para. 334.)

1. Modeling Proposals

Joint Applicants propose that DLC systems should be modeled as "integrated" or IDLC systems. In an IDLC system, voice signals remain digital all the way from the remote terminal to the switch. JA contend that IDLC is the more recent and forward-looking technology that requires less investment in multiplexing equipment, requires less space, and permits traffic engineering efficiencies. (JA, 8/1/03, p. 2.) According to JA's witness Donovan, an IDLC system can be used to provision a stand-alone unbundled loop at the DS-1 level using an interface known as GR-303. (*Id.*, p. 3.) Further, JA claim that SBC-CA's own engineering guidelines call for greater deployment of IDLC systems. (*Id.*, p. 2.)

In contrast, SBC-CA has modeled DLC systems that are known as "universal," or UDLC. In a UDLC system, voice signals are converted from analog to digital at the remote terminal, then converted back to analog at the central office. SBC-CA takes the position that a forward-looking network must allow a carrier to provide unbundled loops to its competitors and it is not technically feasible in a multi-carrier environment to provision a single, or "stand-alone" unbundled loop using an IDLC system.[64] SBC-CA does not dispute that it is technically feasible to unbundle IDLC loops at the DS-1 level (Hearing Tr., 4/14/03, p. 430-31), but it argues that this is not the same as providing a stand-alone loop because individual loops cannot be separately identified when embedded in the DS-1 signal. (SBC-CA 8/1/03, p. 5.) SBC-CA contends that various problems prevent provisioning of stand-alone loops over

[64] The parties do not dispute that IDLC systems can provision loops purchased as part of the UNE-Platform (UNE-P) (*i.e.* loops bundled with a port and switch).

IDLC systems, which include operational, security, and administrative concerns (SBC-CA/Bash Decl., 3/12/03, p. 28). Essentially, SBC-CA says it is unclear how different switches owned and operated by competing carriers can connect to one DLC system, and it provides a letter from its DLC vendor, Alcatel, in support of these assertions. (SBC-CA 8/1/03, p. 5, citing PHE-103.) Moreover, SBC-CA contends it would be costly to add IDLC capability to its existing switches and that IDLC is not cost effective in many situations. (JA/McNeill 2/7/03, p. 27-28.) Finally, SBC-CA says that some amount of UDLC is needed for circuits that cannot be provisioned over an IDLC system, namely ISDN, high capacity services, and burglar alarms. (Hearing Tr., 4/14/03, p. 448.)

In response, JA maintains that SBC-CA and Telcordia agree it is technically feasible to provide stand-alone loops over IDLC. SBC-CA raises some "operational issues" that JA argue are merely a "smoke-screen" and can be resolved. (JA, 8/1/03, p. 5-6.) ORA/TURN and JA respond that the Commission should ignore SBC-CA's claims that provisioning loops over IDLC is more costly because these arguments ignore the proper interpretation of TELRIC and are "based on the work involved with replacing UDLC with IDLC in the existing – embedded – network, not on costs of IDLC versus UDLC in the context of the forward looking network that is appropriate in a TELRIC study." (ORA/TURN 8/1/03, p. 7.) ORA/TURN support JA's proposed assumption of IDLC technology because they believe that JA's proposals during the evidentiary hearing could resolve the operational issues cited by SBC-CA. (*Id.*, p. 4.)

XO states that SBC-CA's DS-1 loop study does not use any IDLC technology, even though SBC-CA admits that it provisions DS-1 loops using IDLC. XO proposes that an assumption of 20% IDLC usage should be used as a modeling input when calculating DS-1 loop costs. (XO 2/7/03, pp. 40-41.)

2. Discussion

First, we find that IDLC is the forward-looking technology choice to include in our model runs. We do not agree with SBC-CA's arguments that IDLC is more expensive than UDLC because this contention is based on the cost to convert SBC-CA's current network. This assumption is inappropriate for a TELRIC analysis, which starts with the assumption of a reconfigured network. In addition, this argument is contradicted by SBC-CA's own documents encouraging IDLC deployment as the most economic method for providing telephone service. (JA 8/1/03, p. 15, citing PHE-4, p. 1 (PBRL 000449).)

Second, although the parties appear to factually dispute whether a stand-alone loop can be provisioned over an IDLC system, we find this dispute is largely semantic. JA describe unbundling a stand-alone loop by cross-connecting DS-1's in the central office. (JA 8/22/03, p. 19.) SBC-CA agrees that this approach is technically feasible, but it does not consider a DS-1 connection as providing a "stand-alone" loop because the loop is embedded in a DS-1 or higher level signal. We find that an individual loop can be unbundled at the DS-1 level using the methodology described by Joint Applicants.

Beyond the semantic dispute over whether a DS-1 connection provides access to a single unbundled loop, the parties agree that even under this technical arrangement involving DS-1 connections, there are "operational issues" that need to be resolved. JA express optimism that this will occur through agreements between incumbent carriers and competitors over operational control issues, and through software fixes. Nevertheless, JA's witness Donovan admitted that he does not know of a stand-alone loop provisioned over IDLC by any carrier in the entire country. (SBC-CA, 8/1/03, p. 5; Hearing, Tr., 4/14/03, p. 439.)

We would like to share JA's and ORA/TURN's optimism that the operational issues will be resolved. In a TELRIC analysis such as this one, however, we must adhere to what is currently available and technically feasible. The evidence shows that no carriers today provide unbundled loops over IDLC due, apparently, to operational issues that remain unresolved. Therefore, we will model a mix of IDLC and UDLC systems, recognizing that IDLC is the forward looking technology choice and that loops can be provisioned through a UNE-P arrangement over IDLC. We will assume that a forward-looking carrier would still include some UDLC systems in its network to allow the carrier to provision stand-alone unbundled loops to competitive carriers, at least until such time as the operational issues involving IDLC are resolved and to provide services that require UDLC systems such as ISDN. We will adopt a mix of 75% IDLC and 25% UDLC as the appropriate modeling input. In other words, this mix assumes that 25% of the loops in the network may need to be unbundled over a UDLC system (*i.e.* 4.5 million assuming a network of 18 million loops). Given current demand for unbundled loops, we think this assumption is reasonable.

We also note that the FCC's Triennial Review Order describes UDLC as one option for unbundling loops in an IDLC system. (TRO, para. 297.) This provides yet another reason to include some UDLC in our model of a forward-looking network. Specifically, the FCC's Triennial Review Order requires ILECs to provide requesting carriers "a technically feasible method of unbundled access" to hybrid loops (*i.e.* loops with fiber feeder and copper distribution facilities) served by Integrated DLC systems and notes that UDLC systems are one method for providing IDLC unbundling.[65]

D. DLC Costs

Both models assume a forward-looking loop design that incorporates digital loop carrier electronics into the loop plant. The models differ in the engineering, furnishing and installation (EF&I) costs for above-ground cabinets, or "remote terminals" (RTs) and underground "controlled environmental vaults" (CEVs) that house these DLC systems.

1. JA Approach

The Joint Applicants maintain that the Commission should use their proposed costs of $51,425 for the installation of DLC equipment in a 6x16 CEV, and $5,740 for installation in a 1,016-line capacity above-ground RT. (JA 8/1/03, p. 32, and Table C-1, p. 37.) According to JA, DLC equipment is pre-assembled at the factory and there are only a "handful of tasks necessary to place and connect the largely pre-assembled DLC systems that SBC-CA California purchases from Alcatel." (*Id.*, p. 32.) JA argue that SBC-CA's contract for DLC equipment with Alcatel contains numerous references to extensive installation requirements placed on Alcatel. Therefore, JA argue that given these contract terms SBC-CA incurs virtually no DLC installation costs and it would be improper to model any. Nevertheless, JA have included the costs described above in the event that the contract does not cover all installation activities.

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[65] The FCC states, "We recognize that it is technically feasible… to provide unbundled access to hybrid loops served by Integrated DLC systems. Incumbent LECs can provide unbundled access to hybrid loops served by integrated DLC systems by configuring existing equipment, adding new equipment, or both." (TRO, para. 297, n. 855.)

In response to this proposal, SBC-CA maintains that its contract with Alcatel does not include installation and that SBC-CA incurs significant costs for the installation of the equipment on site, either by its own personnel or other contractors. (SBC-CA 8/1/03, p. 20.) SBC-CA maintains that JA have omitted key field installation activities from their analysis such as costs for testing the system, copper and fiber splicing, power connection costs, engineering, construction management, transportation, and right-of-way acquisition. (SBC-CA 8/22/03, pp. 26-27.) JA's witnesses acknowledged that "in the way that it appears that SBC-CA uses [the Alcatel contract], there is a separate installation cost." (Hearing Tr., 4/15/03, p. 618.)

2. SBC-CA Approach

In LoopCAT, SBC-CA proposes a factor-based approach to estimate DLC installation costs, based on the ratio of installation costs to material costs. SBC-CA used recent actual data reflecting a mix of DLC installation projects to calculate the relationship between installation and material costs. Material costs are multiplied by this factor in SBC-CA's model to estimate EF&I costs. (SBC-CA/Smallwood 3/12/03, p. 26.) The factor and the costs it produces are proprietary information, but the factor results in DLC installation costs ranging from $300,000 to $500,000, for RTs and CEVs, respectively. (JA 8/1/03, p. 37.) This range is orders of magnitude greater than the $5,740 to $51,425 estimated by JA.

JA criticize SBC-CA's EF&I factor for DLC installation as unsupported, grossly inflated, and out of sync with several other sources of data that allegedly show SBC-CA's actual DLC installation costs. (*Id*., p. 58; JA 8/22/03, p. 53.) First, JA contend that SBC-CA did not provide the accounting data underlying its factors. Second, SBC-CA's proposed installation costs equate to over 6000 hours of work, or two technicians working full time on the project for one and three-quarter years. According to JA, this contradicts Alcatel's own equipment installation instruction touting the "ease of installation" of DLC remote terminal equipment and the views of JA's expert witnesses that DLC systems can be installed in only a few weeks. (*See* PHE-17 p. PBRL-011829; JA 8/1/03, p. 33.) Third, JA compare SBC-CA's DLC installation factor to actual cost data provided by SBC-CA, noting that this data shows actual DLC installation costs are significantly lower than LoopCAT factors and the ratio calculated from SBC-CA's actual jobs is only 18% to 26% of the factor used in LoopCatLoopCAT.[66] (JA 8/1/03, p. 55.) SBC-CA admits that its actual DLC installation costs from a sample of jobs are lower than the factors developed for LoopCatLoopCAT. (SBC-CA 8/1/03, p. 21.) Finally, JA attack the credibility of SBC-CA's witnesses on this topic based on their initial inability to estimate actual DLC installation costs, and their repeated statements that they have no knowledge of the DLC factors used in LoopCAT or what is supposed to be reflected in a TELRIC study. (JA 8/1/03, p. 55.)

3. Discussion

We find that SBC-CA does incur some installation costs above and beyond those included in the contract with Alcatel. SBC-CA's witness Palmer explained that while the contract provides that Alcatel may perform some installation, the contract does not contain prices for this because SBC-CA has not chosen this

[66] SBC-CA provided data involving a sample of 8 actual DLC installation jobs. (PHE 109). In response to a record request from JA, SBC-CA provided another sample of 50 DLC installations (25 RT and 25 CEV jobs). (SBC-CA 8/1/03, p. 20-21.)

option. (SBC-CA/Palmer Declaration, 3/12/03, p. 5.) In our model runs, we will include costs for the on-site DLC installation work that SBC-CA must incur.

It is at this point that we face dueling views of DLC installation costs. JA have assumed a least-cost scenario for all installations that is below the actual DLC installation costs provided by SBC-CA. SBC-CA has proposed an EF&I factor that is above the actual costs it provided, and it cannot adequately explain the difference between its factor and its actual costs.

We find SBC-CA has not met its burden of proof that the factor in its model is accurate, particularly given its actual cost information showing a much lower ratio of EF&I costs to material costs. SBC-CA's witnesses could not satisfactorily explain how the LoopCAT EF&I factor for DLC installation was derived. Although SBC-CA supplied three witnesses on the topic of DLC costs, none of these witnesses could reasonably explain how the LoopCAT factor was derived or how it relates to actual DLC installation costs. While SBC-CA devoted many pages to criticizing HM 5.3's DLC assumptions as too low, and defending its own EF&I factors, SBC-CA failed to provide a reasonable explanation of how SBC-CA's DLC EF&I factor was created. JA charge that SBC-CA's factor includes costs for items such as poles, conduit, and copper and fiber placement that are not appropriate to include here. SBC-CA has not been able to show that these costs are not double counted.

Further, SBC-CA's witnesses on this topic lacked credibility and appeared to operate in silos rather than as a team, deferring questions to another witness and professing little knowledge on the specific question at hand. JA contended that SBC-CA's expert on LoopCAT was unfamiliar with DLC actual costs, while the experts on actual costs could not explain what was assumed in LoopCatLoopCAT. (JA 8/1/03, p. 35.) We find this to be an accurate criticism.

SBC-CA witness Palmer contended that HM 5.3 DLC estimates were too low and did not match actual DLC costs, but he admitted that he did not know actual DLC installation costs. (Hearing Tr., 4/15/03, pp. 572-573.) SBC-CA's witness Bash stated that she thought LoopCAT DLC factors were based on averages across SBC-CA, but she admits she did not have direct input, and only provided guidance. (*Id.*, p. 573.) Later, when asked about specific costs that SBC-CA may have included in its DLC EF&I, Bash stated she did not know what was in the EF&I loading. (*Id.*, p. 586.) Ultimately, we cannot accept SBC-CA's EF&I factor because SBC-CA's cost witness Smallwood says he relied on actual information from recent DLC installations, but witnesses Bash and Palmer from whom he obtained this information cannot explain why actual DLC installation costs do not match the factor.

Therefore, given the record before us, we will not rely on SBC-CA's DLC factor and we will use actual cost information provided by SBC-CA rather than the bottom-up approach advocated by JA. We find this approach is more conservative and representative of SBC-CA's forward-looking DLC installation costs than JA's approach, which assumed an RT could be connected in two weeks for less than $6000. While JA advocate adjustments to SBC-CA's actual costs, we prefer to use the simple averages of costs resulting from SBC-CA's sample of 50 DLC installations, noting that there is a wide range of results here.

When we run the SBC-CA models, we will replace SBC-CA's EF&I factor with the factor derived from the average of SBC-CA's 50 installations. This factor is about one-quarter of SBC-CA's original factor. (*See* JA 8/1/03, p. 43, and Exhibit C-4 and C-5.) SBC-CA supports use of this number for RT and CEV installations, and we will use it along with SBC-CA's proposed new factor for installation of central office terminals. (SBC-CA, 8/22/03, p. 32.) When we run our version of HM 5.3, we will assume EF&I costs for RTs of $22,814 and for CEVs of $49,569 based on SBC-CA's sample data. (JA 8/1/03, p. 43, and Exhibit C-4 and C-5.)

E. Fill Factors in Loop Model

The parties have varying proposals for the amount of spare capacity that should be designed in a forward-looking local exchange network. In TELRIC cost models, designing a network with spare capacity entails use of a "fill factor," or utilization level, as a modeling input. For example, a fill factor of 40% means that 40% of the physical plant is in use, while 60% is available for spare capacity, or growth. (*See* D.96-08-021, *mimeo.*, at 23.)

As the FCC stated in its First Report and Order,

> We conclude that, under a TELRIC methodology, incumbent LECs' prices for interconnection and unbundled network elements shall recover the forward-looking costs directly attributable to the specified element, as well as a reasonable allocation of forward-looking common costs. Per-unit costs shall be derived from total costs using reasonably accurate "fill factors" estimates of the proportion of a facility that will be "filled with network usage); that is, the per unit costs associated with a particular element must be derived by dividing the total cost associated with the element by a reasonable projection of the actual total usage of the element. (First Report and Order, para. 682.)

Key fill factors used in the loop model determine the appropriate investment for copper distribution cable, fiber feeder facilities, copper feeder facilities, DLC equipment, serving area interfaces (SAIs), and premise termination equipment. In the prior OANAD proceeding, the Commission adopted fill factors of 38% for distribution cable and 76% for copper feeder cable. (D.96-08-021, pp. 29-32.)

According to JA, fill factors are a major concern in modeling forward-looking costs, especially distribution cable costs. The lower the fill factor, the more spare, or excess, capacity will be included in the cost study. Therefore, distribution plant costs are inflated at lower fill percentages. (JA/Donovan 10/18/02, p. 53.) JA also express concern that fill factors incorporate an accurate match of investment and demand projections. JA's witness Klick describes how TELRIC models should derive per unit costs by dividing total costs by a reasonable projection of actual total usage. If the numerator of the calculation reflects investment large enough to accommodate line growth, but the denominator ignores line growth by only looking at customers served currently, there is a significant mismatch. As a result, costs per line may be too high because they include more investment than necessary to serve today's customers. (JA/Klick 10/18/02, pp. 15-17.)

SBC-CA has used current fill levels derived from its actual network operations in its modeling, based on the assertion that "current fill levels represent forward-looking fill because SBC-CA's network is efficiently designed." (SBC-CA/Bash 10/18/02, p. 19.) SBC-CA states that "the current fills based upon historical evolution of the network infrastructure are the most reasonable projection of efficient future usage for each of the loop plant components in question, and therefore, comprise the appropriate fill." (*Id.*, p. 19.) SBC-CA's witness Bash says that volatility and uncertainty in demand from "churn" in customers requires fill factors at lower levels than those proposed by JA, in order to serve "ultimate demand."

ORA/TURN criticize SBC-CA's fill factors as too low, particularly when compared to the fill factors SBC-CA assumes in its TSLRIC cost studies for pricing flexibility purposes. According to ORA/TURN, it is improper to incorporate a fill factor based on efficient network utilization into a TSLRIC study, but use embedded or historical network utilization for a TELRIC study. ORA/TURN see no reason to use two different fill factor methodologies, other than to achieve lower cost in a TSLRIC study for maximum pricing flexibility and to achieve a higher cost in a TELRIC study for higher UNE rates. ORA/TURN contend that SBC-CA should not be allowed to strategically select fill factors based on the nature of the end purpose of the cost study. (ORA/TURN/Roycroft Declaration, 2/7/03, pp. 37-38.) SBC-CA responds that it is appropriate for TELRIC to use current measures of average fill, and for a TSLRIC study to use design fill, or "fill at relief." The difference between the two fill measures is a fixed cost which should be shared, and shared costs are not included in TSLRIC studies. (SBC-CA/Tardiff 3/12/03, pp. 34-35.)

In general, we do not agree with SBC-CA's assertion that fill levels derived purely from current network operations are automatically forward-looking. We agree with JA that network enhancements such as Project Pronto or other one-time occurrences that are captured in the SBC-CA's actual operational data could skew fill levels at a point in time to less than optimal levels. Further, we agree with ORA/TURN that there appears to be a wide disparity between the fill levels SBC-CA proposes here versus those used in its TSLRIC studies. While we will not render an opinion on SBC-CA's assertion that different fill levels are appropriate for TELRIC and TSLRIC studies, we find that the large difference calls into question whether SBC-CA's current fill levels are actually forward-looking.

Furthermore, we agree with JA that it is important that fill factors reflect accurate projections of both investment to accommodate growth and a reasonable estimate of demand. We also agree with SBC-CA's witness Tardiff that an efficient carrier always carries spare capacity, and the cost of this spare is appropriately reflected in TELRIC costs. (SBC-CA/Tardiff, 2/7/03, pp. 9-10.) We will keep these principles in mind as we evaluate the fill factors proposed by the parties. We prefer to look at each fill level individually to determine whether SBC-CA or other parties have the better argument for a reasonable forward-looking fill level. We discuss each of the significant fill factors in the loop portion of the model separately below.

1. Copper Distribution Fill

This fill factor relates to the amount of copper facilities, or line pairs, that are modeled in the distribution network. JA propose cable sizing inputs that result in an "achieved fill"[67] rate for copper distribution of 51.6%, while SBC-CA proposes an achieved fill level of 41.7%.[68]

a. JA Proposal

JA contend that many significant changes warrant a reexamination of the 38% copper cable distribution fill factor adopted in the prior OANAD proceeding, such as the accelerated deployment and availability of DSL services which reduce the need for second lines, SBC-CA's updated engineering guidelines stressing increased fill levels, and guidance from the FCC on reasonable fill factors. (JA/Donovan 10/18/02, paras. 101-123.) According to JA,

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67 The term "achieved fill" represents the spare capacity "achieved" after the model is run, as opposed to the "input fill," or sizing factors, which are model inputs that size the network for spare and growth and lead to an output or "achieved fill." (JA/Donovan 10/18/02, p. 51.)

68 *See* Joint Comparison Exhibit, 12/3/03, p. 1 and p. 9, contained in *ALJ's Ruling Reopening the Record to Accept Additional Exhibits*, April 4, 2004, Attachment 4. JA originally claimed that HM 5.3 resulted in an achieved fill of 52.03%, based on an earlier

Footnote continued on next page

HM 5.3 uses engineering guidelines, based on a realistic assessment of outside plant design and available cable sizes, to model a level of fill sufficient to serve SBC-CA's current demand plus reasonably foreseeable demand growth.

Donovan explains that JA's approach to calculating fill is markedly different from the SBC-CA approach. HM 5.3 does not start with an achieved fill factor as an input in the way that LoopCAT does. Instead, HM 5.3 uses "sizing factors" which are inputs in the model to determine the minimum number of cables or fibers necessary to meet current demand plus a cushion for spare. (*Id.*, p. 49.) According to JA, "The use of sizing factors as an input instead of achieved fill is appropriate for a bottoms-up model like HM 5.3 because the model constructs the network first based on sound engineering guidelines rather than building to achieve a certain level of fill." (JA 3/12/03, p. 64.) JA use SBC-CA's current engineering guidelines to design cable sizes to build 1.5 to 2 lines per living unit for residential customers. (JA/Donovan 10/18/02, p. 53.) Donovan contends that the HM 5.3 proposed fill factor of 52% can accommodate an assumed demand growth rate of 3% in order to serve all demand over an assumed 22 year economic life of distribution cable. (*Id.*, p. 54.) In other words, when HM 5.3 models a network with a 52% fill level, the network has 48% spare capacity, or almost double the number of copper loops that are required to serve current demand.

SBC-CA criticizes JA fill rates as too high, with not enough spare capacity. (SBC-CA 2/7/03, p. 55.) SBC-CA says JA's cable sizing factors ignore standard network design of 2.25 lines per living unit, and therefore, would not allow

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run of HM 5.3. (JA/Donovan 3/12/03, para. 188.) These figures were updated and replaced by the Joint Comparison Exhibit.

SBC-CA to serve "ultimate demand" or meet service quality standards set by the Commission. Bash says that JA incorrectly use temporary guidelines for rural areas to justify 1.5 to 2 lines per housing unit, when for California, SBC-CA's current guideline is 2.25 lines per lot. (SBC-CA/Bash 3/12/03, pp. 20-21.) SBC-CA witness Murphy says that HM 5.3's cable-sizing factors are artificial and ignore sizing an actual network to accommodate churn, growth, maintenance, and administrative needs. (SBC-CA/Murphy 2/7/03, pp. 51-53.) McNeill says outside plant should be sized to meet potential demand of a given area because it is more cost effective to place additional capacity at the time of initial placement rather than at a later date. Further, he contends that higher fill levels are correlated to increased maintenance-related activities and longer service intervals. (SBC-CA/McNeill 2/7/03, pp. 18-20.)

All in all, SBC-CA maintains that JA have not proven the wisdom of raising the copper distribution fill factor above the 38% level adopted in the prior OANAD proceeding, particularly when HM 5.3 models far fewer pairs than exist in SBC-CA's network today. (SBC-CA 2/7/03, p. 20.)

b. SBC-CA Proposal

SBC-CA contends that current utilization rates, which are calculated by dividing working pairs by available pairs, are optimal because they were developed under the incentives of price cap regulation and are the best predictor of future utilization levels. (SBC-CA/Bash 10/18/02, p. 22.) According to SBC-CA, higher fill levels cause delays in service, service quality degradation, and higher installation costs. (SBC-CA 3/12/03, p. 43.) Instead, the proper level of spare remains constant over time because as SBC-CA states, "although some spare is used over time, additional spare is always being added so that on average the fill rates proposed by SBC-CA California are achieved. (*Id.*, p. 44.)

SBC-CA contends that the FCC supports use of actual network utilization in TELRIC models when it states that fill factors must be based on a "reasonable projection of the *actual* total usage of the element." (SBC-CA/Aron, 3/12/03, p. 46, citing First Report and Order, para. 682.)

JA and ORA/TURN respond with several criticisms. First, SBC-CA's actual fill factors are not forward-looking because they capture all of the cable facilities currently in SBC-CA's database, rather than reflecting the efficient amount necessary in a forward-looking environment. (JA/Donovan-Pitkin-Turner, 2/7/03, p. 69.) JA say that SBC-CA's newest guidelines plan for less than 2.25 lines per living unit, and SBC-CA's actual fill levels do not incorporate the new, lower guidelines. (*Id.*, p. 133.) Further, SBC-CA has ignored the fact that growth is less today than when the capacity was installed, in part because of DSL line-sharing and broadband reducing the need for additional lines. Similarly, SBC-CA's current fill levels reflect the duplicative installation of copper and fiber facilities during the transition to a fiber-based network. (*Id.*, p. 79.)

Second, JA and ORA/TURN claim that SBC-CA's approach to calculating fill violates FCC pronouncements that fill factors should reflect current demand and not the industry practice of building distribution plant to meet "ultimate demand" because it is too speculative. (ORA/TURN/Roycroft 3/12/03, para. 58; JA/Donovan 3/12/03, p. 84-87.) According to the FCC:

> We find unpersuasive GTE's assertion that the input values for distribution fill factors should reflect ultimate demand. In concluding that fill factors should reflect current demand, we recognized that correctly forecasting ultimate demand is a speculative exercise, especially because of rapid technological advances in telecommunications… Given this uncertainty, we find that basing the fill factors on current demand rather than

> ultimate demand is more reasonable because it is less likely to result in excess capacity, which would increase the model's cost estimates to levels higher than an efficient firm's costs… (Inputs Order, para. 200.)

JA cite to several recent FCC orders where fill factors of 40% or lower were criticized, and where adopted fill rates were in the 50 to 75% range. (JA/Murray, 2/7/03, para. 35.) ORA/TURN further cite to the FCC's statement that "We find that a fill factor that assumes that more than two-thirds of capacity is idle for an indefinite time is unreasonably low." (Kansas 271, para. 80; cited by ORA/TURN/Roycroft Decl., 2/7/03, p. 43.)

Third, JA and ORA/TURN maintain that SBC-CA's varying fill levels for urban, suburban and rural areas are illogical. According to SBC-CA's witness Bash, higher fill levels are justified in urban areas, and lower in suburban and rural areas. (SBC-CA/Bash 10/18/02, p. 17.) Nevertheless, JA and ORA/TURN show that LoopCAT's results contradict Bash's statements because fill rates are lowest in urban zones, and higher in rural and suburban zones for DLC and copper cable. (JA/Donovan-Pitkin-Turner, 2/7/03, p. 80.) This is illogical because equipment in urban areas can be changed out more quickly, so fill in urban areas should be higher than rural fill. In contrast, rural equipment is placed before it is actually needed so it has a lower fill. (*Id.*, p. 79-80.)

c. Discussion

Both SBC-CA and JA suggest changes to the 38% copper distribution fill factor adopted in our prior OANAD decision. We will adopt the fill factor of 51.6% proposed by JA for our model runs. We find this fill factor is reasonable because it provides an adequate level of spare capacity to accommodate a reasonable projection of future demand. The FCC has endorsed fill levels in this range in its own modeling and when reviewing TELRIC cost studies from other states. Further, we find that it is reasonable to use a higher fill factor than the prior OANAD given FCC decisions providing guidance in this area since the Commission's 1996 decision, and given trends in network usage, such as the availability of DSL technology, cable modems, and wireless technologies, that have reduced line growth projections.

There are several reasons why we find that SBC-CA has not met its burden of proving that its embedded fill level is a reasonable proxy for forward-looking utilization. First, when setting the copper distribution fill factor in the prior OANAD proceeding, the Commission adopted a level 5 percent higher than

SBC-CA's embedded fill level. (D.96-08-021, *mimeo.*, p. 30.) SBC-CA has not provided any new rationale for using its actual fill levels now. SBC-CA merely proposes that its current fill rates are forward-looking on the reasoning that its current achieved fill is expected to remain at the same level in the future and because its fill rates have remained unchanged for some time. SBC-CA has not provided an analysis to show that the current fill level may be either too low or too high. The fact that SBC-CA has maintained the same fill level over time does not prove that level is efficient. While SBC-CA reiterates that fill levels have remained constant over time, this could merely be because SBC-CA works to ensure the fill remain constant. It does not mean that this is optimum.

Second, the FCC has not looked favorably on excessive levels of spare capacity or sizing a forward-looking network to serve ultimate demand. SBC-CA's fill level leaves approximately two-thirds of its network unused, and the FCC has criticized this much spare as excessive. Further, SBC-CA sizes its network based on projections of usage exceeding two lines per household without reconciling this standard to current growth estimates or its own temporary guidelines calling for less than two lines per house. SBC-CA interprets the FCC as supporting the use of embedded fills as forward-looking based on an FCC statement that fill factors must be based on a reasonable projection of actual total usage. We find it more reasonable to read this FCC passage as supporting the concept that a forward-looking fill factor should reasonably project actual usage, not that embedded fill levels are automatically forward-looking.

Third, we are not persuaded that a fill level of 51.6% will cause dramatic service delays or installation cost increases, as suggested by SBC-CA. In Section VI.E.8 below, we discuss why SBC-CA's correlation of fill factors and maintenance expenses is not persuasive. Moreover, a fill level of 51.6%, only 10 percent above the fill level proposed by SBC-CA, is premised on the installation of 1.5 to 2 lines per household and leaves 48% spare capacity. It is reasonable to conclude that this level of spare can accommodate customer churn, maintenance, and growth without the need for service interruptions or the installation of additional lines.

Finally, we agree with JA and ORA/TURN that SBC-CA's fill factors that are lower for urban zones and higher for rural areas are illogical and contradict statements of its own witness. The FCC has found that lowest density areas generally have the lowest fills, not vice versa as in LoopCatLoopCAT. (ORA/TURN/Roycroft Declaration, 2/7/03, p. 35, citing Inputs Order, para. 187.)

2. Copper Feeder

HM 5.3 inputs provide an achieved fill rate of 77.5% for copper feeder, which is almost identical to the 76% rate adopted in the prior OANAD order. SBC-CA proposes a fill rate for copper feeder of 66.2%.

SBC-CA's proposed fill rate for copper feeder is based on its current network experience. According to SBC-CA, "network fills have been stable over time and represent the best estimate of utilization on a going-forward basis." (SBC-CA/Smallwood 3/12/03, p. 45.) JA respond that SBC-CA's actual records reflect a work in progress, namely the transition from a basic exchange network to the upgraded Project Pronto DSL-capable network, which deliberately places duplicate facilities. In other words, when SBC-CA places fiber, it does not remove copper. (JA/Donovan-Pitkin-Turner 2/7/03, p. 72.) Thus, SBC-CA's actual records reflect lower usage of copper feeder caused by duplicative facilities. JA contend that if actual fill levels are used for TELRIC modeling, fill is understated, costs are overstated, and the model does not accurately reflect that only one feeder technology would be used in a forward-looking network to serve each distribution area. (*Id.*, p. 73, and paras. 141-156.) SBC-CA responds that even with the addition of fiber facilities under Project Pronto, SBC-CA's copper feeder utilization levels have remained constant because the incremental capacity made available was small. (SBC-CA/Bash 3/12/03, p. 24.)

JA claim that the 77.5% copper feeder fill rate proposed in HM 5.3 allows for 2.5 years of growth in feeder usage. (JA/Donovan-Pitkin-Turner, 2/7/03, p. 137.) SBC-CA criticizes this fill rate as unreasonable because SBC-CA has never had a copper feeder utilization level above 70%. When levels did approach 70%, SBC-CA experienced increased network maintenance costs. (SBC-CA/McNeil, 2/7/03, pp. 19-21.)

ORA/TURN echo the views of JA that SBC-CA's copper feeder utilization rates, which are based on actual network fill rates, are unreasonably low. ORA/TURN note that SBC-CA has argued to the FCC that fills in excess of 82.5% often result in plant rearrangement costs, which implies that the fill levels proposed by SBC-CA can be raised without resulting in higher costs for provisioning spare capacity. (ORA/TURN/Roycroft 2/7/03, p. 34, n. 27, citing SBC comments in the FCC's 1999 Universal Service docket.)

Discussion. D.96-08-021 adopted a 76% fill factor for copper feeder, which is described as the midpoint between fill at installation and fill at relief (*i.e.*, the fill factor at which feeder capacity would have to be added). (D.96-08-021, *mimeo.*, p. 32.) The decision did not agree to adopt Pacific's actual fill factor.

In this proceeding, SBC-CA has not addressed why the Commission should deviate from its prior findings. SBC-CA has not convinced us that we should lower what we consider a forward-looking fill factor for copper feeder facilities just because its actual practices do not match this percentage. SBC-CA claims that a higher fill will result in higher maintenance costs, but as ORA/TURN have pointed out, SBC-CA has told the FCC that this is only an issue at fill rates above 82.5%. Since the fill rate that we adopt is less than this amount, this issue is moot. We find no reason to change the 76% fill factor used in the prior OANAD, and we have run HM 5.3 and the SBC-CA models with a 76% achieved fill factor for copper feeder.

3. Fiber Feeder

JA propose sizing factors that achieve a fill level for fiber feeder of 79.6%. SBC-CA proposes a fill level for fiber feeder of 16.22%.

According to JA, HM 5.3 models 4 fibers to each DLC site, two of which are for redundancy. HM 5.3 then uses the next largest fiber cable size available, which results in additional spare capacity at each DLC site. (JA/Donovan 10/18/02, p. 50.) As a result, the proposed fiber fill rate of 79.6% includes duplicative facilities, so the effective utilization of the fiber strands is at or below 50 %. (Joint Comparison Exhibit, 12/3/03, p. 3, contained in Attachment 4 of ALJ Ruling of 4/1/04.) JA claim that this is consistent with the approach endorsed by the FCC in its universal service proceeding, and supported by SBC-CA at the federal level as well. (JA/Donovan 3/12/03, p. 92, citing Inputs Order, para. 208.) Moreover, JA contend that its fiber feeder fill rates are based on the engineering concept of "fill at relief," as documented in SBC-CA's loop deployment guidelines, but reduced to allow for 2.5 years of feeder growth. (JA/Donovan-Pitkin-Turner, 2/7/03, pp. 134-137.)

SBC-CA characterizes JA's fiber feeder fill inputs as a 100% cable sizing factor and criticizes this as unrealistic because it sizes the network perfectly to meet demand today, but leaves no administrative spare capacity to perform maintenance and accommodate customer moves and relocations. (SBC-CA/Murphy 2/7/03, p. 53.) SBC-CA also contends that the feeder fill rate proposed by JA has never been achieved and operating the network at that fill level would inflate "network health costs." (SBC-CA/McNeill 2/7/03, p. 20.) JA respond that SBC-CA misinterprets the 100% sizing factor in the model as a 100% fill rate. Rather, JA contend that because HM 5.3 models two redundant fibers to each site, it results in an achieved fill of 50% or less. (JA/Donovan 3/12/03, p. 91.)

In contrast, SBC-CA once again proposes a fill rate for fiber feeder based on its actual experience, which it says captures the true fiber utilization in its network today and is designed to accommodate growth over a five-year period. (SBC-CA/Bash 10/18/02, p. 20.) SBC-CA maintains that the appropriate fill level must consider the capacity of the DLC equipment connected to the fiber, a concept it calls "channel fill." (Joint Comparison Exhibit, 12/3/03, p. 4.) Specifically, SBC-CA arrived at its fiber fill rate of 16.22% by multiplying the percentage of "lit" fiber strands that are actually in use by the average utilization of the working strands. (SBC-CA/Smallwood 3/12/03, p. 58.)

JA counter that SBC-CA's calculation of fiber feeder fill incorrectly determines the percent of active fiber strands needed to serve a DLC system, and thereby significantly overstates fiber costs. (JA/Donovan-Pitkin-Turner, 2/7/03, p. 186.) JA maintain that SBC-CA's "channel fill" calculation is meaningless because fiber strands do not have channels and can accommodate nearly unlimited capacity depending on the electronics deployed on each end of the fiber. (Joint Comparison Exhibit, 12/3/03, p. 4.) ORA/TURN states that SBC-CA's fiber feeder fill rates are unreasonably low, particularly given SBC-CA's own advocacy to the FCC for fiber fill factors as high as 100%, as long as fiber redundancy is maintained to allow upgrades and equipment modifications without disrupting customer service. (ORA/TURN/Roycroft, 2/7/03, p. 34.)

Discussion. For our model runs, we will use the fiber feeder fill rate proposed by JA because it mirrors the approach used by the FCC in its modeling, and it provides full redundancy and spare capacity for 2.5 years of growth.

We find that SBC-CA's proposed fiber feeder fill level of 16.22% is not forward-looking for several reasons. First, SBC-CA's proposed fill rate is not consistent with the FCC's findings in its universal service cost modeling, which SBC-CA supported. Second, we find SBC-CA's discussion of "channel fill" unclear. While SBC-CA's discussion of channel fill is no doubt an accurate depiction of the percentage of fiber strands actually in use, we are not convinced that the channel fill concept is useful or relevant to designing and deploying forward-looking fiber facilities. The calculations SBC-CA describes appear to be useful in determining what percent of fiber strands are actually used today. Nevertheless, SBC-CA has not met its burden of proving that an efficient forward-looking network would necessarily be designed to achieve this same usage level of fiber strands. In other words, SBC-CA has not justified why it makes sense to design a network with more than 80% spare capacity in fiber facilities.

Finally, SBC-CA's fill rate is contradicted by statements of its own witnesses. According to Bash, the optimal fill rate for feeder plant is higher than for distribution because feeder is usually placed in underground conduit, on existing poles, or buried along major rights-of-way, which makes it easier to reinforce. (SBC-CA/Bash 10/18/02, p. 20.) SBC-CA's witness McNeil contends that standard engineering principles recognize that because feeder facilities cost less per unit of length than distribution facilities, the objective is to minimize the size of the DA and achieve a reasonable fill of the feeder facilities. (SBC-CA/McNeil 2/7/03, p. 16.) However, SBC-CA has proposed a fiber feeder fill rate less than half of its copper distribution fill rate, without explaining this inconsistency. For these reasons, we reject the 16.22% fill rate proposed by SBC-CA and adopt the JA's proposed fiber feeder fill rate.

4. DLC Common Equipment

JA propose a fill level for DLC common, or "hard-wired," equipment of 74.6%. SBC-CA proposes a fill level of 47.4%.

In the HM 5.3 model, the investment required for DLC common equipment starts with the number of lines for that DLC, inflates that by a "channel unit sizing factor," and then chooses the next larger DLC Remote Terminal size to match the number of lines. HM 5.3 incorporates a choice of DLC systems from 24-line up to a maximum of 8,064 lines in a controlled environmental vault (CEV). (JA/Donovan 10/18/02, pp. 59-60.) JA contend that a 75% fill level allows 3% growth for 10 years (*Id.*, p. 10.)

In contrast, SBC-CA proposes a DLC fill factor based on its actual network operations. Like JA, SBC-CA has sized DLC common equipment to allow for ten years of spare capacity at the outset. (SBC-CA/Smallwood 3/12/03, p. 54.) However, SBC-CA's ten-year projection involves more spare capacity than presumed by JA. According to SBC-CA, JA's common equipment fill level ignores real-world constraints by modeling too many DLC sizes. SBC-CA contends that JA's assumptions result in less spare than is required in actual operating conditions, by assuming that each DLC can be perfectly sized to match the number of lines. SBC-CA claims that sufficient reserve must be maintained to allow for the various services supplied within the DLC. (*Id.*, p. 53.) In addition, SBC-CA claims that high reinforcement costs make it more economical and practical for SBC-CA to size DLC remote terminals for a ten year period when it initially places them. (*Id.* p 54.)

JA criticize SBC-CA for modeling only four DLC configurations, which does not reflect the range of DLC sizes SBC-CA actually deploys. JA contend SBC-CA's modeling choices are less efficient, understate DLC capacity, and lead to more spare capacity than is required. (JA/Donovan-Pitkin-Turner, 2/7/03, pp. 176-177.) Specifically, JA maintain that LoopCAT does not use the correct line capacity for a 6x16 CEV, and SBC-CA admits to this. (*Id.*, para. 356-7.) In addition, JA allege that SBC-CA has double counted fill factors in its costs for CEV structures by assuming a fill factor for the CEV structure itself, on top of the common equipment fill factor. (*Id.*, para. 362.) Finally, JA contend that SBC-CA's historic fill levels for DLC equipment are not indicative of an efficient, forward-looking utilization level because SBC-CA has placed new fiber and DLC facilities on top of copper plant, but is only gradually moving customers to DLC facilities. (*Id.*, para. 141.)

Discussion. We will use a common equipment fill factor of 70% for our model runs. We find that the common equipment fill rate of 74.9% proposed by JA is more reasonable and forward-looking than the 47.4% rate proposed by SBC-CA for several reasons. First, JA's proposed fill factor allows for sufficient growth over a 10-year period, which SBC-CA agrees is a reasonable growth horizon. Second, JA have modeled a range of sizes and allowed spare in each DLC system. In contrast, SBC-CA has not adequately explained why it has modeled only four DLC system sizes, it has understated the capacity sizes of its CEVs, and it has double-counted fill factors by applying a secondary fill to the

CEV structure. For these reasons, we do not find SBC-CA's fill proposal forward-looking.

Nevertheless, we will lower the JA's fill rate slightly to acknowledge SBC-CA's argument that real world constraints may not allow for the perfect assortment of DLC sizes that JA have assumed, and to allow sufficient spare for the range of services supplied by the DLC equipment.

5. DLC Plug-In Equipment

JA propose a fill level for DLC plug-in equipment, i.e. line-cards, of 89.9%. SBC-CA proposes a fill level of 53.1%.

JA support their proposal by contending that their 89.9% sizing factor provides adequate spare for a six to twelve month period, in line with SBC-CA's engineering guidelines which stress minimizing spare plug-in levels. (JA/Donovan 10/18/02 p. 10; JA/Donovan 3/12/03. p. 95.) JA maintain that their proposed fill level is reasonable because DLC plug-in equipment can be placed on an as needed basis. (JA/Donovan-Pitkin-Turner, 2/7/03, para. 350-52.) Further, they note that SBC-CA admits that plug-in equipment is placed to accommodate growth over a six to twelve month period. (SBC-CA/McNeil 2/7/03, p. 22, n. 29.)

SBC-CA's proposal derives from its claim that current fill levels based upon historical utilization of DLC equipment are the best estimate of forward-looking usage, since fill levels have remained static over time. (SBC-CA/Bash 10/18/02, p. 21.)

SBC-CA contends that JA's proposed fill is unrealistic because it ignores inventory management and travel time whenever service orders are placed. According to SBC-CA, there is a trade-off between deploying spare line cards up front and bearing the expense of extra technician trips each time a line card needs augmenting. (SBC-CA/Smallwood 3/12/03, pp. 54-55.) Along the same lines, SBC-CA contends it is unable to manage DLC channels on a single pair basis, and the highest DLC utilization level SBC-CA ever achieved was only slightly above 70%. (SBC-CA/McNeil 2/7/03, pp. 21-22.)

Discussion. We will use a DLC Plug-In fill factor of 75% for our model runs. Once again, SBC-CA has not adequately supported why its current utilization level for DLC plug-in equipment is forward-looking and efficient, particularly when its own guidelines call for minimizing spare plug-ins by sizing for six to twelve months growth. Therefore, we will not adopt SBC-CA's proposed fill level. On the other hand, we will modify JA's proposed 89.9% fill factor to 75% because SBC-CA has made a reasonable argument that a fill level approaching 90% ignores real world constraints such as inventory management and travel time, and assumes a level of efficiency that SBC-CA has never been able to achieve in its own network.

6. SAI Equipment Fill

Serving Area Interfaces (SAIs) refers to the equipment in the loop network that connects feeder and distribution facilities. JA propose a fill factor for SAI equipment of 67.8%, while SBC-CA proposes a fill factor of 47.2%.

The fill level proposed by JA is based on modeling 3.5 lines per residential living unit (2 of which are for distribution termination, and 1.5 for feeder termination), and 2 lines per business. (JA/Donovan 3/12/03, para. 95, n. 61.) In addition, HM 5.3 models SAI equipment sizes that are currently available and may be larger than equipment in place in SBC-CA's network. As JA's witness Donovan explains, SBC-CA's current equipment is based on 1972 guidelines to size SAI equipment for 200 to 600 living units, but equipment available today can serve many more living units. (*Id.*, p. 43.)

SBC-CA criticizes JA for modeling too many SAI sizes, including sizes that are rarely used, thereby artificially reducing the spare that is required in a real-world network. (SBC-CA/McNeill 2/7/03, p. 16.) McNeill maintains that ILECs still use the 1970 era guidelines of sizing distribution areas to serve 200 to 600 living units. He explains that:

> Because feeder facilities cost less per-unit of length than distribution facilities, the objective is to minimize the size of the DA and achieve a reasonable fill of the feeder facilities. (*Id.*)

Thus, SBC-CA claims that JA's larger distribution area assumptions contradict SBC-CA's established practice to minimize the size of distribution areas.

Similar to the approach used by JA, SBC-CA sizes SAI equipment based on an estimation of the distribution and feeder terminations required per loop. In response, JA contend that SBC-CA has made an error in its calculations and double counted the spare terminations required at each SAI by applying a distribution fill factor for two-thirds of the SAI terminations. (JA/Donovan-Pitkin-Turner, 2/7/03, para 289.) SBC-CA's witness admits that it made this error in developing its SAI fill factor, but he does not supply a corrected fill calculation. Rather, SBC-CA maintains that its fill levels are more appropriate than JA's. (SBC-CA/Smallwood, 3/12/03, p. 47.)

Discussion. We will use JA's 67.8% fill factor and find that it is reasonable and forward looking because it is based on 3.5 terminations per line at the SAI, essentially identical to the number of terminations that SBC-CA has proposed. We find JA's proposed SAI fill factor more reasonable than SBC-CA's because SBC-CA admits that it made an error in further applying a distribution fill factor to the terminations it determined were needed, without offering a correction. We will use the fill factor proposed by JA because it has been adequately supported and it allows an adequate number of terminations per line, while still allowing 33% spare capacity for maintenance, churn and growth.

7. Premise Termination Equipment

Premise termination equipment refers to the equipment that terminates a local loop at each customer location and includes the drop-wire from the distribution network to the "network interface device" (NID) on the customer premise. JA have proposed fill factors for business and residential customers' premise termination equipment of 57.5% and 54.2%, respectively. SBC-CA has proposed premise termination fill factors for business and residential customers of 45.6% and 17.5%, respectively. These fill factors are highly dependent on assumptions regarding the number of lines that will be terminated at each business and customer location.

In HM 5.3, JA assumed a 2-pair termination for each residence and a 6-pair termination for each business. (JA/Mercer 10/18/02, Exhibit RAM-5, p. 16.) In contrast, the SBC-CA's LoopCAT modeled a 6-pair termination for each residence as a single dwelling unit, and business premise termination equipment was modeled in a range of sizes depending on information on lines per business customer. (SBC-CA/Smallwood 3/12/03, p. 37.) To understand these fill percentages, we must take a look at the assumptions that underlie these fill factors.

For residential terminations, SBC-CA claims that JA's approach undersizes premise termination equipment by ignoring the network design standard of building more than 2 pairs to each customer location. (SBC-CA/Murphy 2/7/03, p. 52.) In contrast, JA charge that SBC-CA is inflating loop costs by installing equipment to serve 6 lines at each location, when only 2 or less are needed. (JA/Donovan-Pitkin-Turner, 2/7/03, para. 199.) Likewise, JA contend

SBC-CA's approach is flawed because it has not taken into account that many residential premises are in multiple dwelling units. (*Id.*, para. 226.)

For business terminations, SBC-CA used its billing system database for information on lines per customer to propose its premise termination fill factors. (SBC-CA/Smallwood 3/12/03, p. 36.) JA contend SBC-CA's method was flawed for business customers because it focused on lines per customer rather than lines per location, thus ignoring the fact that multiple business could be located at the same location. (JA/Donovan-Pitkin-Turner, 2/7/03, para. 230-32.)

ORA/TURN analyzed current information on SBC-CA's actual premise terminations and state that this data is not consistent with SBC-CA's assumptions in its modeling proposals. Thus, ORA/TURN conclude that SBC-CA's premise termination fill factors are not supported by actual SBC-CA drop and NID purchases and thus are not reflective of current SBC-CA practices or efficient forward-looking ones. (ORA/TURN/Roycroft 2/7/03, p. 31.)

Discussion. We are troubled by the assumptions made in both HM 5.3 and the SBC-CA models in this area. SBC-CA charges that HM 5.3 undersizes premise termination equipment by modeling only 2 pairs per residence, which leaves no room for spare if a residence orders a third line. JA charge that SBC-CA seriously inflates loop costs by installing more costly equipment to serve 6 lines at every residence when current data suggests less than 2 lines per residence are needed on a forward-looking basis. Both sides charge that neither model determines the appropriate NID size by basing it on the reality of multiple dwelling units.

We find that all of these criticisms are valid. JA have assumed the minimum NID required for each residence and underestimated costs in this area. Further, JA criticize the SBC-CA models for not taking into account the economies in premise termination equipment from sizing them for MDUs, but HM 5.3 does not do this either, other than to economize on drops per location. On the other hand, SBC-CA has assumed a high cost NID with too much excess capacity, which results in a low achieved fill for premise termination equipment, and it has ignored the economies to serve MDUs. For business terminations, SBC-CA has used current information to size NIDs to serve businesses, while HM 5.3 has simply assumed that all business can be served by a 6 pair NID. While JA are correct that SBC-CA has not accounted for multiple businesses at one location, HM 5.3 has not done this either.

While we would like to modify the models to account for MDUs and better assumptions regarding premise termination equipment, we lack a solid record for doing this. We think the correct answer in this area lies somewhere between the proposals made by both parties. Further, we are concerned that it is improper to change the fill rates alone without changing all of the underlying assumptions regarding lines per premise and the size of the NID equipment. Without a better record in this area regarding the interrelationship of MDU's, NID sizes, and lines per premise, we find it is better to leave each model alone in this area and not attempt to adjust the NID sizes assumed or the premise termination fills. Instead, we note that HM 5.3 has underestimated, and the SBC-CA models have overestimated, premise termination costs. In our view, the correct cost lies somewhere in between. Thus, when the Commission adopts UNE rates based on the midpoint of its two model runs, we will effectively achieve the same result.

8. Correlation of Fill Factors and Maintenance Costs

SBC-CA argues that it makes intuitive sense that when the network is run with less spare capacity, *i.e,*. at a higher fill level, there is a corresponding increase in repair and maintenance activity. (SBC-CA 3/12/03, p. 45.) According to SBC-CA, higher fill levels lead to complicated conditions that could delay service or create outages. (SBC-CA/Bash 10/18/03, p. 34, and Attachment CMB-13.) SBC-CA's witness Bash claims that the preferred range of fill factors is between 30% and 50%, and that above a 50% level, costs rise due to the need to rearrange plant for installation or repair purposes. (*Id.,* p. 35 and Attachment CMB-6.) The SBC-CA cost model assumes a linear relationship between maintenance cost factors and fill factors so that as a higher fill level is assumed, the maintenance and other expense factors will increase automatically. (SBC-CA/Makarewicz, 3/12/03, p. 27.)

JA criticize SBC-CA's assumption of a linear relationship between maintenance and other expenses and utilization levels. (JA/Donovan-Pitkin-Turner, 2/7/03, pp. 208-09, and 217.) SBC-CA assumes this linear relationship for all fill factors even though Bash's analysis only pertains to copper distribution. According to JA, SBC-CA provides no other analysis to justify linking higher utilization for all facilities to higher expense levels. (JA/Brand-Menko, 2/7/03, p. 106.) JA contend that Bash's analysis is flawed because a proper TELRIC analysis should consider the least *total* cost of a network element and not optimize one cost, such as maintenance expenses, without considering the full range of economic tradeoffs. (JA/Donovan-Pitkin-Turner, 2/7/03, p. 208.) Further, JA question Bash's underlying data and whether it truly supports her conclusions. (*Id.,* pp. 212-213.)

ORA/TURN criticize Bash's assumption that higher fills lead to higher operating expenses, noting that other factors beyond fill could be affecting operating costs. (ORA/TURN/Roycroft 2/7/03, p. 39.) ORA/TURN maintain that Bash's data relates only to distribution maintenance expenses although

SBC-CA tries to correlate all maintenance expenses to higher fill levels. (*Id.,* p. 40-1.) ORA/TURN's witness Roycroft criticizes Bash's analysis for focusing on expenses at such a granular level rather than at the wire center level. Roycroft's own correlation test using SBC-CA loop maintenance expenses for feeder and distribution showed a slight negative relationship between fill level and maintenance expense (*i.e.,* higher fill leads to lower expenses), although his results were not statistically significant. (*Id.,* p. 42.) In response, SBC-CA says that Roycroft's analysis is an "apples to oranges" comparison to Bash's work because he focused on trouble-related maintenance expenses while she focused on provisioning costs. (SBC-CA/Bash 3/12/03, p. 40.)

XO joins JA and ORA/TURN in criticizing SBC-CA's assumed link of higher fill levels to higher maintenance expenses. XO claims that the data submitted by SBC-CA do not show a linear relationship of costs and fill levels, and cost increases only appear when fill rises over 50% on average. (XO 2/7/03, p. 30.) Moreover, XO notes that SBC-CA's most recent Loop Deployment Guidelines, which urge loop engineers to maximize plant utilization, contradict Bash's concerns that higher fills raise maintenance expenses. (*Id.,* pp. 28-29.)

Discussion. First, we agree with JA that Bash has only analyzed the effect of fill levels on one aspect of loop costs, rather than total loop costs. An efficient carrier would not necessarily optimize only this one cost, without doing a comprehensive analysis of the effect of higher fill on all costs.

Second, JA and ORA/TURN raise concerns with the adequacy of Bash's analysis. We agree with ORA/TURN that there could be other factors driving operating expenses higher, and Bash's analysis does not prove a causal relationship between fill and operating expense. Further, Bash's own analysis shows the rise in costs is steeper when fill levels rise above a 50% level. If we use a fill level of 51.6% in our model runs, SBC-CA's analysis would not indicate vast increases in maintenance expenses at our chosen fill level. Therefore, we see no need to link fill factors to maintenance expenses because even if we relied on SBC-CA's analysis by Bash (which we are not inclined to do), it only applies at generally higher fill levels.

Third, ORA/TURN and JA are correct in pointing out that Bash's analysis is only applicable to copper cable fill, and not other fill rates. Bash only shows this correlation for distribution cable, and not for the other modeling areas where SBC-CA has extrapolated that higher fills lead to higher expenses. There is no basis to assume a link between higher fill for feeder, DLC or switching to higher maintenance costs in all of these areas.

Finally, it is unclear what is proven by Bash's table listing service order dates and fill levels. Bash contends her exhibit illustrates that service delays correspond to higher fill levels, and that 14 of 48 delayed orders corresponded to terminal, or SAI, fill levels of 92%. (SBC-CA/Bash 3/12/03, p. 38, describing Attachment CMB-13 of the Bash Declaration, 10/18/02.) We hesitate to rely on any conclusions from a sample of 48 loops in a network of 17 million. Moreover, since we are modeling terminal fill far below 92%, we are not convinced there is any cause for concern.

F. Structure Sharing

"Structure sharing" refers to the modeling assumption that poles and conduit modeled in a forward-looking network may be shared with other utilities. It also refers to the assumption that even within one company's network, feeder, distribution, and interoffice facilities may share the same poles and conduit. In the cost models, a lower structure sharing percentage indicates that more structure costs are shared with other utilities.

For its models, SBC-CA assumes that forward-looking structure sharing will match the levels that are reflected in the cost factors it has calculated as modeling inputs. In contrast, JA contend that state regulatory commissions and the general public may require more structure sharing among utilities in the future (i.e. lower modeling percentages), to reduce costs and prevent disruptions from excavation and other construction. Thus, JA contend that on a forward-looking basis, SBC-CA's engineers will implement more structure sharing. JA criticize SBC-CA's structure sharing assumptions as merely invoking its embedded network.

JA's witness Donovan explains that HM 5.3 varies the percentage of underground structure sharing depending on the density zone and whether the structure is for feeder or distribution facilities. Sharing percentages for feeder range from 50% in low-density areas to 33% in high-density zones (*i.e.,* more costs are shared with other utilities in higher density zones). Sharing percentages for distribution range from 100% in the lowest density zones to 33% in the highest density zones. (JA/Donovan 10/18/02, p. 17-19.) For aerial structure, sharing percentages range from 50% in low-density zones to 25% in the higher density zones. Donovan hypothesizes that as population densities increase, so do the opportunities for sharing of pole space. (*Id.*, p. 19.)

Donovan explains that HM 5.3 also reflects sharing of structure between feeder and distribution cable by assuming a default value of 55% for sharing of feeder and distribution facilities. Donovan claims this percentage is supported by cost models in other states, the FCC's Synthesis Model, and SBC-CA's own loop deployment guidelines. (*Id.*, pp. 19-21.) According to Donovan, it would be illogical for a carrier to place poles on the north side of a street to handle distribution cable, and the south side of a street to handle feeder cable. In his view, feeder cable can be economically routed onto distribution structure. (JA/Donovan, 3/12/03, pp. 96-97.) For interoffice facilities, HM 5.3 assumes that interoffice cable shares structure along existing feeder routes 75% of the time. (*Id.*, pp. 97-98.)

SBC-CA criticizes JA's structure sharing assumptions because they ignore SBC-CA's actual experience and rely on speculation by JA's witnesses. JA erroneously assume that all networks, including those of utility and cable providers, are rebuilt simultaneously, so that each provider would be ready and willing to share structure costs with the hypothetical new entrant in a TELRIC model. Specifically, JA assume that other service providers will finance up to 75% of pole costs, up to two-thirds of SBC-CA underground construction costs, and 75% of the cost to bury cable. (SBC-CA, 2/7/03, p. 58.) SBC-CA contends that the FCC has rejected JA's assumptions regarding structure sharing between utilities. (SBC-CA/Murphy 2/7/03, p. 46.)

Discussion. With regard to structure sharing between utilities, we will not adopt either the proposal of JA or the sharing percentages embedded in SBC-CA's cost factors. We do not find it reasonable to assume that on a forward-looking basis, a carrier building an efficient network would be able to achieve the structure sharing percentages with other utilities that are assumed by the Joint Applicants. Donovan provides little basis other than his own speculation for these sharing percentages. Neither do we find the sharing percentages proposed by SBC-CA to be reasonable, mainly because we cannot identify what these percentages actually are since they are embedded within SBC-CA's various cost factors for conduit, poles, and other structure. If we could have identified SBC-CA's current structure sharing practices, we might have considered using them in our modeling.

Given our dissatisfaction with the structure sharing modeling inputs of both SBC-CA and JA, we will instead use the structure sharing percentages adopted by the FCC in its Synthesis Model, as set forth in its Inputs Order. (Inputs Order, para. 243.) We will use these percentages as inputs in our HM 5.3 model run. When adopting these percentages, the FCC noted that SBC-CA concurred with these percentages and claimed they reflected its current practice. (*Id.*, para. 244.) As we have already noted in our discussion of SBC-CA's modeling flaws, we are unable to make structure sharing modifications in the SBC-CA models.

With regard to intra-network structure sharing, we find that JA's assumption of a 55% sharing percentage between feeder and distribution networks is realistic on a forward-looking basis, and within the range of percentages adopted in other states and by the FCC. It is reasonable to assume that an ILEC would make efforts to economize by sharing networks that it controls. We will adopt this assumption for our runs of HM 5.3.

G. Plant Mix Assumptions

"Plant mix" assumptions refer to the percentages of aerial, buried, and underground plant assumed in the loop network. SBC-CA assumes that a forward-looking plant mix matches its experience in its current network. In contrast, JA use ARMIS data to develop plant mix assumptions for HM 5.3.

JA criticize SBC-CA for relying on embedded rather than forward-looking plant mix data.

SBC-CA contends that HM 5.3 assumes a plant mix that could never be achieved in California because it assumes away the constraints faced by providers operating in the real world. (SBC-CA 2/7/03, pp. 60-61.) According to SBC-CA, JA rely on statewide ARMIS data, but allocate it across density zones based on the opinion of JA's witness Donovan. Further, JA rely on averages of data dating back eleven years rather than more recent data. This results in JA understating the amount of underground facilities that could reasonably be expected on a forward-looking basis given new local ordinances that mandate "out-of-sight" placement of new telecommunications outside plant construction. JA's assumptions are counter to recent trends toward greater use of underground facilities throughout California. (SBC-CA/Murphy 2/7/03, p. 50.) Further, the FCC has assumed higher percentages of underground structure in higher density zones than JA have assumed in HM 5.3. (*Id.*, p. 51.)

Discussion. We find it more reasonable and forward looking to use SBC-CA's plant mix assumptions in our model runs rather than the assumptions developed by JA, primarily because JA arrive at their plant mix assumptions based on information dating back eleven years rather than recent trends.

H. Labor Cost Assumptions

A critical input in TELRIC modeling exercises involves the forward-looking cost of labor to install, operate and maintain the network. Labor costs are manifested in the TELRIC models through not only hourly wage rates, but also assumptions regarding crew size and the time it takes to perform a given task. We now address the key criticisms of the labor cost assumptions in both the HM 5.3 and SBC-CA models.

1. HM 5.3

CWA and SBC-CA criticize labor costs in HM 5.3 as substantially understated. According to CWA, HM 5.3 does not use actual labor cost data provided by SBC-CA, but instead develops its own labor cost inputs without empirical data and based solely on the opinion of a group of industry experts. The opinion of the experts is not supported by adequate documentation. (CWA

2/7/03, p. 6.) CWA states that HM 5.3 is therefore inaccurate with regard to inputs for 1) the number of persons required to operate and maintain certain network elements, 2) the number of hours it takes each person to complete those tasks, and 3) the hourly labor rates paid by SBC-CA to each person who performs these tasks. (*Id.*, p. 5) For example, CWA contends that JA have used a flat hourly labor rate that differs substantially from the rate actually paid by SBC-CA in California. (*Id.*, p.8.) In addition, JA have assumed a two person crew for the installation of buried or underground copper cable, when three persons are actually required to ensure worker safety and promote maximum efficiency. (*Id.,* p. 9.)

SBC-CA criticizes HM 5.3 for its labor productivity assumptions that fail to use California-specific labor factors. (SBC-CA, 2/7/03, p. 62.) For example, SBC-CA contends that HM 5.3 includes unreasonably low assumptions for the installation of an RT cabinet, assuming two technicians can perform the work that normally requires a three-person crew, and unrealistic productivity rates for placing and splicing loop cable. SBC-CA's witness McNeill states that HM 5.3's productivity assumptions could only be achieved in rare circumstances, and not on a consistent basis. (SBC-CA/McNeill 2/7/03, pp. 46-47.) For example, McNeill alleges that HM 5.3 does not include adequate set-up and break down time, does not account for other operating realities and constraints, and fails to incorporate additional labor beyond the outside plant engineer. (*Id.,* pp. 48-49.)

Joint Applicants respond that the labor cost estimates in HM 5.3 are conservatively high. JA witness Donovan defends the assumptions he uses in HM 5.3 regarding the size of labor crews and notes that SBC-CA cannot point to any specific reasoning or government safety mandates for larger crew sizes. (JA/Donovan 3/12/03, pp. 24-26.) Donovan contends that SBC-CA's own witness validates the HM 5.3 assumptions regarding cable placement per day. (*Id.*, pp. 27-28.) Further, Donovan defends his assumptions regarding splicing times as more detailed than SBC-CA's assumptions. (*Id.*, p. 31.)

2. SBC-CA Models

JA criticize SBC-CA for using a labor rate that includes numerous "loadings" that JA allege do not comply with forward-looking cost principles, but instead rely on embedded costs. (JA/Flappan, 2/7/03, p. 4.) These loadings increase the average hourly wage to account for non-productive time, benefits, support assets (such as computers, furniture, and tools consumed in the course of providing labor services), clerical support, and supervisory support. (*Id.*, p. 8.) If SBC-CA's model is used, JA's witness Flappan recommends numerous adjustments to these labor "loadings," including adjustments based on labor information from the U.S. Dept. of Labor Bureau of Labor Statistics (BLS) and adjustments to remove assumed wage increases. (*Id.*, pp. 10-11.) Flappan states that when SBC-CA actual hourly wages are normalized by removing excessive loadings added by SBC-CA, the resulting hourly wage is below the inputs used in the HM5.3 model. Thus, he reasons that HM 5.3 labor costs are conservatively high. (JA/Flappan 3/12/03, p. 3.)

SBC-CA and CWA dispute JA's proposed adjustments to SBC-CA's labor cost loadings. First, SBC-CA and CWA contend that the BLS statistics used by JA are not derived from companies comparable to SBC-CA. (SBC-CA/Makarewicz, 3/12/03, pp. 35-36, CWA 3/12/03, p. 5.) Second, SBC-CA contends it is inconsistent to argue for a lower labor rate while modeling a hypothetically efficient, supra-modern network. (SBC-CA/Makarewicz, 3/12/03, p. 39.) According to CWA, JA unreasonably assume cutting edge technologies in the modeled network, while assuming that SBC-CA can "employ garden variety electricians to operate and maintain its networks and pay them accordingly." (CWA 3/12/03, p. 11.) Third, SBC-CA and CWA contend SBC-CA faces increasing wage, healthcare and pension-related costs, so it is unrealistic to reduce estimates in these areas. (SBC-CA/Makarewicz, 3/12/03, p. 41.)

Similarly, CWA supports the use of SBC-CA labor data because it is derived from the company's collective bargaining agreement with CWA and thus represents the most accurate data available on labor costs. (CWA, 3/12/03, p. 2.) In contrast, CWA contends that the labor-loading adjustments advocated by JA ignore SBC-CA's actual labor cost data and AT&T's own collective bargaining agreements, which commit to specific wage and benefit levels, and increases. (*Id.*, p. 7.)

3. Discussion.

With regard to the labor assumptions in HM 5.3, we agree with SBC-CA that many of the assumptions are based purely on the opinion of JA's witness Donovan. SBC-CA attacks HM 5.3 inputs for wage rates, crew sizes, and assumptions on the length of time to perform certain tasks. We find that it is more reasonable to use SBC-CA's actual hourly wage rate rather than Donovan's opinion, wherever possible. In certain circumstances, we agree with SBC-CA that the crew sizes in HM 5.3 may be understated. We prefer to adopt SBC-CA's more conservative assumptions regarding the crew size for certain installation activities, except for DLC installation that we treat separately.

On the other hand, we do not agree with SBC-CA's criticisms of Donovan's estimates for the amount of time for certain installation activities, particularly cable installation per day and splicing times, as SBC-CA offers no clear information on the amount of time for these installation activities. We find that Donovan has credibly defended his estimates for cable installation per day. (JA/Donovan 3/12/03, pp. 27-28.) Donovan also provides adequate support for his splicing assumptions by showing that they result in higher cost estimates that SBC-CA's own internal costing tool. (*Id.*, p. 32.)

As a result, we find it necessary to run HM 5.3 with a different hourly wage assumption and with larger crew sizes for some activities. As we have already discussed, HM 5.3 did not allow us the ability to make these modifications in all areas. We have made the modifications where possible, and otherwise, we note that it was not possible to adequately modify the labor cost assumptions built in to HM 5.3 in all circumstances.

With regard to the SBC-CA models, we do not agree with the labor loading adjustments suggested by Flappan because they are based on nationwide, historic information for companies that we are not convinced are reasonably similar to SBC-CA. Therefore, we will not make any adjustments to SBC-CA's labor loadings or other labor input assumptions.

I. Crossover Point

SBC-CA models a crossover point from fiber to copper at 12,000 feet. In other words, the maximum length for a copper loop in SBC-CA's LoopCAT is 12,000 feet. LoopCAT assumes that loops longer than 12,000 feet convert, or "crossover," to fiber after 12,000 feet. According to SBC-CA, loops in excess of 12,000 feet are not consistently capable of supporting many services such as DSL, and longer loops introduce inefficiencies into SBC-CA's provisioning processes. (SBC-CA/McNeil, 2/7/03, p. 9.) McNeil further claims that an 18,000-foot loop, as modeled in HM 5.3, cannot provision all the UNEs at issue in this proceeding and would present compatibility problems by not adhering to industry equipment standards. (*Id.*, p. 9.)

JA's HM 5.3 model employs the concept of an economic crossover point. The model varies the transition from copper to fiber depending on its selection of the economic point for that distribution area. The maximum copper loop length modeled in HM 5.3 is 18,000 feet. (JA 3/12/03, p. 34.)

JA criticize SBC-CA's use of a 12,000 foot maximum copper loop length because they contend SBC-CA is modeling a more expensive "special services" loop that has higher technical standards than are required for the loop that has been designated as the UNE in this proceeding, thereby increasing loop prices. JA contend that an 18,000 foot maximum copper loop is capable of supporting both POTS voice service and advanced services. Donovan asserts that the FCC concluded that loops as long as 18,000 feet can support those advanced services that are "*eligible for universal service support.*" (JA/Donovan 3/12/03, p. 36.) He also maintains that other technical problems of 18,000-foot loops alleged by SBC-CA are not applicable for the UNEs at issue in this proceeding. (*Id.*, p. 37.)

Discussion. In the prior OANAD proceeding, the Commission adopted 12,000 feet as the economic crossover point. (D.96-08-021, *mimeo.,* at 61.) FCC rules require that TELRIC "is the forward-looking cost over the long run of the total quantity of the facilities and functions that are directly attributable to, or reasonably identifiable as incremental to, such element, *calculated taking as a given* *the incumbent LEC's provision of other elements.*" (47 C.F.R. Section 51.505(b).) (Emphasis added.)

SBC-CA presents several arguments why designing a network with loops up to 18,000 feet in length might present problems for some services. JA maintain that the services SBC-CA is concerned with are not the subject of this proceeding. Nevertheless, we must design a network, under TELRIC, that assumes the provision of other ILEC services. While the FCC has modeled loops up to 18,000 feet in its Universal Service cost modeling, this was under the assumption that a loop of this length could provide "*all services eligible for universal service support.*" It is not clear that all of the services SBC-CA currently provides are eligible for universal service support. There may be some services SBC-CA provides today, which do not fit the universal service criteria, and that we need to model in the TELRIC context.

Therefore, because the Commission has previously found that an economic crossover from fiber to copper occurs at 12,000 feet, and because we want to make sure that we model a network that can provide all the services SBC-CA currently provides, we will not model copper loops longer than 12,000 feet. We will modify HM 5.3 to assume a 12,000-foot crossover point. SBC-CA's LoopCAT already contains this assumption. However, JA have pointed out that despite this crossover limitation, SBC-CA's LoopCAT model generates approximately 100,000 loops that are longer than 18,000 feet. (JA 2/7/03, pp. 74-75.) We have no ability to modify this outcome. We have noted this as a flaw of SBC-CA's model and as one of the reasons we cannot rely solely on either model for setting UNE rates.

J. Switching Inputs

1. Switch Vendors

One of the key differences between HM 5.3 and SBC-CA's switching module, SICAT, is the input assumption regarding the vendors that will provide switches in a forward-looking environment. SBC-CA bases its price per line for switching investments on its contracts with two switch vendors, Lucent and Nortel. In contrast, HM 5.3 assumes that the price per line is based on current prices offered by Siemens, a switch vendor that SBC-CA does not currently use in California, although SBC-CA does purchase switches from Siemens in other states. (Hearing Tr., 4/16/03, p. 680.) JA contend that the Siemens switch prices are the best indication of forward-looking switch prices.

SBC-CA contends that HM 5.3 inappropriately assumes that Siemens switches will be deployed on a going-forward basis, despite the fact that SBC-CA does not deploy a single Siemens switch in its California network today. (SBC-CA 8/1/03, p. 18.) According to SBC-CA, Siemens switches will not interface or operate properly with existing SBC-CA systems because, unlike the Lucent and Nortel switches, they do not have an OC-3 optical interface that allows digital switches to interface with the interoffice network and they do not handle tandem switch functions. (SBC-CA 2/7/03, p. 67.) Thus, because a Siemens switch with SONET-based optical interface capabilities is not currently available in North America, the Siemens switch prices cannot be relied on for TELRIC modeling. (SBC-CA 8/1/03, p. 14.) Furthermore, SBC-CA alleges that deploying Siemens switches will impose other costs on the company, such as training and network modification, which are not accounted for in HM 5.3. (*Id.*, p. 15.)

In response, JA explain that they use the Siemens switch price as a surrogate for forward looking switch prices. In other words, they believe that forward-looking switch prices for all vendors will move towards the Siemens price. (JA 8/1/03, p. 18.) JA admit the Siemens switch modeled in HM 5.3 does not include a SONET optical interface, but is only equipped with an electrical interface. (*Id.*, p. 17.) Nevertheless, JA contend that the Siemens switch price provides the best forward-looking estimate of switch prices based on their speculation that even if the switch did contain an optical interface, it would not cost any more than, and might even cost less than, the Siemens switch used as a proxy in HM 5.3. (*Id.,* p. 18.) Moreover, JA contend that HM 5.3 incorporates all necessary multiplexing costs to connect to optical switches. (*Id.*) Finally, JA maintain that SBC-CA's arguments regarding extra costs to deploy Siemens switches in its embedded network are inappropriate to consider in a TELRIC study. (JA, 3/12/03, p. 19.)

Discussion. We conclude that we should rely on Lucent and Nortel switch prices to determine unbundled switch costs in our model runs. The problem with JA's argument to use the Siemens contract price as a surrogate for the forward-looking switch cost is that it ignores the fact that the Siemens switch available in North America does not have the optical interfaces necessary to operate in the SBC-CA network. JA conjecture that the newest Siemens switches will come with the optical interface at the same price, but they admit that the switch on which they base forward-looking investment costs does not have the same equipment as the switches that exist in SBC-CA's network today.

Because we cannot rely on JA's argument that the Siemens switch provides all the same functionalities and capabilities as the switches currently deployed in SBC-CA's network, we will only use Lucent and Nortel switch vendor contracts in the switching portion of the model. We do not accept JA's claim that the Siemens switch price should serve as a proxy for a forward-looking prices when we cannot be assured that the Siemens switch is fully compatible with our other forward-looking network assumptions. Additionally, it is not reasonable to expect that a carrier would purchase all of its switching requirements from solely one vendor.

2. Percentage of New, Growth and Replacement Lines

In order to model switching costs in either SBC-CA's SICAT module or HM 5.3, we must determine the appropriate mix of lines purchased over the modeling period. SBC-CA's switching contracts reflect a negotiated price per line based upon the composite forecast demand for each type of line or system that SBC-CA expects to install over the term of each contract. There are three basic types of lines provided under switching contracts – "new" lines, "growth" lines, and "replacement" lines. A new line refers to switching components for a line that is completely new to the site of installation, whereas a growth line refers to a line added to existing facilities. A replacement line refers to switching components that replace an existing switching system (either analog or digital). (*See* SBC-CA/'s Bishop Decl., 2/7/03, p. 5.) Both SICAT and HM 5.3 make input assumptions about the percentage of lines that are new, growth or replacement in order to model switching investment costs.

SBC-CA criticizes JA for assuming in HM 5.3 that 92.6% of lines in the forward-looking network will be purchased at today's new line price, which incorporates a substantial discount over the price for growth lines. According to SBC-CA, it is inconceivable that a switch vendor would provide an entire network of switches at the new switch discount with no further purchases for switch growth or upgrades. (SBC-CA/'s Lundy Decl., 3/12/03, pp. 7-10.)

Instead, a real-world carrier increases capacity and incorporates new technology by adding new, growth and upgrade equipment over time and its network should reflect a mix of such technologies. (*Id.*, p. 19, SBC-CA/Mandella 3/12/03, pp. 2-3.) Furthermore, SBC-CA contends that this Commission's prior OANAD decisions, the FCC, and other states have rejected HM 5.3's unrealistic approach of basing switching costs on too high a percentage of new lines. (SBC-CA/Lundy 3/12/03, pp. 15-16, SBC-CA/Mandella 3/12/03, p. 3.) The Commission has already rejected a similar assumption that Pacific could purchase 90% of its digital lines at the new or replacement price, finding this assumption unrealistic. (SBC-CA/Lundy 3/12/03, p. 17, citing D.98-12-016, pp. 103-04.)

JA defend their input line assumptions as TELRIC-compliant based on the assumption that given current growth projections, a carrier would purchase the vast majority of the lines it needs from switch vendors at the new price. (JA 3/12/03, p. 22.) In turn, JA criticize SBC-CA's SICAT model for including costs to upgrade older generation digital switches and not reflecting a forward-looking mix of digital lines. Specifically, JA criticize SBC-CA for including costs related to switch upgrades and "Other Replacement" lines for miscellaneous purchases under its current contracts. (JA/Ankum 2/7/03, p. 34-35, pp. 50-51.) JA claims these costs are not appropriate for a TELRIC analysis because they relate to growing or upgrading the embedded network, rather than accurately estimating the costs that would be incurred in a forward-looking network.

Discussion. We agree with SBC-CA that JA have assumed too high a percentage of lines can be purchased at the new switch discount. In our own prior OANAD proceeding, we rejected a similar assumption. We find it unrealistic to assume that vendors would sell over 90% of the lines needed for a forward-looking network at the same price that they have negotiated with SBC-CA, which assumes that fewer lines will be purchased at the new line price. Similarly, JA have assumed too low a percentage of lines purchased at the growth, or upgrade price. We find it more reasonable to include a higher percentage of growth line purchases to reflect that in a forward-looking environment, a carrier would not be able to buy all of its switches at the new line discount price currently applicable to SBC, and would have to upgrade its switches and incur growth line costs.

At the same time, it is not reasonable to rely on SBC-CA's actual percentages of lines purchased during the 5 year study period because this reflects a higher percentage of growth line purchases than a carrier would make if it were building a network to compete with SBC-CA. In the prior OANAD, we used an assumption that 40% of lines were purchased at the new line price, and 60% at the growth line price. (D.98-02-106, *mimeo.*, at 104.) We see no reason to deviate from those assumptions here.

A related issue involves JA's criticism that SBC-CA has inappropriately included "other replacement costs" and switch upgrade costs in its switching investment calculations. We find that SBC-CA has not provided adequate justification for its "other replacement costs" and we will remove them when we modify SBC-CA's model to assume a 40%/60% split of new and growth lines. On the other hand, we will not remove the upgrade costs that are included in SBC-CA's SICAT. We find that SBC-CA has provided sufficient justification that over the life of its switches, there will be some costs to upgrade a switch. We do not agree with the JA assertion that the current generation of switches will not require upgrades.

3. Vertical Features Costs

Another aspect of the unbundled switch UNE involves costs for vertical features such as caller ID and call waiting. JA propose that any costs for switching features be included in the port price for the switch whereas SBC-CA proposes that vertical switching features should be priced individually.

a. JA Position.

JA claim that it is not possible to identify feature hardware or software costs that are specific to the activation of individual features in SBC-CA's switching contracts. (JA 8/1/03, p. 71.) In other words, hardware and software for features are not purchased on a per feature basis. Rather, as discussed further below, feature hardware comes with all new lines and feature software is purchased for a suite of features in bulk through a "buyout fee." (JA/Ankum 2/7/03, p. 140.)

Regarding feature hardware, JA claim that these costs are captured in the overall switch price per line because vendors provide feature hardware for new lines in the standard per-line price for the switch. SBC-CA's witnesses confirm that switch prices for new lines cover feature hardware, but line prices for growth do not include hardware. (SBC-CA/Lundy 3/12/03, p. 50, SBC-CA/Bishop 2/7/03, p. 10.) For growth lines, JA calculated what it describes as a de minimis one cent per month per line cost for the necessary feature hardware. (JA/Pitts 3/12/03, p. 19.) JA later revised this estimate downward to a half cent per line per month based on their assertion that at least one vendor provides hardware for growth lines in the growth line price. (Hearing Tr., 4/17/03, p. 824.)[69]

Regarding feature software, JA include these costs in the expense portion of their model because software costs are based on "buyout" fees that allow SBC-CA the right to use feature software on either an "uncapped" basis for unlimited lines, or "capped" to a certain amount of lines. According to JA, language in at least one switching contract states that "it is expected that the caps will not be exceeded." (JA 8/1/03, p. 77 n. 212; Hearing Tr., 4/17/03, p. 861.) Moreover, SBC-CA's own SICAT model does not attempt to calculate costs if the caps are exceeded. Although SBC-CA did identify specific feature related software charges in its contracts, JA claim these references are irrelevant because they are expired, not applicable to SBC-CA's California operations, or refer to the generic software for the overall switch operation. (JA 8/1/03, pp. 77-78.)

JA assert that SBC-CA's proposed feature costs are anticompetitive and violate cost causation by imposing costs on a per feature basis on competitors when SBC-CA does not incur costs to activate features on individual lines. (JA/Ankum 2/7/03, p. 144.) JA note that although SBC-CA has proposed individual feature costs in California, SBC-CA used the same switching contracts to propose including feature costs in the monthly recurring costs for the port in other SBC-CA states such as Texas, Indiana and Wisconsin. (JA 8/1/03, p. 72.)

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[69] JA generally note that costs to upgrade SBC-CA's embedded base of older switches, and provide features on older switches, are not relevant to a TELRIC analysis. (JA 8/1/03, p. 73.)

b. SBC-CA Position

In contrast, SBC-CA claims that it does incur additional costs for specific feature hardware and software installed in its switches and that UNE rates must allow SBC-CA the opportunity to recover these costs. SBC-CA states that its contracts contain separately identifiable costs for the feature hardware and software that are required to offer vertical features to customers. (SBC-CA 8/22/03, p. 49.) SBC-CA develops costs for feature software, feature specific hardware, and queries for caller ID. The monthly cost for these items is based on software investment and cost factors for sales taxes and capital and operating expenses. (SBC-CA/Currie, 10/18/02, p. 22.)

Although SBC-CA admits that some feature hardware costs are included in per-line prices when new lines are purchased, it asserts that costs for hardware for growth lines and the costs for sufficient memory and switch processor capability must also be incorporated in the cost models. (SBC-CA 8/22/03, p. 51.) SBC-CA contends that memory and processor costs are analogous to upgrading a desktop computer from a 386 processor to a Pentium processor as more software is added to the computer. (SBC-CA 8/1/03, p. 34.) With respect to feature software, SBC-CA says its contracts are replete with individual feature prices based on per-line prices, per-switch prices, or buyout arrangements.

c. Discussion.

Although both SBC-CA and JA agree that SBC-CA incurs costs for feature hardware and software, they do not agree on whether features should be priced individually or whether the costs should be incorporated in the monthly port price. The dispute centers around whether demand by a customer for a specific feature on a discrete line causes SBC-CA to incur the hardware and software costs it has identified. JA state, “If SBC-CA incurs feature costs whether or not a customer requests features, these costs are more properly assigned to the switch port because they are not caused by a request for features, rather, they are caused by the provision of switching in general." (JA 8/22/03, p. 67.)

We agree that costs for feature hardware and software that are incurred up front as switches are purchased through per line, per switch, or buyout charges, are more appropriately included in the monthly port price rather than per feature charges. We also find several problems and inconsistencies in SBC-CA's feature cost study that cast doubt on its ability to accurately determine feature costs on a per line basis. Therefore, we will incorporate switch feature hardware and software costs into the monthly port price for our model runs of both SBC-CA's SICAT and HM 5.3.

We find this is appropriate for several reasons. First, there is no dispute that that feature hardware is included as part of the per-line cost for new switches. Further, SBC-CA acknowledges that "the discrete feature hardware, that would be identified in the [switch] contract, are indeed, … very limited components …." (Hearing Tr., 4/17/03, p. 849.) Given these two facts, we find it more reasonable to take the limited feature hardware costs that can be separately identified, above and beyond those already incorporated into the flat per line switching price, and roll them into port rates.

Second, JA's witness Ankum contends that SBC-CA's feature cost study double counts feature hardware costs by calculating feature rates based on costs that are included in the flat per line price for new switches. (JA/Ankum 2/7/03, pp. 144-145.) Given the general agreement that the majority of feature hardware is included in the flat per line price and the lack of response by SBC-CA to Ankum's charge, we find Ankum's position plausible. To avoid potential double-counting, we will roll the identified feature hardware costs into port rates.

Third, SBC-CA suggests that flat per line switching prices do not include the memory and processor costs attributable to features. SBC-CA contends the new line price includes only a limited amount of feature hardware, but additional equipment to meet future demands must be ordered separately. As feature use grows, memory and processor capacity must grow too and there is a cost for these upgrades as specified in the contract. (SBC-CA 8/22/03, p. 51.) Despite this qualification, SBC-CA's own feature cost study does not incorporate memory and processor costs, and it is not clear how we would do this on a per feature basis. JA make a credible argument, using SBC-CA's own data showing average processor utilization well below 100%, that memory and processor utilization are sufficient as engineered for new lines and there is little risk that more is needed. (JA 8/22/03, pp. 63-64, 68.) Furthermore, we have already included switch upgrade costs in our per line switching investment calculations that we described in our discussion of input assumptions for new and growth lines. If we included upgrade costs for features as well, this could potentially lead to double counting.

Fourth, SBC-CA contends that any modeling must account for software costs related to feature use that may exceed the caps in the switching contracts. According to SBC-CA, it does not purchase all features under buyout arrangements and JA ignore specific contract provisions discussed at hearings identifying a number of feature hardware and software charges. (SBC-CA 8/22/03, p. 49.) Despite this assertion, SBC-CA does not incorporate costs exceeding the software caps in its own feature cost study and the switching contracts indicate that software caps will most likely not be exceeded.

Furthermore, SBC-CA's feature study does not account for uncapped feature software, *i.e.,* SBC-CA's ability to activate features on future lines at no extra cost. (JA/Ankum 2/7/03, p. 144.) We find that because feature software costs appear to most often be incurred through buyout arrangement, *i.e.*, SBC-CA buys software in bulk and incurs the software cost whether or not a feature is ordered, and SBC-CA's own feature study does not take this into account in calculating per feature rates, it is more reasonable to roll feature costs into the monthly port price.

Finally, SBC-CA points to specific contract terms as indicative of feature hardware and software costs. (SBC-CA 8/1/03, pp. 35-36.) JA allege that SBC-CA inappropriately includes activities to maintain and upgrade old switches in a TELRIC analysis and that many of the contract references provided by SBC-CA are out of state, zero cost, or refer to contract provisions for far more functionality than simply end-user features and it is not appropriate to assign all of these costs to features. (JA, 8/1/03, p. 76; JA 8/22/03, pp. 69-72.) We do not find SBC-CA's list of contract terms persuasive given the doubts raised by JA. We prefer to take identified feature hardware and software costs, and incorporate them into the port price rather than rely on SBC-CA's feature cost study.

4. Rate Structure

Yet another issue surrounding switch pricing is whether the Commission should adopt a new, simplified rate structure for unbundled switching that abandons the set-up and minute of use rate elements that were adopted in the prior OANAD cases in favor of a monthly flat price per line. In other words, all switching costs would be incorporated into the switch port price. JA contend that a flat price per port is a more accurate representation of the way that

SBC-CA incurs forward-looking switching costs than SBC-CA's current UNE rate structure of usage-sensitive rates. (JA/Pitts, 10/18/02, p. 11.) SBC-CA maintains that rates should remain usage-based because switches are inherently usage sensitive.

a. JA Position

According to JA, TELRIC principles require that rate structures reflect the manner in which costs are incurred. (JA 8/1/03, p. 63.)[70] JA contend that a flat per port price is more proper than a usage-based rate for several reasons. First, JA claim that SBC-CA does not incur any measurable usage-sensitive costs in its current switch vendor contracts, which are used to estimate forward-looking switching costs. JA acknowledge that SBC-CA incurs costs as the number of lines served increases, and growth in the number of lines is accounted for in the HM 5.3 model. However, growth in the number of lines can be distinguished from growth in usage per line, which is often measured in "centi call seconds," or CCS.[71] JA maintain that increases in usage on a per line basis, or CCS, does not impact SBC-CA's costs. Indeed, "SBC-CA has deliberately negotiated its contracts so that it does not have to worry about usage variations among its switches." (JA 8/1/03, p. 64, citing SBC-CA's witness Bishop at Hearing Tr. 4/16/03, p. 716-718.) The contracts indicate the same price per line up to a proprietary "breakpoint" CCS level that has been negotiated with the switch vendors. (Hearing Tr., 4/16/03, pp. 716-718.) When new or replacement lines

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[70] JA cite to the FCC's First Report and Order, para. 743, that states, "We conclude, as a general rule, that incumbent LECs' rates for interconnection and unbundled elements must recover costs in a manner that reflects the way they are incurred."

[71] Switch utilization is typically measured in CCS, where 100 seconds of conversation equals 1 CCS. (Mandella 10/18/02, p. 10.)

are placed, SBC-CA and the switch vendor jointly engineer the switch for each central office based on a 10-year forecast of CCS requirements so that it is unlikely SBC-CA will encounter additional costs for increases in per line usage for at least 10 years. (JA 8/1/03, p. 64-5; citing to Hearing Tr., 4/16/03, pp. 692-695.)

SBC-CA's witness agrees that vendors do not expand the switch processor every time SBC-CA orders additional lines. (JA 8/1/03, p. 65; Hearing Tr., 4/17/03, p. 869.) SBC-CA negotiated to pay the same amount per line for any switch, regardless of actual usage levels, unless usage exceeds a "breakpoint" CCS level, thus the pricing is not usage based. Therefore, JA contend that SBC-CA cannot justify charging CLCs usage-related switching costs, *i.e.*, charges that vary based on the minutes of use per line, "because any conceivable usage-related costs that SBC-CA might incur under those contracts are too trivial to justify a separate charge." (JA 8/1/03, p. 63.)

JA witness Ankum analogizes that SBC-CA's switch purchases are like a bridge that is engineered with 4 lanes for peak hour capacity. (Hearing Tr., 4/17/03, pp. 791-2.) There is a fixed cost to building a bridge to serve the peak hour usage. But there is no incremental cost for one car to cross the bridge in the middle of the night. Similarly, the switch is engineered for the peak hour usage based on a 10 year forecast. SBC-CA pays one price to the switch vendor, whether the switch is engineered for a high usage or low usage level, up to the pricing breakpoint in the contract. Ankum points out that switches engineered for areas with higher usage per line cost the same as switches in areas with lower usage per line. Likewise, switch vendors charge the same price per line whether the line is used for a residential or business customer.

According to JA:

> [T]he critical fact is the switching costs incurred by [SBC-CA] under its switching contracts are not usage sensitive. (JA 8/1/03, p. 71.)
>
> …
>
> A switch for a downtown high-density urban area will cost [SBC-CA] the same for a given number of lines as a switch in a rural community. That is, [SBC-CA] incurs the same costs per line for a high volume customer in a high volume, high usage urban area as it does for a low volume customer in a rural community." (JA/Ankum 2/7/03, p. 122.)

Ankum explains that although SBC-CA's SICAT model makes it look like SBC-CA purchases each switch component separately, in fact SBC-CA purchases switching facilities on a per line basis. (*Id.*, p. 102.) All of the switching costs that SBC-CA's model identifies as usage sensitive are, in fact, included in the fixed per line price. (*Id.*)

Second, JA maintain that SBC-CA's own "Infrastructure Deployment Guidelines" specify minimum capacity requirements for switches that are far in excess of SBC-CA's current usage levels. (JA 8/22/03, p. 62 citing PHE-11, p. 104 and PHE-12, p. 95.) Using Ankum's bridge analogy, each switch, or bridge, is designed to handle a minimum level of peak hour traffic, even if actual traffic is less. JA claim that according to SBC-CA data, the average level of switch processor utilization in California, including all calling and feature demand, is far below the threshold CCS pricing breakpoint specified in the vendor contracts and below the minimum capacity requirements listed in SBC-CA's infrastructure guidelines. (JA 8/1/03, p. 67, citing JA/Pitts Declaration, 3/12/03, Exh. CEP-REB-10.) JA allege this same data shows that average CCS in California is holding steady or declining slightly, so there is no danger of exceeding switching capacity if switches are provisioned at the minimum capacity specified in SBC-CA's deployment guidelines. (JA 8/22/03, p. 64, and Hearing Tr., 4/17/03, p. 795.)

According to JA, per line switch usage may decline as a result of high-speed connections such as DSL and cable modems that take internet traffic off the circuit switches. (JA 8/1/03, p. 67.) Although SBC-CA's Mandella argues that internet traffic has increased network usage,[72] JA rebut this with several arguments. First, when customers use second lines for dial-up access, the increase in usage is associated with line growth rather than more usage per line. Further, Ankum says most of the growth in dial-up access has already occurred and CCS levels per line are actually decreasing due to such developments as increased DSL lines and cable modems that take Internet traffic off the circuit switches. Any CCS per line increase due to dial-up internet traffic has already occurred and should be reflected in the data JA collected from SBC-CA on statewide average CCS per line. SBC-CA admits there is no longer an upward trend in CCS per line. (JA/Ankum 2/7/03, pp. 117-119, citing SBC-CA/Mandella deposition of 11/20/02.) SBC-CA does not dispute the current average statewide CCS levels other than to say that they may be depressed because of the economy and that individual switch CCS levels may be higher. (Hearing Tr., 4/16/03, p. 722.) SBC-CA also does not dispute that switches are installed based on 10-year forecasts of CCS levels, and SBC-CA's own data indicates that average processor utilization is far below maximum levels. (JA 8/22/03, p. 64.)

Third, JA assert that SBC-CA's testimony regarding usage considerations in engineering and maintaining older switches is not relevant to forward-looking costs. While SBC-CA's witness Mandella discusses engineering considerations

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72 SBC-CA/Mandella, 2/7/03, p. 11.

regarding switch usage, he does not show that switching *costs* are usage sensitive. Even if switch components are sized to handle specific amounts of traffic, this does not prove that SBC-CA's switch costs are usage sensitive if all of the components described by Mandella are purchased as part of the per line price (JA/Ankum 2/7/03, pp. 111-13). SBC-CA's witness Lundy confirms that contracts have a per line pricing structure under which the vendors supply all necessary switch components. (JA 8/1/03, p. 69.) According to JA, Mandella's reference to load balancing and managing line concentration ratios refer to maintenance expenses on older, outdated switches which would not be required under a TELRIC model that assumes investment in new, forward-looking switches provisioned based on a 10 year usage forecast. (*Id.*, p. 70.) JA contend these normal maintenance activities are incorporated into any modeling as switch maintenance expenses. (Hearing Tr., 4/17/03, p. 791.)

Finally, JA contend that SBC-CA's proposed usage rate structure discriminates against competitors by forcing them to pay incremental costs per minute of use that SBC-CA itself does not incur. This "impairs CLCs' ability to offer flat-rated services at prices that are competitive with SBC-CA's flat rated residential services. (JA 8/1/03, p. 63.) JA note that usage-sensitive rates have been rejected in other SBC-CA states, namely Illinois, Wisconsin, and Indiana. (*Id.*, p. 64, and JA/Ankum 3/12/03, paras. 6-21.)

b. SBC-CA Position

SBC-CA supports its proposal for usage based switching rates with the testimony of witness Mandella, who describes how switches are engineered based on the estimated usage of the switch, typically measured in CCS. "The switch usage design is engineered to meet the expected call volumes for the busiest hour of the busiest period of the year and is based upon both historical trends and forecasted call volumes for the particular switch being examined." (SBC-CA/Mandella 10/18/02, p. 11.) More usage per line means SBC-CA has to increase the usage portions of the switching equipment. (*Id.*, p. 11.) This can be done by modifying the line concentration ratio,[73] adding more trunks, increasing the links, or "umbilicals," between the host and remote switch, or increasing the memory of the switch processor. (*Id.*, pp. 14-17.)

SBC-CA maintains that evidence shows that switch vendors do not install excess capacity for free. Engineers for the switch vendors and SBC-CA evaluate traffic and demand information, and forecast data, to engineer the appropriate amount of capacity unique to each central office switch, based on CCS requirements. Vendors do not install the maximum amount of CCS capacity in every central office, even if contract prices reflect one price for all capacity up to a specific CCS capacity level. (SBC-CA 8/1/03, p. 24, and SBC-CA 8/22/03, p. 47, n. 155.) SBC-CA cannot install the maximum capacity in every switch, and it must pay for installation of additional capacity in its switches. (SBC-CA 8/1/03, p. 30, and Hearing Tr., 4/16/03, p. 714.) Thus, SBC-CA reasons that usage plays a major role in determining its switch costs.

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[73] The line concentration ratio refers to the ratio of lines in a switch having the capacity to place a call at the same time. (SBC-CA/Mandella 10/18/02, p. 11.)

SBC-CA's witness Aron counters the JA proposal by suggesting that even though vendors recover usage-sensitive costs through a fixed per line price, and even though they may provide enough capacity to handle most situations for this fixed price in the short run, this does not mean that incremental switch usage is free. (SBC-CA/Aron 2/7/03, p. 37.) Aron suggests that usage sensitive rates are justified under a long-run view, which requires that costs incurred to provide capacity be identified and recovered from customers in proportion to their share of switch capacity consumption. (*Id.*, SBC-CA/Aron 3/12/03, p. 77.) SBC-CA witness Lundy argues that in the long run, the price that switch vendors charge is affected by utilization because long-run usage of the switch affects vendors' production costs for switch components. (SBC-CA/Lundy 3/12/03, p. 36.)

Aron explains that there are great variations in customer usage levels and a flat rate for switching would be inefficient because it would increase usage at the margins. (SBC-CA/Aron 3/12/03, pp. 74-75.) Aron says:

> I would expect that flat-rated port prices would result in much higher usage levels on CLEC ports that one would see under usage-sensitive rates, even aside from the responsiveness of individual customers to different price levels. This is inefficient because it leads to the migration of the highest-usage customers to CLECs on the basis of a price structure that fails to reflect the costs that these high usage customers cause to the system, rather than on any basis of relative efficiency or other economic fundamentals. Hence, the fact that there is, in light of the Internet, a substantial variability in usage across customer types in today's economy and the fact that CLECs can target customer types so as to attract those that impose the greatest usage cost burden on the network, make flat-rated pricing inappropriate and inefficient from an economic perspective. (*Id.*, p. 76.)

Aron reasons that CLCs that can control customer type will target high volume customers with a low rate, despite their usage burden on the switch. (*Id.*)

This will be inefficient because the price CLCs will be charged for usage by their high volume customers will not reflect the costs those customers cause in the long run.

SBC-CA alleges that a flat rate for switching is contrary to common industry practice. SBC-CA notes that the FCC has endorsed usage based switching rates in several other states when reviewing Section 271 applications for in-region long distance entry. (SBC-CA 3/12/03, p. 65, n. 254.)

c. PacWest Position

PacWest opposes JA's proposal for flat rates for end-office switching and explains that its own, and other CLCs' interconnection agreements specify that SBC-CA's UNE price for switching is used to determine what PacWest charges SBC-CA for termination of its customers' local traffic. JA's flat rate option leaves no mechanism for carriers to compensate each other for usage on each other's network, and leaves CLCs who invest in their own network facilities with no means of cost recovery. (PacWest/Wood Decl., 3/12/03, p. 23.) PacWest says the Commission cannot ignore the effect of a flat-rated price on the CLCs who apply this rate for various forms of inter-carrier compensation, also known as reciprocal compensation. PacWest maintains there are several economic and policy reasons to reject JA's proposal.

First, PacWest claims that a flat per port rate is inconsistent with the definition of economic cost and violates several of the Commission's CCPs. (*Id.*, p. 4.) According to PacWest, JA are departing from cost causation principles when they argue that costs should follow vendor contracts and not engineering principles. PacWest asserts that JA's reasoning behind a flat rate is flawed because switches do not have infinite capacity. (PacWest/Wood, 3/12/03, p. 5.) Also, PacWest contends that the JA proposal is limited to one category of usage, thus ignoring switched access and toll, which continue to be priced on a usage-sensitive basis. This violates CCP 8, which states that "the cost methodology implementation should ensure that costs for services which use the network in the same way are treated consistently." (*Id.*, p. 11.)

Second, PacWest maintains that the JA proposal ignores the historical treatment of 70% of costs as "traffic sensitive" and 30% non-traffic sensitive." (PacWest 2/7/03, pp. 11-12.) PacWest claims that JA have provided no reason to abandon this traditional split. While the JA proposal implies all costs are non-traffic sensitive, the JA have not explained why this 70/30 split was appropriate in the past, but is no longer. (PacWest/Wood 2/7/03, p. 11.)

PacWest urges that if the Commission does adopt a flat per-port rate structure, the flat rate structure should not be applied in the context of "reciprocal compensation" to CLCs for use of a CLC switch. PacWest says that "given the nature of the services for which reciprocal compensation is charged" a flat per port rate is not appropriate. Thus, the Commission should limit use of the flat rate to what SBC-CA charges CLCs, and SBC-CA should simultaneously calculate a usage-sensitive unbundled switching rate for reciprocal compensation in interconnection agreements. (PacWest 8/1/03, pp. 1-2.) In the three states where a flat per port rate has been adopted, a usage sensitive rate has been retained for reciprocal compensation purposes. (*Id.*, p. 7.) PacWest explains how the HM 5.3 model can calculate a usage-sensitive unbundled switching rate even if a flat per port rate is adopted for SBC-CA. (*Id.*, p. 8.)

d. Discussion

This issue highlights that economists opinions can differ greatly when faced with rate design questions. In this case, experts for both parties reviewed the exact same switch vendor contracts and drew vastly different conclusions.

After intense scrutiny of the switching contracts, both sides do not deny the simple fact that the contracts set prices for breakpoints of CCS, or usage per line, levels. The record shows that in SBC-CA's switching contracts, the primary basis used by switch vendors to charge SBC-CA for its switches is a flat price per line. JA say this proves that usage per line plays no part in switch costs because all usage levels are provisioned at the same price. SBC-CA says the exact opposite--each switch is provisioned based on its usage and there is a cost to go above that usage level.

We find the issue comes down to whether it is reasonable to assume that the capacities provisioned at the prices in the switching contracts will be exceeded. In other words, is it likely that SBC-CA will have to incur an additional cost to accommodate growth in usage per line beyond the 10 year forecast used to provision a new switch? We conclude that given our TELRIC modeling assumptions in this proceeding, it is unlikely that SBC-CA would have to buy additional capacity because switches are provisioned based on a 10-year forecast of capacity requirements. JA have shown that the current statewide average CCS level is well below the minimum quantity CCS provisioned under the contracts and SBC-CA's current CCS levels are below switch maximums. Even if individual lines have higher usage, normal switch operating expenses should cover "grooming" and other switch maintenance work without SBC-CA incurring an additional cost to increase the CCS level of the switch.

Ultimately, we agree with SBC-CA's witness Aron that long-run usage is not free. But we find that given how SBC-CA incurs costs through its switching contracts, switch pricing over the TELRIC modeling period reflects a series of step increases rather than a smooth upward curve. Essentially, the cost SBC-CA incurs for its switches is flat until SBC-CA jumps to a higher level of usage per line. Therefore, we agree that because SBC-CA's cost to obtain switches is a flat per line rate regardless of the usage level provisioned, at least up to the pricing breakpoint, the cost that is passed on to CLCs who use SBC-CA's switch should also be a flat monthly charge. As usage on individual lines increases or decreases, SBC-CA's costs do not change as long as usage does not rise above the maximum CCS level in the switch contract. Although we agree with SBC-CA's Aron that this may cause CLCs to target high volume customers, SBC-CA already does this itself through its own flat-rated pricing plans. Further, as JA's witness Ankum has pointed out, SBC-CA will incur higher costs for high volume users only if three conditions are met simultaneously (*i.e.* all increased usage occurs at the peak hour, the usage exceeds the CCS limitations engineered into the line, and usage increases for a large number of lines and not just a few lines). (JA/Ankum, 2/7/03, p. 107.) We agree with JA that for all of these conditions to be met simultaneously would be extraordinary. Thus, the only time SBC-CA's switching costs rise is when the entire switch must jump to the next CCS level, which is unlikely given that switches are engineered based on a 10-year forecast of usage per line.

We find that charging a flat rate for switching is consistent with TELRIC guidance that rate structures should reflect the manner in which costs are incurred, and consistent with our CCP 2 regarding cost causation. SBC-CA incurs switching costs on a predominantly per-line basis, therefore, there is no basis for it to charge its wholesale customers a usage sensitive rate.

We disagree with PacWest that the flat rate proposal violates cost causation for the reasons we have already explained. In addition, we do not agree that a flat rate for local switching violates CCP 8. It is not clear from this record that tandem, toll, and switched access services use the network in the same way as local switching and that the same rate structure must be used for those services. Moreover, we find that JA have provided ample reasons to deviate from the former 70/30 split of traffic sensitive and non-traffic sensitive costs, based on their analysis of the vendor contracts and CCS provisioning practices. As JA note, SBC-CA itself did not use the former 70/30 methodology either in its own switch costing proposal. (JA/Murray, 3/12/03, p. 46.)

Finally, we do not find that PacWest's concerns over reciprocal compensation should prevent us from adopting a flat rate structure for unbundled local switching. We agree with JA and PacWest that we can employ the same method as other states and retain a usage-sensitive rate for reciprocal compensation purposes. We have calculated usage based end-office switching rates using HM 5.3 and SBC-CA's SICAT which are set forth in Appendix C.

As a side note, the market has rapidly evolved to flat rate monthly pricing for local service, and many other telecommunications services as well. Allowing SBC-CA to collect usage costs from its wholesale customers, who are its competitors in the flat-rated residential market, would place CLCs at a disadvantage. The FCC's Wireline Competition Bureau (Bureau) came to a similar conclusion when it examined the issue of usage based versus flat rates for switching in an arbitration case between AT&T, WorldCom, and Verizon Virginia.[74] In its decision, the Bureau determined that several categories of switching costs should be recovered on a per line port basis, and that charging a

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[74] *See In the Matter of Petition of WorldCom, Inc, Pursuant to Section 252(e)(5) of the Communications Act for Preemption of the Jurisdiction of the Virginia State Corporation Commission Regarding Interconnection Disputes with Verizon Virginia Inc., and for Expedited Arbitration* (CC Docket No. 00-218), Memorandum Opinion and Order, DA 03-2738, (Rel. Aug. 29, 2003) ("VA Arbitration").

per line port price "recovers these costs on a competitively neutral basis, thereby potentially extending to many different subscribers the benefits of competition." (*VA Arbitration*, para. 464. *See also* paras. 471, 472, and 477.)

5. Switch Fill Factors

HM 5.3 models switching UNE costs based on a 94% analog and digital line fill factor. SBC-CA proposes an analog fill factor of 82% and a digital fill factor of 20%.

SBC-CA maintains that the fill factors it uses for digital line ports, analog line ports, and digital trunk ports are forward-looking and based upon the best available data representing conservative estimates of average switch utilization. (SBC-CA, 3/12/03, p. 68.) According to SBC-CA, "[T]he fill factors used in SBC-CA California's cost studies, which are based on current, efficient utilization levels, are the most appropriate values to use." (SBC-CA/Lundy 3/12/03, p. 42.) Further, SBC-CA explains that digital line utilization is lower than analog line utilization because digital "is a newly deployed technology, and as such would be expected to have lower utilization." (SBC-CA/Mandella 3/12/03, p. 16.) As SBC-CA's witness Mandella explains, digital equipment placed today "is sized to meet the projected size of the tract and the anticipated rate of construction," and "utilization of the equipment will be minimal in the early stages of actual service activation and increase over time." (*Id.*)

With regard to HM 5.3, SBC-CA contends that the switch fill factors it uses are based on nothing more than speculation and ignore the need for administrative spare, economic order quantities, and forecast uncertainties. SBC-CA disputes JA's assertion that a 94% fill level is appropriate because switches are highly modular and can be expanded on short notice. SBC-CA alleges that JA fail to account for standard switching equipment order intervals, and that at least one switch vendor has stated that a small switch installation will take 25 weeks from start to finish. (*Id.*, p. 17.)

In contrast, JA argue that SICAT fill factors are based on embedded data, and lead to a digital fill factor that is too low and entirely inconsistent with SBC-CA's assumption of wide deployment of DLC in its loop study. SBC-CA's proposed 20% digital fill factor derives from the fact that SBC-CA has deployed little DLC in its current network during a time when it is implementing a new technology. (JA/Ankum, 2/7/03, p. 99.) Thus, SBC-CA's model reflects actual utilization rates from today's switching network rather than forward-looking usage assumptions. JA contend this violates TELRIC modeling standards. According to JA, SBC-CA's SICAT model has ignored SBC-CA's own engineering guidelines that recommend a far higher digital line "fill at relief" level. (*Id.*, p. 100.)

Discussion. First, we find that SBC-CA has not met its burden in justifying why its current digital fill level is forward-looking. SBC-CA relies on actual fill levels from its network today. In particular, SBC-CA proposes a 20% digital line fill factor as forward-looking, but admits that current digital fill rates are low because the technology is newly deployed. (SBC-CA/Mandella 3/12/03, p. 16.) Moreover, we find SBC-CA's testimony in this area confusing. On the one hand, SBC-CA criticizes JA for assuming that SBC-CA's California network is growing "when, in fact, [SBC-CA's] overall customer base in California is declining, and is expected to decline in the future." (*Id.*, p. 14; and SBC-CA 3/12/03, p. 70, n. 278.) On the other hand, SBC-CA's witness Mandella explains that SICAT is based on a fill factor of 20% for digital lines "consistent with the forward-looking expected utilization of a newly deployed, *growing*, and efficiently managed network." (*Id.*, p. 15, emphasis added.) We are puzzled why SBC-CA has used such a low digital fill factor, which presumably leaves 80% spare capacity for growth in the network, when it contends that its customer base is declining.

Second, we see no reason why there should be such a drastic disparity between analog and digital fill levels. As JA have explained, switching equipment is highly modular and can be expanded within months rather than years, which means minimal spare is warranted. (JA/Ankum 2/7/03, p. 87-88.) SBC-CA's testimony supports this, given Mandella's estimate of 25 weeks for switching equipment installation.

Third, we find that JA's 94% fill levels may be too optimistic and not leave enough room for administrative spare and growth. Instead, we find it appropriate to use SBC-CA's 82% analog fill factor and apply the same rate to digital line assumptions. We will therefore use this 82% fill level in our model runs.

VII. DS-3 Loop Rates

XO proposes that DS-3 loop rates be deaveraged. According to XO, CLCs are tremendously disadvantaged by an average rate for DS-3 loops, when SBC-CA itself is providing DS-3 retail services at deaveraged prices. Furthermore, XO contends that adopting deaveraged DS-3 UNE loop rates will not prejudice SBC-CA because SBC-CA's cost studies have already calculated DS-3 loop costs by deaveraged zones. (XO, 2/7/03, p. 47.)

SBC-CA opposes this proposal on the basis the proceeding was only intended to review cost changes for the UNEs at issue, and not address rate structures. Nevertheless, SBC-CA confirms that its cost studies are able to calculate deaveraged costs for DS-3 loops.

We will adopt XO's proposal for deaveraged DS-3 rates, because SBC-CA's model calculates DS-3 costs on a deaveraged basis and because SBC-CA has not presented any economic rationale to leave the rates averaged. The information clearly exists to adopt DS-3 rates for three zones, and we will do so.

VIII. Further UNE Reexamination Proceedings

As described at the start of this order, this proceeding is a consolidation of the 2001 and 2002 nominations by various parties to re-examine specific UNE rates that SBC-CA charges. The Commission established the annual nomination process in D.99-11-050, intending it to be a quick update to rates set in that order. Unfortunately, the dream of a quick annual re-examination process quickly gave way to the reality of modeling difficulties, protracted discovery battles, and various delays.

Given the enormous effort expended by the parties and the Commission on this 2001 and 2002 re-examination, which has now taken three years to complete, we see the need to modify the re-examination process that we had established in D.99-11-050. Rather than accept annual nominations of UNE's, we will suspend further nominations to re-examine SBC-CA UNE rates until February 2007. It is not reasonable to conduct reviews in 2005 and 2006 because of the need for wholesale pricing stability and regulatory certainty in competitive local exchange markets. Annual re-examination proceedings lead to constantly shifting rates, true-ups, and regulatory delays. The benefit of pricing and market stability outweighs the benefit of an annual wholesale pricing review and continual refinement of UNE rates. Therefore, the nomination process described in D.99-11-050 is suspended until February 2007.

We recognize that parties have already used the annual nomination procedure to submit suggestions for re-examination in 2004.[75] This suspension of

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[75] *See* Application 04-03-013 filed March 12, 2004, which nominates shared and common costs and non-dedicated transport rates for reexamination.

the annual nomination process until 2007 does not prejudge that application. Rather, we will consider it on its merits in a separate order.

IX. Assignment of Proceeding

Carl W. Wood is the Assigned Commissioner and Dorothy J. Duda is the assigned Administrative Law Judge in these proceedings.

X. Comments on Proposed Decision

In accordance with Pub. Util. Code Section 311(d) and Rule 77.2 of the Rules of Practice and Procedure, the Commission mailed the proposed decision of the ALJ in the proceeding. Comments were filed by ______________, and reply comments were filed by ______________.

Findings of Fact

1. In D.95-12-016, the Commission adopted a set of Consensus Costing Principles that it has applied in TSLRIC and TELRIC cost proceedings.

2. Pursuant to federal regulations, the Commission must comply with the FCC's TELRIC methodology when setting UNE rates for SBC-CA.

3. The Commission established cost modeling criteria for this proceeding in a June 2002 Scoping Memo.

SBC-CA Models/LoopCAT

4. The SBC-CA models contain inputs based on the characteristics of SBC-CA's current network operations.

5. The SBC-CA model as presented does not allow the Commission to isolate and determine SBC-CA model inputs related to loop length assumptions, loop cabling inputs, structure sharing assumptions, and labor crew and installation time assumptions.

6. LoopCAT uses embedded cabling characteristics rather than cable-sizing conventions.

7. In its First Report and Order, the FCC rejected embedded cost approaches as not compliant with TELRIC.

8. It is not possible to extract individual inputs from the factors in the SBC-CA models.

9. While LoopCAT factors can be traced to SBC-CA internal accounting data, it is not possible to match this data to publicly-available cost data, such as ARMIS, or other public sources of information.

10. It is not possible to compare installation crew sizes in LoopCAT's factors to actual SBC-CA information or input assumptions in HM 5.3.

11. It is not possible to test the sensitivity of LoopCAT to differing forward-looking assumptions or network configurations without the ability to modify individual inputs.

12. LoopCAT approximates loop lengths for each distribution area assuming that all loops in that distribution area are one-half the "design point," which is defined by SBC-CA's loop planning guidelines as the longest loop that might be built in the next twenty years for existing or potential customer locations.

13. Approximately 100,000 loops in LoopCAT are longer than 18,000 feet.

14. Loops exceeding 18,000 feet will not work properly without additional equipment such as load coils, which are not modeled in LoopCAT.

15. The record does not contain information on SBC-CA's actual loop lengths to modify the design point distance to exclude potential loops.

16. LoopCAT assumes separate drops for each residence and equipment to terminate six lines for every residence.

17. The SBC-CA models calculate costs for 2-wire, DS-1, and DS-3 loops separately.

<u>SICAT</u>

18. SBC-CA's SICAT module calculates switching costs based on SBC's average purchases over a five-year period (1998 through 2002) under its multi-state contracts with switch vendors.

SPICE

19. SBC's SPICE model assumes that a forward-looking interoffice network would mirror SBC-CA's existing interoffice network.

20. SPICE does not produce a total investment figure, but instead calculates "node investment."

21. SPICE does not allow the user to segment demand for different interoffice services such as voice and high capacity services.

22. SPICE estimates costs using factors that incorporate structure sharing data, pole and conduit investment, and EF&I costs that are based on SBC-CA's historical network data.

23. It is not possible to extract individual input information from the factors used in SICAT in order to understand the underlying input, compare it to other public information, or test the effect of different input assumptions.

24. It is not possible to identify the demand level that the SPICE model is designed to serve.

25. The Commission cannot modify demand assumptions and factor inputs in SBC-CA's SPICE model.

ACFs and Expenses

26. The SBC-CA models use ACFs to convert investments into annual costs and expenses.

27. The expense factors in the SBC-CA models do not allow the Commission to isolate or understand individual input assumptions, compare and verify inputs to public information, or test differing assumptions.

28. In this proceeding, SBC-CA uses a different cost methodology than the prior OANAD proceeding.

29. SBC-CA did not reconcile shared and common costs from the prior OANAD with the direct UNE costs calculated through the ACF cost studies proposed in this proceeding.

30. SBC-CA relied on total expenses and investments when calculating its per unit expense factors, which means that its ACFs include expenses related to unregulated activities.

31. SBC-CA's ACFs include expenses related to transactions between SBC-CA and its affiliates.

32. SBC-CA's ACFs include expenses for Project Pronto incurred in 2001.

33. The TBO accrual is a liability for future retiree medical costs already earned by current and former employees.

34. SBC removed some TBO expenses from its ACF study, but states that the proper amount should have been greater than what it actually removed.

35. The record does not contain sufficient information allowing the Commission to modify SBC-CA's expense assumptions to remove potential shared and common costs, unregulated expenses, affiliate transaction costs, retiree costs, and Project Pronto costs.

36. SBC-CA incorporated inflation into its cost models through inflation factors for capital investments and operating expenses.

37. As a result of D.89-10-031, the Commission's New Regulatory Framework incorporates inflation and productivity adjustments.

38. BLS data shows telephone utility worker productivity has exceeded inflation from 1996 through 2000.

39. SBC-CA did not provide information related to actual installation times or material costs, except for DLC costs.

HM 5.3

40. Many of the inputs to HM 5.3 can be modified, such as fill factors, plant mix, structure sharing, switching investment assumptions, and some labor installation times and crew sizes.

41. HM 5.3 uses a customer location database created by a third-party vendor, TNS, as an input.

42. The Commission staff could not modify HM 5.3 inputs related to labor costs in all areas.

43. The HM 5.3 interoffice transport module underestimates demand.

44. In defining TELRIC, the FCC has rejected modeling based on “ultimate demand” in favor of a reasonable amount of excess capacity to accommodate short term growth.

45. Loop lengths based on right-angle connections are longer than straight line connections because the two sides of a right triangle, when added together, are longer than its hypotenuse.

46. Neither LoopCAT nor HM 5.3 follows existing distribution routes or places all loop facilities in today’s locations.

47. TELRIC does not mandate the use of existing outside plant routes.

48. The Supreme Court has rejected basing UNE costs on an incumbent carrier’s historical costs.

49. SBC-CA provided actual DLC installation cost information that was lower than the DLC installation costs used in LoopCAT.

50. HM 5.3 uses SBC-CA customer location information to identify SBC-CA’s current customer locations and cluster them into distribution areas.

51. The clustering algorithm used as an input to HM 5.3 imposed three engineering restrictions relating to maximum copper length, maximum lines served, and maximum distance between two points in the cluster.

52. SBC-CA ran its own clustering scenario with a maximum line size of 1,800 lines, although Commission staff was unable to run its own clustering scenarios.

53. The Commission staff could not fully replicate the preprocessing steps used in either HM 5.3 or the SBC-CA models.

54. LoopCAT assumes that SBC-CA's current customer groupings are forward-looking and efficient and does not regroup customers into different distribution areas.

55. TELRIC allows the reconstruction of the network using existing wire centers, but does not require a cost model to use actual outside plant routes because they may not represent the most efficient, forward-looking plant design.

56. HM 5.3 made simplifying assumptions about customers with the same address where it did not know the square footage "footprint" of a building.

57. HM 5.3 assumes all distribution areas can accommodate a CEV up to 6,451 lines, which is larger than the CEV size SBC-CA normally installs.

58. The Commission could not run a scenario with a lower assumption regarding the maximum lines per distribution area.

59. Equipment to serve 7,200 pairs in a distribution area is readily available.

60. LoopCAT assumes that distribution areas serve a maximum of 200 to 600 households based on guidelines that have been in place for approximately 25 years.

61. HM 5.3 uses many inputs that are based on expert judgments and relies on vendor quotes that are not always documented, but many of these inputs can be modified.

62. The SBC-CA models rely on judgments of engineers and unnamed subject matter experts for many inputs, such as design point assumptions, ACFs, SICAT, and SPICE inputs.

63. SBC-CA did not provide an assessment of new input values for many of the HM 5.3 inputs it criticized.

64. In many cases, it is not possible to make direct comparisons between HM 5.3 and SBC-CA model inputs.

65. It was not possible to change all of the labor rate assumptions in HM 5.3 because they were often embedded with material cost and other input assumptions.

66. Neither SICAT nor HM 5.3 models the characteristics of individual switches.

67. HM 5.3 does not model an interoffice network that can accommodate all of SBC-CA's current interoffice high capacity demand.

68. TELRIC requires the modeling of forward-looking costs attributable to UNEs, taking as a given the incumbent LEC's provision of other elements.

69. HM 5.3 allows the user to adjust inputs to model varying levels of spare capacity.

70. Both HM 5.3 and the SBC-CA models adjust investments to current cost before calculating E/I ratios.

71. Verizon has higher investments per line than SBC-CA.

72. ORA/TURN compared HM 5.3, the SBC-CA models and SynMod using a uniform platform of loop-related and general input values from SynMod.

73. HM 5.3 produced higher costs than SynMod when run with SynMod's default inputs.

74. JA changed eight categories of inputs to HM 5.3, which resulted in a significantly higher loop rate.

75. HM 5.3 can be modified to use different input and engineering assumptions, spare capacity can be increased and expense assumptions can be modified, but it is not possible to modify HM 5.3 with regard to certain labor inputs, the customer clustering process, and demand and assumptions in the interoffice transport module.

Resulting UNE Rates

76. When HM 5.3 and the SBC-CA models are run with similar inputs to match Commission precedent, federal requirements, and additional rationale developed herein, the resulting cost results converge, with some rates converging to almost the same value.

77. Both HM 5.3 and LoopCAT assume uniform distribution of customers throughout the distribution area.

78. Both HM 5.3 and LoopCAT include a mixture of real and hypothetical assumptions.

79. HM 5.3 uses actual customer locations, but clusters these locations into reconfigured, or hypothetical, groupings.

80. LoopCAT uses some existing plant routes, particularly for feeder, but designs loop lengths based on estimates of hypothetical future customer locations.

81. HM 5.3 uses the TNS clustering database as an input, while LoopCAT uses SBC-CA's preprocessed cable records as an input, and the Commission is not able to adjust either of these inputs.

Asset Lives

82. In 1999, the FCC reviewed telecommunications carriers' asset retirement patterns, plans, and current technological developments and trends.

83. The asset lives adopted by the FCC do not match the financial asset lives proposed as modeling inputs by SBC-CA.

Cost of Capital

84. Since 1994, several mergers and acquisitions have impacted the telecommunications industry including Pacific Telesis' merger with SBC, and SBC's subsequent merger with Ameritech.

85. SBC-CA proposes a proxy group of seven companies that have changed substantially since 1998.

86. Both SBC-CA and JA use the CAPM and DCF methods to estimate cost of equity.

87. SBC-CA uses growth estimates from 1999 for its DCF analysis.

88. SBC-CA's interest rate adjustment to the market risk premium differs substantially from other measures of the market risk premium.

89. In prior cost of capital reviews, the Commission has adjusted cost of equity for interest rate changes after completing its CAPM review rather than incorporating interest rate changes into the CAPM model.

90. SBC-CA proposes a risk-free rate of 5.8% based on 1999 government bonds.

91. The CAPM computes a cost of equity for SBC-CA of 11.88% when it is run with a 7.5% market risk premium, a beta coefficient of .93, and a risk free rate of 4.9%.

92. The 12% cost of equity used to derive SBC-CA's cost of capital is slightly higher than the cost of equity adopted for California's energy utilities.

93. The Commission has generally excluded short-term debt when setting the cost of capital for utilities.

94. SBC-CA's proposed capital structure uses market values of equity and debt from 1998.

95. The firms in SBC-CA's proxy group have substantially increased their debt levels in recent years.

96. Ibbotson Associates has stated that a firm's target or optimal capital structure should be used in weighting the cost of equity and debt.

97. The capital structure proposed by JA, which mixes book and market values, comports with SBC-CA's target capital structure.

IDLC/UDLC

98. SBC-CA's engineering guidelines call for greater deployment of IDLC systems as the most economical method for providing telephone service.

99. IDLC loops can be unbundled at the DS-1 level, although operational issues involving, security and administrative concerns have yet to be fully resolved.

100. UDLC loops are required for circuits that cannot be provisioned over an IDLC system, such as ISDN, and burglar alarms.

101. At present, there are no stand-alone loops provisioned over IDLC anywhere in the U.S.

DLC Costs

102. SBC-CA proposes a factor-based approach to estimate DLC installation costs in LoopCAT, based on the ratio of installation to material costs.

103. Cost data provided by SBC-CA shows actual DLC installation costs are lower than those estimated by the factors in LoopCAT.

104. SBC-CA incurs DLC installation costs above and beyond those included in its contract with Alcatel.

105. Actual DLC installation costs provided by SBC-CA are lower than the costs produced by DLC EF&I factors used in the SBC-CA models.

Fill Factors

106. There is a wide disparity between the fill factors SBC-CA proposes in its models and those used in its TSLRIC studies for pricing flexibility.

107. HM 5.3 uses SBC-CA's temporary engineering guidelines to design cable sizes to provide 1.5 to 2 lines per living unit for residential customers.

108. A fill factor of 52% means that there is 48% spare capacity designed into the network.

109. SBC-CA engineering guidelines call for 2.25 lines per lot.

110. The FCC has criticized fill factors in the 40% range, and adopted fill factors in the 50-75% range.

111. The Commission adopted a fill factor higher than SBC-CA's actual fill in the prior OANAD decision.

112. The FCC has found that low density areas generally have lower fill levels, whereas LoopCAT models higher fill levels in low density areas.

113. In D.96-08-021, the Commission adopted a 76% fill factor for copper feeder rather than Pacific's (now SBC-CA) actual fill factor.

114. HM 5.3 models 4 fibers to each DLC site for redundancy, which results in a fiber fill rate of 79.6% that includes duplicate facilities. This approach is consistent with the approach used by the FCC in its universal service cost modeling.

115. SBC-CA proposes a 16.22% fiber feeder fill based on its actual utilization experience and the percentage of fiber strands that are actually in use.

116. SBC-CA's fiber feeder fill is less than half its copper distribution fill rate.

117. For the DLC common equipment fill factor, HM 5.3 incorporates a choice of DLC system sizes from 24 lines up to 8,064 lines. SBC-CA models four DLC sizes, which is less than the range of sizes SBC-CA actually deploys.

118. SBC-CA's DLC common equipment fill factor is based on its actual network operations and allows for ten years of spare capacity.

119. LoopCAT does not use the correct line capacity for a 6x16 CEV.

120. SBC-CA models a fill factor for the CEV structure and a fill factor for the DLC equipment housed in the CEV.

121. SBC-CA engineering guidelines stress minimization of spare DLC plug-in equipment.

122. Placement of DLC plug-in equipment involves travel time to the DLC site and the inability to manage DLC channels on a single pair basis.

123. HM 5.3 models an SAI equipment fill level based on 3.5 lines per living unit.

124. SBC-CA admits an error in developing the SAI fill factor in its model.

125. The SBC-CA models assume a linear relationship between maintenance costs and fill factors, so that maintenance costs rise at higher fill levels.

126. SBC-CA's analysis shows maintenance costs for copper distribution rise with fill levels above 50%.

Structure Sharing

127. The FCC's SynMod and SBC-CA's loop deployment guidelines assume sharing of structure by feeder and distribution cable.

Plant Mix

128. HM 5.3 uses averages of ARMIS data from the last eleven years to develop plant mix assumptions.

129. The SBC-CA models assume forward-looking plant mix matches current plant mix.

Labor Costs

130. Labor costs in HM 5.3 and the SBC-CA models involve inputs for hourly wage rates, crew sizes, and installation times.

131. Labor cost inputs in HM 5.3 involve expert judgment and vendor quotes.

Crossover Point

132. In D.96-08-021, the Commission adopted an economic crossover point of 12,000 feet.

133. Loops longer than 12,000 feet are not consistently capable of supporting many services and loops longer than 18,000 feet present compatibility problems for UNEs.

Switch Vendors

134. SICAT switching investments are based on contracts with Lucent and Nortel, while HM 5.3 models investments based on Siemens switch prices.

135. At present, SBC-CA does not deploy Siemens switches in its California network.

136. The Siemens switch modeled in HM 5.3 with SONET based optical interface capabilities is not currently available in North America.

137. In D.98-12-016, the Commission rejected the assumption that 90% of lines could be purchased at the new line price.

Vertical Features

138. Vertical feature hardware costs are included as part of the per-line cost for new switch lines.

139. SBC-CA's feature cost study does not incorporate memory and processor costs, or costs for feature software for usage above caps in the switching contracts.

140. SBC-CA data shows that average processor utilization is well below 100%.

Switching Rate Structure

141. SBC-CA's switch contracts charge a flat price per line for a given CCS, or usage per line, level.

142. Current statewide average CCS levels are well below the minimum CCS quantity provisioned under the switching contracts.

143. SBC-CA's switching costs per line do not change as long as usage does not rise above the maximum CCS levels in the switch contracts.

144. Other states that have adopted a flat, per port rate structure for switching have retained usage-sensitive rates for reciprocal compensation purposes.

Switch Fill Factors

145. The SBC-CA models use switch fill levels from the current network.

146. Digital fill levels on the current network are low because digital technology is newly deployed.

DS-3 Loop Rates

147. The SBC-CA models calculate DS-3 loop costs on a deaveraged basis.

Annual Reexamination Process

148. In D.99-11-050, the Commission established a process for the annual review of UNE rates.

Conclusions of Law

1. Both HM 5.3 and the SBC-CA models do not allow the Commission sufficient flexibility to modify inputs and test various outcomes.

2. Both HM 5.3 and the SBC-CA models are flawed because the Commission is unable to modify key structural elements of either model.

3. The Commission can run both models with many common inputs and use the results to create a range within which we can adopt reasonable UNE rates for SBC-CA.

4. The Commission cannot rely on either the HM 5.3 or SBC-CA models alone because of the flaws in both models that we cannot correct.

5. HM inputs are at the low end of what we consider reasonable.

6. The results of HM 5.3 generally set the lower boundary for our rate zone.

7. The results of the SBC-CA models generally over-estimate forward-looking UNE costs and therefore set the upper boundary for our rate zone because we could not modify all inputs to the desired levels.

8. The fact that widely discrepant rates from the SBC-CA and HM 5.3 models converge when the models are run with common inputs provides support for basing rates on the midpoint of the range created by the two model runs.

9. The midpoint of the two model runs reasonably mitigates the flaws in both models.

10. The Commission should set UNE rates for SBC-CA based on the midpoint of the range created by running HM 5.3 and the SBC-CA models with our chosen inputs, as set forth in Appendix A.

SBC-CA Models

11. SBC-CA has not proven that its existing cabling inventory, which reflects incremental network growth over many years, is optimal and forward-looking.

12. SBC-CA's models do not comply with TELRIC because they estimate the cost to rebuild the network SBC-CA has in place today, with some changes for forward-looking technology, but not necessarily with the lowest cost network configuration.

13. The fact that SBC-CA has operated under incentive regulation for over ten years does not prove that its models are forward-looking, particularly when individual modeling inputs, such as labor installation times, crew sizes, material prices and structure sharing, cannot be determined or modified to test differing assumptions.

14. Because LoopCAT relies on embedded cable characteristics that cannot be modified, the model contradicts FCC guidance that TELRIC should assume reconstruction of the least-cost network configuration.

15. It is not reasonable to rely on historical accounting information used in SBC-CA's factors without the ability to understand the assumptions underlying the cost information, compare it to public information, or test differing assumptions.

16. LoopCAT's use of the design point to calculate loop lengths results in a network configuration that is not least cost or forward-looking because: a) it is based on twenty year growth forecasts which exceed what we consider "reasonably foreseeable short term growth," as described by the FCC, b) some loop lengths exceed the 18,000 foot limit, and c) the Commission cannot modify SBC's preprocessor calculations of the design point to limit it to existing loop lengths.

17. LoopCAT inflates loop costs by not modeling multiple dwelling units, but instead assuming that each residence requires a separate drop and termination equipment for six lines.

18. The SBC-CA models overstate loop costs by not integrating cost studies for the various loop types and thereby ignoring that these services share much of the same network infrastructure.

19. Issues raised by parties regarding SBC-CA's SICAT model can be addressed by changing SICAT input assumptions.

20. SICAT is not irreparably flawed because it incorporates some non-California switching information based on SBC's multi-state switch vendor contracts.

21. The SPICE model is flawed because the Commission cannot determine the level of demand that it is designed to serve or the total investment it models, and cannot modify its demand assumptions to check the model's sensitivity.

22. The factors used throughout the SBC-CA models are flawed because they cannot be disaggregated to extract individual inputs, compare them to other public information, or modify them to test the effect of differing assumptions.

23. SBC-CA's ACFs may contain some portion of shared and common costs, because SBC-CA uses a different costing methodology than the prior OANAD and did not analyze whether ACFs it now proposes include expenses previously categorized as shared and common costs.

24. Based on the current record, the Commission cannot adjust SBC-CA's ACFs to remove potential double-counting of shared and common costs.

25. It is not reasonable for SBC-CA to include expenses for its unregulated businesses, such as inside wire maintenance and billing services, or for services SBC-CA performed on behalf of its affiliates when calculating expenses related to UNE operations.

26. While some Project Pronto expenses likely benefit UNE operations, it is not reasonable to allocate all Project Pronto expenses to UNE operations as SBC-CA has done.

27. SBC-CA has not met its burden of proving that all of its Project Pronto expenses are forward-looking and appropriately allocated to UNEs.

28. SBC-CA's ACFs should not include the TBO accrual because it is not a current operations cost.

29. It is not possible, given the current record, to isolate and remove expenses for non-regulated operations, affiliate transactions, Project Pronto, and the TBO from the SBC-CA models.

30. The SBC-CA models do not include adequate productivity adjustments simply by modeling equipment using the newest technology or using 2001 expense information.

31. The SBC-CA models should not include inflation adjustments without a corresponding productivity adjustment.

<u>HM 5.3 Model</u>

32. Many criticisms of HM 5.3 can be addressed by input modifications.

33. The clustering assumptions in HM 5.3 are no worse than the loop input assumptions in the SBC-CA models. Both HM 5.3 and LoopCAT involve aspects of loop modeling that the Commission was unable to modify to its satisfaction.

34. HM 5.3 accounts for a reasonable level of growth in network demand and sizes the network to provide appropriate service quality.

35. Even though HM 5.3's use of right-angle routing is not based on SBC-CA's actual outside plant routes, it realistically reflects that networks cannot always follow straight line routes and it most likely increases costs in the model by using a longer route than if customers were connected by straight lines.

36. The fact that SBC-CA actual costs may be higher than the costs produced by HM 5.3 does not prove that HM 5.3 is flawed.

37. HM 5.3 is more reasonable and forward looking than LoopCAT with regard to loop design because it is based on actual customer locations and designs plants based on the realities of where customers are grouped today.

38. HM 5.3 reasonably reconstructs SBC-CA's network within TELRIC guidelines and given existing wire center locations, even if the HM 5.3 network does not follow existing outside plant routes.

39. When HM 5.3 is re-run with clusters limited in size to 1800 lines per cluster, the results demonstrate the tradeoff between feeder and distribution costs.

40. It is reasonable for a forward-looking network configuration to size distribution areas larger than SBC-CA has sized them in the past.

41. It is unreasonable to assume that all distribution areas could accommodate a CEV to serve 6,451 lines.

42. The customer location and loop modeling assumptions in HM 5.3 are no more a "black box" than SBC-CA's preprocessor and input modeling assumptions related to the loop length design point.

43. It is not reasonable to abandon HM 5.3 simply because of disputes over "expert judgment" inputs when these inputs can be modified.

44. Because it is not possible to change all labor rate assumptions in HM 5.3, the model likely underestimates UNE costs and should be used as a lower boundary when setting UNE rates.

45. HM 5.3 and SICAT have taken a similar modeling approach that does not analyze the characteristics of individual switches.

46. Because we cannot identify the demand level that SPICE is designed to serve, we are unable to place SPICE demand input assumptions into the HM 5.3 interoffice model.

47. Because it is unclear whether HM 5.3 incorporates optical interface equipment, HM 5.3 might not allow the provisioning of the high capacity services SBC-CA provides today.

48. Because HM 5.3 appears insensitive to demand changes, it is unclear how it derives its SONET ring structure to set interoffice transport rates.

49. The HM 5.3 interoffice transport module is flawed because it underestimates demand, may not incorporate optical interface equipment, and is insensitive to demand changes.

50. HM 5.3's demand assumptions incorporate a reasonable level of growth, whereas LoopCAT unreasonably models loops to serve ultimate demand.

51. The use of E/I ratios in HM 5.3 is reasonable, if adjusted to remove comparisons to Verizon expense levels.

52. It is reasonable to use recent data from SBC-CA's ARMIS expense information to estimate forward-looking expenses with the HM 5.3 model.

53. SBC-CA has not shown that its current costs are forward-looking, and it would be unreasonable to reject HM 5.3 merely because its results are lower than SBC-CA current costs.

54. HM 5.3 is not structurally biased to produce low results because when it is run with other inputs, it produces higher cost results.

55. Both HM 5.3 and the SBC-CA models fail the Commission's cost modeling criteria, as set forth in the scoping memo of this proceeding because neither allows us to reasonably understand all inputs or modify inputs and assumptions in all areas.

Resulting UNE Rates

56. The Commission should not rely solely on the results of either HM 5.3 or the SBC-CA models, but should use the results of both models to create a zone within which to adopt new UNE rates.

57. If all of the labor inputs in HM 5.3 could be modified, the results of HM 5.3 would be higher than the Commission's runs. Therefore, HM 5.3 generally provides a lower boundary for UNE ratesetting.

58. If loop configuration, structure sharing inputs, and the linkage of fill factors and expenses could be modified in the SBC-CA models, its results would be lower than the Commission's runs.

59. If expense levels in the SBC-CA models could be modified to remove expenses related to affiliates, unregulated ventures, the TBO, and Project Pronto, its results would be lower than the Commission's runs. Therefore, the SBC-CA Models generally provide a ceiling for UNE ratesetting.

60. Given the convergence of model results when both models are run with common inputs, it is reasonable to choose the midpoint of the range resulting from our runs of HM 5.3 and the SBC-CA models as the adopted rate for SBC-CA's UNEs.

61. It is unreasonable to rely on either the HM 5.3 clustering process or SBC-CA's preprocessed loop records because they contain inputs that we are unable to modify.

Asset Lives

62. Asset lives for financial purposes are conservative and may overstate expenses to protect investors.

63. The asset lives proposed by SBC-CA do not match SBC-CA's actual experience, in part because of technologies such as DSL that use copper cable to provide broadband services.

64. The economic asset lives proposed by DOD/FEA based on an analysis by the FCC are reasonable to use as inputs for our TELRIC cost modeling.

Cost of Capital

65. The cost of capital originally adopted for SBC-CA in 1994 should be revised because financial conditions today are vastly different than they were at that time.

66. It is reasonable to use the proxy group of three companies proposed by JA to analyze the cost of equity, debt, and capital structure for our cost of capital analysis.

67. SBC-CA's growth estimates used in its DCF analysis are outdated and not reasonable, and its updated growth estimates in the "b x r approach" are excessive.

68. JA's three stage DCF analysis, based on more current growth rates than SBC-CA's analysis, is more reasonable than assuming all telecommunications firms will grow continuously at a faster rate than the whole economy.

69. SBC-CA's analysis using a market risk premium of 7.5% is reasonable.

70. SBC-CA's interest rate adjustment to the market risk premium is not reasonable because of updated assumptions regarding interest rate effects on equity premiums.

71. A market risk premium of 7.5%, based on Ibbotson Associates study of equity premiums from 1926 to 2001, is reasonable to use in our CAPM analysis.

72. It is more reasonable to base a risk-free rate on 30-year bonds, rather than 10-year bonds, to match the longer investment horizon in our market risk premium figure.

73. A risk free rate of 4.92% is more reasonable than SBC-CA's outdated risk free rate.

74. We should adopt SBC-CA's updated beta coefficient of .93 because it is based on recent data for the same proxy group that we use for our other cost of capital inputs.

75. It is reasonable to round the CAPM cost of equity from 11.88% to 12% to reflect that interest rates are at historic lows and to minimize the regulatory lag inherent to cost of capital adjustments.

76. When setting the cost of equity, we should give more weight to the CAPM results than the DCF model because DCF relies heavily on widely disparate growth forecasts for telecommunications firms.

77. A 12% cost of equity is reasonable because it is within the range of the DCF results obtained by SBC-CA and JA.

78. It is reasonable to determine a cost of capital by looking at the returns investors require in capital markets.

79. It is reasonable to assume that capital markets have already figured the relative risk of UNEs into the equity returns they require for SBC's stock.

80. SBC-CA's UNE business is subject to regulatory risk regarding the accuracy of UNE prices, but little competitive risk given the low level of facilities-based competition.

81. SBC-CA has not proven that UNEs are more risky than SBC-CA's other businesses.

82. SBC-CA's cost of capital should equate to, but not be greater than, the cost of capital for SBC as a whole.

83. The cost of equity for energy utilities is of little relevance to our analysis of SBC-CA's cost of capital because of differing capital structure, financial conditions, and regulatory policies.

84. The Commissions' cost of capital analysis should incorporate long-term debt costs that match UNE asset lives, and are less volatile than short-term debt costs.

85. It is reasonable to assume a long-term debt cost of 7.12% for our analysis.

86. A capital structure based on 50% market values and 50% book values is less sensitive to changes in market conditions than a capital structure based entirely on market values.

87. A capital structure is not forward-looking if it is based on market values from 1998.

88. It is reasonable to base a capital structure on a firm's target capital structure, which includes a mix of market and book values..

IDLC/UDLC

89. IDLC is the forward-looking technology choice for network design.

90. The Commission should assume a mix of 75% IDLC and 25% UDLC in its model runs because IDLC is the forward-looking technology. Some UDLC should be modeled to allow carriers to provision certain services such as ISDN and burglar alarms, and stand-alone loops to CLCs.

DLC Costs

91. It is reasonable to incorporate DLC installation costs above and beyond those listed in the Alcatel contract in our TELRIC model runs.

92. SBC-CA could not reasonably explain how LoopCAT's DLC installation factor was derived.

93. SBC-CA has not shown that its DLC installation cost factor is reasonable and forward-looking because it is greater than actual cost information it provided.

94. The Commission's model runs should incorporate SBC-CA's actual DLC installation costs of $22,814 for RTs and $49,569 for CEVs, rather than LoopCAT's factors or the estimates proposed by JA.

Fill Factors

95. Fill factors derived purely from current network operations are not automatically forward-looking.

96. Fill factors should reflect accurate projections of investment to accommodate growth and a reasonable estimate of demand.

97. A fill factor for copper distribution of 51.6% provides an adequate level of spare capacity to accommodate a reasonable projection of future demand, and is therefore, reasonable.

98. It is reasonable to use a higher fill factor for copper distribution than our prior OANAD decisions given FCC guidance in recent orders, and given trends in network usage that have reduced line growth projections.

99. SBC-CA has not reconciled its standard guidelines that call for more than 2 lines per household with current line growth estimates or its temporary guidelines calling for less than 2 lines per household.

100. The fact that SBC-CA's fill factors may remain constant over time does not prove that these fill levels are optimal.

101. SBC-CA has not met its burden of proving that its current distribution fill factor is a reasonable proxy for forward-looking utilization.

102. It is reasonable to continue to use the 76% copper feeder fill factor adopted in the prior OANAD proceeding.

103. A 79.6% fiber feeder fill rate is reasonable because it is similar to the approach used by the FCC in its modeling and it provides full redundancy and spare for growth.

104. A fiber feeder fill rate of 16.22% is not forward looking because it incorporates 80% spare capacity and it contradicts SBC-CA's statements that optimal fill rates for feeder plant are higher than for distribution.

105. SBC-CA's DLC equipment fill factor is not reasonable because it has understated the capacity of the 6 x 16 CEV, and it has double-counted DLC equipment fill factors by modeling a fill factor for both the CEV structure and the equipment in the structure.

106. A 70% fill factor for DLC common equipment is reasonable because it allows for 10 years of growth and acknowledges that CEV sizes may not perfectly match real world conditions.

107. SBC-CA's fill factor for DLC plug-in equipment is not adequately supported given its current guidelines to minimize spare equipment.

108. A DLC plug-in equipment fill factor of 75% is reasonable given inventory management and other operational constraints.

109. It is reasonable to use an SAI fill factor of 67.8% given the admitted errors in SBC-CA's fill factor.

110. HM 5.3 undersizes premise termination equipment by modeling only 2 pairs per residence, which leaves no room for a third line.

111. SBC-CA overestimates premise termination equipment by modeling equipment for 6 line terminations at each residence, which is greater than forward-looking estimations of lines per residence and ignores the economies of serving multiple dwelling units.

112. Neither HM 5.3 nor the SBC-CA models determine appropriate NID sizes based on multiple dwelling units and it is unclear how to modify the premise termination fill factors without modifying the underlying assumptions in each model.

113. SBC-CA's linkage of fill factors and maintenance expenses is not reasonable because it has only analyzed the effect of fill levels on one aspect of loop costs rather than total loop costs.

114. SBC-CA has not shown a linkage between higher fill levels and higher maintenance for feeder, DLC equipment, or switching equipment.

115. The linkage of fill factors and maintenance expenses is not reasonable because SBC-CA has not shown the linkage applies to anything other than copper cable with distribution fills above 50%.

Structure Sharing

116. The structure sharing percentages between utilities assumed in HM 5.3 are not reasonably supported.

117. The structure sharing percentages in the SBC-CA models are not reasonable because they cannot be identified.

118. It is reasonable to use the structure sharing percentages adopted by the FCC in its Synthesis Model.

119. It is reasonable to assume 55% sharing of feeder and distribution facilities given findings of the FCC on this subject and SBC-CA's own guidelines.

Plant Mix

120. It is reasonable to adopt SBC-CA's plant mix assumptions for our model runs rather than assumptions based on ARMIS data dating back eleven years.

Labor Costs

121. It is more reasonable to use actual SBC hourly wage rates than expert judgment, whenever possible.

122. HM 5.3 underestimates crew sizes in certain circumstances, such as cable placing and splicing.

123. The labor loading adjustments suggested by JA's witness Flappan are not reasonable because they are based on nationwide information for companies that are not reasonably similar to SBC-CA.

Crossover Point

124. It is not clear whether loops longer than 12,000 feet can provide other elements as required by TELRIC.

125. The Commission should model a crossover point of 12,000 feet.

Switch Vendors

126. It is more reasonable to model Lucent and Nortel switches in SBC-CA's network because Siemens switches may not provide all the functions and capabilities provided by the switches currently deployed in SBC-CA's network.

New and Growth Lines

127. JA propose unreasonable assumptions regarding the percentage of lines that can be purchased at the new line discount price.

128. It is reasonable to assume that 40% of lines are purchased at the new line price and 60% of lines at the growth line price to recognize that a carrier would not be able to buy all the switch investment it needs at the new line price currently applicable to SBC-CA.

129. SBC-CA has not adequately supported its "other replacement costs" that it models with switching investments. These should be removed from

Commission model runs because they appear to relate to SBC-CA's embedded switching network.

130. It is reasonable to include upgrade costs in our switching investment modeling.

Vertical Features

131. Feature hardware and software costs that are incurred through per line, per switch, or buyout charges should be modeled in the monthly port price.

132. SBC-CA's feature cost study double counts feature hardware costs that are already included in the per line switching price.

133. Costs to upgrade the switch memory and processor are included in switch upgrade costs as part of the per line switching investment.

Rate Structure

134. It is unreasonable to assume SBC-CA will exceed the capacity limitations in its switch vendor contracts because switches are provisioned based on a 10-year forecast of capacity requirements and average utilization is below the minimum switch capacity that is provisioned under the contracts.

135. UNE Switch pricing should be a flat price per line because SBC-CA switching costs do not change as long as usage does not rise above the maximum CCS level in the switching contract.

136. A flat per port price for switching usage is consistent with TELRIC guidance that rate structures should reflect the manner in which costs are incurred.

137. The flat per port switching rates adopted in this order should not apply in the context of reciprocal compensation between carriers because changes to reciprocal compensation rate structures are beyond the scope of this proceeding.

The usage sensitive rates shown in Appendix C can be used for reciprocal compensation purposes.

Switch Fill Factors

138. It is not reasonable for SBC-CA to apply a low digital fill factor when it contends its customer base is declining.

139. SBC-CA has not shown why analog and digital switch fill rates should differ so drastically.

140. Switching equipment is highly modular and can be expanded in less than a year, so it is reasonable to use higher fill rates for switching equipment.

141. It is reasonable to apply an 82% fill factor to analog and digital lines in the models.

DS-3 Loop Rates

142. It is reasonable to adopt deaveraged DS-3 loop rates because the models can calculate costs to support this result.

Annual Reexamination Process

143. The Commission should suspend further reexamination of UNE prices until February 2007 to provide wholesale pricing stability in the local exchange market.

O R D E R

IT IS ORDERED that:

1. The recurring prices for unbundled network elements (UNEs) offered by Pacific Bell Telephone Company d/b/a SBC California (SBC-CA) that are set forth in Appendices A and C to this decision satisfy the requirements of Section 251(c)(2), 251(c)(3), and 252(d)(1) of the Telecommunications Act of 1996 and are hereby adopted.

2. Pursuant to Commission Resolution ALJ-181 (adopted October 5, 2000), SBC-CA shall prepare amendments to all interconnection agreements between itself and other carriers. Such amendments shall substitute the recurring UNE

prices set forth in Appendices A and C for the UNE prices set forth in such interconnection agreements. Such amendments shall be filed with the Commission's Telecommunications Division, pursuant to the advice letter process set forth in Rules 6.1 and 6.2 of Resolution ALJ-181, within 30 days after the effective date of this order. The amendments do not require a signature of the carriers involved as long as the amendments are limited to substituting the UNE rates adopted in today's order. Unless protested, such amendments shall become effective 30 days after filing. The flat per port switching rates adopted in this order shall not apply in the context of reciprocal compensation between carriers. The rates shown in Appendix C shall be used for reciprocal compensation purposes.

3. The UNE prices adopted in this order shall be effective on the date this order is effective. SBC-CA shall make all billing adjustments necessary to ensure that this effective date is accurately reflected in bills applicable to these UNEs. SBC-CA shall have 60 days from the date of this order to complete the billing program changes necessary to reflect in bills the recurring prices for UNEs adopted in this order. Upon completion of said billing program changes, SBC-CA shall notify the Director of the Telecommunications Division in writing that all of the necessary billing program changes have been completed.

4. Within 90 days of the effective date of this order, SBC-CA shall calculate any billing adjustments owed to or by interconnecting carriers based on the implementation of the rates in this order and ensure these adjustments are reflected in its bills for recurring UNE prices.

5. The annual nomination procedure set forth in Ordering Paragraph 11 of Decision (D.) 99-11-050 is suspended until 2007. SBC-CA or carriers with which

SBC-CA has interconnection agreements, may file nominations of UNEs for review, as described in D.99-11-050, between February 1 and March 1, 2007.

6. Application (A.) 01-02-024, A.02-02-035, A.02-02-031, A.02-02-032, A.02-02-034, and A.02-03-003 are closed.

This order is effective today.

Dated _____________________, at San Francisco, California.

Appendix A
Adopted UNE Rates *

UNEs	Current Rates	Commission Run of SBC-CA Models	Commission Run of HM 5.3	Adopted UNE Rates [1]
Loop				
2-Wire Loop	$ 9.82	$ 13.31	$ 12.52	$ 12.92
Zone 1	$ 8.24	$ 12.01	$ 9.82	$ 10.91
Zone 2	$ 11.19	$ 14.89	$ 13.58	$ 14.23
Zone 3	$ 19.69	$ 18.57	$ 32.56	$ 25.56
4-Wire Loop	$ 36.27	$ 29.58	$ 23.27	$ 26.43
Coin Option	$ 2.98	$ 1.55	$ 0.31	$ 0.93
PBX Option	$ 2.21	$ 1.25	$ -	$ 0.63
ISDN Option	$ 4.51	$ 3.59	$ 0.28	$ 1.94
DS-1 Loop	$ 93.91	$ 57.99	$ 33.43	$ 45.71
Zone 1	$ 89.68	$ 56.92	$ 26.44	$ 41.68
Zone 2	$ 97.78	$ 58.10	$ 40.25	$ 49.17
Zone 3	$ 119.40	$ 66.83	$ 87.16	$ 77.00
DS-3 Loop	N/A	$ 490.58	$ 374.94	$ 432.76
Zone 1	N/A	$ 413.25	$ 334.91	$ 374.08
Zone 2	N/A	$ 611.48	$ 440.16	$ 525.82
Zone 3	N/A	$ 1,206.65	$ 717.70	$ 962.17
4-wire CO Facility Interface Connection	$ 15.15	$ 0.41	$ 2.89	$ 1.65
Port [2]				
2-Wire	$ 0.83	$ 2.83	$ 2.45	$ 2.64
Coin	$ 1.12	$ 2.53	$ 2.39	$ 2.46
Centrex	$ 1.29	$ 2.83	$ 2.45	$ 2.64
DID	$ 1.26	$ 4.51	$ 7.18	$ 5.84
ISDN/BRI	$ 4.26	$ 7.28	$ 6.98	$ 7.13
DS-I	$ 6.31	$ 97.62	$ 160.13	$ 128.87
Switch Usage				
Interoffice - Originating				
Setup per Message	$ 0.001751	$ -	$ -	$ -
Holding Time per MOU	$ 0.000547	$ -	$ -	$ -
Interoffice - Terminating				
Setup per Message	$ 0.002076	$ -	$ -	$ -
Holding Time per MOU	$ 0.000554	$ -	$ -	$ -
Intraoffice				
Setup per Message	$ 0.003974	$ -	$ -	$ -
Holding Time per MOU	$ 0.001071	$ -	$ -	$ -
Unbundled Tandem Switching				
Setup per Attempt	$ 0.000153	$ 0.001653	$ 0.000407	$ 0.001030
Setup per Completed Message	$ 0.000231	$ 0.001799	$ 0.000155	$ 0.000977
Holding Time per MOU	$ 0.000135	$ 0.001198	$ 0.000407	$ 0.000802
Trunk Port Termination				
End Office Termination	$ 6.31	$ 97.62	$ 166.48	$ 132.05
Unbundled Dedicated Transport				
Voice Grade - Fixed	$ 3.05	$ 33.67	$ 4.73	$ 19.20
Variable mileage per mile	$ 0.185735	$ 0.002772	$ 0.008464	$ 0.005618
DS-1 - Fixed	$ 32.15	$ 106.96	$ 34.30	$ 70.63
Variable mileage per mile	$ 1.873612	$ 0.063865	$ 0.203127	$ 0.133496
DS-3 - Fixed	$ 375.36	$ 413.98	$ 960.33	$ 687.15
Variable mileage per mile	$ 36.32	$ 1.60	$ 5.69	$ 3.64
SS7				
SS7 Links				
Voice Grade - Fixed	$ 3.05	$ 33.67	$ 4.73	$ 19.20
Variable mile	$ 0.185735	$ 0.002772	$ 0.008464	$ 0.005618
DS-1 - Fixed	$ 32.15	$ 106.96	$ 34.30	$ 70.63
Variable mile	$ 1.873612	$ 0.063865	$ 0.203127	$ 0.133496
Entrance Facility				
DS-3 Entrance Facility w/o equipment	$ 733.47	$ 124.82	$ 483.01	$ 303.91
UNE-P [3]	**$ 13.93**	**$ 17.67**	**$ 16.13**	**$ 16.90**

* All rates include a 21% markup for shared and common cost.

1 Adopted rate is average of Commission run of SBC-CA models and HM 5.3

2 The following port rates, 2-wire, Centrex and ISDN, include an additional $0.075 for SBC-CA and $0.061 for HM 5.3 of extraneous SS7 investment.

3 UNE-P calculated based on usage assumption of 1400 voice 700 toll.

Appendix B

Comparison of Proposed and Adopted UNE Rates *

UNEs	Current Rates	SBC-CA Proposal	JA Proposal	Adopted UNE Rates
Loop				
2-Wire Loop	$ 9.82	$ 23.86	$ 5.24	$ 12.92
Zone 1	$ 8.24	$ 21.81	$ 4.45	$ 10.91
Zone 2	$ 11.19	$ 27.16	$ 5.77	$ 14.23
Zone 3	$ 19.69	$ 28.99	$ 11.31	$ 25.56
4-Wire Loop	$ 36.27	$ 56.11	$ 9.94	$ 26.43
Coin Option	$ 2.98	$ 3.54	$ 0.13	$ 0.93
PBX Option	$ 2.21	$ 3.25	$ -	$ 0.63
ISDN Option	$ 4.51	$ 16.52	$ 0.13	$ 1.94
DS-1 Loop	$ 93.91	$ 112.24	$ 20.99	$ 45.71
Zone 1	$ 89.68	$ 109.11	$ 17.80	$ 41.68
Zone 2	$ 97.78	$ 115.95	$ 26.70	$ 49.17
Zone 3	$ 119.40	$ 125.20	$ 53.07	$ 77.00
DS-3 Loop	N/A	$ 573.20	$ 210.80	$ 432.76
Zone 1	N/A	$ 398.93	$ 205.05	$ 374.08
Zone 2	N/A	$ 590.58	$ 236.86	$ 525.82
Zone 3	N/A	$ 1,166.63	$ 325.32	$ 962.17
4-wire CO Facility Interface Connection	$ 15.15	$ 0.47	$ 2.49	$ 1.65
Port				
2-Wire	$ 0.83	$ 3.13	$ 1.28	$ 2.64
Coin	$ 1.12	$ 3.13	$ 1.28	$ 2.46
Centrex	$ 1.29	$ 3.13	$ 1.28	$ 2.64
DID	$ 1.26	$ 7.48	$ 4.01	$ 5.84
ISDN/BRI	$ 4.26	$ 12.32	$ 5.25	$ 7.13
DS-I	$ 6.31	$ 163.88	$ 85.88	$ 128.87
Switch Usage				
Interoffice - Originating				
Setup per Message	$ 0.001751	$ 0.001696	$ 0.000068	$ -
Holding Time per MOU	$ 0.000547	$ 0.000784	$ -	$ -
Interoffice - Terminating				
Setup per Message	$ 0.002076	$ 0.000266	$ 0.000068	$ -
Holding Time per MOU	$ 0.000554	$ 0.000784	$ -	$ -
Intraoffice				
Setup per Message	$ 0.003974	$ 0.001584	$ 0.000135	$ -
Holding Time per MOU	$ 0.001071	$ 0.000784	$ -	$ -
Unbundled Tandem Switching				
Setup per Attempt	$ 0.000153	$ 0.001561	$ 0.000360	$ 0.001030
Setup per Completed Message	$ 0.000231	$ 0.001728	$ 0.000135	$ 0.000977
Holding Time per MOU	$ 0.000135	$ 0.000836	$ 0.000360	$ 0.000802
Trunk Port Termination				
End Office Termination	$ 6.31	$ 163.88	$ 91.33	$ 132.05
Unbundled Dedicated Transport				
Voice Grade - Fixed	$ 3.05	$ 39.36	$ 4.01	$ 19.20
Variable mileage per mile	$ 0.185735	$ 0.008470	$ 0.003417	$ 0.005618
DS-1 - Fixed	$ 32.15	$ 124.04	$ 27.49	$ 70.63
Variable mileage per mile	$ 1.873612	$ 0.195415	$ 0.082006	$ 0.133496
DS-3 - Fixed	$ 375.36	$ 483.95	$ 769.80	$ 687.15
Variable mileage per mile	$ 36.32	$ 4.89	$ 2.30	$ 3.64
SS7				
SS7 Links				
Voice Grade - Fixed	$ 3.05	$ 39.36	$ 4.01	$ 19.20
Variable mile	$ 0.185735	$ 0.008470	$ 0.003417	$ 0.005618
DS-1 - Fixed	$ 32.15	$ 124.04	$ 27.49	$ 70.63
Variable mile	$ 1.873612	$ 0.195415	$ 0.082006	$ 0.133496
Entrance Facility				
DS-3 Entrance Facility w/o equipment	$ 733.47	$ 145.94	$ 386.05	$ 303.91
**UNE-P ** **	**$ 13.93**	**$ 30.33**	**$ 8.09**	**$ 16.90**

* All rates include a 21% markup for shared and common cost.

** UNE-P calculated based on usage assumption of 1400 voice 700 toll.

Appendix C

Switching Rates Based on Minute of Use *

UNEs	Current Rates	Commission Run of SBC-CA Models **	Commission Run of HM 5.3 **	Adopted UNE Rates **
Switch Usage				
Interoffice - Originating				
Setup per Message	$ 0.001751	$ 0.001744	$ 0.001085	$ 0.001414
Holding Time per MOU	$ 0.000547	$ 0.000950	$ 0.001008	$ 0.000979
Interoffice - Terminating				
Setup per Message	$ 0.002076	$ 0.000335	$ 0.001085	$ 0.000710
Holding Time per MOU	$ 0.000554	$ 0.000950	$ 0.001008	$ 0.000979
Intraoffice				
Setup per Message	$ 0.003974	$ 0.001641	$ 0.001162	$ 0.001402
Holding Time per MOU	$ 0.001071	$ 0.000950	$ 0.001008	$ 0.000979
Unbundled Tandem Switching				
Setup per Attempt	$ 0.000153	$ 0.001854	$ 0.000407	$ 0.001130
Setup per Completed Message	$ 0.000231	$ 0.001959	$ 0.001162	$ 0.001561
Holding Time per MOU	$ 0.000135	$ 0.001779	$ 0.000407	$ 0.001093

* All rates include a 21% markup for shared and common cost.

** Based on a 70 / 30 split of traffic sensitive / non-traffic sensitive cost.

Appendix D
Glossary of Acronyms

ACF	Annual cost factor
ARMIS	Automated Reporting Management Information System
BLS	Bureau of Labor Statistics (U.S. Dept. of Labor)
CAPM	Capital asset pricing model
CCPs	Consensus Costing Principles
CCS	Centi-call second
CEV	Controlled environmental vault
CLC	Competitive local exchange carrier
DA	Distribution area
DCF	Discounted cash flow
DLC	Digital loop carrier
DSL	Digital subscriber line
EF&I	Engineer, furnish and install
FCC	Federal Communications Commission
HM 5.3	HAI Model, Version 5.3
IDLC	Integrated digital loop carrier
ILEC	Incumbent local exchange carrier
IOF	Interoffice facilities
LEIS	Loop engineering information system database
LoopCat	Loop Cost Analysis Tool
MDU	Multiple dwelling unit
MST	minimum spanning tree
NID	Network interface device
NPRM	Notice of Proposed Rulemaking
OANAD	Commission Rulemaking 94-04-003 regarding “Open Access and Network Architecture Development”
POTS	Plain old telephone service
RBOC	regional bell operating company
ROE	return on equity
RT	Remote terminal
SAI	Serving area interface
SICAT	Switching Cost Analysis Tool
SONET	Synchronous optical network
SPICE	SBC’s Program for Interoffice and Circuit Equipment
SS7	Signaling System 7
SynMod	FCC’s Synthesis Model
TBO	Transitional benefit obligation
TELRIC	Total element long run incremental cost methodology
TSLRIC	Total service long run incremental cost methodology
TNS	Taylor Nelson Sofres
TRO	FCC’s Triennial Review Order
UDLC	Universal digital loop carrier
UNE	Unbundled network element
UNE-P	Unbundled network element platform

(END OF APPENDIX D)