PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

ENERGY DIVISION **RESOLUTION E-4519**
September 13, 2012

R E S O L U T I O N

Resolution E-4519 addresses an appeal by the California Energy Storage Alliance (CESA) to Energy Division staff's disposition of Pacific Gas & Electric (PG&E) supplemental Advice Letter 3253-G-A/3940-E-A. This Advice Letter, filed on behalf of the Self-Generation Incentive Program Administrators (PAs)[1], details revisions to the Self-Generation Incentive Program (SGIP) Handbook to implement Decision (D.) 11-09-015.

Proposed Outcome: This resolution approves the proposed revisions to the SGIP Handbook with modifications to include (a) elimination of certain data formatting requirements by performance data providers for combined heat and power (CHP) systems 300 kW and smaller, and (b) a 5 percent line loss differential between peak and off-peak times for the calculation of round-trip efficiency (RTE) for advanced energy storage (AES).

Estimated Cost: No additional cost is associated with this resolution.

By PG&E supplemental Advice Letter 3253-G-A/3940-E-A, filed on February 17, 2012.

SUMMARY

Pursuant to General Order (GO) 96-B, Section 7.7.1, this resolution addresses CESA's appeal of Energy Division's disposition of PG&E Advice Letter (AL) 3253-G-A/3940-E-A, a supplemental filing which proposed revisions to the SGIP Handbook to implement Decision (D.) 11-09-015.

[1] The SGIP PAs are PG&E, Southern California Edison Company (SCE), Southern California Gas Company (SoCalGas), and the California Center for Sustainable Energy (CCSE) in San Diego Gas & Electric (SDG&E) Territory.

This resolution approves the proposed revisions to the SGIP Handbook with modifications (a) eliminating certain data formatting requirements by performance data providers for CHP systems 300 kW and smaller, and (b) approving a 5 percent line loss differential between peak and off-peak periods for the calculation of RTE, as proposed in CESA's appeal of Energy Division staff's disposition letter. All other protests and appeals are rejected.

BACKGROUND

In compliance with D.11-09-015, PG&E, on behalf of the SGIP PAs, filed AL 3253-G/3940-E recommending revisions necessary to implement the decision. Protests to AL 3253-G/3940-E were received on November 28, 2011. On February 17, 2012, PG&E filed supplemental AL 3253-G-A/3940-E-A, which proposed additional revisions to the SGIP Handbook, including recommendations to implement the hybrid-Performance-Based Incentive payment structure; metering and monitoring protocols; and other amendments. On February 27, 2012, CESA and the California Clean DG Coalition (CCDC) filed protests. CESA requested an extension to the protest deadline to file additional comments, which was granted by Energy Division. On March 12, 2012, CESA filed a second protest letter.

On March 19, 2012, the SGIP PAs filed a reply to the protests requesting that Energy Division reject the issues raised by CESA and CCDC. Energy Division approved AL 3253-G-A/3940-E-A, with an effective date of March 22, 2012. On April 2, 2012, CESA appealed Energy Division staff's disposition letter and requested that a resolution be drafted and placed on the Commission agenda.

NOTICE

Notice of AL 3253-G-A/3940-E-A was made by publication in the Commission's Daily Calendar. PG&E stated that a copy of the AL was mailed and distributed in accordance with Section 3.14 of GO 96-B.

PROTESTS

PG&E's AL 3253-G/3940-E was protested by Flex Energy, Inc., CESA, Debenham Energy, CCDC, Ballard Power Systems, Bloom Energy, and SolarCity Corporation in a timely manner. PG&E filed a reply to protests on December 19, 2011. The modifications included in the protests to the original AL were either accepted and included in the supplemental AL, or deemed out of scope and inappropriate for the informal advice letter process.

PG&E's AL 3253-G-A/3940-E-A was also protested by CESA and CCDC in a timely fashion.

On March 19, 2012, the SGIP PAs filed a reply to the protests requesting that Energy Division reject the issues raised by CESA and CCDC.

Summary of the Protests to AL 3253-G-A/3940-E-A

The following summarizes the major issues raised in the protests and the SGIP PAs' replies to the corresponding issues.

Protest 1a / 1b. Site-specific Metering and Monitoring Protocols

CCDC proposes that the PAs allow small (between 30-500 kW) CHP projects to use site-specific, manufacturer-specific, or technology-specific alternate measurement and monitoring protocols that accurately assess system performance.[2] CCDC also suggests that the Commission require the SGIP PAs to evaluate very small CHP participation levels by the end of the first year, following the effective date of the 2012 SGIP Handbook revisions, to determine whether metering/performance data provider (PDP)[3] costs are barriers to SGIP participation for very small CHP projects.

In the supplemental AL, the SGIP PAs stated that CHP units 300 kW and smaller may use on-board electrical, thermal, and fuel metering systems to minimize costs, instead of the separately installed meters required for larger CHP systems. In their reply, the PAs stated their intent to remove the requirement for Electronic Data Interchange (EDI)[4] 867 data formatting by PDPs and their willingness to evaluate small CHP participation levels in the future in order to determine if current metering/PDP costs present barriers to SGIP participation.

Protest 2a. Temporary Greenhouse Gas Exemption for Energy Storage

CESA requests advanced energy storage (AES) systems be made temporarily exempt from the GHG emissions requirements set forth in statute (and

[2] CCDC Protest, p. 2.

[3] PDPs are responsible for reading and validating all performance meter data prior to the data being transferred to the SGIP PAs for payment of Performance-Based Incentives.

[4] EDI 873 refers to a specific data reporting format.

implemented in D. 11-09-015) in order to allow Energy Division additional time to monitor the methodology and basis for GHG compliance for distributed AES.

In their reply, the SGIP PAs state that exempting AES systems from the GHG requirement would be in violation of Public Utilities Code Section 379.6 (b), Senate Bill (SB) 412 (Kehoe, 2009), which states that eligibility for incentives in SGIP is limited to technologies that will achieve reductions in GHG emissions.[5]

Protest 2b. Round-Trip Efficiency Methodology Based on On-Peak and Off-Peak Emissions Factors

In the supplemental AL, the SGIP PAs propose a RTE requirement of 67.9% for all AES systems. In their protest, CESA proposes a new methodology for calculating the RTE requirement by comparing average emissions during off-peak charging with marginal avoided emissions for on-peak discharge. They argue that distributed AES will most likely be slow-charged over many hours and discharged for only a couple of hours during peak times.

In their reply, the SGIP PAs argue that it is important to maintain a consistent methodology for determining GHG emissions; that the marginal analysis of the impact of AES charging and discharging recommended in the Staff Proposal[6] is the most reasonable basis to determine GHG compliance; and, that 2011 saw more AES applications than any other technology type (a total of 147) - all of which meet the proposed 67.9% RTE requirement.[7] The SGIP PAs also note that they are open to adopting CESA's recommendation to analyze salient data from AES systems in the next few years in order to determine if future changes to the RTE are warranted.

Protest 3. Transmission and Distribution Line Losses

[5] All foregoing statutory references are to the Public Utilities Code.

[6] A September 30, 2010, ruling in R.10-05-004 released a Staff Proposal to recommend modifications to SGIP. The Staff Proposal is available at: http://docs.cpuc.ca.gov/efile/RULINGS/124214.pdf

[7] The RTE requirement was not officially in place when these applications were received. However, by filing the supplemental AL, the SGIP PAs signaled to the storage market that meeting the 67.9% RTE requirement was a condition of receiving an incentive. Thus, SGIP applications for AES included their respective RTE to meet the proposed requirement.

The 67.9% RTE requirement for all AES systems proposed by the SGIP PAs includes line losses at 7.8% for both charging and discharging. CESA argues that the RTE analysis for AES should consider the significant decrease in transmission and distribution line losses that result from AES peak-shifting, and recommends assuming a 5% line loss differential between peak and off-peak times.

No reply comments were filed on this issue.

Protest 4. Greenhouse Gas Exemption for Energy Storage Coupled with Renewable Generation

CESA argues that AES systems charged predominantly from renewables will reduce GHG emissions, and as such should be granted an exemption from demonstrating GHG reductions. Specifically, CESA recommends using a 75 percent baseline, wherein eligibility would be granted if an AES system uses 25 percent or less of its total energy input from non-renewable sources.

In their reply, the SGIP PAs note that, before such a methodology can be implemented, metering costs, configurations, and verification protocols must be established.

Protest 5. System Sizing Limitations for Advanced Energy Storage Paired with Distributed Generation

CESA argues that the system sizing limitations for AES paired with distributed generation should be removed. This size limitation was originally established in D.08-11-044, which states that "the size of the AES should not exceed the capacity of the accompanying generation" (pg. 18).

No reply comments were filed on this issue.

APPEALS

Energy Division's disposition was appealed by CESA in a timely fashion.

Summary of the Appeals

The issues raised in CESA's appeal are the same as those raised in protest, and include:

- Round-Trip Efficiency methodology based on on-peak and off-peak emission factors (Protest 2b)
- Transmission and distribution line losses (Protest 3)

- Greenhouse gas exemption for energy storage coupled with renewable generation (Protest 4)

DISCUSSION

The Commission has reviewed the ALs filed pursuant to D.11-09-015, the protests, reply comments, and subsequent appeal filed by CESA, and makes the following conclusions:

Protest 1a / 1b. Site-specific Metering and Monitoring Protocols

The Commission applauds the SGIP PAs' efforts to address metering and reporting cost barriers to participation in SGIP. Furthermore, we agree with CCDC and the SGIP PAs that it is reasonable to remove certain data formatting requirements for small CHP, since they are permitted to use on-board electrical, thermal, and fuel metering systems. Therefore, we exempt CHP systems 300 kW and smaller from the EDI 867 data formatting requirement. We also direct the SGIP PAs to continue to work with CCDC over the next year in order to determine if further changes to the metering/PDP requirements are necessary.

Protest 2a. Temporary Greenhouse Gas Exemption for Energy Storage

This protest is outside the scope of issues raised in PG&E's AL 3253-G-A/ 3940-E-A. Further, we agree with the SGIP PAs that the protest runs counter to D.11-09-015 and Section 379.6 (b) of the Public Utilities Code, which states: "Eligibility for incentives under the program shall be limited to distributed energy resources that the commission, in consultation with the State Air Resources Board, determines will achieve reductions of greenhouse gas emissions pursuant to the California Global Warming Solutions Act of 2006." To provide a categorical exemption from the GHG emissions reduction requirement for AES, even temporarily, would violate the provisions of Section 379.6 (b). Therefore, we reject Protest 2a.

Protest 2b / Appeal 1. Round-Trip Efficiency Methodology Based on On-Peak and Off-Peak Emissions Factors

The RTE requirement of 67.9% was first introduced by the Energy Division staff proposal in R.10-05-004, where it was vetted by the parties. In calculating the RTE, staff assumed that, in order to help reduce a customer's peak energy and demand charges, energy storage technologies would primarily charge from the grid during off-peak hours and discharge exclusively during on-peak hours. To account for the different emission profiles of the grid during on-peak and off-peak hours, staff used a combined cycle gas turbine (CCGT) as the marginal

generator during off-peak charging, with an emissions rate of 0.368 tonnes CO2/MWh; for on-peak discharging, a combustion turbine (CT) was used as the marginal generator, with an emissions factor of 0.575 tonnes CO2/MWh.

In their protest and appeal, CESA claims that distributed AES will likely be slower to charge than discharge. However, the precise ratio of charge to discharge time is determined not only by technology type, but also by application, which can range anywhere from 1:1 to 5:1 (i.e., the device takes 5 times longer to charge than discharge).[8] Among the 147 AES applications received for SGIP in 2011, the majority of systems have an average charge time of 2 hours and an average discharge time of approximately 2 to 4 hours. The current SGIP data suggests that the difference between charge and discharge times is substantially equivalent within a range of uncertainty. Thus, we find that the staff-proposed marginal avoided emissions methodology for establishing GHG compliance of AES technologies is appropriate.

The most important considerations for the RTE analysis are not the emissions factors themselves, however, but the *difference* between emissions factors for charging and discharging. In staff's analysis, the RTE requirement is calculated by subtracting net emissions produced (off-peak emissions resultant from AES charging) from net emissions avoided (peak hour emissions avoided from AES discharging). Following this method of calculation, the use of average or marginal emissions factors could result in a similar RTE so long as the differences between emissions factors used in the two scenarios are also similar.

In December 2010, Energy and Environmental Economics, Inc. (E3) provided a report to the California Energy Commission on the development of a GHG tool for buildings in California, which includes data on average and marginal seasonal emissions in California.[9] The report indicates that, based on 2008 IOU data, the difference between actual average emission rates during off-peak times and marginal emission rates during on-peak times is reasonably close to the difference between emissions factors used in the staff-proposed RTE

[8] David Connolly, "A Review of Energy Storage Technologies," available at: http://dconnolly.net/files/A%20Review%20of%20Energy%20Storage%20Technologies.pdf

[9] E3, "Developing a Greenhouse Gas Tool for Buildings in California: Methodology and User's Manual V.3," available at: http://ethree.com/documents/ghg/GHG%20Tool%20for%20Buildings%20in%20CA%20v3%20Dec2010.pdf

calculation.[10] We find that the peak and off-peak emissions factors used in the staff-proposed RTE calculation are appropriate, comply with the GHG requirement in Section 379.6 (b), and serve to advance one of the other core principals of the SGIP program: to encourage the deployment of distributed energy resources in California.

In sum, we find that the emissions factors in the staff-proposed RTE calculation are reasonable and appropriate in determining GHG compliance. Therefore, we reject protest 2b and appeal 1.

Protest 3 / Appeal 2. Transmission and Distribution Line Losses

The staff-proposed RTE calculation methodology uses a 7.8% line loss factor for both on- and off-peak periods. In their protest and in the appeal of Energy Division's disposition letter, CESA notes two studies that estimate the range of line losses between peak and off-peak times. They include: a report by the Regulatory Assistance Project, which states that resistive losses can be "four times as great during the summer afternoon peak as they average over the year" and cites Federal Energy Regulatory Commission data referring to average annual losses ranging from 6-11%; and, the Center for the Study of Energy Markets, which estimates minimum losses at 4.3% and maximum losses at 12%. In the distributed generation cost-effectiveness framework adopted by the Commission in D.09-08-026, differences in marginal energy loss factors during summer peak and off-peak times range from 1 - 4.44%, according to the Avoided Cost Calculator developed by E3.[11]

The increase in transmission and distribution line losses during peak demand, as more current passes through transmission and distribution lines, often during periods of high temperature, is well established.[12] We find a 5% differential line loss between on-peak and off-peak times to be reasonable, and adopt it here. The

[10] Using E3's report, the difference between average and marginal emissions factors is approximately 150 tonnes CO2/MWh. The difference between emissions factors in the current RTE calculation is approximately 200 tonnes CO2/MWh.

[11] E3, Avoided Cost Calculator (12/15/10), available at: http://ethree.com/public_projects/cpucdr.php.

[12] Lana Wong, "A Review of Transmission Losses in Planning Studies," available at: http://www.energy.ca.gov/2011publications/CEC-200-2011-009/CEC-200-2011-009.pdf.

5% differential shall be applied to the RTE calculation by assuming line losses of 10.3% during peak discharging and of 5.3% during off-peak charging.

Keeping all other factors unchanged, the revised RTE requirement for AES to be eligible to participate in SGIP is recalculated as 63.5%, as specified in Attachment A. Accordingly, we direct the SGIP PAs to file a Tier 1 Advice Letter to implement this change in the SGIP Handbook.

Protest 4 / Appeal 3. Greenhouse Gas Exemption for Energy Storage Coupled with Renewable Generation

Under current SGIP rules, energy storage may be coupled with renewable generation provided that the participating AES technology meets the minimum RTE requirement and is able to discharge its rated capacity for a minimum of 2 hours. While we agree with the SGIP PAs that it would be premature to grant this request prior to establishing metering and verification protocols, the larger policy consideration in this protest and appeal is whether energy storage coupled with renewable generation meets the intent behind Section 379.6 (b).

The extent to which energy storage coupled with renewable generation reduces GHG emissions depends not only on the mix of generation used to charge AES, but also the RTE characteristics of the storage device and the periods during which charging and discharging occur. For example, charging energy storage from solar photovoltaic (PV) generation during on-peak times may actually lead to lower GHG emissions reductions, due to RTE losses, than if the renewable generation were otherwise exported directly to the grid. A lower RTE factor in this example would further decrease the amount of renewable generation exported to the grid. Since there are a number of different renewable DG technology types that may be coupled with energy storage under SGIP, all of which have unique operating behaviors and generation periods, it is unclear at this time whether charging any AES technology from renewable generation would reduce GHG emissions. Furthermore, it is not evident from either the protest or appeal why 75 percent is the appropriate minimum baseline for AES to charge from renewable resources in order to comply with Section 379.6 (b).

Given these concerns, we reject protest 4 and appeal 3. However, we fully support continued collaboration between the SGIP PAs, CESA and other industry representatives in order to provide additional data and analysis should an exemption for energy storage coupled with renewable generation be warranted in the future.

Protest 5. System Sizing Limitations for Advanced Energy Storage Paired with Distributed Generation

Per Section 5.2 of GO 96-B, a petition for modification is the appropriate filing to modify a decision issued in a formal proceeding. The system sizing limitation for AES was established in D. 08-11-044, and is therefore outside the scope of this resolution. Accordingly, we reject protest 5.

COMMENTS

Public Utilities Code section 311(g)(1) provides that this resolution must be served on all parties and subject to at least 30 days public review and comment prior to a vote of the Commission. Section 311(g)(2) provides that this 30-day period may be reduced or waived upon the stipulation of all parties in the proceeding.

Comments were filed by CESA on September 4, 2012.

In comments on the draft Resolution, CESA does not challenge the Commission's rejection of a "categorical (GHG) exemption….even temporarily" of AES technologies, but argues that PU Code 379.6 states that eligibility for incentives is limited to technologies that the Commission "determines *will* achieve GHG reductions." [Emphasis added.] Therefore, a determination of performance may include a future perspective, and placing an unnecessary requirement on storage may hinder the deployment of AES technologies. CESA believes that there will be sufficient market transformation such that the performance of AES technologies will be GHG reducing over time, and that it is more appropriate to provide a temporary incentive to spur the adoption of AES.

We disagree with CESA's argument that sufficient market transformation is required before the SGIP program can determine whether the performance of AES results in GHG reductions. D.11-09-015 states that a GHG reduction test as a screen for SGIP eligibility is consistent with PU Code 379.6,[13] and further establishes specific GHG requirements that technologies must meet while participating in the SGIP program. Thus, to exempt AES technologies from any GHG-reduction tests at this time is inconsistent with the intent of D.11-09-015.

[13] D.11-09-015, Conclusion of Law 1.

CESA also argues that a GHG exemption for AES coupled with renewable generation where an AES system uses 25 percent or less of its total energy input from non-renewable sources is consistent with the goals and the spirit of PU Code 379.6 and D.11-09-015. We disagree with this assertion for the reasons stated in the Discussion section.

FINDINGS AND CONCLUSIONS

1. Commission Decision 11-09-015 directed the Self-Generation Incentive Program Administrators to file Advice Letters in order to implement modifications to the Self-Generation Incentive Program, including proposals for a Hybrid Performance-Based-Incentive structure, metering and monitoring protocols, and other amendments.
2. It is reasonable to eliminate certain data formatting requirements for small combined heat and power systems, as requested by the California Clean Distributed Generation Coalition and agreed to by the Self-Generation Program Administrators.
3. To provide a categorical exemption from the greenhouse gas emissions reduction requirement for advanced energy storage systems, even temporarily, as requested by the California Energy Storage Alliance, would violate the provisions in Section 379.6 (b) of the Public Utilities Code.
4. The peak and off-peak emissions factors used in the Round-Trip Efficiency calculation as recommended in the supplemental Advice Letter 3253-G-A /3940-E-A are appropriate, comply with the greenhouse requirement in Public Utilities Code Section 379.6 (b), and serve to advance the goals of the Self-Generation Incentive Program.
5. The Commission finds that the difference in line losses that occur between peak and off-peak times is well documented, and that it is reasonable to modify the current Round-Trip Efficiency calculation methodology for advanced energy storage to utilize a 5 percent line loss differential between peak and off-peak periods.
6. Additional data and analysis, as well as metering and monitoring protocols, are needed in order to ensure that advanced energy storage paired with a renewable technology will result in greenhouse gas reductions. Therefore, it is premature to grant an exemption from the greenhouse gas requirements for advanced energy storage coupled with renewable generation at this time. The Program Administrators should continue to work with the California

Energy Storage Alliance and other industry representatives in order to develop these protocols.

THEREFORE IT IS ORDERED THAT:

1. Advice Letter 3253-G-A/3940-E-A is approved as modified herein, effective February 17, 2012.

2. Pacific Gas & Electric Company, Southern California Edison Company, Southern California Gas Company, and the California Center for Sustainable Energy shall eliminate Electronic Data Interchange 867 data formatting requirements in the Self-Generation Incentive Program for combined heat and power systems 300 kW and below, as discussed herein.

3. Pacific Gas & Electric Company, Southern California Edison Company, Southern California Gas Company, and the California Center for Sustainable Energy shall revise the Round-Trip Efficiency requirement for advanced energy storage to be eligible to participate in the Self-Generation Incentive Program, according to the changes specified herein and in Attachment A.

4. Within 30 days of the issuance of this resolution, Pacific Gas & Electric Company, Southern California Edison Company, Southern California Gas Company, and the California Center for Sustainable Energy shall file a Tier 1 Advice Letter revising the Self-Generation Incentive Program Handbook to conform to the changes in Ordering Paragraphs 2 and 3.

This resolution is effective today.

I certify that the foregoing resolution was duly introduced, passed and adopted at a conference of the Public Utilities Commission of the State of California held on September 13, 2012, the following Commissioners voting favorably thereon:

/s/ PAUL CLANON
Paul Clanon
Executive Director

MICHAEL R. PEEVEY
President
TIMOTHY ALAN SIMON
MICHEL PETER FLORIO
CATHERINE J.K. SANDOVAL
MARK J. FERRON
Commissioners

Attachment A

Round-Trip Efficiency Calculation for Advanced Energy Storage Technology

Appendix A: SGIP Staff Proposal GHG Analysis Workbook, Page 1

Storage Minimum Performance Outcomes

Storage Assumptions

Round Trip Efficiency (min.)	63.50%	
Charge/Discharge Time	2	hours
Operation Days	260	/year
Performance Degradation	1%	

Grid Assumptions

GHG Emissions Factor (Charge)	368	Kg/MWH
GHG Emissions Factor (Disch.)	575	
T&D losses (Charge)	5.3%	
T&D losses (Disch.)	10.3%	

Technology	Capacity	Charging*	Line Losses (Charging)**	Net Generation, Charging	Net Emissions Produced	Discharging	Line Losses (Discharging)	Net Generation, Discharging	Net Emissions Avoided	Annual Net Emissions Reduction
Year	MW	MWh	MWh	MWh	Tonne CO2E	MWh	MWh	MWh	Tonne CO2E	Tonne CO2E
Energy Storage										
1	1	819	46	865	318	520	60	580	333	15
2	1	819	46	865	318	515	59	574	330	12
3	1	819	46	865	318	510	59	568	327	8
4	1	819	46	865	318	505	58	562	323	5
5	1	819	46	865	318	500	57	557	320	2
6	1	819	46	865	318	495	57	551	317	(1)
7	1	819	46	865	318	490	56	546	314	(4)
8	1	819	46	865	318	485	56	540	311	(8)
9	1	819	46	865	318	480	55	535	308	(11)
10	1	819	46	865	318	475	55	530	305	(14)
Total	**1**	**8,189**	**458**	**8,647**	**3,182**	**4,972**	**571**	**5,543**	**3,187**	**5**

Round trip efficiency for energy storage must be greater than or equal to 63.5% in order for energy storage to be GHG reducing.

SGIP GHG Analysis Workbook available at: http://www.cpuc.ca.gov/PUC/energy/DistGen/sgip/proposal_workshops.htm