BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Regarding Policies, Procedures and Rules for the California Solar Initiative, the Self-Generation Incentive Program and Other Distributed Generation Issues.	Rulemaking 12-11-005 (Filed November 8, 2012)

COMMENTS OF THE CALIFORNIA ENERGY STORAGE ALLIANCE IN RESPONSE TO ASSIGNED COMMISSIONER'S RULING SEEKING COMMENT ON UPDATING THE GREENHOUSE GAS EMISSION FACTOR FOR SELF-GENERATION INCENTIVE PROGRAM ELIGIBILITY

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FACTOR FOR SELF-GENERATION INCENTIVE PROGRAM ELIGIBILITY**

The California Energy Storage Alliance ("CESA")[1] hereby submits these comments

pursuant to the Rules of Practice and Procedure of the California Public Utilities Commission

("Commission"), and the *Assigned Commissioner's Ruling Requesting Comment on Updating*

Greenhouse Gas Emission Factor for Self-Generation Incentive Program Eligibility, issued by

Assigned Commissioner, President Michael Picker on March 27, 2015 ("ACR").

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[1] 1 Energy Systems Inc., Abengoa, Advanced Microgrid Solutions, AES Energy Storage, Aquion Energy, ARES North America, Brookfield, Chargepoint, Clean Energy Systems, CODA Energy, Consolidated Edison Development, Inc., Cumulus Energy Storage, Customized Energy Solutions, Demand Energy, Duke Energy, Dynapower Company, LLC, Eagle Crest Energy Company, East Penn Manufacturing Company, Ecoult, ELSYS Inc., Energy Storage Systems, Inc., Enersys, EnerVault Corporation, Enphase ENERGY, EV Grid, Flextronics, GE Energy Storage, Green Charge Networks, Greensmith Energy, Gridtential Energy, Inc., Hitachi Chemical Co., Ice Energy, IMERGY Power Systems, Innovation Core SEI, Inc. (A Sumitomo Electric Company), Invenergy LLC, K&L Gates, LG Chem Power, Inc., LightSail Energy, Lockheed Martin Advanced Energy Storage LLC, LS Power Development, LLC, Manatt, Phelps & Phillips, LLP, Mitsubishi Corporation (Americas), Mobile Solar, NEC Energy Solutions, Inc., NextEra Energy Resources, NRG Solar LLC, OutBack Power Technologies, Panasonic, Parker Hannifin Corporation, Powertree Services Inc., Primus Power Corporation, Princeton Power Systems, Recurrent Energy, Renewable Energy Systems Americas Inc., Rosendin Electric, S&C Electric Company, Saft America Inc., Sharp Electronics Corporation, Skylar Capital Management, SolarCity, Sony Corporation of America, Sovereign Energy, STEM, SunEdison, SunPower, Toshiba International Corporation, Trimark Associates, Inc., Tri-Technic, Wellhead Electric (www.storagealliance.org).

CESA strongly supports the continuation of the SGIP pursuant to Senate Bill 861, and appreciates this opportunity to comment on greenhouse gas emissions factors. The SGIP is strategically important to the development and evolution of grid storage in California, not only for customer-sited applications but also for broader grid application. The SGIP effectively advances grid connected energy storage projects and is helping to build the broader ecosystem (e.g. installation, permitting, metering, interconnection) necessary to support all applications of energy storage on the grid. The SGIP is also a critical component of California's energy storage procurement goal per D. 13-10-040, which requires 200 MW of customer-sited energy storage to be procured by 2020. To date, the SGIP has been the primary means to meet this goal.

I.   INTRODUCTION.

Public Utilities Code Section (P.U.) 379.6 was amended on June 20, 2014 by Senate Bill 861 ("SB 861") to include the following additional requirement that must be met by applicants for incentives available under the Self-Generation Incentive Program ("SGIP"):

"On or before July 1, 2015, the commission shall update the factor for avoided greenhouse gas emissions based on the most recent data available to the State Air Resources Board for greenhouse gas emissions from electricity sales in the self-generation incentive program administrators' service areas as well as current estimates of greenhouse gas emissions over the useful life of the distributed energy resource, including consideration of the effects of the California Renewables Portfolio Standard."

CESA strongly supports updating the greenhouse gas ("GHG") emission factors in light of the ongoing transformation in the resources serving California's load, to ensure that the SGIP is appropriately incentivizing technologies that reduce GHG emissions and support California's clean energy policy goals. On January 5, 2015, Governor Brown announced bold new goals for California in his inauguration address, including a 50% renewable target by 2030, further increasing the urgency to revisit emissions factors in consideration of the effects of existing and potential increases in California's Renewable Portfolio Standard ("RPS").

II.   CESA'S RESPONSES TO QUESTIONS POSED FOR COMMENT.

   1) Should the updated SGIP GHG eligibility factor(s) use a short run methodology, a long run methodology, or a combination of the two? Why?

CESA RESPONSE: CESA supports an assumption implicit to the long run approach; namely that in reducing load, SGIP generation technologies displace new RPS generation as well as gas generation. As renewable energy grows as a percent of the state's generation mix, with a likely target of 40% renewables by 2024 and a 50% target by 2030, the displacement effect will become increasingly important. Considering this, CESA recommends that the CPUC use the emissions rate of a combined cycle gas turbine (CCGT), discounted by an appropriate forecasted RPS adjustment of 33%-50%.

However, CESA notes that energy storage, as a non-net-generating technology, will not displace RPS energy. By capturing renewable energy that would otherwise have been curtailed, energy storage will actually allow fewer RPS resources to meet a greater RPS energy requirement. Additionally, energy storage will be able to provide otherwise-curtailed renewable energy to onsite customers and to the grid at the highest value times of day, maximizing the value of California's RPS portfolio.

As discussed in our responses to Questions 9 and 10 below, the operational benefits of energy storage will actually increase as additional distributed and RPS renewables are added to the grid. Energy storage can provide additional system benefits in the form of reduced gas generation starts, which can improve the operational cost and GHG performance of the grid overall. The effects of energy storage are difficult to capture in the SGIP eligibility factor methodology, so CESA would like to propose a methodology based upon production cost modeling, as discussed in our answer to Question 10.

   2) Section 379.6(b)(2) directs the Commission to update the factor "based on the most recent data available to the State Air Resources Board for GHG emissions from

electricity sales in the self-generation incentive program administrators' service areas…" Based on your response to Question 1, exactly what data sources from ARB should be used and how should they be applied to derive the short run and/or long run-based factors?

CESA RESPONSE: The California Air Resources Board ("CARB") maintains and updates an extensive inventory of GHG data; however, they do not maintain a publicly-available data set that specifically reflects GHG emissions from electricity sales in each SGIP Program Administrator's territory. Pursuant to SB 861, CARB receives emissions data on certain SGIP-eligible technologies (e.g., CHP and fuel cell technologies); however, this data is inaccessible to parties outside the CARB due to legal confidentiality requirements.

CESA recommends that the Commission not necessarily restrict itself to only the CARB data as specified in the current SGIP methodology. However, should the Commission elect to rely on the CARB data within the AB 32 Scoping Plan as discussed in D.11-09-015, CESA believes the resulting emissions factor needs to be updated to include an RPS target of 40%. CESA encourages the Commission to be forward-looking in use of any and all-available data in establishing GHG emissions factors. Applicable GHG standards should be based on anticipated resource portfolios in California over time.

An Assigned Commissioner's Ruling issued in the 2014 Long Term Procurement Planning ("LTPP") proceeding included a variety of scenarios "crafted through a collaborative effort amongst CPUC, CEC, and CAISO staff to reflect a reasonable range of possible energy futures."[2] A driving factor underlying each scenario was the growing adoption of renewable energy. As such, multiple future scenarios included a 40% RPS target by 2024. The rationale was that, "the California legislature is exploring the establishment of a higher RPS target and

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[2] *Assigned Commissioner's Ruling on Assumptions, Scenarios and Renewable Portfolio Standard Portfolios in 2014 Long Term Procurement Plan and 2014-2015 California Independent System Operator Transmission Planning Process*, issued February 27, 2014, at p. 35.

trends in RPS procurement indicate a possibility of overshooting 33% by 2020 this scenario would provide policymakers with data to evaluate the system impact of this increased penetration of renewables on the grid.[3]" Since then, several bills have been introduced in the State Legislature that would codify Governor Brown's current climate goals, which include a 40% standard for renewable generation by 2024.[4] Governor Brown has also proposed an expansion of California's renewable energy target to 50% by 2030, further indicating California's likelihood to increase renewable energy beyond the 33% requirement. Considering this strong trend, the Commission should take this opportunity to enable the SGIP to support, and certainly not hinder, the state's progress toward achievement of these goals.

3) The emission factor adopted in D.11-09-015 assumes that SGIP technologies will avoid the need for new renewable generation in proportion to the 20% RPS goal in effect during the time the staff developed its proposals. P.U. Code Section 379.6(b)(2) also directs the Commission to include "consideration of the effects of the California Renewables Portfolio Standard." How should this be accomplished?
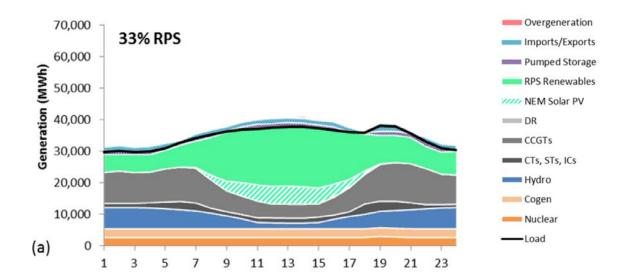
CESA RESPONSE: In D.11-09-015, the CPUC adjusted the ARB emissions factor downwards by 20% to account for the renewable resources required under the RPS. Going forward, CESA strongly urges the Commission to look toward California's anticipated renewable energy penetration when determining the GHG emissions factor for SGIP eligibility. Customer sited base load generation projects will decease net load and therefore directly contribute to renewable curtailment and over generation when renewable generation exceeds load during certain times of the day, effectively making zero emission renewable generation the marginal unit during those times. Modeled data from E3 forecasts that this level of over generation exists at 33% and becomes pervasive at 40% RPS and greater:
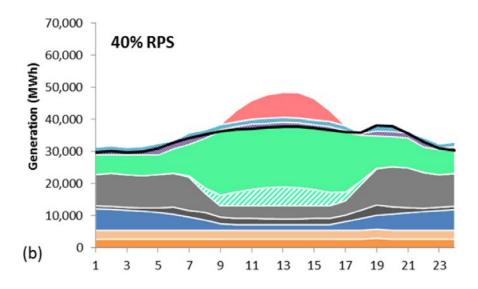
E^3 REFLEX Model: Generation mix for April day in 2030 with the 33% RPS, 40% RPS, and 50% RPS (assumes renewables are predominately solar)
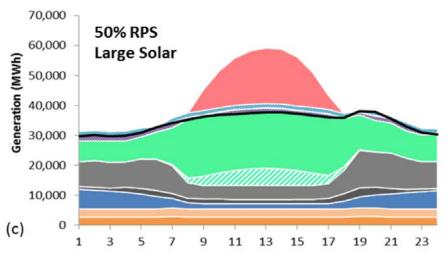
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[3] *Ibid*. Pg. 39.
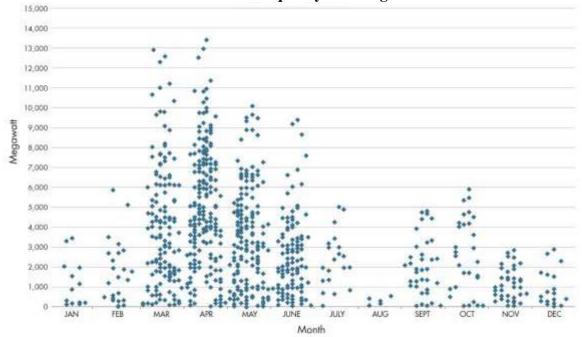[4] AB 21 (Perea); AB 645 (Williams); SB 32 (Pavley); SB 350 (De DLeon).

Overgeneration Statistics	33% RPS	40% RPS	50% RPS Large Solar
Total Overgeneration			
GWh/yr.	190	2,000	12,000
% of available RPS energy	0.2%	1.8%	8.9%
Overgeneration frequency			
Hours/yr.	140	750	2,000
Percent of hours	1.6%	8.6%	23%
Extreme Overgeneration Events			
99th Percentile (MW)	610	5,600	15,000
Maximum Observed (MW)	6,300	14,000	25,000

Source: *Investigating a Higher Renewables Portfolio Standard in California*. E3. 2014.
https://www.ethree.com/documents/E3_Final_RPS_Report_2014_01_06_ExecutiveSummary.pdfC
CAISO testimony earlier this year underscored this issue, and noted that the estimated renewable

curtailment magnitude and frequency would be significant at a 40% RPS scenario.

Estimated Renewable Curtailment Frequency and Magnitude in 2024 at 40% RPS

Source: Prepared statement of Mark Rothleder on behalf of the CAISO (February 20, 2015).
http://www.ferc.gov/CalendarFiles/20150220110211-Rothleder,%20CAISO.pdf

The effect of low net load is already manifesting itself in the form of zero or negative energy prices. On April 14, 2014, CAISO reported that 43% of their 5-minute energy prices were zero or negative during low net load times of the day.
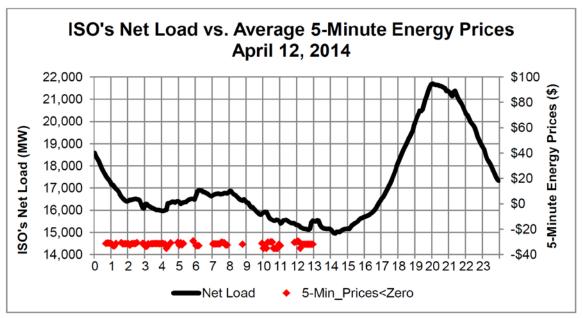

Chart Source: Prepared statement of Mark Rothleder on behalf of the CAISO (February 20, 2015).
http://www.ferc.gov/CalendarFiles/20150220110211-Rothleder,%20CAISO.pdf

The state is well on its way toward meeting and exceeding the current RPS of 33% renewables by 2020. It would be prudent at this time for the Commission to establish eligibility standards based on how SGIP projects can address the opportunities and challenges that will arise as we move beyond the 33% target.   Further, it is important to note that not all SGIP eligible technologies will contribute to reducing net load. For example, energy storage is ideally suited to reducing load on peak, but can actually beneficially increase load during times of over generation and low or negative pricing. The flexibility attributes inherent in energy storage will increase the operational flexibility of the grid to accommodate higher penetrations of renewable energy in the future.

In his 2014 LTPP testimony, Dr. Karl Meeusen, the Market Design and Regulatory Policy Lead in the CAISO's Markets and Infrastructure Policy Group, urged the Commission to: "consider the magnitude and frequency of curtailment to determine if the observed curtailment at 33% RPS but more importantly at 40% RPS is consistent with overall state policy objectives."[5] In other words, eligibility requirements for SGIP should consider the implications of a 40% RPS scenario, as SGIP eligible customer-sited projects will impact system-level GHG emissions and overall grid reliability. Furthermore, the Governor's recently announced energy goals included a 50% renewable energy target, so new legislation is likely to increase the current 33% RPS. CESA thus strongly recommends that the Commission use the 40% RPS for determining the approach to GHG eligibility in the SGIP. CESA believes it is a necessary component for future program eligibility to ensure that technologies receiving SGIP incentives are legitimately leading to GHG reductions.

4) For factors based on long run effects, what combination of technologies, and in what proportions, should SGIP projects be assumed to displace?

CESA RESPONSE: For factors based on long run effects, SGIP generating resources should be assumed to displace a combination of CCGTs and RPS resources. Non-net-generating resources such as energy storage should be viewed in the context of their operations on the grid, including their ability to capture renewable energy that would otherwise be curtailed, their capacity to shift renewable energy to higher-value times of day, and their ability to improve the overall operations of California's generating fleet.

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[5] Phase I.A. Direct Testimony of Dr. Karl Meeusen on behalf of the California Independent System Operator Corporation, dated October 22, 2014 and introduced in R.13-12-010.   Accessed at: http://www.caiso.com/Documents/Oct22_2014_ReplyTestimony_KarlMeeusen_Phase1ALong-TermProcurementPlans_R13-12-010.pdf

5) D.11-09-015 states that SGIP-funded technologies should avoid GHG emissions through at least the first ten years of operation, taking into account system degradation. Should that time frame be revised, and if so, why? Should the time frame be the same for all technologies? If not, what time frames should apply to which technologies and why? How does your proposal comply with the requirement in § 379(b)(2) that the methodology account for "estimates of greenhouse gas emissions over the useful life of the distributed energy resource"?

CESA RESPONSE: CESA sees no reason to change the Commission's current 10-year time frame for measuring the GHG savings enabled by SGIP technologies. Consistent with D.11-09-015, the 10-year horizon should be the same for all technologies.

The Commission should additionally ensure that the SGIP incentivizes technologies that will continue to enable GHG savings in the long term. That is, the SGIP should incentivize technologies that improve the emissions profile of the grid not only in the next ten years, but also as even more renewables are added to the grid. To the extent that SGIP enables technologies that provide future grid emissions reductions, there will be a beneficial emissions multiplier effect on SGIP incentives provided today. An example can be found in distributed photovoltaic ("PV") solar, which was initially incentivized and enabled in California through the SGIP program. Distributed PV is now being installed without state incentives, multiplying the benefit of SGIP incentives provided to PV in the previous decade.

6) Should the 1% per year assumption for performance degradation be revised for one or more SGIP-eligible technologies, and if so, using what data sources?

CESA RESPONSE: CESA does not believe performance degradation needs to be revised at this time.

7) Should the 7.8% line loss factor adjustment to the GHG factor be revised? Explain why or why not. If so, using what data? Should the factor vary by utility service territory, other geographic delineations, or generation profiles of different SGIP technologies? Explain why or why not.

CESA RESPONSE: The basis for the 7.8% line loss factor was CARB's "2008 Climate Change Scoping Plan."[6] The underlying calculation was actually drawn from an earlier study, the CEC's "California Energy Demand 2008-2018 Staff Revised Forecast".[7] According to the CEC, "(CARB) staff members used 7.8 percent since losses were 7.8 percent between 1990-2018 except for four years where it was 7.9 percent (1991, 1993, 1995, and 1998)."[8] Considering the extent to which the generation mix and transmission system has changed since 1990, the Commission should revisit this line loss assumption and update it using the most recent available data. A 2011 CEC study reported that the "average system losses for transmission and distribution…ranged from 5.4 percent to 6.9 percent during 2002 to 2008 based on CEC data. A slightly different range from 4.5 to 8.0 percent can be obtained using U.S. Energy Information Administration data."[9] CESA recommends that the Commission consider the more recent CEC data and update the line loss adjustment factor to the midpoint of its reported range, specifically 6.2%.

8) For SGIP-eligible CHP projects, should the 80% boiler efficiency factor be updated and if so, using what data? Should it vary based on the capacity of the SGIP project or the size of the thermal load? Since exports from technologies not subject to net energy metering do not reduce the utilities' metered load, and thus do not reduce the utilities' obligation to supply RPS-eligible generation, should estimate exports from CHP (or other technologies not subject to net energy metering) be subject to a different emission rate based only on other fossil-fired sources of generation? Explain why or why not.

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[6] *California Air Resources Board, Climate Change Scoping Plan and Climate Change Scoping Plan Appendices*, December 2008, available at:
www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm
[7] Marshall, Lynn and Tom Gorin, 2007. *California Energy Demand 2008-2018, Staff Revised Forecast. California Energy Commission*. Accessed at:
www.energy.ca.gov/2007publications/CEC-200-2007-015/CEC-200-2007-015-SF2.PDF
[8] Wong, Lana. 2011. *A Review of Transmission Losses in Planning Studies. California Energy Commission*. Pg. 24. Accessed at: http://www.energy.ca.gov/2011publications/CEC-200-2011-009/CEC-200-2011-009.pdf
[9] *Ibid*. Pg. 1.

CESA RESPONSE: The 80% boiler efficiency factor is still valid. Regardless of the net energy metering ("NEM") status of a resource, the alternative to a distributed generation resource is energy drawn from the grid. If the average grid heat rate is lower than the heat rate of the on site generation, it is not clear why that on site generation would be incentivized through the SGIP program.

9) Please answer the following questions related to determining the minimum round-trip efficiency for SGIP-eligible storage technologies.

a. In light of the ongoing transformation in the resources serving California's load, is the assumption that combined cycle plants are marginal during off-peak hours and simple cycle plants are marginal during peak hours still valid? Why or why not? If not, what mix of resources should the emission factor assume are on the margin and what data sources should be used? Be explicit regarding whether the effect is long-run, short run, or a combination of the two.

*CESA RESPONSE***:** In light of the ongoing transformation in the resources serving California's load, the assumption that combined cycle plants are marginal during off-peak hours and simple cycle plants are marginal during off-peak hours is no longer valid. The GHG emission profile of the marginal generator is changing dramatically as California implements increasingly higher RPS standards, as discussed in Question 3, above.

As renewable energy grows as a percentage of the overall generation mix, such resources will increasingly be on the margin. The CAISO is already experiencing midday negative pricing due to unneeded renewables[10], and CAISO's 40% RPS by 2024 modeling shows a significant increase in the frequency and magnitude of curtailment – exceeding 13,000MW in some instances during the spring.[11] Based on these forecasts, California's generation mix will likely experience an increase in wind on the margin at night, and solar on the margin during the day as the state meets (and exceeds) its current goal of 33% RPS. Additionally, the Governor's recently

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[10] Prepared statement of Mark Rothleder on behalf of the CAISO (February 20, 2015). Pg.3. http://www.ferc.gov/CalendarFiles/20150220110211-Rothleder,%20CAISO.pdf.
[11] *Ibid*. Pg. 5.

announced goal of 50% renewables by 2030 underscores the need to plan for an RPS level higher than 33%.

CESA also recognizes that customer-sited energy storage systems, given their unique ability to provide back-up power (in addition to other benefits), will displace diesel back-up generators. Diesel back-up systems are pervasive in California and pose significant environmental and human health risks. The South Coast Air Quality Management District ("SCAQMD") estimates that NOx emissions are 200-600x greater per unit of electricity produced than new or well-managed gas- fired power plants[12] and CARB estimates that the operation of an uncontrolled, one megawatt producing diesel generator "operated only during peak demand (250 hours per year) would result in a 50% increase in cancer risk due to diesel exhaust exposures for nearby residents."[13]

For the reasons stated above, CESA recommends that the Commission use the generation mix of the resources included in CAISO's 40% RPS goal for estimating the percentage of time that renewables are on the margin.

b. Would production cost modeling results be useful (e.g., testimony submitted in R.12-06-013) for the avoided GHG emission calculations for storage?

CESA RESPONSE: Production cost modeling is a very useful tool to calculate avoided GHG emissions and other system benefits enabled from deployment of energy storage. CESA strongly recommends use of production cost modeling not only for energy storage but also for other eligible resources. However, because most production cost models, like PLEXOS, are optimized

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[12] The SCAQMD is the air pollution control agency for all of Orange County and the urban portions of Los Angeles, Riverside and San Bernardino counties, the smoggiest region of the U.S. Accessed at: http://www.aqmd.gov/home/permits/emergency-generators#Fact2.

[13] *NRDC Recommendations for a Responsible California Electricity Policy Clean Air, Energy Efficiency, Renewable Resources*. February 19, 2001. Accessed at: www.nrdc.org/media/docs/encamyth_0219.doc

to procure the lowest cost generation, the GHG findings may not necessarily be optimized to their fullest. For example, much of the production cost modeling performed for California assigns costs on emissions for California generators, but not on generators elsewhere in the Western Energy Coordinating Council ("WECC"). This allows for a disproportionate amount of WECC generators with relatively high GHG factors (*e.g.,* coal) to provide energy to the state under PLEXOS simulations when economically feasible to do so. With respect to energy storage, the PLEXOS model is limited to providing ancillary services and the economically expedient time shifting of energy.

Despite these limitations, production cost modeling is still a useful tool for assessing marginal grid emissions rates. There is potential to use these kinds of simulations to estimate average emissions rates, and other operational metrics, such as unit starts, hours and magnitude of curtailment, marginal cost-based prices, and unit dispatch in general. These metrics will be especially important in phase 2 of this proceeding, which will attempt to estimate the value of SGIP resources to the market at large

To provide a first cut at the system benefits of energy storage, CESA retained Energy Exemplar, creator of the PLEXOS computer model, to run CAISO's 40% RPS scenario. Model results are highlighted in Question #10.

> c. To the extent your proposed methodology assumes that storage affects natural gas-fired generation, should the emission factor for combined cycle and simple cycle power plants be updated, and if so, using what data?

CESA RESPONSE: Because CESA recommends using PLEXOS modeling, the emissions rates for gas-fired generation included in the 40% CAISO RPS scenario PLEXOS model should be used.

> d. Should the line loss factors of 5.3% for off-peak and 10.3% for on peak adopted in Resolution E-4519 be updated, and if so, using what data?

CESA RESPONSE: CESA believes the line loss differential between off-peak and on-peak periods should be revised in order to reflect the fact that resistive line losses grow exponentially with load and marginal line losses are approximately twice the amount of the average losses across the transmission and distribution system.[14]

Resistive line losses are calculated using the formula I^2R. Here, "I" is the amperage (current) on any particular transformer or distribution line, and "R" represents the resistance of the wires through which that current flows. It is generally accepted that "R" is constant throughout the year while "I" is a direct function of the energy demand.[15] As the formula suggests, resistive losses increase with the square of the current, meaning resistive line losses increase exponentially as load increases linearly. For example, if the peak load is twice the average load, the resistive loses are four times as great.

According to the CAISO, marginal resistive loses are approximately two times higher than the average resistive losses.[16] This finding is corroborated by the Regulatory Assistance Project[17,] and the Natural Resource Defense Council.[18] When charging off-peak and discharging on-peak, energy storage will be subject to marginal line losses, not average line losses. Therefore, the line loss differential for storage should be 2x the difference between the average off-peak and on-peak line loss. Typical utility-wide average annual losses range from 6%-11%

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[14] Lazar et al. *Valuing the Contribution of Energy Efficiency to Avoided Marginal Line Losses and Reserve Requirements*. The Regulatory Assistance Project. August, 2011. Accessed at: http://www.raponline.org/document/download/id/4537

[15] Lazar, et al. (2011) Pg. 4.

[16] Initial Testimony of the CAISO, Part 1. A.06-08-010. January 6, 2007.

[17] Lazar et al. (2011).

[18] *Building on Michigan's Energy Efficiency Accomplishments.* Natural Resources Defense Council. Accessed at:
http://switchboard.nrdc.org/blogs/rstanfield/NRDC,%20Building%20on%20Michigan's%20Energy%20Efficiency%20Accomplishments.pdf

(difference of 5%).[19]   Reported line losses within the California ISO range from 4.3% - 12% (difference of 7.7%).[20]   Taking the more conservative average line loss range of 5%, and 2x marginal resistive line loss factor, a more appropriate differential for storage should be 10%.

10) Please describe the methodology, assumptions, data sources and resulting emission factors (or round-trip efficiencies) that should be used to determine SGIP eligibility for electric-only, CHP, and storage technologies.
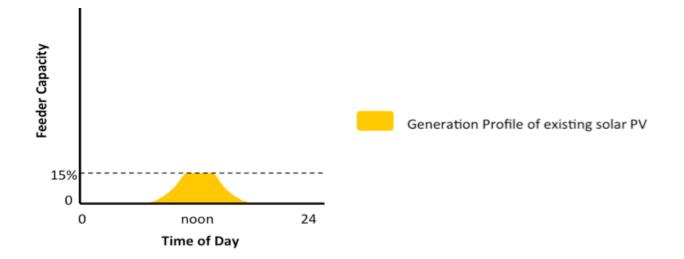
CESA RESPONSE: As noted throughout these comments, CESA supports the long run methodology for calculating emissions factors for electric only and CHP resources.
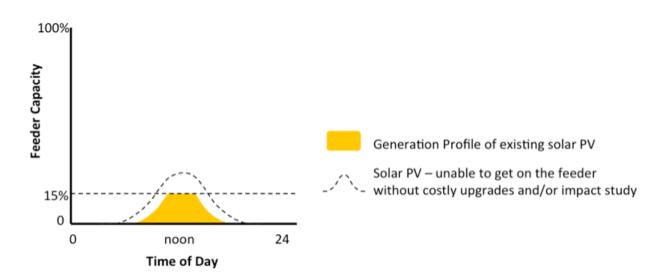
There are several factors that differentiate energy storage from generation resources, and which call for a methodology that appropriately values its net impact on the grid. These factors include the following:
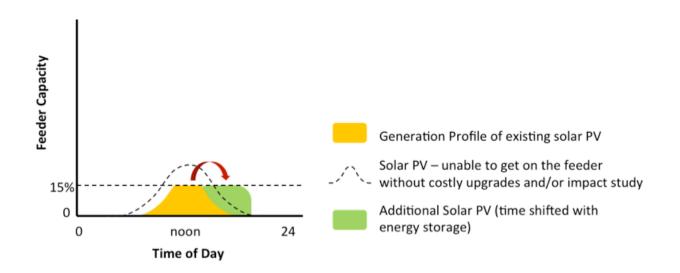
1. Energy storage is not a net generating technology, so the assumption of displacement must be handled differently.

2. Energy storage, due to round trip efficiency losses, may actually marginally increase the generation required by utilities. This effect will be offset by the ability of energy storage to capture renewable energy that might otherwise have been curtailed. Energy storage can also enable increased on site renewable generation, as shown below:

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[19] Lazar (2011). Pg. 3.
[20] Center for the Study of Energy Markets, University of California Energy Institute (Severin Borenstein) "The Market Value and Cost of Solar Photovoltaic Electricity Production." January 2008. Pg. 6

3. Finally, energy storage provides system operational benefits by reducing fossil unit starts and problems associated with over generation.

For these reasons, CESA determined that the most appropriate way to estimate the system benefits of energy storage was to run a production cost model. CESA employed a consultant used by the CAISO, Energy Exemplar, to conduct the modeling, as described below:

Methodology: CESA employed Energy Exemplar to conduct production cost model runs using PLEXOS. The runs used the CAISO's 2014 40% RPS scenario for Long Term Procurement Planning. The purpose of the model run was to understand how grid emissions, unit starts, and curtailment would change with and without energy storage. The following sensitivities were run: (a) with no energy storage, and (b) with Storage (60% RTE).

Assumptions:

Since the SGIP requires energy storage technologies to have a 2-hour dispatch, CESA assumed that only 2-hour storage resources were deployed on the grid. CESA also assumed that the capacity and location of the 2-hour resources would follow the behind-the-meter ("BTM") and distribution-sited targets in AB 2514 (D.13-10-040). The BTM targets are as follows:

- PG&E – 85 MW
- SCE – 85 MW
- SDG&E – 30 MW

Collectively, the BTM allocations equate to 205 MW. As this represents a relatively small amount of capacity, to ensure this would not be lost as "noise" in the model, CESA included 50% of the distribution-sited targets in AB 2514 and assumed they were also 2-hour resources. This led to an additional 212.5 MW of storage:

- PG&E – 92.5 MW
- SCE – 92.5 MW
- SDG&E – 27.5 MW

CESA's consultant distributed the 412.5 MW in proportionately to how storage was located in CAISO's LTPP model. Figure 1 highlights the capacity located in each IOU service territory.

Figure 1. Capacity by Service Territory

Territory	MW
PGE_BAY_2_CC	32.3
PGE_BAY_2_DC	35.15
PGE_VALLEY_2_CC	52.7
PGE_VALLEY_2_DC	57.35
SCE_2_CC	85
SCE_2_DC	92.5
SDG&E_2_CC	30
SDG&E_2_DC	27.5
Total	**412.5**
CC = Customer-sited	
DC = Distribution-sited	

Data Sources: The CAISO's 2014 LTPP 40% RPS (provided by the CAISO).

Results: Under the 60% RTE Energy Storage case, the addition of 412.5 MW of 2-hour energy storage provided a net savings of 203,677 tons of CO_2, along with a reduction of 2,927 Unit Starts across the system (a 6.4% reduction in total annual fossil fuel unit starts). The 412.5 MW of 2-hour energy storage also reduced renewable curtailment by 8.1% equating to shifting 299,002 MWH of renewable energy that would have otherwise been wasted.

The PLEXOS modeling results make it clear that even a small amount of 60% round-trip-efficiency energy storage provides significant system benefits. Consequently, CESA urges the Commission to lower the current threshold of 63.5% for energy storage to 60%.

III. CONCLUSION.

CESA thanks the Commission for the opportunity to submit these comments on the ACR.

Respectfully submitted,

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