

Docket: R.12-03-014

Witness: Bill Powers

Exhibit No.:

Order Instituting Rulemaking to Integrate and
Refine Procurement Policies and Consider
Long-Term Procurement Plans

R.12-03-014

(Filed March 22, 2012)

**PREPARED DIRECT TESTIMONY OF BILL POWERS
ON BEHALF OF
THE CALIFORNIA ENVIRONMENTAL JUSTICE ALLIANCE**

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

JUNE 25, 2012

I. Introduction

My testimony addresses the testimony submitted by the California Independent System Operator (CAISO) in R.12-03-014 on May 23, 2012.¹

Before discussing my comments related to CAISO's testimony, I will summarize my experience and qualifications. I began my career converting Navy and Marine Corps shore installation power plants from oil-firing to domestic waste, including woodwaste, municipal solid waste, and coal, in response to concerns over the availability of imported oil following the Arab oil embargo. I am a registered professional mechanical engineer in California with over 25 years of experience in the energy and environmental fields. I have permitted five 50 MW peaking turbine installations in California, as well as numerous gas turbine, microturbine, and engine cogeneration plants around the state. I organized conferences on permitting gas turbine power plants (2001) and dry cooling systems for power plants (2002) as chair of the San Diego Chapter of the Air & Waste Management Association.

I am also the author of the March 2012 Bay Area Smart Energy 2020 strategic energy plan. This plan uses the zero net energy building targets in the California *Energy Efficiency Strategic Plan* as a framework to achieve a 60 percent reduction in GHG emissions from Bay Area electricity usage by 2020. I authored the October 2007 strategic energy plan for the San Diego region titled "San Diego Smart Energy 2020." The plan uses the state's Energy Action Plan as the framework for accelerated introduction of local renewable and cogeneration distributed resources to reduce greenhouse gas emissions from power generation in the San Diego region by 50 percent by 2020. I am the author of several articles in *Natural Gas & Electricity Journal* on use of large-scale distributed solar photovoltaics (PV) in urban areas as a cost-effective substitute for new gas turbine peaking capacity. I currently serve on the San Diego Environmental and Economic Sustainability Task Force. The mission of the task force is to produce a Climate Mitigation and Adaptation Plan for San Diego. I have a B.S. in mechanical engineering from Duke University and an M.P.H. in environmental sciences from the University of North Carolina – Chapel Hill. My resume is attached as Exhibit A to this testimony.

II. Background – Relevant Requirements

California law now requires that 33 percent of retail electricity sales are procured from renewable resources by 2020. It also sets a requirement of 20 percent of sales from renewables in 2013 and 25 percent in 2016. This 33 percent renewable portfolio standard (RPS) is one of the highest in the nation. California's initial RPS, which was established in 2002, set a RPS of 20 percent of retail electricity sales by 2017. In 2006, the target date was accelerated to 2010. Then-Governor Schwarzenegger signed an executive order in 2008 setting a new RPS target of 33 percent by 2020. On April 12, 2011, Governor Jerry Brown signed the 33 percent RPS requirement into law.

¹ CAISO served an addendum to its testimony on June 19, 2012. Due to the short time frame, I have not been able to fully analyze the addendum in this report.

California’s Assembly Bill (AB) 32 climate action legislation, the *California Global Warming Solutions Act*, was passed into law in 2006. AB 32 mandates that California reduce GHG emissions to 2000 levels by 2010, to 1990 levels by 2020, and reach 80 percent below 1990 levels by 2050.

The California Air Resources Board (CARB) is the lead agency tasked with implementing AB 32. The December 2008 *AB 32 Scoping Plan* developed by CARB proposed the following targets related to energy: 1) reduce demand by 32,000 GWh via energy efficiency measures, 2) add 4,000 MW of combined heat and power to displace 30,000 GWh of conventional generation, 3) reduce natural gas consumption by 800 million therms via energy efficiency measures, 4) add 200,000 solar hot water heaters in compliance with AB 1470, 5) achieve 33 percent RPS by 2020, 6) achieve one million solar roofs, 3,000 MW, by 2017, and 7) implement a CO₂ cap-and-trade program.²

Consistent with the State’s focus on renewables and greenhouse gas reduction, California has instituted an *Energy Action Plan*, which establishes the electricity resource priority list, or loading order, that defines how California’s energy needs are to be met. *Energy Action Plan I* was published in May 2003.³ The CEC and the California Public Utilities Commission (Commission) developed the *Energy Action Plan* to guide strategic energy planning in California. The loading order is summarized in Table 1.

Table 1. Energy Action Plan Loading Order

<ol style="list-style-type: none">1. Energy efficiency, including onsite renewable generation, and demand response2. Renewable energy3. Combined heat and power4. Utility-scale natural gas-fired generation5. Transmission (as needed to support other elements)

The Plan is explicit that rooftop PV is an element of energy efficiency standards for new buildings. *Energy Action Plan I* states that California should “[i]ncorporate distributed generation or renewable technologies into energy efficiency standards for new building construction.”

California law also requires utilities to file a procurement plan with the Commission. The plan is required to demonstrate that the utility, “to fulfill its unmet resource needs, shall procure resources from eligible renewable energy resources in an amount sufficient to

² See California Air Resources Board, *AB 32 Climate Change Scoping Plan* (Dec. 2008) pp. 28, 41–53 <<http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm>> [as of June 21, 2012] [“The cap-and-trade program creates an emissions limit or ‘cap’ on the sectors responsible for the vast majority of California’s greenhouse gas emissions and provides capped sources significant flexibility in how they collectively achieve the reductions necessary to meet the cap”] (hereafter *AB 32 Climate Change Scoping Plan*).

³ State of California, *Energy Action Plan* (May 8, 2003) <http://www.energy.ca.gov/energy_action_plan/2003-05-08_ACTION_PLAN.PDF> [as of June 20, 2012].

meet its procurement requirements.”⁴ The plan is also required to demonstrate that the utility “shall first meet its unmet resource needs through all available energy efficiency and demand reduction resources that are cost effective, reliable, and feasible.”⁵ The Commission recently confirmed that the “loading order applies to all utility procurement, even if pre-set targets for certain preferred resources have been achieved.”⁶

Governor Jerry Brown has proposed specific measures to meet California’s energy goals. He proposes through his *Climate Strategy* and *Clean Energy Jobs Plan* that a majority of the new renewable energy resources to be built in the state by 2020, 12,000 MW of total of 20,000 MW, be local renewable power.⁷ Approximately 3,000 MW of energy storage would be added to the grid to meet peak demand and support renewable energy generation under the Governor’s *Clean Energy Jobs Plan*.⁸ The *Clean Energy Jobs Plan* also calls for the addition of 6,500 MW of new CHP over the next 20 years and substantial improvements in the energy efficiency of new and existing buildings.

The Commission and the IOUs jointly developed the *California Long-Term Energy Efficiency Strategic Plan* in 2008.⁹ The *Plan* was updated in 2011.¹⁰ It calls for 25 percent of existing homes to reach 70 percent reduction in energy usage by 2020, and 50 percent of existing commercial buildings to reach zero net energy by 2030. The *Plan* also calls for a 50 percent reduction in air conditioning loads by 2020. Governor Brown’s April 25, 2012 Executive Order B-18-12 calls for 50 percent of California state government commercial buildings to reach zero net energy.¹¹

Major additional goals of the *Plan* are:

- ffi All new residential construction will be zero net energy by 2020;
- ffi All new commercial construction will be zero net energy by 2030;
- ffi Efficiency of heating, ventilation, and air conditioning systems will 50 percent by 2020 and 75 percent by 2030.

The concept of net zero energy is shown graphically in Figure 1.

⁴ Pub. Util. Code § 454.5(9).

⁵ *Id.*

⁶ See California Public Utilities Commission (CPUC), *Commission Decision 12-01-033* at pp. 18–21.

⁷ Governor Edmund G. Brown Jr., *Support Letter for DRECP Process* (Apr. 25, 2012) p. 2

<[http://www.drecp.org/meetings/2012-04-25-](http://www.drecp.org/meetings/2012-04-25-26_meeting/presentations/04_Office_of_the_Governor_Paper.pdf)

26_meeting/presentations/04_Office_of_the_Governor_Paper.pdf> [as of June 20, 2012]; Governor Edmund G. Brown Jr., *Clean Energy Jobs Plan* (June 2010)

<http://gov.ca.gov/docs/Clean_Energy_Plan.pdf> [as of June 21, 2012] (hereafter *Clean Energy Jobs Plan*).

⁸ *Clean Energy Jobs Plan*, *supra*, [The Plan calls for energy storage equivalent to 5 percent of peak load. California peak load is approximately 60,000 MW. Five percent of 60,000 MW is 3,000 MW].

⁹ See CPUC, *California Energy Efficiency Strategic Plan* (Sept. 18, 2008)

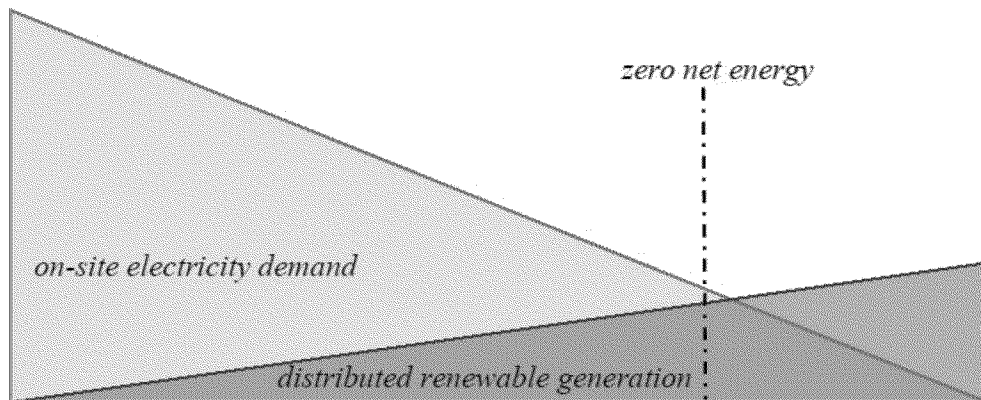
<<http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/eesp/>> [as of June 20, 2012].

¹⁰ CPUC, *California Energy Efficiency Strategic Plan* (Jan. 2011) [Update 2011].

¹¹ See Governor Edmund G. Brown Jr., *Executive Order B-18-12* (Apr. 25, 2012)

<<http://gov.ca.gov/news.php?id=17508>> [as of June 20, 2012] [“State agencies shall also take measures toward achieving Zero Net Energy for 50% of the square footage of existing state-owned building area by 2025”] (hereafter *Executive Order B-18-12*).

Figure 1. Graphical Representation of Net Zero Energy Concept



The *Solar Hot Water and Efficiency Act* of 2007 authorized a ten-year incentive program for solar water heaters with a goal of promoting the installation of 200,000 systems in California by 2017. This is an average installation rate statewide of 20,000 systems per year. By way of comparison, Germany has installed as many as 200,000 solar hot water systems in one year.¹² A Petition to Modify D.10-01-022 proposes to increase residential incentives for solar water heating by 100%, and commercial incentives by 30%.

III. CAISO’s Resource Procurement Assumptions Do Not Account for Energy Efficiency, Demand Response, and Energy Storage and Do Not Properly Account for Distributed Generation and Combined Heat and Power.

A. CAISO Should Have Included More Energy Efficiency.

In its May 23, 2012 testimony, CAISO considered no uncommitted energy efficiency in its modeling.¹³ By not having considered energy efficiency, CAISO’s results are inherently conservative and call for greater MW than what will actually be needed.

In the 2010 LTPP, the Commission used an uncommitted EE assumption of 2,648 MW for SCE in all scenarios considered.¹⁴ This value was based on the mid-case results from

¹² Powers, *Bay Area Smart Energy 2020* (Mar. 2012) p. 164.

¹³ See Response of CAISO to the Second Set of Data Requests of the California Environmental Justice Alliance (hereafter “CEJA Requests 2”), Response to Request No. 3; Response of CAISO to the California Environmental Justice Alliance Data Requests (hereafter “CEJA Requests 1”), Response to Request No. 1; Updated Response of CAISO to the California Environmental Justice Alliance Data Requests First Set (hereafter “CEJA Requests 1 Update”, Response to Request No. 3; Response of CAISO to the First Set of Data Requests of the Sierra Club California (hereafter “Sierra Club Requests 1”), Response to Request No. 28(b). See Attachment C for the full text of all cited data requests and responses. CAISO did include some uncommitted EE in its addendum (CEJA Requests 1 Update), but it did identify the precise amount considered in this scenario and whether all available uncommitted EE was accounted for. The addendum does show that the LCR was reduced after CAISO considered additional EE in the area.

the CEC's 2009 Integrated Energy Policy Report (IEPR), which includes that last adopted uncommitted energy efficiency forecast by the CEC. The CEC's 2009 uncommitted EE forecast was also conservative. For instance, it did not include industrial program savings. Also, it relied on the low realization scenario in California's Big Bold EE Strategies (BBEES).¹⁵ The BBEES initiatives relate to new construction and heating, ventilation, and air conditioning.¹⁶

Since this assumption was developed, the CEC published the 2011 IERP. The 2011 IERP found the IOUs saved approximately 3,770 MW and 4,610 MW in 2009 and 2010 respectively.¹⁷ For uncommitted EE, the 2011 IERP found that:

By 2022, consumption in the mid-demand case would be reduced 3.3 percent if adjusted by the low savings scenario and 6.2 percent using high incremental uncommitted savings. For peak, the reductions range from 4.8 percent to 9.5 percent.¹⁸

As discussed by Julia May, CAISO should have included the percentage of uncommitted EE attributable to the LA Basin in its estimate.¹⁹ The LA Basin is approximately 79% of SCE's total load.²⁰

In addition, as an example of more recent uncommitted EE estimates, in December 2011, the CEC staff released the *Achieving Cost-Effective Energy Efficiency for California 2011–2020* final report, which summarizes utility progress and recommends improvements for publicly-owned utility (POU) efficiency efforts.²¹ The report shows that the POUs reported 4,607 GWh of annual energy savings and 837 MW of peak savings for 2010, which exceeded the Commission's 2010 savings goals for POUs of 2,276 GWh and 502 MW.²²

A CEC projection of the effect of achieving cost-effective energy efficiency measures statewide prepared in 2007 and is shown in Figure 2.²³ This projected pre-dates the more ambitious energy efficiency goals in the *Energy Efficiency Strategic Plan*. The CEC

¹⁴ CPUC, *Scoping Memo in Rulemaking 10-05-006, Attachment 1 Standardized Planning Assumptions (Part 1) for System Resource Plans* (Dec. 3, 2010) <<http://docs.cpuc.ca.gov/efile/RULC/127543.pdf>> [as of June 22, 2012] p. 10 (hereafter "Scoping Memo to Rulemaking 10-05-006, Attachment 1").

¹⁵ CPUC, *supra*, Scoping Memo in Rulemaking 10-05-006, Attachment 1, at p. 10.

¹⁶ California Energy Commission (CEC), *Incremental Impacts of Energy Efficiency Policy Initiatives Relative to the 2009 Integrated Energy Policy Report Adopted Demand Forecast* (May 2010) p. 31–32; see Commission Decision 12-05-015 at p. 13 (summarizing the BBEES programs).

¹⁷ CEC, *The 2011 Integrated Energy Policy Report* (2011) p. 53 <<http://www.energy.ca.gov/2011publications/CEC-100-2011-001/CEC-100-2011-001-CMF.pdf>> [as of June 20, 2012] (hereafter *2011 IEPR*).

¹⁸ 2011 IERP at p. 112.

¹⁹ See CEJA Requests 1 Update, Response to Request No. 3.

²⁰ See June 25, 2012 Expert Report of Julia May on behalf of CEJA in R.12-03-014.

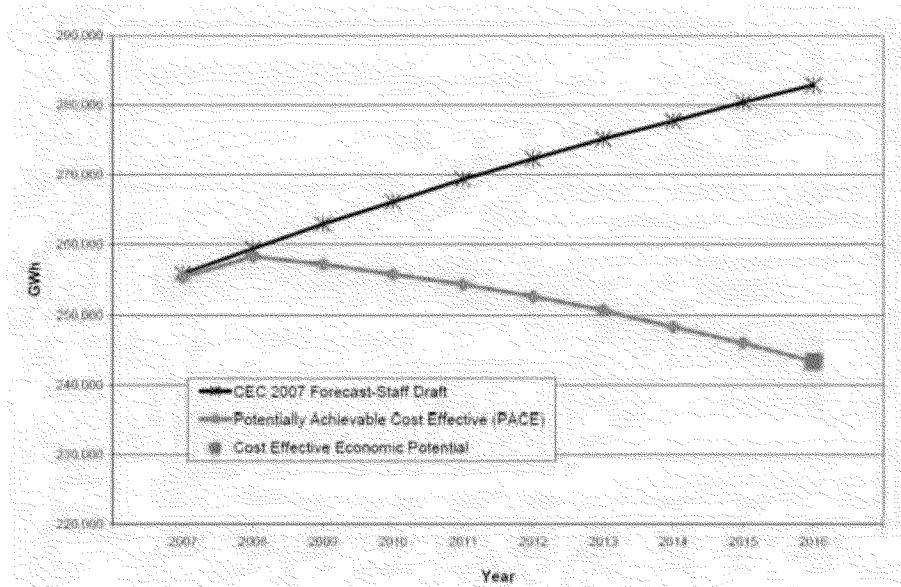
²¹ *2011 IEPR*, *supra*, at p. 8.

²² *Ibid.*

²³ CEC, *Achieving All Cost-Effective Energy Efficiency for California* (Dec. 2007) p. 103, Figure 38.

projected an absolute rate of decline in electricity demand due to achieving all cost-effective energy efficiency is about 10,000 GWh every four years from 2013 forward.

Figure 2. Projected Absolute Decline in California Electricity Demand if All Cost-Effective Energy Efficiency Is Achieved



There are a host of EE programs and measures being implemented by IOUs in California. EE is also a key component of state environmental policies, such as the loading order and AB 32 compliance. While CAISO has argued that it is too difficult to estimate the exact level of EE in effect in 2020, it will certainly be more than the 0 MW CAISO has assumed.²⁴

Any EE assumptions must consider the *Energy Efficiency Strategic Plan*. This *Plan* has been cited as one of the Commission’s main methods of meeting its GHG goals.²⁵ In addition, other recent statewide policies are mandating greater energy efficiency measures. In particular, Governor Brown’s April 25, 2012 Executive Order B-18-12 calls for half of California state government commercial buildings to reach zero net energy by 2025.²⁶

A major element of the state’s *Energy Efficiency Strategic Plan* is to advance residential and small commercial heating, ventilating, and air conditioning systems to ensure optimal equipment performance. As noted, the *Plan* targets a 50 percent improvement in efficiency of heating, ventilating, and air conditioning systems by 2020, and a 75 percent

²⁴ See CEJA Requests 1, Response to Request No. 1; CEJA Requests 1 Update, Response to Request No. 3; CEJA Requests 2, Response to Request No. 3; Sierra Club Requests 1, Responses to Request Nos. 6, 11, 12, 23(c).

²⁵ See CPUC & CEC, *Final Opinion on Greenhouse Gas Regulatory Strategies* <<http://www.energy.ca.gov/2008publications/CEC-100-2008-007/CEC-100-2008-007-F.PDF>> [as of June 22, 2012].

²⁶ See *Executive Order B-18-12, supra*, [“State agencies shall also take measures toward achieving Zero Net Energy for 50% of the square footage of existing state-owned building area by 2025”].

improvement by 2030. Air conditioning loads are the cause of over 30 percent of California's total peak power demand in the summer. Meeting this air conditioning load is a primary driver behind procurement of additional high-cost generation, transmission, and distribution resources.²⁷

Like the rest of California, a significant portion of SCE's peak load is attributable to air conditional loads. SCE can and should expect a significant decrease in this load, at a minimum, due to energy efficiency advancements. This significant decrease is not considered by the uncommitted energy efficiency value that the Commission assumed in the 2010 LTPP because the Commission's 544 MW assumed the low BBEES as discussed above, and that value is based on only accelerating penetration of an older technology, SEER 15 central air conditioning units.²⁸

The average SEER rating for in-use central air conditioning units in California is approximately SEER 10, not the 2006 federal minimum standard of SEER 13 for new units.²⁹ Competitively-priced central air conditioning units with ratings as high as SEER 21 and greater are commercially available. There is about a 20 percent installed price difference between a SEER 13 or 14 unit and a SEER 21 unit. An incremental energy efficiency improvement of nearly 30 percent is realized by selecting a SEER 21 unit over SEER 13 when compared to the SEER 10 basecase.³⁰

The difference in the installed cost (prior to rebates) of a reference case Carrier Corporation 3-ton SEER 13 residential central air and heating unit, which costs approximately \$9,000, and a state-of-the-art Infinity® 21 unit (SEER 21) is around \$2,000.³¹ Carrier offers a rebate on high efficiency units that reduces the cost difference between the SEER 13 and SEER 21 alternatives by about \$1,000.

CAISO's assumption of 0 MW of uncommitted EE also does not address thermal storage air conditioning systems now on the market that could nearly eliminate cooling-related peak demand if installed in new and existing buildings. The Southern California Public Power Authority (SCPPA) has contracted with Ice Energy for 53 MW of ice storage air conditioning units. SCPPA will install more than 6,000 Ice Bear units at 1,500 government and commercial buildings in its member communities.³² The City of Glendale is a member of SCPPA. Glendale Water & Power (GWP) has installed 180 Ice

²⁷ See, e.g., CEC, *Achieving All Cost-Effective Energy Efficiency for California* (Dec. 2007) p. 53.

²⁸ CEC, *Incremental Impacts of Energy Efficiency Policy Initiatives Relative to the 2009 Integrated Energy Policy Report Adopted Demand Forecast* (May 2010) p. 31 [SEER means "Summer Energy Efficiency Ratio." The SEER rating is linear in terms of electricity consumption. This means that a central air conditioning unit with a SEER 20 rating uses one-half the electricity that a SEER 10 unit uses to achieve the same cooling capacity].

²⁹ S. Okura, M. Brost (RLW Analytics, Inc.) & R. Rubin (SDG&E), *What Types of Appliances and Lighting Are Being Used in California Residences?* (2005) [In 2005, 53% of California residences had some form of cooling system].

³⁰ $[(21 - 10)/21] - [(13 - 10)/13] = 0.52 - 0.23 = 0.29$ (29 percent).

³¹ Avalanche Mechanical (Carrier installer) quote to B. Powers for 3-ton SEER 21 central air conditioning and heating unit, September 4, 2007. Quote includes cost of new insulated ductwork.

³² Ice Energy, *Public Power Daily SCPPA to Rollout 53-MW Storage Project* (Jan. 27, 2010).

Bear units in commercial buildings and reduced peak air conditioning load by 1.5 MW.³³ GWP makes these Ice Bear units available free of charge to qualified commercial customers due to their cost-effectiveness at reducing peak load.³⁴

Substantial peak load reduction can also be achieved by upgrading existing commercial and institutional cooling systems. Many commercial buildings use electric motor-driven centrifugal chillers to provide cooling. Centrifugal chillers typically consume more electricity than any other single energy-consuming device in a commercial building.³⁵ The California Center for Sustainable Energy in San Diego has conducted hundreds of energy efficiency evaluations on chillers. Over 90 percent of these systems operate with relative low efficiency, in the range of 1.0 to 1.2 kW/ ton of cooling, using oversized pumps, constant speed equipment, and controls that do not work well.³⁶

Central air conditioning units have a typical operational lifetime of 10 to 14 years.³⁷ Assuming this average age is representative of replacement frequency, more than 50 percent of current central air conditioning units will be replaced over the next 10 years. If each replacement on average reduces unit electricity consumption by 50 percent,³⁸ the electricity consumption of the entire population of central air conditioning units would drop about 25 percent over the next decade.³⁹

Integrating air conditioning cycling capability into each new state-of-the-art central air conditioning unit sold would ensure near universal capability to participate in the air conditioner cycling program. SCE already has a limited cycling program that allows the utility to remotely cycle off-and-on the central air conditioning units of participating customers.⁴⁰ Air conditioner cycling capability could also easily be incorporated into each new unit prior to sale. This capability, if fully utilized, could reduce the instantaneous electricity demand from this population of air conditioners by 50 percent

³³ See City of Glendale, California, *Leading Energy Storage Company to Relocate to Glendale* (Apr. 25, 2012) <http://www.ci.glendale.ca.us/mgmt-svcs/press_release.aspx?AnnouncementID=958> [as of June 22, 2012].

³⁴ City of Glendale Water & Power, *Ice Bear Thermal Energy Storage Program* <http://www.glendalewaterandpower.com/businesses/ice_bear_program.aspx> [as of June 22, 2012].

³⁵ Platts Purchasing Advisor, *HVAC: Centrifugal Chillers* (2004) <www.reliant.com/en_US/Platts/PDF/P_PA_14.pdf> [as of June 22, 2012].

³⁶ The term “kW per ton of cooling” is a measure of the electric energy necessary to operate a commercial or institutional chiller plant. One ton of cooling load is the amount of heat absorbed to melt one ton of ice in one day, which is equivalent to 12,000 Btu per hour.

³⁷ Sears Home Services, *Central Heating & Air Conditioning Systems – A/C & Heating System Replacement* <<http://www.searshomeservices.com/dslp?pid=8&lst=2625&partnerId=shsHvac&gclid=OVMTc=p&OVKEY=fix>> [as of June 22, 2012] [“The average service life of a whole house HVAC unit is 10-14 years”].

³⁸ Assume the average rating of replacement units is SEER 20 and the population being replaced has an average rating of SEER 10. This represents a 50 percent reduction in electricity demand per ton of cooling capacity.

³⁹ If 50 percent of the central air conditioner population reduces demand by 50 percent through replacement with high efficiency units, and there is no change in the demand of the remaining 50 percent of existing central air conditioner units, the overall demand reduction is 25 percent.

⁴⁰ Southern California Edison (SCE), *Summer Discount Plan: Off the Air* <<http://www.sce.com/info/PowerOutages/Facts-Resources/SDP.htm>> [as of June 22, 2012].

beyond energy efficiency reductions, as half these units would be in offline at any given time while the other half are operational.

Air conditioning efficiency improvement is only one of many ways that SCE will realize energy efficiency gains in its service territory. By discounting energy efficiency measures as an effective method of reducing need, CAISO has ignored large potential reductions in peak demand as it asserts the need for new peaking generation. CAISO's numbers are based on flawed assumptions that result in an inappropriately high level of forecasted need.⁴¹

EE goals will also be met through the continued implementation of California's zero net energy building goals. In September 2011, the Commission released its *2010–2012 Zero Net Energy Action Plan* for the commercial building sector to support the state's zero net energy goals.⁴² According to the Commission, California has more zero net energy buildings than any other state.⁴³

The CEC is also contributing to zero net energy goals by regularly updating its building efficiency standards to reflect new technologies and strategies with the goal of achieving 20 to 30 percent energy savings in each triennial update, and by updating appliance standards to include electronics and other devices plugged into electrical outlets that represent an increasing portion of California's energy use.⁴⁴ "In 2010, appliance efficiency standards alone saved an estimated 18,761 gigawatt-hours (GWh) of electricity, representing nearly 7 percent of California's electric load, and saved consumers about \$2.6 billion in energy costs."⁴⁵ Following along this path, on May 31, 2012, the CEC adopted new energy efficiency standards that require all new residential and commercial construction be "rooftop solar ready."

To meet the demand for more efficient electric devices, in 2012, the CEC adopted standards for the estimated 58 million battery chargers sold each year in California that, when implemented, will save state ratepayers an estimated \$306 million each year, provide annual electricity savings of more than 2,000 GWh, and eliminate 1 million metric tons of carbon emissions.⁴⁶

Finally, new legislation continues to push EE forward. For instance, AB 758 directed the CEC to develop, adopt, and implement a comprehensive program to reduce energy consumption in existing buildings, including regulations for energy ratings and improvements in existing buildings.⁴⁷ AB 1109 requires an 11 percent reduction in

⁴¹ See, e.g., CEJA Requests 1, Response to Request No. 1; CEJA Requests 2, Response to Request No. 3.

⁴² CPUC, *Zero Net Energy Action Plan 2010–2012* (Sep. 2011) <<http://www.cpuc.ca.gov/NR/rdonlyres/6C2310FE-AFE0-48E4-AF03-530A99D28FCE/0/ZNEActionPlanFINAL83110.pdf>> [as of June 20, 2012].

⁴³ *2011 IEPR, supra*, at p. 9.

⁴⁴ *Ibid.*

⁴⁵ *Ibid.*

⁴⁶ *2011 IEPR, supra*, at p. 9.

⁴⁷ CEC, *AB 758 Comprehensive Energy Efficiency Program for Existing Buildings* <<http://www.energy.ca.gov/ab758/>> [as of June 20, 2012].

electricity consumption from residential lighting and an 8.6 percent reduction from commercial lighting.⁴⁸

B. CAISO Should Have Included More Demand Response in its Analysis.

CAISO considered no demand response (DR) in its analysis presented in its May 23, 2012 testimony.⁴⁹ DR can and will be used in the future to meet local needs. DR can help meet reliability needs. The Commission recently summarized:⁵⁰

We are also taking steps to update our current Resource Adequacy program rules to conform to the CAISO's wholesale market and place DR on equal footing with generation resources. – in D.11-10-003, we directed that beginning in 2013 retail non-dynamic pricing DR resources must be dispatchable locally in order to qualify for local Resource Adequacy credits.

Importantly, DR can also help integrate renewable energy. The Commission has stated:

Looking ahead to our pursuit of SB IX's requirement that the Utilities obtain 33% of the energy they deliver from renewable sources by 2020, we also expect that DR will likely be called upon to meet new needs beyond its historic role as an emergency resource and peak shaving tool. DR is ideally suited to support grid integration of renewable generation, much of which will be intermittent or variable.⁵¹

The Commission has also stated that:⁵²

DR will be an increasingly valuable resource as we pursue future policy challenges. . . . The California Clean Energy Future plan expressly acknowledges that in addition to its historic role as an emergency and peak demand management tool, DR will be able to provide a range of services that can support grid integration of large quantities of intermittent and variable renewable resources. The plan also articulates our collective commitment to integrating DR into the CAISO's wholesale energy markets.

DR will be a key component in meeting RPS goals of 33 percent renewable energy by 2020.⁵³ As the Commission has stated, "DR is ideally suited to support grid integration

⁴⁸ 2011 IEPR, *supra*, at p. 67.

⁴⁹ CEJA Requests 1, Responses to Request Nos. 2, 4; CEJA Requests 1 Update, Response to Request No. 4; CEJA Requests 2, Responses to Request Nos. 3, 7; Sierra Club Requests 1, Responses to Requests Nos. 7, 12, 21, 28(b); Response of CAISO to the First Set of Data Requests of the Vote Solar Initiative (hereafter "Vote Solar Requests 1"), Response to Request No. 11.

⁵⁰ CPUC, *Commission Decision 12-04-045* (Apr. 19, 2012) p. 15 (hereafter *Commission Decision 12-04-045*).

⁵¹ *Commission Decision 12-04-045, supra*, at p. 77.

⁵² *Id.* at p. 12.

of renewable generation, much of which will be intermittent or variable.”⁵⁴ Further, “DR programs are an essential element of California’s energy resource strategy. Energy Efficiency and DR are our preferred resources for meeting California’s energy needs, ranking at the top of the Loading Order.”⁵⁵

In the 2010 LTPP, to estimate the DR in 2020, the Commission considered available DR programs. It estimated that 2842 MW of DR resources would be available in the SCE territory in 2020.⁵⁶ In addition to numerous Commission DR programs, FERC has required integration of DR into the grid. CAISO is thus working on increasing the dispatch capability of DR. The Commission’s assumption of 2842 MW for SCE in the 2010 LTPP, given all of the DR program advancements, is reasonable and should have been considered by CAISO. Furthermore, this DR estimate from the 2010 LTPP is conservative because it is based on a 1-in-2 forecast rather than a 1-in-10 forecast.

DR can also be expected to increase due to the advent of Advanced Metering Infrastructure (AMI).⁵⁷ AMI is a key component of the Commission’s goal of increasing DR “as a means of reducing electricity demand during peak periods.”⁵⁸ In the settlement between DRA and SCE over SCE’s AMI plan, the parties agreed that SCE’s AMI program could be “expected to generate \$1,174 million in operational benefits and \$816 million in energy conservation, load control, and DR related benefits.”⁵⁹

Other reports indicate the integrate DR technology into existing facilities may not be a major challenge. For instance, a report by Lawrence Berkeley National Laboratory found that “[t]he vast majority of facilities surveyed have either fully or semi-automated control systems in place, indicating that they have technical capability for either fully or semi-automated DR programs.”⁶⁰

CAISO is also engaged in integrating DR into the grid:

Over the last five years, as part of its Market Redesign and Technology

⁵³ *Id.* at p. 77 [“Looking ahead to our pursuit of SB 1X’s requirement that the Utilities obtain 33% of the energy they deliver from renewable sources by 2020, we also expect that DR will likely be called upon to meet new needs beyond its historic role as an emergency resource and peak shaving tool”].

⁵⁴ *Ibid.*

⁵⁵ *Id.* at p. 16.

⁵⁶ CPUC, R.10-05-006, December 2010 Scoping Memo, Appendix 1 at p. 60.

⁵⁷ See CPUC, *Commission Decision 08-09-039* (Sep. 18, 2008) (Approving settlement allowing \$1.63 billion in ratepayer funding for SCE’s proposed AMI project) (hereafter *Commission Decision 08-09-039*); CPUC, *CPUC Approves Advanced Metering Infrastructure for SoCalGas* (Apr. 8, 2010) <http://docs.cpuc.ca.gov/word_pdf/NEWS_RELEASE/116085.pdf> [as of June 22, 2012]; CPUC Smart Grid Workshop, *Smart Grid Implementation at the Sacramento Municipal Utility District* (Mar. 18, 2010) (SMUD received a \$127 Smart Grid Investment Grant from DOE to implement \$308 M worth of projects, including AMI and demand response).; *see also* 2010 LTPP Scoping Memo at p. 20 (stating that the benefits of the AMI program need to be accounted for in the DR assumptions).

⁵⁸ *Commission Decision 08-09-039, supra*, at pp. 2–3.

⁵⁹ *Id.* at p. 16.

⁶⁰ Ernest Orlando Lawrence Berkeley National Laboratory, *Assessing the Control Systems Capacity for Demand Response in California Industries*, (Jan. 2012) p. 22 <<http://drcc.lbl.gov/sites/drcc.lbl.gov/files/LBNL-5319E.pdf>> [as of June 20, 2012].

Upgrade (MRTU), CAISO has engaged stakeholders in designing market products where capacity represented by DR can be bid into wholesale markets, just as traditional generation can be done today. The CAISO expects that integrating DR into its wholesale markets will increase competition, promote efficiency and reduce costs. Through its stakeholder process CAISO has developed two wholesale market products: (1) Proxy Demand Resource (PDR) and (2) Reliability Demand Response Resource (RDRR). PDR enables DR participation as a single resource or an aggregation of resources in the wholesale day-ahead and/or real-time energy markets and in the Ancillary Services market. In July 2010, the Federal Energy Regulatory Commission (FERC) approved CAISO's PDR.⁶¹

The Commission as well has stated that it is “working to facilitate the next phase of DR wholesale integration - direct participation in CAISO whole electricity markets.”⁶²

SCE has a host of ongoing DR activities, as do the other IOUs. The Commission recently approved the budget for DR activities for the IOUs for 2012-2014, including a budget of \$196,338,052 for SCE.⁶³ In that decision, the Commission found that:

SCE also proposes continuation of most of its DR programs from the 2009-2011 budget years with an eye toward incorporating many of these current programs into CAISO's PDR or RDRR requirements. To support CAISO market integration, SCE proposes an Ancillary Services tariff. SCE proposes a new price-responsive Residential Summer Discount Plan, for both legacy and newly enrolled customers. SCE also requests to launch a PLS program. With these programmatic proposals, SCE estimates to increase its load impacts from its current 1,530 MW to 1,824 MW by 2014 with approximately 1,360 MW of its portfolio available to be bid in the CAISO markets with full locational dispatch capability. SCE's application proposes two pilot programs: Smart Charging Pilot and the Workplace Charging Pilot. SCE claims these two pilots facilitate the adoption of new technologies.⁶⁴

SCE projects that it will have 1,900 MW of DR by 2014, a corresponding 250,000 MWh per year of energy savings by 2014, and an additional 1,000 MW of AMI-enabled DR by 2017.⁶⁵

The shutdown of the SONGS facility demonstrates the extent to which alternative resources such as DR can be used to replace traditional generation. In response to the shutdown as SONGS and the loss of its 2,200 MW of capacity, CAISO has recommended

⁶¹ *Commission Decision 12-04-045, supra*, at p. 13.

⁶² *Id.* at p. 14.

⁶³ *Id.* at p. 2.

⁶⁴ *Commission Decision 12-04-045, supra*, at pp. 19-20.

⁶⁵ SCE Smart Grid Deployment Plan Application (A.) 11-07-001, at p. 9

voluntary conservation through Flex Alerts and DR in order to mitigate the potential for outages.⁶⁶

Specifically, CAISO recommends fully funding the Flex Alerts system and restarting the PUC 20/20 program. In addition, CAISO recommends “[f]ully utilize[ing] available demand response . . . [s]eek additional military and public agency demand response . . . [and] [t]ake longer-term steps to increase available demand response system-wide.”⁶⁷

The Commission’s Energy Division requested that both SCE and SDG&E submit Advice Letters “proposing augmentations and improvements to their existing DR programs in response to the planned outage at SONGS. Specifically, the Energy Division letter proposed the consideration of targeted incentive energy conservation programs (e.g., a 20/20 program or similar variation) and/or the expansion of existing PTR programs to additional customer classes.”⁶⁸ SCE, as well as SDG&E, has filed for new DR programs for the summer.⁶⁹ The Commission approved SCE’s and SDG&E’s requests.⁷⁰

A recent California Currents article summarizes the SCE and SDG&E DR programs and their potential:⁷¹

Southern California Edison demand-response programs are estimated to produce more than 1,060 megawatts. Where the energy savings are occurring has not been revealed. SDG&E’s price responsive programs are said to curb 84 MW, with another 20 MW cut from programs triggered when CAISO warns of supply constraints and calls a stage one emergency. On top of that, publicizing the need for conservation from the public via TV and radio can save up to 1,000 MW, said Greenlee (CAISO spokesman).

The public will provide a substantial DR contribution if asked to do so. California electricity consumers dropped usage 10 percent during the 2001 energy crisis in response to IOU media campaigns calling for conservation.⁷² This is far more cost-effective for SCE customers than paying for new generation or transmission and distribution upgrades.

⁶⁶ CAISO, *Briefing on Summer 2012 Operations Preparedness* (Mar. 22–23, 2012) p. 3 <<http://www.caiso.com/Documents/BriefingSummer2012OperationsPreparedness-Presentation-Mar2012.pdf>> [as of June 20, 2012] [“San Diego is at risk of outages under heavy load conditions . . . Conservation and demand response will provide additional margin”]. See also Sierra Club Requests 1, Response to Request No. 23.

⁶⁷ CAISO, *supra*, *Briefing on Summer 2010 Operations Preparedness*, at p. 5.

⁶⁸ CPUC, Final Resolution E-4502 (May 24, 2012) p. 3 <http://docs.cpuc.ca.gov/PUBLISHED/FINAL_RESOLUTION/167572.htm> [as of June 22, 2012] (hereafter *Final Resolution E-4502*).

⁶⁹ The New York Times, *Southern California Edison Files Request for New Demand Response Program for this Summer* (Apr. 28, 2012)

<http://markets.on.nytimes.com/research/stocks/news/press_release.asp?docTag=201204271930BIZWIRE_USPRX____BW6139&feedID=600&press_symbol=97164> [as of June 20, 2012].

⁷⁰ See *Final Resolution E-4502, supra* [approving SCE (AL 2721-E) and SDG&E (AL 2351-E) rebate programs in response to SONGS planned outage]

⁷¹ California Current, *SoCal Grid’s Parameters Tighten* (May 4, 2012).

⁷² Jennings, et. al., *Conservation Motivations and Behavior During California’s Energy Crisis* <http://eec.ucdavis.edu/ACEEE/2002/pdfs/panel08/11_39.pdf> [as of June 20, 2012].

Because CAISO has failed to incorporate any DR into its modeling, CAISO's modeling is unrealistically conservative and calls for more MW than will actually be needed.⁷³

C. CAISO Should Have Considered More Energy Storage in Its Analysis.

CAISO did not consider any energy storage being available or added to the grid before 2021.⁷⁴ This is not a reasonable assumption.

The potential application of energy storage technologies ranges from bulk storage within the transmission system to smaller storage projects within the distribution system. The development of large-scale energy storage systems is moving forward in California. For example, in 2010 FERC approved incentive rates for Western Grid Development's utility-scale battery storage projects in California.⁷⁵ These projects are intended to address specific transmission reliability problems identified by CAISO.

Storage is an ideal way to backup intermittent renewable power. The CEC's Public Interest Energy Research Program released a strategic analysis of energy storage that reports that "[s]tudies indicate that California may require between 3,000 to 4,000 megawatts of fast-acting energy storage by 2020 to integrate the projected increase in renewable energy."⁷⁶

Further, storage has been found to be more effective than conventional peaking generation, and may therefore not be needed on a one-to-one to ratio. A report by SCE found that CAISO's "control area may require between 3,000 and 5,000 MW of additional regulation/ramping services from fast (5-10 MW per second) resources in 2020. . . Fast (defined as 10 MW per second) storage is two to three times more effective than conventional generation in meeting ramping requirements. Consequently, 30-50 MW of storage is equivalent to 100 MW of conventional generation."⁷⁷

In the same report, SCE made several findings related to storage:

⁷³ See CEJA Requests 1, Response to Request No. 2; CEJA Requests 1 Update, Response to Request No. 4; CEJA Requests 2, Responses to Request Nos. 3, 7; Sierra Club Requests 1 Nos. 7, 12, 21; Vote Solar Requests 1, Response to Request No. 11.

⁷⁴ See CEJA Requests 1, Response to Request No. 6; Sierra Club Requests 1, Responses to Request Nos. 5, 11; Vote Solar Requests 1, Response to Request No. 4(d).

⁷⁵ SNL Financial, *FERC approves incentive rates for Western Grid Development's battery storage projects* (Jan. 22, 2010).

⁷⁶ Public Interest Energy Research (PIER) Program Final Project Report, *2020 Strategic Analysis of Energy Storage in California* (Nov. 2011), p. 6
<<http://www.energy.ca.gov/2011publications/CEC-500-2011-047/CEC-500-2011-047.pdf>>, [as of June 22, 2012].

⁷⁷ Southern California Edison, *Moving Energy Storage from Concept to Reality* (May 20, 2011) p. 14
<http://www.energy.ca.gov/2011_energypolicy/documents/2011-04-28_workshop/comments/TN_60861_05-20-11_Southern_California_Edison_Company_Comments_Re_Energy_Storage_for_Renewable_Integration.pdf> [as of June 20, 2012] (hereafter *Moving Energy Storage*).

“Many [storage] technologies are approaching commercial availability. These have been tested for viability, are actively looking for partnerships, and are beginning to sign substantial contracts with customers.

Energy storage companies are actively targeting the utility storage market and have established strong external support and momentum. Storage companies are developing internal knowledge about utility interests and priorities and are providing more sophisticated value propositions for their products.

The vast majority of energy storage products are not in direct competition with one another, due to different power-to-energy ratios, cycling capabilities, and other attributes (see the technology comparison sidebar).”⁷⁸

AB 2514, signed into law in September 2010, directs the Commission to open a proceeding by March 2012 to determine the amount of energy storage, if any, to be developed by the IOUs.⁷⁹ Similar language is included for POUs. The Commission initiated this energy storage proceeding in December 2010.⁸⁰ The bill initially contained specific energy storage targets. These targets included energy storage equivalent to 2.25 percent of the daily peak load by 2014, and 5 percent of the daily peak load by 2020.⁸¹ Daily peak load is defined as a utility’s average peak electrical demand over the previous five years. On a statewide level, assuming an average statewide peak load of 50,000 MW, this is equivalent to somewhat over 1,000 MW of energy storage in 2014 and 2,500 MW of energy storage in 2020.⁸² Specific percentage energy storage targets were dropped from the final version of AB 2514.

The Governor’s *Clean Energy Jobs Plan* also “envisions, accelerated development of energy storage capacity to support integration of renewable resources into the California grid.”⁸³

Despite recognizing the value of storage and the increasing availability of storage technology, CAISO fails to consider storage as a viable option.⁸⁴ Storage projects are being developed and will be on-line to potentially meet bundled need. For example,

⁷⁸ *Id.* at p. 29.

⁷⁹ Assembly Bill 2514 (Sep. 29, 2010) <http://www.leginfo.ca.gov/pub/09-10/bill/asm/ab_2501-2550/ab_2514_bill_20100929_chaptered.html> [as of June 20, 2012].

⁸⁰ CPUC, *R.10-12-007* (Dec. 2010).

⁸¹ Megawatt Storage Farms, Inc., *Comments of MegaWatt Storage Farms on CAISO Conceptual Statewide Transmission Plan*, (Feb. 17, 2011) p. 5.

⁸² Assembly Bill 2514, Introduced February 19, 2010 <http://www.leginfo.ca.gov/pub/09-10/bill/asm/ab_2501-2550/ab_2514_bill_20100219_introduced.html> [as of June 22, 2012].

⁸³ CEC, *Renewable Power in California: Status and Issues* (Dec. 2011) p. 27; *see also 2011 IEPR, supra*, p. 75 n. 92.

⁸⁴ CEJA Requests 1, Response to Request No. 6; Sierra Club Requests 1, Responses to Request Nos. 5, 11; Vote Solar Requests 1, Response to Request No. 4(d).

Beacon Power constructed flywheels connected to a California wind farm,⁸⁵ and PG&E is installing 4 MW of sodium-sulfur utility scale battery projects in 2012.⁸⁶

In addition, storage projects such as the 53 MW distributed storage project by Ice Energy was not considered by CAISO as a resource. SCE also has a number of demonstration projects that incorporate energy storage, SCE has also made storage a major aspect of its Smart Grid plan. The failure to consider *any* storage projects that are on-line or being constructed as an available resource makes CAISO's analysis unrealistically conservative. These resources need to be considered since they are a viable way to meet load requirements and are an integral part of SCE's Smart Grid plan.

Funding for storage initiatives is increasing in California. Investments in energy storage have increased by 13 fold over the past year, accounting for 11 percent of total investment dollars in clean technology in 2011.⁸⁷ A bill has also been introduced in Congress that would provide for an energy investment credit for energy storage that connected to the grid.⁸⁸

The Commission also granted eligibility to Advanced Energy Storage to be included as a qualifying facility in the Self-Generation Incentive Program, citing the ability to "reduce peak demand and GHGs."⁸⁹

FERC has also begun examining how storage can be integrated into the grid. For instance, in 2010, FERC put out a request for comments on rates and other issues related to new energy storage technologies.⁹⁰

In partnership with the DOE, SCE is currently testing 8 MW of "large-scale lithium-ion batteries for storing intermittently-generated wind energy."⁹¹ The project stores wind energy generated in the Tehachapi Wind Resource Area.⁹²

⁸⁵ See CEC, *Energy Commission Awards \$2 Million to PG&E for Battery Storage Research* (Feb. 9, 2010) <http://www.energy.ca.gov/releases/2010_releases/2010-02-09_battery_storage.html> [as of June 20, 2012].

⁸⁶ Pacific Gas and Electric Company, *PG&E Smart Grid Deployment Plan 2011-2010* (June 2011), <http://www.pge.com/includes/docs/pdfs/shared/edusafety/electric/SmartGridDeploymentPlan2011_06-30-11.pdf> [as of June 20, 2012].

⁸⁷ Next 10, *2012 California Green Innovation Index* (2012) p. 16 <http://next10.org/sites/next10.huang.radicaldesigns.org/files/2012_GII%20Report_mech_final.pdf> [as of June 20, 2012]; see also *id.* at p. 20 ["California has been a consistent leader in battery technology patent registrations. Reaching 258 total patents in the 2008-10 period, filings increased by 55 percent from the prior period. Lithium Battery represents the second largest category of battery patents. The largest category represents a mix of technologies"].

⁸⁸ See *Storage Technology of Renewable and Green Energy Act of 2009* ("STORAGE Act of 2009") <<http://wyden.senate.gov/imo/media/doc/storage.pdf>> [as of June 20, 2012].

⁸⁹ CPUC, *Commission Decision 11-09-015* (Sep. 8, 2011) p. 19, 62.

⁹⁰ Federal Energy Regulatory Commission (FERC), *Request for Comments Regarding Rates, Accounting and Financial Reporting for New Electric Storage Technologies Docket No. AD10-13-000* (Jun. 11, 2010) <<http://www.ferc.gov/media/headlines/2010/2010-2/06-14-10-notice.pdf>> [as of June 20, 2012].

⁹¹ Southern California Edison, *Energy Storage is Key to More Efficient Grid* <<http://www.sce.com/PowerandEnvironment/smartgrid/energy-storage.htm>> [as of June 20, 2012].

SCE also has a Home Battery Pilot Project to assess the potential for use of lithium ion batter cells used in Plug-in Electric Vehicles for energy storage in residential and small commercial applications.⁹³ “SCE proposed to test the concept by integrating home energy storage with Demand Response (DR) strategies, renewable energy generation (wind and solar) and SCE’s advanced metering infrastructure.”⁹⁴ The pilot projects will include up to 50 sites by the end of 2012.⁹⁵ “The program assumes that peak demand can be reduced by up to 4 kW per home for up to two hours per day.”⁹⁶

SCE has also stated that it “launched a dedicated energy storage strategic planning effort in January 2010.”⁹⁷ Drivers for this project included federal stimulus funds targeting the “green tech” sector through 2009’s American Recovery and Reinvestment Act, “totaling \$620 million explicitly for energy storage projects with a further \$3.5 billion in related smart grid investment.”⁹⁸

In addition, SCE’s Irvine Smart Grid Demonstration is a \$79 million pilot project that “will comprehensively test various storage operational uses and applications within a Smart Grid over a 3-year time frame.”⁹⁹ SCE’s current R&D initiatives also include community energy storage (distributed units of 25 to 50kW/50 to 100kWh), and residential home energy storage units.¹⁰⁰

BrightSource Energy Inc. has also added its SolarPLUS thermal energy storage capability to three of its power purchase agreements with SCE. “The new set of contracts . . . consist of two BrightSource solar thermal plants scheduled to deliver electricity in 2015 and three plants with energy storage scheduled to deliver electricity in 2016 and 2017.”¹⁰¹

⁹² Southern California Edison, *Tehachapi Wind Energy Storage (TSP) Project* (Nov. 3, 2010) <<http://energy.gov/sites/prod/files/ESS%202010%20Update%20Conference%20-%20Tehachapi%20Wind%20Energy%20Storage%20-%20Loic%20Gaillac,%20SCE.pdf>> [as of June 20, 2012].

⁹³ See Southern California Edison, *Home Battery Pilot Technical Requirements* (Nov. 3, 2009) p. 5 <<http://asset.sce.com/Documents/Environment%20-%20Smart%20Grid/HomeBatteryPilotTechnicalRequirements.pdf>> [as of June 20, 2012].

⁹⁴ *Ibid.*

⁹⁵ *Ibid.*

⁹⁶ *Ibid.*

⁹⁷ Rittershausen & McDonagh, *Moving Energy Storage from Concept to Reality: Southern California Edison’s Approach to Evaluating Energy Storage*, at p. 12 <http://www.edison.com/files/WhitePaper_SCEsApproachtoEvaluatingEnergyStorage.pdf> [as of June 20, 2012].

⁹⁸ *Ibid.*

⁹⁹ Southern California Edison, *Panel Discussion: The Economics of Distributed Energy Storage* (Sept. 7, 2011) p. 12 <<http://eosenergystorage.com/documents/SCEPresentation-The-Economics-of-Distributed-Storage.pptx>> [as of June 21, 2012].

¹⁰⁰ Southern California Edison, *SCE Evaluation of CES Batteries and Systems* (May 2 – 4, 2012) p. 8 <http://www.electricitystorage.org/site/download.php/2012_presentations/i47_gaillacv1.pdf> [as of June 21, 2012].

¹⁰¹ The Daily Energy Report, *BrightSource, SCE Add Energy Storage Capabilities to Power Purchase Agreements* <<http://www.dailyenergyreport.com/2011/11/brightsource-sce-add-energy-storage-capabilities-to-power-purchase-agreements/>> [as of June 21, 2012].

Brightsource has stated that by adding storage, it will be able to forego building an additional 200 MW plant.¹⁰²

Other SCE storage projects include a contract “to furnish a turnkey 1 MW S&C Smart Grid SMS™ Storage Management System on Catalina Island, off the coast of California. The Smart Grid SMS is a fast-responding automatic controller that uses built-in intelligence to control charging and discharging of sodium-sulfur batteries.”¹⁰³

Finally, both CAISO and SCE have recognized that increasing storage potential in California is necessary and have identified market barriers to storage development.¹⁰⁴ CAISO as well has elaborated at length on growing opportunities for energy storage in California and the steps it is taking to remove barriers to storage development. In the energy storage proceeding, CAISO has stated that:¹⁰⁵

It has recently undertaken the following initiatives that have already facilitated, or will soon facilitate, the ability of energy storage to participate in ISO markets. In July 2010, the ISO sought approval to revise several aspects of its tariff requirements for ancillary services in order to expand the pool of resources able to participate in the ISO’s ancillary services markets. The revisions, which FERC approved in September 2010, relaxed certain requirements that the ISO concluded were no longer required for reliable operation . . . These changes were designed specifically to enhance the ability of energy storage and other non-traditional resources to participate in the ISO’s ancillary services markets, consistent with the ISO’s operational and reliability needs. In addition, in August 2011, the ISO filed a proposal with FERC for approval of a market enhancement known as regulation energy management . . . this enhancement will facilitate the ability of limited energy storage resources to participate in the ISO’s regulation market by enabling them to bid their capacity more effectively while still meeting the ISO’s continuous energy requirements for regulation. In November 2011, FERC approved the ISO’s regulation energy management proposal, based on findings that it reduces barriers to the ISO’s ancillary services markets for ‘non-generator resources’ and ‘allows non-generator resources to participate more fully in CAISO’s regulation market, consistent with continuous energy requirements.’ The ISO is currently working with stakeholders to initiate a market simulation of

¹⁰² Sustainable Business, *Brightsource Signs Big Energy Storage Deal* (Nov. 29, 2011)

<<http://www.sustainablebusiness.com/index.cfm/go/news.display/id/23193>> [as of June 21, 2012].

¹⁰³ Energy Central, *S&C Electric Company Helps Southern California Edison Reduce Greenhouse Gas Emissions* (Jun. 27, 2011)

<<http://www.energycentral.com/generationstorage/energystorage/news/vpr/11151/S-C-Electric-Company-Helps-Southern-California-Edison-Reduce-Greenhouse-Gas-Emissions>> [as of June 21, 2012].

¹⁰⁴ Shigekawa & Allred, *Comments of Southern California Edison Company to the California Public Utilities Commission on the Energy Storage Framework Staff Proposal, R.10-12-007* (Jan. 31, 2012), p. 3 <<http://docs.cpuc.ca.gov/efile/CM/158861.pdf>> [as of June 21, 2012] (“Opportunities currently exist for energy storage, and more will develop as barriers are overcome”).

¹⁰⁵ CAISO, *Comments of the California Independent Systems Operator Corporation on Initial Staff Proposal, R.10-12-007* (Jan. 13, 2012) pp. 4–6 <<http://docs.cpuc.ca.gov/efile/CM/158871.pdf>> [as of June 21, 2012].

regulation energy management and expects to bring this functionality into production later this year.

In addition to these two FERC-approved tariff revisions, the ISO has recently commenced two initiatives to refine its markets that should facilitate the participation of energy storage. In December 2011, the ISO initiated a Pay for Performance Regulation stakeholder initiative in response to FERC Order No. 755, which directs independent system operators and regional transmission organizations to revise their frequency regulation services to ensure that faster ramping resources are compensated for the greater amount of frequency regulation they provide in comparison to resources with longer ramp rates.

Although the stakeholder process is still ongoing, the ISO's most recent straw proposal includes design elements that would compensate resources depending on both the total movement of a resource in response to automatic generation control signals over a given period and the accuracy with which the resource responds to the regulation signal. Such refinements in compensation should facilitate the participation of non-traditional generation resources – such as energy storage – in the regulation market, provided that those resources are able to ramp more quickly and respond more accurately than traditional generation resources.

The ISO also has recently initiated a stakeholder process to develop a market-based flexible ramping capacity product to address reliability concerns and operational needs in the ISO's real-time market. This product, once developed, will provide an additional means for fast-ramping resources to participate in the ISO's markets in a manner that meets an important operational need.

As demonstrated by the multitude of projects, CAISO's assumption of no energy storage is unreasonable. CAISO should have included at a minimum all of the existing projects. In addition, as shown above, many other projects are being constructed and planned for the system before 2021. These projects should have been evaluated for inclusion into the modeling assumptions.

D. CAISO Should Have Considered More Local Renewable Energy in its Analysis.

CAISO should have considered more renewable energy capacity in its analysis.¹⁰⁶

Regarding distributed PV generally, the Commission observed with its approval of the PG&E 500 PV project that:

This solar development program has many benefits and can help the state meet its aggressive renewable power goals," said CPUC President Michael R. Peevey. 'Smaller scale projects can avoid many of the pitfalls that have plagued larger renewable projects in California, including permitting and transmission challenges.

¹⁰⁶ See, e.g., Sierra Club Requests I, Responses to Request Nos. 26, 27, 33, 35, 36 (describing CAISO's assumptions).

Because of this, programs targeting these resources can serve as a valuable complement to the existing Renewables Portfolio Standard program.¹⁰⁷

PV should be counted towards meeting RA peak needs. The CEC has recognized the value of energy generated from distributed PV as a cost-effective substitute for natural gas-fired peaking generation. The CEC denied an application for a 100 MW natural gas-fired peaking gas turbine plant, the Chula Vista Energy Upgrade Project (CVEUP) in San Diego County, in June 2009. The application was denied in part because the CEC opined that rooftop PV could potentially achieve the same objectives for comparable cost.¹⁰⁸

The June 2009 CEC decision implies that any future applications for gas-fired generation in California should be measured against using distributed PV to meet the demand. The final CEC decision in the CVEUP proceeding states:¹⁰⁹

“Photovoltaic arrays mounted on existing flat warehouse roofs or on top of vehicle shelters in parking lots do not consume any acreage. The warehouses and parking lots continue to perform those functions with the PV in place. . . . Mr. Powers (expert for intervenor) provided detailed analysis of the costs of such PV, concluding that there was little or no difference between the cost of energy provided by a project such as the CVEUP (gas turbine peaking plant) compared with the cost of energy provided by PV. . . . PV does provide power at a time when demand is likely to be high—on hot, sunny days. Mr. Powers acknowledged on cross-examination that the solar peak does not match the demand peak, but testified that storage technologies exist which could be used to manage this. The essential points in Mr. Powers’ testimony about the costs and practicality of PV were uncontroverted.”

The CEC concluded in the CVEUP final decision that PV solar arrays on rooftops and over parking lots may be a viable alternative to the gas turbine project proposed in that case, and that if the gas turbine project proponent opted to file a new application, a much more detailed analysis of the rooftop PV alternative would be required.

In 2009, the Commission evaluated a renewable energy strategy that relies primarily on distributed PV, known as the “High DG” strategy, to achieve the state’s 33 percent by 2020 goal.¹¹⁰ The High DG alternative substitutes 15,000 MW_{ac} of distributed PV for a comparable amount of remote utility-scale solar and wind projects in the utility 33 percent by 2020 reference case scenario.¹¹¹ The Commission determined that the cost of the High DG alternative would be comparable to the cost of the utility reference case scenario if the capital cost of PV was about one-half the cost assumed by the Commission in its analysis.

¹⁰⁷ CPUC, *CPUC Approves Solar PV Program for PG&E* (Apr. 22, 2010) [Docket A.09-02-019.]

¹⁰⁸ CEC, *Chula Vista Energy Upgrade Project – Application for Certification (07-AFC-4) San Diego County, Final Commission Decision* (Jun. 2009).

¹⁰⁹ *Id.* at pp. 29–30 (internal citations omitted).

¹¹⁰ CPUC, *33% Renewable Portfolio Standard Implementation Analysis Preliminary Results*, (Jun. 2009) p. 19, Table 2 (hereafter *33% Renewable Portfolio*).

¹¹¹ *Id.* at p. 52.

The LCOE for distributed PV assumed by the Commission in reaching this conclusion was \$168/MWh.¹¹² The cost of PV has dropped dramatically since 2009. Solar panel cost dropped 46 percent in 2011 alone.¹¹³

The Commission determined that the cost of the High DG alternative would be comparable to the cost of the utility reference case scenario if the capital cost of PV was about one-half the \$7/Wac capital cost assumed by the Commission in its analysis. \$306/MWh was the levelized cost-of-energy assumed for the \$7/Wac distributed PV capital cost. The Commission stated that a distributed PV capital cost of \$3.70/Wac would result in cost parity with the utility 33 percent reference case scenario. The distributed PV levelized cost-of-energy assumed by the CPUC for distributed PV with a capital cost of \$3.70/Wac was \$168/MWh.¹¹⁴

The Commission prepares quarterly summary reports on the state's progress toward RPS goals. The fourth quarter 2011 report includes pricing data on RPS contracts for the first time, in conformance with SB 836 (2011) RPS contract price reporting requirements.¹¹⁵ SB 836 requires that average RPS contract prices be reported by contract year, technology type, and size range by each IOU. The average 2011 contract prices reported by PG&E for 0-3 MW solar PV was \$129/MWh. The average 2011 contract prices reported by SCE for 0-3 MW solar PV was \$142/MWh. The average price reported by PG&E for 3-20 MW solar PV projects was \$114/MWh. The average price reported by SCE for 3-20 MW solar PV projects was \$124/MWh.¹¹⁶

Competitive power purchase contract prices for commercial rooftop PV systems in California at the end of 2011 were: \$130/MWh for 1 MW systems, \$140/MWh for 500 kW systems, and \$150/MWh for 100 kW systems.¹¹⁷ The 2012 tariff price for commercial rooftop PV systems that are 100 kW or greater is \$0.14/kWh, or

¹¹² *Id.* at p. 31 [The CPUC PV sensitivity analysis assumed a thin-film PV capital cost of \$3.70/Wac with a cost-of-energy of \$268/MWh. The report defines High DG in this manner, “[a]ssumes limited new transmission corridors are developed to access additional renewable resources to achieve a 33% RPS. Instead, extensive, smaller-scale renewable generation is located on the distribution system and close to substations.” (*Id.* at 19).]

¹¹³ Bloomberg, *First Solar Latest Casualty in Renewable Energy Shakeout* (Apr. 18, 2012).

¹¹⁴ *33% Renewable Portfolio*, *supra*, at p. 31. [The CPUC PV sensitivity analysis assumed a thin-film PV capital cost of \$3.70/Wac with a cost-of-energy of \$168/MWh. “Thus, the Solar PV Cost Reduction sensitivity results in the High DG Case having similar overall costs to the 33% RPS Reference Case and other renewable resource mixes that depend on central station renewable generation.” (*Id.* at p. 31). The report defines High DG in this manner, “Assumes limited new transmission corridors are developed to access additional renewable resources to achieve a 33% RPS. Instead, extensive, smaller-scale renewable generation is located on the distribution system and close to substations.” (*Id.* at p. 19).]

¹¹⁵ CPUC, *Renewable Portfolio Standard Quarterly Report – 4th Quarter 2011—Attachment A* (Feb. 2012) <<http://www.cpuc.ca.gov/NR/rdonlyres/3B3FE98B-D833-428A-B606-47C9B64B7A89/0/Q4RPSReporttotheLegislatureFINAL3.pdf>> [as of June 22, 2012.]

¹¹⁶ *Id.* at p. A-4, Table A-2.

¹¹⁷ Lewis C. – Clean Coalition, *Making Clean Local Energy Accessible Now*, (Dec. 8–9, 2011) p. 8 [PowerPoint presentation, California Foundation for the Economy and Environment workshop on distributed renewable generation, Sausalito, California.]

\$140/MWh.¹¹⁸ This clean payment rate for commercial rooftop PV systems is well below the parity price of \$168/MWh identified by the Commission for the utility reference case 33 percent RPS compliance strategy. Due to continued cost declines and policy support, the Solar Energy Industry Association projects that distributed generation in California will reach 5.3 GW by 2016 alone.¹¹⁹

The actual availability of the solar resource in SCE territory during the top 100 demand hours is approximately 96 percent.¹²⁰ The actual availability of peaking natural gas-fired resources is at best equivalent to that of rooftop PV systems. Recent natural gas-fired peaking turbine projects in the Bay Area, including 200 MW Mariposa Energy Center and 760 MW Marsh Landing Generating Station, state expected availability in the range of 92 to 98 percent. The projected availability of Marsh Landing is 94 to 98 percent.¹²¹ The projected availability of Mariposa Energy Center is 92 to 98 percent.¹²²

The loss of one large natural gas-fired plant has potentially major implications for grid reliability. For example, the Sempra 600 MW combined cycle plant in Mexicali, Mexico, which is under CAISO operational control and connects directly to the SDG&E Imperial Valley substation, was in forced outage due to a steam turbine generator problem on September 8, 2011.¹²³ September 8, 2011 was the third day of the most intense heat wave of 2011 in SDG&E service territory. The lack of voltage support at the Imperial Valley substation on that day led contributed to a cascading series of trips that caused the largest blackout in many years in Southern California and Northern Baja California.

The high reliability of solar PV, combined the grid reliability benefits of distributing output over many smaller sources instead of a single unit, make rooftop PV an excellent substitute for conventional natural gas-fired peaking units in SCE territory. Numbers from the California Solar Initiative demonstrate an on-peak capacity factor for distributed PV of at least 50 percent.¹²⁴ Solar PV is predictably available during periods of peak demand. The reason the PV capacity factor is lower than the solar availability of

¹¹⁸ See City of Palo Alto, *Palo Alto CLEAN Program* <<http://www.cityofpaloalto.org/news/displaynews.asp?NewsID=1877&targetid=223>> [as of June 21, 2011] [describing Palo Alto's CLEAN program]; Greentech Media, *It's Official: Palo Alto, Calif. Has a Feed-In Tariff for PV* (Mar. 6, 2012) <<http://www.greentechmedia.com/articles/read/Its-Official-Palo-Alto-Calif.-Has-a-Feed-In-Tariff-for-PV-/>> [as of June 21, 2012].

¹¹⁹ SEIA, *California DG and Utility Solar Capacity* (May 2012) [attached hereto as Attachment A.]

¹²⁰ See Exhibit B (attached to this report).

¹²¹ CEC, *Marsh Landing Generating Station – Commission Decision* (Aug. 2010) p. 8. [“The overall annual availability of the MLGS as measured by equivalent availability factor (EAF) is expected to be approximately 94 to 98 percent.”]

¹²² CEC, *Mariposa Energy Project – Commission Decision* (May 2011) pp. 1–2 [“Applicant intends that the Mariposa Energy Project (MEP) provide operating flexibility and rapid start capability, i.e. the ability to quickly start up and provide efficient part load and base load power. It expects an annual availability factor of 92 to 98 percent for the project”]

¹²³ Federal Energy Regulatory Commission, *Arizona – Southern California Outages on September 8, 2011 – Causes and Recommendations*, April 2012, p. 4. Map of affected area shows Sempra Termoelectrica (TDM) combined cycle plant in Mexicali “on outage.”

¹²⁴ See Itron, *CPUC California Solar Initiative Report* (Jun. 2010) pp. 5-6 to 5-10 <http://www.cpuc.ca.gov/NR/rdonlyres/70B3F447-ADF5-48D3-8DF0-5DCE0E9DD09E/0/2009_CSI_Impact_Report.pdf> [as of June 22, 2012].

at least 96 percent is because peak production from a fixed PV array occurs at mid-day and the demand peak generally occurs in mid-afternoon. Distributed PV is also predictably available at a reduced level on partly cloudy days when the output of multiple dispersed PV systems is averaged together.

A number of state goals are currently increasing the amount of PV across the state, including Governor Brown's goal of the development of 12,000 MW of local renewable energy by 2020, the SB 32 feed-in tariff program, the Commission's Renewable Auction Mechanism, and the SB1 target of 3,000 MW of net-metered solar DG by 2017.¹²⁵ As the CEC has found:¹²⁶

Recent trends indicate increasing market interest in renewable development. The 2009 RPS solicitation by the investor-owned utilities (IOUs) drew bids from developers offering to supply enough renewable generation to meet half of the IOUs' total electrical load in 2020, and IOUs currently have signed contracts for roughly 14,000 MW of new renewable capacity. In 2010, state and local entities issued permits for 9,435 MW of renewable capacity, and another 28,000 MW is being tracked in various permitting processes.

Similarly, in-state renewable generation represented about 75 percent of total renewable generation from more than 10,000 MW of renewable generating capacity.¹²⁷ Renewable energy has a projected annual growth rate of 18 percent per year from 2010–2016,¹²⁸ while California is currently adding approximately 25 MW per *month* of PV.¹²⁹ Further, CAISO's interconnection queue includes about 57,000 MW of renewable capacity, and there are 450 active interconnection requests for DG systems in the Wholesale Distribution Access Tariff queue totaling about 5,200 MW.¹³⁰

One recent Los Angeles Business Council report found that the City of Los Angeles has approximately 5,536 MW of rooftop solar potential.¹³¹ The same study estimated a rooftop solar potential for Los Angeles County of 19,113 MW.¹³² Navigant, under

¹²⁵ See *AB 32 Climate Change Scoping Plan*, *supra*, at pp. 41-53. .

¹²⁶ *2011 IEPR*, *supra*, at p. 34–35. [Citing California Energy Commission, *Renewable Energy Action Team-Generation Tracking for Renewable Projects* (Jun. 11, 2012) <www.energy.ca.gov/33by2020/documents/renewable_projects/REAT_Generation_Tracking_Projects_Report.pdf> (as of June 22, 2012).]

¹²⁷ *Id.* at p. 29.

¹²⁸ *Id.* at p. 76.

¹²⁹ See CPUC, *About the California Solar Initiative*

<<http://www.cpuc.ca.gov/PUC/energy/Solar/aboutsolar.htm>> [i.e. general CSI plus NSHP].

¹³⁰ *2011 IEPR*, at p. 35.

¹³¹ Los Angeles Business Council, *Bringing Solar Energy to Los Angeles: An Assessment of the Feasibility and Impact of an In-Basin Solar Feed-in Tariff Program* (Jul. 8, 2010) p. x

<http://www.labusinesscouncil.org/online_documents/2010/Consolidated-Documents-070810.pdf> [as of June 21, 2012].

¹³² *Ibid.*

contract to the CEC, determined the California statewide rooftop solar technical potential to be 60,929 MW.¹³³

The Solar Electric Industry Association estimates that distributed solar generation will reach 5,300 MW by 2016.¹³⁴ Thus, a high case of 6,000 MW in 2020 is reasonable, as is the mid case of 4,500 MW by 2020.

The construction of new generation and transmission in California is primarily justified by utilities on projections of rising peak load. Therefore, it is necessary to understand what percentage of solar and wind capacity will be reliably available during peak demand to avoid excessive construction of conventional generation and transmission infrastructure.

Hot summer days are cloud-free or nearly cloud-free in the greater Los Angeles area. This results in maximum output from solar resources during peak demand periods.¹³⁵ In contrast, wind intensity is generally lowest during summer mid-day and afternoon periods. As a result, the solar resource would have the predominant market price depression effect on summer afternoons when market prices are highest. The PV system output peak is mid-day, while the summer demand peak usually occurs in the mid-afternoon.

The reduction in German electricity market prices caused by renewable energy depressing market prices in 2009 is estimated at approximately \$5 billion by the German government.¹³⁶ Germany produced approximately 16 percent, or 94,000 GWh, of its total electricity demand with renewable energy resources in 2009.¹³⁷ The \$5 billion per year reduction in the market price of power is a \$5 billion per year savings to German ratepayers. Germany has an electricity market that is approximately twice the size of the California market at about 526,000 GWh per year of end user consumption.¹³⁸

Many California jurisdictions are supporting renewable DG by expediting permitting barriers. The California County Planning Directors Association is also coordinating a multi-stakeholder effort to draft a model ordinance for solar electric facilities for cities

¹³³ Navigant, *Distributed Renewable Energy Assessment Final Report*, prepared for the Public Interest Energy Research Program, California Energy Commission, August 11, 2009, p. 43. "NCI's (Navigant's) PV technical potential is significantly higher than other PV estimates because these other studies are not true technical potentials. Rather, they are constrained by the distribution system."

¹³⁴ Solar Energy Industries Association, *California DG and Utility Solar Capacity* (May 2012).

¹³⁵ See Attachment B.

¹³⁶ German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety, *Cost and benefit effects of renewable energy expansion in the power and heat sectors*, June 2010. Merit order effect of renewable energy estimated at 3.6 to 4 billion Euros in 2009. 1 Euro = 1.334 dollars as of January 16, 2011. Therefore 3.6 to 4 billion Euros = 4.8 to 5.3 billion dollars.

¹³⁷ Yale Global, *Germany Leads With Its Goal of 100 Percent Renewable Energy*, September 7, 2010. Approximately 9,800 MW of solar and 25,800 MW of wind resources were online in Germany by the end of 2009; UPI.com, *German renewable industry booming*, March 24, 2010.

¹³⁸ See International Energy Agency, *Statistics Germany 2009*

<http://www.iea.org/stats/electricitydata.asp?COUNTRY_CODE=DE> [as of June 21, 2012] [Final 2009 consumption of electricity = 526,000 GWh].

and counties across the state.¹³⁹ Further, the Commission is engaged in making ongoing improvements to PV interconnection policies, including a “best practice” for DG penetration levels, and “[n]ew rules under which distributed generation developers obtain and retain queue position.”¹⁴⁰

SCE’s service territory is an ideal region for distributed PV systems. SDG&E states, “Renewable DG penetrations (in particular solar photovoltaic (PV) generation) are projected to steadily increase across SCE’s service territory.”¹⁴¹

Distributed DG is increasing across SCE’s territory due to a variety of renewable programs. For instance, SCE’s CREST program allows applicants to sell renewable power to SCE for DG facilities not greater than 1.5 MW.¹⁴² SCE is installing 500 MW of solar PV over the next 5 years.¹⁴³

The city of Los Angeles is also working to rapidly expand its solar PV, demonstrating the great potential for solar development exhibited by the greater Los Angeles area. On April 3, 2012, the LA City Council approved the Department of Water & Power to move forward with its feed-in tariff program of up to 150 MW by 2016.¹⁴⁴ Similarly, LADWP’s Solar Incentive Program has installed 25 MW at over 3,100 customer locations as of February 2011.¹⁴⁵ The LA Business Council has also found that the City of LA has more than 12,000 acres of “prime space” for solar development on rooftops, “with capacity to create as much as five gigawatts of clean, locally generated power.”¹⁴⁶

The report goes on to call rooftop PV:

¹³⁹ 2011 IERP at p. 36, <http://www.energy.ca.gov/2011publications/CEC-100-2011-001/CEC-100-2011-001-CMF.pdf>.

¹⁴⁰ See CPUC, *Rule 21 Settlement Filed*

<<http://www.cpuc.ca.gov/PUC/energy/Procurement/LTPP/rule21.htm>> [as of June 21, 2012].

¹⁴¹ Moving Energy Storage from Concept to Reality, Southern California Edison, at p. 22 (May 20, 2011)

[http://www.energy.ca.gov/2011_energypolicy/documents/2011-04-](http://www.energy.ca.gov/2011_energypolicy/documents/2011-04-28_workshop/comments/TN_60861_05-20-11_Southern_California_Edison_Company_Comments_Re_Energy_Storage_for_Renewable_Integration.pdf)

[28_workshop/comments/TN_60861_05-20-](http://www.energy.ca.gov/2011_energypolicy/documents/2011-04-28_workshop/comments/TN_60861_05-20-11_Southern_California_Edison_Company_Comments_Re_Energy_Storage_for_Renewable_Integration.pdf)

[11_Southern_California_Edison_Company_Comments_Re_Energy_Storage_for_Renewable_Integration.p](http://www.energy.ca.gov/2011_energypolicy/documents/2011-04-28_workshop/comments/TN_60861_05-20-11_Southern_California_Edison_Company_Comments_Re_Energy_Storage_for_Renewable_Integration.pdf)

[df](http://www.energy.ca.gov/2011_energypolicy/documents/2011-04-28_workshop/comments/TN_60861_05-20-11_Southern_California_Edison_Company_Comments_Re_Energy_Storage_for_Renewable_Integration.pdf)

¹⁴² SCE, *SCE’s California Renewable Energy Small Tariff (CREST) Program* (Jan. 3, 2012) p. 1

<<http://asset.sce.com/Documents/Shared/CRESTParticipantInstructions1207.pdf>> [as of June 21, 2012].

¹⁴³ U.S. Department of Energy, *DOE Perspective on High Penetration PV* (Mar. 2011)

<[http://www.cpuc.ca.gov/NR/rdonlyres/2B8F9E63-6FE9-4F9D-B569-](http://www.cpuc.ca.gov/NR/rdonlyres/2B8F9E63-6FE9-4F9D-B569-BEFE9A185BA6/0/DOEReDecKWL20110304.pdf)

[BEFE9A185BA6/0/DOEReDecKWL20110304.pdf](http://www.cpuc.ca.gov/NR/rdonlyres/2B8F9E63-6FE9-4F9D-B569-BEFE9A185BA6/0/DOEReDecKWL20110304.pdf)> [as of June 21, 2012].

¹⁴⁴ Los Angeles Business Council, *Policy Priority: CLEAN LA Solar Program for the City of LA*

<<http://www.labusinesscouncil.org/sustainability/index.php>> [as of June 21, 2012]; see also Council of the

City of Los Angeles, *Ordinance No. 182108* (Apr. 12, 2012) <[http://clkrep.lacity.org/online/docs/2011/11-](http://clkrep.lacity.org/online/docs/2011/11-0617-s2_ord_182108.pdf)

[0617-s2_ord_182108.pdf](http://clkrep.lacity.org/online/docs/2011/11-0617-s2_ord_182108.pdf)> [as of June 21, 2012].

¹⁴⁵ Implementation Plan for the Statewide Water Quality Control Policy on the Use of Coastal and

Estuarine Waters for Power Plant Cooling, LADWP, at p. 4 (April 1, 2011)

[http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/powerplants/harbor/docs/hgs_ip2011](http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/powerplants/harbor/docs/hgs_ip2011.pdf)

[.pdf](http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/powerplants/harbor/docs/hgs_ip2011.pdf)

¹⁴⁶ More than 12,000 Acres Atop LA City Rooftops Provide Huge Opportunity for Solar Development, Los Angeles Business Council (April 16, 2012)

http://www.labusinesscouncil.org/online_documents/2012/12000-Acres-of-Rooftop-Solar-Potential-in-LA-20120426.pdf

A massive, underutilized resource that belongs exclusively to Greater Los Angeles. While the integration of this much distributed solar into the electricity grid in the short-term could be a considerable challenge, *Los Angeles can still feasibly incorporate gigawatts of this latent rooftop solar capacity more cost-effectively than virtually any other place in North America.*¹⁴⁷

E. CAISO Should Have Considered More Combined Heat & Power in Its Analysis.

CAISO considered no uncommitted CHP in its May 23, 2012 testimony.¹⁴⁸ In its Addendum, CAISO considered an incremental 209 MW of uncommitted combined heat and power being added to the LA Basin in 2021: 195 in Western LA Basin, 6 MW in Big Creek/Ventura, 8 MW is in Overall LA Basin but not Western.¹⁴⁹

CHP refers to facilities that use a small gas turbine, engine, or fuel cell to generate electricity and convert exhaust heat to useful steam or hot water. Combined heat and power facilities are commonly found at college campuses, hospitals, and commercial and industrial complexes. The state of California has set ambitious CHP targets. The *AB 32 Scoping Plan* CHP target is 4,000 MW of new CHP in California by 2020.¹⁵⁰ The economic potential for new CHP in California was identified as 6,500 MW by 2030 in the ICF International April 2010 report prepared for the CEC on California CHP potential.¹⁵¹ Governor Brown called for the addition of 6,500 MW of CHP in California by 2030 in his *Clean Energy Jobs Plan*.¹⁵² The AB 32 target of 4,000 MW of new CHP by 2020 is consistent with a 2030 target of 6,500 MW of new CHP.

This growth trajectory for CHP development is also consistent with the California Air Resources Board's 2008 Scoping Plan adopting a CHP goal of an additional 4,000 MW of installed CHP capacity by 2020 as a key measure to reduce the state's emissions of greenhouse gases.¹⁵³

SCE has 1,489 MW of existing CHP, as included in the 2010 LTPP assumptions.¹⁵⁴ SCE is expected to add additional incremental CHP in its territory before 2021. In light of the

¹⁴⁷ Los Angeles Business Council, *Bringing Solar Energy to Los Angeles: An Assessment of the Feasibility and Impact of an In-Basin Solar Feed-in Tariff Program* (Jul. 8, 2010) p. 15 <http://www.labusinesscouncil.org/online_documents/2010/Consolidated-Documents-070810.pdf> [as of June 21, 2012].

¹⁴⁸ See Response of CAISO to Second Set of Data Requests of CEJA, Response to Request No. 3.

¹⁴⁹ See CAISO 5/25/12 Response to CEJA Data Requests 1, Dated BLANK 2012, Question 5.

¹⁵⁰ California Air Resources Board, *AB 32 Climate Change Scoping Plan*, December 2008, p. 44. See <http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm>

¹⁵¹ CEC PIER, *Combined Heat and Power Assessment – Final Consultant Report*, prepared by ICF International, April 2010, p. C-9.

¹⁵² Clean Energy Jobs Plan, http://gov.ca.gov/docs/Clean_Energy_Plan.pdf

¹⁵³ CARB Scoping Plan, at pages 43-44. This plan is available at

http://www.arb.ca.gov/cc/scopinplan/document/adopted_scoping_plan.pdf

¹⁵⁴ See CPUC, *supra*, Scoping Memo to Rulemaking 10-05-006, Attachment 1, at p. 57.

recent CHP settlement, SCE, along with the other utilities has launched its CHP Request for Offers.¹⁵⁵

In the 2010 LTPP, the Commission used an assumption of 322 MW for additional CHP in 2020, and 360 MW of incremental demand-side CHP for 2020 for SCE.¹⁵⁶ This assumption is reasonable in light of the CHP settlement and in light of the recent ICF analysis, which confirms that SCE has significant room for growth in CHP capacity.¹⁵⁷

F. CAISO’s Assumption That All Once-Through Cooling Facilities Will Retire Is Not Reasonable.

CAISO’s modeling assumptions are largely built around the need to replace once through cooling (OTC) capacity that will presumptively retire in order to comply with the State’s OTC policy.¹⁵⁸

The State’s OTC policy however, does not require any coastal OTC power plants to actually retire. Instead, the State’s policy allows OTC plants to remain operating should they comply with one of two “tracks” in the OTC policy. Track I requires the implementation of an acceptable cooling technology, such as closed cycle wet cooling system or closed cycle dry cooling.¹⁵⁹ Track II encompasses measures such as using operation or structural controls, or both to reduce impingement mortality and entrainment of marine life for the facility on a unit-by-unit basis if Track I is not feasible.¹⁶⁰

Pursuant to the State’s policy, many OTC generating units plan not to retire but to comply with the State’s OTC policy through one of the two tracks. For instance, AES-South Land (AES-SL), which owns and operates approximately 4,200 MW of OTC-based generation in SCE territory, will comply with the State’s OTC policy through Track I.¹⁶¹

¹⁵⁵ See Southern California Edison, *Renewable & Alternative Power – Combined Heat and Power (CHP): Combined Heat and Power Facilities Request for Offers* (Dec. 15, 2011) <<http://www.sce.com/EnergyProcurement/renewables/chp.htm>> [as of June 22, 2012].

¹⁵⁶ See CPUC, *supra*, Scoping Memo to Rulemaking 10-05-006, Attachment 1, at p. 49.

¹⁵⁷ See CEC, *Combined Heat & Power: Policy Analysis and 2011-2030 Market Assessment* (Feb. 2012) at p. 46 <<http://www.energy.ca.gov/2012publications/CEC-200-2012-002/CEC-200-2012-002.pdf>> [as of June 22, 2012] (“The two regions with the largest amount of technical potential are PG&E and SCE. . . Since PG&E also has the largest amount of existing CHP installations, the remaining CHP potential indicates that SCE has more room for growth in CHP capacity . . .”).

¹⁵⁸ CEJA Requests 1, Responses to Request Nos. 1, 2, 3, 5, 6; CEJA Requests 1 Update, Response to Requests Nos. 3, 4, 5; CEJA Requests 2, Responses to Request Nos. 2, 5; Sierra Club Requests 1, Response to Request Nos. 2, 34; Vote Solar Requests 1, Responses to Request Nos. 2, 8.

¹⁵⁹ State Water Resources Control Board, Resolution No. 2011-0033 (July 19, 2011) <http://www.swrcb.ca.gov/water_issues/programs/ocean/cwa316/docs/amdplcy052512.pdf> [as of June 22, 2012].

¹⁶⁰ *Id.*

¹⁶¹ AES Southland, *Implementation Plan Statewide Policy Use of Coastal and Estuarine Waters Power Plant Cooling: AES Alamos Generating Station* (June 16, 2011) at p. 1 <http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/powerplants/alamos/docs/ags_revi sedip2011.pdf> [as of June 22, 2012].

AES-SL’s OTC compliance plan for the Alamos Generating Station (ALGS) would replace the six OTC existing units at the facility with 1,000 MW simple-cycle or combined-cycle units between June 2018 and March 2019.¹⁶² Additional MW would be installed between May 2022 and 2024.¹⁶³ “In total, ALGS is anticipated to be repowered to 2,042 MW with an estimated 600 MW of simple cycle gas turbine and 470 MW of combined cycle technology.”¹⁶⁴

Similar plans exist for other OTC facilities in SCE’s territory. The Huntington Beach Generating Station (HBGS) intends to comply with Track I of the OTC policy by replacing two of the four existing units to simple-cycle or combined-cycle technology with 470 MW of new generation commercially available for dispatch by the second quarter of 2019.¹⁶⁵ The additional construction and commercial operation of 400 MW of new generation would occur by the second quarter of 2022.¹⁶⁶ “In total, the HBGS is anticipated to be repowered to 870 MW with an estimated 300 MW of simple-cycle gas turbine and 570 MW of combined-cycle technology.”¹⁶⁷

The Redondo Beach Generating Station’s (RBGS) compliance plan would replace four existing units at the facility, with an initial 300 MW coming online in the third quarter of 2018, another 300 MW in the fourth quarter of 2018, and 300 MW in the second quarter of 2019, for a total of 900 MW of new generation.¹⁶⁸ An additional 270 MW of new generation would come online by the second quarter of 2024. “In total, RBGS is anticipated to be repowered to 1,170 MW.”¹⁶⁹

Further, site operator AES-SL has also found that it “may have the available space to construct approximately 2,300 MW across all three [of its] sites without the demolition of existing generating units.”¹⁷⁰ AES-SL predicts that “other than the approximate ninety days between the shutdown of the existing units and the commercial operations of the new units to support commissioning activities, AES-SL is not aware of any time periods when electrical generation will be infeasible at the ALGS.”¹⁷¹ In other words, compliance with the State’s OTC policy can feasibly be accomplished with minimal shut-down or service interruption.

¹⁶² *Id.* at p. 1, 6.

¹⁶³ *Id.* at p. 6.

¹⁶⁴ *Ibid.*

¹⁶⁵ AES Southland, *Implementation Plan Statewide Policy Use of Coastal and Estuarine Waters Power Plant Cooling: AES Huntington Beach Generating Station* (June 16, 2011) at p. 2, 6

<http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/powerplants/huntington_beach/docs/hb_revisedip2011.pdf> [as of June 22, 2012].

¹⁶⁶ *Id.* at p. 6.

¹⁶⁷ *Ibid.*

¹⁶⁸ AES Southland, *Implementation Plan Statewide Policy Use of Coastal and Estuarine Waters Power Plant Cooling: AES Redondo Beach Generating Station* (June 16, 2011) at p.6

<http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/powerplants/redondo_beach/docs/r gs_revisedip2011.pdf> [as of June 22, 2012] (hereafter *AES Redondo Beach Implementation Plan*).

¹⁶⁹ *Ibid.*

¹⁷⁰ AES Southland, *supra*, *AES Alamos Implementation Plan*, at p. 6.

¹⁷¹ *Id.* at p. 8.

AES Southland also states that these:

new units will provide operating flexibility to effectively integrate increasing amounts of renewable energy into the electrical transmission and distribution system. AES-SL believes the redevelopment of the existing OTC projects in the South Coast Air Basin (SCAB) will be effective in meeting California's future needs forecasted for the 2020 planning horizon within the Los Angeles Basin LCR.¹⁷²

Further, “[t]he new units will provide operating flexibility to effectively integrate increasing amounts of renewable energy into the electrical transmission and distribution system.”¹⁷³

Other plant operators are intended to keep units running through compliance with Track I or II. The El Segundo Generating Station intends to comply with Track I with the new generation will subsequently be commissioned to be online by the summer of 2013.¹⁷⁴ Like AES-SL's facilities, El Segundo will implement rapid response technology intended to be “compatible with California's increased reliance on renewables in that when adequate renewable power is not available, ESEC can quickly come on line and provide replacement electricity.”¹⁷⁵

The Ormond Beach Generating Station (OBGS) intends to comply with Track II.¹⁷⁶ OBGS in all has a capacity of 1,520 MW. GenOn intends to achieve compliance under Track 2 no later than December 31, 2020.¹⁷⁷ The Mandalay Generating Station intends to comply with the OTC policy under Track II by the prescribed deadline of December 31, 2020.¹⁷⁸

In addition, it is not clear that even if OTC plants are retired, that the same amount of MW will be needed to replace them. Many existing OTC facilities are currently running

¹⁷² *Id.* at p. 2.

¹⁷³ *Ibid.*

¹⁷⁴ Plant Manager Ken H. Reisz, El Segundo Power, Letter to Philip Isorena, Chief of NPDES Unit for State Water Resources Board re California 316(b) Policy – Implementation Plan, El Segundo Generating Station (Mar. 30, 2011) at p. 2
<http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/powerplants/el_segundo/docs/esgs_ip2011.pdf> [as of June 22, 2012].

¹⁷⁵ *Ibid.*

¹⁷⁶ Ormond Beach Generating Station Implementation Plan for the Statewide Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling (April 1, 2011)
http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/powerplants/ormond_beach/docs/ob_ip2011.pdf

¹⁷⁷ *Id.* at p. 16.

¹⁷⁸ Mandalay Generating Station Implementation Plan for the Statewide Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling, at p. 4 (April 1, 2011)
http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/powerplants/mandalay/docs/mgs_ip2011.pdf

far below capacity. For instance, in 2007, most units ran less than 10 percent of the time.¹⁷⁹

Furthermore, a report prepared for the State Water Resources Control Board found that several OTC facilities could retire by 2015 with no need for additional replacement capacity. The report concluded that a more than adequate reserve margin would still exist “with as little as \$135 million in in-state transmission upgrades.”¹⁸⁰

IV. Reliance on CAISO’s Modeling Will Lead to Over-Procurement of Fossil-Fuel Resources in Violation of the Loading Order

The Commission should ensure that resource planning is being conducted in the context of California’s *Energy Action Plan*. On paper, support for the *Energy Action Plan* is unanimous. Fidelity to the *Energy Action Plan* is stated in virtually every state energy agency planning document and every application by the state’s IOUs for conventional infrastructure projects, including natural gas-fired generation and new transmission. However, no fundamental redesign of IOU financial incentives accompanied development of the *Energy Action Plan*. For the last century that IOU model has remained relatively unchanged – the sole source supplier of vertically integrated electricity generation, transmission, and distribution services.

As a result, California energy policy operates in a form of parallel universe – all actors pledge support to the *Energy Action Plan* in concept, while finding avenues to continue and even go beyond the status quo. The IOU business model is based on private monopoly control of generation, transmission, and distribution of electricity. Revenue is generated by steel-in-the-ground projects owned by the IOU. These include T&D infrastructure, power plants, and meters.

Historical utility practice demonstrates that the utilities need more specific requirements to ensure they follow the loading order. In 2006, the Commission admonished the IOUs for filling their net short positions with conventional resources, as opposed to the other resources in the loading order, without providing reasonable analysis to support such a position.¹⁸¹ It held that strict compliance with the preferred resource loading order would be necessary for all future LTTPs and required the IOUs to “conform to the energy and environmental policies in place.”¹⁸² This order stemmed from the Commission’s concern that filling the IOUs’ net short positions with conventional resources would lead to “the

¹⁷⁹ See CEC, *Comments to State Water Resources Control Board Concerning Its Coastal Power Plant Preliminary Draft Policy and Related Scoping Document* (May 2008) at pp. 18-19, available at http://www.energy.ca.gov/siting/documents/2008-05-20_CHAIRMAN_SWRCB.PDF.

¹⁸⁰ *Id.* (quoting California Ocean Protection Council & State Water Resources Control Board, *Electric Grid Reliability Impacts from Regulation of Once-Through Cooling in California* (ICF Jones & Stokes, April 2008) at p. 3, available at http://www.swrcb.ca.gov/water_issues/programs/tmdl/docs/power_plant_cooling/reliability_study.pdf).

¹⁸¹ D. 07-12-052 at p. 3.

¹⁸² *Id.* at pp. 3-4.

effect of there being no room in an IOUs' portfolio for other resources, or the conventional resources [becoming] obsolete and result[ing] in large stranded costs."¹⁸³

For example, California's high reserve margins of natural gas capacity demonstrate its over-procurement of natural gas plants, which is inconsistent with the loading order.¹⁸⁴

Investment in excessive and unnecessary natural gas-fired capacity will undermine investment in renewables, energy efficiency, and new CHP, and is inconsistent with California's energy strategy. Ratepayers will shoulder the burden of a project approval process that does not carefully weigh the need for new natural gas-fired projects or transactions before committing ratepayers to major, long-term financing obligations.

Other options cost less and are consistent with California's energy goals. Distributed PV resources, for example, have a lower overall cost (when transmission costs and transmission losses are considered) than remote renewable generation technologies, do not require back-up peaking turbines, and can be used to meet SCE's unmet needs.

CAISO's modeling results call for additional MW in unneeded resources. Not only did CAISO rely on overly conservative, and therefore, inaccurate assumptions, it also fails to consider whether preferred resources under the loading order could be used to meet the purported need. Today, the IOUs continue to build and contract for utility-scale natural gas fired plants and remote utility-scale solar and wind plants, and the transmission lines necessary to reach them, while extolling the virtues of energy efficiency, rooftop PV, and CHP. The reality is that energy efficiency measures and onsite generation, owned by customers in the form of solar panels on the roof or CHP, undercut the justification for an IOU to build more utility-owned infrastructure.

CAISO's model fails to consider how alternative resources such as DR could be used in lieu of additional traditional generation, in compliance with the loading order.¹⁸⁵ Unmet needs in its service territory through a strategy that prioritizes energy efficiency, rooftop and distributed PV of all types, and CHP, rather than through natural gas-fired plants. CAISO's model is not consistent with the Commission's continued commitment to the *Energy Action Plan's* loading order that prioritizes energy efficiency and DR to meet California's energy needs.¹⁸⁶

This prioritization would result in ratepayer savings and significant reductions in GHG emissions. The reduction in demand for electricity and natural gas, achieved through energy efficiency measures and the addition of PV, CHP, geothermal, and wind, also

¹⁸³ *Id.* at p. 6.

¹⁸⁴ California Clean Energy Future Metrics, California Energy Commission at p. 3, *available at* http://www.energy.ca.gov/2011_energypolicy/documents/2011-07-06_workshop/background/Metrics_July_IEPR_Reserve_Margin_v5.pdf (showing the reserve margin for summer 2011 to be approximately 30 to 45%).

¹⁸⁵ CEJA Requests 1, Response to Request No. 2; CEJA Requests 1 Update, Response to Request No. 4; CEJA Requests 2, Responses to Request Nos. 3, 7; Sierra Club Requests 1, Responses to Request Nos. 7, 12, 21; Vote Solar Requests 1, Response to Request No. 11.

¹⁸⁶ D.12-04-045 at p. 36.

reduces the price of electricity and natural gas in wholesale energy markets. This is known as the “merit order effect.” It reduces the cost of electricity and natural gas for all ratepayers.

V. The Commission Should Not Authorize New Procurement When CAISO Failed to Consider All the Available Resources, Have Not Followed the Loading Order, and Are Inappropriately Relying on a 1-in-10 Demand Scenario with Transmission Failures

CAISO’s assumptions result in a reserve margin that is more conservative than the 15 to 17 percent reserve margin required by the Commission. Even the Commission’s 15-17 percent reserve margin for a 1-in-2 year is conservative. WECC only requires a 7 percent reserve margin for a 1-in-2 year. This level of planning reserve ten years out is inconsistent with Commission decisions that have set the required long-term reserve margin.

In addition, there is no need to procure new natural gas generation resources now when other resources such as DR can be procured in a shorter time frame.¹⁸⁷

Finally, over-procurement of fossil-fuel resources will continue to crowd out renewables and other preferred resources from the market. In order to meet AB 32 goals of 80 percent below 1990 levels by 2050, it is likely that we will need to reduce GHG emissions to a greater degree than can be achieved through a 33 percent RPS.¹⁸⁸

In sum, reliance on CAISO’s modeling results will lead to over-procurement of unneeded fossil fuel generation, which in turn will undermine *Energy Action Plan* loading order and AB 32 goals. More accurate modeling should be completed prior to considering any new fossil fuel procurement.

VI. Conclusion

For all of the above reasons, the Commission should not authorize new procurement based on the results of CAISO’s modeling.

¹⁸⁷ See News Release: Summer Grid Outlook Complicated by Possible Extended Outage of Nuclear Power Plant (March 22, 2012) <http://www.caiso.com/Documents/SummerGridOutlookComplicated-PossibleExtendedOutage-NuclearPowerPlant.pdf> (describing resources that can be available in a couple of months in response to a potential outage).

¹⁸⁸ See California Council on Science and Technology, *California’s Energy Future – The View to 2050*, p. 22 (May 2011) <http://www.ccst.us/publications/2011/2011energy.pdf>