PORT OF OAKLAND
AB2514 ENERGY STORAGE ASSESSMENT

MARCH 2014

WSP | Built Ecology

EXECUTIVE SUMMARY

Assembly Bill No. 2514 [AB2514] was issued in September 2010. This bill requires local publicly owned electric utilities to determine appropriate targets, if any, for the procurement of viable and cost-effective energy storage systems.

This bill is targeted at large energy providers, particularly those that incorporate utility scale renewable energy generation plants within their portfolio. This report address the feasibility of energy storage given the Port of Oakland's (Port) current energy portfolio. Based on the metered data provided this report finds that the Port would not currently benefit from renewable energy storage and recommends no storage be built as part of a 2016 target. During the reevaluation period (after 2016) the Port could benefit from storage if large/larger renewable generation systems were installed.

The Port is a very small publicly owned utility that serves approximately 125 to 150 customers annually. The Port's current renewable energy systems, provide energy directly to the airport. Metered data was provided by the Port of Oakland's Engineering Utilities Department. The energy generation systems at the Port of Oakland include:

Airport - FedEx
750kW PV system tied to SS-1/SS-1A
500kW Natural Gas Fuel Cell tied to SS-1/SS-1A

Airport - FAA
250kW PV system tied to SS-1/SS-1A

Energy storage will not benefit the Port at this time as:

- Currently, renewable energy generation never exceeds the airport's demand for energy
- The renewable energy generation occurs at an ideal time – 11AM to 6PM. This is the grid's peak period where demand for energy across the network is at its highest (particularly in the summer). This is ideal financially, for two reasons:
    1. As a user of power, if the Port were ever subject to time of use charges, the renewable energy would offset energy costs when they are their highest
    2. As a retailer of energy, the Port is generating energy when it is selling energy at its highest rate.

  This is also ideal for emissions reduction, as the grid emissions are worse, in California, during the peak times of the day. By offsetting energy demand during the peak period, the Port is offsetting the maximum associated grid emissions.
- To reduce peak loads, energy storage could be used to store renewable energy generated and release it during the peak hours. Based on the meter data provided this could potentially reduce peak loads by 14%. However, this would not save cost as the Port's energy purchase contracts are not based on time of use charges, nor is there a demand charge for the energy the Port purchases. Further, as discussed above, this would not reduce emissions, in fact, it would increase emissions as this strategy applied to the Airport's PV system would reduce the grid's baseload demand rather than the peak load demand, and would be less efficient than reusing the renewable energy directly, at the time of generation. This demand reduction strategy could offset the need for the Port to invest in additional capacity. Currently the Airport network is operating at 50% of its capacity and does not require additional capacity.
- For an energy storage system to be viable, the Airport PV system would need to be:
    - 6 times as large to see any excess renewable energy generation that could benefit from storage on an ideal day where PV output is high and energy load is low
    - 7 times as large to see any excess renewable energy generation that could benefit from storage on a day when PV output is at its max
    - 12 times as large to see any excess renewable energy generation that could benefit from storage on the worst day, when PV output is low (winter time) and demand is high

  The airport could add other large on-site energy generation systems that, in combination with the current PV array, could make on-site energy storage a viable solution.
- Given that the Maritime properties do not currently incorporate renewable energy, there is no opportunity for renewable energy storage. Future developments, particularly at the Oakland Army Base, could benefit from energy storage if:
    - At the time of peak renewable energy generation, demand for energy is less than the renewable energy generated
    - The renewable energy strategy includes renewable energy production outside of peak load hours – ie renewable energy generation occurred at night.
    - The existing Port electrical service was limited in capacity and could not support new Maritime developments without the construction of additional capacity.

AB2514 REQUIREMENTS

Assembly Bill No. 2514 [AB2514] was issued in September 2010 (attached as exhibit 1). This bill requires local publicly owned electric utilities to determine appropriate targets, if any, for the procurement of viable and cost-effective energy storage systems.

This report interprets the requirements of AB 2514 with respect to the Port of Oakland [Port] and assess the viability of a number of energy storage systems that are commercially available for application at the Port.

AB 2514 is targeted at larger electric utilities. The Port has a very small fraction of customers compared to these larger electric utilities, however being a local publicly owned utility, the Port must adhere to the Bill.

The bill is targeted to have the following benefits -
a. INCREASE RENEWABLES:
Increase the amounts of renewable energy resources in the electrical transmission and distribution grid thus minimizing greenhouse gases

b. ENABLE INTERMITTENT RENEWABLE ENERGY GENERATION:
Buffer the variable energy generation from wind and solar energy that will be entering the California power mix on an accelerated basis

c. REDUCE COSTS:
Reduce costs to ratepayers by deferring the need for new fossil fuel-powered peaking power plants and avoid or defer distribution and transmission system upgrades and expansion of the grid

d. REDUCE PEAKING PLANT EMISSIONS:
Reduce the use of high carbon-emitting peaking plants which will have substantial co-benefits from reduced emissions of criteria pollutant.

e. REDUCE GRID EMISSIONS:
Reduce the use of carbon-emitting power plants currently integrated into the US energy generation portfolio

f. OVERCOME MARKET INERTIA AGAINST STORAGE:
Improve the understanding of where energy storage is applicable.

As these are the main declarations of the bill, the viability of the energy storage options will be measured against each of these along with its ability to:
- reduce energy costs
- effectively store energy

ASSEMBLY BILL NO. 2514 SCHEDULE

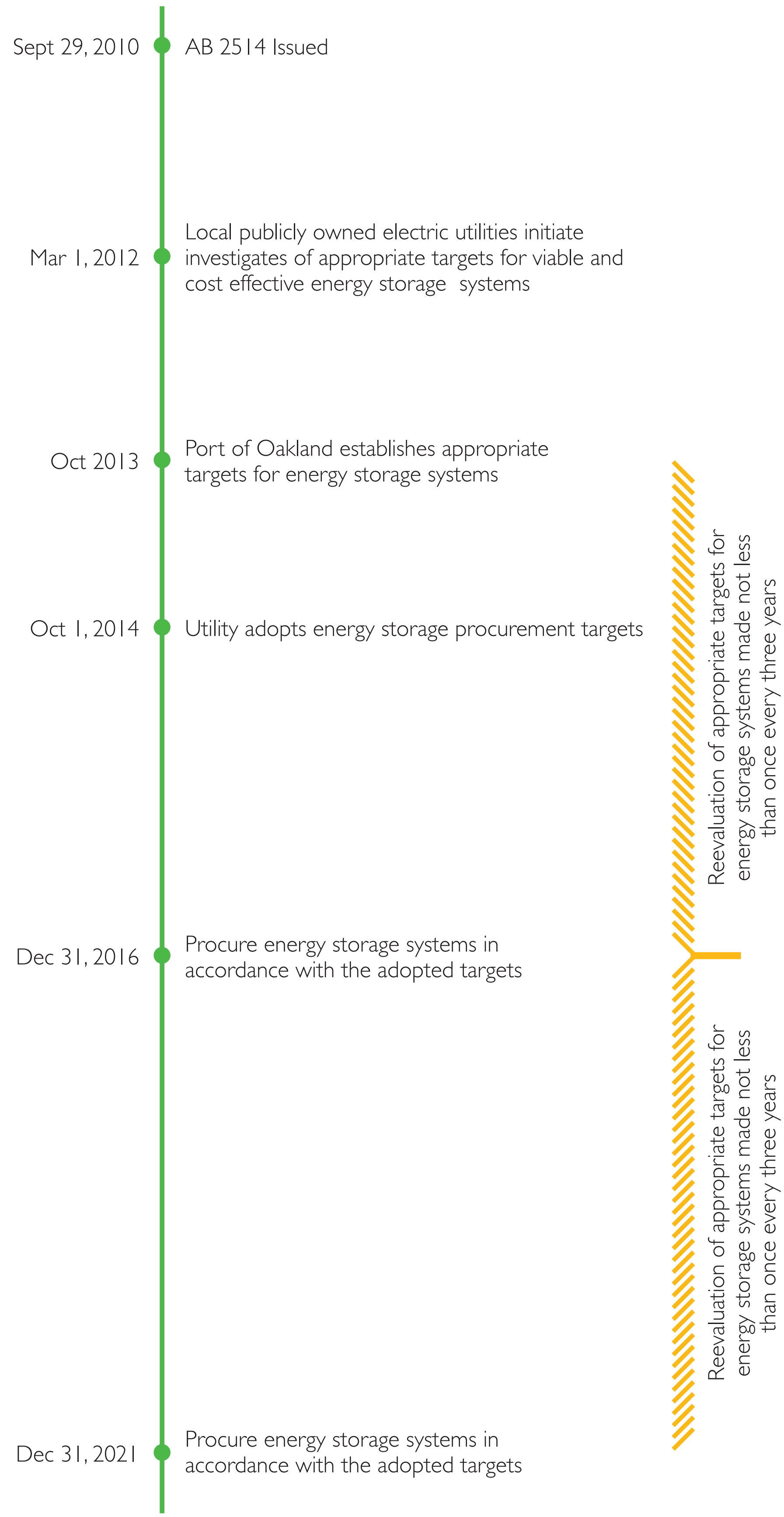


Figure 1

EXISTING ENERGY USE PROFILES

The Port consists of three main property divisions - Airport, Maritime, and Commercial Real Estate. The Port's energy customers are only in the Airport and Maritime properties.

The Port purchases power at a flat rate which does not vary based on the time of use and does not have a separate demand charge. The historical price paid per MWH is shown below.

MONTH	PRICE PER MWH
JUL-11	$54.75
AUG-11	$53.31
SEP-11	$53.10
OCT-11	$53.31
NOV-11	$53.11
DEC-11	$53.31
JAN-12	$45.13
FEB-12	$44.85
MAR-12	$45.13
APR-12	$45.70
MAY-12	$45.89
JUN-12	$45.20
JUL-12	$47.86
AUG-12	$47.86
SEP-12	$47.71
OCT-12	$41.93
NOV-12	$42.14
DEC-12	$42.37
JAN-13	$42.78
FEB-13	$42.18
MAR-13	$42.08
APR-13	$44.54
MAY-13	$44.66
JUN-13	$44.54

Interestingly, there is an overall downward trend to the price of electricity based on the last 3 years of data.

ENERGY USAGE PROFILES

- The Port delivers more energy to the Airport than to the Maritime property
- SS-1 and SS-1A at the Airport use similar amounts of energy to serve the airport
- The airport uses more energy in the winter possibly due increased lighting demand due to less daylight hours or due to heating (where done electrically)
- FISCO which serves the Maritime properties uses the most energy each year
- The OAB service consumes a small fraction of the total energy
- Monthly consumption varies by approximately +/- 10% within the year.

MARITIME ENERGY PROFILE (MWH/MONTH)

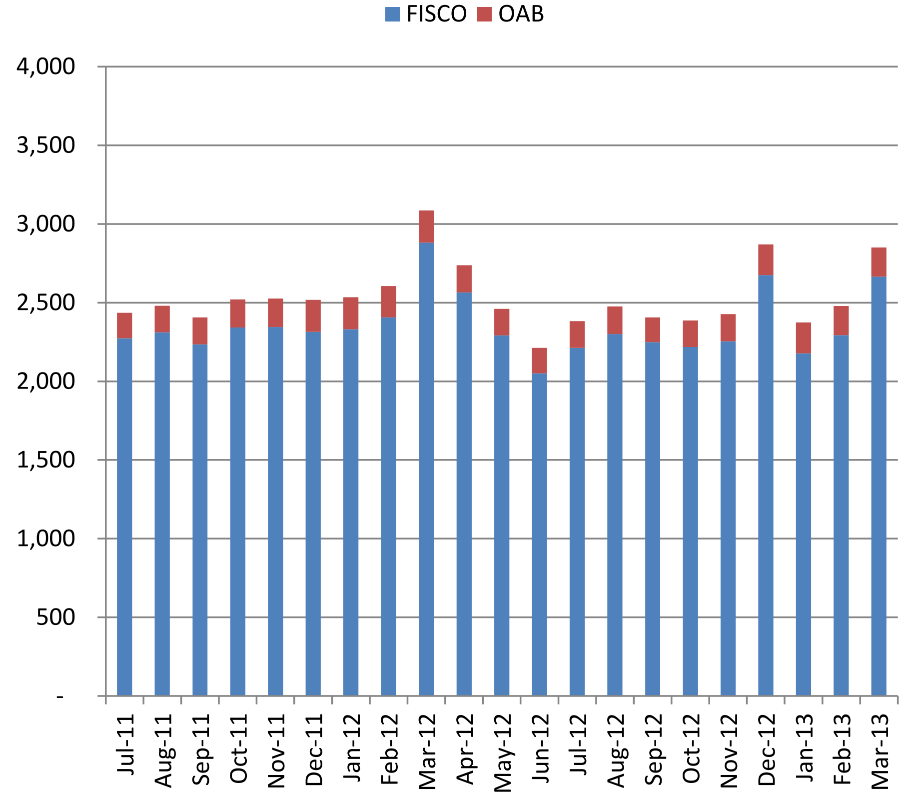


Figure 2

AIRPORT ENERGY PROFILE (MWH/MONTH)

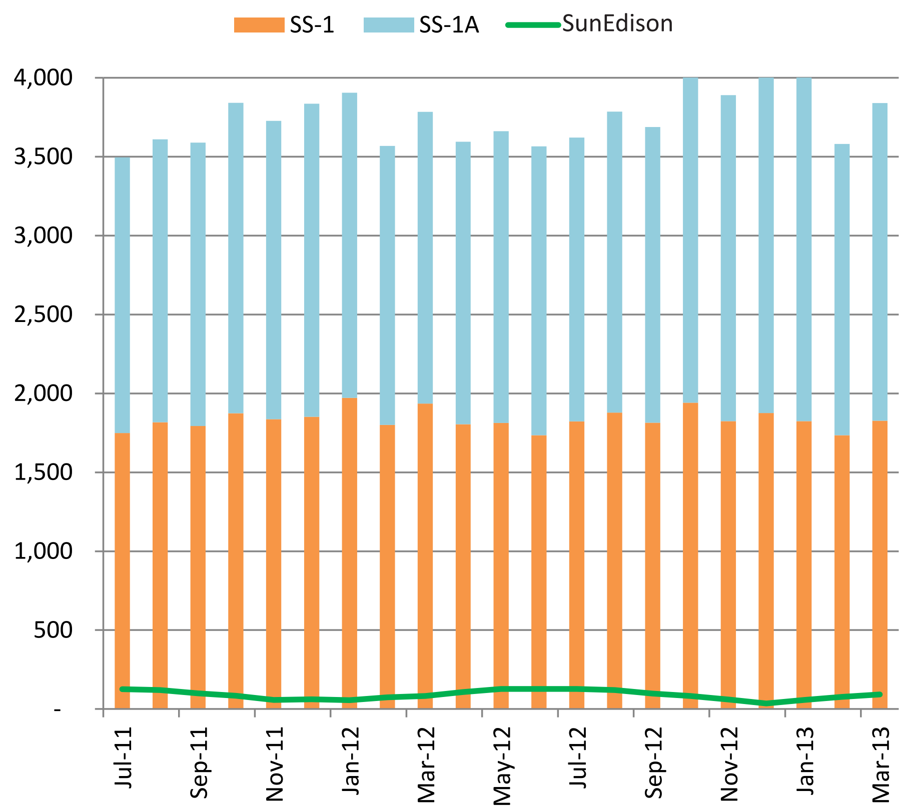


Figure 3

STORAGE OPPORTUNITIES - ENERGY

The benefits of energy storage, both environmental and financial, are maximized when excess, free, renewable energy is available *(Figure 4)*. This is particularly true with a flat energy rate, such as the energy purchase rate at the Port. Only the Airport property has access to on-site renewable energy; which, based on the monthly data, produces, on average, just over 2% of the total energy consumed by the airport. The solar PV system never produces more energy than is used on a monthly basis, however to understand if excess solar energy is available for storage and reuse, we have to look at hourly daily profiles.

July 9, 2011: Peak Solar Power Production - 594 kW *(Figure 5)*
Looking at a day when the PV system is working at its best indicates if there is an opportunity available for energy storage. Even on this day, with maximum PV output, only 17% of the total airport load is met. This indicates that no excess free renewable energy available for storage.

January 17, 2012: Peak Airport Demand - 6,905 kW *(Figure 6)*
On a peak airport day, with loads well above 6,000 kW, the PV system would have to be 12 times its current size for excess energy to be available for storage. Also, of important note, is the peaks occur in the morning and late afternoon, when solar radiation is at its lowest and as such PV energy production is low. This indicates that, currently, there is little to no peak load lopping by the PV system.

July 31, 2011: Maximum Solar Power Fraction - 572 kW *(Figure 7)*
On this day, the airport load is low, while the solar output is high. This is the ideal situation where excess renewable energy might be available. However, even on this day, the PV system would need to be at least 6 times larger for a marginal amount (183 kWh) to be stored and reused at a later time.

Hourly Profile: Theoretical Energy Storage Opportunity

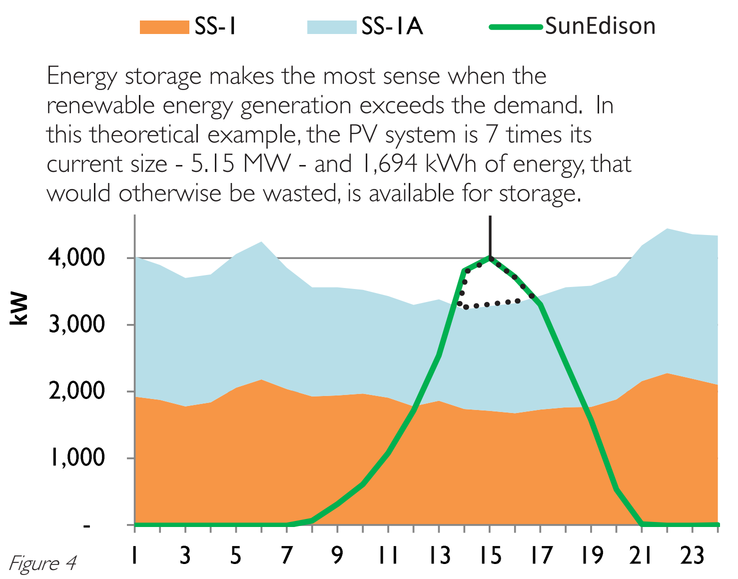


Figure 4

Hourly Profile: July 9, 2011- Peak Solar Power Production (594 kW)

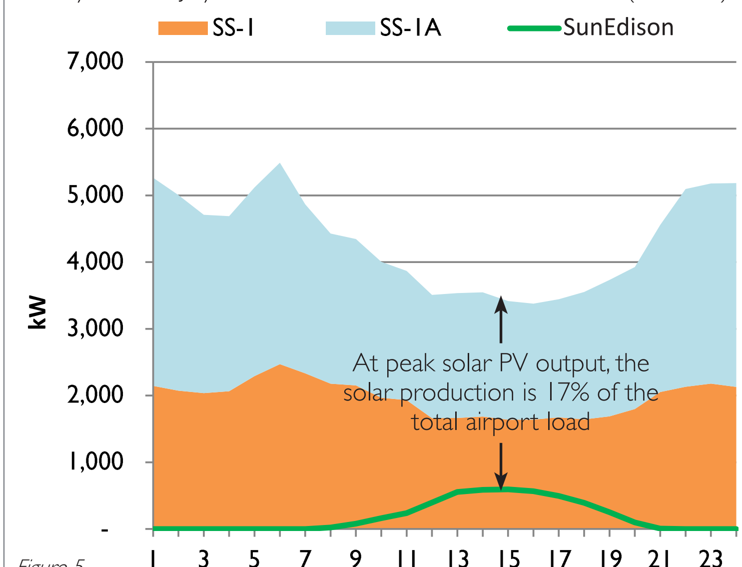


Figure 5

Hourly Profile: January 17, 2012 - Peak Airport Demand (6,905 kW)

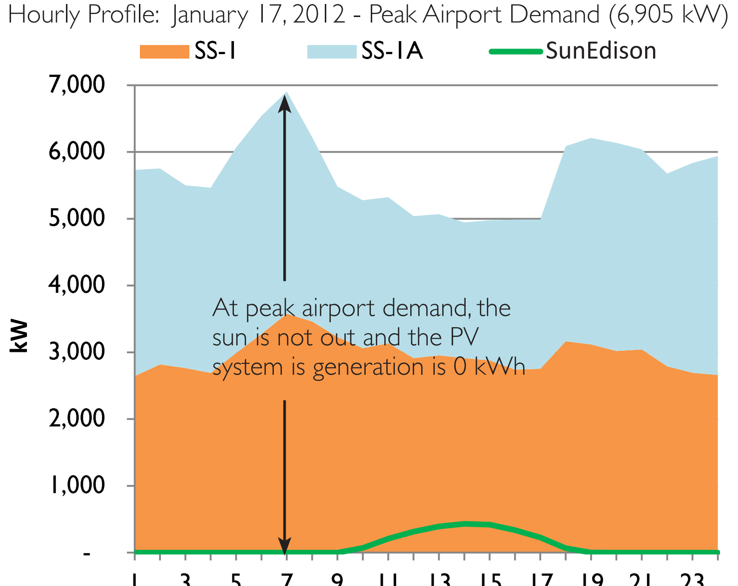


Figure 6

Hourly Profile: July 31, 2011 - Solar Power Production (572 kW)

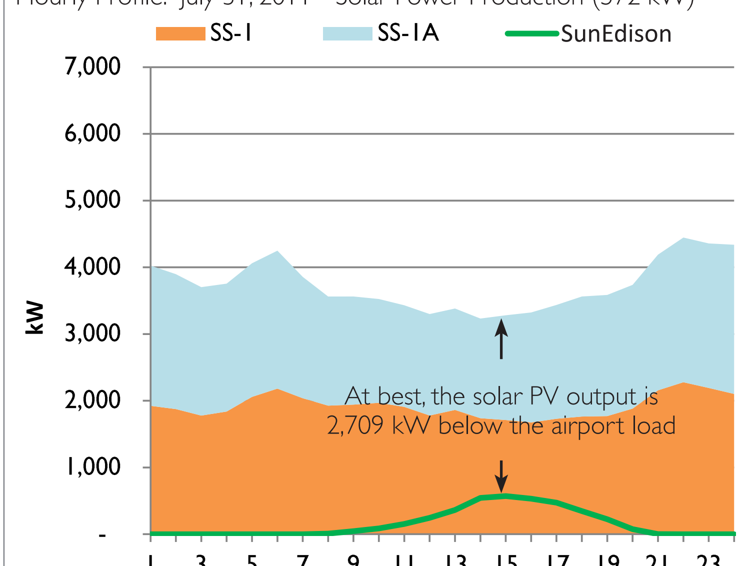


Figure 7

STORAGE OPPORTUNITIES - DEMAND

Although the Port of Oakland does not currently pay a demand charge or a time of use charge, we investigated the current opportunity that energy storage could have on reducing peak demand *(Figure 8)* and as such reducing the need for construction of additional electrical infrastructure and/or the opportunity for emissions reduction.

Based on the metered data provided, the peak airport demand is 6,905 kW which occurred on January 17, 2012 *(Figure 9)*
At this time:
SS-1 was delivering 3,577 kW and [SS-1 has the capacity to deliver 8,000 kW, leaving 4,423 kW spare capacity available]
SS-1A was delivering 3,328 kW [SS-1A has the capacity to deliver 8,000 kW, leaving 4,672 kW spare capacity available]

With the current Airport demand and PV system generation, we can expect a 14% peak load reduction if energy storage was implemented. Additional controls would need to be incorporated such that the storage releases the energy at the peak times based on a set load limit

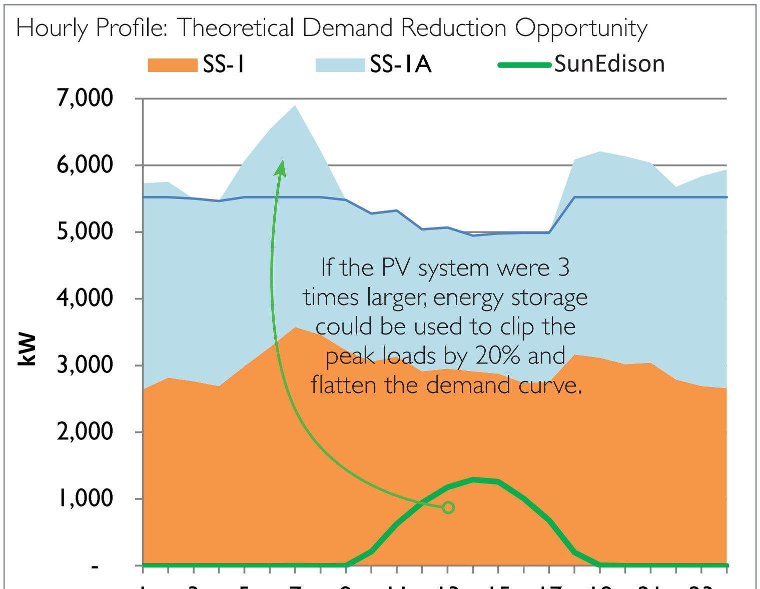


Figure 8

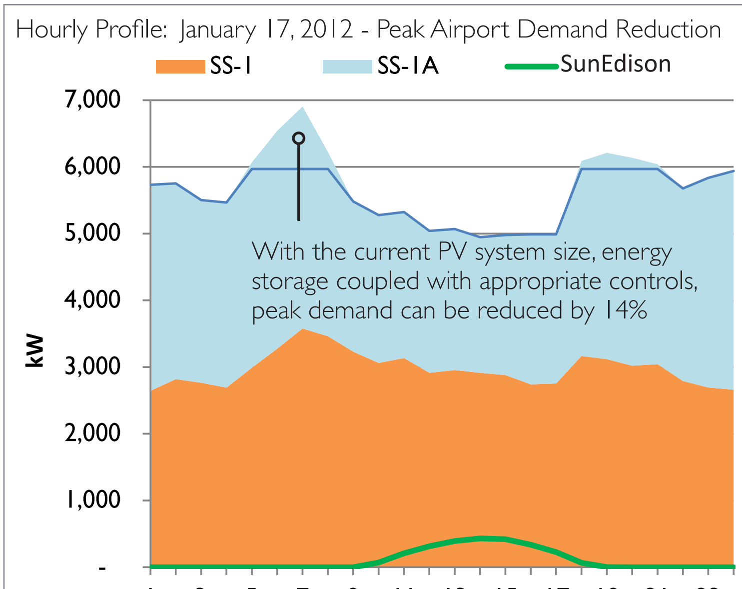


Figure 9

Currently, the Port uses all the renewable energy that is produced by their renewable energy system (as discussed on the previous page). As such, energy storage will have no benefit in reducing total energy consumption. However, it is possible for the renewable energy storage to reduce emissions if the energy is stored and then released to offset energy demand when the grid supply is at its dirtiest.

The Airport peaks typically occur from 5AM to 8AM, and from 6PM to 9PM, which are off-peak and shoulder periods. During these times, the California grid is typically firing its baseload plants and a few peaker plants to meet the demand. The Airport PV system typically generates energy from 11AM to 6PM. During this time, particularly in the summer, the California grid is firing its peaker plants.

If the Port's PV energy is stored and reused during the Port peaks, overall emissions could actually increase as this strategy would reduce the need to operate the grid's baseload plants and increase the need to operate the grid's peaker plants, particularly in the summer. This energy storage strategy would only result in reduced emission if the grid's baseload plants generate more emissions than the grid's peaker plants.

Port Power emissions:
- Based on documentation provided by the Port pursuant to (SB1305) in 2011, the Port's power resource mix was comprised of 32.4% renewable energy and 67.6% of an unspecified power source. This unspecified power source is delivered through electricity transaction that are not traceable to specific generation sources. As such, for this study, it is assumed that the power resource mix for this unspecified power source has emission equivalent to the published data for California*

	Power mix	Annual Output Emissions rate	Annual Peaker Plant
		c02 equiv. [lbs/mwh]	c02 equiv. [lbs/mwh]
Port of oakland	32.4%	0	0
unspecified sources = California	67.6%	727.26	1085.56
port of oakland (assumed for this study)	100%	491.6	733.8

* US EPA - eGrid 2007 Version 1.1 Year 2005 GHG Annual Output Emission Rates

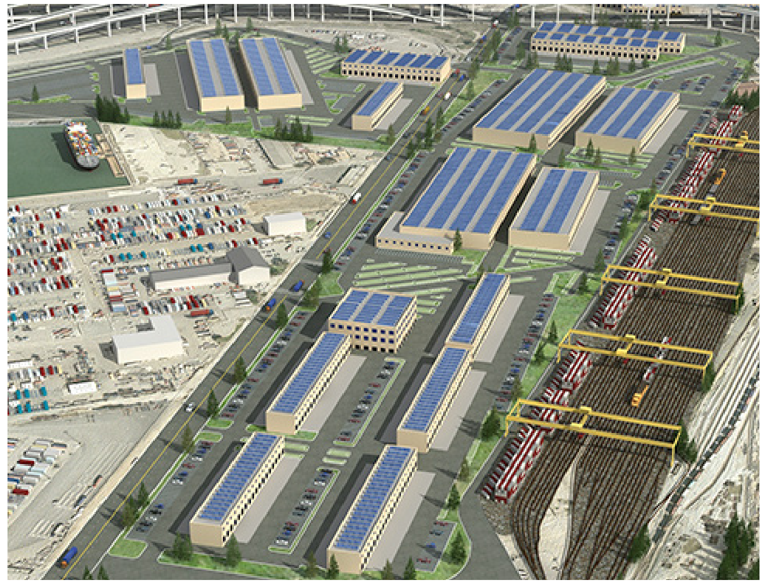
The CO2 equivalent of the peaker plants are higher than the annual output emissions rate and as such, the baseload plants produce less emissions. These plants are most likely hydro and/or nuclear plants (the EPA considers nuclear plants to have 0 CO2-equivalent emissions)

STORAGE OPPORTUNITIES - MARITIME

Currently the Port does not serve the Maritime properties with renewable energy however, early renderings of the redevelopment at the Oakland Army Base (OAB), show a significant amount of PV. This page helps understand the impact of these systems and the future opportunities for energy storage on the Maritime properties.

If the build out at the OAB looks similar to the image on the right, the PV system capacity could be 5 to 13 times the size of the PV system at the Airport. The graphs below show the current energy demand and the generation of a "Future PV" system that is 6 times the size of the Airport system - 4,500kW.

In this scenario, if OAB loads are unchanged, we can expect a number of days a year with excess renewable energy could be stored and reused. An energy storage system could save roughly 225,000kWh/year. However, it is unlikely that the OAB loads will remain unchanged with future development. As such, as the OAB redevelopment plans develop, future assessments of energy storage will need to consider the projected loads.



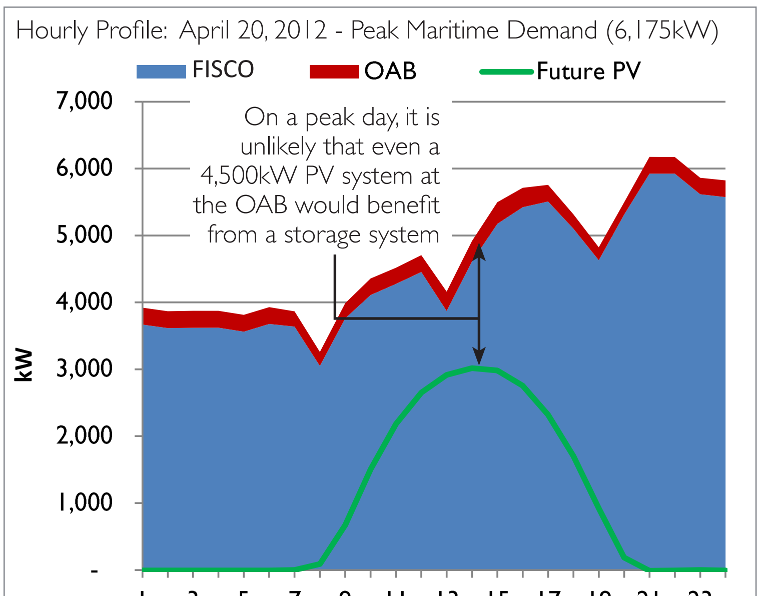


Figure 10

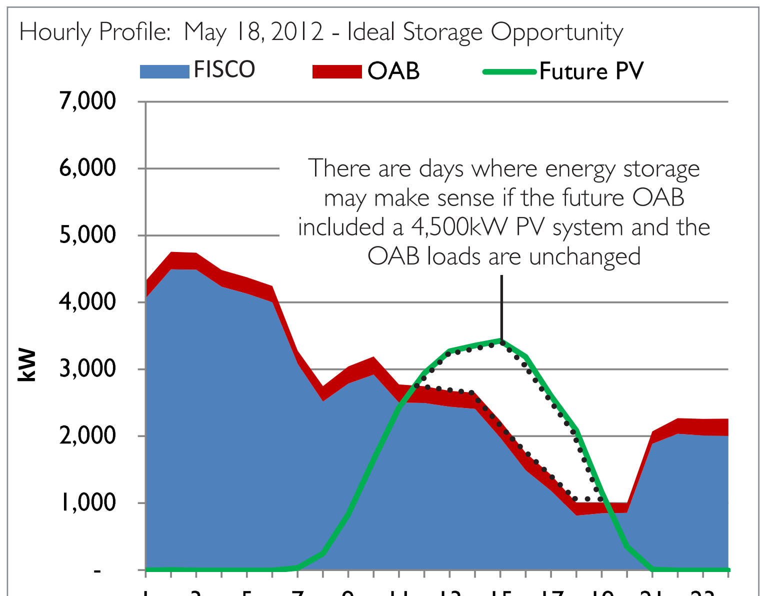


Figure 11

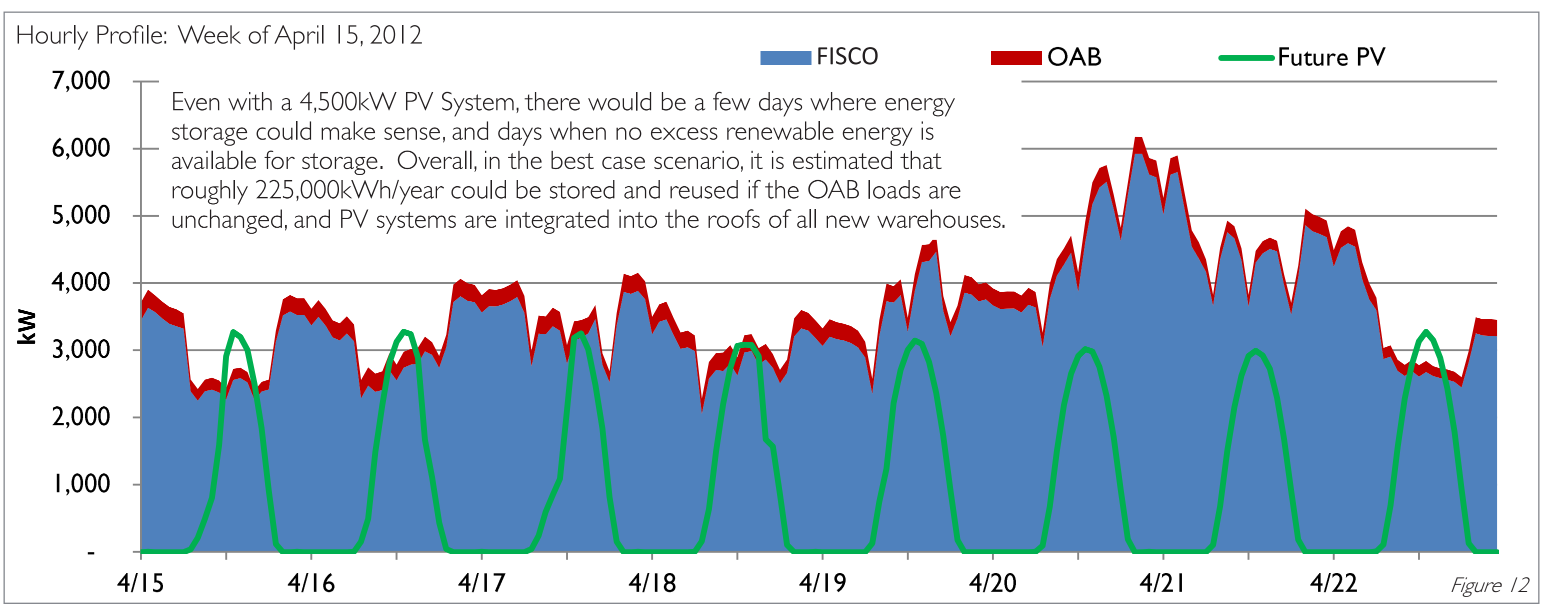


Figure 12

STORAGE OPTIONS

BATTERY STORAGE

Battery storage is what most people think of when they think of energy storage. It is a straight forward way to store electrical energy and is proven at the utility scale. Different battery types offer various levels of power, life, and energy density. Batteries also offer a low loss rate, with claims as high as 90% AC-AC roundtrip efficiency - 90% of the energy going into the system for storage, can be pulled out.

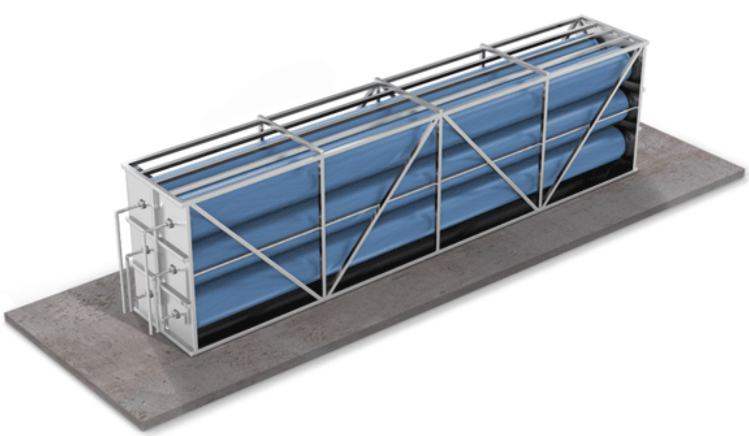
Containerized Grid Storage Solution
Image: A123 Energy Solutions

	AIRPORT	MARITIME
INCREASE RENEWABLES	No - battery storage would not increase the amount of renewable energy at the Airport. The existing PV can grow by 7 fold before excess renewable energy became an issue and battery storage would be required for further renewable energy growth.	The Port does not currently supply renewable energy that is generated on Port property, to the Maritime property. Energy storage, does not provide benefit under any metric at this time.
ENABLE INTERMITTENT RENEWABLE ENERGY GENERATION	No - battery storage would not be required to buffer intermittent generation of the PV system at the airport. The airport is tied to a larger central grid and the current PV output never exceeds the demand for energy. As such intermittent availability is not an issue.	
REDUCE COSTS	No - battery storage would not reduce infrastructure costs as the current Airport network has sufficient capacity to meet the current demand.	
REDUCE PEAKING PLANT EMISSIONS	No - battery storage would not decrease peaking plant emissions. In fact, battery storage would shift the PV energy generated during the peak periods of the day to the morning and early evening Airport peaks, actually increasing emissions.	
REDUCE GRID EMISSIONS		
OVERCOME MARKET INERTIA AGAINST STORAGE	Battery storage is not applicable at the Airport and, if applied, would confuse the understanding of where energy storage is applicable	

COMPRESSED AIR ENERGY STORAGE

Compressed air storage can be used to store electrical energy by storing high-pressure compressed air and releasing it at a later time to drive a turbine generator to produce electricity. Typically compressed air energy storage has been achieved by storing the compressed air in existing geological formations as this alleviates the cost of the storage medium. As the Port does not have access to geological voids, compressed air energy storage would have to be achieved via physical containers such as the one depicted here sized equivalent to a shipping container.

Conventional compressed air systems have efficiencies of 10% to 20%. This low efficiency makes compressed air energy storage a non-starter for the Port even if PV systems were expanded well beyond their current size. Burgeoning technologies show potential to increase this efficiency but these higher efficiency systems are currently not commercially available.



Containerized Compressed Air Energy Storage System
Image: LightSail Energy

STORAGE OPTIONS

THERMAL ENERGY STORAGE

Thermal energy storage can be used when renewable energy technologies produce heat, rather than electricity. Solar thermal systems are a good example where thermal storage can be used. In fact, almost all solar hot water systems use hot water tanks to store the hot water generated for reuse as required by the hot water demand. The Airport could benefit from a solar hot water and solar thermal storage system to reduce its hot water demand in the heavily used bathroom sinks and to offset the hot water energy at the numerous food restaurants.

Cold water thermal storage could also be used at the airport during the summer when there is a higher demand for chilled water. Chilled water can be generated more efficiently at night, when ambient conditions are cooler and direct evaporative cooling can be achieved with cooling towers. This chilled water can be stored in water tanks or phase change material, and reused during the day to reduce chilled water demand. Based on the information provided, there does not appear to be a correlation with high energy usage and expected times of high cooling energy. This would indicate that cooled water thermal energy storage would not have a significant impact on energy consumption. More detailed Airport BMS data could be reviewed to better understand the opportunity for cold water thermal storage.

Phase Change Material Thermal Storage
Image: WSP Built Ecology

	THERMAL ENERGY STORAGE	ELECTRICAL ENERGY STORAGE
INCREASE RENEWABLES	Increases the opportunities for solar hot water and other renewable technologies that generate thermal energy. These technologies are typically decoupled from the electrical grid but do help to reduce gas demand when gas boilers are used for heating.	Can increase the amounts of renewable energy in the electrical grid when the renewable resource generates more power than demanded from the grid
ENABLE INTERMITTENT RENEWABLE ENERGY GENERATION	Does buffer against intermittent generation as is required for traditional thermal renewable energy systems such as solar hot water - hot water is generated during the day, stored and then is used at night for a shower.	At the Port, intermittent generation by the PV system is not an issue as all energy generated by the system is instantaneously consumed.
REDUCE COSTS	When coupled with solar hot water, thermal energy storage could reduce gas costs for the Port	Electrical energy storage at the Port would increase energy costs. There is no wasted solar PV energy. Storing energy generated by the PV system for reuse at a later time would only result in energy losses associated with the storage system
REDUCE PEAKING PLANT EMISSIONS	Ice storage could reduce the need for chiller operation during peak periods of the day, however there is no indication from the metered data that peaking is caused by high cooling loads at the Port facilities are peaking at	Electrical energy storage could reduce peaking if energy was generated by the renewable system during off peak hours, stored, and the released during peak hours. This is not the case at the Port.
REDUCE GRID EMISSIONS	A decrease in emissions related to the gas grid could be realized. Electrical grid emissions reduction could be realized when heating and/or cooling is done electrically and thermal energy storage reduces the heating and/or cooling loads	
OVERCOME MARKET INERTIA AGAINST STORAGE	Hot water thermal storage is integral to solar hot water systems and there is no resistance to this technology. Chilled water thermal storage also has a long history in the market, particularly ice storage. Newer technologies such as Phase Change Material thermal energy storage is burgeoning and may be applicable at the Port.	Electrical energy storage for the Port would require much larger renewable energy systems before it would make sense.

EXHIBIT I: ASSEMBLY BILL NO. 2514

Assembly Bill No. 2514

CHAPTER 469

An act to amend Section 9620 of, and to add Chapter 7.7 (commencing with Section 2835) to Part 2 of Division 1 of, the Public Utilities Code, relating to energy.

[Approved by Governor September 29, 2010. Filed with Secretary of State September 29, 2010.]

LEGISLATIVE COUNSEL'S DIGEST

AB 2514, Skinner. Energy storage systems.

Under existing law, the Public Utilities Commission (CPUC) has regulatory authority over public utilities, including electrical corporations, as defined. The existing Public Utilities Act requires the CPUC to review and adopt a procurement plan for each electrical corporation in accordance with specified elements, incentive mechanisms, and objectives. The existing California Renewables Portfolio Standard Program (RPS program) requires the CPUC to implement annual procurement targets for the procurement of eligible renewable energy resources, as defined, for all retail sellers, including electrical corporations, community choice aggregators, and electric service providers, but not including local publicly owned electric utilities, to achieve the targets and goals of the program.

The existing Warren-Alquist State Energy Resources Conservation and Development Act establishes the State Energy Resources Conservation and Development Commission (Energy Commission), and requires it to undertake a continuing assessment of trends in the consumption of electricity and other forms of energy and to analyze the social, economic, and environmental consequences of those trends and to collect from electric utilities, gas utilities, and fuel producers and wholesalers and other sources, forecasts of future supplies and consumption of all forms of energy.

Existing law requires the CPUC, in consultation with the Independent System Operator (ISO), to establish resource adequacy requirements for all load-serving entities, as defined, in accordance with specified objectives. The definition of a "load-serving entity" excludes a local publicly owned electric utility. That law further requires each load-serving entity to maintain physical generating capacity adequate to meet its load requirements, including peak demand and planning and operating reserves, deliverable to locations and at times as may be necessary to provide reliable electric service. Other existing law requires that each local publicly owned electric utility serving end-use customers to prudently plan for and procure resources that are adequate to meet its planning reserve margin and peak demand and operating reserves, sufficient to provide reliable electric service to its customers. That law additionally requires the utility, upon request, to provide the Energy Commission with any information the Energy Commission determines is necessary to evaluate the progress made by the local publicly owned electric utility in meeting those planning requirements, and requires the Energy Commission to report the progress made by each utility to the Legislature, to be included in the integrated energy policy reports. Under existing law, the governing body of a local publicly owned electric utility is responsible for implementing and enforcing a renewables portfolio standard for the utility that recognizes the intent of the Legislature to encourage renewable resources, while taking into consideration the effect of the standard on rates, reliability, and financial resources and the goal of environmental improvement.

This bill would require the CPUC, by March 1, 2012, to open a proceeding to determine appropriate targets, if any, for each load-serving entity to procure viable and cost-effective energy storage systems and, by October 1, 2013, to adopt an energy storage system procurement target, if determined to be appropriate, to be achieved by each load-serving entity by December 31, 2015, and a 2nd target to be achieved by December 31, 2020. The bill would require the governing board of a local publicly owned electric utility, by March 1, 2012, to open a proceeding to determine appropriate targets, if any, for the utility to procure viable and cost-effective energy storage systems and, by October 1, 2014, to adopt an energy storage system procurement target, if determined to be appropriate, to be achieved by the utility by December 31, 2016, and a 2nd target to be achieved by December 31, 2021. The bill would require each load-serving entity and local publicly owned electric utility to report certain information to the CPUC, for a load-serving entity, or to the Energy Commission, for a local publicly owned electric utility. The bill would make other technical, nonsubstantive revisions to existing law. The bill would exempt from these requirements an electrical corporation that has 60,000 or fewer customers within California and a public utility district that receives all of its electricity pursuant to a preference right adopted and authorized by the United States Congress pursuant to a specified law.

Under existing law, a violation of the Public Utilities Act or any order, decision, rule, direction, demand, or requirement of the CPUC is a crime.

Because certain of the provisions of this bill require action by the CPUC to implement, a violation of these provisions would impose a state-mandated local program by creating a new crime. Because certain of the bill's requirements are applicable to local publicly owned electric utilities, the bill would impose a state-mandated local program.

The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement.

This bill would provide that no reimbursement is required by this act for specified reasons.

The people of the State of California do enact as follows:

SECTION 1. The Legislature finds and declares all of the following:

(a) Expanding the use of energy storage systems can assist electrical corporations, electric service providers, community choice aggregators, and local publicly owned electric utilities in integrating increased amounts of renewable energy resources into the electrical transmission and distribution grid in a manner that minimizes emissions of greenhouse gases.

(b) Additional energy storage systems can optimize the use of the significant additional amounts of variable, intermittent, and offpeak electrical generation from wind and solar energy that will be entering the California power mix on an accelerated basis.

(c) Expanded use of energy storage systems can reduce costs to ratepayers by avoiding or deferring the need for new fossil fuel-powered peaking powerplants and avoiding or deferring distribution and transmission system upgrades and expansion of the grid.

(d) Expanded use of energy storage systems will reduce the use of electricity generated from fossil fuels to meet peak load requirements on days with high electricity demand and can avoid or reduce the use of electricity generated by high carbon-emitting electrical generating facilities during those high electricity demand periods. This will have substantial cobenefits from reduced emissions of criteria pollutants.

(e) Use of energy storage systems to provide the ancillary services otherwise provided by fossil-fueled generating facilities will reduce emissions of carbon dioxide and criteria pollutants.

(f) There are significant barriers to obtaining the benefits of energy storage systems, including inadequate evaluation of the use of energy storage to integrate renewable energy resources into the transmission and distribution grid through long-term electricity resource planning, lack of recognition of technological and marketplace advancements, and inadequate statutory and regulatory support.

SEC. 2. Chapter 7.7 (commencing with Section 2835) is added to Part 2 of Division 1 of the Public Utilities Code, to read:

Chapter 7.7. Energy Storage Systems

2835. For purposes of this chapter, the following terms have the following meanings:

(a) (1) "Energy storage system" means commercially available technology that is capable of absorbing energy, storing it for a period of time, and thereafter dispatching the energy. An "energy storage system" may have any of the characteristics in paragraph (2), shall accomplish one of the purposes in paragraph (3), and shall meet at least one of the characteristics in paragraph (4).

(2) An "energy storage system" may have any of the following characteristics:

(A) Be either centralized or distributed.

(B) Be either owned by a load-serving entity or local publicly owned electric utility, a customer of a load-serving entity or local publicly owned electric utility, or a third party, or is jointly owned by two or more of the above.

(3) An "energy storage system" shall be cost effective and either reduce emissions of greenhouse gases, reduce demand for peak electrical generation, defer or substitute for an investment in generation, transmission, or distribution assets, or improve the reliable operation of the electrical transmission or distribution grid.

(4) An "energy storage system" shall do one or more of the following:

(A) Use mechanical, chemical, or thermal processes to store energy that was generated at one time for use at a later time.

(B) Store thermal energy for direct use for heating or cooling at a later time in a manner that avoids the need to use electricity at that later time.

(C) Use mechanical, chemical, or thermal processes to store energy generated from renewable resources for use at a later time.

(D) Use mechanical, chemical, or thermal processes to store energy generated from mechanical processes that would otherwise be wasted for delivery at a later time.

(b) "Load-serving entity" has the same meaning as defined in Section 380.

(c) "New" means, in reference to an energy storage system, a system that is installed and first becomes operational after January 1, 2010.

(d) "Offpeak" means, in reference to electrical demand, a period that is not within a peak demand period.

(e) "Peak demand period" means a period of high daily, weekly, or seasonal demand for electricity. For purposes of this chapter, the peak demand period for a load-serving entity shall be determined, or approved, by the commission and shall be determined, or approved, for a local publicly owned electric utility, by its governing body.

(f) "Procure" and "procurement" means, in reference to the procurement of an energy storage system, to acquire by ownership or by a contractual right to use the energy from, or the capacity of, including ancillary services, an energy storage system owned by a load-serving entity, local publicly owned electric utility, customer, or third party. Nothing in this chapter, and no action by the commission, shall discourage or disadvantage development and ownership of an energy storage system by an electrical corporation.

2836. (a) (1) On or before March 1, 2012, the commission shall open a proceeding to determine appropriate targets, if any, for each load-serving entity to procure viable and cost-effective energy storage systems to be achieved by December 31, 2015, and December 31, 2020. As part of this proceeding, the commission may consider a variety of possible policies to encourage the cost-effective deployment of energy storage systems, including refinement of existing procurement methods to properly value energy storage systems.

(2) The commission shall adopt the procurement targets, if determined to be appropriate pursuant to paragraph (1), by October 1, 2013.

(3) The commission shall reevaluate the determinations made pursuant to this subdivision not less than once every three years.

(4) Nothing in this section prohibits the commission's evaluation and approval of any application for funding or recovery of costs of any ongoing or new development, trialing, and testing of energy storage projects or technologies outside of the proceeding required by this chapter.

(b) (1) On or before March 1, 2012, the governing board of each local publicly owned electric utility shall initiate a process to determine appropriate targets, if any, for the utility to procure viable and cost-effective energy storage systems to be achieved by December 31, 2016, and December 31, 2021. As part of this proceeding, the governing board may consider a variety of possible policies to encourage the cost-effective deployment of energy storage systems, including refinement of existing procurement methods to properly value energy storage systems.

(2) The governing board shall adopt the procurement targets, if determined to be appropriate pursuant to paragraph (1), by October 1, 2014.

(3) The governing board shall reevaluate the determinations made pursuant to this subdivision not less than once every three years.

(4) A local publicly owned electric utility shall report to the Energy Commission regarding the energy storage system procurement targets and policies adopted by the governing board pursuant to paragraph (2), and report any modifications made to those targets as a result of a reevaluation undertaken pursuant to paragraph (3).

2836.2. In adopting and reevaluating appropriate energy storage system procurement targets and policies pursuant to subdivision (a) of Section 2836, the commission shall do all of the following:

(a) Consider existing operational data and results of testing and trial pilot projects from existing energy storage facilities.

(b) Consider available information from the California Independent System Operator derived from California Independent System Operator testing and evaluation procedures.

(c) Consider the integration of energy storage technologies with other programs, including demand-side management or other means of achieving the purposes identified in Section 2837 that will result in the most efficient use of generation resources and cost-effective energy efficient grid integration and management.

(d) Ensure that the energy storage system procurement targets and policies that are established are technologically viable and cost effective.

2836.4. (a) An energy storage system may be used to meet the resource adequacy requirements established for a load-serving entity pursuant to Section 380 if it meets applicable standards.

(b) An energy storage system may be used to meet the resource adequacy requirements established by a local publicly owned electric utility pursuant to Section 9620 if it meets applicable standards.

2836.6. All procurement of energy storage systems by a load-serving entity or local publicly owned electric utility shall be cost effective.

2837. Each electrical corporation's renewable energy procurement plan, prepared and approved pursuant to Article 16 (commencing with Section 399.11) of Chapter 2.3 of Part 1, shall require the utility to procure new energy storage systems that are appropriate to allow the electrical corporation to comply with the energy storage system procurement targets and policies adopted pursuant to Section 2836. The plan shall address the acquisition and use of energy storage systems in order to achieve the following purposes:

(a) Integrate intermittent generation from eligible renewable energy resources into the reliable operation of the transmission and distribution grid.

(b) Allow intermittent generation from eligible renewable energy resources to operate at or near full capacity.

(c) Reduce the need for new fossil-fuel powered peaking generation facilities by using stored electricity to meet peak demand.

(d) Reduce purchases of electricity generation sources with higher emissions of greenhouse gases.

(e) Eliminate or reduce transmission and distribution losses, including increased losses during periods of congestion on the grid.

(f) Reduce the demand for electricity during peak periods and achieve permanent load-shifting by using thermal storage to meet air-conditioning needs.

(g) Avoid or delay investments in transmission and distribution system upgrades.

(h) Use energy storage systems to provide the ancillary services otherwise provided by fossil-fueled generating facilities.

2838. (a) (1) By January 1, 2016, each load-serving entity shall submit a report to the commission demonstrating that it has complied with the energy storage system procurement targets and policies adopted by the commission pursuant to subdivision (a) of Section 2836.

(2) By January 1, 2021, each load-serving entity shall submit a report to the commission demonstrating that it has complied with the energy storage system procurement targets and policies adopted by the commission pursuant to subdivision (a) of Section 2836.

(b) The commission shall ensure that a copy of each report required by subdivision (a), with any confidential information redacted, is available on the commission's Internet Web site.

2838.5. Notwithstanding any provision of this chapter, the requirements of this chapter do not apply to either of the following:

(a) An electrical corporation that has 60,000 or fewer customer accounts within California.

(b) A public utility district that receives all of its electricity pursuant to a preference right adopted and authorized by the United States Congress pursuant to Section 4 of the Trinity River Division Act of August 12, 1955 (Public Law 84-386).

2839. (a) (1) By January 1, 2017, a local publicly owned electric utility shall submit a report to the Energy Commission demonstrating that it has complied with the energy storage system procurement targets and policies adopted by the governing board pursuant to subdivision (b) of Section 2836.

(2) By January 1, 2022, a local publicly owned electric utility shall submit a report to the Energy Commission demonstrating that it has complied with the energy storage system procurement targets and policies adopted by the governing board pursuant to subdivision (b) of Section 2836.

(b) The Energy Commission shall ensure that a copy of each report or plan required by subdivisions (a) and (b), with any confidential information redacted, is available on the Energy Commission's Internet Web site, or on an Internet Web site maintained by the local publicly owned electric utility that can be accessed from the Energy Commission's Internet Web site.

(c) The commission does not have authority or jurisdiction to enforce any of the requirements of this chapter against a local publicly owned electric utility.

SEC. 3. Section 9620 of the Public Utilities Code is amended to read:

9620. (a) Each local publicly owned electric utility serving end-use customers, shall prudently plan for and procure resources that are adequate to meet its planning reserve margin and peak demand and operating reserves, sufficient to provide reliable electric service to its customers. Customer generation located on the customer's site or providing electric service through arrangements authorized by Section 218, shall not be subject to these requirements if the customer generation, or the load it serves, meets one of the following criteria:

(1) It takes standby service from the local publicly owned electric utility on a rate schedule that provides for adequate backup planning and operating reserves for the standby customer class.

(2) It is not physically interconnected to the electric transmission or distribution grid, so that, if the customer generation fails, backup power is not supplied from the electricity grid.

(3) There is physical assurance that the load served by the customer generation will be curtailed concurrently and commensurately with an outage of the customer generation.

(b) Each local publicly owned electric utility serving end-use customers shall, at a minimum, meet the most recent minimum planning reserve and reliability criteria approved by the Board of Trustees of the Western Systems Coordinating Council or the Western Electricity Coordinating Council.

(c) Each local publicly owned electric utility shall prudently plan for and procure energy storage systems that are adequate to meet the requirements of Section 2836.

(d) A local publicly owned electric utility serving end-use customers shall, upon request, provide the Energy Commission with any information the Energy Commission determines is necessary to evaluate the progress made by the local publicly owned electric utility in meeting the requirements of this section.

(e) The Energy Commission shall report to the Legislature, to be included in each integrated energy policy report prepared pursuant to Section 25302 of the Public Resources Code, regarding the progress made by each local publicly owned electric utility serving end-use customers in meeting the requirements of this section.

SEC. 4. No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution because a local agency or school district has the authority to levy service charges, fees, or assessments sufficient to pay for the program or level of service mandated by this act or because costs that may be incurred by a local agency or school district will be incurred because this act creates a new crime or infraction, eliminates a crime or infraction, or changes the penalty for a crime or infraction, within the meaning of Section 17556 of the Government Code, or changes the definition of a crime within the meaning of Section 6 of Article XIII B of the California Constitution.

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