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US Electric Utilities & IPPs

Americas

Electric Utilities

Sector Comment

In Search of the Storage Solution

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■ California formalizes procurement requirements for energy storage

The California Public Utilities Commission (CPUC) finalized new energy storage requirements for its investor-owned utilities, creating a target worth effectively 1.375 GW by 2020. The program would require the first of four biennial solicitations to be issued by March 1st, 2014, with the utilities able to ratebase up to 50% of this. More importantly, the solicitation explicitly limits the participation of large-scale pumped hydro (>50 MW), limiting any ‘low-cost’ solutions from impeding its development. Rather, the CPUC’s initiative appears to be explicitly geared towards incentivizing novel approaches to storage, mandating targets related to transmission (conventional grid-scale solutions), distribution (likely storage coupled with distributed generation solutions), and ‘customer’-derived (while bill management, power quality, and Electric vehicle interconnection are cited, this remains the vaguest of the three categories).

■ More ratebase growth for California utilities; modest at first though

We read this as a modest positive for all three California utilities, enabling at best ~$50 Mn in incremental spending across the three (split 45/45/10% for PG&E/SCE/SDG&E respectively) for 2014/15, with a scaling up in investment through 2020: the solicitation targets are 200/270/365/490 MW for the 2014/16/18/2020 procurements, respectively. In aggregate, we estimate investment is likely to reach ~$6 Bn (~assuming ~$5,000/kW, quite conservative in our view) to achieve the mandate, with up to half of the *capital* investment required able to be rate based.

■ Storage ‘clips’ peaks, limiting premium pricing for generators

Meanwhile, we read this development as a modest negative for wholesale generators in the state, with the RFO specifically targeting the development (of seemingly uneconomic) investments in storage to ‘clip’ peak prices in the state. We remain bearish on peak prices in the state due to growing solar penetration (both utility scale and distributed) and this latest mandate appears to put pressure on the value of ‘flexible’ capacity as well—the linchpin to pricing for any remaining conventional generators later in the decade (following the retirement of once-through cooled assets). The move is notable in the development of further competing technologies to thermal generation to the extent to which California is able to effectively ‘commercialize’ energy storage (much the way it, along with other countries have already done for solar). Specifically, the impact is likely most negative for CPN, DYN, among other California generators. Ultimately, we increasingly believe markets outside California will eventually be forced to develop more explicit market values for flexibility (similar to the way values are currently placed on ancillary services), allowing improvements to more appropriately value resources able to accommodate growing renewable penetration and further enabling the development of storage solutions.

What's the target? California buckets out storage goals

California has mandated specific targets for the three perceived niches of storage. While the concept of pumped storage has existed for some time, the US has largely abandoned this source of peak reduction given land use concerns. Rather, we look for a wide range of alternate technologies to be implemented, albeit most remaining focused on battery-sourced solutions at various scales.

Storage is the 'next chapter' with California at the front

With this mandate, California is once again taking leadership in the next chapter for renewables: Storage. While in the very early stages, this will provide a platform for what we believe to be the only missing element in the proliferation of intermittent and peak power sources such as solar. We believe this mandate could help accelerate some of this early stage development as utilities are able to rate-base it, and view it positively for the solar industry. Our top solar pick is SunEdison (SUNE), which is a leader in the distributed generation

Table 1: California Storage Grid Domain Proposed Targets

Storage Grid Domain	Proposed Energy Storage Procurement Targets (MWs)				
Point of Interconnection	2014	2016	2018	2020	Total
Southern California Edison					
Transmission	50	65	85	110	310
Distribution	30	40	50	65	185
Customer	10	15	25	35	85
Subtotal SCE	90	120	160	210	580
Pacific Gas and Electric					
Transmission	50	65	85	110	310
Distribution	30	40	50	65	185
Customer	10	15	25	35	85
Subtotal PG&E	90	120	160	210	580
San Diego Gas & Electric					
Transmission	10	15	22	33	80
Distribution	7	10	15	23	55
Customer	3	5	8	14	30
Subtotal SDG&E	20	30	45	70	165
Total - all 3 utilities	200	270	365	490	1,325

Source: California Public Utilities Commission

Energy Storage Solutions: Which will technology will lead?

The tables below summarize the current state of existing and emerging grid storage technologies, many of which are already in some state of small-intermediate sized deployment around the world. We note that PCG is currently working with the Department of Energy after being awarded a grant to support site, design and testing of a 300 MW, 10-hour cycle Compressed Air Storage plant. With both the capital and levelized costs across a range of potential materially 'above' market, we see the latest program as introducing significant subsidies to achieve the state's policy goals.

While peak clipping appears to be a homogenous product, the dispatch characteristics around the required dispatch, speed with which it can be both called upon, and time to recharge remain a key variability among the technologies listed below.

Table 2: Overview of Various Energy and Battery Systems

Type	System	Size (MW)	Cycle time (Hrs)	Levelized PV of Installed Cost $/kW	Levelized Cost of Energy $/MWh	Levelized Cost of Capacity $/kW-Yr
Mechanical	Pumped Hydro	1,200	8	$ 5,750	$ 220	$ 415
Mechanical	Compressed Air - above ground	50	5	$ 4,950	$ 210	$ 385
Mechanical	Compressed Air - below ground	400	8-26	$ 4,500	$ 120	$ 345
Dry & sealed	Sodium-Sulfur Battery	100	7	$ 6,100	$ 260	$ 680
Dry & sealed	Sodium-Nickel-Chloride Battery	50	5	$ 5,000	$ 300	$ 600
Flow liquid	Vanadium Redox Battery	50	5	$ 7,000	$ 450	$ 800
Flow liquid	Iron-Chromium Battery	50	5	$ 3,000	$ 200	$ 375
Flow liquid	Zinc-Bromine Battery	50	5	$ 3,750	$ 215	$ 400
Metal-air catalyst	Zinc-Air Battery	50	6	$ 3,200	$ 160	$ 350
Flow liquid	Lead-Acid Battery	100	4	$ 8,000	$ 600	$ 850
Mechanical	Flywheel Energy Storage	20	15 min	$ 4,250	$ 375	$ 490
Dry & sealed	Lithium-ion Battery	10	2	$ 4,300	$ 700	$ 500

Source: DOE/EPRI 2013 Electricity Storage Handbook

Table 3: Current and Emerging Technologies

Current Technologies	
Pumped Hydro	Large mature technology.
Compressed Air - above ground	Besides pumped hydro, the only commercial bulk energy storage currently available.
Compressed Air - below ground	Salt domes and caverns are ideal. PCG & DOE are working on a 300 MW plant
Sodium-Sulfur Battery	AEP operating 11MW at 5 locations and there is 160 MW operating in Tokyo. Used with wind turbines.
Sodium-Nickel-Chloride Battery	Seeing some small unit deployment at solar sites.
Vanadium Redox Battery	1 MW or smaller units now operating in renewable integration, end-user energy mgmt and telecom
Iron-Chromium Battery	Can be used for time shifting at utility or customer side of the meter as well as for freq reg
Zinc-Bromine Battery	Still early stage of field deployment and demonstration trials at 1 MW size
Zinc-Air Battery	Very high energy density and low cost. Candidate for elec vehicles and power electronics.
Lead-Acid Battery	Very mature tech but not used at utility scale because of weight, bulk, short cycle-life, and reliability issues
Flywheel Energy Storage	Very fast response (4 ms). Only very small units in use (up to 25 kWhs), but energy density 10x batteries.
Lithium-ion Battery	Widespread commercial use. Fast response time. Currently dominate grid-scale deployment.
Other Emerging Technologies:	
Liquid Air Energy Storage	Promises to be low-cost. First scaled demo 2014.
Non-fuel Compressed Air	Optimizes cycle and thermal storage. 2015 pilot for 5 MW.
Underground Pumped Hydro	New concepts. Early stages.
Nano-supercapacitors	Lab testing now. High power and energy density. 2015 deployment.
Advanced Flywheels	Higher energy density. Under development for 2015, mostly for use in freq reg.
H2/Br Flow	Bench testing. Low cost. 2014 pilot.
Advanced Lead Acid Battery	Low cost, high-cycle life. 2015 early field trials.
Novel Chemistries	Bench testing. Very low cost and long cycle life. 2015 testing.
Isothermal Compressed Air	2 MW system demo for distributed storage. 2013 pilot.
Advanced Lithium-ion	Ongoing lab experiments. 2015-2020.

Source: DOE/EPRI 2013 Electricity Storage Handbook

■ Statement of Risk

Risks for Utilities and Independent Power Producers (IPPs) primarily relate to volatile commodity prices for power, natural gas, and coal. Risks to IPPs also stem from load variability, and operational risk in running these facilities. Rising coal and, to a certain extent, uranium prices could pressure margins as the fuel hedges roll off Competitive Integrateds. Further, IPPs face declining revenues as in the money power and gas hedges roll off. Other non-regulated risks include weather and for some, foreign currency risk, which again must be diligently accounted in the company's risk management operations. Major external factors, which affect our valuation, are environmental risks. Environmental capex could escalate if stricter emission standards are implemented. We believe a nuclear accident or a change in the Nuclear Regulatory Commission/Environment Protection Agency regulations could have a negative impact on our estimates.

Risks for regulated utilities include the uncertainty around the composition of state regulatory Commissions, adverse regulatory changes, unfavorable weather conditions, variance from normal population growth, and changes in customer mix. Changes in macroeconomic factors will affect customer additions/subtractions and usage patterns

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UBS 12-Month Rating	Rating Category	Coverage[1]	IB Services[2]
Buy	**Buy**	44%	32%
Neutral	**Hold/Neutral**	46%	32%
Sell	**Sell**	10%	19%
UBS Short-Term Rating	**Rating Category**	**Coverage[3]**	**IB Services[4]**
Buy	**Buy**	less than 1%	less than 1%
Sell	**Sell**	less than 1%	less than 1%

1:Percentage of companies under coverage globally within the 12-month rating category.
2:Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.
3:Percentage of companies under coverage globally within the Short-Term rating category.
4:Percentage of companies within the Short-Term rating category for which investment banking (IB) services were provided within the past 12 months.

Source: UBS. Rating allocations are as of 30 September 2013.

UBS Investment Research: Global Equity Rating Definitions

UBS 12-Month Rating	Definition
Buy	FSR is > 6% above the MRA.
Neutral	FSR is between -6% and 6% of the MRA.
Sell	FSR is > 6% below the MRA.
UBS Short-Term Rating	**Definition**
Buy	Buy: Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.
Sell	Sell: Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.

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UBS Securities LLC: Julien Dumoulin-Smith; Mahavir Sanghavi.

Company Disclosures

Company Name	Reuters	12-mo rating	Short-term rating	Price	Price date
SunEdison Inc.[16]	SUNE.N	Buy	N/A	US$9.71	23 Oct 2013

Source: UBS. All prices as of local market close.
Ratings in this table are the most current published ratings prior to this report. They may be more recent than the stock pricing date

16. UBS Securities LLC makes a market in the securities and/or ADRs of this company.

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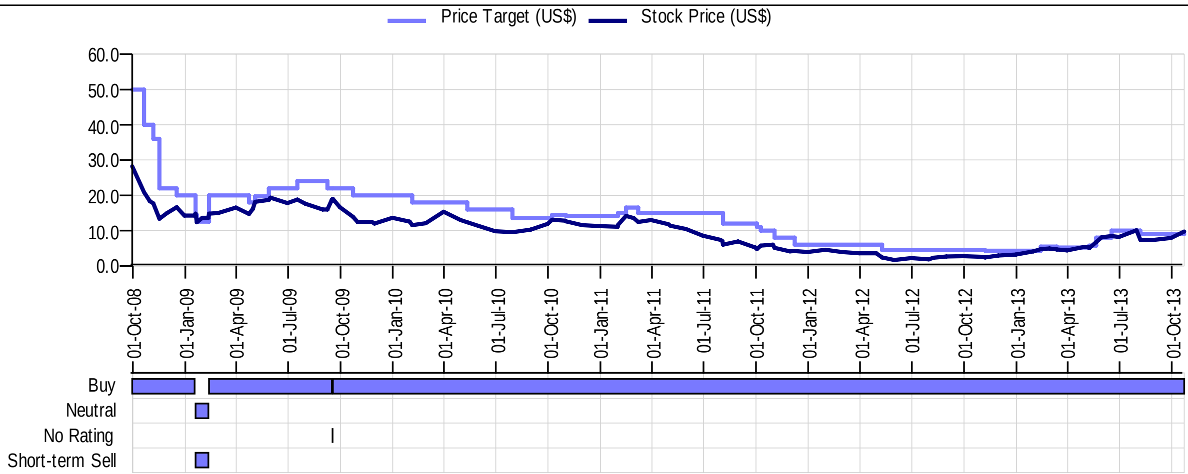
SunEdison Inc. (US$)



Source: UBS; as of 23 Oct 2013

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