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"Energy Storage for Renewable Integration" comment.

May 2, 2011

Chairman Weisenmiller and Commissioner Douglas

I work for Solera Power Corporation. Solera is working on a small solar thermal system coupled with an inexpensive storage component that will allow operation 24/7 or become a dispatchable solar system.

I am aware of:

(a) the intermittency of some renewable systems;
(b) the need of steadily maintaining a supply of electricity;
(c) the difficulty and cost of storing energy;
(d) the high cost of generating renewable energy;
(e) the defensive position of the utilities, and;
(f) the zeal of regulators to prevent abuses by utilities.

There is agreement that there is no magic solution. The power grid needs storage to:

(a) absorb instantaneous blips in the system;
(b) absorb short term shortfalls in the system, lasting a few minutes;
(c) smooth intermittency of certain sources, and;
(d) shift generation to peak hours.

While there are possible solutions and the California Energy Commission can create another line item on the rate payers bill to include the cost of the storage, I would like to urge you to take a step or two backwards, to try to see the problem in a different perspective:

1. electricity is a natural monopoly – it is capital intensive and sells a product through a complicated network of cables and it is not cost effective to have two companies competing for clients in the same city;
2. the states have provided the utilities a geographical area of action, provided they adhere to rules and regulations and to certain standards of quality, safety and profitability;
3. Many of the rules and regulations are almost 100 years old, have sometimes been imposed by different organizations (states, municipalities, cities) resulting in conflicting signals and have been tinkered with to the point that they are now at times inconsistent, obsolete or impractical;
4. given the continuous power struggle with regulators, the utilities are conservative and will only invest in proven components approved by regulators;
5. after the "fiasco" of the de-regulation and the subsequent California Energy Crisis, the regulators are afraid to learn from the mistakes and revisit a free market approach;
6. hydro, geothermal or biomass are renewable but not intermittent;

7. attempting to regulate and define a price for a service without taking into consideration market driven possibilities only distorts the markets.

We have to accept reality:

a. The user has gotten accustomed to an extremely reliable service at a reasonable price. The utilities have done an excellent job in the past of finding a way of providing the quality needed by having spinning reserves, taking in or taking out generators as needed, and connecting themselves with a larger system to reduce the size/impact of the fluctuations.

b. The utilities are aware of the intermittency of the "new" renewable energy (i.e. wing and PV panels). They are not interested in renewable energy and only through substantial arm twisting (i.e. imposition of RPS) they are procuring renewable energy. They fought "net metering" and succeeded in defining a MRP based on their most efficient combined cycle that guarantees solar can not compete and wind is kept at such low price due to its intermittency that it requires convoluted tax gymnastics bordering on tax avoidance schemes for some positive financial return.

c. The utilities have positioned themselves strategically. If the authorities want intermittent renewable energy, they will take it but either the quality goes down or someone has to provide storage, a new expense to be compensated.

d. The world is changing. While in the past, economies of scale have encouraged large systems, solar, wind and even biomass do not scale well. Insisting on large solar systems requires large land areas and huge storage. A good analogy is the railroad system. Without any doubt, the most efficient way of moving cargo, yet 80% of the cargo is moved by trucks. Distributed generation is the equivalent of trucks.

The pharmaceutical or electronic segments invest 10% of their sales on research; the automotive segment about 3%, the oil industry (not counting exploration) about 2% and the electric sector less than 1%.

Storage for short term fluctuations

The utilities have the obligation to provide a reliable service, which could be defined as the residential user having electricity in his house 99.99% of the time (slightly less than one hour of disconnection in a year), at a voltage between 108 and 122 and a frequency between 59.5 and 60.5 Hz, or the current definition of quality and reliability that the CEC/PCUC considers appropriate.

It follows that the utilities are obligated to provide the storage/mechanism needed to absorb all the instantaneous blips and short term shortfalls. They should be free to decide to provide it via flywheels, ultra-capacitors, batteries or spinning reserves. The regulator, as usual, might only accept certain costs.

By insisting that the utilities meet the quality and reliability requirements, the regulators are throwing back the problem to the utilities and the utilities will have to find a way of coming up with the solution.

The utilities, by insisting on extremely low tariffs for renewable sources due to its "intermittency" have tacitly accepted the risk of the intermittency. They could have accepted a higher price, insisting that wind generators provide dispatchable or steady supply, in which case the industry would have worked to find a solution to the intermittency attracted by a reasonable price. It is the same for PV panels. If the current market reference price is insufficient to attract steady renewable resources, maybe the price is too low.

Long term fluctuations and/or peak shifting

While they are two problems, for the purpose of the discussion they can be grouped as one. There is value in capturing wind energy at night to deliver it at peak times. There is value of shifting solar thermal or PV panels a couple of hours. The problem is how to compensate it.

The poor experience with de-regulation prevents the authorities from accepting a market based solution. By forcing everybody to sign long term PPAs, there are no free generators with excess energy to cover gaps. California has the proper tools to have a "free" generating system and uses day-ahead formulas to dispatch generators based on their generation cost and has a flexible system to compensate for variations. Yet, there are no free generators – only expensive and inexpensive systems. At times, the additional energy is brought from outside the state sources.

Suggestion

I have basically three suggestions:

The first suggestion is to unbundle the cost of electricity from the consumer bill. The utilities should directly pass the cost of generation. If the cost goes up or down with the price of natural gas, let it be. By sticking to artificial averaging mechanisms based on projections of prices, the regulators are distorting the market.

The second suggestion is that everybody should pay TOU rates. The smart meters should provide instantaneous pricing. While waiting to have sufficient smart meters, an average, calculated by CAL_ISO should be used to sell electricity to the distributors, which could break its demand by county, city or circuit, and use the daily demand curve/price as a proxy for each residential consumer. It is nothing new, nor very difficult. My utility bills were unbundled in VA fifteen years ago and it should not be difficult to implement.

Without instantaneous information, the smart grid is a novel and easy way of disconnecting someone, based on location, last name, credit rating, political connections or any other random or targeted goal, but the user only has two signals to affect his behavior – peak or non-peak. If everyone turns the washer, dryer or AC at 8:00 pm, we will move the peak there. If the signal is to run the appliances when the price is less than 15¢/kwh, at least we are beyond the critical peak period.

The third suggestion is to allow the renewable generators to operate as free agents. Solar thermal installations will seek storage to generate at peak time. Large PV panel installations will seek storage to ease the quick fluctuations due to cloud cover, and eventually experiment with options to shift generation to peak time. The mechanisms are already in place. ISO already tracks the price and dispatches according to needs. The only thing that needs to be done is accept that renewable energy generators could be free generators.

Each company might offer their energy on the same day-ahead mechanism. The ISO should dispatch them on the order of cost and pay each dispatched system the price paid to the last dispatched system. Renewable operators can offer their energy at the time of their choosing, offering it at $0/MW, knowing that once dispatched they will be paid the prevailing market rate, whether it is $30/MWh or $300/MWh. The mechanism is already used to dispatch/pay hydro systems. ISO has mechanisms to cover eventualities and penalties for those dispatched but not providing energy.

ISO can implement the RPS for the system, by giving priority in the dispatch to renewable generators. Alternatively, each renewable operator (just like any other generator) offers its tariff for a given time at certain price.

Making them free agents does not remove the intermittency. For wind or PV panels, a market mechanism of instantaneously averaging the generation or paying only for the minimum amount generated during each 5 or 15 minute period would send sufficient signal for the owners of PV panels or wind turbines to smooth their generation. They will quickly start trying to figure out a way to avoid the penalties, or averaging or minimum payment and will be seeking ways to generate during peak, and will get paid by the market.

The proposal is simple and makes sense, plus it will start providing clear signals for demand response from residential users that now have a fluctuating tariff and can postpone their consumption to times that make more sense. A smart meter can disconnect the fridge and the AC once the price of electricity touches $0.25/kwh. With only two/three different prices in their time of use, the user quickly finds out that the house is getting hot and turns on the air conditioner, because the difference between peak tariff and night tariffs is small compared with the level of discomfort he/she is experiencing.

Rather than creating a new "storage" item on the bill, the suggestion lets the market forces attract the needed investments to maximize their revenues. It might even encourage utilities to invest in renewable energy, something that so far they have avoided.

Drastic departure from the current status is almost inconceivable. There are too many created interests. There are too many contracts to be modified and too many parties capable of legally blocking it. It is easier to work around the edges, even if doing so adds another layer of complication to an old system. Trying to keep a dying dinosaur alive is complicated. There will be renal failure, heart complications or respiratory ailments. Eventually all die.

This is an opportunity as good as any other to rethink that the objective is:

1. to have a 99.99% reliable system;
2. at the lower possible cost, and;
3. with 33% renewable energy in the mix by 2020.

The second and third objectives are incompatible. No amount of regulation is going to change that. We have a sophisticated system to keep track of generation costs and of regulators to prevent abuses. Let's use them.

I will be happy to expand on the above.

Respectfully,

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