ESA annual meeting 2000

BPA collected thoughts on Utility energy storage for Renewables & Transmission use

BPA Perspectives From BPA Power Business Line - Renewables ES needs - George Darr - Renewable Program

- An energy storage system that is clean, cheap, reliable and modular/portable would enable renewable projects to sell flat blocks of power at HLH or sell via cheap non-firm transmission access

- BPA's Wyoming wind project (Foote Creek) currently pay Scottish Power (PacifiCorp) to replace local power and deliver energy on the west side of the mountains – this costs 15 mils ($15/megawatt) for "storage and transmission" costs currently (transmission costs end up being "pancaked" – stacked up on the way to the customer)

- Transmission capacity is purchased in flat blocks, i.e. a power producer must provide firm blocks of power with a requirement of +/- 1 or 2 %

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- Transmission system charge for over/under delivery of power are very high, Van Cycle Ridge wind project penalties are 100 mills/mw, for power delivery that are out of range (this applies to all power producers, renewable, hydro, thermal) – the reason for these punitive charges is that the transmission operator has to supply non delivered power, which can be quite costly on the open market at any particular moment.

- Transmission line capacity can be limited in renewable projects because they are often located at the end of long, skinny transmission lines that do not have much, if any free capacity to transfer load during high load hours (HLH), which is when prices are the highest

- For example the Foote Creek Wind projects could spend up to 15mills/kwh for storage to reduce transmission and storage charges if there were a workable storage system (I don't have the life expectancy of the project or power output to give as examples for ESA members to work back to capital equipment cost for storage device)

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- Other advantages of energy storage would be that with flat power blocks of renewables (wind, solar, etc.) could displace dirtier or higher CO2 content sources of power like coal or natural gas.
- If energy storage systems were of large enough size they could help with night time operational issues on a hydro system, where minimum flows must be maintained for fish, navigation and other reasons – i.e. store energy at night, maintaining flows and sell during the day at HLH prices.

- This could help minimize the use of pumped storage facilities which have gained recreational and fishing uses that once put in place are politically hard to return to hydro operations use

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- Caveats on this scenario – without demand charges or retail access laws these systems will be less economic and likely
- Two size requirements suggested here – 25kw or less and 1mw and larger
- 25kw and smaller – use would be for residential or commercial users that likely would be small solar and/or wind systems
- Again an energy storage system that is clean, cheap, reliable, have transfer and paralleling equipment included, is modular/portable and that would enable renewable projects to sell flat blocks of power at HLH or sell via cheap non-firm transmission access, additionally it should take AC/DC inputs at low voltages, 220/480V AC and 3-12V DC to minimize losses into the storage system, have a high side inverter that puts out at distribution voltages for a net metering sale of the energy

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- Larger wind based energy system (1 mw or larger) – depends on how the operator wants to play to electricity market. Options could be selling week ahead strips of power (minimum sale is 1mw for the 96 HLH time period during the business week) or month ahead sales or hour ahead sales or a combination of the above. The site energy availability and sales strategy would likely determine the unit size and output capabilities to optimize returns based on the rules of the ISO/RTO or pool operator.

- For assumption purposes lets say you have four 750kw wind turbines (3mw) with average output is likely to be 1/3 of the peak or 1mw. So to sell a weekly strip of 1mw of power and have a margin of safety for delivery you need a 100mw storage unit. To sell the 1mw strip you would need a minimum of 1mw/hour energy output. If the energy storage system could inject the energy at a larger rate (the whole 100mw in an hour) that would enhance the ability to sell at peak spot prices, say in August in California or winters in the Pacific Northwest or other cold peaking areas. Larger energy storage ability would increase the value.

Perspectives From BPA Transmission Business Line - Gordon Comgys – BPA TBL systems operations and planning

- This energy storage system need is focused on transmission system use for system stability.

- 1.Use for “redispatch” of power – i.e. near or at a large customer facility (load center) to be used at peak load times for relief of transmission line congestion, peak shaving – to net out loads for 4 hours or longer, to offset winter load peaks and would likely be used for periods up to 2 weeks in emergency conditions. . It should be easily and inexpensively increased in capacity and output size so that future load growth could be accommodated, expanding to 8 hours use, at higher power levels in the future. Start up time would need to be about 1 minute if it’s variable cost is high, so it only is used after a rare contingency. If variable cost is low, then start up time can be 1 hour and the operation would come on in the absence of a transmission contingency.

- 2. Another application could also increase transfer capability over lines in use if the the energy storage device automatically kicked in within milliseconds and stayed on for several seconds if needed following contingencies.

Perspectives From BPA Transmission Business Line - Gordon Comgys – BPA TBL systems operations and planning

- Why would a transmission operator consider such a facility rather than build new transmission? Non cost issues are involved in new line siting, such as environmental and visual impacts of new lines that local citizens raise. Also the time to site a new line can take up to or more than 3-5 years for new lines or even just upgrades to current line.

- What cost might be acceptable to overcome non cost issues? Around 100% over conventional system costs for an energy storage system fly, but if orders of magnitude above that and it may not be selected due to other alternatives such as load curtailment.

Perspectives From BPA Transmission Business Line - Gordon Comgys – BPA TBL systems operations and planning

- If there is the probability of a load curtailment for a region, in a short time frame, an energy storage system would look like a viable option as well.

- Where would be a good site for this capability? Near the major load centers in the Willamette Valley and Puget Sound. A large mobile unit could also mitigate the effects of power transformer outages due to the 4 week replacement time frame.

Perspectives From BPA Transmission Business Line - John Haner – BPA TBL R&D

- Studied energy storage systems seriously several years ago and came to these conclusions:
- No one use justifies and energy storage system, such as a SMES for system stability, but multiples uses could justify a system, add reliability to the SMES and it could make sense.
- Biggest fear of an energy storage system is stranded costs, so it should be mobile (i.e. you could move it to areas with need 2-3 times a year)
- For system stability use - fast like a SMES, solid state inverter of 300-400 mw size, 10 – 20 MW-sec or larger energy storage
- For transmission system load leveling/ congestion management it should kick on in 1-2 minutes, have a 300-400mw solid state inverter, have 100-200 mw or larger energy storage

Perspectives From Mike Hoffman - PBL/Energy Efficiency

- CECA distributed generation policy forum – distribution utilities fear stranded distribution asset issues if distributed generation grows rapidly, interconnection standards with be a big hassle unless set at the national level

- Environmental values can drive decisions that are not based on economics – example of late 1980's decision in the Pacific NW to put 44,000 miles of stream and rivers off limits to further hydro projects to protect salmon, by the NW Power Planning Council

- Seattle Summit – Environment & Clean energy

- Sam Wylie – Put clean energy on election screen (300 articles on his supprt of Bush, did get a good response relative to getting rid of coal generation

- Catherine Mekalip-Thompson Enron Environment group: What would a carbon tax mean for energy storage? Corporate valuations of many companies would change radically and quickly, I think