

September 23, 2015

Clean Power Development LLC
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Steven V. King
Executive Director and Secretary
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RE: Modeling energy storage in integrated resource planning, Docket UE-151069

Clean Power Development LLC (CPD LLC) appreciates the opportunity to comment. CPD LLC was formed to support policy and renewable energy project development, capitalizing on the need for future reliable clean energy to successfully implement the Environmental Protection Agency's (EPA) Clean Power Plan in successfully de-carbonizing our power system cost-effectively.

Over the past decade, the Northwest has seen explosive growth in wind generation. Wind generation on Bonneville Power Administration's (BPA) balancing authority in the Northwest grew from almost nothing in 1998, to over 4,700 megawatts (MW) today.

As a result of this exponential growth, the installed operating wind energy capacity in the Northwest is one of the highest in the country as a percentage of load (15% wind penetration) with the majority located in the Columbia River Gorge representing over a \$6 Billion clean energy investment and substantial rural economic development.

Unfortunately, new wind project development in the Northwest effectively died several years ago due to California fencing out renewables and the region's Renewable Portfolio Standards largely met. What was left was BPA trying to integrate all this non-dispatchable wind on their system. Still, their transmission interconnection queue currently has over 7,600 MW in study with over 8,000 MW likely by 2024.

As a result of this operating "must take" wind capacity, the Northwest's hydropower assets are at the very edge of their capability with little flexibility left for future expansion to integrate additionally intermittent resources. Plus, these hydropower leviathans were not designed to ramp at the speed and frequency necessary to balance this variable carbon-free resource.

Taking into account the social cost of carbon, the EPA has announced rules to curb greenhouse gas emissions in a big way over a number of years with their Clean Power Plan. The benefits of this plan have a huge societal benefit in addressing climate change in a significant way. Nationally, the proposed rules target coal plants and impact Washington State more than any other state.

Big changes regionally will be necessary to meet the goals of the EPA's Clean Power Plan. With the coals plants serving the Northwest currently, there will be a considerable need for low-carbon replacement capacity. Over the next 20 years, PacifiCorp alone is planning to take down 2,800

MW of coal-fired generation in the West. Aging infrastructure is another driving factor for retirement, with the average age of these coal plants being over 40 years old.

With the procurement options available for new generation on an unsubsidized and levelized cost of energy basis, assuming new run-of-the-river hydropower is largely built out, wind energy is one of the most affordable forms of electricity today to meet clean energy and carbon reduction goals. In the Columbia River Gorge in Washington and Oregon, there is a substantial amount of additional wind projects proposed in this rich resource area that can be developed without significant environmental impact.

However, the Achilles' heel of wind integration lies in the intra-hour variability and uncertainty of wind, making this resource difficult to dispatch. The challenge is to find a way to make wind energy and other intermittent resources in synch and balanced with load on a real-time basis.

Combining energy storage with intermittent renewables holds great promise for the wind industry in the Northwest and the next quantum leap in market growth. Storage can unlock the greater value of existing and future renewables by integrating them with no carbon emissions. What is needed is bulk carbon-free storage with high operability and flexibility to not only respond quickly when power is needed, but to absorb excess energy in overgeneration conditions.

Of the viable, least-cost storage options available, pumped storage is the ideal grid-scale solution and complementary to batteries on a distribution level. Pumped storage is ultra-mature, proven, and essentially the biggest, cost-effective batteries on the planet with staggering potential for economic development. Albeit, pumped storage projects require a long-view to realize and are upfront capital intensive.

A dedicated off-river or "closed loop" pumped storage project such as the Klickitat Public Utility District's JD Pool Pumped Storage Project does not have the operational and environmental restrictions imposed such as the run-of-the-river dams that occur on the Columbia River, and hence, can freely start, stop, reverse, and fluctuate as needed by the power system without negatively impacting the aquatic species, or adversely impact other demands such as food control, fish passage, navigation, irrigation and recreation.

Pumped can respond to load changes within seconds and can operate across a broad range of all time scales, from seconds through hours, to days and months, to ensure that sufficient generation will always be available to meet load and match changes in generation and demand on a real-time basis, and on an hour-to-hour and sub-hour time-frame.

At the tip of the spear for "barriers to overcome" is the economic analysis and modeling of storage sub-hourly energy grid services and environmental benefits at a regional level to capture the revenue and cost savings pumped storage bring both as generation and load in a Balkanized grid with no regional organized market, Independent System Operator or Regional Transmission Organization. Many of these modeling tools have been developed by Argonne National Laboratory for California and can be economically adopted by Pacific Northwest National Laboratory for the Northwest region with the proper policy direction and funding.

Sincerely,

Nathan A. Sandvig

President

Clean Power Development LLC