**“High Voltage Integration” Policy Option**

***Flexible and Renewable Resources for the Big Grid***

At a recent meeting of solar energy advocates and activists, Shannon Eddy, Executive Director of the Large Scale Solar Association, reviewed the status and outlook for central station solar power projects in California. None of the large solar thermal power projects in construction, nor those likely to be commissioned, incorporates thermal energy storage.

With plant economics determined primarily by energy purchase prices, leading solar thermal power project developers and their utility power purchase counter-parties had little incentive to seriously consider including high temperature thermal storage in plant functional specifications. Further, large solar plants in the current wave of deployment, both CSP and solar PV, have in some cases encountered siting and permitting challenges serious enough to cause already licensed projects to be abandoned or to negatively impact plant life cycle economics.

With California’s renewable policy emphasis shifting to goals for distributed generation deployment, the solar PV industry is likely in turn to shift its emphasis to development of community scale projects an order of magnitude smaller than the large scale projects in the current round of deployment. Such projects will have generally the same impacts on big grid management as deployment of similar, larger projects. So, unless storage-coupled solar thermal projects are also deployed, grid operational flexibility requirements will be met in a variety of costly and environmentally sub-optimal ways, including deployment of additional central station natural gas fueled plants.

In short, thermal storage-coupled solar plants can provide cost effective energy plus the grid operational flexibility that will increasingly be needed as renewable portfolio standards ratchet upward. That’s the good news. The bad news is their development risk may be too high to attract adequate project development investment.

Meanwhile, California transmission grid owners, i.e. mostly investor-owned utilities, will be investing many billions of dollars in new and upgraded transmission infrastructure to ensure grid operational reliability and flexibility, and to enable increasing amounts of renewable electricity to flow to the state’s electricity customers. They will not, however, be investing in flexible renewable energy generation unless they are allowed to. Solar thermal power has greater economies of scale than solar PV, but its project development costs are higher, and project lead times are longer. Achieving California’s goals to expand its distributed generation resources will increase the need to capture grid flexibility benefits that storage-coupled solar thermal plants offer.

One strategy option to secure this outcome is to allow and even encourage California’s investor owned utilities to invest in large storage-coupled solar thermal plants.

In this case, project development risks inherent in large solar thermal plants would be shouldered by California ratepayers, and state policy goals to meet grid reliability and portfolio mix standards would be met at potentially lower cost and less reliance on carbon based fuels. Ratepayer benefits would include avoidance of environmental and economic penalties related to curtailment of solar PV and wind plants, as well as minimization of inefficient use of carbon-based fuels and energy waste involved in charging and discharging electrical energy storage.1

As noted in last month’s *High Voltage Integration* article, the price of the necessary flexibility provided by the big grid and its centralized resources may increase substantially as overall penetration of variable renewable sources increases. Relatively inexpensive and efficient high temperature thermal energy storage is a cost mitigation option worth considering. A preliminary assessment of ratepayer benefits and risks of treating storage coupled solar thermal plants as grid flexibility assets should be completed.

**Notes and References:**

1. See <http://www.nrel.gov/docs/fy12osti/52978.pdf> for a preliminary analysis of using dispatchable CSP plants to avoid PV curtailments at high solar penetration levels. Economic benefits are not evaluated.