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California Energy Commission

Re: Docket No. 12-IEP-1D

Clean Coalition Comments for the Workshop on Strategies to Minimize Renewable Integration Costs and Requirements and Improve Integration Technologies

June 18, 2012

This workshop brought to an end a phase of information-gathering and discussion on the challenges faced in developing renewable energy in California. It is only the beginning, however, of the next stage, in which the ideas presented will be incorporated into actions and real change for the state. The Clean Coalition looks forward to continuing to provide information and advice as the 2012 IEPR Update takes shape.

The topic of improving integration should be framed as the challenge of integrating all our energy sources – not simply making renewables fit within the existing framework. The world is changing and energy generation and consumption are significantly more complex than they used to be. We now use renewables of many types, as well as fossil fuels and natural gas. We drive electric vehicles. We use advanced modeling and forecasting technology every day. And we are beginning to deal with climate change. Together, these components make up our energy future and none can be addressed in isolation.

Given the massive and unavoidable changes we need to make in our energy system, traditional methods of generation need to adapt to the changing environment. Grid management needs to be more proactive and horizontally managed. It should not be something controlled only at a central transmission hub. Rather, the creation of a strong Distribution Planning Process (DPP), in addition to the existing TPP, would accommodate higher DG penetration while avoiding transmission bottlenecks and chicken-and-egg issues in siting.

Integration must be a mutual effort, with developers and decision makers across the board making use of the newest forecasting, grid modeling, and storage. These technologies are available, often coming from Californian companies, and could be used now.

Technology-Enabled Intelligent Grid

Integration, by definition, does not work with a piecemeal approach. Generation at a variety of scales, energy storage, demand response, and efficiency must grow as a complementary team. Although challenging, the type of energy system we need can already be seen at work in pilot programs and university microgrids around the country. These emerging systems use an intelligent grid (IG), providing automatic and nearly instantaneous responses in both demand and supply based on real-time signals from the grid.

In recent decades, our energy system has advanced slower than other industries. Its history and stability create an inertia not felt by the software and telecommunications industries. But a rapidly changing energy landscape requires adoption of technological innovations and diverse expertise from these and other related fields.

Advance forecasting is an overarching need in any IG future. The best systems combine forecasts of weather, usage, and grid performance to control ramping rates and can be used at any level from on-site generation to national grid balancing. SolAspect is one company providing this service with a model using neural networks to learn and improve its performance through real-life experience. Additionally, this technology was developed and licensed at UC Merced, assuring in-state expertise and income.

To support the large expected increase in distribution-level generation, advanced grid modeling programs can accurately tell controllers where on the grid it makes sense to upgrade lines or encourage renewable development. Using algorithms such as those developed by the software company Qado, controllers can see and isolate potential problem areas before they lead to wider system impacts.

Energy Storage Of All Sizes

Storage provides benefits at all levels, from residential installations to central station generation and for both public and private projects. Generators participating in net metering or CLEAN programs can smooth their own output with on-site storage. Small amounts of short-term storage are sufficient to

handle the brief intermittencies and rapid ramping of renewables due to changing weather. This part of the storage solution will first ease the challenge of load balancing at the substation level and, at higher on-site levels of storage, reduce consumption of purchased grid energy for the generator.

Sub-stations or central stations can make use of medium to large amounts of energy storage. Intermediate levels of storage will bridge over brief outages while sections of the grid reconfigure after a fault. Larger amounts will allow complete microgrids to function independently during major regional outages, as demonstrated by programs such as UC San Diego's. This provides not only convenience for residents within the microgrid, but emergency support for safety and security needs over a larger surrounding area.

Utility scale renewable generation that is co-located with sufficient energy storage can manage its own intermittency and ramping, thereby greatly increasing its dependability and value to a managing authority. Instead of presenting a liability to a utility, projects such as AES's Laurel Mountain, which combines wind turbines and battery storage, become operating reserve sources and can qualify for financial incentives otherwise enjoyed only by fossil fuels. Predictable, but intermittent, resources such as sun and tidal power could be marketed as base load if paired appropriately with storage facilities.

ZBB Energy Corporation creates just such storage options. Placed behind a meter, they can make a home or a commercial site effectively invisible to the grid by controlling storage and matching battery discharge to load. Several small installations that do not find it financially viable to manage their own energy can aggregate or sell to a third party that serves as an intermediary with the local utility.

The adoption of electric vehicles on a broad scale will be another powerful force at all levels on storage, functioning basically as flexible, mobile, and intelligent battery back-up. Homes with intelligent grid capability can balance their own power, and commercial fleets will provide tremendous leeway in time of use and mitigation of ramping and demand spikes.

Role of Natural Gas

Natural gas ramping plants should be the last resort, and could be relied on to a far lesser extent than we require currently. Intermittency and unmet load peaks would be dramatically smaller or even nonexistent if forecasting, automated demand response, and energy storage are truly employed at their full potential.

The "Partners for Success" triangle shown in the workshop depicts natural gas, DR, and ES as roughly equal legs of a triangle. However, well-implemented storage could take over most of the listed roles of

natural gas, including fast ramping and almost instantaneous dispatch of energy. During the workshop, there was considerable discussion of how quickly reserve capacity needed to be dispatchable. Most of the natural gas plants currently available take well over the 15 minute time frame suggested by Chairman Weissenmiller to come up to full power. Forecasting can help determine what quantity, speed, and location will provide sufficient backup, but fast, cost-effective response is always desirable and battery storage provides valuable flexibility by acting as spinning reserve for immediate distribution. Additionally, the emissions from natural gas are incompatible with a carbon neutral society and will need to be phased out of our energy system in the near future.

Conclusion

The private companies cited in these comments are used only as examples. The Clean Coalition does not have a professional connection with any of them or specifically endorse their products. However, we do support the type of work they are doing and believe the most state-of-the-art technology should be rapidly adopted – with interoperability always in mind since this is a rapidly evolving field and will have many players.

Coordinating an intelligent grid with distributed generation (IG+DG) will provide tremendous flexibility and capacity to meet all of California's energy needs. If forecasting, modeling, and storage options available now are deployed together, our clean energy future could begin immediately. It requires only political leadership and consistent incentives to secure a safer future in a matter of years, not decades.

Thank you for your time and commitment to this important issue.

Valerie Seymour
Policy Associate
Clean Coalition

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