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**Supplemental comments on Demand Flexibility for U-161024**

I suggest we raise our level of thinking about demand response. One investor-owned utility is contemplating only evaluating "slow DR" in their upcoming IRP, where a utility may call a resource for several hours around 6 times per year. While this is a good start, it overlooks the current thinking for DR services. There is a new type of emerging resource, Demand Flexibility. This enables a utility to shape load every day to reduce costs, minimize the Duck Curve impact, and avoid overloading T&D wires.

The easiest example to understand with regional precedent is BPA's controllable hot water heater pilot project. A utility can shift load to more optimal times and even shape load to meet power availability, potentially on a daily basis. This can be done by combining both a technological communication pathway and a new finer-grained rate structure that varies hourly. Demand Flexibility can enable load shaping to satisfy utility constraints by intelligently scheduling the load. This can be acceptable to customers if DF technology shifts load while maintaining a service level agreement with the owner of the device (ie, ready by time X and always providing some minimum level of heat or charge). For this reason, Demand Flexibility is best done with two-way communication between the DF program implementer and the device, instead of just price signals. This enables a DF program to predict and schedule daily loads on a per-device basis without compromising usability of the device. However, one-directional information flow is acceptable, with potentially less satisfaction among program participants.

The Rocky Mountain Institute wrote a report called "The Economics of Demand Flexibility", projecting significant cost savings in generation, T&D, energy arbitrage, regulation, and spinning reserves. Further, they have an example from SRP showing Demand Flexibility reduces peak demand by 48% on average every month (admittedly, that was for a summer peaking utility with significant air conditioning load). The full report is available for free here: http://www.rmi.org/electricity_demand_flexibility

RMI lists case studies from Hawaii and other utilities. Controlling air conditioners and electric vehicles as the cheapest options, then electric water heaters. On the high end was electric clothes dryers and batteries (page 40). The results were slightly different for Alabama Power (page 45). They have utility-specific supply curves for demand flexibility, though they don't seem to detail commercially available solutions. Also, their estimates for electric vehicle load are too conservative – many cars charge at 2x or 3x the rate they estimated, commonly at 6.6 kW or 9.6 kW, sometimes 20 kW.

Appendix A of the full report gives a detailed breakdown of how to estimate DF's value to the grid. Their value of capacity used in their study is $91/kW-yr, which should be very similar to 2017 estimated peaker capital costs.

A completely separate approach is to "gamify" both conservation and voluntary demand flexibility. Chai Energy (chaienergy.com) created a mobile app and in-home hardware to monitor energy usage, then worked with California utilities to monetize DR opportunities. For homeowners, the app will occasionally tell them about "power pay days", where if they reduce their electricity usage, they may get compensated by their utility at up to $10/day. This innovative approach may succeed in taking a rather erudite topic and converting it into something customers might actively want to participate in. Who knows whether their business model will succeed, but it's an interesting experiment.

Regulators can support innovative, consumer-engaging experimentation by:

1) Embracing standards for communication from utilities to Demand Flexibility providers. Ideally one standard should be used. Definitely not three.
    a. The CA EIM and BPA Technology Innovation program dictate OpenADR 2.0.
    b. Software should eliminate any need for staffing any 24x7 operations center for both Demand Flexibility and DR providers.

2) Allowing Demand Flexibility program implementers reasonable access to home utility data including AMI meter readings at a nominal cost.
    a. To gain acceptance, privacy must be protected either through anonymized data or requiring user authorization for sharing utility billing & metering data with individual providers. Perhaps one day block chains (the underpinnings of crypto currencies like BitCoin) might provide part of a solution.
    b. In terms of price, there is an organization called Green Button Data that will provide real-time household electric load updated every 7 seconds, at a cost of $120/meter/year. The RMI study points to a value of Demand Flexibility that makes this real-time data prohibitively expensive for many applications. While data sharing platforms do have significant costs, the fee charged must be reasonable enough where a Demand Flexibility program with substantial fixed O&M + a non-negligible customer acquisition cost can pencil out for the participant, provider, utility, and ratepayers.
    c. Alternately, relaxed monitoring and data reporting requirements can alleviate this. Demand Flexibility programs should make some reasonable attempt at measuring delivered results, but rigorous auditing may be prohibitively expensive.

3) Work with the Distribution System Collaborative (DiSCo) project run by WA PUD Association and other stakeholders to develop, implement, & standardize a computer-readable view of each utility's distribution system, along with a way of mapping customers to feeders.

4) Ensure Demand Flexibility program implementers have visibility into load and market availability similar to what the California ISO provides, in terms of real-time numbers and day-ahead forecasts. This information should be available per balancing authority.

5) In the future, allowing Demand Flexibility program providers to sell through regional utilities to access to the California EIM, once they hit large thresholds of available power as specified by CAISO.

Embracing Demand Flexibility could help save a huge amount of capex, while preserving and extending the value of our existing T&D investments. Please consider adding requirements around Demand Flexibility to future IRP's, or otherwise considering these more powerful ideas. While there aren't many commercially available off-the-shelf solutions, it may be time for a pilot project to help utilities grasp the benefits and keep rates low, without accidentally overbuilding generation, transmission, or distribution.

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