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Via Electronic Mail

Steven V. King
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Washington Utilities & Transportation Commission
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Re: Docket No. UE-151069 - Comments of Avista Utilities

Avista Corporation, dba Avista Utilities (Avista or Company), submits the following comments in accordance with the Washington Utilities and Transportation Commission's (Commission) Notice of Opportunity to Comment (Notice) issued August 7, 2015, as filed with the Code Reviser in Docket UE-151069.

Avista appreciates the Commission's continued efforts in the investigation of modeling energy storage in Integrate Resource Planning (IRP) and its applicability toward the present and future electric grid. We look forward to the continued discussion on where assumptions, language, and analytical methodologies can be explored and standardized.

As discussed in the Notice, the Commission is seeking comments regarding the topics identified within Commission Staff's White Paper and on available models for valuing the services that energy storage provides.

The following comments are in response to Commission Staff's White Paper and to the questions outlined in the Notice.

<u>Comments on Commission Staff White Paper</u>

As a means for setting the stage for the following comments, there are two domains in which the value of energy storage should be considered, the distribution system and the bulk power system. The IRP process focuses on the acquisition of assets intended to serve bulk power system needs. Localized value on the distribution system is not currently a consideration and would be a product of Distribution Resource Planning (DRP) methodologies that are just now being evaluated by Avista. We anticipate that Avista will engage in DRP to optimally place distributed energy resources in the future, one of which being energy storage. DRP can be an additional input that informs future IRP efforts to insure inclusion of all benefits that can be achieved with distributed energy resources. The IRP process alone cannot provide the business case in total for energy storage at current development costs.

In its White Paper, Commission Staff outlined a number of questions about modeling the benefits of energy storage in an IRP or resource procurement process. Today's utility models focus on larger resource value streams, namely capacity and energy, and to a lesser extent other ancillary services. The components modeled capture the significant majority of the value of the various resource options evaluated, including energy storage. Many of the "value propositions" identified in the Notice are not unique to energy storage; they are and can presently be provided at very low cost from other traditional generation resources, both existing and new. In other words, most energy storage system values likely can be provided at lower cost by traditional resources. That detailed models do not exist to quantify many of the value propositions listed in the Notice is further evidence that the value of energy storage is indeterminate, if not small.

Contrary to the White Paper, Avista does not view the lack of a Northwest organized energy market or price signals as barriers to energy storage adoption. It also is not clear that energy storage economics are, or will be, as compelling as renewable energy investments given that the resource consumes rather than generates electricity. This is a salient point to reinforce:

energy storage does not produce electricity, it simply makes it dispatchable; and it does so at a loss of energy. Energy storage lacks the operational and economic attributes of an electricity generator and the characteristics of demand-side load reduction measures.

The Commission Staff White Paper states that energy storage can follow renewable energy's path to economic viability. Regulatory and tax policies designed to favor energy storage will be necessary, however, to allow the resource to compete with other more cost-effective options.

For two reasons Avista does not agree with the White Paper's statement that "…holistic analysis goes far beyond the current modeling practices of the utilities, which to date have not identified or quantified the benefits associated with energy storage. This precludes the IRP models from selecting energy storage, because without those offsetting benefits, energy storage remains cost prohibitive." First, Avista's IRP analyses adequately quantify the benefits that would accrue to any energy storage system, namely: peak shaving, energy arbitrage, the system balancing services of regulation/frequency control, load following and energy imbalance, and contingency reserves. Our analysis shows that these benefits can presently be obtained through the use of lower-cost means. Any other capabilities beyond these products (e.g., black start) are not a significant portion of the total value of energy storage. Second, even if the other capabilities were more significant, the economics of energy storage are, at present, cost prohibitive at existing and projected cost trajectories in the Pacific Northwest.

This is not to say that energy storage has no future. The White Paper correctly points out that the "flurry of activity" benefits from "significant assistance from federal and state funds." Avista supports this "flurry" in the sense that it ensures appropriate research and development occurs to help utilities understand the potential value for the resource. Avista's participation in one of the Pacific Northwest National Laboratory pilot programs illustrates the Company's commitment to research and development in this arena.

In summary, Avista has made significant efforts to evaluate energy storage in concert with research and development activities around the technology. The absence of energy storage from Avista's IRP preferred resource strategy is not the result of inadequate modeling or regulation by the Commission. It is from a lack of compelling economics and commercialization possibilities at this time. Energy storage, just like many technologies in the R&D stage, does not meet the basic criteria for inclusion in the later stages of an IRP analysis: commercially-available at utility scale at a cost reasonably competitive with generation or conservation alternative options.

<u>Questions from Notice</u>

A. The following list identifies some of the potential uses, benefits or "value propositions" that energy storage systems could offer to a utility. How should a utility model such benefits in an IRP or resource procurement process?

1. Peak Shaving

Response: Existing production-cost models contain algorithms able to reasonably represent the peak shaving capabilities of many resources, including energy storage. Some models may struggle with the consumptive nature of energy storage (i.e., losses), but in most cases the models are flexible enough to enable the analyst to fairly represent peak shaving value. In the case of Avista and its IRP process, we use Aurora to value the peak shaving capabilities of all evaluated resources, including energy storage.

2. Transmission and Distribution Upgrade Deferrals

Response: On its face, energy storage has the potential to defer transmission and distribution (T&D) investments. However, such deferrals are location-specific and uncertain. T&D upgrades are "lumpy" in that additions cannot be made to meet load growth in small increments. Therefore an energy storage technology might delay investment for a few years, but when the needs of the system outgrow the energy storage system a large investment is made that eliminates the original need for the energy storage system. The result is T&D providing at best a few years' delay in traditional system upgrades, meaning the overall contribution from energy storage is small relative to other benefits. Once defined, including the value of delayed T&D,

investment in the IRP process is not conceptually difficult and fits well within existing methodologies.

3. Outage Mitigation

Response: Utilities have existing protocols and metrics to ensure their systems are reliable and at a level that is satisfactory to their customers. Perfect reliability would be prohibitively costly, and achieving such a state should not be the goal to which energy storage is valued. If a utility has a need to improve reliability, energy storage may be considered in an effort to mitigate outages, but should continue to compete against lower-cost alternatives and traditional resources that likely will bring with them the ability to generate the highest-value power system service, i.e., energy, which energy storage systems cannot.

4. System Balancing
- **a. Regulation/frequency control**
- **b. Load Following**
- **c. Energy Imbalance**

5. Contingency Reserves

Response: System balancing and contingency reserves can be modeled reasonably well in some existing production cost models by describing in the models the various capabilities of energy storage. These models will capture the significant majority of energy storage value. The better method, and one employed by Avista, is evaluating one's generation portfolio with an optimization engine so as to maximize the utilization of both existing and new traditional resources and energy storage. The largest reason for enhancing modeling with new optimization tools is that the hydro system has inherent flexibility when conditions change significantly from the past (e.g., with the inclusion of renewables).

6. Reactive Power Support

Response: Reactive power is a consumptive use of capacity provided by generation assets or by capacitor banks along the electricity distribution system. Reactive power generally must be produced in the rough vicinity of the reactive power-consumptive load, but not necessarily at the load. Reactive power is a smaller-cost ancillary service, and generally utilities do not have detailed avoided cost studies to quantify those costs, from energy storage or any other technology. Avista is in the early stages of evaluating the introduction of reactive power support into its ADSS model, but its introduction likely will show very small system costs associated with reactive power support.

7. Network Stability Services

Response: Avista is not certain what is meant by Network Stability Services, but notes that today's system operates in a stable and reliable manner. Each added resource and transmission and distribution investment brings with it, by definition, capabilities to assist in network stability services. Smart Grid investments also enhance such services absent energy storage systems.

8. System Black Start Capability

Response: Black start capability, while important for bringing an existing system back into service, is infrequently used, making its average value very small in relation to the overall power delivery system cost. Existing Avista systems and interconnections with other utilities provide this capability at very low cost. Avista does not anticipate a need for new investment in this service in the near or long-term future, and thus does not model the service explicitly.

9. Other

Response: Avista does not have any additional benefits to describe apart from what was described above.

B. Models are available today that assign values to the many different use cases of a storage system. These models optimize the value of a storage system by selecting the service that provides the most benefit to the utility and consumers at a particular moment. What technical capability do the utilities have to perform similar modeling? Given that planning in Washington focuses on a least-cost, least-risk resource analysis, how could utility resource plans best analyze and incorporate such analysis into existing IRP and resource procurement models?

Response: A number of models are being proposed by the national labs and other groups. They contain powerful optimization algorithms that attempt to model the physics of energy storage systems. Unfortunately, these are not disciplined by market values. The hardest part of the equation is not developing optimization algorithms, but providing reasonable avoided cost values for the ancillary service products the storage systems are attempting to supply. On the face, the price data would seem simple, yet value is highly dependent on the operation of the remaining generation portfolio absent the storage system. Price data, in this instance, is of much greater importance than the optimization algorithm itself.

Avista has modeling tools capable of optimizing its existing portfolio, both with and without energy storage systems. Our proprietary ADSS system in its present state can value energy, peak shaving, energy arbitrage, system balancing and contingency reserves. ADSS could be enhanced to consider reactive power support when it is determined that such an evaluation is necessary.

Beyond using technology like ADSS, the results must be integrated into the IRP. Just as the Company does for many other resource options, and as demonstrated in its 2015 IRP with regard to quantifying the ancillary service value of energy storage and other traditional generation assets, the results of ADSS can be input into PRiSM. Conceptually, the analysis is/was completed as follows: 1) determine the fixed life-cycle costs of owning a new resource option, including capital investment and operations and maintenance; 2) run our production cost model (Aurora) to determine the life-cycle energy value of the new resource option, accounting for fuel and variable operations and maintenance; 3) determine the value of a new resource's ancillary services, as determined by ADSS runs; 4) subtract the values from Step 2 and Step 3 from Step 1; 5) select the resource or resources that have the least-cost as determined in Step 4. In the case of Step 5, Avista uses its proprietary PRiSM model to select the least-cost mix of resources.

C. Utilities, as balancing authority areas, currently provide ancillary services. As balancing authorities, what ancillary services are the utilities responsible for providing? What resources are do utilities currently use to provide ancillary services? What are the costs associated with using these resources to provide ancillary services, and what is the opportunity cost of using the resources to provide ancillary services? Would it be appropriate for Washington to use rates for ancillary services in organized electricity markets as a proxy for valuing the ancillary benefits of energy storage in Washington?

Response: Avista provides a number of ancillary services, as outlined in its Open Access Transmission Tariff (OATT). These include: 1) scheduling, system control and dispatch service, 2) reactive supply and voltage control; 3) regulation and frequency response; 4) energy imbalance; 5) operating reserves; and 6) generator imbalance service. The services are procured from varying resources depending on system conditions that change very rapidly. Our hydro resources provide the overwhelming majority of these services, but our gas resources assist with operating reserves and less frequently with the other ancillaries.

The costs and opportunity costs of providing ancillary services are one and the same. The costs vary from zero in many periods to tens or hundreds of dollars in infrequent, extreme conditions where our system is limited by physics and/or wholesale electricity market prices. Avista has not yet performed a specific study to quantify the overall costs of these services. Instead it includes the obligations as part of its overall IRP modeling. The costs therefore are embedded in the analysis. Pulling the specific costs out from the IRP modeling would not in and of itself be difficult for us; however, most of our generation resources can interchangeably provide the necessary ancillary services and attaching a unique value to each separate ancillary service will require extensive covariance analysis.

Based on the complexity described, and our region's vastly different mix (i.e., hydro- versus thermal-based) of generation resources and ancillary service costs, it would be inappropriate to use prices from other market areas. Any such analysis would grossly over-state the value of ancillary services, both to existing resources on the northwest grid, and new technologies such as energy storage.

D. What additional questions should the Commission consider in the course of this investigation?

Response: There appears to be a barrier between the scientists and engineers studying energy storage and the analysts attempting to perform economic analysis on the technology. Answers being provided by scientists and engineers do not appear comprehensive enough to complete a robust IRP analysis. And the data being provided is not in a form compatible with the existing IRP framework. The scientists and engineers would benefit from a better understanding of the entire data set required for an IRP analysis. One question the Commission should consider is: can the present workshop proceedings be used as a forum to help bridge the divide between the scientists and engineers studying energy storage systems, and the utility analysts needing to translate the work to utility IRPs?

If you have any questions regarding these comments, please contact Clint Kalich at 509-495-4532 or clint.kalich@avistacorp.com.

Sincerely,

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