BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON

UM 2011

In the Matter of PUBLIC UTILITY COMMISSION OF OREGON, General Capacity Investigation.	Comments of Renewable Northwest Regarding E3's Report and Staff's Comments **March 8, 2021**

I. INTRODUCTION

Renewable Northwest is grateful to the Oregon Public Utility Commission ("the Commission" or "PUC") for the opportunity to comment on E3's December 2020 Principles of Capacity Valuation Report ("E3 Report") and Commission Staff's January 14, 2021 Opening Comments ("Staff Comments") as part of the process of "work[ing] collaboratively on a generic capacity valuation methodology and draft rules to codify that methodology" in this General Capacity Investigation docket.[1] In these comments we first provide a brief background of this docket, reiterating the goal of identifying a "harmonized" approach to capacity across different contexts and dockets. We next discuss some broad observations and principles regarding capacity against the backdrop of an increasingly complex electricity system where least-cost, least-risk resources are generally variable renewable generators. Finally, we respond to several elements of the E3 Report and Staff Comments, framed here as questions to which we offer answers. Again, we appreciate the opportunity to comment and look forward to continued engagement in this important investigation.

II. BACKGROUND

The Commission's authority over and background interest in overseeing this investigation are helpful to bear in mind as stakeholders in this docket proceed with an exploration of capacity methodologies.

Under ORS 756.040(2), the Commission has the broad "power and jurisdiction to supervise and regulate every public utility and telecommunications utility in this state, and to do all things

[1] Oregon Public Utility Commission, Docket No. UM 2011, *Procedural Memorandum* at 1 (Jan. 29, 2021).

necessary and convenient in the exercise of such power and jurisdiction." ORS 756.515(1) further gives the Commission authority to open an investigation into any matter relating to public utilities. Following conversations across a number of Commission dockets, the Commission issued Order No. 19-155, opening a general capacity investigation. The Staff Report forming the basis for the Commission's order observed that "[t]here have been several methodologies used to establish capacity values based on resource type, such as distributed generation, utility-scale generation, energy efficiency and other upcoming technologies such as energy storage and demand response."[2] Thus the Commission opened this investigation in the hope that "[a] holistic investigation into … issues related to capacity could lead to a harmonization of some of these disparate approaches."

III. COMMENTS

We begin with some general observations and principles regarding a modern understanding of capacity before moving on to a discussion that more closely parallels E3's and Staff's filings.

Capacity, or the capacity value of a particular resource type, can have different implications in different system contexts. Traditionally utilities and regulators would compare technologies to a "perfect capacity" resource, one that would always be available when called upon by a grid operator. As our electricity system has evolved, however, stakeholders increasingly agree that this "perfect capacity" approach is no longer appropriate. Not only is the approach misaligned with a grid that is moving away from conventional thermal resources to clean, non-emitting resources, but also climate-affected weather systems are highlighting the reality that there is no "perfect capacity" resource. As the events in California in 2020 and Texas in 2021 have shown, resources assumed to be reliable under normal conditions may face operational limitations brought about by our increasingly changing and increasingly extreme weather patterns. To construct a fair and transparent capacity valuation methodology, all resources need to be accurately assessed using comprehensive data and appropriate levels of granularity to ensure that we are not over- or under-valuing resources.

The recent uptake of least-cost, least-risk hybrid renewable-plus-storage resources and standalone wind and solar will affect the operating profile of existing gas generation in many markets. Gas generators will likely have to cycle more frequently and will operate for fewer run hours each year, pushing up their costs on a per-MWh basis. This should encourage companies, investors and policy makers to plan for the long term rather than for short-term needs, and to consider resources that are better equipped to balance renewables. Diverse renewables,

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[2] Oregon Public Utility Commission, Docket No. UM 2011, Order No. 19-155 at Appx. A, p. 2 (Apr. 26, 2019).

standalone storage, and demand-side flexibility can provide services equivalent to gas generators at much lower emissions level as electricity systems move towards complete decarbonization.

With this context in mind, we need to think about this investigation into capacity not in terms of past practices but future trends that dictate looking for more sophisticated solutions to valuing capacity. And now we move on to our responses to the E3 Report and Staff's Comments, again framed here as questions and answers:

1. **What methodology or methodological baseline should the Commission use to determine the capacity contribution of a resource?**

    a. ***Is the Effective Load Carrying Capability (ELCC) methodology described by E3 an appropriate general methodology to determine the capacity contribution of a resource?***

Yes, effective load carrying capability, commonly known as ELCC, is currently the most appropriate reliability metric available to evaluate the capacity contribution or capacity value of resources including but not limited to thermal, renewables, storage, and demand response.

Both E3 and Staff have focused on ELCC as a tool for determining the capacity contribution of individual resources. Renewable Northwest has long supported use of ELCC to determine capacity across multiple contexts and dockets at the Commission and elsewhere. Accordingly, we welcome E3's and Staff's focus on this important tool.

We support the use of ELCC because it can be fairly applied across different resource types and create an "apples to apples" comparison of capacity contributions. Fair application is possible because, rather than focusing on a proxy resource, ELCC uses probabilistic analysis to determine how a resource will affect a system's loss of load probability ("LOLP") or loss of load expectation ("LOLE") and contribute to the system's ability to meet a target LOLP or LOLE value. Thus the ELCC of a resource depends not only on the type of generation technology being studied but also on patterns in electricity usage and the type and quantity of other resources already on the grid. Although calculating ELCC for emerging resources such as battery storage, hybrids, and demand response may pose challenges and possible modifications, ELCC is still broadly viewed as the most accurate way to calculate the capacity contribution of these resources -- assuming it is backed up by the required data and modeling granularity that we delve into below in these comments.

A resource that is expected to be available during high-risk hours (the hours when a loss-of-load event is most likely) will generally have a higher capacity or ELCC value than a resource that delivers the same capacity only during low-risk hours. Since the foundation of ELCC is in its probabilistic analysis, multiple years of weather data -- typically five to seven years's worth -- should be used to determine the ELCC values of renewable resources to capture the effects of inter-annual variability. The ELCC analysis should be performed with additional weather years using historical data in order to account for any unusual high or low "outliers" in the data, particularly as those "outliers" become more frequent due to climate change.[3] ELCC can be performed on data from one historical year at a time; thus only one accredited capacity value is derived per modeled weather year. The results of each weather year can then be trended into an average by analyzing at least five years of historical information, which will produce consistency from year to year in accrediting capacity. This method is currently being used by Southwest Power Pool to calculate capacity accreditation for solar and wind resources.[4]

In addition, generic ELCCs may not be able to calculate the variation in resources across the state. For example, wind speeds can vary greatly by geographic region. This variety materially affects corresponding capacity factors / hourly generation profiles. It is important to note that any ELCC methodology adopted by the Commission should take into consideration the geographic diversity of a resource's contribution to the reliability needs of a grid. In fact, in recent RA Track 3B proceedings before the California Public Utility Commission ("CPUC"), it has been shown that "there is a need for granular location and resource type modeling due to wide variation in production profiles for the same technology type in different locations."[5] Here in Oregon, too, we recommend the Commission require that locational granularity be considered in calculation of ELCC, especially for renewable resources. For generic resources, this analysis can be done by creating disaggregated resource zones and attributing an ELCC value in each zone (separate from utility BAA) separately instead of having an all-encompassing resource ELCC value for the entire BAA/region.

E3 presented the "library" grouping mechanism to align compensation with the characteristics of resources. We recommend that this grouping be conducted on a resource basis as currently envisioned but also that the grouping account for the locational granularity of similar resources across geographical locations by creating "resource zones." We also support creation of a new "library" entry for hybrid resources, since they will likely form a significant share of the future resource mix as we move toward complete decarbonization of our electricity system.

[3] https://www.energy.gov/sites/prod/files/2014/12/f19/5-Margolis-DEPresentation-Sep2014.pdf
[4] ELCC Wind Study Report. Southwest Power Pool. August 2019. Available at: https://www.spp.org/documents/60434/2019%20elcc%20wind%20study%20report.pdf
[5] See CPUC D. 19-09-043.

In addition, the regional Resource Adequacy Program ("RAP") under development by the Northwest Power Pool ("NWPP") in concert with twenty investor-owned and public utilities in region and currently in the detailed design phase is also considering providing capacity accreditation using ELCC values for resource classes including renewables, storage, and demand response; the program is considering a UCAP methodology for thermal resources.[6] PacifiCorp, Portland General Electric, and Idaho Power -- the three major IOUs in Oregon -- are all active participants in developing this program. The non-binding phase of this program will begin in mid-2021 with the binding phase starting in 2022. We recommend that Staff work to align any proposed rules for capacity crediting methodology with the regional program to ensure consistency for stakeholders.

b. Should ELCC values vary year-to-year for future years based on future load and resources?

The ELCC of a resource class is dynamic in nature and depends on the load and resource balance of the grid in which it operates. As mentioned previously, the ELCC value can change with variations in load shape, operational characteristics, and resource additions. Since the value is primarily driven by high-LOLP hours, the ELCC of a resource class would typically change (increase or decrease) slightly each year as more resources are added and both high-LOLP hours and the probability itself change. Another important consideration is the dependence of ELCC on the types of new resource additions -- in other words, is the resource synergistic or antagonistic with existing resources on the grid. For example, the combination of solar paired with storage is likely to be synergistic with many existing portfolios because it generally has the ability to deliver clean, non-emitting energy during early-evening high-LOLP hours. Thus, resource procurement (and retirement) decisions, and specifically the type and characteristics of generation resources procured (or retired), can significantly affect the ELCC values of new and existing resources.

While there is a common misconception that the ELCC of resources such as wind and solar decrease when additional resources are added to the grid, in reality different types of generating resources interact with each other and can create "diversity benefits" that boost ELCC values. Adding significant solar generation can move reliability issues into the evening hours, which in turn increases the ELCC of wind power and battery storage resources that produce or can deliver electricity in the evening hours. Adding evening-producing wind power could push reliability issues back into the daytime, increasing the ELCC of solar resources. Thus, diversity in renewables can boost ELCC values and ensure grid reliability at a level greater than the sum of

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[6] "UCAP" stands for unforced capacity and refers to a resource's available capacity accounting for forced outage rates.

the individual reliability contributions. For this reason, renewable diversity can be a critical component of ensuring grid reliability in the transition to clean electricity.

c. How frequently should ELCC values be updated?

From a planning standpoint, calculating ELCC using multiple probabilistic simulations is a time- and capital-intensive task. But because ELCC values are dynamic, these values should be updated periodically, ideally every two years or perhaps in concert with the resource procurement cycle of a utility.

For emerging resources such as storage, hybrids and demand response or demand flexibility, however, ELCC values of various configurations and operation may change more frequently and thus may need to be updated yearly -- at least initially, as new projects come online. Additionally, resource characteristics may require an updated ELCC value at a certain point in time -- for example, after a particular number of years, a hybrid resource may no longer operate by charging the storage component only from the connected renewable resource but may instead may allow grid charging, which in turn may lead to higher capacity value and thus entail a change in the ELCC value.

d. Should vintage ELCC values be locked-in?

A "vintaged marginal" approach to ELCC is closely related to the marginal ELCC approach but locks in the ELCC value of each resource at the time it comes online. This credit is thereafter retained by the resource for a predetermined period of sufficient duration to enable a degree of revenue certainty for developers. Locking in a value provides additional financial stability that a purely marginal approach doesn't and also ensures that the total accredited ELCC will sum to the portfolio total.

A caveat that is worth noting is that locking in ELCC values for too long a period may push market design towards a model that resembles long-term contracting more than today's competitive markets, diluting liquidity and inhibiting competition. Therefore, there may be practical difficulties defining the ELCC lock-in period, given the potential for owners to modify their resources through upgrades or partial retirements.

e. If the ELCC methodology is appropriate for determining the capacity contribution of a resource, should the Commission measure the "Last-in," "First-in," or "Portfolio" ELCC?

Last-in and Portfolio ELCC are both sound scientific methods to calculate ELCC of a resource. Last-in ELCC will be more appropriate since it captures the marginal effect of a particular resource addition to the fleet. To calculate ELCC, a database is required that contains hourly load requirements and generator characteristics. For conventional generators, rated capacity, forced outage rates, and specific maintenance schedules are the primary requirements. For renewable resources such as wind and solar, multiple years of hourly power output are required to capture the inter- and intra-annual variability. Ideally, at least five years of resource output data are sufficient to calculate an accurate ELCC value.

f. Should the Commission authorize utilities and parties to use heuristic methods to approximate ELCC? If so, when and how?

The classic method of computing the ELCC metric requires substantial reliability modeling and an iterative process that is computationally intensive. Thus, heuristic methods, although not ideal since they produce approximate ELCC values, may be appropriate if and only if they use sufficient data points to capture variations in resource operation on an inter- and intra-annual basis.

E3's report describes a heuristic in which first, loss of load hours are determined and second, the resource's contributions during those hours are assessed to calculate its ELCC. This method is also called "capacity factor approximation." Heuristic methods reduce the computational effort by either approximating the relationship between capacity added and LOLP or by focusing on some subset of hours that are considered to be high risk for LOLP. It is also important to note that apart from load shape, other factors will also influence ELCC. For example, generation that is on maintenance and is not available will increase LOLP during those times. Peak periods are generally those periods with highest LOLP, but that is not always the case when hydro and maintenance schedules increase hourly LOLP during lower-load periods. Thus, any solar or wind generation that can provide capacity value during these often overlooked hours should be assigned a higher ELCC value.

Using hourly LOLP heuristics for energy storage and hybrid resources, however, will not reflect the actual capacity value provided by these resources because it does not capture the duration of loss of load events. Thus more sophisticated methods may be necessary to assess the capacity contribution of energy storage and hybrid resources depending on their actual operational characteristics, which may differ from any standardized approach. For example, Staff's report mentions PacifiCorp's treatment of hybrid resources in the 2019 IRP wherein the "combined storage is modeled with a maximum output equal to 25 percent of the renewable resource nameplate and a four-hour storage duration." In its recent 2021 IRP roundtables,[7] however, PacifiCorp has discussed increasing the maximum output of storage to 50 percent of renewable resource nameplate capacity due to its ability to provide higher capacity utilization of storage paired with renewables. Thus, assigning ELCC value for hybrid resources and storage resources such as 4-hour batteries and pumped-hydro should be done on a case-by-case basis considering these resources' actual dispatch and locational value.

g. Should all utilities in Oregon be required to use the same model to determine capacity contribution?

We recommend all utilities in Oregon use the same modeling methodology based on probabilistic analysis to capture the capacity contribution of all resources including but not limited to thermal, renewable, hybrid, storage, and demand response resources. While the actual model being used might be different, the core principle of probabilistic analysis to calculate ELCC values must be consistent. Another factor that needs to be consistent across utilities to ensure robust capacity values is the use of multiple weather years and locational granularity based on resource zones as mentioned above in these comments.

h. Should a utility be required to use the same model when determining the capacity contribution of all resources or should the model vary by resource type?

To ensure uniformity and equitable ELCC values, a utility should use the same modeling framework to calculate the ELCC of all resources including but not limited to thermal, renewable, storage and demand response resources. Different resource types have different operating characteristics which may affect their ability to contribute to reducing the capacity needed during high-LOLP hours. Gas plants, although "dispatchable," have planned and forced outages which may exclude them during hours of need. Wind and solar are variable but predictable and may provide some level of capacity contribution at different hours depending on individual resource characteristics. Hybrids and demand response on the other hand may be tailored to operate during grid-stress hours, making them particularly valuable. ELCC values should capture these effects.

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[7] PacifiCorp's 2021 IRP roundtable held on October 22, 2020. https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/PacifiCorp_2021_IRP_PIM_October_22_2020.pdf

2. What methodology or methodological baseline should the Commission use to determine the value of capacity provided by a resource?

a. Should the Commission adopt a valuation methodology that considers the utilities' need for capacity, i.e., distinguishes between periods during which the utility needs to acquire capacity and periods when it does not?

Forecasting a utility's "need" for capacity is driven by a multitude of factors apart from the actual need arising in the near-term or through resource planning. For example, a utility may feel that it would be prudent and cost-effective to invest into flexible capacity resources before the need shows up to tap into financial incentives such as tax credits or lower technology capital costs. In addition, the grid can also experience unusually high-LOLP hours during a utility's sufficiency period, driven by change in load shapes caused by forced outages, weather events, and other difficult-to-predict variabilities in the grid including high levels of electrification, load additions, etc.

b. How granular should the valuation be? Should the Commission determine capacity values by peak-period and non-peak period, or should the Commission be more granular and develop a methodology that values capacity for every hour in a year? Do the values change from year-to-year?

Capacity requirements can emerge during multiple hours across the year and thus cannot be efficiently demarcated into peak and non-peak periods. Thus, a more granular approach would drive customers better.

c. Should adder values for ancillary services or resiliency be calculated in this docket?

Capacity resources such as battery storage, hybrids, and pumped storage can provide critical grid-balancing services; however, we do not take a firm position as to whether these values are within the scope of this docket. We do wish to call parties' attention to a new MIT study that explores the value of energy storage as the penetration of solar and wind on the grid increase to 50 percent and higher.[8] This study found three key value streams for storage that may be helpful to call attention to: (1) storing excess renewable generation that would otherwise be curtailed; (2) deferring transmission upgrades by relieving grid congestion; and, last but not least, (3) replacing thermal generation, specifically gas peaker plants that only run for a few hours at a time.

[8] https://www.sciencedirect.com/science/article/abs/pii/S0306261920309028.

IV. CONCLUSION

Renewable Northwest again thanks the Commission for this opportunity to comment regarding how to calculate and assign a value to capacity. We look forward to continued participation in this investigation.

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