2021 ELCC Workshop Q&A

The questions and comments in the tables below were submitted during the ELCC Workshop PSE hosted for interested parties on August 31, 2021.

#	Asked by	Question	Responding Entity	Answer
1	James Adcock	Slide 10: Why do you continue to use 88-year old "weather data" ? Due to Climate Change, weather data from the previous century is in no-way indicative of winter weather extremes now and in the future. Puget already told IRP participants in the previous IRP cycle that PSE would stop using this ancient out-of-date data, yet PSE continues to use it. Why should the UTC or anyone else believe PSE claims for the need (say) for additional Peakers if PSE continues to use this ancient, and distortive, data? Even if PSE (say) were to only use the most-recent 40 years of weather data -- from 1980 on -- the results would be much more truthful and representative of PSE's actual current and future needs. -- As I have already complained about for literally the last dozen years. PSE has already had literally a dozen years to	PSE	PSE is using the 88 temperature years to align with the data and simulations in GENESYS, which ties to the regional model and matches the regional curtailments. PSE's ELCC workshop presentation includes a discussion of some of the climate change analysis that PSE will be doing. PSE has posted a link to a recording of the ELCC workshop in the 2021 Bidders' Conference and Stakeholder Workshops section of its RFP web site (www.pse.com/rfp).
3	Fred Heutte	How is the quantity of Mid-C resources estimated for any given hour or day?	PSE	There are a couple of different Mid-C resources. One of the resources is the 80-year hydro, which is being simulated on an hourly basis. We also have wind located at Mid-C and have simulated 250 hourly draws through the National Renewable Energy Laboratory (NREL) database. If any new resources come in, we would go through the same simulation process and correlate it to the resources to ensure that we match the correct hourly shapes to the correlations.
4	Justin Raade	Why doesn't LOLH = LOLE x 24?	PSE	PSE runs simulations for 8760 hours x 7040 simulations. At this time, PSE's analysis captures loss of load expectations (LOLE) in days, rather than in hours like the loss of load hours (LOLH) metric. For example, if loss of load events occur in two hours over two days, the model will count two hours and two days. On the other hand, if loss of load events occur in two hours in one day, the model will still count two hours, but only one day. In this regard, the equation LOLH = LOLE x 24 doesn't work all the time.
5	David Brown	In running your models for 2027 and 2031, what is your assumption about your current base load resources? Do you assume the coal plants are offline and the gas plants are curtailed most hours?	PSE	PSE assumes coal plants--such as Colstrip 3 and 4--will be offline and retired by the end of 2025. For gas plants, PSE considers the first outage and planned outage rate in our simulations.
6	Sashwat Roy	What is the logic behind limiting Battery min SoC to 20% when batteries are able to discharge full capacity?	PSE	A minimum state of charge (SOC) for lithium-ion batteries is is 20%. If these batteries drop below the minimum SOC, they have higher degradation levels. PSE also looked at flow batteries, which we understand can be discharged to a 0% SOC. There are many different battery options and PSE anticipates that we may receive bids for some of them through the All-Source RFP. In the RFP modeling section of PSE's ELCC workshop presentation, PSE explains how Phase 2 of the All-Source RFP will take into account the attributes of batteries with different states of charge or roundtrip efficiencies. PSE has posted a link to a recording of the ELCC workshop in the 2021 Bidders' Conference and Stakeholder Workshops section of its RFP web site (www.pse.com/rfp) for interested parties.

8	Anne Newcomb	Will you be ramping up to use renewables and storage as the baseline to replace Colstrip? If not, why, and what do you plan to use in place of lost coal power?	PSE	In its 2021 Integrated Resource Plan (IRP), PSE modeled the full portfolio and established a preferred portfolio wherein Colstrip will be retired at the end of 2025. To meet the requirements of the Clean Energy Transformation Act (CETA), PSE is ramping in new renewable resources to supply 80% of its delivered load with renewable and non-emitting resources by 2030 and 100% by 2045, and is also replacing Colstrip in its electric resource portfolio. PSE also has a contract with the Centralia coal plant that expires at the end of 2025, creating a significant capacity need beginning in 2026. As reflected in PSE's 2021 IRP (see Chapter 1, pages 1-12 to 1-14), the preferred portfolio would add a substantial amount of new renewable resources, demand response and conservation. The goal is that all of these resources would work together to replace the Colstrip and Centralia contracts. Additionally, PSE has a significant need for dispatchable, flexible, peaking capacity. While the majority of PSE's incremental need is expected to be met with renewable resources, storage, demand response and conservation, PSE will still need a peaker capable of producing 237 MW of dispatchable capacity. For the 2021 All-Source RFP, PSE will evaluate the ability of all resources to meet the Company's renewable and peak capacity needs. For more information about PSE's expected resource needs and preferred portfolio, see PSE's 2021 IRP available at https://pse-irp.participate.online/.
9	Sashwat Roy	Aren't those requirements covered in warranty payments? If you discharge fully, you pay a different amount than if you charge 20%.	PSE	PSE also looked at flow batteries, which we understand can discharge to a 0% SOC. There are many different battery options and we anticipate that we may receive bids for some of them through the All-Source RFP. In the RFP modeling section of PSE's ELCC workshop presentation, PSE explains how Phase 2 of the All-Source RFP will take into account the attributes of batteries with different states of charge or roundtrip efficiencies. PSE has posted a link to a recording of the ELCC workshop in the 2021 Bidders' Conference and Stakeholder Workshops section of its RFP web site (www.pse.com/rfp) for interested parties.
10	Anonymous Attendee	Can you further elaborate on the perfect capacity being added with the new generator resource? Is the perfect capaciy being added incrementally with the new resource and then reoptimized?	PSE	Yes. For a 100 MW new resource, PSE would first add the 100 MW resource to PSE's portfolio, and then add perfect capacity until it reaches a 5% LOLP. The process could be something like +100 +100 +50+25+3 = +278 MW. For energy storage, PSE would first add the storage resource to PSE's portfolio, and then add perfect capacity until it reaches the previous EUE.
11	Steve Johnson	Could you expand on what "not just the same pattern" means? Pattern of what?	PSE	On slide 24 of the workshop presentation, PSE is describing the risks of relying on a preliminary temperature sensitivity analysis based on a limited data set and repeating hourly temperature patterns. For example, in the course of a single day, temperatures might trend down, or, in another scenario, they may start low and warm up in the middle of the day. Temperature patterns within a day are very variable; therefore, it's important to use data from multiple years to capture this variability for the resource profile, rather than to simply repeat data from a single year.
12	Elaine Hart	Regarding the schedule on slide 22, when will you be providing information about changes that will be reflected in Phase 2 of the RFP?	PSE	At this point, we do not have the detailed schedule. As we learn more, we will develop and share with stakeholders a more detailed schedule of when we expect to see results. Bidders will be informed through the RFP process and stakeholders will be informed through the IRP process.
13	Michael Rooney	Following up, I think Elaine's question was directed at the RFP schedule, not the IRP?	PSE	At this point, we do not have the detailed schedule. As we learn more, we will develop and share with stakeholders a more detailed schedule of when we expect to see results. Bidders will be informed through the RFP process and stakeholders will be informed through the IRP process.

14	Elaine Hart	I think that my question may have been misunderstood. I'm wondering about the schedule for the RFP, not the next IRP. It sounds like there are updates that PSE plans to make for Phase 2 of the RFP and I'm wondering when that information will be shared with stakeholders and bidders? Thanks.	PSE	1. Interested parties may file written comm~~e~~ents related to PSE's effective load carrying capability ("ELCC") estimates and use in the 2021 All-Source RFP in WUTC docket UE-210220 by September 30, 2021. 2. PSE will file a response to stakeholder comments by November 11, 2021, prior to incoprating any potential udpates into the ELCC values that will be used in Phase 2 of the All-Source RFP. 3. PSE will also review the report and recommendations by the independent consultant E3. 4. Updates are expected to be completed by ~~M~~mid-2022. Once PSE has reviewed the stakeholder comments and consultant reccomendations, we will prepare a more detailed work plan and schedule for the resource adequacy model.
15	Anonymous Attendee	Can you please explain why the 2021 IRP ELCC values for solar/wind and Li-Ion combinations are 15.4% and 23.1% respectively? Do you assume that the outage event is therefore off-peak?	PSE	PSE runs a full, annual evaluation of these different resources. The ELCCs are looking at reducing the peaks, or the perfect capacity, by an equivalent resource and adding in these new resources. When thinking of a hybrid resource, you can think of increasing the capacity of a renewable resource. For example, solar on its own is about 3% but solar plus battery is 15.4%. Wind on its own is about 17% but wind plus battery is 23.1%.We are increasing the capacity contributing of that renewable resource.
16	Andres Alvarez	Can you give a specific date by which you will inform stakeholders of updates to the existing RA analysis and whether, if any, will be incorporated to the Phase II of the RFP?	PSE	Slides 36 and 37 describe some specific updates that PSE will be looking at in either the All-Source RFP or a future planning process. PSE will consider the reccommendations of E3 in its final report and stakeholder comments filed in WUTC docket UE-210220 as navigate this process. Once we receive and have had an opportunity to review the feedback, PSE will be in a better position to determine the extent of the updates and develop the schedule.
17	Don Marsh	It looks like summer is going to become a bigger challenge, and batteries are an "ideal solution" for summer, according to your primer. Will PSE boost battery investments to address these trends?	PSE	PSE is looking at impacts to the Resource Adequacy Model and at the temperature sensitivity discussed in slides 24-26 to assess what may happen in the summer. Batteries and solar can help with summer events; but, given that PSE is a winter-peaking utility, we still need to plan for the winter events as well.
18	Patricio Fuenzalida	For the Temperature Sensitivy, did the peak shift from Winter to Summer by 2031?	PSE	A full discussion of the demand forecast is provided in Chapter 6 of the 2021 IRP. PSE's 2021 IRP is available to interested parties online at https://pse-irp.participate.online/.
19	Anne Newcomb	With this new weather data in mind from slides 25 and 26, will you be adding more solar between now and 2025	PSE	PSE will be acquiring new renewable and non-emitting resources in the coming years to meet the requirements of CETA. The requirements can be met with qualifying renewable resources such as solar or wind, or other qualifying non-emitting resources. PSE looks forward to evaluating the resource alternatives offered through the 2021 All-Source RFP process.
20	Willard Westre	Are the ELCC ratings averages or are seasonal values used in the analysis	PSE	The ELCC rating is an annual value.
21	Justin Raade	Did you consider any scenarios with energy storage resources with durations longer than 8 hours? Wondering what the ELCC of such resources would be.	PSE	Although the 2021 IRP did not look at generic energy storage resources with a duration longer than 8 hours, it is reasonable to assume that all else equal, an energy storage resource with a discharging duration longer than 8 hours would have a higher ELCC than the IRP generic resource ELCC.
22	Andres Alvarez	If a resource is delivered to COB/Malin or John Day, but brings its own transmission, will this resource still receive the limited capacity credit? Or will these resources be considered for the full capacity credit?	PSE	It depends on whether the resource uses PSE transmission capacity or its own transmission capacity. If the former, then the resource would receive a limited capacity credit as it would not be available during non-winter months and the ELCC is calculated on an annual basis. If the latter and the resource can deliver on a firm basis throughout the year, then its ELCC would would not be limited due to seasonal deliverability constraints.

23	Kyle Frankiewich	Slide 27: I understood that ELCC includes some consideration of unplanned outages. Why are dispatchable resources given a 100% ELCC credit? They aren't identical to the theoretical 'perfect capacity' concept used in the ELCC calculation.	PSE	PSE includes its peak capacity contribution at 23 degrees for thermal resources, and includes the forced outage rate and planned maintenance into the simulations. Part of the 907 MW need from the 2021 IRP includes the forced outages of those thermal resources. Moving forward, for a new, dispatchable, thermal resource, we would have to run a simulation on the forced outage and maintenance cycles. Theoretically, with a 3% forced outage cycle, the ELCC credit for a dispatchable resource should be about 97%.
24	Don Marsh	For this RFP, is PSE considering all the other benefits batteries can provide? For example, batteries can increase reliability for contingencies other than resource adequacy. They can stabilize frequency and voltage, defer T&D costs, enable more renewable resources, etc. Will these benefits be considered in a different forum to maximize benefits to ratepayers?	PSE	In addition to the capacity contribution of battery storage resources, PSE's RFP analysis also recognizes other benefits that batteries can provide. In the quantitative evaluation, PSE utilizes both the Aurora and Plexos models to value the energy, capacity, and ancillary services benefits of every proposal. Storage can provide an ELCC benefit, and it can also provide benefits associated with system cost optimization (T&D deferral for on-system storage), ancillary services and energy arbitrage. The value of a~~n~~ storage offer will vary depending upon the resource's characteristics, including capacity, efficiency, storage size and duration (if applicable). Duration can affect all value streams; all things equal, longer duration resources generally result in a higher value stream in than shorter duration resources in PSE's analysis.
25	Willard Westre	The discount rate here is higher than the discount rate in the IRP. Can you explain?	PSE	In the 2021 IRP, PSE used a discount rate of 6.80%, which is the Company's after-tax, weighted average cost of capital ("WACC") from PSE's most recent General Rate Case. On slide 31, the 7.39% discount rate shown in the illustrative example is PSE's pre-tax WACC. In the RFP evaluation, a 6.80% discount rate will be used to be consistent with the IRP methodology. For the calculation shown in the illustration, the value of the additional capacity contribution for the 21% ELCC Wind example would be $1.08M using a 6.80% discount rate vs $1.03M using a 7.39% discount rate.
26	Anne Newcomb	Who answered Kyle's question in chat?	PSE	This question was answered during the workshop by Elizabeth Hossner, one of our presenters. A written response is also provided in the Q&A above (#23).
27	Kyle Frankiewich	E3, slide 9: So is the flawed premise that other entities in the region would continue to stay short, which clearly wouldn't happen? Is that why it's more reasonable to presume that the region will 'top up' its resources?	E3 (consultant)	It's not necessarily standard practice for a utility to do detailed modeling of a regional market to shape the availability of imports. PSE has done more than what most utilities would have done which makes sense since the availability of this regional hydro surplus is important. It is standard to 'top up' your own system so that it is adequate before calculating your ELCC which PSE has done. There is not necessarily a standard way to think about the regional market so the practice is not non-standard but this piece is so important that we would like to know what would happen if the regional system is adequate. It is a seperate question on whether you think that is the right approach as you have to add significant capacity to make the regional system adequate. It is a fair to question whether enough capacity will be added regionally so that the region meets a 5% loss of load standard. We haven't tried to answer that question yet - first, we want to know if it would make a difference at all. We can then ask a follow-up question of what should PSE assume about the regional system?
28	Sashwat Roy	What approximate increase in ELCC % do you see with a full discharge compared to 20% min SoC?	PSE	PSE saw a roughly 2% increase in pumped storage hydro ELCCs when it widened its assumption for the operating range of these resources from 12%-100% to 0%-100% in its analysis. It would be reasonable to expect a similar result for battery storage resources, if PSE were to adjust this assumption from a 20% to a 0% minimum SOC.

29	Andres Alvarez	Did E3 explore transmission import differences between the 2016 GENESYS model and the updated GENESYS mdoel? For example, the 2016 model assumes only 2500MW of imports from CA. But the redeveloped model also assumes import capability from Utah and British Columbia. I assume that additional import capability to the region would translate to lower regional curtailments.	E3 (consultant)	Since PSE is relying on the older GENESYS model for this analysis, our review of it was with regards to the old GENESYS model. We haven't had a chance to think about whether our results may be different if PSE used a different model to shape the import availability. The new GENSYS model does not have the same 20-year history of people reviewing its output and people feeling comfortable with them so it may be a bit premature for PSE to use that model.
30	Elaine Hart	Slide 9: It seems like PSE is identifying a multi-day RA problem, even in the near-term and that this is preventing storage resources from charging in off-peak hours so they can contribute on-peak. Does the PNW have a multi-day RA problem in the near term or is this a modeling artifact based on PSE's assumptions about market access? Would it be reasonable to assume for a near-term ELCC calculation that there will be enough surplus available in off-peak hours to charge 4-6hr storage from the grid?	E3 (consultant)	This is why E3 has recommended that PSE do a bit more work in this area. We do think that historically, the multi-day events have shown up in the GENESYS modeline due to the overwhelming dependence of the region on hydro and the limitations that show up during a drought year. We think as more resource diversity and perfect capacity are added, it will become slowly less dependent on hydro. If you add perfect capacity to the regional system, we anticipate that the LOLE windows will narrow a bit which is why we recommend PSE test this with their model. The storage question is an empirical question that can be answered with the modeling. What we have seen so far is that even in the near-term, the longer duration outage events are the binding constraint. Over time, this may moderate but that is what we want to test. The primary planning constraint in the region has been an energy deficit, not a capacity deficit. A visual that helps illustrate this is - you may add battery packs next to Lake Roosevelt but if Lake Roosevelt is empty due to drought conditions, the battery cannot charge.
31	Kyle Frankiewich	E3, slide 12: Are there other industry practices that E3 has reviewed regarding how to model a changing climate? Any views on NWPCC's efforts?	E3 (consultant)	We haven't had a chance to review the Northwest Power and Conservation Council's (NWPCC) efforts in that area specifically. We do understand that they are doing a fair amount of work to take that issue on. A changing climate is particularly important for the northwest not only because of loads and temperatures, but because of the changing hydrological cycles and how the snow pack versus rain fall patterns may change, and how the runoff patterns may change. It is an area that is continuing to evolve and will likely have a lot of attention over the next few years across the industry on what the weather and future loads may look like. The loads may also be changing due to electrification of vehicles and heat pumps being added in the Puget Sound basin.
32	Anonymous Attendee	Two questions. One, on the slide with the graphs (slide 25) with the specific resource availability and the addition of the assumption that regional resources will meet a 5% LOLP. From the visual, it looked like the impact actually increased the outage time. Is that correct? Two, on the impact of correlation of the wind and solar with the days in which there are extreme events, Arne said that the impact was on the ELCC of storage. Wouldn't it also increase the ELCC of solar and reduce the ELCC of wind?	E3 (consultant)	No, on slide 24, the outage time did not increase. As you move from the base case to the modified base case, the only thing that happens is the addition of 500 MW to help fill the gap in early February. The pink area in loss of load in the modified base case is a bit smaller and narrower due to the modification. Our outage duration is now 41 hours and on the previous slide, it was 42 hours. Yes, it would increase the ELCC of solar and reduce the ELCC of wind during extreme weather events, particularly in the summertime events. It may have a slight negative impact on the ELCC of battery storage because it may impact the availability of energy for charging with respect to the LOLEs. If the energy is more constrained, that might reduce the capability of batteries to flex to meet the capability of these events.

34	Andres Alvarez	It is unclear how additional hydro flexibility would be detrimental to storage ELCC values. In theory, the linear optimization should aim to minimize all unservered energy events. This would also mean that the hydro would be optimized such that it could charge the storage if it foresees a shortage a week ahead.	E3 (consultant)	This gets into the interactions of hydro and the other resources on the system, including the perfect capacity. In effect, in the chart on the left, on slide 26, if all that is really needed is to fill in the white areas between the black load curve and the resource stack, and you can use hydro to do that without a LOLE in any of the other hours, then in effect, the hydro has performed the same way an additional battery would perform. If you think about it physically, there is actual storage of water in reservoirs for potential electricity generation. The question for additional, more accurate modeling by PSE is, if they model their hydro as a flexible resource, how much would that impact the ELCC of batteries? We know that directionally it would reduce the ELCC of batteries as it would compete to meet these short duration events in the same way that demand response would.
35	Anne Newcomb	Solar is basically non-existant on these charts (slide 26). What is your take on this?	E3 (consultant)	We pulled winter events as PSE is a winter-peaking utility which is why solar is not a major factor here. If peak loads change to the summertime, solar will have a greater role during those events.
36	Andres Alvarez	My understanding here is that a reduction in ELCC here would be primarily due to a lower peak need, but not because storage is not charging (i.e. this would affect all resources, not just storage)?	E3 (consultant)	If you could dispatch your hydro to a higher level, that would reduce your peak need but would, in turn, reduce the perfect capacity that PSE would have to add to make sure that it was calibrated to that 5% LOLP. By reducing that perfect capacity, it reduces the amount of energy that is available for charging batteries at a given time. The bigger factor is if you have these peaking events and can meet them with your existing resources, even though you may not be able to sustain for many hours because you may not have enough water behind the dams. However, if you can meet those short-duration events by flexing your existing resources, then a new resource that can only flex for a short duration isn't as valuable because you already have a resource that provides that service in your existing portfolio.
37	Don Marsh	Is it possible that there are environmental consequences of varying hydro discharges? Fish, etc.?	E3 (consultant)	Yes, it's not only possible, it's certain. That's a big part of why the modeling is complex because each hydro project has its own rules that have been established and refined over many decades with both state, local and federal agencies and regulatory commissions. It's very complicated to consider how much hydro discharge is possible without damaging the environment.
38	Anne Newcomb	In Minnesota there has been modeling that reflects solar/batteries to be effective. Considering they are a similar latitude, why are we so different in NW?	E3 (consultant)	Despite the weather, the Minnesota electric system is a summer-peaking system; Xcel Upper Midwest has a summer peak of 9400 MW as compared to a winter peak of 7400 MW. They also meet most of their heating needs with gas whereas in the northwest, electric heat is more prevalent given the affordability of hydropower. The other reason is the dominance of the hydro asset and the ability to flex the storage of that asset which has enabled the northwest to have very few gas Peakers. This also means that during a drought year, the energy deficit becomes the biggest driver of loss of load events.

39	Anonymous Attendee	Given that PGE has shifted to a summer peaking utility is it not reasonable that PSE may do the same? And given that we are building a system for the future not the past shouldn't solar + storage show higher ELCCs on the PSE system for summer peaks?	E3 (consultant)	The weather is different in Portland than it is in Seattle and does not have the same moderating effect that Puget Sound has on the weather in the Bellevue/Seattle areas. However, if the climate continues to change as it has been, PSE could shift. This also effects planning beyond resource planning and includes transimssion and distribution planning all the way down to the transformers which can overheat and cause outages. You have to run the numbers to be able to know if solar and storage would show higher ELCCs on the PSE system for summer peaks and when they may become a summer-peaking system. We recommend running these numbers, models and sensitivities and PSE agrees.
40	Anne Newcomb	Is all of Thermal shown in grey on charts generated from gas?	PSE	Yes, the thermal resources shown in grey in the charts on slide 24 are all generated from gas. Coal will have been retired from the portfolio by this point.
41	Steve Johnson	What analysis of the PSE modeling did E3 do to reach its conclusions? Did E3 rerun PSE models? Or did it just look at the model logic?	E3 (consultant)	We are not doing any model runs as part of this engagement as the timing did not allow, and that would be a much longer and larger engagement. We have looked at their methodology, inputs and outputs. Since we have done our own models before, we are good at debugging models and figuring out when outputs don't quite make sense. We have worked with PSE over the last month to discuss these outputs - this process takes time and is why we are not quite done yet.

Commment report

#	Commenter Name	Comment	Responding entity	Acknowledgement
2	James Adcock	Follow-up comment: 88-years weather "Regional" PNW-wide may be less distortive than 88-years "Local" coastal region -- Puget and Seattle -- who have experience 18 degrees of coldest winter day warming. Thus what makes sense for modeling on a "Regional" basis may be nonsense on a "Local" -- Seattle and Puget -- modeling basis. And if I remember correctly unlike Puget, Seattle *does not* use 88-year old weather data.	Maul Foster (moderator)	Thank you for your comment. It has been shared with the team.
7	Fred Heutte	Just to note that limiting user side features of this Zoom session to the absolute minimum (Raise Hand and Q&A) is significantly restricting our ability to have a -technical- discussion.	Maul Foster (moderator)	Thank you for your comment. It has been shared with the team.
33	James Adcock	Comment for emphasis: E3 finds that 94% of PSE modeled loss of load happen with weather conditions which existed prior to 1972 -- 50 years ago -- conditions which no longer exist today. This corresponds exactly to my complaints of PSE's modeling for the last 12 years: That PSE's use if ancient weather data greatly exaggerates PSE's peak winter capacity needs. Even if PSE were to "just" limit their use of weather data to the most recent 40 years -- 1980 and later -- this would result in a greatly reduced exaggeration of PSE's modeled peak winter capacity needs.	Maul Foster (moderator)	Thank you for your comment. It has been shared with the team.
43	Kyle Frankiewich	Thanks, Elizabeth! The notice for opportunity to comment from the Commission should be filed today to Docket UE-210220.	PSE	Interested parties can find the notice in WUTC docket UE-210220, or on PSE's RFP web site (www.pse.com/rfp) in the Updates and Notifications section.