

2019 Integrated Resource Plan Technical Advisory Group Meeting #5
Hilton Bellevue
King County Room
300 NE 112 Avenue Southeast, Bellevue, WA 98004
February 7, 2019
9:30 a.m. – 4:15 p.m.

Attendees

Members

- James Adcock, Citizen at Large
- Daren Anderson, The NESCOgroup*
- Larry Becker, Northwest Power Consulting
- Joni Bosh, NW Energy Coalition
- Charlie Black, Invenergy
- Rob Briggs, Vashon Climate Action Group
- Rachel Brombaugh, King County
- Brad Cebulko, Washington Utilities and Transportation Commission (WUTC)
- Carla Colamonici, Public Counsel*
- Nancy Esteb, Renewable Energy Coalition*
- Orijit Ghoshal, Invenergy
- Kelly Hall, Climate Solutions
- Warren Halverson, Coalition of Eastside Neighborhoods for Sensible Energy (CENSE)
- Howard Harrison, Sierra Club
- Mike Hopkins, FortisBC*
- Doug Howell, Sierra Club
- Fred Heutte, NW Energy Coalition
- David Howarth, National Grid
- Amanda Jahshan, Renewable Northwest*
- Steven Johnson, WUTC
- Kevin Jones, Vashon Climate Action Group
- Virginia Lohr, Citizens' Climate Lobby
- Don Marsh, CENSE
- Kate Maracas, Western Grid Group*
- Nicholas Matz, City of Bellevue
- Tomas Morrissey, Pacific Northwest Utilities Conference Committee (PNUCC)*
- Michael O'Brien, Renewables Northwest*
- Court Olson, Optimum Building Consultants
- Bill Pascoe, Orion Renewable Energy Group and Absaroka Energy*
- Deborah Reynolds, WUTC
- Marty Saldivar, Northwest Pipeline
- Nate Sandvig, National Grid Ventures
- Kathi Scanlan, WUTC
- Mark Sellers-Vaugh, Cascade Natural Gas*
- David Tomlinson, Solar Horizon
- Bill Westre, Union of Concerned Scientists

Guest speakers

- Arne Olson, Energy + Environmental Economics (E3)
- John Fazio, Northwest Power and Conservation Council (NWPPCC)

Public Observers

- Lori Elworth
- David Morton
- George Pohndorf, Snohomish County Public Utility District
- Nancy Shimeall, customer/Climate Reality
- David Perk, 350 Seattle

- Randy Hardy, Hardy Energy Consulting

Project team

- Diane Adams, EnviroIssues
- Kara Durbin, Puget Sound Energy (PSE)
- Alice Hackbart, PSE
- Nate Hill, PSE
- Elizabeth Hossner, PSE
- Elise Johnson, EnviroIssues
- Michele Kvam, PSE
- Irena Netik, PSE
- Garret LaBove, PSE
- Phillip Popoff, PSE
- Allan Vann, EnviroIssues

* Indicates remote attendance

Meeting objectives

- PSE provides TAG members an opportunity for a resource adequacy dialogue focusing on the following:
 - NWPCC power supply adequacy assessment
 - PSE's electric capacity need, electric planning margin and effective load carrying capacity
 - E3's results from a Pacific Northwest resource adequacy study
- PSE presents the gas planning standard

Welcome and introductions

Facilitator Diane Adams of EnviroIssues opened the meeting at 9:30 a.m. by welcoming attendees and providing safety information. Diane reviewed the meeting packet, meeting objectives and reminded attendees of meeting ground rules. Members of the Technical Advisory Group (TAG) and the PSE team introduced themselves. Diane noted feedback received on the summary for TAG #4 requesting attribution of comments made during TAG meetings, and requested TAG members who want their comments to be attributed to them in meeting summaries share their name and affiliation before speaking.

Irena Netik, PSE director of energy supply planning and analytics, announced a petition to extend the Integrated Resource Plan (IRP) due date. The petition was filed in order to allow PSE to account for any carbon legislation passed by the Washington State Legislature so those legal changes can be included in the final IRP. This petition was filed on February 1, 2019 and was shared with the TAG that day. The petition has since been amended for a clarification point and this has been uploaded to pse.com. For details, see the *Petition for 2019 IRP Extension dated February 1, 2019* and *Petition for 2019 IRP Extension dated February 4, 2019* as distributed and posted at www.pse.com/irp. Irena noted the project team will submit a revised work plan to the TAG by February 28 with this extension included. TAG members expressed interest in the filed petition and discussed the potential extension, making the following key points:

- Virginia Lohr requested PSE consider holding the IRPAG meeting planned for March 18 even if an extension is granted, noting TAG members are preparing for the meeting topic about carbon reduction goals. Kevin Jones and Warren Halverson agreed with this request, noting some IRP stakeholders have requested carbon reduction targets from PSE for years and would like the opportunity to present their views as TAG members to PSE executives before legislation is passed. Kevin requested an action item from PSE concerning this matter, specified David Mills, Sr. Vice President to be present, and for PSE to provide rationale for canceling the March 18

meeting if they chose to do so. PSE will take the requests to hold the March 18 meeting into consideration and will report back to the TAG.

- Doug Howell referenced an email exchange the Sierra Club sent to PSE and others where the Sierra Club expressed concern regarding PSE's petition. The groups noted PSE could utilize the IRP extension to lobby for changes to potential carbon legislation which would reduce potential impacts to PSE. Doug Howell and Bill Westre requested PSE provide information on which aspects of the proposed legislation they support in order to provide transparency. PSE responded that the petition was filed in order to allow adequate time for any potential legislation to be incorporated into the final IRP, not to allow time for lobbying the legislature.
- Don Marsh asked PSE if the Energize Eastside technical meeting tentatively planned for March will still be held before the City of Bellevue Energize Eastside public hearing. Irena replied that the Energize Eastside project team is working to plan the technical meeting and does not yet have a date selected. Don noted the City of Bellevue hearings were originally scheduled to take place in January but were rescheduled after citizens asked to delay the hearings until after the TAG Energize Eastside technical meeting¹. Don expressed a preference for the technical meeting to be held prior to the public hearings and shared he would ask the City of Bellevue to delay the hearing again until after the listening session. James Adcock reiterated Don Marsh's concerns.
- Kathi Scanlan noted the WUTC will consider the PSE petition on February 15. Kathi stated the WUTC supports PSE's petition and supports holding the Energize Eastside listening session in March before the City of Bellevue public hearing.
- Brad Cebulko expressed a preference for legislative topics to not be discussed at an IRP TAG meeting, noting the TAG is intended to discuss technical components of the IRP and TAG members can become involved with carbon legislation outside of TAG meetings. Kevin Jones disagreed with this statement, noting requests for action items related to the petition are not about the legislation itself, but the TAG's input on decision makers who have the authority to set carbon reduction targets.
- Charlie Black noted legislators typically ask businesses how potential legislation will affect their activities, and some companies will run analyses to assess that and provide a response. Irena responded that PSE is engaged in discussions with the legislature due to questions which were asked of PSE which they are working on responding to. Charlie Black also noted no TAG members spoke supporting a delay of the Energize Eastside meeting.

Irena gave updates on action items from previous IRP meetings. For details, refer to the *Open action items from previous IRPAG and TAG meetings* document as distributed in the meeting packet (also available on slides 5 to 11 of the meeting materials posted at www.pse.com/irp). Irena noted there are several action items which will stay "In progress" until the final IRP is filed. These action items are noted with an asterisk. The TAG discussed the action item list, making the following key points:

- Warren Halverson noted Action Item 8 on the March Energize Eastside meeting, referred to the meeting as a presentation, when the original request was for a meeting with technical discussion and an answering of questions within the WUTC letter on Energize Eastside. Irena noted this clarification will be added to the action item.
- Regarding Action Item 3 on methane leakage rates, Rob Briggs asked if a six-month extension on the IRP process would allow PSE enough time to provide the references for their assumed upstream methane leakage rate with the TAG in advance of the development of the draft IRP. Irena said the project team will take this request into consideration. Virginia Lohr requested the asterisk be removed from Action Item 3 regarding methane leakage rates, and that the wording be adjusted to say PSE will distribute the references for the leakage rate, rather than consider the request. Irena stated PSE will adjust the action item as requested.

¹ This statement was later refuted by Nicholas Matz of the City of Bellevue. For details, see page 10 of this summary.

Overview of electric resource adequacy

Garret LaBove, PSE senior resource planning analyst, provided the TAG with a presentation on resource adequacy. Garret outlined what electric resource adequacy is and how it is assessed, including different resource adequacy standards which can be used. Garret used an analogy comparing electric reliability to road reliability, showing how different electric reliability standards would describe road reliability in different scenarios. For details, see the *Overview of electric resource adequacy* presentation as distributed in the meeting packet (available on slides 13 through 27 of the meeting materials posted at www.pse.com/irp).

TAG members asked questions of Garret at the conclusion of the presentation. James Adcock noted that while different electric reliability standards can be used to get more sophisticated and accurate information about electric reliability, PSE utilizes old climate data which would create inaccuracies in how it conducts resource planning. Joni Bosh asked about the length of short-term capacity market purchases. Garret replied that short-term purchases are variable in length, with the shortest being hourly bilateral contracts and the longest being shorter than a few years.

Resource Adequacy in the Pacific Northwest

John Fazio, senior systems analyst for the NWPCC, provided a presentation on resource adequacy in the Pacific Northwest (NW) region. John described the adequacy assessment NWPCC conducts for the region each year, which projects resource adequacy five years into the future. This assessment measures the likelihood of a potential energy shortfall. The NWCC adopted a 5% Loss of Load Probability (LOLP) as the adequacy standard, meaning the region needs to have a 5% chance or less of a firm load shortage in a given year. Nationally, there are no recognized or recommended standards and some utilities are considering moving to different standards to improve the accuracy of their resource adequacy assessments. For details, see the Briefing on 2022-23 Power Supply Adequacy presentation as distributed in the meeting packet (available on slides 28 through 48 of the meeting materials posted at www.pse.com/irp).

TAG members asked questions and discussed various topics throughout the presentation, making the following key points:

Load forecasts for 2023 and 2035

John Fazio described load forecasts for the NWPCC region, described as annual average load, winter average peak, and summer average peak. This was compared with annual average load growth rates predicted for the region from 2016 through 2035, both with energy efficiency targets incorporated and no energy efficiency changes. Don Marsh stated PSE's anticipated load growth rate seems too high because it is 1.3% without energy efficiency incorporated, which is higher than the highest predicted load growth rate without energy efficiency for the larger NWPCC region. John noted that unlike PSE's modeling, the NWPCC growth rates shown include conservation from the 7th Power Plan. He also explained the regional numbers he is presenting are older data than PSE's 2019 IRP load forecasts, but overall load growth rates are trending downward due to momentum changes in energy usage.

John also presented results of a study that was recently published, that examined the potential implications of climate change. John noted this study was not performed as part of the NWPCC's Resource Adequacy Advisory Committee process, but will probably be presented and discussed in those forums. Don asked why the NWPCC winter peak load forecast is declining and the summer peak load forecast is growing, while PSE's summer peak has been declining. John noted for the NWPCC forecast the effects of climate change are creating the decline in winter peaks and increase in summer peaks. This effect will only increase when new IPCC data is downscaled and incorporated into load forecasting. John shared that detailed information on how climate events may influence resource adequacy in the NW is available in a paper he coauthored which was recently published in *Nature Communications*.

Resource nameplate capacity

John Fazio highlighted 54% of the region's resource nameplate capacity comes from hydropower. James Adcock asked how the NWPCC modeled their critical hydro year, and if they adjust this year based on climate change forecasting. John explained the NWPCC uses a drought year of 1937, and the water year record is not adjusted for climate change because it is a conservative metric used to look at every possible water condition for LOLP to reduce the chance of having an energy shortfall. With climate change effects overall annual LOLP will not change drastically, but the months of anticipated energy shortfalls will shift from winter to summer. James expressed a preference for planners to only use water conditions which could plausibly happen in the future given climate change effects.

Market availability from the Southwest

John Fazio noted surplus energy from the southwest peaks in fall months, but the amount of power available to the NW is limited to 3,425 MW. Nate Sandvig asked how the NWPCC is considering using large amounts of solar energy projects being constructed in California. John replied that changes in California will be accounted for in the NWPCC's next power plan along with legislative changes in various states. Brad Cebulko noted British Columbia has approximately 8,000 MW of surplus power and asked how that is stepped down to only 2500 MW available to the NW. John explained the NWPCC takes into consideration local transmission loading and related congestion in cities in British Columbia, in addition to a compromise from the committee preventing the NW from over-relying on power imports to avoid a shortfall.

James Adcock asked if conservative estimates used to prevent power shortfalls compound on each other to the point of being unreasonably conservative, leading to the construction of additional power generation which is not needed. John noted the NWPCC is taking actions in the next power plan to update their model and use better tools to address resource adequacy and avoid over-conservative estimates. James also stated that when PSE builds power infrastructure related to conservative resource adequacy estimates, it benefits the larger regional grid and may disincentivize other utilities from building infrastructure, leading to PSE ratepayers disproportionately covering the cost of new infrastructure.

Bill Pascoe asked how both the flexibility and variability of hydropower is modeled by NWPCC. John replied the NWPCC uses the modeling developed by BPA, with a plant-specific monthly dispatch, in addition to hourly constraints for fish bypass. The NWPCC will be using an updated version of this model in the future which will utilize hourly plant-specific dispatch and plant flexibility.

2023 and 2035 monthly LOLP

John presented a graph of projected LOLP by month in both 2023 and 2035. The graph displayed an increase in LOLP in summer months and a decrease in LOLP in winter months from 2023 to 2035, but the region is still projected to peak in LOLP in winter months in 2035. Rachel Brombaugh asked why August was graphed in two parts. John explained hydro flows differ widely between early and late August, changing the LOLP.

Don Marsh asked if the LOLP projections account for potential new solar infrastructure construction, and John replied the LOLP projections assume no new resource construction, aside from conservation from the 7th Power Plan. Rob Briggs asked how the LOLP projections account for the expected increased use of air conditioning units in Western Washington. John explained an econometric model was used to project existing air conditioning trends forward into the future.

James Adcock asked how NWPCC's historical temperature data compares to PSE's data. John explained the NWPCC uses historical records from 1929 on for Seattle, Portland, Boise and Spokane. The daily temperature patters from 1929 through 2017 are modeled as a random variable because hourly temperatures were not available until 1993. However, the NWPCC recently found hourly data going back to 1948, which will be used in the future along with IPCC data downscaled for the NW region. James asked if this will capture the anticipated large temperature swings in coastal areas. John noted it will but reminded the TAG that temperatures in Seattle and Portland will be averaged with Spokane and Boise, reducing the coastal cities' temperature impact on the region. James asked if the NWPCC is making

efforts to account for extreme weather days becoming warmer than average temperature days over time due to climate change, and John replied they are, referring back to his earlier discussion. James expressed a preference for PSE to also account for this change.

Effective load carrying capacity

Garret LaBove continued presenting on electric resource adequacy, focusing on PSE's electric capacity. Garret outlined how PSE conducts resource adequacy modeling, provided a graph of PSE's draft electric peak capacity resource need, and effective load carrying capability (ELCC). For details, see the *PSE electric capacity need and planning margin* and *effective load carrying capacity* presentations as distributed in the meeting packet (available on slides 50 through 65 of the meeting materials posted at www.pse.com/irp).

TAG members asked questions and discussed various topics throughout the presentation, making the following key points:

Reasonableness of historic temperature data

Garret provided reasoning for the temperature data used by PSE, noting that in PSE's analysis it is possible but highly unlikely that the service area would experience temperatures as extreme as the winter of 1949-50. James Adcock asked if the temperature and hydro data have been adjusted based on changes in hydropower operation in the 1980s. Garret explained the hydro data is streamflow data from the Bonneville Power Administration (BPA), which would not have been affected by the change in operations. The temperature data runs from 1929 to 2016, which is consistent with the NWPCC methodology.

Phillip Popoff noted that while the data from 1929 to 2016 includes extreme temperatures from 1950 that have not been seen in the past 30 years, this large date range is used to include all possible temperature scenarios. Phillip also explained that going back to 1929 increases does increase the number of extreme hours, but the number of mild hours is significantly greater than the number of extreme hours. This drives the expected value of those extreme hours to be a very low value. Phillip showed PSE's data implies there is less than 0.1% chance that we could see temperatures more extreme than we have seen in the last 30 years. This means the extreme temperatures are included in the modeling as possible, but extremely unlikely for future weather events.

James Adcock expressed concern with using this older temperature data, noting the extreme weather events from the data are increasingly unlikely in the future due to climate change, and including them in the model could have impacts on the LOLP. Virginia Lohr and Kate Maracas echoed James' concern, noting PSE uses projections for some metrics but is using historic temperature data instead of projected temperature data. Phillip noted current PSE methodology is in alignment with the NWPCC, and PSE looks forward to using downscaled IPCC climate data when available from the NWPCC. Don Marsh noted the rate at which low temperatures are increasing will likely increase as climate change accelerates, which may decrease resource need in the winter. Don expressed a preference for projecting temperature data into the future to account for this.

James noted he has asked for PSE to update their temperature data methodology in previous IRPs and had previously asked for a straw-man argument where data from more recent years is shown and compared. Phillip noted that James recommended the NWPCC examine a 30-year case during a NWPCC's Resource Adequacy Advisory Committee meeting and Phillip supported this request. Phillip also pointed out that John's 30-year analysis demonstrates the region would need more resource, not less, which Phillip suggested was probably consistent with the temperature information he presented earlier. The current PSE methodology, which follows the NWPCC's methodology, results in fewer power plants being needed. Kathi Scanlan stated WUTC staff is unlikely to recommend a methodology which deviates from the NWPCC's methodology.

Regional view from GENESYS model

Nate Sandvig asked if PSE is considering scenarios greater than 3,400 MW of imported power from Canada. Garret responded the model currently only takes the imported power as a single data point and does not look at scenarios greater than that limit, but changes to the model will allow for those scenarios to be evaluated in the future. Nate encouraged PSE to consider increasing the imported power limit to 5,000 MW or more in future scenarios.

Joni Bosh and Charlie Black noted PSE reported 2,300 MW of Mid-C transmission in the previous IRP, while the current IRP shows 2,000 MW of Mid-C transmission. Joni and Charlie asked what changed these numbers between IRPs. Garret clarified PSE made several updates and clarifications to their transmission access. Of the current 2,000 MW, PSE has expiration dates on contracts which are usually renewed. Charlie asked for PSE to provide a schedule of Mid-C contracts and expiration dates. Further, representatives of the WUTC requested additional information on updates and clarifications to the transmission access assumptions. Garret noted these will be included in Appendix D of the IRP.

Calculating effective load carrying capacity (ELCC)

Garret explained how ELCC is calculated and that the data from John Fazio of the NWPC is utilized in the analysis that leads to this calculation. James Adcock asked if the new Green Direct solar project would only affect LOLP in the summer months. Garret explained that the project will help meet winter LOLP needs as well because the project will generate power in winter months, just for fewer daylight hours. James asked if PSE could provide the TAG with a graph of LOLP by month, similar to the graph John Fazio provided for the NWPC region. Garret said PSE could develop this graph [*update: this was generated and shared with the TAG on February 27, 2019 and is also available on pse.com/irp*].

For further clarification between the draft notes and the final notes considering the above discussion, the following has been inserted:

The difference between the Green Direct 2 Solar and Washington Generic Solar is that the Green Direct 2 Solar resource will be the first large-scale solar generation plant in PSE's portfolio. Its 18% ELCC is reflective of, first and foremost, the reliability issues that it addresses during the limited winter daylight hours directly in PSE's system and, second, a small component attributable to the hydro reshaping that occurs when solar is added to the GENESYS regional model. In the most current ELCC calculations, this regional hydro reshaping component accounts for an increase of approximately 0.4 percentage points of the ELCC.

With the 150 MW capacity Green Direct 2 Solar resource added into PSE's base portfolio, the next 100 MW of Washington Generic Solar is then an incremental addition. The opportunities to address reliability issues become increasingly limited as the portfolio saturates with injections of solar power during a narrow slice of time in the winter. Additionally, in the regional model, these small additions (relative to the Pacific Northwest) have limited hydro reshaping opportunities. The most recent calculations show that this incremental 100 MW of Washington Generic Solar added to the regional model constitutes an increase of approximately 0.2 percentage points in ELCC.

The shift in ELCC values for energy-limited resources comes directly from deeper and longer-duration reliability events to address in the Resource Adequacy Model. This is the consequence of ensuring that every temperature year and every hydro year match between the GENESYS model and the Resource Adequacy Model. While this tethering between the regional model and PSE's model has been available in PSE's analysis for some time, the events from the GENESYS model appeared to be independent when applied to the Resource Adequacy Model previously. This had the effect of dampening extreme events: a very cold day in PSE's system could have lined up with a mild day in the region, and vice versa; additionally, years with higher inflows in PSE's system could be aligned with lighter inflow conditions in the region, and vice versa. However, ensuring that these events occur simultaneously, by perfectly aligning the temperature and hydro simulation-years between these two models, better reflects the

realities that we face as a utility dependent on short-term capacity purchases via long-term firm transmission.

With this alignment, a cold day in PSE's system, as experienced by the Resource Adequacy Model, is now aligned with the same cold day in the region. This means that our power supply is tighter at the same time that the region's power supply is tighter, increasing risk of outages from unit failures. Likewise, low or critical hydro conditions tighten up the region's supply at the same time that our contracted slice generation along the Columbia River is reduced as well. Taking this together, extreme regional events tend to produce long and deep outages as the region's hydro system shapes around flattening the impact of an event. This means that outages from GENESYS commonly appear as 16 hour events, corresponding to "heavy load" or "on-peak" market trading hours during the day, Hour Ending (HE) 7 through 22, or 6:00 am through 10 pm. PSE's position creates exposure to these long events, often coinciding with increased demand from a cold weather event.

Thus, ELCCs for energy-limited resources have declined between the 2017 and 2019 IRPs as their ability to maintain an EUE target is challenged by longer outages. Energy-limited resources can achieve higher ELCCs through additional storage volumes, thereby allowing these resources to substitute more capacity in long duration events.

ELCC saturation analysis

Garret noted that diversity of renewable resource type and geography matters, with ELCC declining as more of the same resources are added. Each resource is more valuable when paired with other resources in other areas. This is also true with pumped storage and solar battery projects.

Bill Pascoe noted that while PSE said pumped storage projects are operationally complex, different technology exists which does not require reversal from pumping to generating and could operate at a more granular level. Garret explained this technology was not included in the analysis because PSE used what HDR identified as generic resources and parameters. Bill noted he previously mentioned the ternary pumped storage technology when the initial HDR report was reviewed, and requested PSE consider incorporating it into their modeling.

James Adcock asked why pumped storage was only listed as having a peak capacity of 50% when solving to an EUE target at 5% LOLP. Garret replied that outages in the region tend to be of a long duration, which presents challenges to the reliability value of energy-limited resources such as pump storage. Brad Cebulko asked why the peak capacity credit for EUE at 5% LOLP is lower for a larger pumped storage facility. Garret explained that, though the ELCC declines, the total reliable capacity is greater for the larger pumped storage facility. However, the denominator for the ELCC equation is even larger than the increase in the numerator, resulting in a lower ELCC. Garret added that saturation effects occur for many technology types, where the incremental marginal value of equivalent resources tends to decline. Additionally, pumped storage facilities have a higher minimum discharge, which is even higher when the project is low on storage volume. David Tomlinson also noted that chemical batteries have a more linear discharge of energy than a pump storage system, which loses efficiency as it drains.

E3's resource adequacy in the Pacific Northwest

Arne Olson, Senior Partner at E3, provided a presentation on E3's resource adequacy study of the NW. The presentation detailed the study background and methodology, results for different years, and a summary of key findings. For details, see the *Resource Adequacy in the Pacific Northwest* presentation as distributed in the meeting packet (available on slides 68 through 114 of the meeting materials posted at www.pse.com/irp).

TAG members asked questions and discussed various topics throughout the presentation, making the following key points:

Reliability challenges on a deeply-decarbonized grid

Arne noted challenging conditions can exist on a deeply-decarbonized grid when a multi-day cold snap coincides with low wind, solar and hydro production, and presented a sample graph of load during a cold snap event. Rachel Brombaugh asked if the graph was developed using historical or modeled temperature data, and Arne replied it used historic data. Rachel and Nate Sandvig asked how frequently cold snaps like the graphed scenario happen in the region. Arne did not have that information off hand but mentioned a bell curve was used to identify the likelihood of the scenario.

Kevin Jones asked why demand response was not shown as part of the sample graph. Arne explained the graph is meant to be a simplified example, and E3 would like to use more data on how demand response would impact load in long cold snaps. Arne asked if Kevin could provide additional historical data or projected data for E3 to consider. Kevin also asked what the tradeoffs are between building a gas peaker plant or overbuilding storage to avoid the graphed scenario. Arne replied the gas peaker plants are less expensive but don't provide opportunities for storing renewable energy when it is available.

2030 results

Arne presented the impacts of planned coal retirements and the potential of all coal retiring from the NW portfolio. Following through with planned coal retirements would mean the grid would need 8 GW of new capacity by 2030. If all coal is retired, then 16 GW will be needed. Court Olson noted that the portfolio needs do not consider the cost of carbon, or the increasing efficiency of building construction, which may reduce the needed capacity.

James Adcock asked if E3 used the same temperature and hydro data as PSE and NWPCC, and if E3 projected temperature and hydro data into the future. Arne replied that E3 uses the same hydro data as PSE and NWPCC, and for temperature used 1949-2016. Arne noted a jump in the temperature data is visible in 1980, so a 30-year data set may change the results. E3 did not project future temperature data because they do not conduct climatology work.

Bill Westre noted E3 replaced phased-out coal with natural gas and did not include a wind replacement percentage. Arne explained their study was not trying to conduct economic optimization by 2030 and was instead highlighting how much overall capacity was needed. When conducting economic optimization, much of the phased-out coal could be replaced with wind and solar. Doug Howell noted the Legislature is looking at the study and interpreted the results as meaning more gas plants are needed by 2030 rather than wind and solar. Doug requested Arne's previous point about economic optimization be included in the report as a correction.

Rob Briggs asked if E3 considered renewable hydrogen technology at all. Arne replied it is an experimental solution which was not evaluated. Rob noted HDR said renewable hydrogen could be an option for PSE, and Arne asked for links and information from Rob on the technology.

2050 results

Arne presented various portfolio options for meeting the region's energy needs in 2050. Bill Westre asked if E3 considered fugitive methane leakage when calculating percent carbon reduction. Arne replied they used accepted carbon standards, and captured fugitive methane emissions in a different section of the report.

Virginia Lohr asked if E3 considered future technologies in their analysis. Arne explained the E3 modeling was based on existing technology, which would likely result in conservative estimates of needed

resources. Virginia asked if assuming load growth was a reasonable assumption, given potential future energy efficiencies. Arne replied that it is a reasonable assumption, given energy efficiencies will likely be canceled out by increases in electricity use to decarbonize other sectors.

[Clarification note: PSE will distribute E3's final report on regional resource adequacy to the TAG when it is publically available].

PSE gas planning standard

Phillip Popoff, PSE manager of resource planning, presented an overview of PSE's gas planning standard, including PSE's methodology for developing it and comparison to gas planning standards of other NW gas utilities. For details, see the *PSE gas planning standard* presentation as distributed in the meeting packet (available on slides 115 through 125 of the meeting materials posted at www.pse.com/irp).

TAG members asked questions and discussed various topics throughout the presentation, making the following key points:

James Adcock expressed concern with the methodology PSE used, noting old temperature data could be creating overly-conservative planning standards. Don Marsh asked Phillip why the incremental benefits and costs of reliability should be roughly equal. Phillip replied that a benefit to cost ratio of one balances the benefits and costs to customers of building new infrastructure.

Next steps and action items (status update as of the time of the final notes, dated March 7, 2019)

Irena reviewed outstanding action items updated at the beginning of the meeting, in addition to new action items discussed throughout the meeting:

- PSE will identify a contact for PSE's carbon reduction goals.
 - Status: In progress.
- PSE will include carbon impact in scenarios or sensitives.
 - Status: In progress.
- PSE will include gas emission rate as a percentage and details on methodology in the draft IRP and the final IRP. PSE will utilize a potential 6-month extension on the final IRP deadline to provide this information in advance of the draft IRP.
 - Status: In progress.
- Provide a description of the difference between the 2017 and 2019 combined heat and power potential by March 29, 2019.
 - Status: In progress.
- PSE will follow up with TAG members regarding posting requests and documents received prior to the revision of TAG guidelines.
 - Status: In progress.
- PSE will consider methodology for posting TAG questions and answers publicly.
 - Status: In progress.
- PSE will discuss their resource adequacy work at the February 7 TAG meeting and will bring representatives from E3 and other groups to discuss regional resource adequacy work.
 - Status: Completed.
- PSE will continue planning the Energize Eastside meeting and invite TAG members.

- Status: This meeting is planned for August 2019, as detailed on the PSE 2019 IRP stakeholder meeting schedule dated February 28, 2019, shared with TAG members and available on pse.com/irp. PSE acknowledges two communications from TAG members in protest of this change. These emails are provided as Attachment 2.
- PSE will consider providing an opportunity for additional energy efficiency dialogue around policy and implementation of energy efficiency.
 - Status: Considered and added to the revised IRP stakeholder meeting schedule dated February 28, 2019. This meeting is planned for August 2019.
- PSE will add approximate line miles and project statuses to the planned major projects list and will consider including cost ranges.
 - Status: In progress; to be included in draft IRP and final IRP, cost ranges will be included if publically available.
- PSE will include several previous IRP load forecasts in the IRP and compare those forecasts to actuals for multiple years
 - Status: In progress; to be included in draft IRP and final IRP.
- PSE will develop a gas planning standard and will share it with the TAG.
 - Status: Completed. PSE reconsidered this request and instead highlighted the differences in the standards at the February 7 TAG meeting.
- PSE will verify the numbers and calculations used to develop the electric vehicle load as a percentage of load in 2035.
 - Status: In progress; to be included in the draft IRP and final IRP.
- PSE will add a recommendation for time-of-day rate analysis to the 2019 IRP action plan.
 - Status: In progress; to be included in the 2019 IRP action plan.
- PSE will share draft generic resource assumptions with the TAG prior to the February 7 TAG meeting.
 - Status: Completed.
- PSE will share a comparison of the 2017 IRP electric resource costs with the 2019 IRP electric resource costs prior to the February 7 TAG meeting
 - Status: Completed.
- PSE will share reliability data with TAG members as provided to the WUTC prior to the February 7 TAG meeting.
 - Status: Completed.
- PSE will hold the planned March 18 IRPAG meeting on carbon reduction goals and the listening session with David Mills, Sr. Vice President, or will provide reasoning for delaying this meeting to TAG members.
 - Status: Rescheduled for May 2019 as detailed in the revised IRP stakeholder meeting schedule dated February 28, 2019. TAG member protest concerning the date change is provided in Attachment 3. *Reasoning for this change:* PSE acknowledges that there was interest in a March listening session and during TAG meetings, March was stated as the month for this opportunity, however with the anticipated passing of new clean energy legislation, a May listening session will allow for a more productive discussion since stakeholders are largely interested in a carbon reduction goals dialogue. A notice to the IRPAG mailing list will be forthcoming to ensure sufficient notice concerning the changes to the meeting schedule.
- PSE will distribute a link to John Fazio's paper prior to TAG #6.
 - Status: Completed.
- PSE will file an updated work plan with new proposed meeting dates by February 28.
 - Status: Completed.
- PSE will develop a graph of LOLP by month and will distribute it to the TAG.
 - Status: Completed.
- PSE will consider evaluating the ELCC of longer storage batteries.
 - Status: Completed.

Nicholas Matz of the City of Bellevue responded to comments at the beginning of the meeting regarding the rescheduled city hearing for the Energize Eastside project. The City of Bellevue rescheduled the Energize Eastside hearing from January to March by statute, with deference to participation in the hearing. The reschedule was not conducted to accommodate TAG meeting².

PSE will distribute meeting notes with action items outlined on February 21, 2019. February 28 is the deadline for TAG attendees to provide comments on meeting notes to PSE. PSE will post the final meeting notes on the IRP website: www.pse.com/irp by March 7, 2019.

IRP comment period

The comment period began with facilitator Diane Adams reviewing the comment guidelines. Based on feedback received from TAG members at TAG Meeting #4, each commenter was given four minutes of speaking time instead of two due to the low number of signups.

- James Adcock, Citizen at Large: Hi, I'm a member of the TAG, a former electrical engineer and long-time PSE IRP participant. I want to express my disappointment today with this meeting. It is just like PSE to design the meeting to control the meeting and the discussion. By my perceptive, I'm trying to be polite and PSE is being rude. I'm trying to highlight points concerning the 75,000 lives being lost by PSE and I'm trying to highlight my concerns about the adding the additional resources that PSE is recommending and which are not needed, including gas peakers. It is not impolite to try to raise the technical issues and raise the issues on what is really going on. The temperature distributions in the 1950s and before cannot predict the future. The temperature profiles being observed today are completely different than what PSE is basing the IRP on. This needs to change.
- David Morton, ratepayer: The IRP says that it must consider the cost of risks associated with environmental effects including emissions by carbon dioxide. While it appears that PSE has performed a detailed analysis of carbon dioxide emissions, a though analysis of the amount of methane PSE is contributing is lacking. Methane easily escapes into the atmosphere and through its unscrupulous measures, action is not taken to prevent, detect, and repair methane leaks stating from the underground natural gas deposits, through refineries and pipelines, all the way to PSE's intended destinations. Reports show that the U.S. natural gas industry is leaking way more methane than previously thought.

Solar and wind technologies are becoming price competitive much faster than predicted. The IRP ignores the most important cost of renewable energy. Currently pending state legislation may require PSE to come clean and make good on the promises of renewable electricity made by Green Direct and the vague and misleading promises of the "Green Power" and "Solar Choice" marketing campaigns.

PSE knows that their current and future combustion of fossil fuels and leakage of methane to the atmosphere have been contributing and will continue to contribute to dangerous global warming. PSE promote renewable energy while at the same time planning to sell more electricity generated by burning natural gas. Though this combustion of fossil fuels and leakage of methane, PSE has helped create a severe public nuisance in which the public suffers injury, loss, or damage caused

² Nicholas Matz later confirmed with the City Attorney Office that the reschedule was never considered to accommodate TAG scheduling.

by rising seas, coastal flooding, wildfires, hurricanes, heat waves, and other impacts of climate change.

- Virginia Lohr (Vashon Climate Action Group (letter read and submitted)

At the January 2019 Technical Advisory Group (TAG) meeting, comments from PSE's Integrated Resources (IRP) team led me to believe that temperature data would be treated the same way in the 2019 IRP as it was in the last IRP. I hope I misunderstood. That does not seem consistent with statements from the 2017 IPR process, including statements on climate change modeling from the WA Utility and Transportation Commission (UTC) staff³. These are excerpts:

PSE indicates that the region is experiencing long-term warming... PSE has begun to question using extreme cold weather values to represent peak winter days...

PSE identifies gaps in information that it needs to better plan for climate change... Staff recommends that PSE explore the costs and benefits of identifying or developing this data... This effort should evaluate whether the continued use of older weather data sets... is still appropriate... PSE should include the specific actions it is taking in pursuit of this priority... in the next IRP.

PSE's recent comments also do not seem consistent with the response⁴ to UTC staff from Ken Johnson, PSE's Regulatory and Government Affairs Vice President, which had these words:

PSE believes that the addition of modeling for regional climate change impacts... is a positive addition... Northwest Power and Conservation Council staff has performed analyses similar to those suggested by Staff. Although PSE's ability to advance regional forecasting... due to climate change may be limited, PSE will engage as much as practicable.

Mr. Johnson's letter suggests there will be at least some changes in the 2019 IRP. This was not apparent at the previous TAG meeting, when we heard that PSE will use weather data that goes back 32 years with no predictions for the future.

At TAG meetings, we repeatedly hear that PSE is winter-peaking. That has been true in the past and it may be true in the future, but it also seems plausible that winter peaks may change in intensity and frequency. It also seems plausible that in the future PSE will experience more and longer summer peaks. Jens Nedrud, PSE's Manager for System Planning, noted at the TAG meeting, that PSE has experienced some peaks "on hot summer days." He also noted that "today, everybody puts in an air conditioner."

It is not prudent for PSE to look only far backward at weather data when predicting the next 20 years or to overlook expectations and commitments made in the 2017 IRP.

³ https://www.utc.wa.gov/_layouts/15/CasesPublicWebsite/GetDocument.ashx?decide=513&year=2016&docketNumber=160918

⁴ https://www.utc.wa.gov/_layouts/15/CasesPublicWebsite/GetDocument.ashx?decide=668&year=2016&docketNumber=160918

Appendix 1

Comments to the IRP sent via email during TAG #5 for inclusion in the record

Email comment 1

From: Hoa Pantastico
Sent: Thursday, February 07, 2019 11:28 AM
To: Kvam, Michele
Subject: Comment for IRP TAG meeting

Hi Michele,

I could not be at today's IRP TAG meeting, but wanted to pass along a comment:

In these next 20 years (and really as soon as possible), PSE (and all utilities) needs to get to 100% Clean Energy. We have the cost-effective technologies to move us in that direction now. We should prioritize renewable energy technologies over both natural gas and coal. Much more can be done to get more renewables, especially solar, on the grid. This must be a priority in PSE's 20 year plan.

If you are not the person fielding questions and comment, please forward this to the correct person.

Thank you!

Hoa Pantastico

Email comment 2

From: Chris Chapin
Sent: Thursday, February 07, 2019 12:15 PM
To: Kvam, Michele
Cc: records@utc.wa.gov
Subject: Please prioritize a Carbon Free PSE!

Hi Michele,

I could not be at today's IRP TAG meeting (I have attended in the past and spoke out during the hearings), but wanted to pass along a comment.

In these next 20 years (and really as soon as possible), PSE (and all utilities) needs to get to 100% Clean Energy. We have the cost-effective technologies to move us in that direction now. We should prioritize renewable energy technologies over both natural gas and coal. Much more can be done to get more renewables, especially solar, on the grid. This must be a priority in PSE's 20 year plan.

Thank you!

Chris Chapin

Email comment 3

From: Sean Sullivan

Sent: Thursday, February 07, 2019 12:36 PM

To: Kvam, Michele

Subject: Integrated Resource Plan

Dear Ms. Kvam,

I understand that PSE is working on an Integrated Resource Plan. I am writing to urge PSE to get to 100% clean energy. Just today in the New York Times there is another dire article about global warming. We all see it. We are all experiencing it.

If we are to continue to advance as a society, we must meet this challenge together. I urge PSE to lead by prioritizing renewable technologies over both natural gas and coal. This must be the priority in PSE's 20 year plan.

Sincerely,

Sean Sullivan
3932 Wallingford Ave North #1
Seattle, WA 98103

Appendix 2

Comments of TAG members in protest to rescheduling Energize Eastside meeting

Email comment 1

From: whalvrsn1@frontier.com [mailto:whalvrsn1@frontier.com]

Sent: Tuesday, February 26, 2019 1:44 PM

To: Kvam, Michele

Cc: Netik, Irena; Popoff, Phillip; Diane Adams; Amanda Jahshan; Bill Pascoe; Brad Cebulko; Brian Grunkemeyer; Court Olson; Dan Kirschner; Daren Anderson - NESCO Group; David Broustis; David Howarth; David Nightingale; David Tomlinson; Devin McGreal; Fred Heutte; Jimad@msn.com; Joni Bosh; kate@westerngrid.net; Scanlan Kathi (UTC); larry.becker1@frontier.com; Mark Sellers-Vaughn; Mike Hopkins; Nancy Esteb; Nicholas Matz; Noah Roselander; Hansennp; Rachel Brombaugh; Rector Andrew (UTC); Rob Briggs; Russ Weed; Russell Steele; marty.saldivar@williams.com; Nathan Sandvig; Steven Johnson; Virginia Lohr; Tomas Morrissey; Willard Westre; Don Marsh

Subject: February 7th TAG minutes

Hi Michelle,

In regard to your request for feedback and further clarification of the February 7 TAG minutes, I would like to draw your attention to your Attachment: 2019 Integrated Resource Plan Action item #8 regarding Energize Eastside. It reads:

Action item	Description	PSE action	Status
#8 Progress	Host a presentation of the Energize Eastside project and invite TAG members. (TAG #4, January 9, 2019)	The presentation is being planned and will be communicated to TAG members.	In

I believe that the minutes do not accurately represent the action item that was recommended by TAG members -- including representatives of the WUTC -- and agreed to by PSE.

As to the action item and description:

The action item should more clearly state agreement to hold an analytical review of Energize Eastside at a regularly scheduled TAG meeting. The allotted time was four hours to include presentation and Q&A's. The meeting was scheduled for March 18th.

My notes for the January 9th meeting show that:

1. PSE agreed to review Energize Eastside including load flow studies and customer demand forecasts. The 2017 IRP Chapter 8 was mainly descriptive and was never reviewed by the committee. The purpose here is to help better understand the underpinnings of this project through a technical dialogue -- both questions and answers.

2. PSE agreed to provide meaningful follow up and answers to questions raised in the WUTC's 2017 IRP acknowledgement letter including " a thorough examination of the analysis supporting a conclusion of need." More specifically,

- o "The effect of the power flows due to entitlement returns on the need for the Energize Eastside Project.

- o The reason for, and effect on the need for Energize Eastside Project, of modeling zero output from five of PSE's Westside thermal generation facilities.

- o PSE's choice not to provide modeling data to stakeholders with Critical Energy Infra structure Information clearance from ERC.

- o Resolution of the effect of lower load assumptions on the need for Energize Eastside Project.

- o It is still unclear if a joint utility analysis of all available transmission and potential interconnections in the Puget Sound region might solve the Energize Eastside reliability issues."

At the February 7th meeting, PSE shared that they have requested a six month extension in submitting the IRP. The reason given was legislative action regarding carbon emissions may impact the 2019 IRP. They suggested that further IRP meetings be postponed for that reason.

3. Since Energize Eastside was scheduled and not impacted by any potential legislative actions, it was recommended to have this presentation and discussion at the March 18 already scheduled TAG meeting. Mr. Don Marsh provided a handout further clarifying technical issues and questions.

We would appreciate your making this request part of the formal record and making appropriate changes to the minutes and action item #8. .

Thank you,

Warren Halverson
Technical Advisory Representative

Email comment 2

From: Don Marsh [mailto:don.m.marsh@hotmail.com]

Sent: Saturday, March 02, 2019 8:39 AM

To: IRP -- mail --; Netik, Irena; Popoff, Phillip

Cc: Diane Adams (dadams@enviroissues.com); Doug Howell; Kvam, Michele; Johnson, Ken; Odell, Nina; Popoff, Phillip; Gafken, Lisa (ATG); Suetake, Nina (ATG); carlac; Nightingale, David (UTC); Cebulko, Bradley (UTC); Scanlan, Kathi (UTC); Joni Bosh; Amanda Jahshan; Kelly Hall; Wendy Gerlitz; Brian Grunkemeyer; Jesse Piedfort; T. Gould; Kevin Jones; Virginia Lohr; Rob Briggs; Mary Paynter; Dan Streiffert; Rich Voget; peter orth; Alec Connon; Ron Snell; Steven Hofer; Vicki Grayland; Nancy Shimeall; Alex Ramel; Neal Anderson; Jane Lindley; Elyette Weinstein; Willard Westre; Court Olson; Brombaugh, Rachel; Kim Danke; David Morton; Howard Harrison; David Perk; Lynn Fitz-Hugh; Bonnie Shipman; Bill Moyer; Claudia Riedener; Phyllis Farrell; Gary Piazzon; Anne Miller; Linda Hagedorn; Judith Akins; LeeAnne Beres; Carol Mangan; jasca10@yahoo.com; deansmith4@me.com; jamie.s.margolin@gmail.com; kurtis.dengler@gmail.com; eddyssunprincess

Subject: RE: Update to PSE's 2019 IRP public meeting schedule and filing date

Dear Irena and Phillip,

Thank you for the updated TAG meeting schedule.

We must strongly question the rationale for delaying the TAG meeting to answer the UTC's questions about Energize Eastside until August, after public hearings on PSE's permit applications have been held and the legal record for the project has been set in stone.

The Commission posed its questions about Energize Eastside in its response to PSE's 2017 IRP, dated May 7, 2018

(<https://www.utc.wa.gov/layouts/15/CasesPublicWebsite/GetDocument.ashx?docID=1743&year=2016&docketNumber=160918>, page 10). By delaying the TAG meeting until August 6, 2019, PSE will have allowed 15 months to pass without a response to the UTC or the public addressing the substance of these questions. This decision increases the risk of the Commission questioning the prudence of this project if it comes to the Commission in a subsequent rate case hearing. Do PSE's owners (including the newest ones) understand that PSE is putting hundreds of millions of dollars at risk by proceeding with an expensive and possibly unnecessary project under a cloud of unanswered questions?

We had hoped to discuss alternative solutions that would be less expensive, better for the environment, and easier to construct. For example, in the Energize Eastside DEIS, an alternative is described that would place 20 MW natural gas powered generators in 20 Eastside substations. This alternative was rejected for the sole reason that the generators would be too noisy to operate in residential areas.

Fortunately, the steady march of technology has made other options feasible. It is now possible to install a very quiet 20 MW / 80 MWh battery in each of these substations for a reasonable cost. The form factor of these batteries is roughly the size of two shipping containers, which can easily fit in most of the Eastside substations we have surveyed. The cost of this solution would be roughly equivalent to the cost of Energize Eastside, but it offers additional flexibility to respond to a wider set of outage scenarios on the distribution grid. Besides improved reliability and resiliency, these batteries could also be used to increase the percentage of renewable electricity in the Eastside's power mix, with corresponding environmental benefits. Furthermore, the public would be more comfortable if PSE can avoid digging big holes for new transmission towers uncomfortably close to the 50-year-old Olympic pipelines located in a narrow utility corridor that passes through dozens of Eastside neighborhoods.

Ratepayers and the impacted communities would appreciate the opportunity to discuss these ideas prior to the public hearings for Energize Eastside. Scheduling the TAG meeting in the middle of our summer vacation, when most people would be least likely to attend, looks like a cynical strategy on PSE's part. PSE can restore our shaken confidence in the process by requesting a delay in the public hearings until the TAG and Commission staff can understand the technical justification for the project.

Please reschedule the TAG meeting and/or the public hearings for the Energize Eastside project.

Sincerely,

Don Marsh

Appendix 3

Comment of TAG member concerning (now rescheduled) March 18 IRPAG meeting

Email comment 1

From: Kevin Jones [mailto:kevinjonvash@gmail.com]

Sent: Thursday, February 07, 2019 11:09 PM

To: Doug Howell

Cc: Netik, Irena; Kvam, Michele; Johnson, Ken; Odell, Nina; Popoff, Phillip; Gafken, Lisa (ATG); Suetake, Nina (ATG); carlac; Nightingale, David (UTC); Cebulko, Bradley (UTC); Scanlan, Kathi (UTC); Joni Bosh; Amanda Jahshan; Kelly Hall; Wendy Gerlitz; Brian Grunkemeyer; Jesse Piedfort; T. Gould; Virginia Lohr; Rob Briggs; Mary Paynter; Dan Streiffert; Rich Voget; peter orth; Alec Connon; Ron Snell; Steven Hofer; Vicki Grayland; Nancy Shimeall; Alex Ramel; Neal Anderson; Jane Lindley; Elyette Weinstein; Willard Westre; Court Olson; Brombaugh, Rachel; Kim Danke; David Morton; Howard Harrison; Don Marsh; David Perk; Lynn Fitz-Hugh; Bonnie Shipman; Bill Moyer; Claudia Riedener; Phyllis Farrell; Gary Piazzone; Anne Miller; Linda Hagedorn; Judith Akins; LeeAnne Beres; Carol Mangan; jasca10@yahoo.com; deansmith4@me.com; jamie.s.margolin@gmail.com; kurtis.dengler@gmail.com; eddyssunprincess

Subject: Submitted PSE TAG action item

Hi Irena and Michele,

The action item which we discussed at the TAG meeting today, which I recall you accepted, is:

PSE to hold the agreed upon listening session with PSE VP David Mills on March 18, as currently planned, or provide rationale to the TAG stating the rationale for a reschedule.

Thanks for the opportunity to discuss the importance and schedule criticality of this meeting.

Kevin Jones

Vashon Climate Action Group

Email comment 2

On Wed, Feb 6, 2019, 08:40 Doug Howell <doug.howell@sierraclub.org> wrote:

Hi Irena and Michelle. I am including Ken Johnson and Nina Odell in this email because I recommend they attend tomorrow's Advisory Group meeting on the Integrated Resource Plan (IRP). Hi Ken and Nina.

As communicated in your email on Friday, February 1, you informed us that PSE is petitioning for delay in this IRP due to the expected passage of legislation that will change the IRP.

I am confident members of the IRPAG would like to better understand the implication of the 100% clean electricity legislation (SB 5116 / HB 1211) for the IRP process, and would appreciate the opportunity to express their thoughts about the legislation in relation to Puget's IRP.

As you may recall, many groups across your service territory wrote two letters to PSE at the beginning of this IRP process. These letters are attached. In these letters, we called upon PSE to provide a blueprint for a carbon-free electricity future. Now SB 5116 / HB 1211 can deliver on that promise. We need to know how PSE is going to influence this legislation.

I strongly recommend adding time to the agenda tomorrow to accomplish the following goals:

1. PSE explains potential outcomes for PSE's system and planning if the legislation is to pass
2. PSE's makes clear its position on critical issues on this legislation including the clean energy benchmarks for 2030 and 2045, and potential amendments related to cost caps and reliability that could undermine these essential benchmarks.
3. Provide an opportunity for members of the IRPAG to share their thoughts on the legislation in relation to PSE.

We are at a cross roads. There is strong demand from your customers for a clean energy future. You are already providing this carbon-free pathway for iconic business customers such as Boeing, Microsoft and Starbucks. Now we need to know PSE's position on this landmark legislation that will ensure clean energy for the rest of your customers.

If you are delaying the IRP because of legislation, and this legislation can provide what groups have been asking PSE to deliver since last May, then it is fair and appropriate to make sure your stakeholders know the details of your position on this legislation

Thank you. We look forward to seeing you tomorrow.

Doug Howell
Sr. Campaign Representative
Sierra Club
180 Nickerson Street
Suite 202
Seattle, WA 98109
(206) 204-7017