Northwest Power and Conservation Council

2021 Northwest Power Plan

Statement of Basis and Purpose for the 2021 Power Plan
and
Response to Comments on the Draft 2021 Power Plan

May 2022

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The Northwest Power and Conservation Council adopted the 2021 Northwest Power Plan in February 2022. https://www.nwcouncil.org/2021-northwest-power-plan This document briefly summarizes the statutory framework and substantive and procedural requirements that guided the Council's power-planning effort, and the resulting steps the Council followed in developing, considering, and adopting the 2021 Power Plan. This document also identifies the key issues, conclusions, and recommendations involved in the Council's considerations, deliberations and adoption of the power plan. These are identified largely through the framework of a response to comments the Council received on the draft 2021 Power Plan.

To the extent that provisions of the federal Administrative Procedures Act apply to the Council, this document serves as the "statement of basis and purpose" described in 5 U.S.C. §553 of the APA to accompany agency decisions on final rules.

Statutory Framework – The Northwest Power Act

The Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act or Power Act) directs the Northwest Power and Conservation Council to develop a "regional conservation and electric power plan," and then to review the power plan not less than every five years. The Council had adopted the Seventh Northwest Power Plan in February 2016. In February 2019, the Council formally began the power plan review process that led to the development and adoption of the 2021 Power Plan, the eighth power plan produced by the Council. https://www.nwcouncil.org/meeting/2021-northwest-power-plan-kick-webinar-february-21-2019

Prior to the review of the power plan, the Power Act also requires the Council to call for recommendations to amend the Council's Columbia River Basin Fish and Wildlife Program; engage with the region in a fish and wildlife program amendment process;

and adopt a final amended fish and wildlife program based on the recommendations, supporting documents and views obtained through the public process. So, prior to beginning this review of the power plan, the Council in 2018 called for recommendations to amend the Council's 2014 Columbia River Basin Fish and Wildlife Program, conducted a lengthy program amendment process, and adopted the 2020 Addendum to the 2014 Program. https://www.nwcouncil.org/reports/2014-columbia-river-basin-fish-and-wildlife-program; https://www.nwcouncil.org/fw/program/2020addendum

In reviewing, developing and adopting the "regional conservation and electric power plan," the Act tells the Council to give priority to conservation and generation resources that are "cost-effective," and it also tells the Council to give priority to resources in the following order: first, to conservation; second to renewable resources; third, to generating resources using waste heat or generating resources of high fuel-conversion efficiency; and fourth, to all other resources. Per the Act the plan must also set forth a scheme for implementing conservation measures and developing generating resources to meet the obligations of the Bonneville Power Administration (Bonneville), and to do so with due consideration by the Council for (A) environmental quality; (B) compatibility with the existing regional power system; (C) protection, mitigation, and enhancement of fish and wildlife and related spawning grounds and habitat, including sufficient quality and quantity of flows for successful migration, survival, and propagation of anadromous fish; and (D) other criteria that may be set forth in the plan.

The Power Act then requires the plan to include the following elements:

- an energy conservation program, including model conservation standards
- recommendations for research and development
- a methodology for determining quantifiable environmental costs and benefits
- an electricity demand forecast of at least 20 years
- a forecast of power resources estimated by the Council to meet the obligations of the Bonneville Power Administration and the amounts that can be met by resources in each of the priority categories; the power resource forecast shall (i) include regional reliability and reserve requirements; (ii) take into account the effect, if any, of the requirements of the fish and wildlife program on the availability of resources to Bonneville; and (iii) include the approximate amounts of power the Council recommends Bonneville acquire on a long-term basis and may include, to the extent practicable, an estimate of the types of resources to be acquired
- an analysis of electricity reserve and reliability requirements and cost-effective methods of providing reserves designed to insure adequate electric power at the lowest probable cost

- the fish and wildlife program promulgated earlier by the Council under Section 4(h) of the Act to protect, mitigate, and enhance fish and wildlife and related spawning grounds and habitat affected by the development and operation of any hydroelectric project on the Columbia River and its tributaries

As for the process involved in adopting such a plan, the Power Act generally requires that the Council ensure widespread public involvement in any effort to develop regional power policies, including the power plan, by maintaining comprehensive programs to inform the Northwest public of major regional power issues, obtain public views concerning major regional power issues, and secure the advice of Bonneville's utility customers and others. Specifically relevant to the power plan, the Power Act requires the Council to hold public hearings on the proposed plan before adoption in the four northwest states represented by the members of the Council. The Act also requires that in the preparation, adoption, and implementation of the plan, the Council and Bonneville shall encourage the cooperation, participation, and assistance of appropriate federal agencies, state entities, state political subdivisions, Indian tribes, Bonneville customers and other utilities in the region, and the general public. The Council largely follows the notice-and-comment procedures specified in the federal Administrative Procedures Act, providing notice of the draft power plan and an opportunity for written public comment and opportunities to testify at public hearings in the four states represented in the Council.

The Power Act also requires that the Council establish and use at least one "scientific and statistical advisory committee" to assist in the development, collection, and evaluation of technical information relevant to the Council's development and review of the regional conservation and electric power plan. The Council has established and made use of eight different advisory committees in the development of the 2021 Power Plan. The Council also made occasional, ad hoc use of a forum integrating several advisory committees at once for relevant topics. https://www.nwcouncil.org/energy/advisorycommittees. The advisory committees are one way the Council regularly obtains the views of Bonneville, Bonneville's utility customers, relevant public interest groups and industry associations, the region's ratepayers and general public, and other important participants in regional power policies.

The substantive elements of the plan required by the Act, and the process and public engagement the Council is directed to follow before adopting the final power plan, are intended to help effectuate the purposes of the Northwest Power Act. Among these are to encourage conservation and efficiency in the use of electric power, encourage the development of renewable resources within the Pacific Northwest; assure the Pacific

Northwest an “adequate, efficient, economical, and reliable power supply”; and to provide for the participation and consultation of the Pacific Northwest States, local governments, consumers, Bonneville customers, users of the Columbia River System; federal and state fish and wildlife agencies, the region’s Indian tribes, and the general public in the development of regional plans and programs related to energy conservation, renewable resources, other resources, and protecting, mitigating, and enhancing fish and wildlife resources, facilitating the orderly planning of the region's power system, and providing environmental quality.

Developing the 2021 Northwest Power Plan

In February 2019 the Council formally began the most recent power plan review with a kick-off presentation by webinar. https://www.nwcouncil.org/meeting/2021-northwest-power-plan-kick-webinar-february-21-2019. Over the course of the next more than two years, the Council engaged in a series of technical and policy analyses necessary for the power-planning process. This included, among many other activities:

- analyzing the availability, costs, energy values, environmental costs and impacts, and other facets of a host of conservation measures, demand response measures, and generating resource types;
- developing, reviewing and revising forecasts of demand (load), resource additions and retirements, wholesale electricity prices, and natural gas and other fuel prices;
- assessing regional resource adequacy;
- vetting, populating and running the various analytical tools and models that the Council utilizes during the power plan process;
- identifying a set of baseline conditions for incorporation into the model analysis and then identifying and analyzing a set of scenarios to test different assumptions or developments relating to resources, markets, demand and other factors;
- identifying and continually refining a set of key issues for the Council to consider and resolve in developing the 2021 Power Plan.

The Council held numerous public meetings of its advisory committees during this time, in order to display and discuss these and other developments. The Council and its four-member Power Committee also met in public at least once every month during the power plan development period, discussing progress, reviewing staff analyses and other staff products, listening to the views of others, and providing feedback to the staff. Information on all these activities may be found at https://www.nwcouncil.org/2021-northwest-power-plan; https://www.nwcouncil.org/2021-power-plan-technical-

information-and-data; and https://www.nwcouncil.org/2021powerplan_committee-and-council-presentations.

The Council then released for public review the draft 2021 Power Plan in September 2021. https://www.nwcouncil.org/sites/default/files/2021powerplan_2021-5.pdf; https://www.nwcouncil.org/news/council-approves-release-of-draft-2021-northwest-power-plan. Along with the text of the draft 2021 Power Plan, the Council made available on its website the Supporting Material for the draft 2021 Power Plan, providing technical support and context for the elements of the draft plan – the functional equivalent of plan appendices in past power plans. *See* https://www.nwcouncil.org/2021-northwest-power-plan; https://www.nwcouncil.org/2021powerplan_sitemap; https://www.nwcouncil.org/2021powerplan_supporting-material-overview. (The versions of the Supporting Material available at these links are the final versions, revised to some degree from the versions available at the time of the draft. The versions available at the time of the draft are stored at https://nwcouncil.box.com/s/12srlhtribk58kr9mybusykp8uw64xbs.) The Council provided wide public notice of the draft plan and supporting material to, among many others, Bonneville, Bonneville's utility customers, other utilities, relevant state, federal, tribal and local agencies and governments, businesses and trade associations, public interest organizations, and the public at large. https://www.nwcouncil.org/news/council-approves-release-of-draft-2021-northwest-power-plan.

The Council received nearly 200 formal and informal written public comments on the draft 2021 Plan until November 19, 2021. *See* https://app.nwcouncil.org/energy/powerplan/2021/comments/ (compilation of the major written comments). The Council also held four public hearings on the draft power plan, all of them held virtually due to the limitations imposed by the covid-19 pandemic. Each public hearing was denoted as the public hearing for one of the four states of the Council, with particular efforts made to identify it as the public hearing for that state and for public outreach in that state, although commenters could, if they chose, attend and comment during any of the four public hearings no matter where they resided. https://www.nwcouncil.org/2021-northwest-power-plan; https://www.nwcouncil.org/meeting/power-plan-public-hearing-hosted-montana-september-27-2021; https://www.nwcouncil.org/meeting/power-plan-public-hearing-hosted-washington-october-7-2021; https://www.nwcouncil.org/meeting/power-plan-public-hearing-hosted-oregon-october-12-2021; https://www.nwcouncil.org/meeting/power-plan-public-hearing-hosted-idaho-october-14-2021. The Council also received public comment on the draft at its public Council meetings from September to November 2021. All written comments, comment

summaries by staff, and public hearing transcripts were circulated to Council members and relevant staff.

After significant deliberations by the Council and its power committee from November 2021 into February 2022, the Council revised the draft plan in certain respects and then unanimously voted to adopt the final 2021 Northwest Power Plan at the Council's regularly scheduled public meeting in February 2022. This Council meeting, as with all public meetings held by the Council since early 2020, was held virtually due to the pandemic restrictions. https://www.nwcouncil.org/2021-northwest-power-plan; https://www.nwcouncil.org/news/2021power-plan-adopted; https://www.nwcouncil.org/meeting/council-meeting-february-15-2022.

The 2021 Power Plan contains all of the substantive elements required by the Northwest Power Act. The Council made its final decision after carefully considering all of the information developed for the power plan's administrative record, including extensive staff analyses and the views expressed in the comments and consultations before the draft and then generated by public review of the draft plan. After the adoption of the final 2021 Power Plan text, the Council also informally approved the final versions of the Supporting Material developed and revised by staff to support the final plan text. https://www.nwcouncil.org/2021-northwest-power-plan; https://www.nwcouncil.org/2021powerplan_sitemap; https://www.nwcouncil.org/2021powerplan_supporting-material-overview. And finally, at the Council's regularly scheduled public meeting in May 2022, the Council approved this response to comments and general explanatory statement.

Summary of Key Issues, Conclusions, and Recommendations in the 2021 Power Plan/Responding to Comments on the Draft 2021 Power Plan

The Council's work on the 2021 Power Plan came in the middle of an unusual and dramatic transformation in the power system in the northwest and the western US as a whole, driven by policies and economic trends that are pushing out fossil-fueled generation, adding renewable resources with different power system characteristics, and potentially electrifying significant sectors of the economy. The Council grappled throughout the power plan process with a host of relatively obvious issues arising out of that transformation. The comments on the draft power plan largely echoed the issues already under consideration. This means a summary of and response to key comments on the draft is also a way to illuminate the key issues the Council grappled with throughout the power plan process, in developing the draft power plan, in considering the comments on the draft and in deliberating and deciding on the final 2021 Power Plan.

This document is organized by topic or key issue. Major issues and comments are summarized, followed by a response in italics explaining how the Council dealt with the issues and comments in the final power plan. Comments have been paraphrased and summarized. Not every comment has been separately summarized or responded to, especially given the overlap in topics. Also, many topics or comments overlap in a way that could fit into more than one section in the document; they have been raised and addressed in just one appropriate place, with some light cross-referencing.

A number of comments sought relatively minor clarifications, corrections or slight modifications of particular language in the draft plan. The Council responded with corresponding minor revisions in the text of the plan or supporting material, and these will not be discussed here. Other comments were statements of support for the draft plan or some aspects of it – most of those are not mentioned or addressed here.

The key point, however, is that the Council members and key staff reviewed and carefully considered all comments, written and oral, in shaping the final power plan. For all the detail, *see* https://www.nwcouncil.org/meeting/council-meeting-december-14-2021; https://www.nwcouncil.org/sites/default/files/2021_12_p2.pdf; and https://www.nwcouncil.org/sites/default/files/2021_12_2.pdf (high-level summary of comments by staff discussed with Power Committee and full Council in December 2021); https://www.nwcouncil.org/meeting/council-meeting-january-11-2022; https://www.nwcouncil.org/sites/default/files/2022_01_p1.pdf; and https://www.nwcouncil.org/sites/default/files/2022_01_3.pdf (staff recommendations on

response to comment and possible revisions to the draft plan document and supporting material discussed by staff with Power Committee and full Council in January 2021); https://www.nwcouncil.org/meeting/power-committee-meeting-january-28-2022 (discussion of comments and possible plan revisions with Power Committee at special committee meeting on January 28, 2021); https://www.nwcouncil.org/meeting/council-meeting-february-15-2022; https://www.nwcouncil.org/sites/default/files/2022_02_p1.pdf; and https://www.nwcouncil.org/sites/default/files/2022_02_3.pdf (final discussion of proposed edits to the draft power plan, organized around the summary and response to comments, with the Power Committee and the full Council in February 2022).

Organization:

Demand forecast

The Northwest Power Act requires the Council include as an element of the power plan a demand forecast of at least 20 years. The demand forecast is one of a number of important considerations in the Council's determination of what new conservation and generation resources should be added add to the region's power supply to help maintain system adequacy.

The Council develops a range of demand forecasts, and does not expect actual demand to match any of them, recognizing the inherent uncertainty of forecasting the future. The point is to capture the risk that different levels of future demand might place on resource supply and resource adequacy, and then determine an appropriate cost-effective resource strategy that reduces the risk. The Council's demand forecast is an end-use forecast, incorporating end-use details and projections for each consuming sector, including residential, commercial, industrial, and agriculture, and, for the first time in the 2021 Power Plan, transportation and its related fuel usage. End-use forecasting requires estimating detailed economic forecasts for each consuming sector as well as forecasts of demographic trends and electricity and fuel prices, all of which significantly impact energy use. To create a range of future load forecasts, the Council used three sets of economic drivers (base, high, and low), with climate-adjusted data and its associated impact incorporated as well. In developing the end-use forecast, the Council utilized its Demand Forecasting Advisory Committee throughout the power planning process. Meeting information and presentation materials are available here. https://www.nwcouncil.org/energy/energy-advisory-committees/demand-forecast-advisory-committee/. Section 3 of the Power Plan outlines the demand forecast for the planning period, with detailed explanations of the economic, demographic, and energy use forecasts, forecasting methodology, inputs and assumptions available in the supporting materials here: https://www.nwcouncil.org/2021powerplan_economic-and-energy-use-forecasts/

The Council received comments on its demand forecast throughout the process, echoed in comments received on the draft plan. Comments for the most part raised concerns that the Council may be underestimating forecasted loads, resulting in an understated demand forecast and potentially an inadequate resource strategy for the region. Most of these comments focused on how the Council considered climate data in assessing how temperatures would affect load, and how the Council considered state decarbonization policies and resulting electrification assumptions that will have an impact on forecasted demand.

More specifically, some commenters raised concern that the climate change-adjusted precipitation and temperature data incorporated into the load forecast model did not sufficiently capture a wide-range of temperature conditions, and that the use of this data and the Council's approach missed the risk of extreme temperatures, both hot and cold. Other commenters felt the Council's analysis overstated the risk. Other commenters expressed concern that the Council's choice to use an hourly temperature shape based on a single historical year missed potential load risks from other shapes within the historical record. Comments on the draft plan relative to how the Council dealt with climate change data in the demand forecast came from, among others, Seattle City Light, Pacific Northwest Utilities Conference Committee (PNUCC), Oregon Department of Energy (ODOE), Renewable Northwest, GridForward, and Northwest Natural.

In past power plans, the Council included only the direct effects of temperatures on loads, and largely used historical temperature records for those effects. For the 2021 Power Plan, the Council expanded its analysis to incorporate climate change impacts in the load forecast analysis and load forecasting model, and accounted for both direct and indirect effects. Specifically, the load forecasting model included two layers of climate impacts on electricity use: 1.) impact of direct variables (e.g., climate-adjusted daily temperature and precipitation), and 2.) impact of indirect variables (e.g., increase in air conditioning, increase in migration (population), increase in commercial space and multi-family units). Additionally, even though not incorporated explicitly in the load forecast model, the Council also took into consideration qualitatively the impact of indirect variables that have stochastic behavior (landslides, floods, wildfires).

How the Council incorporated climate change data into its demand forecasting and in other power system analyses is discussed in the 2021 Power Plan in Sections 3 and 6. The Council used climate data developed by the federal agencies' River Management Joint Operating Committee (RMJOC). The RMJOC may have been the source, but the Council staff reviewed the current state of climate science and analysis to be comfortable that the RMJOC information reflected an objective assessment of the underlying climate change data itself. And while the RMJOC selected 19 climate scenarios to model and analyze the climate impacts on hydro power, flood risk management, water supply, ecosystem, and biological operation, for purposes of the power plan and in the context of power system adequacy, the Council selected three scenarios of the 19 that could approximately represent the full range of the RMJOC scenarios and the range in summer and winter hydro generation and winter heating degree days and summer cooling degree days, which serve as proxies for winter and summer loads. The scenarios chosen were selected to provide the widest range of flows and temperatures for the winter and summer periods – the three that could reasonably represent the ensemble winter heating and summer cooling degree-day

distributions of the 19 RMJOC scenarios and did not contain significant bias. The Council is comfortable that the scenarios selected do not overstate or understate the risk of extreme temperatures on loads. While the Council did not do a broad analysis between the historical and climate-adjusted data, the Council did look at trends in historical and climate change temperatures, and those details are available here: https://www.nwcouncil.org/2021powerplan_trends-in-historical-and-climate-change-temperatures/. Additionally, the historical data was also used as a point of comparison in the climate scenario selection process, with those details available in the supporting materials here: https://www.nwcouncil.org/2021powerplan_climate-change-scenario-selection-process/.

More detailed descriptions as to how the Council developed the energy use forecasts, and how it reasonably incorporated climate change information in doing so, can be found in the supporting materials for the 2021 Power Plan. See https://www.nwcouncil.org/2021powerplan_energy-use-forecasts/ (and following pages); https://www.nwcouncil.org/2021powerplan_integrating-climate-change-policies-and-data/ (and following pages) The supporting materials also document the load forecasts without climate change impacts, for comparison. The Council fully discussed and vetted its approach for selecting the climate scenarios with the System Analysis Advisory Committee, and similarly discussed and vetted how the information was used in the work to shape a range of demand forecasts with the Demand Forecast Advisory Committee in meetings from 2019 -2021. https://www.nwcouncil.org/meeting/system-analysis-advisory-comm-webinar-january-23-2020/; https://www.nwcouncil.org/meeting/system-analysis-advisory-committee-march-4-2020/; https://www.nwcouncil.org/energy/energy-advisory-committees/demand-forecast-advisory-committee/

Even though the Council concluded it reasonably integrated into the analysis and considered the potential for extreme temperature events, it also recognized this is an issue of concern to many, especially given recent heat and cold events in California and Texas, which severely stressed both states' power systems. For this reason the Council added to the final 2021 Power Plan (at 118-19) a research and development recommendation for further work to asses and understand the potential for extreme weather events and their effects on the power system. The Council recommended that Bonneville and regional utilities work with the Council to develop better methods to estimate the frequency, magnitude, and duration of such events, and integrate the investigation of the impact of such events into the full range of power system models, including those used by the Council in its power planning processes.

Regarding the hourly temperature shaping concerns, because the Council's load model requires hourly temperature data, the RMJOC daily temperatures were transformed into hourly temperatures, which were then used by the Council in selecting its three climate scenarios from the broader 19, as discussed above. After working through one climate scenario using historical hourly temperatures to transform the climate data forecasted regional daily minimum and maximum temperatures into hourly temperatures, staff determined that it would be impractical to use all 71 historical hourly temperature shapes for every future climate year from 2020 to 2049 for all climate scenarios. Therefore, to calculate hourly shapes for the daily climate temperatures, staff worked to find a representative hourly shape that was the closest to the average of the 71 historical hourly shapes and provided an appropriate representation of the minimum and maximum temperatures for the climate scenarios. The Council's exact procedure used to calculate representative hourly shapes for the climate scenarios can be found here: https://www.nwcouncil.org/2021powerplan_transforming-climate-change-daily-hourly-temperatures/; but, the results of this work showed that the historical year-1987 hourly temperature shape was the closest to the 71-year average curve for every future year from 2020 to 2049 in all climate scenarios. Therefore, year-1987 was used to transform the climate daily temperatures to hourly temperatures for use in selecting the three climate scenarios and as an input in the load forecasting model. Given the impracticality of using all 71 historical hourly temperatures and the comprehensive procedure used to calculate an appropriate representative hourly shape, the Council is comfortable relying on the single historical year and is not concerned potential load risks were missed that would impact the demand forecast overall in doing so. Even so, recognizing the complexities of integrating climate data and the potential impact on planning for the electric system, the Council did recommend in the power plan a broader regional conversation on methods to adapt our forecasts to a changing climate in the future (See Section 10, Recommendations on Research and Development). More information on how climate change data was incorporated into this plan can be found here:
https://www.nwcouncil.org/2021powerplan_summary-climate-change-scenarios/
https://www.nwcouncil.org/2021powerplan_methodologies-incorporating-climate-change-projections-loads/
https://www.nwcouncil.org/2021powerplan_incorporating-climate-change-economic-and-demographic-forecasts/. And presentations to the Demand Forecast Advisory Committee and the Council regarding the development of the load forecasts can be found here: https://www.nwcouncil.org/energy/energy-advisory-committees/demand-forecast-advisory-committee/
https://www.nwcouncil.org/2021powerplan_committee-and-council-presentations/

The issue of greater attention concerned the impact of decarbonization policies. Many commenters took issue with how the Council considered and incorporated the implementation effects of state decarbonization and climate policies, stating that the Council did not reasonably consider and incorporate the implementation of these

policies and understated the projected impact on regional loads of the coming electrification of building, transportation and other uses, leaving the region with an inadequate resource strategy. Some commenters took particular aim at how the Council estimated the increase in electrification of transportation, and on how the Council considered the potential of hydrogen fuels for transportation and the indirect impacts on electrical loads.

Besides the way the Council incorporated electrification projections into the range of demand forecasts, the Council also analyzed a “pathways to decarbonization” scenario – commenters asked for clarification or modification as to how the Council created, focused and incorporated this scenario into the plan, and also clarification or greater explanation as to how the Council considered the results of this scenario analysis in developing the new resource strategy. Other commenters challenged the value of the decarbonization pathways scenario as too speculative and unrealistic and of little value and asked the Council to remove reference to it from the plan.

More generally, a number of commenters considered the decarbonization/electrification issue to be one of the most important or the most important issues that the Council faced in the plan, and were concerned that if mishandled, the resulting resource strategy would leave the region with an inadequate power system – and connected that risk to other uncertainties underlying the plan and its resource strategy. For just one example, a comment from the Northwest Energy Efficiency Alliance (NEEA) asked the Council to consider “the possibility that the pace of transportation electrification and renewable resource development remains uncertain and very influential. A faster-paced electrification and slower resource development could leave the region with a substantial resource deficit, a risk that could be mitigated by investment in demand side resources.” Other than NEEA, comments on the draft plan relative to how the Council dealt with the potential impacts on loads resulting from electrification due to decarbonization policies – and the critical relevance to the resource strategy - came from, among others, the Washington State Energy Office, Oregon Department of Energy, Columbia River Inter-Tribal Fish Commission, PNUCC, Seattle City Light, Puget Sound Energy, Benton PUD, Washington Public Utility Districts Association, Northwest Energy Coalition, Climate Smart Missoula, Friends of 2 Rivers, 350 Montana, Spark Northwest, Ecumenical Ministries of Oregon, Northwest Natural, Northwest Gas Association, Tri-Cities Development Council, and many individual commenters.

As for the comments regarding the states’ decarbonization policies and the Council’s consideration of the effects of these policies on loads, the Council generally agrees that if the pace of electrification under these decarbonization policies truly does accelerate, the region could experience a significant increase in loads more rapidly than expected,

which would likely require resources beyond the recommendations provided in the plan's resource strategy. However, the Council worked to balance the uncertainty in the pace and extent of electrification that might occur from the implementation of these policies with the underlying analytical data currently available to the Council about electrification and loads and resources in order to produce a resource strategy that allows the region to get through a time of significant change and yet still assures the region an adequate, efficient, economical and reliable power supply without over-investing in new resource, at least until the next power planning period begins.

To this end, as noted above, for the first time in the 2021 Power Plan, the Council included the transportation sector as a consumer end-use to inform the regional demand forecast as well as to gain insights into how the electrification of vehicles may impact regional emissions. Three transportation cases were developed for the plan that included a model reference case (forecasts a gradual shift to plug-in electric vehicles in the light duty vehicle (LDV) category over the planning horizon; heavy duty vehicles (HDV) remain primarily in diesel fuel); a high electric case (builds on reference case, with an aggressive move to plug-in electric vehicles in the LDV category, additional electrification of transit buses and the addition of electric trucks in the HDV light category); and a model H2E case (builds on the high electric case, with a transition to hydrogen fuel cell vehicles in the HDV Med and Heavy categories.). Based on this modeling, the Council expects substantial growth in this sector relative to the amount of electricity used today and recognized that continued electrification of the transportation sector could result in an even more significant growth in the demand for electricity in the region, especially by the end of the power planning time horizon. From these cases, it is clear that the range of potential future electric loads is large and primarily dependent on the extent of electrification of transportation (as well as buildings). The Council developed the plan's resource strategy in consideration of these needs.

With regard to a particular set of comments on how the Council characterized the potential impact of hydrogen-fuel vehicles on load compared to the impacts of battery electric vehicles, as described above the Council did consider the impact of battery electric vehicles on loads as well as the impact on loads from hydrogen fuel-cell vehicles, and recognized that the widespread use of electric and hydrogen-fueled vehicles would have a substantial impact on future electricity load growth. For fuel cell vehicles, however, the hydrogen must be produced and delivered to filling stations, which creates new electricity demand and potentially significant growth in demand in the Northwest if produced in region. Therefore, given this potential and the demand to the system, the Council also estimated the indirect electricity that would be required for hydrogen fuel production. Additional information on this analysis can be found in the

supporting materials here: https://www.nwcouncil.org/2021powerplan_transportation-model-findings/; https://www.nwcouncil.org/2021powerplan_hydrogen-and-fuel-cells/

At the same time, the Council also recognized that forecasts of the pace and extent of electrification into the future are very uncertain, especially trying to forecast whether and when the rate of electrification accelerates beyond the current trends. Forecasts on this topic beyond the first five or six years of this plan are especially suspect. The Council did several things to take this risk into account. First, rather than try to project something so uncertain and different into the 20-year demand forecast, the Council used scenario analysis to look at a very high-end case of decarbonization and electrification – the pathways to decarbonization scenario. In this scenario the Council analyzed the impact on the electricity sector of efforts to substantially reduce economy-wide greenhouse gas emissions. The policies the Council tested included replacing gasoline vehicles with electric ones, relying on the transportation cases above, as well as updating the efficiency of appliances and equipment in homes, business, and manufacturing at an accelerated pace. This analysis pushed the limits of the resource expansion that could be supported by the Council's analytical structure. But clearly reaching the economy-wide decarbonization targets set forth in these decarbonization policies would substantially increase demand for electricity, which if matters played out in the way indicated in the scenario, would drive load growth to a level that was hard to model in terms of resource needs. Certainly, the region would need substantially more of all the resources in the resource strategy – increased addition of renewable resources, energy efficiency, demand response, and batteries and other forms of storage.

Second, the Council recommended continued close coordination with policymakers and utilities that are pursing regional emissions reductions and utilizing strategies that increase the adoption of zero or low-emission vehicles that increase electric load. More information on transportation modeling for the plan can be found in the supporting materials here: https://www.nwcouncil.org/2021powerplan_transportation/; https://www.nwcouncil.org/2021powerplan_transportation-model-findings/.

Third, the Council also added information to the final 2021 Power Plan (in section four – discussed in the next section) showing maximum incremental energy needs in winter and summer for the 2020s and 2030s emerging from the analysis of all the various planning scenarios, including the decarbonization scenario. This information helped illustrate how much the system needs varied between the different scenarios with some scenarios showing substantial needs. The Council developed its resource strategy using this information.

Fourth, in response the Council included elements in the resource strategy that reflected the uncertain impacts of electrification. The Council recommended the region acquire at least *3,500 megawatts of renewable resources in the resource strategy, while also recommending that policymakers pursuing aggressive electrification policies and affected utilities evaluate adding even more renewables within their portfolios. The Council also noted that the possibility or risk of greater electrification was a significant factor that supported the Council's decision to include a regional target range for energy efficiency substantially greater than what was a starting base for that target – and could be the reason for the region to pursue energy efficiency investments at the upper end of the range. See https://www.nwcouncil.org/2021powerplan_cost_effective_conservation_recommendation_summary/. In addition, the Council recommended as part of the model conservation standards that jurisdictions pursuing economy-wide decarbonization policies should pursue multiple approaches to reduce carbon, including significant energy efficiency investment. Substantial, ongoing, sustained energy efficient investments have the potential to significantly diminish the risks to the power system of accelerated electrification from decarbonization. Increased demand from accelerated electrification would also justify greater investments in the regional portfolio of demand response, storage, and distributed generation resources.*

In sum, the Council is confident that the plan's resource strategy recommendations are reasonable and sufficient to accommodate the acknowledged range of uncertainty in the pace of electrification through this transition period, based on the data and information available to date. Still, the Council recognized in several places in the plan that electrification from climate policies in certain states could possibly increase utility loads rapidly, requiring building resources beyond the recommendations laid out in the plan in order to maintain regional system adequacy. See, e.g., 2021 Power Plan at 4. The Council commits to monitoring these developments closely, regularly reporting to the region, and reconsidering the resource strategy as necessary. See 2021 Power Plan at 3-5, and see the discussion on the resource strategy and resource adequacy below.

The Council also received comments calling on the plan to support or recommend a ban on the use of natural gas in buildings.

This comment is addressed here, as the only relevance this would have to the Council power planning would be its effects on load demands from the electrical system. The Council has to consider the impacts of policies and laws of this type for the potential electrification of end uses, and thus make sure the system can handle the increases in demand, impacts to resource adequacy, and an increased need for new resources. But,

the Council does not have a role under the Act to recommend changes in the existing economy other than the addition of new conservation and generation resources.

Wholesale electricity price forecast

One of the usual inputs into the plan analysis is a forecast of wholesale electricity prices, as the wholesale price of electricity is a key driver in decisions to develop and operate resources. To develop a reasonable range of future prices requires more than an assessment of current resources and demand and more than a look at just the Pacific Northwest, given how interconnected is the western grid. The Council had to assess possible changes in demand and a buildout of future resources throughout the western grid to generate wholesale power prices for the region.

What to assume as a buildout of resources across the west proved more than the ordinary challenge in this power plan. Traditionally, forecasted increases in load have been the primary driver for the construction of additional resources, as load-serving entities were assumed to build or acquire to meet load growth, while respecting reserve margins. But, the Council also has to assume that utilities will also meet state and other legal requirements and stated policy goals as well. And state laws and related policies requiring that utilities have certain increasing percentages of renewable resources and clean energy resources will require the addition of substantial resources across the west. The scale of that assumed buildout has been a contentious issue throughout the power plan process. The Council worked for many months, much of it through its advisory committees, to describe a buildout that met state laws and utility policy commitments, allowed for the retirement of resources on known schedules, met expected load demands, and allowed for traditional reserve margins – that is, resulted in an adequate system. The scale of the resource buildout that met those requirements, and the resulting impacts on wholesale power prices and on market dynamics across the west, was so different than past experience that it has been difficult for many to countenance.

Illustrative of this issue were comments from Bonneville on the draft power plan asking the Council to alter its approach to the treatment of resource expansion outside the region. Bonneville noted that it did not find any of the expected buildouts to be reasonable or to closely resemble that of especially California's own view of its projected resource buildout. "Our main concern is that the assumed new resource builds, particularly over the next few years, are not feasible given traditional Greenfield financing, permitting, construction timeframes, policies, and cost caps." Bonneville encouraged the Council to reconsider adjusting (lowering) its baseline resource buildout to be more reflective of California's policies and forecasts. And as Bonneville noted, "[d]ue to important relationship between the Western Interconnection buildouts, the resulting electric price forecast, and NW resource adequacy results, Bonneville believes

the adequacy issues (measured in loss of load probability) are understated in the draft Plan."

The Council exhaustively vetted the approach to the westwide resource buildout and the resulting wholesale electric price forecast taken in the draft plan through its Generating Resources Advisory Committee and System Analysis Advisory Committee and in public meetings with the Council's Power Committee. The plan's supporting materials detail how the Council carefully analyzed the renewable and clean energy legal requirements and policy commitments across the west, how the Council modeled the impacts of those requirements, and the resulting effects on the wholesale price forecast. See https://nwcouncil.org/2021powerplan_wholesale-electricity-price-forecast/; https://nwcouncil.org/2021powerplan_wecc-wide-buildout-results/; https://nwcouncil.org/2021powerplan_existing-policies/; https://nwcouncil.org/2021powerplan_wecc-existing-system-and-retirements/

The Council agrees that how to forecast resource expansion given the current legislative and economic environment is an evolving pursuit by industry and researchers. But the Council did not see a path to changing the baseline approach of assuming current generating technology and that existing legislative mandates would in fact be met, as dramatic as the results of that compliance might appear. Also, the resource strategy considered more than the baseline conditions, including limitations on westwide wholesale market impacts, and limitations on the use of existing natural gas, in the analysis and deliberations that underlie the resource strategy in the plan.

The Council will continue to work with Bonneville and others on improvements in how to forecast resource expansion across the west and its impacts on wholesale prices, on markets and on resource needs in the northwest. The Council also recognizes that this is one of a number of key issues directly relevant to the issue of whether the power plan's resource strategy is sufficient to preserve regional resource adequacy. As explained in the overarching discussion of the resource strategy and resource adequacy later in this document, the Council concludes that it handled this and other key matters in a reasonable fashion in shaping the resource strategy, but the Council also commits to ongoing monitoring developments and assessing impacts to resource needs and resource adequacy.

Resource Adequacy - Assessment

The 2021 Power Plan includes Section 4 on “forecasting regional reserve and reliability requirements.” This section includes a discussion of the meaning of “reserves” under the Act, a similar discussion of what it means for a power system to be “adequate,” and then a description of the Council’s methods for assessing regional power system needs to maintain adequacy. The latter includes methods and information for identifying gaps between existing system capabilities and anticipated future requirements and for evaluating future resource capabilities to fill those gaps.

The draft power plan also included in this section an assessment up to 2025 of the adequacy of the existing power supply. Draft 2021 Northwest Power Plan, pp. 4-24 to 4-26. A rolling assessment of the adequacy of the regional power supply five years out is a task the Council undertakes annually, with the assistance of its Resource Adequacy Advisory Committee. https://www.nwcouncil.org/energy/energy-advisory-committees/resource-adequacy-advisory-committee/

This adequacy assessment drew a substantial amount of attention and comment both prior to the release of the draft power plan and in the comment on the draft plan. Some concerns stemmed in part from the fact that the Council has been transitioning from the model it had been using as a primary tool for the adequacy assessment – the “classic” GENESYS – to a redeveloped GENESYS, and the results given by the two models differed substantially, with the redeveloped model indicating far less of a regional resource adequacy issue than the older model even in the face of resource retirements in the region. Other concerns stemmed from the fact that the resulting adequacy analysis, using the new model, indicated an adequacy issue in 2023 that went away by 2025, resulting more from market dynamics that affected resource dispatch than from the addition of new resources. Another set of concerns stemmed from the fact that the redeveloped GENESYS model includes a more detailed and sophisticated set of dam-by-dam hydrosystem operations than the classic GENESYS model, and some commenters were concerned the model still needed further testing and improvements before being satisfied it appropriately modeled hydrosystem operations. Others expressed concerns that how the new model incorporated market dynamics and thermal plant operations was still unclear and needed further vetting. Also, commenters expressed concern that the message resulting from the assessment – indicating little or no regional resource adequacy issues in the next five years – seemed inconsistent with the recent assessments of many others in the region and intuitively inconsistent with a region and a western interconnection facing significant resource retirements in the next few years.

The Council staff had reasonable explanations for all these differences and complexities, discussed in detail at the Council's advisory committees and in the Council's Power Committee prior to the release of the draft power plan. The Council also held several advisory committee meetings and a three-day technical workshop open to the public to display and vet the redeveloped GENESYS model. Even so, many commenters on the draft power plan still expressed these and other related concerns. And the collective conclusion of these commenters was that the draft plan's assessment of resource adequacy had not been sufficiently vetted – nor had the model – and that this section in the plan should be heavily caveated or removed with a recommendation to take up further work on the assessment of adequacy after the completion of the plan. Without detailing all the specifics, comments of this nature came from, among others, the Public Power Council, PNUCC, PNGC, Public Generating Pool (PGP), Northwest Requirements Utilities (NRU), Washington Public Utility Districts Association, Bonneville Power Administration, Oregon Department of Energy, Seattle City Light, Puget Sound Energy, Benton PUD, Flathead Electric Cooperative, Western Montana Electric Generating & Transmission Cooperative, Idaho Consumer Owned Utilities Association, Northwest Gas Association.

The Council removed the five-year adequacy assessment from section 4 of the final plan. The Council is confident the work that had been done was reasonable and the methods and conclusions were not fundamentally flawed. But, the Council also acknowledges the substantial amount of discomfort still remaining in many of the people and entities participating in and reviewing the power plan development. Fortunately, while the annual five-year adequacy assessment is a tool that is useful outside of the power plan to identify publicly potential adequacy issues, it is not necessary to conduct or include an adequacy assessment of this type done in this way for the power plan. Other parts of this section in the plan and other sections (such as the discussion of the demand forecast in section 3 and the discussions of the resource development plan in section 6) identified both the necessary planning work and the relevant information that allowed the Council to analyze potential load demand and system needs, identify gaps between existing system capabilities and anticipated future requirements, and evaluate future resource capabilities to fill those gaps. Further explanation is provided in the supporting material – see https://www.nwcouncil.org/2021powerplan_2021-power-plan-resource-adequacy-overview/. The Council also discussed the power plan approach to adequacy throughout the power plan process with its Resource Adequacy Advisory Committee and System Analysis Advisory Committee.

With regard to actually analyzing system needs for the power plan, the Council also added to Section 4 information showing maximum incremental energy needs in winter and summer for the 2020s and 2030s emerging from the analysis of various planning

scenarios. This information helped illustrate how much the system needs varied between the different scenarios – a topic also highlighted above, with regard to the demand forecast, and below, in the discussion of the plan's resource strategy and system adequacy - with some scenarios showing substantial needs even within the 2020s. The Council developed its resource strategy using this information.

The Council has committed to continuing to work on improving how it assesses resource adequacy, through its Resource Adequacy Advisory Committee and in other public forums and consultations. This includes further vetting and discussion of the redeveloped GENESYS, of the assumptions and inputs into the model, of the results of any adequacy assessment resulting from the analysis. The Council will make this evaluation of methods and models part of its priority commitment to the ongoing monitoring and assessment of the resource adequacy situation in the Pacific Northwest.

The Council also received comment, such as from Renewable Northwest, recommending that the Council move away from its reliance on a single adequacy metric, annual Loss of Load Probability (LOLP), to a set of metrics with greater granularity that would provide a more precise estimate of power supply adequacy, such as Loss of Load Events (LOLEV), Loss of Load Hours (LOLH), and Expected Unserved Energy (EUE).

The Council had also identified the need to assess the value of additional adequacy metrics prior to the work on the 2021 power plan. The Council will make the evaluation of the metrics part of the ongoing work described above to assess how the Council and the region assess resource adequacy.

The Council also received comments such as from the Northwest Energy Coalition calling on the Council to review and enhance all its power planning models. The Council should review its entire modeling ecosystem that includes the combination of the Regional Portfolio Model, AURORA, and GENESYS, and in so doing, the Council should seek out opportunities to collaborate with other organizations advancing state of the art power system modeling.

The Council's priority focus first will be on the redeveloped GENESYS model and its use in assessing resource adequacy. But yes, the Council plans to review the value of the current suite of models it uses in power planning prior to the next power plan. The Council will do so in an open collaborative fashion, again primarily through its advisory committees, and will look to engage with and learn from others involved in sophisticated power system modeling wherever they may be.

Existing Generating Resources/System

Hydropower

Expected generation from the region's existing hydropower system is an important input into the power plan considerations leading to the new resource strategy. The 2021 Power Plan process included a number of issues and comments relevant to the hydropower system.

modeling – use of the redeveloped GENESYS

An issue and related comments (such as from Seattle City Light) about the Council's development and use of a revised GENESYS model have been discussed above in the section on the adequacy assessment. The Council is confident the revised model provided a useful look at streamflows and hydropower generation sufficient for the 2021 Power Plan. The Council staff spent a considerable time discussing and vetting the model with the advisory committees, in a technical workshop, and in conversations with the Council's Power Committee. That said, the Council also committed the staff to continue working on improving and vetting the model, in a transparent and public way.

modeling – climate change impacts on streamflows

In past power plans the Council used historical streamflows in the Council's GENESYS model for the simulation of the operation of the hydroelectric system. However, for the 2021 Power Plan, and after lengthy public consultation through the advisory committees and before the Council, the Council decided to use data from three of the 19 climate scenarios developed by the federal agencies' River Management Joint Operating Committee (RMJOC), and use that climate scenario data to develop and incorporate into the GENESYS model climate-modified streamflows. A detailed description of how the Council simulated the streamflows for the power plan and estimated the resulting generation can be found at https://www.nwcouncil.org/2021powerplan_integrating-climate-change-policies-and-data/; https://www.nwcouncil.org/2021powerplan_summary-climate-change-scenarios/; https://www.nwcouncil.org/2021powerplan_climate-change-scenario-selection-process/; https://www.nwcouncil.org/2021powerplan_trends-in-historical-and-climate-change-river-flows/; https://www.nwcouncil.org/2021powerplan_genesys-model/; https://www.nwcouncil.org/2021powerplan_climate-scenario-flows-for-genesys/.

While a number of entities had concerns about the redevelopment of the GENESYS model, as noted above, participants and commenters by and large agreed with or did

not have a concern with the concept and manner in which the Council decided to include climate-change impacts to streamflow and generation in the baseline conditions analyzed for the plan's resource strategy. *See, e.g.,* the comments on the draft plan from Seattle City Light "support[ing] the innovative approach the Council has taken to quantitatively consider climate change in this Plan, such as the effort to include projected impacts from climate change on both load and generation resources. This is a prudent recognition that historical climatology is likely to not fully capture weather variability within the planning period, particularly farther into the future. The general conclusions of climate change impacts on hydrogeneration corroborates findings in the scientific literature over the past decade."

That said, Seattle City Light commented further that the Council's analysis could advance understanding of the level of climate change impacts if the Council compared the climate change-influenced results with "a traditional approach using historical climatology." More concern came in the comments of the Public Generating Pool, noting that while the Council's work "is a step forward," it came with a cost. "[I]nstead of considering 80 different streamflow scenarios, the studies in this Draft Power Plan consider only 30 streamflow scenarios. An examination of the differences between these data sets shows that the lowest water year captured in the New GENESYS study is 92 Maf, whereas the 80-year historical set includes two water years have water year volumes of 77.6 Maf and 81.6 Maf. PGP believes that the data set used by GENESYS does not capture a sufficiently wide range of water conditions to accurately determine adequacy and advises the Council to re-examine the New GENESYS streamflow data set to see if lower water years could be included."

The PGP comments focused on historical annual runoff amounts. The Council did not select and incorporate climate-modified streamflows based on annual runoff amounts. Instead the Council focused on winter and summer flows and resulting generation. Without going into significant amount of detail here (that can be found at the links above), the scenarios selected for winter streamflows and generation were all comparable to the generation under the lowest historical winter generation. And the scenarios selected for summer were all lower than historical. The Council discussed its proposed approach to selecting climate scenarios and deciding how to simulate streamflows and generation with its advisory committees numerous times, and received general support to proceed.

All that noted, the Council has also committed to continue working over the next year with its advisory committees and in other ways on an ongoing effort to vet and improve the redeveloped GENESYS model, including how it models dam-by-dam operations, flows and generation.

hydrosystem operations required to benefit spawning, rearing and migration of juvenile and adult fish – current and future

As discussed in the plan itself, in section 11 (pp 131-32), the Council includes, in all its hydrosystem modeling for the power plan, the system operations required by law for the benefit of spawning, rearing and migration of juvenile and adult fish. When the Council modeled hydrosystem operations for the draft Plan, it incorporated into the model the operations specified in the 2020 Biological Opinions for the operations of the Columbia projects and in the Council's Columbia River Basin Fish and Wildlife Program. This includes required storage reservoir operations, run-of-the river pool elevations, and spill and other passage operations. Expected generation is estimated without violating these requirements. One purpose of the plan's resource strategy, under the Power Act, is to ensure that the operations for fish and wildlife can be reliably delivered while the system also meets load obligations. *See also* https://www.nwcouncil.org/2021powerplan_genesys-model/.

In October 2021, after the Council published the draft power plan for public review and comment, the federal agencies operating the Columbia River System agreed to a slightly different set of spill and run-of-river reservoir operations for 2022, for one year only. *See* *http://pweb.crohms.org/tmt/JointMotion_TermSheet_CourtOrder_OCT2021.pdf.* The Council received comments on the draft that the Council should rerun the model analysis incorporating these newly agreed-to operations, such as in the comments from the Columbia River Inter-Tribal Fish Commission,

The Council decided not to revise the operations in the baseline conditions and re-run the model analyses for all the scenarios. The Council added a footnote to the plan itself (p. 131) explaining why. Although a formal analysis or report was not available, Bonneville Power Administration staff publicly reported Bonneville's estimate that the operations agreement for 2022 would reduce the federal system's average hydro output approximately 45 aMW compared to the operations that were to occur in 2022, as specified in the 2020 Columbia system Biological Opinion. See: https://www.newsdata.com/nw_fishletter/bpa-estimates-power-impact-of-additional-spill-in-agreement/article_5b341294-56c6-11ec-9028-e702aac7ae67.html. The Council confirmed this estimate in an email exchange with Bonneville staff. What was reported by Bonneville accords with a back-of-the-envelope assessment by Council staff. The size and duration of that change in generation is not of a magnitude to affect the resource strategy, so the Council decided not to go to the expense and time required to update the baseline operations and rerun all the models. As the Council begins its work

after the 2021 Power Plan to further vet and improve the GENESYS model, it will also update the operations required for fish and wildlife.

The Council also received comments on the draft that the Council should not assume the operations required for fish and wildlife will remain static through the power plan period. The Council should at least acknowledge that fact, and some asked the Council to analyze at least one if not a range of scenarios with additional operational requirements for fish and wildlife, such as additional spill, further limits on the run-of-the-river pools during migration season, or additional water out of storage dedicated to flows and temperature benefits for fish. Comments of this nature came from, among others, the Columbia River Inter-Tribal Fish Commission, the Washington Department of Fish and Wildlife, Idaho Rivers United, and the Orcas Power and Light Cooperative.

The Council agrees that future operations for fish, like so many other power system characteristics, are likely to be different in the future than today. Different operations have not been agreed to or decided upon, so the Council could not include different operations in the baseline conditions for the model. The Council can run scenarios during a power plan – or outside a power plan - with different fish operations, to see what the effects might be on the resource strategy, just as it does for other future uncertainties. The Council has limited staff resources and time during the power plan process, and decided to allocate those resources to formal analysis of other uncertainties during the planning period.

The Council did take this possibility into consideration even so, in a number of ways. The Council assumes that if hydrogeneration were further limited, whether due to changes in the required fish operations, or because of limits that might be imposed in the future on the use of the hydrosystem's flexibility (see next issue), the implications for the resource strategy would be in the same general direction as the current elements of the plan's resource strategy – i.e., system needs would increase, and additional resources would be needed to maintain system adequacy, to be addressed most likely by some combination of additional renewable resources, energy efficiency, demand response, and storage. This possibility or risk of further limits on hydrogeneration was one of several factors that supported the Council's decision to include a regional target range for energy efficiency substantially greater than what was a starting base for that target. See https://www.nwcouncil.org/2021powerplan_cost_effective_conservation_recommendation_summary/. It would also be a factor, for example, in why the Council's regional renewables target was to acquire "at least" 3500 megawatts of additional renewable resource capability, a minimum that may need to be higher if other uncertainties reduce amounts available.

Second, the Council recognized more generally that one of the significant factors influencing the determination of the resource strategy and its sufficiency for resource adequacy was the generation available from the hydrostystem. And so the uncertainty in the future output of the regional hydroelectric system is one of the uncertainties the Council commits to monitoring and reporting on regularly and reconsidering as matters develop. See the discussion on the resource strategy and resource adequacy below.

Finally, as noted above the Council committed, following the power plan, to continued work to vet and improve the redeveloped GENESYS model, which has excellent capabilities for analyzing a range of future hydrosystem operations. And the Council has committed to organizing and supporting an investigation into the changing nature of the hydrosystem operations in the wake of the addition of substantial amounts of renewable resources, with an aim "to explore the possible benefits and consequences of different hydropower system operations to identify a path forward that provides greater benefit to both power and fish" (pg 111). That investigation will need to consider several future scenarios for fish operations. As the discussions currently underway around the future of fish operations proceed, they should provide significant information for modeling relevant scenarios.

hydrosystem flexibility important to integrating renewable resources and system adequacy, and the possible implications for the river and for fish

A related issue concerns the implications of the use of the flexibility of the existing hydrosystem to help the region's power system integrate new renewable resources, absorb the changing market dynamics, allow for the retirement of coal-fired generation, and maintain system adequacy. The 2021 Power Plan explains the nature of this issue, at 111 and 135-36. The Council's 2014 Columbia River Basin Fish and Wildlife Program contains measures recommended by the state and tribal fish managers calling on system operators to investigate and to minimize or reduce daily flow fluctuations due to adverse impacts to fish (at 38, 39, 63, 64, 91, 95, 153, 154, 176, 208, 263-64). And yet the power system analyses indicate a system adequacy benefit from using the existing hydropower system's flexibility for increased daily ramping of generation and thus river flows. The Council identified this potential conflict as an issue early in the power plan analyses leading up to the draft power plan, and then highlighted it in the draft 2021 Power Plan, as noted.

The Council received comments during plan development and then on the draft plan from across the spectrum recognizing the issue and concerned that or wondering whether the plan's resource strategy and regional resource adequacy conclusion might

be too dependent on hydrosystem flexibility of a magnitude that cannot be sustained. And the Council received some comments noting the issue but calling on the Council to recognize in the resource strategy precisely the benefit to the power system gained by reliance on the flexibility of the existing hydrosystem. Comments on this topic came from, among others, the Columbia River Inter-Tribal Fish Commission (CRITFC), Oregon Department of Energy, Idaho Office of Energy, Public Power Council, Orcas Power and Light Cooperative, Washington Public Utility Districts Association, Idaho Water Users, Northwest Energy Coalition, Renewable Northwest.

CRITFC in particular urged the Council to reconsider its analysis and resource strategy as based on a "flawed assumption" that the hydroelectric system can integrate all the new renewable resources at low or no cost, which then created an artificially low cost that crowded out resources such as additional energy efficiency, demand response, and storage. CRITFC also requested that the Council run an additional scenario in which daily ramping of generation and flows was held within a more limited range, to see the effects on other resources needed to maintain system adequacy.

The Council recognized the seriousness of this issue in the 2021 Power Plan, at 111 and 134-35. And it was in the wake of identifying this particular issue that the Council committed, as part of the research and development recommendations in section 10, "to organize and support an investigation into the implications of these changing river flows. This effort will bring together Bonneville, system operators, the federal and state fish and wildlife agencies, and the region's tribes. The goal will be to explore the possible benefits and consequences of different hydropower system operations to identify a path forward that provides greater benefit to both power and fish." (at 111)

The Council decided not to run an additional scenario during the power plan to test the resource strategy implications of a limit on hydrosystem flexibility. Because the dimensions of this issue are just emerging, and the extent of the actual survival impacts to fish from ramping of this nature so unknown, any particular limit chosen for a quick scenario run would have seemed arbitrary. The necessary additional analysis on hydrosystem operations requires substantial additional time to both create and sufficiently vet with regional stakeholders, and would be better pursued in the near future, as part of the Council's ongoing commitment to vet and improve the model, further investigate resource adequacy in a transitioning power supply, and investigate the appropriate role of hydrosystem operations in this future system with corresponding benefits to fish.

Finally as already discussed above with regard to future fish operations, the Council did take into account the risk to the resource strategy from future limits on hydrosystem

generation. The implications for the resource strategy would be in the same general direction as the current elements of the plan's resource strategy – i.e., system needs would increase, and additional resources would be needed to maintain system adequacy, to be addressed most likely by some combination of additional renewable resources, energy efficiency, demand response, and storage. See the discussion below of the regional resource strategy and resource adequacy. The Council will monitor and assess this factor closely. And see, for example, that the possibility or risk of further limits on hydrogeneration as one of several factors that supported the Council's decision to include a regional target range for energy efficiency substantially greater than what was a starting base for that target. See https://www.nwcouncil.org/2021powerplan_cost_effective_conservation_recommendation_summary/.

lower Snake River dams

Throughout the power plan period, the Council received public input asking the Council to analyze a scenario that would explore the resource strategy implications of removing the four federal dams on the lower Snake River; recommend the removal of those dams; recommend these dams be preserved as an important part of the system; and/or maintain the Council's approach of not engaging in an analysis of the lower Snake River dams in this power plan. Comments on the draft power plan echoed one or more of these points from state agencies, Indian tribes, environmental and fishing groups, utilities and utility organizations, other river users, and hundreds of individuals. The entities include, among many others, the Columbia River Inter-Tribal Fish Commission, Washington Department of Fish and Wildlife, Washington State Energy Office, Washington Department of Energy, Northwest Energy Coalition, Idaho Rivers United, Idaho Conservation League/Columbia Riverkeeper, Environment Washington, Cascade Volcanoes Chapter of the Great Old Broads for Wilderness, Southern Resident Killer Whale Salmon Initiative, Washington Public Utility Districts Association, Oregon Municipal Electric Utilities Association, Salmon River Electric Cooperative, Idaho Water Users.

The Council explained its approach to the issue of the lower Snake River dams in the 2021 Power Plan, at 136-37. See also the discussion in the supporting materials at https://www.nwcouncil.org/2021powerplan_cost-effective-methodology-providing-reserves/. To reiterate here as well:

The Council's task in the Power Plan under the Northwest Power Act is to recommend what new conservation and generation resources should be added to the existing system. That "existing system" analysis has to include consideration of resources the

Council knows will be retired during the planning period. The Council did that in this power plan.

The Council's task in the Power Plan under the Act is not to assess whether existing resources should be retired, assess whether they are or are not economically viable, or recommend whether they be retired. This includes the federal and non-federal dams of the existing system. Instead, our task is to develop a resource strategy of new cost-effective conservation and generating resources to be added to and compatible with the existing power supply, while also taking into account any planned retirements. That is what the Council did in the 2021 Power Plan.

As a planning agency, the Council can and often does ask "what ifs" to test what would happen to the future needs of the power system and resource strategy if something changed that is not yet planned or expected, including the implications for the new resource strategy if the Council lost the output of an existing resource. The Council does this for information's sake, for the Council and others, to help the Council and others assess risk and change and possible needs. When the Council does this kind of analysis the focus is, again, always on what would be the effect on system needs and thus the new resources strategy if this event happened, not on whether the event (the retirement of an existing resource) should occur.

The Council has engaged in this type of analysis both within and outside of a power plan process, just as it continues to look at other future uncertainties that might affect the new resource strategy - such as demand and price forecasts or conservation costs and availability. For just a few examples, in the 1990s, outside of any power plan, the Council power staff analyzed the new resource needs and system impacts if the lower Snake dams were removed. Also, in the Sixth and Seventh Power Plans the Council evaluated power planning scenarios that included, for example, possible removal of the lower Snake dams (6th Plan); the planned and unplanned loss of a generic large carbon-free resource (7th Plan); and removal or significant reductions in the output of coal plants not yet scheduled (both). In this current power planning effort, the Council included a scenario among others to assess what would happen if the dates of coal plant retirements accelerate.

All such analyses are fully consistent with the Council's new resource planning authority under the Northwest Power Act. The Council does not have to do these kinds of analyses as part of its power plan – it can decide to do such an analysis, in or out of the power plans. From these types of analyses the Council and others gain information, information that helps when the times comes for the Council to develop the least-cost, acceptable-risk resource strategy recommendation as part of the power plan, and in the

face of substantial future uncertainty from all directions. Other interested parties in the region benefit from the planning analyses of the Council, consistent with and fulfilling the Council's public engagement and public awareness mission in the Act, such as (among others) the general requirement in Section 4(g) of the Act that the Council take steps to "inform the Pacific Northwest public of major regional power issues" and "insure widespread public involvement in the formulation of regional power policies."

On this basis, and given the other complicated power system transition issues the Council had to address during this plan, the Council decided it was not an appropriate use of limited staff time and resources during this power plan to once again run a scenario analyzing the power system implications of the retirement of the dams on the lower Snake River. At the same time, the Council recognized that "there may be value to the region, following the completion of the power plan, in analyzing the power system effects if the output of the dams were no longer available sometime in the future, including what replacement resources would be needed to achieve similar levels of reliability. The Council will begin scoping and considering whether to undertake this analysis after the plan is adopted." 2021 Power Plan, at 137. The Council will decide later whether running this study is an effective use of its resources.

The Council has been consistent and clear on this all along – in past power plans, in the work prior to the draft in the power planning process, in the draft, in the supporting material for the draft, and now in the final 2021 Power Plan and in this response to comments.

Most of the comments on this topic were not focused around particular provisions of the Northwest Power Act. But one comment from one individual focused in particular on the language of one of the required elements of the plan – that the plan contain "an analysis of reserve and reliability requirements and cost-effective methods of providing reserves designed to insure adequate electric power at the lowest probable cost" (Section 4(e)(3)(E). The commenter argued that this provision cannot be satisfied unless the Council analyzes and compares the cost of existing system resources to new resources in providing reserves and developing the resulting resource strategy. And, in the perspective of this commenter, information from the federal agencies' recent Columbia River System Operations (CRSO) Environmental Impact Statement (EIS) indicated or established that the regional power system would be more expensive with the federal dams on the lower Snake River remaining in place and operating than if removed and their power services replaced.

The Council responded to this comment in the supporting material on the Cost Effective Methodology for Providing Reserves, in a "Note on the Power Plan's resource strategy,

including cost-effective methods of providing system reserves – and the relevance under the statute of existing system resources." *https://www.nwcouncil.org/2021powerplan_cost-effective-methodology-providing-reserves/ The explanation will not be repeated here – for the full response to comment this explanation is incorporated by reference here. Note only that the argument in the comment is not an accurate way to read or understand this or any other provision of the Act.*

For the record, note also that the underlying premise in the comment – that the information in the CRSO EIS concluded that the power system costs and power supply rates would be reduced with the implementation of the dam removal alternative – is not consistent with the facts and discussion in the CRSO EIS. As noted in the supporting materials, in the 2020 Columbia River System Operations Environmental Impact Statement, the relevant federal agencies estimated the effects of dam removal would add hundreds of millions in dollars to the region's power system costs compared to the no action alternative. See e.g., CRSO EIS, https://www.nwd.usace.army.mil/CRSO/Final-EIS/#top, Chapter 3, pgs. 3-10, 3-960, 3-977 (Table 3-181), Appendix H, pgs. H-1-10 to H-1-12, H-4-14 (Table 4-12), H-4-17 (Table 4-15)). The commenter presented an incorrect map from the EIS of projected rate impacts – the correct map is Figure 5-4. MO3 Average Residential Rate Pressure by County (% Change from the No Action Alternative)." It comes from page H-5-43 of Appendix H (Power and Transmission), and it shows that the federal agencies' power system analysis of MO3 (the dam removal alternative) resulted in upward wholesale and retail rate pressure, whether looking at a "least cost portfolio" or a "zero carbon portfolio." The map is consistent with page after page of information and figures in the associated text in Section 3.7 of Chapter 3 and all of Appendix H. The commenter also presented a summary table from Appendix Q of the CRSO EIS for the premise that costs would be less for the dam removal alternative than any other alternative, including the "no action" alternative or the preferred alternative. That chart – Table 7.3 on page Q-7-6 – actually depicts federal system implementation costs only, meaning that if the dams were removed, the costs of operating and maintaining the federal system, that is, the costs of operating and maintaining and capital improvements at the dams and required fish mitigation costs - would obviously be less than they are now if the dams were removed, even accounting for the costs of physically removing the dams, which is the only other component of this limited cost table. The costs considered in this portion of Chapter 3 of the EIS (Section 3.19) and Appendix Q did not include and had nothing to do with the costs of replacement resources and other power services, as the text and other figures of both the relevant section of Chapter 3 and the entirety of Appendix Q make obvious. Again, the total costs to the regional power system and the ratepayers were analyzed and reported in Section 3.7 of the EIS and Appendix H, with the results

described above. The Council did not analyze the costs, rate impacts or economic status of these dams itself; the point here is only to note that it is the opposite of accurate to claim that the CRSO EIS presented information to the Council proving the costs of the regional power system would be less without the dams than with them.

Council's Fish and Wildlife Program

The Council received a related comment from the Northwest Resource Information Center asserting that prior to adopting a 2021 Power Plan "the Council must" reopen its fish and wildlife program and "produce a new draft program, and ultimately a Snake River salmon restoration plan that will ensure achievement of the salmon restoration intent of the Act" and then in a revised draft of the 2021 Power Plan "the Council must explicate the quantifiable environmental costs and benefits of the proposed new energy portfolio/plan compared to the Federal Columbia River Power System status quo and, compared to the Snake River salmon mandate of the Power Act," "explicating all priceable and non-priceable benefits" of making changes in the Federal Columbia River Power System necessary to restore Snake Rivers salmon to productive levels while maintaining an economic and reliable power supply."

The Council, as required by the Northwest Power Act, did call for recommendations and amended the Fish and Wildlife Program prior to its review of the power plan that led to the 2021 Power Plan. The Council adopted program amendments based on the recommendations, especially the recommendations of the state and federal fish and wildlife agencies and the region's Indian tribes, again as required by the Act. See 2021 Power Plan, at 138-39 (Section 12: Fish and Wildlife Program); and also 131. No entity challenged at the Ninth Circuit the resulting program for failure to be adopted consistent with the statute; no entity other than NRIC commented in the power plan process on the need to reopen the fish and wildlife program before adopting the power plan. In addition, as noted above, the power plan effort itself is a planning effort to decide what new cost-effective conservation and generation resources to add compatible with the existing system, and not an examination of the value of the existing system. In these comments, NRIC continues an incorrect view of what the statute requires that the Ninth Circuit rejected in NRIC's challenges to the Sixth Power Plan and the 2014 Fish and Wildlife Program.

Existing Generating Resources/System

Natural Gas (and existing fossil-fueled generation in general)

Natural gas-fueled power plants are a significant part of the region's existing power system. One of the 2021 Power Plan's conclusions is that effective use of those plants over the next decade will help to maintain regional system adequacy as the power system transitions to greater amounts of renewable resources. Beyond that the future availability of the existing natural gas plants is murky at best, as at least two states in the region – and California and others in the west - have laws or policies aiming to have 100% of the generating resources serving load in their states be free of greenhouse-gas emissions by sometime before mid-century, a trend likely to accelerate. In addition, utilities themselves have put goals in place to transition away from greenhouse gas generating resources, for example, Idaho Power, which set a goal in 2019 to provide 100-percent clean energy by 2045. This is the context for comments and perspectives the Council received during the power plan period and on the draft power plan relevant to existing natural gas generation (addressed here) and new natural gas plants (addressed in a different section below).

natural gas price forecast

The Oregon Department of Energy (ODOE) commented that the Council should revisit its natural gas price forecast to ensure that the 2021 Plan adequately captures the risk of higher gas prices and what that would mean for the plan's resource strategy.

The natural gas price forecast is discussed in the 2021 Power Plan at 55-56, with extensive details and explanations in the power plan's supporting materials, starting at https://www.nwcouncil.org/2021powerplan_natural-gas-price-forecast/ and continuing on through several web pages. The Council included a range of prices developed across a suite of gas delivery points, including major gas hubs, power plant delivery points, and the city gate. Continuing a recent trend, the Council forecasts projected relatively low natural gas prices. The Council also recognized, in its price forecast and in developing the regional resource strategy, that natural gas prices can be volatile, skyrocketing on a daily or weekly or monthly basis often due to supply disruptions, as the region experienced in October 2018 with a pipeline rupture in British Columbia, as well as the winter troubles in Texas in early 2021.

The Council completed the natural gas price forecast for the power plan in the fall of 2019, after significant work by the staff with the Council's Natural Gas Advisory Committee and with the Council's Power Committee. As the Council developed and

decided on the draft 2021 Power Plan, and during and after the comments on the draft plan, the staff continued to monitor price developments and update the supporting materials for the price forecast. The Council did not find that events after the fall of 2019 provided a reason or need to revisit or update the forecast. In particular the Council staff concluded, and the Council agreed, that the price forecast range covered recent episodes of price volatility. Other than the comment from ODOE, the Council did not receive comment urging the Council in this direction.

The Council did recognize the risk and uncertainty around the availability and price volatility of natural gas in developing the resource strategy. For example, the possibility or risk of greater-than-expected generating costs – whether the costs of new resources or the costs of operating existing generation – was one of many factors that supported the Council's decision to include a regional target range for energy efficiency greater than what was a starting base for that target. See https://www.nwcouncil.org/2021powerplan_cost_effective_conservation_recommendation_summary/. In another example, the Council ran a scenario that included explicit emissions pricing on the dispatch of all resources in the west, one way in which gas prices could be higher on a sustained basis – regional renewable additions increased by just over 13% over 20 years (p. 84-85). And in general the Council recognized that what might happen to the availability of natural gas generation or natural gas prices was one more uncertainty or risk to the success of the plan's resource strategy. See the discussion below of the regional resource strategy and resource adequacy. The Council will monitor and assess this factor closely.

retire natural gas/all fossil-fuel generation

A number of individuals commented that the Council should recommend that all natural gas plants in region be retired (or that all fossil-fueled plants be retired) or that the Council recommend that the states adopt or accelerate the dates by which natural gas generation should cease.

As discussed above with regard to hydropower projects, the point of the Council's work on the power plan under the Northwest Power Act is to analyze and recommend what new conservation and generation resources need to be added to the region's power supply to maintain an adequate, efficient, economical and reliable power supply. Our task under the Act is not to recommend the retirement of existing system resources. The Council does need to take into account decisions made by others to retire, constrain, or reduce the output of existing resources so that we may then analyze and decide what resources need to be added to assure the region retains an adequate, efficient, economical, and reliable power supply. We have done so for this plan. The

Council considered the laws and policies in place that will affect future availability and use of the existing natural gas plants (as well as the development of new natural gas facilities, discussed in the section below on new resources). The use of the existing plants is not limited within the planning period, and no existing plants have planned retirement dates within the planning period. The Council's analysis indicates that effective use of these plants will be an important factor in maintaining regional system adequacy in the next decade as coal plants are retired and substantial amounts of renewable resources with different characteristics are added and integrated, even as the Council also recognized that "uncertainty remains over the role of existing natural gas-fired power plants beyond this decade." See 2021 Power Plan, at 4-5, 42, 49-50, 57-59, 60-61, 104, 116; https://www.nwcouncil.org/2021powerplan_existing-policies/; https://www.nwcouncil.org/2021powerplan_baseline-conditions/; https://www.nwcouncil.org/2021powerplan_organized-and-limited-markets-energy-and-capacity/; https://www.nwcouncil.org/2021powerplan_early-retirement-coal-generation/; https://www.nwcouncil.org/2021powerplan_greenhouse-gas-regulation-cost-and-impacts/; https://www.nwcouncil.org/2021powerplan_pathways-decarbonization/.

The Council has committed in this plan to monitor and evaluate the region's evolving system and policies and to report this information to the region as new details become available. This includes tracking developments in law and policy and in resource development to assess how these factors are affecting the availability of use of the existing natural gas plants. See Section 1 of the 2021 Plan and the overarching discussion of the resource strategy and resource adequacy below.

analyze retirement of natural gas/all fossil-fuel generation

A comment from the Washington Public Utility Districts Association recommended that the Council run a scenario to investigate the resource strategy implications from retiring not just the coal plants but also the region's natural gas plants.

For the reasons noted above – trends in state legislation and policy and other system developments will eventually begin to constrain the use and existence of the existing natural gas plants - analyzing the impacts to the power system and the new resource strategy of the retirement of natural gas plants is indeed an investigation the Council will have to undertake at some point in the future. This may be a key topic for discussion in the next power plan.

Existing Generating Resources/System

Nuclear

Individuals commented that the plan should recommend that the region retire the region's existing nuclear generating.

As discussed above with regard to hydropower projects and natural gas plants, the point of the Council's work on the power plan under the Northwest Power Act is to analyze and recommend what new conservation and generation resources need to be added to the region's power supply. Our task under the Act is not to recommend the retirement of existing system resources. The Council does need to take into account decisions made by others to retire, constrain, or reduce the output of existing resources so that we may then analyze and decide what resources need to be added to assure the region retains an adequate, efficient, economical, and reliable power supply. The region's one nuclear plant is not scheduled for retirement, and no law or policy developments are putting its continued use at issue.

The Council's analysis for this plan indicated that effective use of the regional power system's existing resources, including the region's one nuclear plant, will be important in helping to maintain regional resource adequacy while retiring coal generation and adding and integrating substantial amounts of renewable resources with different system characteristics. See 2021 Power Plan, at 3-5, 58.

Conservation

This section is the first in a shift to the *new* resources considered in the 2021 Power Plan. In developing the power plan's new resource strategy, the Northwest Power Act directs the Council to give priority to resources that are cost-effective, with first priority to conservation. An energy conservation program to be implemented under the Act, including model conservation standards, is then the first-stated element of the power plan.

For the 2021 Power Plan, the Council recommends that the region acquire between 750 and 1,000 average megawatts of energy efficiency by the end of 2027 and at least 2,400 average megawatts by the end of 2041. The lower end of this recommended range represents cost-effective energy efficiency acquired at a moderate pace based on stakeholder feedback and recent historical activity, whereas the higher end of the range represents cost-effective efficiency that is acquired more rapidly (2021 Power Plan, at 33-34, 45).

Of that regional target, the Council recommends that Bonneville acquire between 270 and 360 average megawatts of cost-effective energy efficiency by the end of 2027 and at least 865 average megawatts by the end of 2041. This amount represents 36 percent of the overall regional target, based on an assessment of the cost-effective conservation potential in areas served by power purchased from Bonneville. Within the six-year target, the Council recommends Bonneville acquire a minimum of 243 average megawatts of cost-effective energy efficiency through Bonneville's programs, including self-funded utility contributions, and Bonneville's participation in NEEA's market transformation activities. (2021 Power Plan, at 97-98)

The 2021 Power Plan's energy conservation program can be found in section 5, at 32-41, and additional important considerations, recommendations and discussions of conservation's role in the resource strategy can be found at 3-4, 43-46, 59, 61-63, 79-81 (resource development plan), 97-100 (Bonneville and energy efficiency) 108-11, 116-17 (implementation, research and development recommendations relating to conservation). Extensive supporting materials on conservation describe and explain the basis for the Council's conclusions and recommendations. https://www.nwcouncil.org/2021powerplan_sitemap/; https://www.nwcouncil.org/2021powerplan_conservationinpoweract/. The Council made extensive use of its Conservation Resources Advisory Committee to introduce, discuss, and vet the conservation supply curves and other conservation information for the 2021 Power Plan, and much of the detailed technical information is found on the web pages devoted to the CRAC. https://www.nwcouncil.org/energy/energy-advisory-

committees/conservation-resources-advisory-committee/; https://www.nwcouncil.org/2021-power-plan-technical-information-and-data/. Finally, the Regional Technical Forum, sponsored and managed by the Council, has been an ongoing source of energy savings estimates for specific conservation measures, feeding information into the power plan process as well. https://rtf.nwcouncil.org/

How the Council analyzed conservation and established the 2021 Power Plan's conservation targets generated substantial comment throughout the planning process, with most - if not all - of the issues echoed again in comments on the draft plan.

regional target and methodology for setting target

The Council received substantial comments on the regional conservation targets throughout the power plan process, including on the draft plan, and on the methodology the Council followed to determine the appropriate levels of cost-effective conservation. Many commenters supported the Council's conservation target, the considerations that the Council used to develop the regional target range, and/or the fact of the Council stating the energy efficiency target as a range. Many commented that setting the regional conservation target as the range acknowledged the uncertainty inherent in planning conservation acquisition in the current context and appropriately recognized that individual utilities' needs and abilities to achieve savings will differ. Comments of this type came from, among others, the Bonneville Power Administration, PNUCC, Public Power Council, Northwest Requirements Utilities, Western Montana Electric G&T, Idaho Consumer-Owned Utilities Association, Oregon Municipal Electric Utilities Association, Washington Public Utility Districts Association, Flathead Electric Cooperative, Orcas Power and Light Cooperative.

Some of these commenters, even while generally supportive, were skeptical that the Council's baseline and scenario analyses fully justified the range or the higher end of the recommended range, or that it would be possible or appropriate to implement the higher end of the range, or were opposed to comments from others calling on the Council to set the target at or above that higher level (e.g. Public Power Council, Flathead Electric Cooperative, Oregon Municipal Electric Utilities Association. Washington Public Utility Districts Association (WPUDA)). WPUDA commented, for example, that a 500 average MW (aMW) lower-end target would better reflect the cost-effective level determined in most model runs, and that any argument about the need to preserve efficiency infrastructure was a poor argument to support the proposed 750 aMW figure.

Many others commented that the regional conservation target should be higher than 750-1000 aMW range proposed by the Council. Some of the same commenters also called on the Council not to adopt a range but instead the set a point target, preferably at the upper end of the range. The reasons given were many, primarily falling into two broad categories. One comment thread was that the Council is underestimating the increase in energy demand that is to come from economy-wide electrification due to the impact of decarbonization policies. (*See* the discussion of the demand forecast above.) The Council needs to set a higher target to maintain and strengthen the existing conservation program foundation, as that foundation will be needed for further expansion as the region implements new clean energy and climate policies and takes on new demand from transportation and building electrification. A Renewable Northwest comment labelled the Council's rationale as creating an artificial competition between renewable energy and energy efficiency that is contrary to the deep decarbonization goals that multiple states in the region are currently on track to achieve.

The other (and related) comment thread supporting a higher target was that in the determination of how much conservation is cost-effective in comparison to other resources, the Council failed to capture all the economic, energy, and environmental benefits to the power system from conservation. This includes comments that the Council underestimated the resiliency, capacity, flexibility, transmission and distribution deferral, unquantifiable environmental, non-energy, and/or equity benefits of conservation measures.

One particular individual (David Baylon) commented that the plan's energy efficiency supply curves were missing substantial potential because of the methodology used, comments primarily from a decarbonization perspective. The Small Business Utility Advocates commented with concern that the plan may not use the best data to draw accurate conclusions regarding commercial customers and thus the Council should review this customer class, the data the Council are using, and the Council's conclusions regarding whether the plan considers the small commercial customer class conservation potential accurately and equitably.

NEEA provided the Council a particularly extensively set of comments on the topic of the Council's cost-effective methodology. While generally quite supportive of the Council's energy efficiency programs and conservation methodology, NEEA also commented that the Council's methods for identifying and calculating costs and benefits for conservation undervalued the contribution of conservation to system resiliency and its ability to avoid or mitigate the impact of extreme weather events; treated tax credits differently between conservation measures and renewable generation, depreciating the comparative value of energy efficiency; incorporated forecasted declines in capital costs

for solar and other renewables, but not for conservation measures; valued renewable energy credits (RECs) in a way that overly benefitted renewable resources compared to conservation; did not quantify environmental costs and benefits consistently between conservation and generating resources; failed to recognize the value of non-energy benefits of conservation that are important but difficult to quantify; and significantly underrepresented the deferred transmission and distribution costs assigned to energy efficiency.

Many commenters integrated the two threads, and then tied their concerns to the larger issue of regional resource adequacy, epitomized by the comments of the Northwest Energy Coalition, the Washington State Energy Office, and the Columbia River Inter-Tribal Fish Commission. Summarized as: The Council should revisit its cost-effectiveness methodology for conservation for two purposes. First, the calculation of cost-effectiveness should be increased to incorporate the full range of conservation system value, including energy, capacity, and flexibility. Second, cost-effectiveness should be broadened to integrate consideration of decarbonization policies and other concerns such as equity. Council should increase the conservation targets in the 2021 Power Plan to maintain at least the level of activity called for in the Seventh Power Plan and work with Bonneville and utilities to try to exceed even those targets. The role conservation plays in ensuring resource adequacy in the current context is undervalued in the draft plan. Energy efficiency provides a hedge against the possibilities of greater electrification than expected and/or new renewables or the transmission needed to bring them to load do not come online as expected by the Council's analysis.

Comments of these types came from the Washington State Energy Office, Oregon Department of Energy, Columbia River-Inter-Tribal Fish Commission, Washington Department of Fish and Wildlife, Northwest Energy Coalition, Northwest Energy Efficiency Alliance, Energy Trust of Oregon, Renewable Northwest, City of Missoula, Idaho Rivers United, Climate Smart Missoula, 350 Montana, and several individuals. More generally, the Oregon Department of Energy and Northwest Energy Efficiency Council commented that the plan should recommend the Council initiate a process to re-evaluate its cost-effective methodology for energy efficiency.

Besides the discussion in the plan, the Council described in the supporting materials its conservation methodology and how it applied the methodology in establishing the target range, especially at https://www.nwcouncil.org/2021powerplan_conservation-program/; https://www.nwcouncil.org/2021powerplan_regional-target_energy-efficiency-targets/; https://www.nwcouncil.org/2021powerplan_important-attributes-energy-efficiency/; https://www.nwcouncil.org/2021powerplan_conservation-methodologies/; https://www.nwcouncil.org/2021powerplan_cost-and-benefits-energy-efficiency-

resources/; https://www.nwcouncil.org/2021powerplan_resource-strategy-analysis-energy-efficiency-inputs/; https://www.nwcouncil.org/2021powerplan_cost-effective-methodology/; https://www.nwcouncil.org/2021powerplan_cost_effective_conservation_recommendation_summary/ The Council carefully considered all the comments submitted during development and on the draft plan, and decided to maintain the regional conservation target put forth in the draft in the final 2021 Power Plan. The substantive perspectives in the comments on the draft had been aired and discussed often prior to the draft, in the Conservation Resource Advisory Committee and before the Council and its Power Committee. The Council concluded it reasonably established the methodology and target, based on all the information in its record, as explained in the plan and supporting materials. The Council added detail to a number of these explanations following the comments on the draft, and added footnotes to the plan in section 5 to link especially to the explanation in the supporting materials as to how the Council established the cost-effective level of conservation for the 2021 Power Plan and what is the Council's cost-effective methodology. The explanations in the supporting materials are incorporated here and not repeated.

The Council recognized the unusual context of the 2021 Power Plan for conservation compared to the power plans of the last 20 years, primarily because of the policy drive and legal requirements to require the addition of renewable generating resources to the region's power supply and retire thermal resources, and because the costs of the new solar and wind resources are now so low in relative terms. The comparative value of conservation had to be different and lower at this juncture than in the past, for these reasons. At the same time the Council also recognized a slew of uncertainties affecting the comparative value of conservation, many of them not precisely quantifiable or even the least bit quantifiable at this time. The Council did its best to consider these values as relevant factors in determining the target (see https://www.nwcouncil.org/2021powerplan_cost_effective_conservation_recommendation_summary/), while also recognizing the limits of that effort. E.g., there are conservation measures that provide "resilience," and the Council developed its conservation target with an acknowledgment of that value. At the same time the Council "has not developed a method for quantifying the value of this resilience for inclusion in its power plan modeling. Additional work is needed to determine the valuation of this metric for energy efficiency, along with consideration of how this might apply to other resources." Quote is from https://www.nwcouncil.org/2021powerplan_important-attributes-energy-efficiency/; see also 2021 Power Plan at 36-37, 116-17; https://www.nwcouncil.org/2021powerplan_cost_effective_conservation_recommendation_summary/; https://www.nwcouncil.org/2021powerplan_cost-and-benefits-energy-efficiency-resources/#_otherenben. These sections of the plan have similar discussions

about valuing and considering other power system attributes provided by energy efficiency, such as flexibility and balancing, in determining a regional target for energy efficiency. And the Council included in its research and development recommendations that the Regional Technical Forum "investigate methods for quantifying the value of flexibility and resiliency for energy efficiency measures," while working with other regional experts to ensure symmetrical treatment with other demand-side and supply-side resources. 2021 Power Plan, at 117.

The Council also noted that the possibility of greater electrification from decarbonization policies was a significant factor that supported the Council's decision to include a regional target range for energy efficiency substantially greater than what was a starting base for that target – and could be the reason for the region to pursue energy efficiency investments at the upper end of the range. See https://www.nwcouncil.org/2021powerplan_cost_effective_conservation_recommendation_summary/. In addition, the Council recommended as part of the model conservation standards that jurisdictions pursuing economy-wide decarbonization policies also pursue multiple approaches to handle the additional loads and reduce carbon, including significant energy efficiency investment. Substantial, ongoing, sustained energy efficient investments have the potential to significantly dampen the risks to power system adequacy from accelerated electrification due to decarbonization.

The Council disagrees with comments that the plan's energy efficiency supply curves were missing substantial potential because of the methodology used. For extensive discussions as to how the Council identified conservation potential and the results for the supply curves, see 2021 Power Plan, 33-37, 42-43, 45-46, 61-63, 108-11; and especially all the discussions of conservation potential in the supporting materials: https://www.nwcouncil.org/2021powerplan_conservationpotential/ https://www.nwcouncil.org/2021powerplan_estimating-energy-efficiency-potential/ (and all the sector potential pages that follow, including the commercial class); the discussion of the actions to be taken in support of the target https://www.nwcouncil.org/2021powerplan_actions-support-target/ (and following pages, especially the research discussions of stock assessments and end use load research); and https://www.nwcouncil.org/2021powerplan_addressing-equity-energy-efficiency/. The work the Council did to estimate conservation potential for the supply curves was substantial, reasonable, and well documented. The Council did recognize areas in which further work should be done to improve the assessment of conservation resource potential, such as the action item to develop the commercial end-use intensity dataset to target buildings with high energy intensity. See 2021 Power Plan, at 109-11, and more generally at 34-35; https://www.nwcouncil.org/2021powerplan_addressing-equity-energy-efficiency/. To the extent some of these comments differed with how the Council

estimated the pace and extent of electrification from decarbonization, that is a disagreement in how much potential should be included and discussed above and elsewhere, not a problem with the methodology for assessing potential.

With regard to other comments on the methodology, the Council in particular disagrees with the comments from NEEA that the Council failed to consider costs appropriately or in some way treated resource costs differently or inconsistently between conservation and generating resources. The Council worked hard leading up to this plan to develop a framework for consistent treatment of resource costs, to include the broad range of system costs recognized by the statute, and to include quantifiable environmental costs and benefits in as reasonable and consistent a way as possible. For the discussions and explanations on the resource cost framework, the costs and benefits included for conservation, and the methodology for including quantifiable environmental costs and benefits, see https://www.nwcouncil.org/2021-power-plan-technical-information-and-data/#_OtherMaterial; https://nwcouncil.app.box.com/s/u6q3xu1q1p4be2ydrp28vbyqinag62q7; https://www.nwcouncil.org/sites/default/files/2019_0312_p2.pdf; https://www.nwcouncil.org/2021powerplan_global-assumptions-power-plan/#resource-cost-framework; https://www.nwcouncil.org/2021powerplan_cost-and-benefits-energy-efficiency-resources/#_otherenben; 2021 Power Plan, Section 11; https://www.nwcouncil.org/2021powerplan_methodology-determining-quantifiable-environmental-costs-and-benefits/ E.g., tax credits are not treated differently between conservation measures and renewable generation, as at the time of supply curve development and the decision on the power plan, there were no tax credits to account for in conservation measures. Similarly, there are no RECs for energy efficiency, so nothing to include in costs. With regard to forecasted declines in capital costs, unlike with the costs of solar and some of the other generating resources, the Council did not have clear data to suggest declining costs of energy efficiency measures. In fact, there are several cases where the cost of energy efficiency measures increased. Without clear data demonstrating declining cost curves for specific energy efficiency resources, the Council could not include declining cost factor for conservation measures as for generation. The framework or methodology for including environmental costs and benefits is consistent with the statute and is also as consistent across measures and resources as the Council can reasonably make it, acknowledging that absolute consistency is not required, appropriate in all cases, or always possible. The issue of particular concern, dealt with in the last few power plans, concerned reductions in wood smoke that may occur from the implementation of conservation measures is discussed at length in the environmental cost and benefit methodology.

The Council did not undervalue the value for conservation measures in deferring transmission and distribution costs. The comments about valuing transmission and distribution deferral benefits are also relevant to the demand response measures, and so the topic is discussed in more detail in that section below. Also see the discussion here: https://www.nwcouncil.org/2021powerplan_cost-and-benefits-energy-efficiency-resources/#_DefT&D; https://www.nwcouncil.org/sites/default/files/2019_0312_p3.pdf.

Finally, the Council did not see the need or benefit for calling for an overarching or comprehensive process after the plan to evaluate its methodology for identifying cost-effective conservation. At bottom, the Council is always self-assessing and improving its methodology for determining cost-effective conservation, with the help of its conservation advisory committee and the Regional Technical Forum. The Council identified specific areas to focus on in the near future, as noted above.

Bonneville's comments added a particular gloss to the issues raised about the regional conservation target. While Bonneville was supportive in general of the Council's approach to energy efficiency, and supportive of the conservation target range, Bonneville called on the Council to establish the upper end of the range – 1000 aMW – as the level representing cost-effective energy efficiency acquired at a normal pace, not 750 aMW. Bonneville commented that setting the target at the low end of the range undermined the point of a target range and unnecessarily constrained the conservation measures the Council would consider to be reportable against the target. The region's utilities would be unable to implement a number of important measures that have costs above the level which the Council justified as the cost-effective determination, and it would be difficult to increase the pace of efficiency adoption required to achieve the full proposed target range with the measures within the cost effectiveness threshold. Bonneville strongly encouraged the Council to set the cost effectiveness threshold at the top end of the proposed target range. Bonneville argued that doing so will ensure program offerings meet the needs of end users across all sectors and support small and rural utilities, avoiding major negative impacts to the region's energy efficiency efforts.

Bonneville also commented that the Council should include weatherization measures in the target for energy efficiency. The Columbia Inter-Tribal Fish Commission commented that the plan should recommend that all tribal homes and businesses should be fully weatherized by 2025, and more generally that the plan should recommend that utilities weatherize and achieve net zero energy for all low-income homes by 2035.

The Council did not accept Bonneville's recommendation to establish the level of cost-effective conservation at the upper end of the range – at 1000 aMW – while still retaining the range of 750 to 1000 aMW as the target. As noted above, the Council

understood that the lower end of the range represents cost-effective energy efficiency acquired at a moderate pace, based on stakeholder feedback and recent historical activity, whereas the higher end of the range represents cost-effective efficiency that is acquired more rapidly. To simply set the level of cost-effectiveness at the upper end of the range, even at a moderate pace of acquisition, would not be consistent with the information and analysis in the record. It would also seem to be inconsistent with the requirements of the Power Act, as it would mean the region could meet the lower end of the target and still leave a significant amount of cost-effective conservation undeveloped. There might conceivably be situations in which the Council could recommend the region not develop all the cost-effective conservation identified in the plan. But nothing about the current situation with the region's power supply and the transformative pressures on that system could support that recommendation. The Council realizes that establishing a level of cost-effectiveness for the 2021 Power Plan in a way that totals 750 aMW of cost-effective potential means that there are conservation measures that some feel are desirable to implement but are now too expensive to be considered cost-effective. The Council has taken some of those concerns into account – such as the recommendation to continue efforts at residential weatherization, even if the measures are, for now, no longer cost-effective. And the Council recognizes that individual entities might decide to implement other measures as beneficial to their particular systems and/or their consumers, whether or not implementation can be counted against the regional cost-effective target.

The Council did recommend that Bonneville and others in the region continue to invest in weatherization programs, specifically targeting those structures that are leaky and/or have zero or limited insulation. This should include any tribal-owned structures with these needs. While some of these weatherization measures are not cost-effective relative to the plan, and so those particular savings achieved will not count towards the plan target, these measures are important for a number of reasons, including for extreme weather resilience and to achieve the equitable distribution of the benefits of conservation in an area traditionally cost-effective and already in the progress of widespread implementation. Changing the cost-effective target to accomplish the continued weatherization of unweatherized structures is not necessary and would create its own set of problems. 2021 Power Plan, at 35, 36, 43, 99, 116-17; see also https://www.nwcouncil.org/2021powerplan_important-attributes-energy-efficiency/#resilience; https://www.nwcouncil.org/2021powerplan_addressing-equity-energy-efficiency/#targetedweatherization; https://www.nwcouncil.org/2021powerplan_cost_effective_conservation_recommendation_summary/; https://www.nwcouncil.org/2021powerplan_addressing-equity-energy-efficiency/.

Two miscellaneous comments relating to the cost effectiveness methodology and conservation analysis: The Council received comments recommending that the Council use utility costs as the basis for cost effectiveness. And comments recommending the Council amend its modeling approach to adopt energy efficiency first, and only add in other resources if system needs require a generating resource even after taking into account all possible savings from energy efficiency.

Under the definition of cost effectiveness in the Northwest Power Act, the cost-effective resource comparison must be determined at the level of the "consumers of the customers" – that is, what is cost effective for the end users, not the utilities. It is important to understand the cost impacts to the utilities, but it cannot be the basis for determining what resources are cost effective. The other comment is similarly inconsistent with the Act, or at least not required by the Act. Whatever conservation is cost effective and reliable and available to meet or reduce system needs, of course the resource strategy should call for the acquisition of that conservation on an ongoing basis, before acquiring any other more expensive resource. But if, as is the case with the 2021 Power Plan and renewable generating resources, another resource is less costly than other conservation measures and is reliable and available to meet system needs, it makes sense under the Act to acquire that generating resource instead of moving to more expensive conservation.

Bonneville share of the regional conservation target

As noted in the beginning of this section, in the 2021 Power Plan the Council recommends that Bonneville acquire between 270 and 360 average megawatts of cost-effective energy efficiency by the end of 2027 and at least 865 average megawatts by the end of 2041. This amount represents 36 percent of the overall regional target, based on an assessment of the cost-effective conservation potential in areas served by power purchased from Bonneville. Within the six-year target, the Council recommends Bonneville acquire a minimum of 243 average megawatts of cost-effective energy efficiency through Bonneville's programs, including self-funded utility contributions, and Bonneville's participation in NEEA's market transformation activities.

How to determine Bonneville's responsibility for a share of the regional conservation target has been an issue throughout the development of the power plan, including in discussions with the Council's Conservation Resource Advisory Committee and with the Council's Power Committee before the Council settled on an approach for the draft plan. The comments on the draft plan echoed the issues faced by the Council throughout the process. Comments from, among others, the Northwest Energy Coalition, Washington State Energy Office, and the Ecumenical Ministries of Oregon called for the Council to

maintain what has been a general understanding – although never specified in a power plan itself – that Bonneville should achieve 42% of the regional conservation target. Others, particularly Bonneville's customer utilities recommended and supported the Council reexamining in this power plan Bonneville's appropriate share of the regional conservation target and supported a target share less than 42%. Some of those utilities – Western Montana G&T, Flathead Electric commented that a 36% share was too high, given that the draft plan identified Bonneville's current share of regional load service at approximately 32%. Washington Department of Fish and Wildlife commented more generally that the Council's 2021 Power Plan should continue to emphasize the important role of energy efficiency improvements to help integrate renewables and improve system flexibility, for its own sake and for the benefit of fish and wildlife, and a robust target for Bonneville would help support Bonneville's important leadership role in providing energy efficiency equitably in the region.

The Council described the conservation target share for Bonneville and explained the rationale for that determination in the 2021 Power Plan at 97-100 and in the supporting materials at https://www.nwcouncil.org/2021powerplan_bpa-target_energy-efficiency-targets/ and https://www.nwcouncil.org/2021powerplan_bpa-ce-potential-share/ (and links to measure-level assessment of conservation potential). That explanation is incorporated by reference here and not repeated, except to note that the Council gave careful consideration to this topic and the comments; that the 2021 Power Plan was an appropriate moment to reexamine the basis on which to determine Bonneville's share of the regional conservation target; and that basing that determination of an examination of the conservation potential within the area Bonneville serves is an improvement on setting the Bonneville target based on its share of regional load. The Council also explicitly recognizes the value that Bonneville's implementation of energy efficiency provides to the region to ensure a reliable power system and achieve various decarbonization goals. 2021 Power Plan, at 98.

NEEA commented that the portion of the power plan relating to Bonneville's conservation target should recognize energy savings from codes and standards as a component of market transformation programs and therefore be counted towards the programmatic target for Bonneville.

The Council noted that codes and standards are important mechanisms for acquiring efficiency, particularly in the longer term, and that it is imperative that Bonneville and the regional utilities continue supporting efforts to develop and achieve cost-effective energy savings via improved codes and standards. The Council also needed to be clear what its expectations are for Bonneville to achieve through its own efforts, so did not include savings from codes and standards in the "programmatic" portion of the

Bonneville target, even as a share of savings from codes and standards is part of Bonneville's total conservation target. See 2021 Power Plan at 98, 99; https://www.nwcouncil.org/2021powerplan_bpa-target_energy-efficiency-targets/.

conservation target implementation/enforcement and related matters

The Council received a number of comments relating to implementation of the plan's conservation targets. The Washington State Energy Office commented that the plan should explicitly outline what cooperative actions the region, the Council, and Bonneville should take to address a future shortfall in conservation acquisition and set forth the conditions that trigger these actions. The Northwest Energy Coalition commented that the plan should take note of Bonneville's "considerable, persistent shortfall" in achieving the Seventh Power Plan conservation target, and should recommend steps to make up lost ground. The Public Power Council commented that energy efficiency resources should be acquired from the most effective channels available, including momentum savings, market transformation and programmatic savings – and savings should be counted and recognized regardless of source. The Council also received comments that if a conservation target is not achieved, this should be cause for reexamining the Council's analysis as much as looking at underlying reasons that utilities did not achieve the target.

The 2021 Plan does provide that the Council will work cooperatively with Bonneville to address any shortfalls. The Council also interacts regularly with Bonneville staff and management on conservation implementation, and at any time the Council may, under the Power Act, review the actions of Bonneville to determine the extent to which Bonneville is implementing its responsibilities to the power plan and fish and wildlife program, and to request that Bonneville take an action to carry out the Administrator's responsibilities under the plan. The Council did not need to belabor this point in the power plan. More important, because the conservation shortfall at the end of the Seventh Power Plan became clouded with the issue of whether the plan was clear about what the Council expected of Bonneville with regard to achieving conservation savings from different categories, the Council added the explicit provision to the 2021 Power Plan recommending Bonneville acquire a minimum of 243 average megawatts of cost-effective energy efficiency through Bonneville's programs by the end of 2027, including self-funded utility contributions, and Bonneville's participation in NEEA's market transformation activities, plus additional savings from other mechanisms to a minimum total of 270 aMW. Any shortfall in conservation acquisitions from the Seventh Plan also factors into the assessment of the conservation potential still to be acquired under the 2021 Power Plan. Beyond that, the Council is a planning body, not an enforcement agency and cannot take enforcement actions. And of course, anytime

there might be a shortfall in achieving the conservation targets in the plan – whether regional or Bonneville specific – the Council will assess all the relevant factors as to why the shortfall occurred, including the viability of the target itself in implementation. The Council agrees with the Public Power Council that cost-effective conservation should be acquired from the most effective channels available, including programmatic savings, savings from codes and standards, market-induced savings (identified as "momentum savings" by commenters) and savings from market transformations, and that savings should be counted and recognized regardless of source. The fact that the Council broke out some expectations for achievements from particular sources is intended to help guide implementation in the manner the Council expects to be most effective. For example, market-induced savings and market transformation efforts tend to be long-term acquisition strategies, rather than a means to provide savings in the near term. Programmatic savings, on the other hand, are achievable in the short term, within the plan's action plan period. And without programmatic investments, it is more difficult to achieve as much in terms of market-induced savings in the long-term. But just because the Council provided some expectations for achievements in certain savings categories does not mean the Council will not record the savings from the other categories.

The Council received a set of comments related to the difference between a regional target and the situation of individual utilities. The Columbia River Inter-Tribal Fish Commission (CRITFC) commented generally that the Council, in the plan, should set utility-specific efficiency targets and propose a surcharge on utilities that miss the target. CRITFC also called for the plan to include recommendations for utilities, the Northwest Energy Efficiency Alliance, and other organizations to implement comprehensive programs to improve energy management practices in the commercial and industrial sectors. The Washington Public Utility Districts Association commented that the Council should explicitly recognize in the plan that some conservation programs that are appropriate for the region may not be cost-effective for individual utilities and vice versa, and that the identified regional energy efficiency target range often will not effectively or even accurately "prorate" to cost-effective targets for individual utilities, especially smaller utilities: The Northwest Requirements Utilities was one of a number of utilities and utility organizations to similarly comment that the Council include more recognition that the needs and abilities of individual utilities to achieve savings will differ. The Council also received comments from an individual that the rate structures of publicly owned utilities, and the fact that these rates and rate structures are not regulated, is a major impediment to effective implementation of conservation across the region.

The Council sets a conservation target for the region and for the Bonneville share of the region. It does not have the data, resources, or mandate to set specific conservation targets for individual utilities. The Council's analysis as to whether a conservation

measure is cost-effective does not depend on local or utility-specific considerations – even, as discussed below, the Council does recognize that local or utility-specific considerations may influence how conservation measures are implemented in specific areas. And, the determination of cost-effectiveness for the plan's resource cost comparison as required by the Act must be based on all direct costs to the end-using customer, not just utility costs.

The Council does recognize that the amount of cost-effective conservation potential and the ability of utilities to support conservation in their service territories can differ significantly between areas and utilities. The Council specifically does not intend for its regional or its Bonneville target simply to be understood or allocated proportional to different utilities. The intent instead is to assist individual utilities in determining for their service territory how they can best structure their programs to acquire energy efficiency and is not intended to be prescriptive on how individual utilities should run their energy efficiency programs. The plan explicitly recognizes that "utilities with a rural customer base have significant challenges and fewer resources for implementing cost-effective efficiency programs. These challenges are recognized, and Bonneville and/or other regional organizations such as NEEA should support these rural utilities in reaching efficiency goals." 2021 Power Plan, at 34, 99.

That said, the Council does expect Bonneville to "use the Council's methodology and associated parameters for cost-effectiveness to identify efficiency opportunities at levels that are cost-effective for the region." 2021 Power Plan, at 98. And the Council's methodology for calculating the cost-effectiveness of individual energy efficiency measures relative to the overall regional target can be found here: https://www.nwcouncil.org/2021powerplan_cost-effective-methodology/.

The comments concerning the rate structures and rate regulation of publicly owned utilities should be directed to state legislatures and public utility boards. The Council is not persuaded that the rates dynamic with regard to publicly owned utilities is a significant regional impediment to the implementation of conservation. But even if it is, the Council does not have any say over how utilities set their rates, or whether and how they are regulated in their rate setting by the states.

Northwest Natural commented that some of the language in the model conservation standards (MCS) section relating to the conversion of electric space conditioning and water heating implied the Council is encouraging fuel switching.

The Council clarified the language in the MCS section to make clear this is not the case. The Council recognizes that some jurisdictions are pursuing electrification of end uses

as a part of economy-wide decarbonization. The Council's point in the MCS is to make sure energy efficiency investments are a prominent consideration in this effort to achieve electrification of end uses in a cost-effective manner.

Demand Response

For the 2021 Power Plan, the Council recommended as part of its resource strategy that utilities examine two demand response products for implementation -- residential time-of-use (TOU) rates and demand voltage regulation (DVR) -- to offset the electric system needs during peaking and ramping periods and to reduce emissions. The plan includes a number of additional discussions, considerations and recommendations with regard to demand response measures. This includes that the Council recognized that there may be similar demand response products that are also frequently deployable, low cost, and with minimal customer impact that could provide similar benefits which should be considered in utility planning; the Council recommended Bonneville and regional utilities consider the value of adequacy, capacity, and emissions reduction when evaluating demand response in integrated resource plans and other analyses; that utilities and organizations develop demand response capability in part by leveraging existing energy efficiency infrastructure as part of an integrated demand-side management approach to optimize delivery; and other related matters. The Council then recommended that Bonneville should work to enable and encourage its customer utilities to pursue these and other low-cost and high-value demand response measures in an equitable manner. And finally, the Council noted that it will track regional demand response implementation to assess progress, recognizing that the lack of a regionwide economic signal for capacity makes adopting demand response challenging. 2021 Power Plan, at 4-5, 45, 47, 49, 63-65, 81-82, 89, 100, 101, 105-07, 109, 112-13, 115, 117-18, 132. The Council staff developed and vetted the recommendations regarding demand response with the assistance of especially its Demand Response Advisory Committee; further developed and explained its methodology and assumptions for assessing demand response potential and developing demand response supply curves; explained how and why it went about considering and making conclusions for how to incorporate demand response measures into the plan's resource strategy; and discussed demand response topics and the demand response supply curve development with the Council and its Power Committee all through the process. *See* https://www.nwcouncil.org/2021powerplan_demand-response/ (and follow-on web pages on supply curves, potential, methodology, and interaction with energy efficiency); https://www.nwcouncil.org/energy/energy-advisory-committees/demand-response-advisory-committee/; https://www.nwcouncil.org/2021-power-plan-technical-information-and-data/#demandresponse; https://www.nwcouncil.org/2021powerplan_committee-and-council-presentations/#demandresponse.

Echoing considerations and comments the Council heard throughout the power plan process, the Council received a number of comments related to how the draft plan addressed demand response. This included comments stating that the plan should

require more demand response and have an explicit target for demand response (e.g. Northwest Energy Coalition, Sierra Club, Washington State Energy Office, Washington Department of Fish and Wildlife, Ecumenical Ministries of Oregon, City of Missoula, Climate Smart Missoula). Adding to this point, the Council received comments that the plan should recommend all non-residential customers (commercial and industrial) be moved to time of use rates (Columbia River Inter-Tribal Fish Commission), and that the plan should recommend the Regional Technical Forum integrate equity metrics or additional non-energy benefits into energy efficiency and demand response measures (Ecumenical Ministries of Oregon, Washington State Energy Office, Northwest Energy Coalition). On the other hand, the Council also received comments that the demand response recommendations are optimistic (Orcas Power and Light), and that the plan should recommend utilities consider all demand response products and select the best that fit their circumstances (GridForward).

In previous power plans, specifically the Seventh Power Plan, the Council's analysis selected a certain amount of demand response measures for the resource strategy as a cost-effective way to meet fall, winter and summer peak demands under critical water and extreme water conditions. Thus, going into the 2021 Power Plan, the expected purpose and use of demand response in the power system was to reduce demand during peak hours, and the assumptions initially built into the demand response supply curves for the plan were around this attribute of how to reduce a short-term need during what would be assumed to be very high-price periods. However, in early analysis, these sort of traditional demand response products in the supply curves with limited dispatch showed minimal comparative value in the portfolio model, and consequently demand response was not being acquired in the baseline conditions or scenario analysis. As the plan analysis proceeded, it became clear that this was occurring because as the system evolves, system needs that relate to demand response measures are less about peak adequacy and more about a persistent need to mitigate rapid changes in net load (load minus primarily renewable resources). Given this demonstrated shift in power system needs, and based on follow-on analysis and sensitivity studies run by staff, it was determined that the demand response products that could provide the most cost-effective value within this shifting power system were those that either have minimal customer impact when deployed and thus could be dispatched frequently (e.g. demand voltage reduction, or DVR), or are intended to result in a day-to-day shift in usage patterns (e.g. time of use programs, or TOU). Precisely, the analysis showed that low-fixed cost, frequently deployable demand response programs, like DVR and TOU, could be designed to meet adequacy needs as well as reduce energy costs and emissions associated with meeting peak times. More information on the sensitivity analysis as well as the development of the supply curves can be found here: https://www.nwcouncil.org/sites/default/files/2021_05_p4.pdf;

https://www.nwcouncil.org/2021powerplan_demandresponse-assumptions/; https://www.nwcouncil.org/2021powerplan_total-demand-response-potential/; https://www.nwcouncil.org/2021powerplan_assessing-demand-response-potential/; https://nwcouncil.app.box.com/file/523518165446?s=cu4aqp23gfymbupmbaprvpwzq26jjps8

Through this analysis and working to understand how demand response products may be used to provide the most value to this power system in transition, the Council grappled with many of the issues raised in the comments. The Council debated the amount of cost-effective demand response to include in the resource strategy, specifically deliberating on whether the model analysis was fully capturing the adequacy risk of needing additional capacity in the region, given the accelerating pace of thermal retirements, the different characteristics of the resources replacing the thermal plants (primarily renewables), and the possible electrification of transportation and buildings that would add to load, and the significant value frequently deployable and low-cost demand response products could provide to maintain adequacy. From this deliberation, the Council ultimately recommended more demand response in the resource strategy than the minimum indicated in the baseline analysis, as specified through the recommendation for utilities to examine time of use (TOU) and demand voltage regulation (DVR) products that can help substantially in ramping and peak periods, combined with a potential assessment that 520 megawatts of DVR and 200 megawatts of TOU is available and should be acquired by 2027 to obtain the maximum regional benefit. 2021 Power Plan, at 47.

To the comments concerned that the demand response targets are optimistic, while the Council is assured in the effort undertaken to determine the demand response resource recommendations, the Council also put forth these recommendations with the explicit acknowledgement that there may be barriers to adoption. For example, the Council explicitly recognized that the target recommendation depends, in part, on investments made by utilities to install advanced meter infrastructure (AMI) across their service territories and that not all utilities have done so. Therefore, the Council encouraged Bonneville, regulators, and utility leadership to support investment in AMI architecture. 2021 Power Plan, at 47). The Council also recognized that demand response adoption will be impacted by utility specific needs, where the peak need may or may not correspond to a regional need. The Council also noted that the most strategically valuable program offerings may vary between utilities, and so, other similar products that are also frequently deployable, low cost, and with minimal customer impact should also be considered (see 2021 Power Plan, at 47 and supporting materials here: https://www.nwcouncil.org/2021powerplan_demandresponse-assumptions/). Further, the Council also noted the limitations in current analysis and modeling given the

changing system dynamics, acknowledging that the value of demand response, including its non-energy benefits, may be not fully captured quantitatively. Therefore, in addition to the resource strategy recommendations, the Council also recommended utilities and Bonneville continue to consider the value of adequacy, capacity, and emissions reduction when evaluating demand response in integrated resource plans and other analysis (page 47) and research opportunities to use demand response to support system balancing (page 112). The Council also recommended the Regional Technical Forum explore the mutual benefits of energy efficiency and demand response in providing grid flexibility (37). Lastly, regarding those comments that suggested the plan recommend all non-residential customers (commercial and industrial) be moved to time of use rates, not all potential demand response (DR) products were included in the supply curves, and this product was not included because most commercial and industrial customers already have time-varying charges. Staff coordinated with the Demand Response Advisory Committee on supply curve development and the committee supported not including this in the supply curves. Therefore, the Council concluded that the amount and nature of demand response included in the resource strategy was reasonable and strongly supported by the information in the record, and that less or more would not be as reasonable and justified. More information on the supply curve development, including Demand Response Advisory Committee meeting materials can be found at the links above and here: https://www.nwcouncil.org/2021powerplan_demandresponse-assumptions/; https://www.nwcouncil.org/meeting/demand-response-advisory-committee-june-30-2020/; https://www.nwcouncil.org/meeting/demand-response-advisory-committee-april-12-2021/

As with so many of these other issues in a time of unusual system transformation, the Council recognizes that the value, amount, and types of demand response that might be cost effective and needed is but another uncertainty or risk to the success of the plan's resource strategy in maintaining regional resource adequacy. Significant changes in the pace and extent of electrification or any of a number of other variables could also affect the demand response equation. The Council will monitor and assess these factors and system adequacy closely. See 2021 Power Plan, 3-5, and the overarching discussion below of the regional resource strategy and resource adequacy.

The Council also received a number of comments regarding other demand-side management techniques and products, non-wires alternatives, grid-interactive efficient buildings, and other innovative technologies and distributed energy resources. Many of the comments recommended the Council include more information and analysis regarding the role of these technologies in meeting system needs and load management, as well as the benefits they may provide to deferring investments in the

transmission and distribution system. Some comments also stressed the importance of work on these technologies in the interim to support future power planning analysis. Comments of these types came from the Oregon Department of Energy, Washington State Energy Office, PNGC, Columbia River Inter-Tribal Fish Commission, Northwest Energy Efficiency Council, Northwest Energy Coalition, Ecumenical Ministries of Oregon, and others. Some commenters also recommended the Council expand its regional integrated demand-side management planning efforts to a broader range of customer side resources.

Demand-side management resources, especially energy efficiency, have played a significant role in the Council's power planning and the region's resource portfolio from the very beginning and still do in the 2021 Power Plan resource strategy. The Council agrees with the comments received in terms of the potential benefits these technologies present to the system. The Council also, however, agrees with the sentiment of those comments encouraging additional regional work and research in this area to support additional analysis and information regarding these technologies in future power planning processes. To this point, the Council recommended the region continue to fully fund recent regional efforts to meter and characterize energy use in residential and commercial buildings. This effort will provide information as to how we use energy today and how new technologies may shift and reduce the timing of energy use, ensuring effective investment in all demand-side opportunities in the future. 2021 Power Plan, at 110. The Council also recommended that efficiency programs, through NEEA and others, continue to invest in emerging technology research for efficiency measures to better understand the efficacy and applicability of potential technologies (at 114). In addition, the Council recommended the region consider the role of battery storage, targeted demand response, and other demand side resources to address existing transmission capacity challenges and recommended that utilities and Bonneville consider the value of these opportunities on a case-by-case basis to address local needs (at 113; and also discussed below in a separate section on batteries and energy storage). Further, the Council called upon utilities and organizations, as they develop demand response capability to do so by leveraging existing energy efficiency infrastructure and considering energy efficiency and demand response together as part of an integrated demand-side management approach that optimizes delivery of both resources (at 47). While the Council agrees with the sentiment of the comments in that these technologies may provide ample value in the future in meeting system needs and this should be incorporated into this power plan as appropriate, the Council also sees the need to support additional research into this area at this time to develop further information for use in future power planning analysis, before concluding that more of these activities and technologies should be part of the plan's resource strategy than the level in the 2021 Power Plan.

With regard to the comments related to distributed generation, distributed generation is considered a secondary resource in the 2021 Power Plan and as such was still considered a viable resource option for future power planning needs. More information on the development of resource options and the consideration provided can be found in the supporting materials here: https://www.nwcouncil.org/sites/default/files/2020_0616_p3.pdf; https://nwcouncil.app.box.com/file/455796987510?s=aqip6qjkx2kwu27fdhe3gbog4vwumk9f; https://www.nwcouncil.org/meeting/generating-resources-advisory-committee-september-25-2019/; https://www.nwcouncil.org/2021powerplan_secondary-resources/. More on this topic in the discussion of new generating resources below.

The Council also received comments (also noted above with respect to conservation) stating that the deferred transmission and distribution costs assigned as a benefit to demand response as well as conservation measures were significantly undervalued. Comments of this nature came from the Northwest Energy Efficiency Alliance and the Columbia River Inter-Tribal Fish Commission.

The Council did not undervalue the value of either demand response or conservation measures in deferring transmission and distribution costs. The values incorporated for the supply curve inputs are based on the contribution of such measures in reducing peak winter loads, thus reducing the need for new capacity resources and associated additional transmission and distribution investments. The Council used data from five transmission utilities and four distribution utilities to estimate these values and vetted these values with its advisory committees. For the 2021 Power Plan the Council did assume that conservation and demand response (DR) could defer transmission and distribution by lowering peak loads, and the total value of deferral was at a levelized cost of approximately $9.80 per kilowatt-year (levelized in 2016$). Because the Council's task is to prepare a regional power plan, this deferral value represents an average planning estimate over the entire region, not necessarily a site-specific implementation cost value. Therefore, in some areas demand response could have significantly higher value to defer build and the value would be much higher than the $9.80 cost assigned for the region for purposes of the Council's power plan. There are also areas in the region, however, where such resources have negligible value to defer build, and all of this must be factored into the Council's analysis in establishing a regionwide transmission and distribution (T&D) deferral value for planning. The Council reasonably determined the T&D amount through input from regional utilities and more information on the Council's process for updating the T&D deferral value for the 2021 power plan, the methodology, and the coordination with the utilities to do so can be found here: https://www.nwcouncil.org/sites/default/files/2019_0312_p3.pdf;

https://www.nwcouncil.org/2021powerplan_assessing-demand-response-potential/#_ftn2; https://www.nwcouncil.org/2021powerplan_demandresponse-assumptions/; https://www.nwcouncil.org/2021powerplan_global-assumptions-power-plan/; https://www.nwcouncil.org/2021powerplan_cost-and-benefits-energy-efficiency-resources/#_DefT&D; https://www.nwcouncil.org/sites/default/files/2019_0312_p3.pdf.

The Council also received a couple of comments regarding vehicles, specifically that the plan should recommend that auto manufacturers implement vehicle-to-grid capabilities in all new electric cars and that utilities develop the capability to use the functionality in their service territory. Also, that the Council recommend that automobile manufactures include systems that allow electric vehicles to schedule charging during off-peak periods, and include for Bonneville and utilities to work to improve the efficiency of electric vehicles.

The Council did consider the idea of direct load control of electric vehicle charging systems in the total demand response potential assessments that supported development of the demand response supply curves. Through this work, the Council found that with the current stock and projected growth of electric vehicles (EVs), the cost to implement this product is quite high, and therefore not ultimately included in the demand response supply curves at a cost that would be cost-effective to implement. Also, a well-developed time of use (TOU) program can mitigate some of the impacts of charging during peak times (even if not the same level of control as direct load control, and TOU programs were recommend in the plan's resource strategy. More information on demand response (DR) potential and assumptions is available here: https://www.nwcouncil.org/2021powerplan_total-demand-response-potential/; https://www.nwcouncil.org/2021powerplan_demand-response-general-methodology/; https://www.nwcouncil.org/2021powerplan_demandresponse-assumptions.

New Generating Resources

Renewable resources – wind and solar

amount and characteristics

The 2021 Power Plan's resource strategy calls for the region to add at least 3,500 megawatts of renewable resources by 2027. Renewable resources, particularly onshore wind and solar photovoltaic, have been in the Council's power plans and the region's resource portfolio for several years. Even so, a recommendation of this size for renewable generation in the Council's power plan is a significant increase compared to previous power plans.

The Council received a number of comments on its renewable resource recommendations, including related to the amount recommended, with some comments concerned the amount is too low and others concerned it is too high. Those concerned that amount might be too low pointed particularly to the decarbonization efforts around the region as a basis for recommending additional energy from renewables as well as other resources for the plan's resource strategy. Comments of this type came from, among others, the Washington State Energy Office, Puget Sound Energy, PNUCC, and Northwest Energy Coalition.

Others commented that the Council should not have focused so narrowly on renewable resources for generating resource additions, and that the plan called for too great a build of renewables while not calling for the addition of other types of generating resources. These comments focused on concerns for regional resource adequacy and reliability as the region retires thermal generation that is dispatchable and with high availability and adds only renewable resources with significantly less contribution to capacity. Many of these comments also questioned or disagreed with the levelized costs, expected energy production, and/or associated capacity contributions the Council assigned to renewable resources. Other comments emphasized the adverse impacts to the market of adding additional, cumulative renewables producing significant amounts of energy at certain types of day, which lower market prices to a point where it is difficult for existing thermal plants to commit and compete, presenting added adequacy concerns at times of capacity needs. Comments of this type came from, among others, Benton PUD, Franklin County PUD, Tri-Cities Development Council (and undersigned entities), Salmon River Electric Co-op, Flathead Electric Co-op, PNGC, Western Montana Electric G&T.

The Council also received comments (already noted above in the section on existing hydropower system) from entities concerned about the significant demands placed on hydropower operations in supporting the integration of renewables, recommending the Council re-examine the role that other resources – such as energy storage - could play in helping to integrate renewables. Comments along these lines came from, among others, Renewable Northwest, the Columbia River Inter-Tribal Fish Commission, and Washington Department of Fish and Wildlife.

The issues raised in the comments on the draft echoed issues the Council grappled with throughout the power plan process, including leading up to the development of the draft plan. As discussed elsewhere, the regional electric system is undergoing a significant transition prompted both by economics and by clean and decarbonization laws and policies pushing the region towards non-emitting resources and broader electrification efforts. Because the cost of renewables, particularly utility-scale solar, has rapidly and significantly decreased, an assessment of actual trends and the modeling analysis projected into the future, both indicate significant renewable builds in the region and WECC-wide to meet loads, to meet legal requirements, to quickly and cheaply reduce greenhouse gas emissions from the electric sector, and to provide abundant energy. The region and the west are also experiencing the retirement of coal-fired power plants in particular, due to the same laws and policies as well as increased economic competition from lower cost renewable and existing natural gas resources. Therefore, the power system of the region and west-wide is shifting to renewables at an aggressive pace, and the transition and its impact became even more evident through the Council's modeling and analysis of future needs. The Council's responsibility is to ensure the region maintains an adequate, efficient, economical and reliable power supply through this transition, which required the Council to look closely at both at the energy and capacity value of not just the resources to be added but also of the system's existing resources that are not retiring and how they might be used in the context of adding a significant amount of renewables as well as the conservation measures and certain types of demand response products. The Council remains convinced that it assessed these system capabilities competently and adequately, and the resulting resource strategy is a cost-effective way for the region to handle this transition over the next set of years – that is, that the amount of renewables recommended for addition is cost effective and can be integrated into a system that has sufficient existing generating capacity, especially when that capacity is supported by the capacity value of cost-effective conservation and demand response, and can remain adequate and reliable. Our analysis also projects that there will be times of that market conditions will result in generation curtailment of both these new renewable resources and the existing renewable resources in the region due to more electricity being produced than demand.

The Council is also cognizant that electrification trends and other factors might require the addition of greater amounts of renewables in the region for the system to remain adequate – that is part of the reason the recommendation is "at least" 3500 megawatts. But, the information before the Council did not indicate it was reasonable at this point to assume that more had to be added with certainty, especially in light of what will be added across the west that will be accessible through the wholesale market. Overbuilding can be an economic problem just as difficult as underbuilding, as the region has learned at other times.

With regard to the particular comments on the capacity contribution of various resources, as described in greater detail in the supporting materials, for this power plan the Council developed a method to assess effective capacity for sets of resource portfolios. This differs from past plans where the effective capacity was assessed for individual resources only. Effective capacity is assessed by how much additional demand can be adequately served by an increment of a new resource. The metric used by the Council to quantify this capacity is the Associated System Capacity Contribution (ASCC). The ASCC is not a capacity factor nor the common effective load carrying capability. Rather, the ASCC is measured as the percentage of nameplate capacity that a resource can provide toward meeting the adequacy reserve margin (ARM), which represents the amount of surplus capacity needed above the expected load to maintain an adequate power supply (i.e. meet the Council's 5% LOLP adequacy standard).

A resource's ASCC is assessed by analyzing how much a potential peak-hour shortfall is reduced by adding an incremental amount of the new resource. However, because of the interaction between resources in a portfolio, the ASCC for a specific resource may change as the resource portfolio changes meaning the effective resource capacity contribution varies with the amount of new resources added and varies based on the overall resource mix. (In an overly simplistic explanation, adding renewable resources that produce energy and allow the existing hydropower and natural gas resources to be able to shift their production to times of peak needs means the associated system capacity contribution of adding the renewables can be significantly greater than the capacity contribution of the renewables alone.) Therefore, while the Council's past practice to calculate the ASCC for individual resource types captured the decline in the ASCC when more of a particular resource was added, it did not capture the decline in the ASCC when other types of resources were added. To capture this dynamic interaction between resources, in the 2021 Power Plan, aggregate ASCC values were assessed for many different combinations of new resources and stored in an ASCC array. The ASCC array holds the composite ASCC for every combination of resources studied. Therefore, the ASCC array provides a more accurate estimate of the amount the portfolio's effective capacity increases than compared to using individual resource

ASCC values that could lead to overbuilding or underbuilding. The Council's Regional Portfolio Model then used the ASCC array to assess how much any new resource strategy reduces peak needs, ensuring that viable resource strategies produced adequate power supplies, with the buildouts then checked in the Council's adequacy model (GENESYS) to ensure that any resulting strategy met the Council's adequacy standard (LOLP is under 5% but not zero (overbuilt)). The resources and the two levels of capacity additions for each resource type included in the ASCC array are shown in the supporting materials here: https://www.nwcouncil.org/2021powerplan_associated-system-capacity-contribution.
More information on the ASCC can be found in the supporting materials here: https://www.nwcouncil.org/2021powerplan_needs-assessment/; https://www.nwcouncil.org/2021powerplan_resource-adequacy/. *https://www.nwcouncil.org/sites/default/files/2021_03_p1.pdf; https://www.nwcouncil.org/sites/default/files/2020_0915_p3.pdf; https://www.nwcouncil.org/sites/default/files/2020_08_p4.pdf*
And more information on the System Analysis Advisory Committee, which reviewed and vetted the Council's approach for the ASCC this power plan can be found here: https://www.nwcouncil.org/energy/energy-advisory-committees/system-analysis-advisory-committee/; https://www.nwcouncil.org/meeting/system-analysis-advisory-committee-february-3-2021/; https://www.nwcouncil.org/meeting/system-analysis-advisory-committee-february-17-2021/; https://www.nwcouncil.org/meeting/system-analysis-advisory-committee-march-17-2021/; https://www.nwcouncil.org/meeting/system-analysis-advisory-committee-march-31-2021/.

Thus, utilizing and relying on these metrics in its modeling, as well as follow-on staff analysis, including scenario analyses, the Council recommended the region acquire at least 3,500 megawatts of renewable resources by 2027, in addition to 750-1000 average megawatts of cost-effective energy efficiency, and strategic investment in demand voltage regulation and time of use demand response products, coupled with regional coordination to conservatively operate existing system resources and increase reserves held, which, taken all together, results in a cost-effective approach to maintain an adequate and reliable system through to the next planning period. To arrive at this recommendation, the Council incorporated the clean laws and policies on the books into its planning (see https://www.nwcouncil.org/2021powerplan_existing-policies_clean-policy-analysis/) and, as raised in the comments, grappled with the fact that increasing the amount of renewables has a direct effect on the reserves needed to maintain an adequate system and the fixed cost to the system, as well as the fact that adding more renewables creates dynamics where market costs are so low that it becomes uneconomic for existing thermals to commit day ahead, which impacts available

reserves and adequacy. The Council weighed these concerns against its related findings that decreasing renewables below 3,500 megawatts would also increase the overall system cost, increase the need for other resources, including energy efficiency and natural gas, increase the region's reliance on external markets, and increase the region's emission levels. However, it was also clear from our analysis that the prospect of additional new natural gas being built in the region was quite uncertain due to the difficulties of siting new plants in many parts of the region due to the policies in place and investing in more energy efficiency would come at a higher system cost. Therefore, taking these concerns together, as well as the fact that the scenario modeling showed a range in renewable resource buildouts but none less than 3,500 megawatts, the Council recommended the region acquire at least 3,500 megawatts of renewables, as a cost-effective option for meeting energy needs and reducing emissions. This recommendation, however, is directly connected to the Council's additional resource recommendations for the region, including the recommendation for the region to commit to a more conservative operation of existing power system resources through a reserve pooling effort or a financial incentivization to generators to hold more reserves. Based on the Council's reserves work, this is a more cost-effective option to maintain an adequate system than investing in more energy efficiency than recommended in the resource strategy, which would be a more expensive alternative (as noted above), or relying more on the external market and external generation, which would be a more uncertain and riskier alternative. Additionally, as noted, the Council acknowledges that if electrification from decarbonization efforts proceeds more quickly or deeply than expected, the resource strategy would likely not be sufficient, which is why the Council recommended the region acquire at least 3,500 megawatts of renewable resources, and why the Council also recommended that those localities and utilities pursing aggressive emissions reductions to evaluate adding even more renewables. Further, the Council is committed to continuing to monitor and evaluate the region's evolving policies to keep pace with new developments and report out accordingly. More information on the resource strategy evaluation can be found in this following Power Committee presentation: https://nwcouncil.app.box.com/file/820803495055?s=5duz0rpm5yphnudts2a5gspzbc4j31cw; see also the 2021 Power Plan, at 3-5 and the overarching discussion of the resource strategy and resource adequacy below.

With regard to the comments on the use of hydropower and/or other resources to integrate renewables into the system, comments of this nature have already been addressed in the section on hydropower above. To summarize here: Throughout the power plan, the Council grappled with the issue of how the existing hydropower system is being used and could be used further in helping to integrate the addition of new renewables on the system while thermal plants retire – essentially, using the flexibility of

the hydropower system to reduce generation during the day when abundant energy comes from renewable resources, and ramp up generation at peak and other times when renewable resources are not available. The daily ramping of generation will be accompanied by significant ramping of river flows, only partly moderated at present by system operations required to benefit juvenile migrating fish, such as required project spill. The Council recognizes that less within-day hydro flexibility than can currently be provided will result in a higher system cost and a less adequate system, which would likely mean other new resources that could help integrate renewable resources would become cost-effective for selection in the resource strategy. Therefore, due to both system adequacy concerns as well as concerns regarding how these changes in operation may affect river flows, environmental conditions, and fish migration, the Council committed to organizing and supporting a deeper investigation into the potential impact on river flows of changing hydropower operations due to the increasing penetration of renewable generation. The goal of this investigation will be to explore the possible benefits and consequences of different hydropower system operations to try and identify a path forward that provides greater benefits to fish and power. 2021 Power Plan, at 111, 135-36. The Council also recognized the need to investigate additional approaches to support renewables integration, building off of the Council's reserve analysis and recommendations in the resource strategy noted just above. See 2021 Power Plan, at 112. The Council is committed to continued monitoring and evaluation of the system and bringing the region together to explore the benefits and consequences of different hydropower system operations.

land use impacts

Beyond the amount and characteristics of renewables, commenters also raised concern regarding the associated land use impacts with siting and constructing renewables, especially development of this magnitude in the region, recommending the Council emphasize or better acknowledge potential effects to fish and wildlife, habitat, cultural and traditional resources, as well as impacted communities (see comments from, for example, the Columbia River Inter-Tribal Fish Commission, Idaho Office of Energy and Mineral Resources, Washington Department of Fish and Wildlife, Tri-Cities Development Council, Franklin County PUD, Benton PUD). Another commenter also recommend the Council consider doing something similar to the protected area identified in the Fish and Wildlife Program when exploring renewable resources in terrestrial habitats (Idaho Office of Energy and Mineral Resources).

As discussed in greater detail elsewhere, the Act requires the Council to develop the resource strategy for the plan with "due consideration by the Council for (A) environmental quality…[and] (C) protection, mitigation, and enhancement of fish and

wildlife and related spawning grounds and habitat including sufficient quantities and qualities of flows for successful migration, survival, and propagation of anadromous fish…." How the Council provided this due consideration is outlined in Section 11 of the plan. The land use impacts associated with the development of generating resources is just one matter addressed within that section. To summarize briefly, here, the siting, construction, and development of any generating resources has impacts on land use, fish and wildlife, fish and wildlife habitat, environment, cultural resources, and local communities, and these impacts must be considered by the Council in development of its resource strategy. Given the large-scale of renewable resource deployment indicated in our modeling, both in region and across the western interconnect, staff explored the implications of a build of this size with the Council to capture those considerations not explicitly accounted for in single resource reference plant (see https://www.nwcouncil.org/sites/default/files/2021_06_p1.pdf). Out of this discussion, and in line with the comments received, in the power plan, the Council recommended that the region be mindful of the individual and cumulative impacts when siting new renewable resource development. Specifically, the Council recommended that siting of renewables be carried out in a manner that protects wildlife, fish and cultural resources, with an emphasis to incorporate "least impact, less conflict" siting principles and a prioritize strategic outreach and engagement in siting processes with fish and wildlife agencies, tribes, and communities directly affected by development. 2021 Power Plan, at 134-35. Because the Council is not responsible for siting decisions and siting authorities have no obligations to the Council's power plan, the Council did not go so far as to recommend protected area like principles for siting renewables nor develop a list of criteria or standards for others to consider in assessing the impacts of a renewable build of this size beyond the recommendations noted above. However, the Council is committed to working with stakeholders throughout the region to help guide consideration of the aggregated effects of new renewable resources. 2021 Power Plan, at 134-35.

transmission availability

Finally, commenters raised concerns regarding transmission. These included comments questioning whether the existing transmission system is adequate to support the recommended addition of renewable resources of these amounts; whether the Council is ignoring or underplaying the need for additional transmission and distribution lines to fully integrate a projected renewable build of this magnitude; and whether the transmission system is sufficient to allow the region to rely on the availability of energy from resource development throughout the west to the extent expected by the Council underlying its resource strategy. Commenters recommended the power plan include a more thorough examination of the possibility that transmission constraints and needs

will affect the resource recommendations, working toward a more integrated approach to transmission and generation expansion planning generally. And that the Council's power planning work should include more explanation and discussion about transmission and distribution system elements, or should at least provide additional explanations as to how the omission of these elements might impact the resource selection process.

Comments of these types came from, among others, Seattle City Light, Idaho Consumers Owned Utilities Association, Orcas Power and Light Cooperative, Washington Public Utilities Assn, Western Montana G&T, Puget Sound Energy, Idaho Office of Energy and Mineral Resources, Oregon Department of Energy, Northwest Energy Coalition, Columbia River Inter-Tribal Fish Commission, Grid Forward. The Council also received comments that the plan should include specific recommendations for modernizing and increasing the efficiency of the transmission system, such as from GridForward, Franklin County Commissioners and a number of individuals.

The Council is not a transmission system planner under the Act. But, as the Council assesses new generating resources for potential addition to the system, the Council must consider the costs of the transmission needed to bring the resources to load (in a regional or reference plant sense, not in terms of individual plant siting), and at least assess to a reasonable extent whether the transmission services are available to support the development. That is what the Council did, integrating transmission considerations to a significant extent, even if the planning for expansion is not integrated at the Council. E.g., no generating plants are added in the analysis without information indicating there is available transmission to deliver the output.

The Council acknowledges that one component of a reliable power supply is the security of a robust transmission system. As explained in the power plan, for transmission the Council uses assumptions established by transmission planning organizations to estimate the ability to deliver electricity around the Western electric grid. The Council assumes that these organizations and regional utilities will work together to ensure appropriate investments are made to the transmission system to maintain the current ability to deliver electricity around the region. See, e.g., 2021 Power Plan, at 3-4, 28, 44-45 and 44 n.35, 46-47, 50, 69-70, 112-13. The Council did not study expansion of the transmission system in this power plan nor does the plan's resource strategy have specific requirements for additions to the transmission or distribution system. To undertake an integrated study and analysis as recommended by the commenters was not practical within the timeframe of this power plan and would take additional modeling tools and staff beyond the Council's current capabilities – and presumably also unnecessary, as there are sufficient transmission planning and

operating entities in the region and in the western interconnection, and the Council and these entities can appropriately coordinate on resource development analyses.

In the preparatory work leading up to the power plan process, the Council did undertake an analysis to understand the level of current utilization of the existing transmission system, motivated by the fact that since the Seventh Power Plan it was clear policies and economics were driving towards large renewable builds in the region and throughout the west, while the region had a set and shrinking inventory of open, long-term, firm point-to-point transmission service on a planning and allocation basis, even as the physical utilization of that inventory is modest in most places. The assessment indicated it is entirely common for a given transmission path to be fully contractually encumbered on a long-term firm basis, while still having available physical capacity most or all hours of the year, making it clear that transmission encumberment is a commercial issue, not a physical capacity issue for the region. For more information on this analysis see the supporting materials here: https://www.nwcouncil.org/2021powerplan_transmission/.

Using this analysis and other information, the Council estimated the regional potential of different generating resource reference plants, which along with energy efficiency and demand response became the portfolio model analysis for selection to fulfill future resource needs. Specifically, the Council leveraged the transmission utilization analysis to determine the maximum buildout potential of a given resource in various locations. This maximum buildout was set as an upper bound limit for potential selection by the Council's power planning models, rather than limiting resource potential based on available commercial transmission inventory as was done in past plans. The Council based the maximum buildout for a reference plant on the aggregate regional load on transmission less any technical limitations, which allowed the model to select resource acquisitions based on cost, policy requirements, and operational constraints. Importantly, this methodology did not allow for an overbuild beyond the capabilities of the current transmission system, while it did allow higher utilization of the current system where physically possibly, with safeguards built into the modeling. For more information on this analysis, as well as development of the reference plants, which included GRAC review and vetting, see the supporting materials here: https://www.nwcouncil.org/2021powerplan_methodology-assessing-new-generating-resource-technology-options-power-plan/; https://www.nwcouncil.org/2021powerplan_generating-resource-reference-plants/ . Based on the analysis incorporating this new approach into the reference plants, and staff follow-on analysis, the Council concluded reasonably that the buildout of 3,500 megawatts of renewables by 2027 is feasible and supported within the current transmission system. See, for example, the June 15-16, 2021 Power Committee work

session presentation and discussion. https://nwcouncil.app.box.com/file/820803495055?s=5duz0rpm5yphnudts2a5gspzbc4j31cw).

Even so, the Council also agrees with commenters that transmission is an issue that requires further study, including potential upgrades and additions or improved efficiencies in the existing transmission system, given that sufficient transmission capability on the system is imperative for the region to continue to transition to additional renewable resources. For this reason, relying on the transmission utilization analysis, the Council explicitly stated in the power plan that it is time for the region to reconsider how we contract, reserve, and schedule access. The Council also recommended the region's transmission providers work with utilities, load-serving entities, NorthernGrid, and others to develop a comprehensive review of the existing state of the transmission system; research potential short-term and long-term solutions to alleviate new resource development barriers, while balancing existing long-term contracts and compensation to transmission providers; and explore the potential benefits of implementing a regional transmission operator in the Pacific Northwest. 2021 Power Plan, at 112-13. This latter recommendation was made in tandem with the Council's recommendation for the region to explore non-wire alternatives, including demand response, for the value these technologies may present in deferring transmission and supporting the integration of renewables, together with the Council's commitment to engaging with the transmission planners and others to encourage better research and coordination for the regional power system and long-term planning. 2021 Power Plan, at 112-13.

At bottom, the Council also acknowledged that the conclusions about the adequacy of the transmission system to support the renewables development and market penetration at the scale expected have some degree of uncertainty, while being quite important to the success of the resource strategy in maintaining regional system adequacy. The Council is committed to closely monitoring and reporting on these developments, and will revisit the conclusions if necessary. 2001 Power Plan, at 3-5; and see the overarching discussion of the plan's resource strategy and resource adequacy below.

New Generating Resources

Energy storage – especially as paired with renewable resources

Batteries and other energy storage activities were not selected for the regional resource strategy for the 2021 Power Plan. The Council received a number of comments related to this finding, with nearly all of these comments recommending energy storage in the resource strategy, or at least a greater emphasis in the power plan on the value of storage and the conditions under which it would be a cost-effective addition to the regional resource strategy. Commenters raised concerns that the Council's analytical methods and models do not appropriately capture the capacity and flexibility value of storage, especially as a support role for integrating renewable resources and maintaining an adequate system. These comments included recommendations for further updates to the Council's models and model inputs and assumptions to capture these attributes and refine the resource strategy. A number of the commenters also paired comments about the cost effective value of storage as necessary for integrating renewables and maintaining resource adequacy with comments casting doubt on the ability or desirability of other resources to be available to do so – such as the increasing use of hydrosystem flexibility – or doubt that the elements of the resource strategy are prepared to handle the level of both energy and new capacity that will needed due to electrification from decarbonization policies. Comments of these types came from. among others, Oregon Department of Energy, Idaho Office of Energy and Mineral Resources, Washington State Energy Office, Columbia River Inter-Tribal Fish Commission, Washington Department of Fish and Wildlife, Northwest Energy Coalition, Renewable Northwest, City of Missoula, Friends of 2 Rivers, 350 Montana, Ecumenical Ministries of Oregon.

The Council agrees with commenters that energy storage will play a role in the future electric grid, and may be especially important to particular utilities as they adjust to new resource requirements. However, based on the information and analysis leading to the power plan's resource strategy, the Council concluded that utility-scale batteries and other storage technologies were not cost-effective or needed for the region to be able to integrate renewables adequately, as the needs in the region over the next two decades for energy storage differ substantially from that needed in the rest of the western interconnection.

Three types of energy storage reference plants were developed and available as a resource option for the Council's portfolio expansion modeling tools (RPM and Aurora): 4-hour stand-alone battery storage, solar pv plus battery storage, and pumped storage. As detailed in the supporting materials for each reference plant, energy storage can

provide a multitude of ancillary services to the power system and potentially capacity depending on the region; co-locating renewables with storage helps avoid curtailment, reduce integration needs, provide grid services, and reduce transmission costs, and pumped storage has the ability to provide flexible capacity and energy balancing to the grid, augment renewable generation and reduce renewable curtailment, and ancillary services. The Council developed each of these reference plants with input and review by the Generating Resources Advisory Committee and more information is available in the supporting materials here: https://www.nwcouncil.org/2021powerplan_utility-scale-battery-storage_generating-resource-reference-plants/; https://www.nwcouncil.org/2021powerplan_solar-pv-battery-storage_generating-resource-reference-plants/; https://www.nwcouncil.org/sites/default/files/2019_1015_p4.pdf; https://www.nwcouncil.org/2021powerplan_pumped-storage_generating-resource-reference-plants/; https://www.nwcouncil.org/sites/default/files/2019_12_p2.pdf; https://www.nwcouncil.org/energy/energy-advisory-committees/generating-resources-advisory-committee/.

While recognizing the potential opportunities and value for these resources, under a range of scenario analyses, the results showed a very limited role for energy storage in the region, however. In simple terms, the region has sufficient existing system resources combined with new conservation and targeted demand response measures to integrate new renewable resources at a cost less than with batteries added as well. Energy storage did play a role in the one decarbonization scenario that presented aggressive load growth and limited resource availability, creating circumstances where storage was needed to maintain adequacy. Even in that scenario, battery storage and co-located solar pv plus battery were still acquired in limited amounts and not acquired until the tail end of the planning period (late 2030's).

In comparison, when the Council analyzed WECC-wide buildout assumptions, by 2030 the estimated development of new generating resources includes approximately 6,000 megawatts of stand-alone battery, 87,000 megawatts of co-located solar pv, plus battery, and 5,000 megawatts of pumped storage in areas of the west outside of the northwest. Energy storage will be an important resource playing a significant role to maintain resource adequacy and meet renewable and clean energy policies in the western interconnection over the next decade, and those benefits will be experienced in the northwest through the wholesale market.

Even if there is not a sufficient signal to call for a regional target for adding battery storage in the Pacific Northwest, the Council did recognize that several large renewable resource-plus-battery projects are in the development pipeline in the region, along with

several proposed pumped storage projects. Each utility will have different needs to assess and strategies for addressing that may or may not make the addition of storage appropriate in local context. More information on the Council's findings can be found in the following presentation to the Power Committee: https://www.nwcouncil.org/sites/default/files/2021_11_p3.pdf. More information explaining this dynamic was also added to the supporting materials, which can be found here: https://www.nwcouncil.org/2021powerplan_wecc-wide-buildout-results/.

Given the role energy storage is anticipated to play in the western interconnect, and the role it could play in the region to meet certain needs as detailed above and especially if the flexibility of the hydrosystem cannot be utilized to the extent anticipated to help support renewable integration and maintain adequacy, the Council recognized storage as a resource of obvious potential and value. And so the Council recommended that the national labs, research institutions, trade allies, and utilities continue to work with developers and manufacturers to research and explore the regional resource potential of supply-side emerging technologies including energy storage. The Council also recommended that the region consider the role of battery storage and other demand-side resources to address existing transmission capacity challenges. 2021 Power Plan, at 113-14. Also, as with many of the other power system and resource issues the Council faced in this power plan in a time of transition and uncertainty, the Council recognized that as reasonable as its conclusions appear to be, matters might develop different than expected – greater limits on the use of hydrosystem flexibility, greater pace and extent of electrification of building and transportation uses, unexpected improvements in batteries and their costs, etc. – which might then require additional or different new resources to maintain system adequacy. The Council commits to close monitoring and reporting on this transition and its myriad of attributes. See 2021 Power Plan at 3-5 and the overarching discussion of the resource strategy and resource adequacy below.

New Generating Resources

Renewable resources – emerging technologies

Emerging technologies and resources were analyzed in development of the 2021 Power Plan, as the Council recognized there are opportunities for new, emerging technologies to compete with established resources and to play a role in the future power system as the region transitions toward cleaner resource portfolios. For the first time in this plan, the Council developed an emerging technology reference plant to be added as a resource option in the Council's scenario analysis, competing as an option against primary generating resources as well as additional energy efficiency potential. To develop the emerging tech reference plant, the Council modeled one emerging technology - small modular nuclear reactors - as a proxy to represent the potential of any emerging technology that could be commercially available in the next ten years.

The Council received a handful of comments on its emerging tech analysis. Some commenters called for stronger consideration in the resource strategy for small modular reactors – those comments are discussed below, in the section of new nuclear generating resources. Other commenters sought greater support for various renewable emerging technologies. Two commenters in particular recommended that the Council use offshore wind as the proxy resource for the emerging tech reference plant (Oregon Coast Energy Alliance Network and Pacific Ocean Energy Trust), and those two and others (e.g., Renewable Hydrogen Alliance, GridForward) recommended further examination of and support in the power plan for new energy technologies in general and/or specific technologies, including ocean and wave energy technologies and electrolytic hydrogen.

As defined by the Council, emerging technologies are resources and technologies that have a long-term potential in the region but are not commercially available or deployable on a large scale at the beginning of the power planning. For this power plan, several emerging resources and technologies were examined, discussed, and reviewed, including with the Generating Resources Advisory Committee. Resources analyzed included offshore wind, small modular reactors, enhanced geothermal systems, wave energy, and carbon sequestration technologies. Presentations to the GRAC as well as additional information on each of these emerging technologies can be found in the supporting materials here: https://www.nwcouncil.org/2021powerplan_emerging-technologies_generating-resource-reference-plants/;

As noted above, for the 2021 Power Plan, the Council developed an emerging tech reference plant, with small modular reactors selected as the proxy resource for the reference plant due to the fact it is considered as a resource option in several regional IRPs and regional development is planned. This decision was reviewed, vetted and discussed with the Generating Resources Advisory Committee as well. (Links to more information on the development of the emerging tech reference plant are provided below in the section on new nuclear resources.) Even though small modular reactors were ultimately selected as the proxy resource, the point was to develop a reference plant that could serve as a proxy for all of the emerging technology options reviewed by the Council, including emerging renewable energy technologies, given that all emerging technologies reviewed have the potential to play a role in the future system, all are carbon free, all could potentially be available to fulfill clean policy goals (depending on commercial readiness), and all have overnight capital costs that are currently above the primary resources. Therefore, while small modular reactors do not reflect all of the attributes or challenges of the other resources, it does do its job as a proxy representing the potential value of any emerging technologies that could be commercially available in the next ten years, offshore wind included. And, although emerging tech was not selected as a viable resource option in our scenario analyses for this planning period, the future value of these resources was captured within the Council's recommendations for continued research and development into these technologies. Specifically, the Council recommended the national labs, research institutions, trade allies, and utilities continue to work with developers and manufacturers to research and explore the regional resource potential of supply-side emerging technologies such as offshore wind, small modular nuclear, enhanced geothermal systems, energy storage, carbon sequestration technologies, and other carbon-free resources. 2021 Power Plan, at 114. Additionally, the Council recommended the region identify potential barriers to deployment of new emerging supply side-resources, including costs, transmission, siting, etc. and work towards solutions when it is in the best interest of the region; and recommended efficiency programs, through NEEA, regional universities, national labs, and others to continue to invest in its emerging technology research for efficiency measures. 2021 Power Plan, at 114. Relatedly, the Council also recommended regional utilities continue to fund research and development on emerging technologies for energy efficiency in an amount commensurate with 2020 levels or greater. 2021 Power Plan, at 35. With these recommendations, the Council will continue to track progress on emerging technologies and their potential future in the power system for the next power plan.

As to the comments regarding electrolytic hydrogen and encouraging further evaluation of this resource as a grid-level energy storage technology and as a resource to support ancillary services, the 2021 Power Plan is the first to explore the use of hydrogen-

related technology as a potential clean energy resource. This meant specifically including hydrogen applications in our transportation and end use load forecast models, as discussed in more detail in the demand forecast section, above, and in the supporting materials here: https://www.nwcouncil.org/2021powerplan_hydrogen-and-fuel-cells/. But, beyond that, at this time, given that the extent of information about electrolytic hydrogen and how it might play a role in the regional power system is limited, the Council would like to see this technology develop further before exploring broad applications. To this end, the Council recommended study of the impacts, benefits, and challenges that large scale demand and production of hydrogen in the region might have on the power system overall, and in particular, hydro and renewable power. 2021 Power Plan, at 113.

New Generating Resources

Natural Gas

As noted above in the existing generating resources section, one of the 2021 Power Plan's conclusions and resource recommendations is that effective use of the region's existing natural gas facilities through this next decade will help to maintain regional system adequacy as the power system transitions to and integrates greater amounts of renewable resources. The Council did not recommend new natural gas development as part of the regional resource strategy.

The Council received comments on its analysis, conclusions and recommendations regarding new natural gas development throughout the power plan process, echoed in comments on the draft plan. For example a handful of individual commenters supported the fact that the Council did not include new gas in the draft plan's resource strategy. (Some of the same commenters called on the Council to call for the retirement of existing natural gas facilities as well – addressed above in the section on existing natural gas resources - and for the Council to call for a ban on natural gas use in new buildings – addressed in the section on environmental considerations.) On the other hand, comments on the drafts such as those from Benton County PUD and Franklin County Commissioners believe additional natural gas development may be necessary to maintain system adequacy, and were concerned that the Council's plan might hinder decisions by utilities to develop gas if needed.

As noted in the discussion of existing resources, the Council did give close consideration to the current set of laws and policies affecting the development and use of new natural gas plants and other carbon-emitting resources. The Council also developed reference plants and resource costs for new combined-cycle combustion turbines and gas peaker natural gas facilities to include in the portfolio analyses, and analyzed the technology trends and resource potential of natural gas. The Council also developed and analyzed scenarios and variants on scenarios that had the effect of testing the possible role of new natural gas plants in the regional resource strategy. The analyses indicated that new natural gas plants were not a necessary part of the regional resource strategy – that lower-cost renewable resources and cost-effective energy efficiency and demand response measures combined with effective use of existing system resources and markets was sufficient to maintain system adequacy from a regional perspective without needing to move to the next resource in terms of cost – new natural gas generation. The Council also noted the obvious practical difficulties and practical limits of siting new natural gas plants in many areas of the region and the west, even in theory currently allowed by law. See 2021 Power Plan at 4, 42, 43, 49-51, 57,

59, 60, 65-67, 72-73, 76-77, 84, 104; see also https://www.nwcouncil.org/2021powerplan_natural-gas_generating-resource-reference-plants/; https://www.nwcouncil.org/2021powerplan_methodology-assessing-new-generating-resource-technology-options-power-plan/; https://www.nwcouncil.org/2021powerplan_levelized-cost-energy/; https://www.nwcouncil.org/2021powerplan_existing-policies/; https://www.nwcouncil.org/2021powerplan_baseline-conditions/; https://www.nwcouncil.org/2021powerplan_organized-and-limited-markets-energy-and-capacity/; https://www.nwcouncil.org/2021powerplan_early-retirement-coal-generation/; https://www.nwcouncil.org/2021powerplan_greenhouse-gas-regulation-cost-and-impacts/; https://www.nwcouncil.org/2021powerplan_pathways-decarbonization/.

The Council did receive comments from NW Natural concerned that the plan understates the potential for renewable natural gas.

The 2021 Power Plan is the first power plan in which the Council has modeled renewable natural gas as part of the end-use forecast. As explained in the supporting materials, there is minimal renewable natural gas that is being produced and placed on the system in the region currently. Thus in order to understand the potential use and benefit of renewable natural gas for the Pacific Northwest, staff developed a forecast of the percent of natural gas end-use consumption that could be met by locally sourced renewable natural gas through the planning period. To inform this forecast, staff reviewed recently completed studies that estimated the potential future supply of renewable natural gas nationwide and in region and sought specific input from the Council's Natural Gas Advisory Committee and the Oregon Department of Energy and the Washington Department of Commerce. More information on the studies and forecast can be found here in the supporting materials: https://www.nwcouncil.org/2021powerplan_renewable-natural-gas/; https://www.nwcouncil.org/meeting/natural-gas-advisory-committee-june-3-2019/. Given the limited renewable natural gas currently in production and available, the studies reviewed as well as staff's coordination with regional experts, the Council is comfortable with the forecasted potential for renewable natural gas developed and considered for this power plan. The Council, however, supports continued evaluation of renewable natural gas and its potential role in the region including to reduce greenhouse gas emissions, which is reflected in the renewable natural gas recommendations for long-term planning in the 2021 Power Plan, at 16-17.

Finally, the Council received comments related to its analysis of upstream methane emissions in this power plan. Specifically, Northwest Natural commented that the Council does not examine or include the upstream (or downstream) emissions

associated with any other resources (e.g. coal, hydropower, wind, solar, etc.) beyond natural gas, and that the Council should treat all resource options on a consistent bases. Northwest Natural supported the Council moving to a life-cycle accounting of emissions for all resources or not including the upstream emissions of natural gas. The NW Energy Coalition commended the Council for working to include upstream methane emissions in its resource considerations, and also recommended that the Council commit to working with a broader set of regional experts beyond industry representative to understand the impacts of upstream methane emissions from natural gas.

The Council estimated, included and considered upstream methane emissions from the natural gas industry for the first time in the planning process. The Council staff estimated upstream methane emissions related to the extraction, production and transport of natural gas to be used for generations and included these estimates in the social cost of greenhouse gas emissions incorporated into the baseline conditions in the regional portfolio model as a damage cost on emissions and thus as one component of the total system cost (or the portfolio cost). In estimating the upstream methane emissions, staff coordinated closely with the Council's Natural Gas Advisory Committee on the methodology and inputs, with meeting materials available here: https://www.nwcouncil.org/meeting/natural-gas-advisory-comm-webinar-december-18-2019/; https://www.nwcouncil.org/meeting/natural-gas-advisory-comm-webinar-methane-and-power-plan-april-9-2020/. See also https://www.nwcouncil.org/sites/default/files/2020_0616_2.pdf). For the discussion in the 2021 Power Plan as to how the Council considered upstream methane emissions, see at 16-17, 59-60, 116, 127, 133-34.

The Power Act directs the Council, in the development of its power plans, to include quantifiable environmental costs in new resource costs when the Council has sufficient information to do so, and more broadly to give due consideration to environmental quality in developing the new resource strategy. A primary point for consideration for this and previous plans has been the issue of greenhouse gas emissions and climate change. Methane is the primary component of natural gas, it is a potent greenhouse gas, and oil and natural gas systems are emission sources. Therefore, estimating and including upstream methane emissions (along with other greenhouse gases) from natural gas production in a social cost factor is one way the Council tried to quantify environmental costs and give due consideration to environmental quality in this power plan, working to get a more complete understanding as to the effects of the region's electricity sector on emissions, informing our analysis of the clean and decarbonization focused policies and their implementation in the region.

As to the resource cost comparison, while the Act does not require consistency in estimating resource system costs, the Council generally agrees with commenters that taking care not to skew the resource cost comparison and treating resources consistently is an aspiration useful in allowing for a fair comparison of conservation and generating resources considered for the new resource strategy. And the Council does include in life-cycle resource costs the regulatory costs imbedded in the fuel costs intended to address environmental impacts, be that fuel coal or water or uranium or whatever. Given the lack of direct regulation of emissions of such significance as greenhouse gas emissions, however, the Council saw it as important to include some sort of environmental cost in the analysis as a regulatory proxy. The concern over skewing the cost comparison in practice, however, was one consideration the Council factored into an approach of including the social cost of greenhouse gas emissions in the total portfolio cost in the baseline conditions, rather than assuming that facilities with carbon emissions would dispatch with emission pricing included in their variable cost. The Council did include one scenario - the greenhouse gas tipping point scenario – in which explicit pricing of greenhouse gas emissions in dispatch was explored, with a finding that more renewable resources (particularly solar) would be built in the baseline, with less dispatch of gas. See https://www.nwcouncil.org/sites/default/files/2021_05_7.pdf).

Even so, the Council acknowledges gaps in our understanding when it comes to upstream methane emissions for natural gas facilities, which is why the Council included in its research and development recommendations the need for future work and study on this topic. 2021 Power Plan, at 116-17 (Improved valuation of model inputs, upstream methane). The Council expects this work to occur in coordination and collaboration with our advisory committees and interested stakeholders, involving technical experts from state and federal agencies, industry representations, and experts outside of industry. This work and any resulting study, as well as continued Council work on our models, climate change and greenhouse gas emissions broadly, will support and inform how the Council incorporates these emissions into our future power planning and resource cost estimates for natural gas as well other resources as appropriate. See, for example, the Council's 2017 analysis leading up to this power plan related to methane and reservoirs, a topic discussed further in a different section below: https://www.nwcouncil.org/sites/default/files/p3_130.pdf; https://www.nwcouncil.org/news/2017/03/16/columbia-and-snake-river-reservoirs-not-associated-high-greenhouse-gas-emissions/

New Generating Resources

Nuclear

As discussed above in several places, the Council's findings in the power plan indicate that the region's existing resources, which includes one nuclear plant, remain important for providing reserves and maintaining an adequate system as more renewable resources are brought online and integrated into the system. The Council's new resource strategy did not, however, include the development of any new nuclear plants.

The Council received comments recommending the Council add nuclear plant development in the resource strategy, from the American Nuclear Society, Franklin County Commissioners, Tri-Cities, and individuals. Some of the same commenters and the Columbia River Inter-Tribal Fish Commission recommended that the Council provide additional information and analysis regarding nuclear resources overall, including additional information related to integration, costs, and the future use and potential role for nuclear generation in the region. The particular focus of the comments were on the potential for what are known as small modular reactors.

Analyzing new generating resources is an initial step in the Council's power planning process to put forth a cost-effective resource strategy that assures the region an adequate, efficient, economical, and reliable power supply. As defined under the Act, for a resource to be cost-effective, it must be forecast "to be reliable and available within the time it is needed." The Council has generally been conservative in forecasting changes in technology or cost that would make resources or measures available during the planning period, and, therefore, options for consideration in the power plan. For the 2021 Power Plan, however, as noted above, the Council developed an emerging technology reference plant to be added as a resource option in the Council's analysis, competing against primary generating resources and energy efficiency. As defined by the Council, these emerging technologies are resources and technologies that have a long-term potential in the region but are not commercially available or deployable on a large scale at the beginning of the power planning period. Therefore, for modeling purposes the earliest in operation date was 2030. Small modular reactors were just one emerging tech resource analyzed by the Council, and small modular reactors were ultimately used to develop the emerging tech reference plant, serving as a proxy for all of the emerging technology options analyzed by the Council. Even though emerging tech resources were not selected as part of the resource strategy or through the scenario analysis, the Council recognized the potential opportunity for new, emerging, supply-side technologies to compete with established resources in the future, which was why an emerging tech reference plant was developed for this power plan to inform that

future power system analysis, especially in light of the decarbonization policies recently adopted. Additionally, the Council acknowledged the potential value of these emerging resources, including nuclear, through the number of recommendations included in the plan that support and encourage continued research and investment into these technologies. Through this work, additional information and analysis will be incorporated into the Council's next power planning process, informing the resource development options and analysis. See 2021 Power Plan at 65, 114-15 More information on the Council's evaluation of SMRs and development of the emerging tech reference plant, including cost information, can be found here in the supporting materials: https://www.nwcouncil.org/2021powerplan_emerging-technologies_generating-resource-reference-plants/#smr; https://www.nwcouncil.org/2021powerplan_levelized-cost-energy/. More information on the Council's categorization of new generating resource options is available here in the supporting materials: https://www.nwcouncil.org/2021powerplan_methodology-assessing-new-generating-resource-technology-options-power-plan/. In addition, this categorization as well as the development of each reference plant was presented and vetted with the Generating Resources Advisory Committee and meeting materials are available here: https://www.nwcouncil.org/energy/energy-advisory-committees/generating-resources-advisorycommittee/; https://nwcouncil.app.box.com/file/667778497592?s=nnfkfiq9vugg3umtb2e8np0tqm78ztni.

New Resources – Methodology for Determining Quantifiable Environmental Costs and Benefits

The Northwest Power Act directs the Council to give priority to resources that are "cost-effective." The definition of the "cost-effective" in the Act tells the Council to use the "system cost" for each resource to be compared, defined to mean "an estimate of all direct costs of a measure or resource over its effective life." One of the many categories of costs listed for the Council to include in "system costs" is "quantifiable environmental costs and benefits," to be based on "a methodology developed by the Council as part of the plan." And then a different section of the power plan provisions notes that one required element of the power plan is a "methodology for determining quantifiable environmental costs and benefits" for the purposes of the cost-effective comparison of resources.

The "environmental cost/benefit methodology is in Section 11 of the 2021 Power Plan, at 121-30, supported with a further discussion at *https://www.nwcouncil.org/2021powerplan_methodology-determining-quantifiable-environmental-costs-and-benefits/* The Council has been consistent through many power plans in its understanding, explanation and implementation of this methodology.

The Council received comments on the draft plan to the effect that the methodology described by the Council does not adequately capture the entire scope of environmental costs and benefits of various resources, or is not consistent in its treatment of environmental costs of different resources, or should not try to be consistent in its treatment of costs and benefits, or should be but is not including important non-energy, non-environmental benefits in resource costs.

Many or most of these comments came up in the context of how the Council determined the system cost of conservation measures, and determined which measures are cost-effective compared to generating resource alternatives. Those comments have been noted and responded to in the section on "conservation" above, and in the plan and the supporting material explanation, too. Another comment concerned how and why the Council included a quantified cost of upstream methane emissions in the costs relating to a new natural gas plant. Those comments have been noted and responded to in the section of new natural gas resources also above. In general, as explained in the plan and in the supporting material, the Council's framework or methodology for including environmental costs and benefits is consistent with the statute and is also as consistent across measures and resources as the Council can reasonably make it, acknowledging that absolute consistency is not required, appropriate in all cases or always possible.

The purpose of this section here is to note a couple of other comments about the methodology. For one, the Friends of 2 Rivers commented that it was wrong of the Council to omit the environmental/social costs of climate change to the fossil fueled resources. As not doing so would greatly underestimate their true cost and leads to their being incorrectly selected as affordable.

The comment is not correct. The Council did include a social cost of greenhouse gases in its analysis. See 2021 Power Plan, at 80, 84, 125-26, 127, 130, 134 https://www.nwcouncil.org/2021powerplan_global-assumptions-power-plan/. Also, the regional resource strategy for the 2021 Power Plan does not include any new fossil-fueled generation.

Idaho Rivers United commented that a "social cost" of hydropower should be included in the analysis of the plan, given that the hydropower dams alter the flow and connectivity of river systems; adversely affect fish and wildlife populations as well as their habitat; and have negative socio-economic and biophysical implications. Idaho River also commented that methane emissions associated with dams along the hydrosystem must be incorporated into climate change modeling and emissions projections. The Northwest Resource Information Center (NRIC) commented similarly about considering the quantifiable costs and benefits of the existing hydropower system, in a comment aimed also at having the Council reopen the Fish and Wildlife Program and reexamine the fish and wildlife requirements on the hydropower system – noted and addressed above, in the existing hydropower section of this document.

The methodology for quantifying environmental costs and benefits is part of the new resource cost comparison. New hydroelectric power dams are not one of the new resources that the Council included as commercially available in any significant amount for possible selection in the resource strategy. The Council has developed the "protected areas" to protect fish and wildlife populations and their habitat from new hydropower development.

With regard to methane emissions from reservoirs, again, for the purposes of the resource cost comparison for the 2021 Power Plan's resource strategy, the Council had no need to consider this issue - new hydroelectric development was not in the resource mix for selection. To understand in general the implications, in 2017, leading up to the power plan process, Council staff investigated the possibility of methane emissions from Columbia system reservoirs. The Council did this because of a September 2016 study from Washington State University researchers that looked at greenhouse gas emissions from existing reservoirs of all types around the world and concluded that global methane emissions from reservoirs have likely been under reported and may be a greater

contributor of greenhouse gas emissions than previously understood. Council staff reviewed the study and information on the reservoirs in the region and "initially concluded that there is not enough data available to make detailed emissions estimates specific to the Pacific Northwest's reservoir system." The staff also found that "the region's reservoirs likely do not have the characteristics most strongly associated with high emissions." That is, the Columbia River system in general does not produce the kind of nutrient-rich environment that supports excessive plant growth, and therefore the system reservoirs are unlikely to emit large levels of methane gas. *https://www.nwcouncil.org/sites/default/files/p3_130.pdf; https://www.nwcouncil.org/news/2017/03/16/columbia-and-snake-river-reservoirs-not-associated-high-greenhouse-gas -emissions/ The Environmental Protection Agency (EPA) kicked off a 3-yr measurement program at 120 reservoirs across the United States. The results of this analysis may prove helpful in future PNW reservoir methane emissions estimates. https://www.nwcouncil.org/2021powerplan_greenhouse-gas-emissions-generation/* https://www.nwcouncil.org/sites/default/files/2017_0314_p3.pdf *No better or additional data came to light during the development of the 2021 Power Plan. In any event, to return to the main point, quantifying the social cost of reservoir methane emissions would matter under the Act only if new hydropower was part of the potential resource mix for the plan's resource strategy, and it was not.*

“Due Consideration” / Equity Considerations

The Northwest Power Act provides that the power plan is to include the scheme or strategy for adding new conservation and generating resources “with due consideration by the Council for (A) environmental quality, (B) compatibility with the existing regional power system, (C) protection, mitigation, and enhancement of fish and wildlife and related spawning grounds and habitat, including sufficient quantities and qualities of flows for successful migration, survival, and propagation of anadromous fish, and (D) other criteria which may be set forth in the plan.” The Act does not require anything specific in the plan with regard to the “due consideration” requirement - as compared to the methodology for quantifying environmental costs and benefits, which is a required element of the plan, discussed in the last section. Even so, the Council often includes a section explaining how it duly considered matters required by the statute. The second half of Section 11 of the 2021 Power Plan (at 130-37) describes a set of relevant issues the Council considered in shaping the plan’s resource strategy, particularly concerning environmental quality, fish and wildlife, and compatibility with the existing power system. Some of how the Council considered these matters can also be found in other portions of the power plan and the supporting materials, as noted where relevant.

Most of the relevant considerations that were a focus of comments to the Council throughout the power plan and then on the draft power plan have been addressed in other sections of this document, above. This includes, among other things, how the Council:

- incorporated climate change impacts into the demand forecast and into the planning assumptions about runoff, river flows and hydropower generation
- considered the impact of state laws and policies seeking to reduce carbon emissions not just from the power sector but also other sectors of the economy, with implications for electrification and resource needs
- considered climate change impacts on system operations, including extreme or outlier effects and the need for system resiliency
- factored in the concept of a social cost of greenhouse gas emissions
- took into account concerns about the impacts on wildlife and habitat and land uses from the development of new generating facilities
- considered the methane emissions from natural gas production and transportation
- assessed the interplay between hydrosystem operations and impacts to fish and wildlife and the operations required to the benefit of fish
- responded to questions about methane emissions from reservoirs
- responded to comments seeking to have the Council either analyze or recommend the removal of existing system resources for environmental reasons

Concerns about “equity” were raised during this power plan process, that is concerns over the disparate impacts of energy development and energy planning and related matters on different communities and people.

“Equity” is not a separate criteria or responsibility in the power plan provisions of the Northwest Power Act. The only mention of “equity” in the Act relevant to new resource development is that Bonneville, in exercising its authorities in Section 6 to acquire resources, is to insure that the benefits of this section of the Act “are distributed equitably throughout the region,” a provision largely about ensuring equity among customer classes and different geographic regions of the northwest. Still, equity can be a factor for “due consideration” in how the Council exercises its planning responsibility under the Act if the Council so chooses – as “other criteria [for due consideration] set forth in the plan.” The point of the power plan is still what new cost-effective conservation and generation resources should be added to the region’s power system, but the considerations in that planning can include equity considerations, too, to the extent relevant. E.g., the Council can examine the environmental effects of new generating resources generally and throughout the region; it can also consider whether those impacts are inequitably distributed in the region. E.g., in the Seventh Power Plan, the Council included a model conservation standard provision calling on the Bonneville and the utilities to determine how to “improve participation in cost-effective conservation programs from any underserved segments,” in light of information indicating under-participation.

In that light, the Council received comments throughout this power planning process and on the draft plan in support of what considerations and work the Council was giving to equity, with a variety of commenters urging the Council to expand the emphasis. The Council received comments such as that the plan should recommend Bonneville incorporate equity in programs and operations; that the plan should recommend the Regional Technical Forum incorporate equity metrics into the analysis of energy efficiency and demand response measures; that the plan should ensure that the benefits of weatherization and other efficiency programs and new distributed generation technologies be available to members of the region’s Indian tribes, while also protecting the cultural and wildlife resources of the tribes from renewable resource development; and that the plan carry forward a prior model conservation standard (MCS-1) from the Seventh Power Plan and recommend Bonneville and the regional utilities increase equity and reduce barriers to conservation to improve participation in cost-effective conservation programs from any underserved segments, including especially the manufactured home segment. Comments of these types came from, among others, the Northwest Energy Coalition, Washington State Energy Office, the Columbia River Inter-

Tribal Fish Commission, Oregon Coast Energy Alliance Network, UCONS, LLC, and the Electric Equity Series (Jim Perich-Anderson).

The Council decided to pursue considerations of equity in this power planning effort in the following ways: In February 2021 the Council hosted a "Systems Integration Forum" (SIF) to explore how the Council might integrate concepts of energy equity into the 2021 Power Plan, as well as in future work. An output of the forum was a list of potential actions the Council might draw from to better incorporate equity considerations into the 2021 Power Plan and subsequent work. Council staff also surveyed advisory committee members and interested parties for their feedback, to help select and prioritize possible actions, which the staff discussed with the Council in May 2021. The staff continued to work with the members up to and following the draft on what ways equitable considerations might be important to the 2021 Power Plan's resource strategy, and what considerations might be more relevant to pursue after the power plan, depending on staff resources and relevance to power planning. Equity considerations as they affected the plan itself are discussed in the 2021 Power Plan, at 37, 38, 115-16. Supporting materials and presentations are found at https://www.nwcouncil.org/2021powerplan_diversity-equity-and-inclusion-power-plan/; https://nwcouncil.app.box.com/s/cz2x7wn1b4cou1ow2u7t86dotxin3pnc; https://www.nwcouncil.org/meeting/sif-2021-power-plan-and-dei-february-19-2021/ https://www.nwcouncil.org/2021powerplan_addressing-equity-energy-efficiency/.

Ways in which equity considerations affected the plan's resource strategy include, for example, the work the Council did to ensure as part of the conservation program that weatherization efforts continue, to provide system resilience but also to spread efficiency benefits widely among different socio-economic and geographic communities helping to achieve equity of residential energy burden (discussed in the conservation section above). The Council also acknowledged that in some cases a home may be beyond weatherization and in those instances home replacement programs should be considered, with utilities and agencies exploring co-funding options to best serve these homes. 2021 Power Plan, at 35. Manufactured homes representing just one under-served segment of the economy were intended to be captured within these recommendations. Also, the plan recommends that utilities begin utilizing energy use intensity data for commercial buildings to identify those customers in greatest need of conservation measures, yet previously missed by programs. Id. The plan also includes the Council's recommendation that those who approve the siting of new generation protect the resources and lands and uses relevant to the tribes and to rural communities, and consult with the tribal governments and provide opportunities to participate for affected people and communities in the decision-making process (discussed in the section on renewable resources above). The Council also noted the

need for better information and data on equity impacts in regional and utility planning, and so recommended "that the region convene a series of workshops to investigate existing equity data–encompassing generation, transmission and distribution, and demand-side resources–share publicly available data sources, and perform a gap analysis to identify areas where further research and data are needed."

The Council did not have sufficient information to identify or call for the inclusion of equity metrics at this point. The key at this time is to identify inequitable impacts, and gaps in information on impacts, and then consider ways to surmount those equity challenges.

External Market Reliance / Organized Markets

The Council received a number of comments related to external markets and market reliance, organized markets, transmission and transmissions systems and regional transmission organizations, and related matters. Some of these topics are related, some are disconnected, but all have been gathered and discussed here.

Many comments raised concerns about whether adequate transmission is available to support the level of renewable resource development in the power plan's resource strategy, and about integrated generation and transmission planning more generally. *Those comments and the underlying issue have been discussed above, in the section on new solar and wind renewable resources.*

Related were comments and concerns about external market reliance, that is, about how the Council analyzed and considered the potential of utilities in the region to rely on the market for power from outside the northwest and the relationship of that reliance to regional resource adequacy. This included concerns that the plan's regional resource strategy and resulting conclusions about resource adequacy may include too great a reliance on power available from the market outside the region, power that might not be as available as expected (due to transmission constraints or an under-build of needed resources outside the region or other factors) or might be at higher prices than expected. The Council received other comments about the adverse effects of being too tied to a westwide market (and a northwest power system) saturated with intermittent renewable resources, with resulting depressed and even negative market prices and resource curtailments and interference disincentives for dispatchable resources to commit. Others commented in general with caution about uncertainties in the amount and benefits of market exposure, calling on the Council to explore further but be cautious about commitments and reliance.

Others commented more broadly that the plan should recommend that the region integrate piecemeal efforts on markets and adequacy and move toward a comprehensive regional solution, e.g. form or join in an Independent System Operator/Regional Transmission Organization – that western RTO is both likely to occur and may be necessary to make the power system transition identified in the plan actually work, and thus the Council should offer leadership on this key issue. Others commented with caution about recommending an RTO, as something that might be explored further but need not be endorsed in the Council's plan. And that an investigation of an RTO or organized marker should be clear about Bonneville's role in such an organized market or transmission system, consistent with Bonneville's governing statutes.

The Council included relatively conservative limits on external market imports and exports in its baseline analysis, and also ran a scenario in which the Council relaxed the limits on what can be imported and exported between the region and the rest of the western interconnection. As important as the market can be, the resource strategy for the region remained roughly the same under either scenario, indicating the degree to which there are a number of fungible resources and factors in the existing power system that can help integrate the new renewable resources in the region and remain adequate. "While [relaxing limits on external market reliance] reduced the adequacy-needs input into our resource analysis, the results from our models had minimal changes to the resource additions examined. While there were some minor changes to the pace at which renewable generators are built within the region, the overall results did not indicate removing these limitations would change the resource strategy." See 2021 Power Plan, at 67-70 (quote is at 70). The Council also analyzed a scenario in which it substantially limited the supply of electricity available from outside the region, with variants allowing or limiting other resource development as well (natural gas or renewables). Regional additions of renewable resources again did not change much – "indicat[ing] that renewable resource additions at this level are likely required to meet regional policy targets, in addition to being part of the least-cost portfolio under various assumptions about external markets" - while different market scenarios did affect the amount of energy efficiency developed in the region. 2021 Power Plan, at 69, 70-75.

The Council also more generally recognized both reasons of risk as to why utilities and others in the region might be reluctant to plan for expansive reliance on the external market, and also what the benefits might be to the region of greater reliance, especially if that market could be more organized and regionally governed. "A less expensive, but riskier alternative is to plan on more external generation to support the region in times of need. Other regions have varying policies, requirements, and Northwest regional stakeholders have less say in their planning processes. Without a more formalized collaborative process like an organized market, this strategy, while taking advantage of the diversity of a large pool of existing resources, would likely expose the region to significantly more risk." 2021 Power Plan, at 106-07.

That last statement dovetails with the comments about the value of moving the region or the west toward an organized market/RTO, and whether and what the Council should say about that topic in the plan. As part of these considerations, the Council also analyzed a scenario that was a proxy for the effects of a more organized market, exploring resource additions if utilities "created a combined approach to planning for new resources and created a unified transmission rate" and a "proxy for how centrally dispatched markets with a consistently applied adequacy standard could impact

decisions about resource additions. Again, the addition of renewables in the region did not change substantially; other new resource addition, especially energy efficiency were more sensitive. 2021 Power Plan, at 69, 70-74.

The conclusions the Council drew from the scenario analyses and other considerations throughout the planning process is that there is definite value to be realized in the region from greater cooperation among the players and the regions. How far that should go – including all the way to an integrated west-wide organized market and RTO – was not for the Council to opine on at this moment. Instead, the Council recommended that Bonneville and the regional utilities "work together and with others in the Western electric grid to explore the potential costs and benefits of new market tools, such as capacity and reserves products, that contribute to system accessibility and efficiency." The Council stated that it would "expect to see significant cost savings from greater regional collaboration to drive more efficiency into the system operations," and that "a more aggressive examination would expand such a cost and benefit analysis to include the development of an organized or independently operated electricity market across the region. While any market design should protect the region's investments in its existing generation and transmission system, there may be reliability and cost benefits from the central dispatch of resources across a broad footprint." At the same time the Council recommend further work toward a better understanding, under the changing power system dynamic, "of the impacts of changes in market liquidity outside the region and the implications, especially for peaking and ramping periods, and pursue additional collaborative approaches to mitigate identified risks." 2021 Power Plan, at 48.

One form of organized cooperation under development in the region is the Western Resource Adequacy Program by the Western Power Pool (expanded from the Northwest Resource Adequacy Program of the Northwest Power Pool during the time the Council was working on the 2021 Power Plan). The Council received comments from utilities and utility organizations and others throughout the power plan process – and then on the draft plan – that the Council should encourage Bonneville and other utilities to participate in the Western Resource Adequacy Program (WRAP). Some of these same commenters were concerned throughout the process – and with the draft - that the Council was underestimating the resource adequacy problems the region is facing, which could undermine the momentum to develop the WRAP. And at least one commenter recommended that the Council, for future power plan cycles, examine whether continued resource adequacy work by the Council is necessary if resource adequacy is being addressed through the Western Resource Adequacy Program. Comments relating to the WRAP and resource adequacy came from, among others, the Washington State Energy Office, Public Power Council, PSE, Benton PUD.

Consistent with the comments, as noted above, the 2021 Power Plan encourages Bonneville and the utilities and others to explore increased cooperation in developing organized markets and market mechanisms, including especially capacity and reserve sharing markets and products, building on the Power Pool's resource adequacy efforts to date. 2021 Power Plan, at 48, 106. Also, as described in the section above on the resource adequacy assessment, the Council removed the section of the draft plan on the adequacy assessment and replaced it with a better description of what the Council's analysis indicated about the spectrum or range of needs the region faces. It is precisely cooperative efforts like the WRAP that will assist in the region in addressing resource adequacy needs through this power system transition in a cost-effective manner.

The Council expects to continue focusing on resource adequacy it its planning. The Council's planning responsibilities under the Northwest Power Act require that the Council consider resource adequacy, and do so as an planning entity independent of the utility industry. Also, the Council's power plan responsibilities are different from what the WRAP effort as presently described. The Council's concerns about resource adequacy are long-term and particularly focused on what new resources will need to be added to the system; the WRAP as currently designed has more of an immediate or short-term focus and is building toward mechanisms by which participants get access to the surplus capacity of other participants to address or avoid resource adequacy concerns.

Resource Strategy and Resource Adequacy

The purpose of the power planning effort, and of all the inputs and considerations into that effort, is for the Council to recommend a new resource development plan (or resource strategy) for the region. The 2021 Power Plan recommends, as a regional resource strategy, that the region add to the regional power supply over the next six years at least 3500 MW of renewable resources, 750-1000 aMW of energy efficiency with an emphasis on energy efficiency measures that provide capacity benefits, and certain targeted demand response measures, along with a set of additional recommendations to Bonneville and the utilities to work together to explore the potential costs and benefits of new market tools, and other relevant recommendations in other sections, particular in the conservation program. The Council's analysis indicates that the region's power supply will remain adequate, reliable, affordable and efficient with these resource additions, when combined with effective use of the region's existing resources – especially the hydropower system and existing natural gas plants – and reliance on resources outside the region that will be available via the westwide wholesale power market. Relying increasingly on variable-output generation brings risk, but the power supply should remain adequate and reliable if the recommendations in the 2021 Plan are implemented. See 2021 Power Plan, at 42-90, esp. 42-48.

And as highlighted elsewhere, the Council developed this resource strategy for the 2021 Power Plan in the midst of – and intends it to work within - an unusual and dramatic transformation in the power system in the northwest and the western US as a whole, driven by policies and economic trends that are pushing out fossil-fueled generation, adding renewable resources with different power system characteristics, and potentially electrifying significant sectors of the economy. States, municipalities, and utilities throughout the west have adopted laws, policies and programs requiring the addition of renewable resources, disallowing the use of fossil-fueled generation, especially coal-fired generation, and ultimately requiring a transition to all or nearly all non-fossil fueled generation. The owners of many coal-fired power plants that have served load in the region or throughout the west have recently retired or will be retired over the next decade due to these laws and policies and for reasons of economics and efficiency. Increasing amounts of renewable resources are being added to the system, and much more will need to be added across the west in the next decade to meet the legal and policy requirements. Thus, electricity generation is shifting away from fossil fuels to renewables, resources with different power system characteristics. Solar and wind power are becoming less expensive, and their low cost is driving down wholesale power prices, particularly mid-day, forcing other types of generation out of the market at times and also making the economics of cost-effective conservation also very different than in the Council's past experience. Meanwhile, several states have also adopted laws and

policies aimed at decarbonizing other sectors of the economy, with implications for increasing loads on the electrical system significantly through possible electrification of the energy use of especially buildings and transportation.

The Council and its staff, working with the Council's advisory committees, grappled throughout the power plan process with a set of issues arising out of this power system transition - all of which have been identified and discussed somewhere above in this document – working through them to help shape the elements of a possible resource strategy needed to maintain an adequate and reliable system. *See, e.g.,* https://www.nwcouncil.org/meeting/power-committee-webinar-may-27-2021; https://nwcouncil.app.box.com/s/lj5re5bf4r4v5n1rubmx70ia5uukqpom (Power Committee discussion of key findings and emerging issues in developing draft power plan).

In the Introduction to the draft power plan (and, now, in the final 2021 Power Plan, at 3-5), the Council highlighted some of the issues and considerations affecting the conclusions about the resource strategy and resource adequacy. The bulk of the comments on the draft plan then highlighted one or more of this same collection of issues, all contributing in some way to a larger expression of concern about overall regional resource adequacy: That is, comments that for one or more of these reasons, the plan's recommended resource strategy significantly understates the amount of new resources needed to maintain an adequate regional power system, often accompanied by a recommendation for more resources or different resources or both. Collecting the major concerns and comments into one summary:

- possible under-estimation of the impact of the loss of the region's coal-plant generation, especially the contribution to meeting seasonal and daily peak capacity in parts of the region, and/or an over-estimation of the ability of the portfolio of new and remaining resources to adequately replace these power supply characteristics

- the possibility that the schedule of retirements of the remaining coal plants serving the northwest and the west will accelerate, leading to larger system needs earlier than expected and thus might require additional new resources and earlier than projected in the draft plan's resource strategy

- whether the projected build out of renewable resources in the region can occur as quickly as needed in the draft resource strategy and will not be more constrained than expected by land use and siting concerns, by financing concerns, and/or by delays in planning and approvals and construction

- whether a build out of renewable resources for the rest of the west will occur of the magnitude and rate required by current state legislation and utility targets, affecting wholesale power markets and market prices

- concern that the transmission capabilities in the west and in the region may not be sufficient to support the addition of significant amounts of renewable resources and deliver the power as needed to the places in need

- possible over-reliance on what will be available from the westwide wholesale power market, because of a more limited build out than expected, because of greater transmission constraints than expected, and/or because of other demands and limits on the market outside the region

- whether regional load projections underlying the plan may be unrealistically low, for both energy and capacity needs, in that electrification resulting from state and local decarbonization policies may be greater and increase faster than expected and thus the power system will not be adequate to meet the needs without substantial additional resources

- the fact the resulting system remains adequate in part because of the ability in the region and throughout the west to rely on the generation from natural gas plants, when that reliance could plausibly be more limited by further shifts in policies, increased gas supply disruptions, and unexpected price increases

- whether the resulting system remains adequate in part because of increasing reliance on the flexibility of the hydropower system, especially daily ramping up and down to a degree that may not be sustainable for reasons of environmental protections for migrating and rearing fish and other matters

- the fact that the plan assumes system operations intended to improve conditions for fish will remain static and not evolve in a way that will constrain hydropower generation further, with the added possibility or desire by some that mainstem hydropower projects be scheduled for removal for the same reason

- possible under-estimation of the future costs of renewable resources

- possible under-estimation of the value of energy efficiency improvements and demand response measures to meet the needs

- possible over-estimation of the future costs and under-estimation of the possible contribution or value to the region of storage, especially batteries

Comments raising one or more of these concerns and tying them to larger concerns about regional resource adequacy came from across the spectrum, including the Washington State Energy Office, Oregon Department of Energy, Bonneville Power Administration, PNUCC, Public Power Council, Northwest Requirements Utilities, PNGC Power, Seattle City Light, Puget Sound Energy, Washington Public Utility Districts Association, Benton PUD, Flathead Electric, Western Montana G&T, Orcas Power & Light Cooperative, Oregon Municipal Electric Utilities Association, Idaho Consumer Owned Utilities Association, Columbia River Inter-Tribal Fish Commission, Washington Department of Fish and Wildlife, Northwest Energy Coalition, Renewable Northwest, Franklin County Commissioners, Tri-Cities Development Council, and many individuals.

The Council grappled with these concerns throughout its deliberations, reflected ultimately in the text of the resource strategy and the rest of the 2021 Power Plan. Responses to each of the topics/comments can be found in relevant sections above. More generally, however, the Council's power planning ethic has always focused on acknowledging and accepting uncertainties and risk. The Council's work here as in every power plan includes evaluating ranges of important inputs, a variety of different scenarios, and a host of potential resource strategies in an effort to reduce the risks imposed by the inherent uncertainties in future loads, costs, resource availability, and other relevant system characteristics. In this instance, the Council's analyses indicated that the recommended resource strategy reasonably includes sufficient amounts of generation and conservation to accommodate these very real risks and uncertainties and sustain an adequate and reliable power system through the power planning period, even given how central many of these factors are to the plan's resource strategy. Over-committing to the building of new resources in the plan's resource strategy at this moment would itself be a risk and cost the region has suffered through before.

For this reason, the Council adopted the plan's resource strategy under explicit acknowledgement of the assumptions and factors that make it work and allow the Council to project the resulting system as adequate and reliable amidst the attendant uncertainties and risk. And the Council also committed to the work needed, after the adoption of the power plan, to monitor and evaluate the rapidly changing industry and how the region's evolving power system is keeping pace. Any further changes and developments will be reported as new information and analyses are available, and will also be reflected in the 2021 Power Plan's mid-term assessment.

Miscellaneous

Action Plan

Past power plans have included an Action Plan – a separate chapter gathering recommendations in the plan for implementation in the next 5-6 years, until the next power plan. The Council received comments on the draft asking the Council to again include an Action Plan in the 2021 Power Plan.

The Council decided for this plan to connect the plan's recommendations more closely to the substance of the plan out of which the recommendations arise, as a way of providing some internal discipline on the identification of key recommendations for priority implementation over the next half-decade. See especially the recommendations in the sections on the regional resource development plan, the expectations for Bonneville, the conservation program, and research and development. The Council has summarized the plan's recommendations in the supporting materials. https://www.nwcouncil.org/2021powerplan_summary-recommendations/.

The Washington Public Utility Districts Association asked the Council to extend the action plan period through 2030 to better coincide with new state mandates and provide at least some chance for the region to plan, permit, construct and operate the new and expanded generation and transmission resources necessary to comply with these mandates.

The 2021 Power Plan, as with all power plans under the Act, also has a longer-term focus and set of recommendations, twenty years in most instances. The further out in time the planning effort proceeds, the greater the effects future uncertainties have on the viability of specific recommendations. Specific recommendations are more valuable for near-term implementation, even if intending to moderate the longer-term risk from unexpected developments. And then, of course, the Council has an obligation under the Act to review the plan within five years. Thus, the 2021 Power Plan does have insights and resource recommendations relating to 2030 and beyond, even if not a specific detailed resource strategy outside of 2027.