

CHAPTER 4: ACTION PLAN

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INTRODUCTION

The action plan describes things that need to happen in order to implement the Council's Seventh Power Plan. It focuses on the next six years and the priorities in the plan. The Action Plan starts with activities that comprise the Regional Resource Strategy. The following three sections set forth actions that the Region, the Bonneville Power Administration and Council itself should undertake to support implementation of the Seventh Plan. The final section describes activities that the Council will engage in to maintain and enhance its analytical capabilities. In many cases, the action plan suggests the entities that have primary responsibility for implementation activities and a time frame for completion of the action.

RESOURCE STRATEGY

Energy efficiency is the first priority resource in the Northwest Power Act. The Council's analysis for the Seventh Plan affirmed that energy efficiency improvements provide the most cost-effective and least risky response to the region's growing electricity needs. Further, acquisition of cost-effective efficiency reduces the contribution of the power system to greenhouse gas emissions. While many new sources of carbon-free electricity are available, they are currently more expensive and provide little winter peaking capacity. The acquisition of cost-effective efficiency will also buy time to develop cost-effective alternative sources of carbon-free generation.

Over the past decade the region has successfully accomplished conservation, exceeding both the Fifth and Sixth Plan's goals. Nevertheless, achieving the level of conservation identified in the Seventh Plan will require continued aggressive actions by the region. While the aggressive pursuit of new conservation is the primary focus of the Regional Resource Strategy for the next six years, the second priority is to develop the ability to deploy demand response resources to meet system capacity needs under critical water and weather conditions.

After energy efficiency, the increased use of existing natural gas generation offers the lowest cost option for reducing regional carbon emissions and replacing retiring coal generation. Moreover, it is clear that after efficiency and demand response, new natural gas-fired generation is the most cost-effective resource option for the region in the near-term.

At the regional level, the probability that new natural gas-fired generation will be needed to supply winter peaking capacity prior to 2021 is quite low. However, the Seventh Plan recognizes that meeting capacity needs and providing the flexibility reserves necessary to successfully integrate growing variable generation sources may require near-term investments in generation resources to provide reliable electricity supplies in specific utility balancing areas. In addition, individual utilities have varying degrees of access to electricity markets and varying resource needs. The Council's regional power plan is not necessarily a plan for every individual utility in the region, but is intended to provide guidance to the region on the types of resources that should be considered and their priority for development.

Combined development of improved efficiency, demand response, renewable generation as required by state renewable portfolio standards and the increased use of existing natural gas generation, will help delay investments in more expensive and carbon emitting forms of electricity



generation until state and regional carbon dioxide emission reduction compliance plans are developed and implemented and alternative low-carbon energy technologies become cost-effective.

Resource Strategy Action Items

The Council recommends that the region pursue the following actions to implement the Seventh Plan’s resource strategy:

RES-1 Achieve the regional goal for cost-effective conservation resource acquisition. [Utilities, Energy Trust of Oregon, Utility Regulators, Bonneville, NEEA and States] Conservation programs and budgets should be designed to achieve savings based on the schedule shown below. Cumulative accomplishments, starting with savings acquired in FY2016, should achieve a minimum conservation goal of 1400 aMW by 2021, 3100 aMW by 2026 and 4500 aMW of cost-effective conservation by 2035. The Council will monitor achievement of cost-effective savings annually to assess progress towards both the biennial milestones detailed below and longer-term goals. Expected savings in excess of Sixth Plan targets prior to 2016 have been taken into account in setting the goals below and do not count towards meeting these goals. Savings achieved in excess of the biennial milestones below should be considered part of the next biennial progress toward the conservation goals.

Conservation Energy Milestones by Fiscal Year in Average Megawatts

	FY16-17	FY18-19	FY20-21	FY22-23
Annual Energy	370	460	570	660
Cumulative Energy	370	830	1400	2060

RES-2 Evaluate cost-effectiveness of measures using methodology outlined. [RTE, Bonneville, NEEA, Utilities, Energy Trust of Oregon] To determine if a measure is cost-effective, from a total resource cost basis, and in order to ensure that the cost-effectiveness formulation incorporates the full capacity contribution of measures and risk avoidance, regional utilities should use the methodology described in Appendix G: Conservation Resources and Direct Application Renewables. This method assures that all the costs and benefits are captured, that the time-dependent shape of the savings are accounted for, and that the capacity contribution of the measures are fully taken into account.

RES-3 Develop and implement methods to identify system specific least-cost resources to maintain resource adequacy. [Utilities, Energy Trust of Oregon, Utility Regulators, Bonneville, NEEA, and States] The Seventh Plan’s analysis identified a potential need to add resources, including conservation and demand response, to maintain an adequate and reliable system. The Council’s resource strategy includes guidance to Bonneville and the region’s utilities on what resources would meet these needs at the least cost from a regional perspective. However, it is not possible in the Council’s regional plan to

specify exactly when additional resources will be needed or which resources and in what amounts best match the needs of individual entities. While the Council will continue to analyze these issues from a regional system perspective, the region's utilities and Bonneville should develop and implement methods to evaluate resource decisions to maintain resource adequacy. These methods should be consistent with the Council's Seventh Plan and with the Council's annual Resource Adequacy Assessment. To consider all potentially available resources including conservation and demand response these methods should:

- Include an assessment of whether additional conservation acquisitions, beyond the levels set forth in RES-1, would be the least-cost resource for meeting the additional Bonneville or utility resource needs,
- Include an assessment of whether demand response would be the least-cost resource for meeting the additional Bonneville or utility resource needs,
- Evaluate cost-effectiveness by comparing the cost of increasing conservation acquisition and demand response to the cost of resources that add to regional reliability, such as additional thermal generation resources, rather than to short-term market purchases (e.g. RES-2),
- Consider thermal generation resources especially when local transmission congestion or provision of ancillary services provide added benefits, and
- Assess the individual positions of Bonneville or the utility with regard to the contribution to individual and regional reliability.

The Bonneville Resource Program following the next Council Resource Adequacy Assessment (scheduled for 2016) should outline an approach and schedule to accomplish this action item. Utility integrated resource plans developed after the next Resource Adequacy Assessment should also include comparable approaches.

RES-4 **Expand regional demand response infrastructure.** [Utilities that dispatch resources, Utility Regulators, Bonneville and States] Utilities and Bonneville should begin to or continue to develop or contract for systems to enable rapid expansion of demand response programs targeting winter or summer peaks relative to their individual system needs as assessed in RES-3. Such contracts and/or systems should be capable of integrating demand response into utility dispatch and operations and should be tested to verify that they can provide reliable demand reductions. These systems should be in place prior to the announced retirement date of existing coal generation facilities in the region and be maintained as a resource for deployment under low-water, high-load conditions or other times of system stress.

RES-5 **Support regional market transformation for demand response.** [NEEA, Utilities that dispatch resources, Utility Regulators, Bonneville and States] Regional market transformation efforts and techniques should be used to reduce the cost and expand the availability of products that exist on the customer-side of the meter that could serve as demand response resources. The region has a proven track record of working with manufacturers and engaging in standards and code processes to reduce the cost and

increase the market penetration of energy efficient products. These same approaches should be applied to demand response. For example, including demand-response ready controls in regional market transformation initiatives for energy efficiency in consumer appliance and lighting controls could accelerate the ability to develop automated demand response resources employing those products. A systematic approach to market transformation should be well established two years in advance of the next power planning process.

- RES-6 Expand renewable generation technology options considered for Renewable Portfolio Standards (RPS) compliance.** [Utilities, Utility Regulators, and States] As utilities continue to comply with existing state Renewable Portfolio Standards they should assess the cost and generation potential for utility-scale solar photovoltaic technologies when developing strategies to comply with existing state Renewable Portfolio Standards. Each utility should consider its own cost and resource need profile in such assessments. The Council will review utility Integrated Resource Plans and state compliance processes to track the types of renewable resources developed under state RPS.
- RES-7 Regional carbon emissions.** [Utilities, Bonneville, Utility Regulators, and States] The Council did not evaluate resource strategies for state level compliance with the Environmental Protection Agency’s Clean Power Plan (Clean Air Act, Sections 111(b) and 111(d)) carbon dioxide emissions limits. However, analysis for the Seventh Plan found that compliance was highly probable *at the regional level* through the reductions in emissions from coal-plants that are already scheduled for retirement, by achieving the regional conservation goals set forth in RES-1, by satisfying existing state Renewable Portfolio Standards and by re-dispatch of existing gas-fired generation. Should individual states or the region seek further emissions reductions, the least cost resource strategies identified by the Council rely on the re-dispatch of both existing coal and natural gas generation, rather than increased use of renewable resources that do not supply winter capacity.
- RES-8 Adaptive Management.** [Council, Utilities, Bonneville, Utility Regulators, and States] In order to track Seventh Plan implementation and adapt as needed the Council, in cooperation with regional stakeholders, will provide:
- Annual Resource Adequacy Assessments
 - Annual Conservation and Demand Response Progress Reports
 - Mid-Term Assessment of Plan Implementation and Planning Assumptions

Regional Actions Supporting Plan Implementation

The Council recommends that the region pursue the following actions to implement the Seventh Plan:

REG-1 Develop robust set of end-use load shapes with plan to update over time. [Council, Bonneville, NEEA, Utilities, Energy Trust of Oregon] The capacity value of energy-efficiency measures is significant. Data on new and emergent loads, including stand-by loads, however, is lacking. Additionally, where no more recent data is available, many of the end-use load shapes used in the Seventh Plan were developed 30 years ago. The region needs to update these load shapes to better understand peak contributions. Completion of this action will result in a data set of hourly (8760 hours per year) load shapes for a wide variety of end-uses and building segments. A business case for this study was completed for the Regional Technical Forum in 2012. Improvements in technology and opportunities for out-of-region coordination should reduce the cost of updating load shapes as compared to the 2012 business case. An update of the business case, specific work plan for implementation, and funding secured to accomplish this study should be completed by the end of 2016. Priority should be given for end-use load shapes that impact winter peak and to fill significant gaps in existing end-use load shape data.

REG-2 Provide continued support for the Northwest Energy Efficiency Alliance (NEEA). [Bonneville, Utilities, and Energy Trust of Oregon] Provide continued support for NEEA's 2015-2019 strategic and business plans. Consider additional support for NEEA to provide regional leadership on new opportunities where NEEA's core competencies, economies of scale and risk mitigation provide maximum value to the region. Identify and adopt new initiatives, and facilitate strategic planning efforts among partners to implement conservation opportunities identified in the Seventh Plan. Market transformation initiatives implemented by NEEA may need to be revised or expanded to encompass changing markets and the rapid progress in energy codes and standards. Specific action items in the Seventh Plan for which NEEA is the lead implementer include:

Activities within the existing scope of NEEA's 2015-2019 Strategic and Business Plans:

- REG-10. Develop strategies to coordinate energy-efficiency planning within region.
- MCS-4. Develop a regional work plan focusing on emerging technologies to help ensure adoption.
- REG-7. Conduct regional sector-specific stock assessments.
- MCS-7. Monitor and track code compliance in new buildings.
- REG-8. Understand the impact of codes and standards on load forecasting and regional conservation goals.

New activities not included in NEEA's 2015-2019 Strategic and Business Plans:

- MCS-6. Develop and deploy best-practice guides for the design and operations of new and emerging industries, such as data centers.



- REG-1. Develop robust set of end-use load shapes with plan to update over time.
- ANLYS-6. Prioritize research and adoption of energy-efficiency measures that also save water.
- RES-5. Support regional market transformation for demand response.

REG-3 Collaborate on demand response data collection. [Utilities, Bonneville and Utility Regulators] To assist with regional power planning, utilities should include the following information in their Integrated Resource Plans and Bonneville in its Resource Program:

- Data (date and amount) on the historic dispatch of demand response (DR)
- Future plans for DR acquisition, including an assessment of the system need (e.g., winter capacity, wind integration, etc.) that DR is anticipated to meet
- Assessment of DR potential within the utility's service territory

REG-4 Collaborate on collection of regional operating reserve planning data. [Utilities, Bonneville, and Utility Regulators] Utilities should include their planning assumptions for the provision of operating reserves in their Integrated Resource Plans and Bonneville in its Resource Program. These assumptions should emphasize reliability ahead of economic operations, that is, reasonable estimates for times of power system stress. The following should also be included :

- An estimate of the utility's or Bonneville's requirement for operating reserves
- Reasonable planning assumptions for the amount of the reserve requirement estimated to be held on hydropower generation and which projects should be assigned in power system models to provide these reserves
- Reasonable planning assumptions for the amount of the reserve requirement estimated to be held on thermal plants and which plants should be assigned in power system models to provide these reserves
- Reasonable planning assumptions for any third-party provision of reserves

REG-5 Conduct regular conservation program impact evaluations to ensure that reported energy and capacity savings are reliable. [Bonneville, RTF, Energy Trust of Oregon, Utilities, Utility Regulators] Implementation of cost-effective energy efficiency is a key element of all least-cost resources strategies where energy efficiency is the single largest system investment in new resources. As such, the region needs to assure the implementation of efficiency programs produces reliable, cost-effective energy and capacity savings. The Regional Technical Forum should maintain and update its program impact evaluation guidelines and standards to ensure the reliability of energy and capacity savings reported and to inform the adaptive management of energy savings programs going forward. Bonneville, utilities, Energy Trust of Oregon, and regulators should assure effective evaluations of the energy and capacity impacts of programs occur on a regular basis. The Regional Technical Forum should track these evaluated savings in its regional conservation progress report.

REG-6 Report on progress toward meeting Seventh Plan conservation objectives including the contribution of conservation to system peak capacity needs. [RTF, Council, Bonneville, Utilities, Energy Trust of Oregon, and NEEA] As part of the



Council's review of Seventh Plan implementation, the Regional Technical Forum should collect data annually from Bonneville, Utilities, Energy Trust of Oregon, and NEEA to report on progress towards meeting the plan's conservation goals and objectives. This Regional Conservation Progress Report should address whether and how the conservation technologies and practices identified in the plan are being developed for acquisition through local utility programs, coordinated regional programs, market transformation, adoption of codes and standards, code compliance efforts, and other mechanisms. The report should incorporate results of program impact evaluation and identify any acquisition gaps that need to be addressed. Given the importance of the capacity contribution of conservation identified in the Seventh Plan analysis, the report should also include estimates of the contribution of conservation to system peak capacity needs.

- REG-7 Conduct regional sector-specific stock assessments.** [NEEA] The stock assessments are a valuable resource for individual utilities and the region and should be updated regularly. Updated data should be available by early 2020, in time to inform the development of the Eighth Plan. Continue to enhance and improve the residential, commercial, and industrial assessments with regional review and input. Add an agricultural stock assessment that would improve understanding of opportunities in that sector, recognizing current data collection activities by Bonneville and difficulties in acquiring needed data. Currently, only the residential and commercial assessments are built into the NEEA 2015 through 2019 business plan, but there is significant value in collecting data for the industrial and agriculture sectors as well. Efforts in these sectors require coordination with stakeholders to establish the appropriate data collection methods. NEEA should define a schedule for designing and executing these assessments with a goal of having data available for all sectors by early 2020.
- REG-8 Reflect the impact of codes and standards on load forecast and their contribution to meeting regional conservation goals.** [NEEA, Utilities, Energy Trust of Oregon, Bonneville, National Labs] NEEA should track the savings impact of enacted codes and standards and collect the necessary data, such as saturation of appliances, number of units installed, and unit savings. These savings impacts can then be included in load forecasts and may be claimed against savings goals. NEEA should leverage the work Bonneville has completed to quantify the impacts of federal standards adopted since the development of the Sixth Plan. NEEA should produce an annual report on the savings impact of standards and updated models to link savings and load forecast estimates.
- REG-9 Use whole-building consumption data to improve energy and demand savings acquisitions and estimates.** [Bonneville, Utilities, Energy Trust of Oregon, NEEA, Trade Allies, Evaluators, Regulators] Utilities should exploit the greater availability of interval data and analytic tools to improve estimates of both energy and demand savings and encourage facilities to undertake whole building improvements. Utilities and regulators should facilitate the sharing of whole building data (including billing data) with regional analysts, recognizing security and privacy concerns. These data will be useful in identifying savings potential from emerging technologies, new uses of electricity that contribute to load growth and standby or "idle mode" energy use. Utility program

portfolios should incorporate programs that rely on a whole building approach to savings. A report on data analysis approaches and availability barriers should be completed by the end of 2017.

REG-10 **Develop strategies to coordinate energy-efficiency planning within region.** [NEEA, Bonneville, Energy Trust of Oregon, Utilities] Regional entities working together can more cost-efficiently capture conservation for many measures that have broad regional application and require coordination among implementing parties. NEEA recently facilitated the development of an initial regional strategy for commercial and industrial lighting, one of the largest sources of new efficiency potential in a very fast-changing market with a complex delivery infrastructure that crosses all utility boundaries. Similar facilitation efforts should be developed for other areas where regional cooperation among utilities, Bonneville, states, trade allies, and others is valuable. NEEA should initiate at least three such regional strategy efforts by the end of 2016.

Regional Actions Supporting Plan Implementation – Model Conservation Standards

The Council recommends that the region pursue the following actions to implement the Seventh Plan’s Model Conservation Standards:

MCS-1 **Ensure all-cost effective measures are acquired.** [Bonneville, Utilities, Energy Trust of Oregon, States] In order to achieve all cost-effective conservation, all customer segments should participate in programs. The Northwest Power Act has required that the Bonneville Power Administration (BPA) distribute the benefits of its resource programs “equitably throughout the region.”¹ Bonneville and the regional utilities should determine how to improve participation in cost-effective programs from any underserved segments. Although low-income customers are often an underserved segment, other hard-to-reach (HTR) segments may include: moderate income customers, customers in rural regions, small businesses owners, commercial tenants, multifamily tenants, manufactured home dwellers, and industrial customers. Ideally, the customers in the HTR segment should participate in similar proportion to non-HTR customers, assuming similar savings potential.

To accomplish this goal, Bonneville and the utilities in their overall data collection should include, to the extent it is readily available, demographic and business characteristic data that helps identify the existence of any HTR segments. Bonneville and the utilities should also coordinate with local and state agencies to leverage available data on various HTR segments. For example, community action programs will have information

¹ Northwest Power Act §6(k), 94 Stat. 2722

on low-income customers and program participation. The portion of participating customers in the assumed HTR segments should then be compared against the portion of customers within these segments in the utility's service area. This will determine which customer segments are indeed underserved. There may be other approaches to determining the HTR segments. For example, utilities may be able to review federal census tract data against program participation. Bonneville and the utilities should report to the Council on the proportion of participation from HTR segments and how these data were collected. The report should occur in 2017, and then annually thereafter. The strategies to improve participation by HTR segments should be considered in BPA's overall assessment and possible redesign of energy efficiency implementation as described in BPA-6.

After the first report, and prior to the completion of the Council's mid-term assessment, Bonneville and the utilities should devise strategies to improve participation by customers in cost-effective conservation in any underserved HTR segments identified in the report.

Evaluating all HTR sectors is important. In evaluating the sub-sectors highlighted below, considerations should include where data are readily available:

- **Small and Rural Utilities:** One specific segment that has been shown to have special difficulties in implementing energy-efficiency programs is the small and rural utility segment. A study conducted by the RTF in 2012 identified technical support needed by these utilities and infrastructure delivery constraints.² A series of initiatives have been put in place to remedy some of the problems identified in that report and improve participation, but issues may remain that the assessment should investigate. For example, some utility customers of Bonneville may have limited staff and limited access to contractors to effectively use their Bonneville energy efficiency incentive. Strategies to improve participation should consider arrangements among utilities to share efficiency planning and implementation activities. Product availability and measure uptake may lag in smaller rural markets compared to larger markets. NEEA market transformation initiatives focused on those lagging markets should be considered as possible solutions along with assistance from Bonneville on education, program administration and measures directly tailored toward the small and rural utilities.
- **Low-Income Households:** Existing programs, such as the U.S. Department of Energy Low-Income Home Energy Assistance Program, have provided an infrastructure to increase penetration of energy-efficiency measures into the low-income segment. However, it is not known whether these programs and their current structure are sufficient. The assessment should determine whether the pace of low-income

² Small and Rural Utility RTF Technical Support Needs Study.

http://rtf.nwcouncil.org/subcommittees/smallutilities/RTF%20Small_Rural_01-19-12_FINAL.pdf

conservation improvements achieved, over the last five years, is sufficient to complete implementation of nearly all remaining cost-effective potential in the low-income segment by 2035. Strategies to improve participation and pace of acquisition should consider further coordination between utility, tribal, and Community Action Programs (CAP) identified by Bonneville's Low-Income Work Group. That work group should continue to seek improvements in program coordination and implementation as a joint effort between utilities, tribes, states and CAP agencies.

- **Moderate-Income Households:** The up-front cost required to purchase or install efficiency measures is often a significant barrier to moderate-income customers. Financial incentives from utilities, Bonneville, and Energy Trust of Oregon usually only cover a portion of measure cost, thus potentially limiting the participation of these customers, who do not qualify for the high incentives offered in programs for low-income households. The assessment should investigate program participation rates among households above the low-income threshold and below median income levels and the reasons for any discrepancy relative to higher income households. The Energy Trust of Oregon has a well established program called Saving Within Reach that could provide helpful guidance on the potential establishment and operation of a moderate income program should a program be needed region-wide.
- **Manufactured Homes:** The manufactured home segment may face special challenges related to income, ownership, building codes, and some difficult-to-implement conservation measures specific to manufactured housing and their heating systems. The assessment should determine whether the adoption of measures in the manufactured home segment is on pace to complete implementation of nearly all remaining cost-effective potential over the next 20 years. Where expected shortfalls appear, specific barriers to implementation should be identified and solutions targeted at those barriers. While this market segment has been successfully targeted with a limited set of conservation measures (e.g. duct sealing), a more comprehensive approach that identifies and implements an entire suite of cost-effective measures during a single visit may be more cost-efficient.

MCS-2 **Develop program to assess and capture distribution efficiency savings.** [RTF, Bonneville, Utilities] Significant cost-effective savings can be achieved through voltage optimization measures, such as conservation voltage regulation. The relatively slow historical adoption of these measures has been due to a variety of barriers that may be addressed by programs or performance standards. By spring of 2017, Bonneville should develop a plan to determine potential savings identify barriers, and develop program assistance or distribution system performance standards. The plan should outline resource needs sufficient to assess potential and begin programs for one-third of its utility customers and customer load by 2021 with the goal of implementing all cost-effective measures for 85 percent of its utility-customer load by 2035. Investor-owned utilities should do similar assessments and implement cost-effective efficiency improvements by 2035.

- MCS-3 Encourage utilities to actively participate in the processes to establish and improve the implementation of state efficiency codes and federal efficiency standards.** [State Regulators, Bonneville, Utilities] Without robust efficiency programs paving the way for new measures and practices, efficient building codes and standards could not achieve their current levels of efficiency. However, for codes to continue to improve, programs need flexibility in pursuing measures that may not currently be cost-effective, but demonstrate likely cost reductions. In addition, as building codes and federal standards begin to push the envelope of emerging efficiency practices, regulators should provide allowance for programs to offer measures and practices which are new, have limited market acceptance or availability, or are part of voluntary code provisions. Based on results of code compliance studies, Bonneville and the utilities should work with authorities having jurisdiction to encourage code compliance in any areas where it is lacking. This activity should be ongoing throughout the action plan period and should be reviewed after each new code adoption.
- MCS-4 Develop a regional work plan to provide adequate focus on emerging technologies to help ensure adoption.** [Bonneville, NEEA, Utilities, National Labs, Energy Trust of Oregon, Council] Nearly half of the potential energy savings identified in the Council's Seventh Power Plan are from emerging technologies or measures not in previous plans. The region has proven success at moving emerging technologies and design strategies into the marketplace and should continue to work toward this goal. This includes (1) tracking adoption of new measures in the Seventh Plan supply curves, (2) identifying actions to advance promising technologies and design strategies, (3) increasing adoption of existing technologies with low market shares, and (4) scanning for new technologies and practices. The Regional Emerging Technology Advisory Committee (RETAC) should develop a work plan to ensure success in these four areas and to track progress over the action plan period. The initial work plan should be developed by mid-2016 and updated every two years.
- MCS-5 Actively engage in federal and state standard development.** [Council, Bonneville, NEEA, Energy Trust of Oregon, Utilities] Regional presence in the standard setting process has provided immense value to the region and the country. NEEA, on behalf of the region's utilities, should lead the effort to continue and perhaps expand this engagement with the U.S. Department of Energy as well as provide data and recommendations. The Council should continue to represent the Northwest states' interest in these processes. The region's engagement should inform the standards and the test procedures. NEEA should also assist the states in the development of state-level standards for products not covered by the federal rules. This should be an ongoing activity with periodic assessment of resource requirements.
- MCS-6 Develop and deploy best-practice guides for the design and operations of emerging industries.** [NEEA, Bonneville, Utilities, Trade Allies, States] Emerging industries such as indoor agriculture and large data centers are rapidly increasing throughout the region. Many of these facilities have significant load that could be reduced with guidance on best-practice design and operational approaches. Development of the first generation of best-practice guides should be available by late-

2016. NEEA should identify opportunities to deploy the best-practice guides to decision makers and design and operations professionals in the respective industries.

MCS-7 Monitor and track code compliance in new buildings. [NEEA, State code agencies, National Labs] Ensure new residential and commercial buildings are built at or above code-required levels across the four Northwest states. NEEA should work with regional code stakeholders to develop and implement appropriate methods to directly measure levels of code compliance and associated energy savings. The compliance study should assess local jurisdiction code plan review and inspection practices. Site visits with local code jurisdictions, and the design and construction industry should be conducted to assess training, education, and other resource needs to assure high levels of code compliance. NEEA should explore whether there may be other regional entities (e.g. Pacific Northwest National Laboratory) with whom NEEA could collaborate and leverage its work. NEEA's work plan and budget should include sufficient resources for continuing compliance studies with the expectation of reports for all states and sectors by 2020. Ideally, the completion of these reports should be timed to inform future code updates.

Bonneville Actions Supporting Plan Implementation

The Council recommends that Bonneville pursue the following actions to maintain consistency with the Seventh Plan:

- BPA-1 Achieve Bonneville's share of the regional goal for cost-effective conservation resource acquisition.** [Bonneville] Bonneville should continue to meet its share of the Seventh Plan conservation goals working with its public utility customers, the Northwest Energy Efficiency Alliance, the Regional Technical Forum, the states, and the tribes. Bonneville should ensure that public utilities have the incentives, support, and flexibility to pursue sustained conservation acquisitions appropriate to their service areas in a cooperative manner, as set forth in detail in the conservation action plan items. Bonneville should offer flexible and workable programs to assist utilities in meeting the conservation goals, including a backstop role for Bonneville should utility programs fail to achieve these goals. Should public utility savings fall short of Bonneville's share of the regional conservation goal, the Council expects the agency to conduct an assessment of the problem and implement solutions. **(See Action Item RES-1 for specifics)**
- BPA-2 Update methods to identify least-cost resources needed to maintain regional adequacy. (See Action Item RES-3 for specifics)** [Bonneville]
- BPA-3 Continue efforts to establish demand response.** [Bonneville] Bonneville should continue its efforts to evaluate and enable the use of demand response as a resource to meet future resource needs. This effort should identify and remove barriers to successful implementation of demand response and include:
- Establishing resource acquisition rules for demand response as an integrated part of assessing resource needs as detailed in RES-3
 - Expanding the infrastructure for demand response as detailed in RES-4

- Identifying the amount and cost of demand response potential including potential in the Bonneville customer utilities service areas that could be made available for Bonneville resource needs
- Assessing barriers to the further development of demand response by Bonneville and implementing actions to overcome those barriers

Bonneville should include the resource acquisition rules, the potential assessment for demand response and the assessment of barriers to developing demand response in its Resource Program.

- BPA-4 Improve access to demand response data.** [Bonneville] Bonneville should create systems to add demand response dispatch data to its existing publicly available data on the Bonneville public website. **(See Action Item REG-2 for specifics)**
- BPA-5 Quantify the value of conservation in financial analysis and, budget-setting forums.** [Bonneville] Bonneville should estimate both the cost and benefit (value) of its historic and forecast investments in energy efficiency with respect to its overall net revenue requirement for both power supply and transmission services. Data on both the costs and benefits should be publicly available in forums where agency budgets and investment allocation are discussed and decisions are made. The value of conservation is often missing from discussions setting budgets for conservation while the cost elements are always present. By quantifying the financial value of cost-effective conservation and the revenue requirement compared to no conservation, there would likely be greater buy-in from utility customers for the efficiency expenditures. Bonneville should work with the Council to develop a method to calculate estimated value of conservation (e.g., return on investment) and provide the estimate as part of its budgeting processes, Integrated Program Review, Capital Investment Review, and annual budget documents. Bonneville should have robust data to make this estimate before its next Integrated Program Review.
- BPA-6 Assess Bonneville’s current energy efficiency implementation model and compare to other program implementation approaches.** [Bonneville] Bonneville’s current efficiency program approach is based on a proportional funding model. Program offerings and incentives are designed to provide equal access to measures and program funding in proportion to Tier 1 load. This model, while effective in achieving funding equity among customer utilities, may limit the ability of Bonneville to focus its acquisition efforts on acquiring all cost-effective conservation in the region.

By the end of 2017, Bonneville should commission a study to assess alternative program design, funding allocation and incentive mechanisms and compare benefits and costs of implementing alternative models. Bonneville should develop the scope of the study in consultation with the Council and stakeholders. Alternative program approaches could include a focus on the value of the savings based on winter capacity needs, geographical needs, or localized capacity constraints. Additional approaches should explore different cost performance metrics such as lowest first year cost, lowest levelized cost, or highest benefit-to-cost ratio. The study should develop an example portfolio for each approach,

assessing the resulting potential savings and costs to Bonneville and its customers. The study should, for each portfolio:

- Assess likelihood of achieving all cost-effective conservation;
- Address the technical, policy, and economic tradeoffs;
- Assess the incentives and disincentives to program participation;
- Assess administrative process efficiency;
- Assess changes in the value of cost-effective energy efficiency, revenue requirements and how the benefits flow to customers (see BPA-5);
- Assess effectiveness of achieving savings for large projects at end-use customers;
- Assess effectiveness of the bi-lateral transfer mechanisms in allowing utilities to exchange energy-efficiency funding to balance utility circumstances of power needs and conservation potential.

- BPA-7 Bonneville should perform an analysis of its operating reserve requirements.** [Bonneville] Bonneville should conduct an analysis of the most cost-effective method of providing operating reserves that meet system reliability requirements at the lowest probable cost. Bonneville should report the input assumptions, methods of analysis and results of this analysis to the Council for use in the Council's planning process. The analysis should be included in each Bonneville Resource Program. (See Northwest Power Act, §4(e)(3)(E), 94 Stat. 2706.)
- BPA-8 Bonneville should continue to evaluate methods for reducing or mitigating regional generation oversupply conditions.** [Bonneville] Bonneville should work with its customers to create incentives that help mitigate generation oversupply conditions.
- BPA-9 Bonneville and the Council should develop a report that identifies barriers to conservation acquisition by Bonneville's customer utilities with recommended strategies to eliminate or minimize such barriers. [Bonneville, Council]** The report should identify economic, contractual, motivational, institutional, and political barriers to acquisition and implementation of conservation and demand response measures. Strategies to address barriers should be developed in consultation with customer utilities and other stakeholders. The report should be completed by the end of 2017.
- BPA-10 Enhancing BPA end-use load forecasting.** [Bonneville, Council] Council staff will work closely with Bonneville staff to implement the Council's long-term end-use forecasting model. The enhancement in end-use modeling capability will enable BPA to better reflect impacts of future codes and standards and assist BPA conservation plans to more explicitly account for impact of conservation acquisitions on forecast loads.

Council Actions Supporting Plan Implementation

- COUN-1 Form Demand Response Advisory Committee. [Council]** A major finding of the Seventh Plan is that the region would benefit from the development of demand response (DR) resources. To facilitate this, the Council should establish a Demand Response Advisory Committee to assist in the identification of strategies to overcome regional barriers to DR implementation and the quantification of DR potential. The scope of this committee's activities should be to facilitate the deployment of demand response resources in the region by serving as a forum for sharing program experience and data. This committee should be chartered by the Council by the end of FY2016.
- COUN-2 Continue to co-host the Pacific Northwest Demand Response Project (PNDRP). [Council]** The Council should continue to coordinate with the Regulatory Assistance Project to host the Pacific Northwest Demand Response Project (PNDRP). PNDRP should be convened at least annually.
- COUN-3 Review the regional resource adequacy standard. [Council, Resource Adequacy Advisory Committee, Bonneville, Pacific Northwest Utilities Conference Committee]** The Council's current adequacy metric (loss of load probability) and threshold (maximum value of 5%) has been used since 2011 as a good indicator of potential future power supply limitations. However, the loss of load probability metric may not be the most appropriate for determining the adequacy reserve margin and the associated system capacity contribution for specific resources (see COUN-4 and COUN-5), both of which are critical components of the Regional Portfolio Model. The loss of load probability metric (as currently defined) is also not appropriate for estimating the effective load carrying capability of resources. The Council should review and, if necessary, amend its standard. Any change to the adequacy standard should be adopted by the Council in time to be used for the development of its next power plan.
- COUN-4 Review the Resource Adequacy Assessment Advisory Committee assumptions regarding availability of imports. [Council, Resource Adequacy Advisory Committee, Bonneville, Pacific Northwest Utilities Conference Committee]** The Council's current assumptions regarding the availability of imports from out-of-region sources and from in-region market resources should be reexamined. The sensitivity of total system cost to import availability has been demonstrated in the Regional Portfolio Model analysis. To minimize cost and avoid the risk of overbuilding, the maximum amount of reliable import should be considered. The Resource Adequacy Advisory Committee should reexamine all potential sources of imported energy and capacity and make its recommendations to the Council. Any changes to import assumptions should be agreed upon in time to be used for the development of the next power plan.
- COUN-5 Review the methodology used to calculate the adequacy reserve margins used in the Regional Portfolio Model. [Council, Resource Adequacy Advisory Committee, System Analysis Advisory Committee, Bonneville, Pacific Northwest Utilities Conference Committee]** Resource strategies developed using the Regional Portfolio Model are very



sensitive to the adequacy reserve margin (ARM), calculated using output from the Council's adequacy model (GENESYS). The ARM is effectively a minimum build requirement that ensures that resource strategies selected by the Regional Portfolio Model will produce acceptably adequate power supplies. The underlying methodology and assumptions used to assess ARM values should be thoroughly reviewed by regional entities. Any changes to the ARM methodology should be agreed upon prior to the development of the next power plan.

- COUN-6 Review the methodology used to calculate the associated system capacity contribution values used in the Regional Portfolio Model.** [Council, Resource Adequacy Advisory Committee, System Analysis Advisory Committee, Bonneville, Pacific Northwest Utilities Conference Committee] Resource strategies developed using the Regional Portfolio Model are very sensitive to resource associated system capacity contribution values (ASCC), which are calculated using the Council's adequacy model (GENESYS). The ASCC provides the effective capacity value of resources when they are incorporated into a power supply with storage (e.g. the Northwest hydroelectric system). The methodology and assumptions used to assess ASCC values should be thoroughly reviewed by regional entities. Any changes to the ASCC methodology should be agreed upon prior to the development of the next power plan.
- COUN-7 Perform a regional analysis of operating reserve requirements.** [Council] The Council will use the Bonneville analysis of reserve requirements (See action item BPA-7) and work with other regional stakeholders to complete a regional analysis of the most cost-effective method of providing operating reserves that meet reliability requirements at the lowest probable cost. This analysis should be completed in time to include in the next power plan.
- COUN-8 Participate in and track WECC activities.** [Council] The Council should continue to represent the Northwest region in the planning activities at the Western Electric Coordinating Council (WECC), including participation on the Loads and Resources Subcommittee (LRS). The LRS develops WECC resource adequacy guidelines and assessments and acts as the interface with NERC in these areas and on NERC's development of standards in the resource adequacy area. The WECC and NERC activities provide the background within which the Council analyzes adequacy issues and approaches and develops its regional adequacy assessments.
- COUN-9 Monitor regional markets and marketing tools that impact the dispatch of the power system.** [Council] Since the Sixth Plan, the region has seen the advent of an energy imbalance market between PacifiCorp and the California ISO. There have also been efforts underway at the Northwest Power Pool to create products and services that improve the dispatch of the power system for balancing load and generation. Both of these efforts have resource implications for the region. The Council should monitor these efforts and any additional efforts that impact dispatch to assess whether its power system modeling should be altered.

COUN-10 Reaffirm and update Section 6(c) policy. [Council and Bonneville] The Council and Bonneville worked together in the 1980s to establish a policy on how to implement Section 6(c) of the Northwest Power Act, the provision specifying how Bonneville is to assess and decide whether to add a “major resource” to its system. The Section 6(c) policy includes a provision that requires Bonneville periodically to review and (if necessary) update the policy, with the help of the Council. Bonneville and the Council and Bonneville last reviewed and updated the policy in 1993, and have mutually agreed to defer review ever since. The Council and Bonneville should review, reaffirm or update the Section 6(c) policy within the next two years.

COUN-11 Participate in efforts to update and model climate change data. [Council, River Management Joint Operating Committee, System Analysis Advisory Committee, Resource Adequacy Advisory Committee] The Council should continue to work with regional entities that collect and process results from global climate analyses. This includes monitoring efforts overseen by the RMJOC to downscale global results for use in the Northwest. Information that is critical for use in Council planning models includes climate modified unregulated flows, their associated rule curves and projected monthly temperature changes. The Council will also continue to explore ways to incorporate climate induced impacts to hydroelectric generation and load into its Regional Portfolio Model. Results from the most recent Intergovernmental Panel on Climate Change Assessment Report are currently being downscaled for the Northwest but that work is not expected to be completed until early 2017. The results of that effort should be thoroughly vetted prior to the development of the next power plan.

MAINTAINING AND ENHANCING COUNCIL'S ANALYTICAL CAPABILITY

The Council's power plan is extremely data and model intensive. Maintaining data on electricity demand, resource development, energy prices, and generating and efficiency resources is a significant effort. It is one that the Council's staff cannot do alone. Data collection for the regional power system and alternative resources available to meet demand is something best accomplished through regional cooperation. The action plan contains recommendations to maintain and improve planning data for the region.

Load Forecasting

ANLYS-1 Improve industrial sales data. [Council, NEEA, Utilities] The Council will work with BPA, NEEA, and utilities to improve industrial sector sales data by disaggregating those data by NAICS codes to improve forecasting and estimates of conservation potential. Currently, industrial sales are reported by utilities to FERC and EIA in an aggregate fashion. Reporting sales data at a more disaggregated, industry specific (e.g. lumber and wood products, food processing) level would improve the ability to forecast loads and conduct assessments of conservation potential. The Council in cooperation with Bonneville should develop a system to regularly collect and categorize data accounting



for at least 80% of industrial loads. Confidentiality issues should be addressed and solved. This process and improved industrial data sets should be completed by 2018.

- ANLYS-2 Improve long-term load forecast for emerging markets.** [Council, Demand Forecasting Advisory Committee] The Council should enhance the Council's long-term end-use forecasting model's capability to account for rooftop solar PV with electricity storage, Data Centers (large, small and embedded data centers), and indoor agricultural (cannabis) loads. The Council will work with utilities and advisory committee members to monitor and forecast loads for these fast growing markets.
- ANLYS-3 Explore development of an end-use conservation model.** [Council] Many conservation planners in the industry utilize an integrated end-use based conservation assessment model to closely tie savings to load forecasts. In addition, models may also be improved by including performance-based efficiency approaches. The Council will scope the development of a working model. Depending on findings/budget, the Council may contract out model development. Report on scope will be completed by 2017.
- ANLYS-4 Review and enhancement of peak load forecasting.** [Council, Demand Forecasting Advisory Committee, Resource Adequacy Advisory Committee] This task reviews and reconciles peak load forecasting methods used for long-term resource planning (RPM) and short-term Adequacy Assessment (Genesys) analysis. This task should be completed before the next Resource Adequacy Assessment.

Conservation

- ANLYS-5 Establish a forum to share research activities and identify and fill research gaps.** [Council, RTF, NEEA, Utilities, Energy Trust of Oregon, Bonneville] There are a variety of ad hoc conservation-related research initiatives ongoing in the region. Among these activities are research on reliability of energy and capacity savings, emerging technologies, end-use load shapes, regional stock assessments, product and equipment sales data, and non-energy impacts of efficiency measures. However, these activities lack the coordination that could improve usefulness, reduce duplication, provide better access to existing data, and identify significant research gaps. The Council should facilitate a research coordination forum to define research needs, identify key players and a coordinating body, identify gaps, and develop plans to prioritize gap filling. The forum should develop a roadmap and a work plan to identify tasks and implementers considering the existing research initiatives currently underway. The roadmap and work plan should be completed by mid-2018.
- ANLYS-6 Prioritize research and adoption of energy-efficiency measures that also save water.** [Council, RTF, Bonneville, Utilities, Energy Trust of Oregon, NEEA] In recognition of the non-energy benefits of saving water, utilities should prioritize adoption of cost-effective measures that also conserve water. Several such measures identified in the Seventh Plan (showerheads, water supply facilities improvements, irrigation improvements) save water in addition to energy. Consideration of water conservation

benefits in addition to energy-savings benefits should increase the likelihood of measure adoption. In addition, the last comprehensive study of water/wastewater was completed over ten years ago and should be updated. This action item calls for: tracking and reporting of water savings in addition to energy savings, conducting research to better understand savings opportunities for water-processing industries (water supply and wastewater), evaluation of water-saving measures, and raising awareness of other water-saving measures. A new or updated analysis of water/wastewater baseline should be completed by 2018.

ANLYS-7 Reporting should include explicit information on what baseline is assumed.

[Bonneville, Utilities, Energy Trust of Oregon, NEEA, RTF] As part of its annual Regional Conservation Progress (RCP) report, the RTF provides the Council an estimate of energy savings toward the current plan's conservation goals. To accurately determine this, the RTF and Council need to understand what baseline was assumed for the energy-efficiency measures. The progress against the plan's goals should be measured against the plan's baselines. If the baseline is not aligned with the plan, the RTF can (generally) adjust the savings accordingly as long as measure and baseline information are included in the utility's tracking system. Bonneville currently endeavors to make these adjustments through its momentum savings analysis. The RTF should provide a progress report by the end of 2018 with the goal that all savings provided for the RCP report include baseline information by 2020.

ANLYS-8 Identify and analyze significant non-energy impacts. [RTF, States] Although difficult to quantify, non-energy impacts (both benefits and costs) due to efficiency improvements (such as water savings and health benefits due to reduction in wood smoke emissions³) may be significant and thus justify societal investment, regardless of whether the measures are cost-effective on an energy benefits and costs alone. The region should conduct research to identify and quantify such non-energy impacts. The Regional Technical Forum in cooperation with the RTF Policy Advisory Committee should identify and provide information to prioritize research on non-energy impacts taking into consideration the resources needed to sufficiently quantify impacts and the potential impact of quantification on measure cost-effectiveness. States should consider such benefits when setting cost-effectiveness limits for measures and programs recognizing that it may not be appropriate for the utility system to pay for non-energy benefits that do not accrue to the power system. Specifically related to health benefits from wood smoke reduction, the RTF should include model language on residential space heating measures for which significant secondary health benefits exist, as these measures are updated. As other significant non-energy benefits are identified with substantiated research, the RTF should either quantify or include model language to note their impact.

³ See Chapters 12 and 19 for more information

ANLYS-9 Include reliability of capacity savings estimates in RTF guidelines. [RTF] The RTF should update its guidelines to include savings reliability requirements for capacity, similar to how it currently treats energy savings estimates. In doing so, the RTF will review the unit energy savings measures to determine whether existing load shapes meet those requirements and identify any research needs to improve reliability of capacity estimates. The RTF should develop recommendation memos that address each measure and identify research needs for all measures by the end of 2017.

Generation

ANLYS-10 Planning coordination and information outreach. [Council] The Council will continue to participate in the development of Bonneville's Resource Program and in utility integrated resource planning efforts. In addition, the Council will periodically convene its planning advisory committees for purposes of sharing information, tools, and approaches to resource planning.

ANLYS-11 Re-develop the revenue requirements finance model – MicroFin. [Council, Bonneville, User Group] The Council, in coordination with Bonneville and a user group convened from interested parties of the Generating Resources Advisory Committee, should review and redevelop the revenue requirements finance model MicroFin, with a completed model in place by the Seventh Plan Mid-Term Assessment. The Council should develop a work plan to review the current version of MicroFin, identify technology needs in order to upgrade the model, and either perform the redevelopment in-house or outsource it via a request for proposals. The redevelopment should be completed by the Seventh Plan Mid-Term Assessment in order to have time to prepare the model for use in the development of the Eighth Plan. The Council should convene a user's group to help ensure the new model is user friendly and to help inspect the results.

MicroFin is the Council's primary financial tool for developing levelized costs and RPM inputs for new generating resources and it is in need of redevelopment. The model produces accurate and useful results, however it is based on a legacy system that no longer fits the current Excel environment and is cumbersome to work with. An upgrade will allow for easier enhancements to be made to the model and an improved user interface. The new model will ideally be accompanied by a user's guide that will ensure that it is easier to use as well as to share with the public.

ANLYS-12 Update generating resource datasets and models. [Council] The Council should review its various generating resources datasets, looking for opportunities to consolidate and streamline the data update process. This review and possible upgrade to a single system or dataset should be ongoing after the Seventh Plan, with completion in time for the Eighth Plan. The Council maintains and updates multiple sets of data on regional generating resources and projects, including:

- Project database – tracks existing and new projects in the region and their development and operating characteristics, generation data, technology and specifications, and various other data
- Renewable Portfolio Standard (RPS) Workbook – tracks generating projects and state RPS within WECC (with a focus on the Pacific Northwest) and forecasts future resource needs
- AURORA resource database
- GENESYS dataset

These datasets are important sources of information for many of the Council's models and analyses. While currently maintained separately, they share much of the same information and there is an opportunity to streamline both the updating of data and the data sharing. The value in a consolidated data source would be to ensure that all of the models are using the exact same data and values and it would also reduce staff time spent updating and maintaining multiple datasets.

ANLYS-13 Monitor and track progress on the emerging technologies that hold potential in the future Pacific Northwest power system. [Council, Generating Resources Advisory Committee] The Council should continue to monitor on an ongoing basis the emerging technologies identified in the Seventh Plan as potential resources of the future regional power system. There are several emerging technologies which could play an important role in the operation of the future power system, including:

- Distributed power with and without storage (Solar PV, CHP)
- Utility Scale Solar PV with battery storage
- Enhanced geothermal systems (EGS)
- Offshore wind
- Wave and tidal energy
- Small modular reactors (SMR)
- Energy Storage
 - Pumped storage with variable speed technology⁴
 - Battery storage
 - Other

The Council should track significant milestones in development, cost and technology trends, lifecycles, potential assessments, and early demonstration and commercial projects. Included in the analysis of the technologies is identifying any potential benefit the resource might provide during low water years. By monitoring these resources

⁴ While pumped storage itself is not an emerging technology, its potential uses and benefits are changing and emerging to fit new generation challenges. It should be monitored along with the emerging technologies and assessed as a resource in the future power system.

closely in between power plans, the Council will be prepared to analyze them and determine if they are viable resource alternatives in the Eighth Plan.

ANLYS-14 Scope and identify ocean energy technologies and potential in the region, determine cost-effectiveness, and develop a road map with specific actionable items the region could collaborate on should development be pursued. [Council, Generating Resource Advisory Committee] The Council should convene a subgroup of the Generating Resources Advisory Committee that includes regional utilities and other ocean energy stakeholders to a) scope out the emerging ocean energy technologies and identify the cost and realistic potential in the region, b) develop a set of regional priorities and action items needed should ocean energy development be pursued, and c) foster better coordination of utility efforts and investments in ocean energy.

There are several ocean energy technologies that have significant technical potential in the Pacific Northwest, including wave energy, off-shore wind, and tidal. These technologies are still emerging and in various stages of the research and development phase. While there have been efforts within the region to pursue the research and development of ocean energy, they have been relatively isolated and have not resulted in investments and projects to-date. The Council can help to foster better coordination of utility efforts across the utility community in collaboration with developers and other stakeholders to determine if there is regional interest in the development of ocean energy and outline steps to explore it further.

ANLYS-15 Research and develop a white paper on the value of energy storage to the future power system. [Council, Generating Resources Advisory Committee] The Council should convene a subgroup of subject matter experts from its Generating Resources Advisory Committee to assist in the research and development of a Council white paper on the full value stream of energy storage and its role in the power system, including transmission, distribution, and generation. In addition, the white paper should investigate the existing need for frequency and voltage regulation and balancing reserves in the regional power system. The Council should author the white paper with help from industry experts, or lead a request for proposals and select a consultant to write the paper. The white paper should be completed in advance of the Eighth Plan.

One of the potential constraints to extensive storage development is the ability of the developer and/or investor to capture and aggregate the full value of the storage system's services in a non-organized market and transform interest and overall system need into revenue streams and project funding. Many of the benefits of large scale storage are the portfolio effects for an optimized regional system, not just solely to a specific power purchaser, utility or end-user, and therefore it can be difficult to raise funds and seek cost-recovery for storage projects if the purchaser is not directly benefiting from all of the services, or is paying for a service that benefits others who are not also contributing funds. The white paper should clearly identify the issues and barriers and provide useful information that would be beneficial to the region's decision makers, power planning entities and integrated resource planning processes.

ANLYS-16 Track utility scale solar photovoltaic costs, performance and technology trends in the Pacific Northwest, and update cost estimates. [Council, GRAC] The Council should continue to monitor on an ongoing basis the costs and performance and technology trends of solar PV in the Pacific Northwest and update the forecast of future cost estimates as necessary. This should be done on an ongoing basis and with the assistance of subject matter experts from the Generating Resources Advisory Committee.

Solar PV is a rapidly evolving technology, both in terms of cost and performance. The Seventh Plan required development of a forecast of future solar PV costs. With continued uncertainty over solar installation costs and performance, updates to estimated installation costs and forecasts are required to accurately reflect the real world market. Utility scale solar installations paired with large battery systems could add further value to solar and is another important trend to follow. Detailed production estimates for many locations across the Northwest would also be useful.

ANLYS-17 Track natural gas-fired technology costs and performance, and update as necessary, particularly around combined cycle combustion turbine (CCCT) and reciprocating engine technologies. [Council, Generating Resources Advisory Committee] The Council should continue to monitor natural gas-fired technology costs and performance and technology trends in the Pacific Northwest, specifically concerning CCCTs and reciprocating engines. This should be done on an ongoing basis and with the assistance of subject matter experts from the Generating Resources Advisory Committee.

Natural gas-fired generation, particularly CCCT and reciprocating engine technologies, continue to evolve in terms of cost and performance and may play an important role in the future power system.

ANLYS-18 Monitor new natural gas developments in the region and gauge the potential impact on the regional power system. [Council, Generating Resources Advisory Committee, Pacific Northwest Utilities Conference Committee] The Council should monitor and track on an ongoing basis new natural gas developments in the region (such as pipelines, storage, LNG export terminals) and determine the potential future impacts on the regional power system. PNUCC is following similar issues, which may offer an opportunity for collaboration.

New natural gas uses and system development in the region may impact future power generation. On-going issues to track and potentially analyze include:

- Potential pipeline constraints, particularly on the west-side
- LNG facility developments in Canada and the West Coast of the U.S.
- Shale production from Canada and the U.S. Rockies
- Methanol plant development
- Natural Gas Vehicle (NGV) transportation

- Track on-going research on methane emissions resulting from gas production and transportation, and potential policy impacts

ANLYS-19 Monitor current and proposed federal and state regulations regarding the impacts of generating resources on the environment in the Pacific Northwest and subsequent impacts to the regional power system. [Council, Generating Resources Advisory Committee] The Council should continue to monitor and track on an ongoing basis the current and proposed regulations regarding the environmental impacts of generating resources and the subsequent impacts on the regional power system in terms of cost and operation.

System Analysis

ANLYS-20 Review analytical methods. [Council, Bonneville] As is customary between power plans, the Council will undertake a comprehensive review of the analytic methods and models that are used to support the Council's decisions in the power plan. The goal of this review is to improve the Council's ability to analyze major changes in regional and Bonneville systems and make recommendations to ensure a low-cost, low-risk power system for the region. This review will focus on changing regional power system conditions such as capacity constraints, integrating intermittent resources, and transmission limitations to better address these issues in future power plans.

ANLYS-21 GENESYS Model Redevelopment. [Council, Resource Adequacy Advisory Committee, System Analysis Advisory Committee, Bonneville, Pacific Northwest Utilities Conference Committee] The GENESYS model has been used extensively by the Council, Bonneville and others to assess resource adequacy. It contains, as one of its modules, Bonneville's hydro regulation model (HYDROSIM). GENESYS has also been used to assess costs and impacts of alternative hydroelectric system operations (e.g. for fish and wildlife protection). It can be used to assess the effective load carrying capability of resources (e.g. wind and solar) and it can provide estimates of the impacts of potential climate change scenarios. The model, however, has components and file structures that are decades old. Because of the multiple uses of GENESYS and because it is a critical part of the Council's process to develop the power plan, it should be redeveloped to bring the software code up to current standards, to improve its data management and to add an intuitive graphical user interface (GUI). The use of an outside contractor is likely the best course of action but options will be reviewed by the Council, Bonneville and the System Analysis and Resource Adequacy Advisory Committees. Recommendations will be made to the Council to decide on an appropriate approach given the funding available. This redevelopment should be completed in time for the next power plan.

ANLYS-22 Enhance the GENESYS model to improve the simulation of hourly hydroelectric system operations. [Council, Resource Adequacy Advisory Committee, Bonneville, Pacific Northwest Utilities Conference Committee] The Council's GENESYS model simulates the operation of the hydroelectric system plant-by-plant for monthly time steps. For hourly time steps, however, it simulates hydroelectric dispatch in aggregate. To do that, an approximation method is used to assess the aggregate hydroelectric system's

peaking capability. That method should be reviewed and enhanced to better simulate the hourly operation of the hydroelectric system. As a first step, the Resource Adequacy Advisory Committee should review real-time operations. In order to improve the simulation, it may be necessary to break up the aggregate hydroelectric system used for hourly simulations into two or three parts, reflecting the different conditions and operations on the Snake River and on the upper and lower Columbia River dams. This work may also require the use of an outside contractor. Any changes in the GENESYS model should be complete in time for the next power plan.

Transmission

ANLYS-23 Coordinate with regional transmission planners. [Council] ColumbiaGrid and Northern Tier Transmission Group (NTTG) both have regional responsibilities for transmission system planning. The Council will coordinate with these organizations to work towards consistent regional planning assumptions and track efforts that may have implications for the power plan.

ANLYS-24 Transmission Expansion Planning Policy Committee (TEPPC). [Council] One of the primary functions of TEPPC is to oversee and maintain public databases for transmission planning. The Council will work with this committee on coordinating the public data used in the Council's planning process with the data produced by this committee. To the extent possible the Council will use these data to inform assumptions for generation and load outside the region.

FISH AND WILDLIFE

F&W-1 Investigate further the effects of resource development, especially renewable resource development and associated transmission, on the environment in general and on wildlife in particular. [Council, State Fish and Wildlife Agencies, Indian Tribes, State Energy and Energy Siting Agencies, Transmission Providers, Utilities, Bonneville] The region's fish and wildlife agencies and Indian tribes have expressed significant concern about the cumulative impacts to wildlife and the environment from the development of the region's power system, other than the effects from hydroelectric projects themselves for which there is a robust protection and mitigation program. This concern increased in the wake of the recent spurt in development in the region of renewable and gas-fired generation and the associated transmission lines, and the possibility of further such development. What is not clear is whether the current mechanisms for analyzing and addressing these effects are indeed inadequate, and if so, what can or should be done about this situation. The Council should work with representatives of the state fish and wildlife agencies and Indian tribes along with the state energy and energy siting agencies, transmission providers, utilities, Bonneville, and others to gain a better understanding before the next power plan of the nature and extent of both the adverse effects and of the regulations and programs intended to address those effects. This includes investigating and assessing what is known already about the extent of the effects; what laws, regulations and programs exist to analyze, assess, and address these effects and the efficacy of these efforts; what actions



have been required to protect and mitigate for the generating resource and transmission effects and the efficacy of those actions; what gaps exist, if any, in terms of unaddressed cumulative impacts to the environment and wildlife from resource and associated transmission development; and how well the Council is considering these effects and costs in its power plan resource analysis.

DRAFT