COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION
700 NE Multnomah Street, Suite 1200
Portland, Oregon 97232
(503) 238-0667
F (503) 235-4228
www.critfc.org

March 17, 2023

John Hairston
Administrator
Bonneville Power Administration
911 NE 11th Avenue
Portland, OR 97232
jlhairston@bpa.gov

RE: Draft 2022-2027 Energy Efficiency Action Plan

Dear Administrator Hairston:

On behalf of the Columbia River Inter-Tribal Fish Commission, we are pleased to provide these comments on BPA's Draft 2022-2027 Energy Efficiency Action Plan. BPA and its customers have been leaders in promoting energy efficiency in the Pacific Northwest, and these efforts have provided significant benefits to consumers, the economy, and fish and wildlife.

We urge BPA to maintain and expand its energy efficiency efforts. The proposal in the draft to significantly reduce BPA's programs is not consistent with the Administration's Climate Action Plan, will reduce benefits to consumers, result in more greenhouse gas pollution, and hurt fish and wildlife and other tribal resources.

Background

The Columbia River Inter-Tribal Fish Commission (CRITFC) was created by the Nez Perce, Umatilla, Warm Springs, and Yakama tribes in 1977. CRITFC provides technical, policy coordination and enforcement services to the four tribes. More than 40 years ago, CRITFC assisted its member tribes in developing the provisions for the Northwest Power Act's energy planning and fish and wildlife requirements. Since then, it has supported its member tribes desire for improving the condition of the Basin's anadromous fish populations.

Recent dramatic reductions in Columbia Basin salmon populations and the West Coast energy planning environment prompted CRITFC to undertake a second major revision to its Energy Vision for the Columbia Basin. The CRITFC Energy Vision includes recommendations intended to protect the tribes' treaty-secured fish, wildlife, cultural and other resources.

The first Tribal Energy Vision in 2003 included recommendations to avoid another energy shortage like that of 2001, which damaged fish and wildlife and the economy. The second Energy Vision in 2013 focused on reducing hydroelectric dam impacts on salmon populations and decreasing costs for consumers.

The 2022 Energy Vision takes a holistic approach to meeting energy needs during this time of energy transition while protecting tribal resources. It includes recommendations to increase energy efficiency, improve load management and energy storage, strategically site new renewable resources, ensure resource adequacy and address transmission availability and reliability. These recommendations will reduce peak loads and other pressures on the power system while improving reliability and reducing costs. They will also protect the resources that are vital to the tribes' economies, culture, and religion. A copy is available at https://critfc.org/energy-vision/.

The 2022 Energy Vision includes specific recommendations; relevant excerpts are attached to these comments.

Comments on BPA Energy Efficiency Draft Plan

The Columbia River Inter-Tribal Fish Commission recommends that BPA increase its targets for energy efficiency to maintain the level of activity called for in the Seventh Power Plan (581 average megawatts identified as BPA's portion). We offer the following specific comments and the excerpts from the Energy Vision provide more details and analysis.

1. Energy efficiency is a low-cost resource that has saved Pacific Northwest consumers over $75 billion dollars—these savings are growing at about $5 billion per year and it does not make sense to reduce these benefits.

2. Energy efficiency improvements are inherently fish and wildlife friendly. They require no "steel in the ground" in undisturbed landscapes and will not damage tribal cultural resources. They do not create any greenhouse gases.

3. Energy efficiency provides benefits to the power system and salmon. The energy savings are matched to loads and provides more saving during peak hours in the winter and summer. This reduces the need for peak energy resources and river fluctuations that hurt salmon migration.

4. Reducing energy efficiency programs is not consistent with the Administration's Climate Action Plan. BPA should continue to be a leader in aggressive actions to address the climate crisis.

5. Energy efficiency is a proven, reliable resource. The region has 45 years of experience delivering these programs. The region has saved 7,200 average megawatts since 1978 through energy efficiency programs, codes, and standards. Energy efficiency operates 24/7, unlike wind and solar energy resources they are generally not subject to variations in weather. Unlike thermal resources they are immune from fuel price increases.

6. The U.S. Energy and Employment Report shows that over 100,000 people are employed in our region working with energy efficiency at utilities, the Northwest Energy Efficiency Alliance (NEEA), the Energy Trust of Oregon, state agencies, and at the many trade allies

and contractors that work to implement programs and deliver efficiency services.[1] Reducing these programs will threaten the businesses and jobs in this industry.

7. The tax credits and incentives in the recently enacted Inflation Reduction Act will increase the demand for these programs.

8. Energy efficiency and conservation can benefit low-income populations including tribal peoples. The IRA includes billions of dollars for tribal governments to implement retrofits of tribal housing (page 12 of your draft). The BPA Action Plan should have specific provisions for tribal programs to address the unique circumstances in this sector. As we have stated before, tribal housing often requires additional repairs for energy efficiency, solar, and battery technologies to be effective. These efforts need to be expanded not reduced.

9. The BPA action plan should specifically include heat-pump water heaters, thermal-mass of buildings; and pilot programs to promote net-zero buildings.

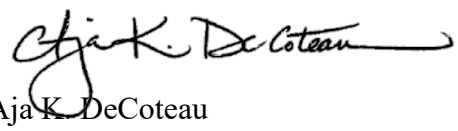
10. BPA did not meet the Council's energy efficiency goals under the Seventh Power Plan it needs to fill that deficit and maintain programs. "BPA and its customers delivered 537.5 aMW of energy savings over the Seventh Power Plan, nearly meeting the plan's overall goal of 580.7 aMW." (Page 18 of BPA draft action plan). BPA starts with a 43 average megawatt deficit in the meeting the Council's prior goals and now proposes to reduce its goal to 300 average megawatts through 2027 (page iii of the draft action plan).

11. BPA references changes in cost effectiveness for energy efficiency (page 7 of draft action plan). CRITFC provided detailed comments to the Council that its analysis on this issue was flawed. The Council assumed unrealistic river operations that violated current ESA requirements and did not address future structural and operational changes at the federal dams. These faulty assumptions reduced the costs of integrating wind and solar and made less energy efficiency cost competitive. The Council promised to review its analysis but has so far failed to do so.

12. To close on a positive note, we support BPA's inclusion of demand response. This was a significant recommendation in the Energy Vision—the region needs to control loads to better match the availability of renewable resources. We urge BPA to provide leadership on this important issue.

We have provided excerpts from the CRITFC Energy Vision that describe the recommendations for BPA related to our comments. The excepts also provide more technical information to support our recommendations.

Sincerely,



Aja K. DeCoteau
Executive Director

[1] 2020 Report: https://www.usenergyjobs.org/.

Cc: Jennifer Granholm, Secretary of Energy
Elena Kazarov, Long Term Energy Efficiency Planner, eakazarov@bpa.gov
David Conrad, DOE, Office of Indian Affairs
Sara Gonzales-Rothi, Council on Environmental Quality

Excerpts from the Energy Vision for the Columbia River Basin

Adopted by the Columbia River Inter-Tribal Fish Commission on February 15, 2022

Summary

CRITFC has provided excepts from the Energy Vision for the Columbia River Basin related to the comments on BPA's Energy Efficiency Action Plan. Copies of the Energy Vision were provided to BPA and are available at https://critfc.org/energy-vision/.

A major theme of the Energy Vision is to ensure that renewable resources in combination with increased storage, reductions in peak demand, and increased energy efficiency can provide clean, adequate, reliable, and affordable electricity, support the restoration of heathy, harvestable salmon populations, and prevent future damage to salmon and steelhead and other tribal resources caused by the electrical system.

The Northwest is at a critical crossroad, facing challenges to the health of the planet and the future of iconic fish and wildlife. These challenges are especially important to tribal resources that have sustained tribal people since time immemorial.

One path leads to affordable, carbon-free energy that harmonizes with the ecosystem. This future would prioritize energy efficiency, renewable resources, new storage technologies, reductions in peak loads, and other strategies that are compatible with the needs of fish and wildlife. These efforts would reduce the impacts of renewable resource projects and transmission lines on tribal resources and save consumers money.

The other path creates conflicts between renewable resources and tribal resources and results in higher costs for consumers.

Choosing the first path will require the courage to act, common-ground solutions, and a commitment of resources to accomplish the hard work ahead. It will also require the humility to periodically evaluate and adjust course based on new information and understanding.

CRITFC and its member tribes are committed to working with other regional interests to lead the region to a brighter and healthier future. Affordable and reliable power is important to regional families and businesses, tribal and non-tribal. The true wealth of our region begins with the health of our rivers, fish, and the ecosystem they support, which is our culture, history, and future.

Excerpts from the Energy Vision for the Columbia River Basin

3.3. Reduce Peak Demand

Controlling energy demand during times of peak energy usage needs to be a priority for the region. Electric supplies must meet energy demand every second of the day. Electricity demand peaks in the mornings as individuals and business begin their day to heat or cool buildings and in the late afternoons when people come home and need to heat or cool their houses, prepare

dinner, and turn on other appliances. These daily peaks get larger on very cold or very warm days because it takes even more energy to heat and cool buildings.

Cutting peak demand will reduce damage to salmon and steelhead. River fluctuations disrupt migration and increase exposure to predators. Reducing peak demand will also reduce greenhouse gas emissions from thermal power plants.

There are quantifiable benefits to consumers from reducing peak loads. For the electrical system, lower demand on peaks translates into fewer capital resources that are needed to serve loads. The grid can serve the same total energy needs with fewer generating plants and a smaller investment in new transmission and distribution lines over time if peaks are lowered. Line losses and ancillary services can also be reduced with lower demand.

Appendix E [of the Energy Vision] describes the high cost of the transmission and distribution system associated with meeting peak demand. For example, serving the highest 600 hours during a year (out of 8,760 hours) is estimated to cost between $0.50 and $1 per kilowatt hour, compared to the average costs residential customers pay of about $0.08 to $0.12 per kilowatt hour. These high transmission and distribution costs get averaged into everyone's electric bill.

The analysis of the cost effectiveness of energy efficiency, storage, and other demand response actions should incorporate more accurate costs for the transmission and distribution systems needed to meet peak loads. The Council's analysis for the draft 8th Power Plan appears to use an average rate for transmission in the region of $31 per kilowatt per year and the average distribution cost of $26 per kilowatt year[2] in calculating the benefits of deferring construction. CRITFC's analysis estimates that the transmission and distributions costs of serving the top 600 hours (out of 8760 per year) is between $80 and $100 per kilowatt year.[3] Using these higher costs when calculating the value of deferring peak loads would likely improve the cost effectiveness of actions that reduce peak loads.

Reducing peak demand would also defer or eliminate the need for some new transmission and distribution systems. For example, BPA and four Northwest investor-owned utilities spent more than $8 billion on transmission and distribution systems over the past five years. Future expansions will add significant costs and can adversely affect sensitive resources along power line routes. See Section 3.10 and Appendix E for more information on transmission and distribution costs.

As discussed above, the region is currently valuing the "flexibility" of the hydroelectric system at zero, but we know the changes projected for the system will have devastating effects on fish and wildlife. The evaluation of programs to reduce peak demand must address these impacts on fish and wildlife and other tribal resources.

Adopting technologies that allow for peak load control may have significant advantages for fish passage. Once in place to control peak loads, it is a small step to use them to shape loads on a

[2] Northwest Power and Conservation Council memorandum *Updated Transmission and Distribution Deferral Value for the 2021 Power Plan*, March 5, 2019.
[3] Draft *Energy Vision for the Columbia River Basin*, Appendix E.

continual basis. Shaping loads could then translate into reducing energy demand pressures that compete with salmon and steelhead.

By 2030, according to one estimate, the United States will have nearly 200,000 megawatts of cost-effective load flexibility potential, equal to 20% of estimated U.S. peak load. That is three times the existing demand response capability, with savings for consumers from avoiding utility system costs estimated at $15 billion annually. This flexibility, largely by use of technology for managing energy use in buildings, can help cost-effectively address several grid challenges, from growth in peak demand, to higher levels of variable renewable energy generation, to increasing electrification of transportation and other loads.[4]

As energy systems acquire the general ability to control loads, we can envision a time when loads can be shaped to harmonize with electricity supplies and the hydro system configurations and operations needed for fish and wildlife.

Several utilities have experienced flat or declining peak winter loads, while their summer peak loads have increased slightly.[5] The region needs to build on these efforts to reduce future peak loads. These efforts will reduce costs, improve salmon survival, and improve the reliability of the electric system.

3.3.1. Energy Efficiency Reduces Peak Demand

Recommendation 4: The Council, BPA, and utilities should include the peak savings and reductions in transmission and distribution benefits in calculating the capacity value of energy efficiency programs.

Energy efficiency programs continue to be among the lowest-cost ways to meet future energy needs. They have the added benefit of reducing peak demand. Extensive regional experience shows that balanced energy efficiency portfolios disproportionately save electricity during peak periods. A well-insulated home or office requires less heat in the winter and less air conditioning in the summer. Energy efficiency is "fish friendly". It is the energy resource that has the least potential to damage tribal resources. The table below shows the NPCC analysis of the energy efficiency savings between 2016 and 2019. It shows that the total savings were 857 average megawatts. These programs resulted in 1,683 megawatts of peak savings in the winter and 1,042 megawatts in the summer.

[4] Hledik, R., A. Faruqui, T. Lee, and J. Higham. 2019. The Brattle Group. "The National Potential for Load Flexibility: Value and Market Potential Through 2030." https://brattlefiles.blob.core.windows.net/files/16639_national_potential_for_load_flexibility_-_final.pdf.
[5] For more information, see Appendix E.

Capacity Savings by End Use - All Sectors Combined		
Year	(Multiple Items)	
Row Labels	**Sum of Winter MW Savings**	**Sum of Summer MW Savings**
Lighting	698.06	445.43
HVAC	519.19	145.70
Whole Bldg/Meter Level	185.24	133.75
Unknown	59.56	47.57
Process Loads	47.83	49.15
Electronics	45.71	37.14
Water Heating	44.68	25.12
Refrigeration	40.84	44.73
Motors/Drives	22.12	21.13
Compressed Air	14.88	14.77
Utility Transmission System	1.62	1.57
Food Preparation	1.31	1.23
Facility Distribution System	0.97	1.00
Utility Distribution System	0.67	2.91
Irrigation	0.60	70.97
Grand Total	**1,683.28**	**1,042.17**

These programs have the added benefit of matching electric energy growth. As the number of new homes and business are built and new efficient appliances are added, the energy and capacity savings increase.

The Council's draft 8th Power Plan[6] assumes a total additional conservation potential of 5,103 average megawatts in 2041 that "saves 9,105 megawatts of summer peak and 8,511 megawatts of winter peak."[7]

The Lawrence Berkely Laboratory collected data on costs, energy savings and peak demand savings for electricity efficiency programs for 36 investor-owned utilities and other public agencies in nine states (Arizona, Arkansas, California, Colorado, Illinois, Massachusetts, Maryland, New York, and Texas) for 2014 to 2017.[8] The savings during the study period averages $0.029/kilowatt-hour (kWh) and varies by a factor of three ($0.013/kWh to $0.039/kWh) across the nine states. The report states:

> Based on this initial study, electricity efficiency programs appear to be a relatively low-cost way for utilities to meet peak demand, compared to the capital cost of other resources (Lazard 2018; EIA 2019) that can be used to meet peak demand. However, many energy efficiency technologies, such as more efficient light bulbs, are "passive" and are not dispatchable. In such cases, efficiency resources do not provide the same services as a natural gas peaking turbine, making comparisons between these resources complex. At the same time, our results suggest that electricity efficiency programs that reduce peak demand merit strong consideration by utilities and regional grid operators.

[6] Please note that the Energy Vision was adopted before the Eighth Power Plan.
[7] https://www.nwcouncil.org/2021powerplan_conservationpotential.
[8] https://emp.lbl.gov/publications/peak-demand-impacts-electricity.

> Further, "active" efficiency measures such as lighting controls enable active management of efficiency resources, offering additional grid services.

These cost-effectiveness calculations should also consider the very high costs of transmission and distribution systems that serve these peak loads as discussed above and in Section 3.10 and Appendix E.

3.3.3. Demand Response and Load Management

Integrating renewable resources with the region's electricity needs will require better management of electricity loads. This section describes several important actions.

A. Load Management.

Recommendation 6: Utilities should use demand response to manage system loads, reducing peak loads, ensuring reliability by encouraging customers to reduce demand during peak periods or shift loads from peak to off-peak hours.

Utilities and BPA should pursue actions to manage loads by shifting them to times when renewable power is available and to minimize impacts on fish and wildlife. These actions will reduce costs and environmental impacts.

The Council's 7th Power Plan (2016) identified significant potential to reduce or shift peak demands. It found:

> The Seventh Power Plan assumes the technically achievable potential for demand response in the region is over eight percent of peak load during winter and summer peak periods by 2035. This assumption is based on the Demand Response Program Potential Study commissioned by the Council and feedback from regional stakeholders. This figure represents approximately 3,500 megawatts of winter peak load reductions and nearly 3,300 megawatts of summer peak load reductions by the end of the study period. In addition, the study identified additional potential for summer and winter demand response that could be available by the end of the study period to provide for load and variable generation balancing services.[9]

The Council's draft 8th Power Plan significantly reduced the estimates for demand response, primarily because it was not as cost effective as renewable resources.

> The Council recommends utilities examine two demand response products: residential Time-of-Use (TOU) rates and Demand Voltage Regulation (DVR) as a means to offset the electric system needs during peaking and ramping periods and to reduce emissions. A given utility's time of need may differ from the region's, but these products are likely still

[9] nwcouncil.org/7thplan, page 14-2.

> part of a cost-effective strategy. Our assessment shows about 520 megawatts of DVR and 200 megawatts of TOU available by 2027.[10]

As discussed elsewhere, the flawed assumption that the hydroelectric system can integrate all the new renewable resources at low or no cost creates an artificially low cost that crowds out resources like demand response. The analysis of these measures should fully consider the environmental benefits and significant cost savings from reducing the need for transmission and distribution to serve peak loads. Including an accurate accounting of the environmental impacts associated with the "steel in the ground" these costs of renewable resource and transmission construction is likely to make more demand response and related measures cost effective. Viewed from a broader perspective, the federal and state environmental policies, such as carbon reduction and endangered species preservation, are not limited by cost-effectiveness thresholds.

CRITFC urges the Council to expand demand voltage reduction and time of use programs and consider other demand response programs as alternatives to batteries or other storage devices. For example, innovators like OhmConnect are marketing their free demand response assistance as a way of reducing energy blackouts in California.[11]

Utilities should pursue demand response in residential and commercial buildings and other sectors. For example, Idaho Power and PacifiCorp are running demand response programs for air conditioning cycling and irrigation pumping. These programs are designed to reduce summer peak demands.

B. Electric Vehicles

Recommendation 7: Automobile manufactures should include systems that allow electric vehicles to schedule charging during off-peak periods.

Electric cars and plug-in hybrid cars should be a win-win-win for consumers, the environment, and salmon. Electric vehicles have very low operating and maintenance costs, reduce greenhouse gases and other air pollution, and reduce dependence on foreign oil. If owners charge car batteries at times that help integrate renewable resources and improve salmon survival the region can achieve these benefits.

Auto manufacturers should provide scheduling software that can control when the cars charge and promote its use (these systems are already standard on some electric vehicles). If timers are not incorporated and used, drivers might start charging when they get home from work and add to peak energy demand. This would make things worse for consumers, the power system, and salmon.

Recommendation 8: Utilities should integrate electric vehicle charging and batteries into the power system to reduce costs to consumers and the power system and improve salmon migration.

[10] Draft 2021 Power Plan, page 6-41.
[11] https://www.ohmconnect.com/about-us.

Utilities should install smart meters that would charge electric vehicles when there is low-cost surplus power and use electricity from those vehicles' batteries during peak periods. In these "vehicle to grid" systems, a electric vehicle owner could get a discount on the electricity, and this could be a cost-effective way to meet peak and provide storage at a lower-cost than utility-scale batteries.[12] This approach could also reduce the need for new transmission and distribution lines. These efforts will require improvements in information sharing so charging can be scheduled during the optimum time to reduce environmental impacts.

Electric vehicles should also be integrated with on-site solar systems to charge vehicles while the sun is shining and use their batteries when the sun goes down or during extended shortages. For example, the 2022 Ford F-150 Lightning battery can power an average home for about three days.[13]

Recommendation 9: BPA and utilities should work to improve the efficiency of electric vehicles.

An analysis by Amory Lovins concludes:

> Efficiency gains achievable by integrative design of whole light-duty vehicles can be severalfold larger, yet cheaper, than those predicted by canonical incremental technology-by-technology analyses. This means that US and international efficiency standards rest on overly conservative analyses; electrification can be cheaper and faster than conventionally assumed; and the efficiency potential predicted by groups like the US National Research Council and assumed in climate-mitigation assessments need major revision, aided by evaluation processes that better assess whole-vehicle design and early signals from concept vehicles. [14]

Current electric vehicles have high EPA miles per gallon (electric equivalent) ratings compared to internal combustion engines. For example, a Tesla Model 3 has a combined rating of 142 MPGe and a Hyundai Ioniq is rated at 133 MPGe.[15] Increasing the efficiency several fold would stimulate the adoption of these vehicles and reduce impacts on the electricity system.

C. Hot Water Heaters

Recommendation 10: the Council, BPA, and utilities should fund the incremental costs of heat pump water heaters to stimulate the adoption of this technology.

Heat pump water heaters are more efficient than conventional systems and provide both energy and capacity savings in new houses. The conversion of existing houses to heat pump water

[12] Clean Vehicles as an Enabler for a Clean Electric Grid: https://iopscience.iop.org/article/10.1088/1748-9326/aabe97.
[13] https://www.motortrend.com/news/2022-ford-f-150-lightning-electric-truck-charging-generator-power/
[14] Lovins, A., "Reframing Automotive Fuel Efficiency," 2020, https://doi.org/10.4271/13-01-01-0004.
[15] https://www.fueleconomy.gov/feg/evsbs.shtml.

heaters will also provide benefits. The Council's 7th Power Plan estimated that cost-effective conversions from electric resistance to heat pump water heaters would reduce peak demands by 1,250 megawatts during winter (January) and just over 1,850 megawatts in summer (August) by 2035. These systems come with built-in demand reduction capability to help reduce peak loads.

Utility incentive programs would increase market penetration and likely drive down costs. This was the experience with "new technology" such as six-inch wall insulation and R-50 windows in the 1st Power Plan in 1983. BPA and utilities paid the added costs of these measures, suppliers started stocking them, manufactures mass produced them, subcontractors learned to install them, and the costs came down.

Recommendation 11: Utilities and BPA should develop and fund programs to schedule when water heaters operate.

Time of day water heating technology is commercially available. Water pre-heated during the middle of the night, can last through the morning peak use period. This technology can be used in today's hot water heaters, and can be made more effective in replacement tanks, by increasing the size of the water tanks. More sophisticated and easy to use demand-response enabled equipment is also coming onto the market, thanks to state-level standards passed in Oregon and Washington for CTA-2045 compliant water heaters for the residential market. To get the benefits of the peak reduction potential, however, utilities will need to develop customer-centric demand response programs.

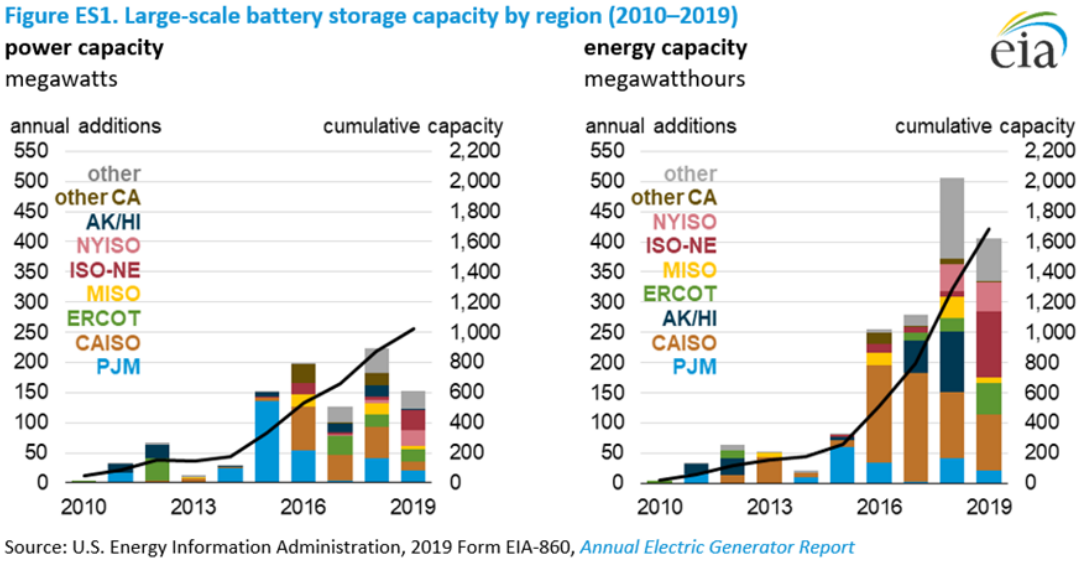
3.3.4. Increase Electricity Storage

Integrating renewable resources with the region's electricity needs will require significant energy storage. This section describes several important actions to secure energy storage by fish friendly means.

A. Utility-Scale Batteries

Recommendation 12: BPA and utilities should implement utility-scale battery projects.

The chart below from the U.S. Energy Information Agency shows the expansion of utility-scale batteries between 2010 and 2019.



The growth of these batteries is expanding quickly as costs come down.[16] California will have 3,000 megawatts of utility-scale batteries to store electricity to meet peak demands online by the end of 2021. These lithium battery systems store power from solar plants during the day and can provide four hours of electricity when the sun sets.

New battery technologies, such as those based on iron flow chemistry, are on the horizon that may reduce the need for the use of precious metals in energy storage.[17] An iron flow battery has six-to-twelve-hour storage cycles, are scalable to 2000-megawatt hour systems, and have a 25-year operating life.[18] These and other technologies can provide reliable energy storage and do not require the rare earth minerals of lithium batteries. The WECC projections show approximately 200,000 megawatts of solar and battery projects by 2045.

These batteries could help address some reliability and renewable resource integrations issues in the Northwest. Winter peaks often last more than twelve hours and will likely require a combination of storage, improved efficiency measures, demand management, and other strategies to serve these electricity needs, especially in low-water years (please see Section 3.7 on Resource Adequacy).

Northwest utilities should review the experience with these batteries and begin construction of systems at strategic locations. For example, these batteries could be located near load centers or near major generation and transmission hubs to reduce the transmission and distribution costs.

The Council's draft 8th Power Plan discusses the role of batteries but does not call for actions to promote their use. It is CRITFC's understanding that the Council did not find them cost effective compared to other alternatives. As discussed elsewhere, the Council is assuming the hydroelectric dam reservoirs can be used as a huge battery at low or no costs (except to salmon). This flawed assumption prejudices the cost effectiveness of storage technologies that do not

[16] See Oregon Department of Energy 2020 Biennial Energy Report Utility Scale Storage Technology Review.
[17] https://www.bloomberg.com/news/articles/2021-09-30/iron-battery-breakthrough-could-eat-lithium-s-lunch.
[18] https://essinc.com/iron-flow-chemistry/.

increase the mortality of migrating salmon. It is also contrary to the Northwest Power Act's mandate for due consideration to environmental impacts in the Council's energy planning processes. [19]

B. On-Site Batteries

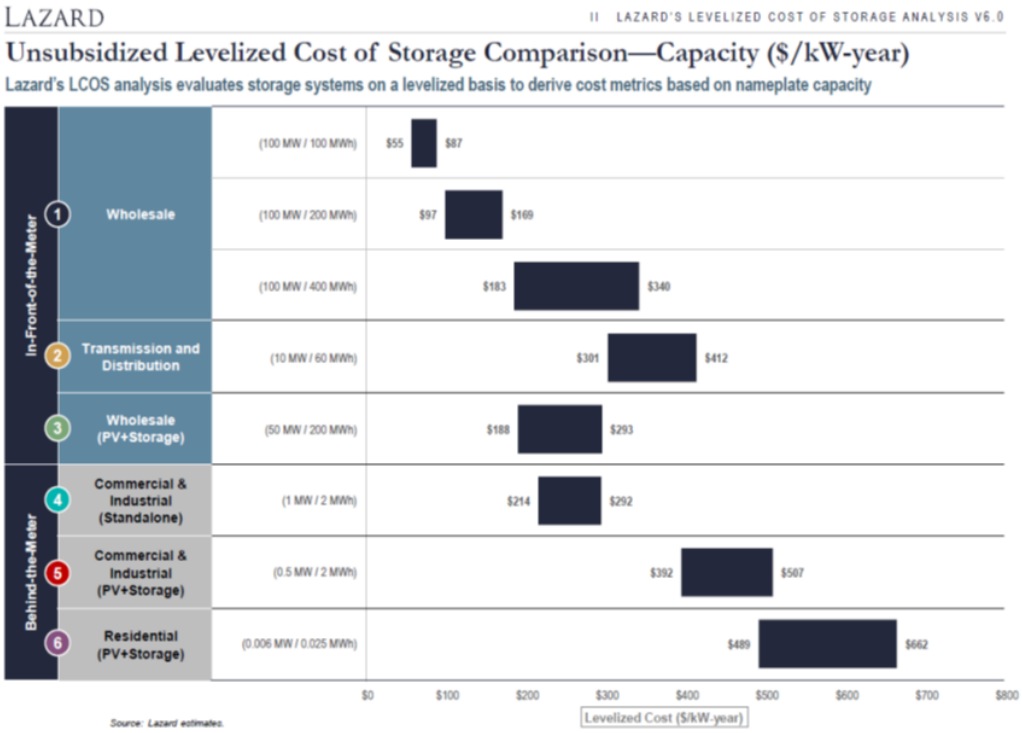
Recommendation 13: BPA and utilities should implement incentive programs to expand the use of on-site batteries.

On-site generation and home and business storage systems are becoming commercially available. For example, Tesla has a Solar Roof and Powerwall system to generate and store electricity for a house. The Powerwall also tracks National Weather Service alerts for severe weather and fully charges the battery in case of a forecasted power outage. The system also has time-based controls to use stored power when grid costs are expensive and net metering credits for excess solar energy sent to the grid.

The Oregon Legislature passed a bill in the 2021 session to allocate an additional $10 million for the solar and storage rebate program to help bring down the costs of these systems. The rebates may cover up to 40 percent of the net cost for a residential system installed for a customer that is not considered low- or moderate-income, up to 60 percent of net cost for a low- or moderate-income customer, and up to 50 percent for a low-income service provider.[20] Other states should establish such programs.

The chart below, prepared by Lazard Bank, shows the unsubsidized levelized cost of storage alternatives.[21]

[19] For more details, see CRITFC's letters to the NPCC posted at https://critfc.org/tribal-treaty-fishing-rights/policy-support/public-documents/?topic_area=energy-vision.
[20] https://www.oregon.gov/energy/Incentives/Pages/Solar-Storage-Rebate-Program.aspx.
[21] Lazard's Levelized Cost of Storage Analysis – Version 6.0, Lazard's Bank, 2020, page 5.



C. Space Heating and Cooling Stored in Buildings

Recommendation 14: BPA and utilities should fund programs to reduce peak loads using the thermal mass of buildings.

Heating and cooling effects can be stored in building mass, including mass that may have been added for this specific purpose. The technique of using thermal mass (*e.g.*, properly located rocks, concrete, or other material) to store heat and cold is ancient but may be coming back in style as Northwest universities include energy efficient building design courses in their renewable energy engineering programs.[22] Adding mass to residential buildings is being tested in regional pilots. Storage of heating and cooling in buildings to meet these needs through peak periods has possibilities for around the clock applications similar to hot water storage.

Commercial buildings generally have a high mass, so they can be pre-heated and pre-cooled by using off-peak energy prior to the buildings being occupied in the morning. The potential for saving on transmission and distribution, generation, line losses, and ancillary services is very large.

With appropriate incentives for building owners, web-based thermostat controls can enable existing buildings to store energy for heating and cooling. These controls allow a utility dispatcher to pre-heat and pre-cool buildings thereby shifting the power consumption to an off-

[22] The University of Oregon has created an Energy Studies in Buildings Laboratory with programs in Eugene and Portland employing and educating students in building designs that address climate change needs of society. *See* *https*://esbl.uoregon.edu. The Oregon Institute of Technology was the first university in the nation to offer a renewable energy engineering degree including coursework in energy efficient building design. *See* http://catalog.oit.edu/preview_program.php?catoid=9&poid=2030.

peak period. This is an example of using the thermal mass already in the building as a storage medium. Once the platform that enables these web-based controls is in place, all energy devices using these controls could be operated for energy management purposes.

3.4 Energy Efficiency Resources

Energy efficiency programs reduce both peak demands and year-round energy needs. Energy efficiency has been proven as a reliable resource in the Northwest with costs that are less than half the cost of new gas-fired power plants. These programs save consumers money and reduce the emissions of pollutants that cause climate change. They are fish compatible.

Energy efficiency also reduces the region's seasonal storage needs because energy savings closely track energy demand. The "flexibility" of energy efficiency is extremely valuable. Energy efficiency programs have no adverse effects on fisheries or other tribal resources.

According to the Council, the region has saved 7,000 average megawatts since 1978 through energy efficiency programs, codes, and standards. That is enough electricity to serve more than 5 million homes. The U.S. Energy and Employment Report shows that over 100,000 people are employed in our region working with energy efficiency at utilities, the Northwest Energy Efficiency Alliance (NEEA), the Energy Trust of Oregon, state agencies, and at the many trade allies and contractors that work to implement programs and deliver efficiency services.[23]

These energy efficiency programs have saved northwest consumers over $70 billion dollars and those savings are growing at about $5 billion per year. The NPCC data shows that more than $8.5 billion has been spent by northwest utilities on energy efficiency programs—a significant portion of these funds were spent in the region, providing jobs and economic activity.

3.4.1. Secure All Cost-Effective Energy Efficiency.

Recommendation 17: The Council should increase the conservation targets in the 8th Power Plan to maintain at least the level of activity called for in the 7th Plan and work with BPA and utilities to try to exceed the targets.

In the draft 8th 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.[24] These energy efficiency targets are significantly lower than the 7th Power Plan when the Council estimated that over 4,000 average megawatts of conservation could be acquired cost-effectively over the 20-year planning period.

One reason for the Council's decreased recommendation appears to be that solar and wind energy costs are lower than some of the energy efficiency. These lower renewable resources costs include the Council's assumption that this energy can be integrated using the regions' dams

[23] 2020 Report: https://www.usenergyjobs.org/.
[24] Draft 2021 Power Plan, page 5-29.

and reservoirs at little or no cost. This planning assumption is not accountable to the reality of dam operations on the Columbia River System.

It is also CRITFC's understanding that part of this reduced conservation potential is because LED lights are already in wide use and the Obama Administration adopted 49 new federal standards that are capturing some of the 7th Plan's targeted savings, so the baseline load forecast for 7th plan is lower. If this is the case, the Council should clearly communicate this change is the baseline and that new conservation measures are in addition to this baseline.

The CRITFC recommendation to maintain at least the level of activity for energy efficiency programs called for in the last plan are based on several factors:

First, we understand that the Council will be evaluating alternative river operations that we believe are likely to increase the costs of integrating solar and wind energy when compared to energy efficiency. Maintaining the program levels from the 7th Power Plan would avoid slowing energy efficiency efforts that the region may regret.

Second, the Council's cost-effectiveness calculations should include the very high peak energy costs of transmission and distribution systems. CRITFC's analysis from 2013 showed the transmission and distribution costs of meeting the highest 15 percent of peak energy needs ranged from 79 cents to $1.19 per kilowatt-hour. Energy efficiency and other behind-the-meter actions avoid those high transmission and distribution costs. These avoided costs must be duly accounted for in cost-effectiveness determinations.

Third, the Council notes that the energy conservation industry employees 100,000 people. Reducing these programs means downsizing this work force and reducing the number of companies providing these services when the region will likely need them in the future. Many industries are experience shortages of workers. Losing a trained work force could take years to recruit and retrain.

Fourth, as the Council reconsiders its energy efficiency targets for the 8th Power Plan, it should assume a higher penetration rate. The 7th Power Plan assumed that only 85 percent of the cost-effective conservation will be achieved. If the region could achieve 100 percent of these savings, it would save consumers an additional $300 million per year.[25] If we assume these savings are phased in over the life of a 20-year power plan; the additional savings could total about $3 billion by 2036.

Fifth, the Council, BPA, and utilities should include incentive programs for measures that are on the margin to stimulate new technologies. The Council and Northwest Energy Efficiency Alliance should identify promising measures and develop programs to bring down cost and increase the commercial availability. The region has had success with similar efforts where early investments reduced long-term costs.

[25] De-rating the energy efficiency that is achievable by 15 percent represents 600 average megawatts of low-cost power that were not included in the NPCC conservation targets for the Seventh Power Plan. A simple calculation of the value (marginal resource costs minus cost of conservation[25] multiplied by 1000 average megawatts) shows that the value of this additional conservation is $300 million per year.

BPA and utilities can afford to pay the incremental costs of these marginal measures. The Northwest Power Act requires measures to be economically feasible for consumers, taking into account financial assistance from the Bonneville Power Administration and the region's utilities.

It is important to note that BPA and utilities do not pay the full cost of the energy efficiency. Consumers usually pay a share of the costs of these programs. Building codes and appliance standards provide significant savings at no cost to utilities. A rough calculation of the costs of energy efficiency savings that were paid for by utilities is about $8 per megawatt hour[26]—a fraction of the costs of alternatives or the value of the electricity sold in the market over this period. The Council should conduct its own analysis of the utility paid costs in considering the costs and benefits of stimulating new technologies. During the first seven power plans energy efficiency was about half the cost of alternative generating resources.

Sixth, there is a great deal of business and public interest in energy efficiency that did not exist in prior decades. Customers are asking for green certifications and business are routinely marketing products with zero-carbon footprints. Congress and the Biden Administration are considering infrastructure programs to address the climate crisis and increase funding for these programs.

Seventh, analysis indicates that there is likely additional energy efficiency available. We reviewed two papers that addressed this issue:

The first is a paper entitled: *Beyond Supply Curves*, by Fred Gordon and Lakin Garth of the Energy Trust of Oregon and Tom Eckman and Charles Grist formerly at the Northwest Power and Conservation Council. It discusses how new technologies, which are often impossible to forecast, have significantly increased the amount and reduced the cost of energy efficiency measures. Based on prior experience, the high efficiency windows in the 2005 Council Power Plan were 12 percent more efficient than the assumptions used in the Council's 1983 plan. The paper also shows how the cost of compact fluorescent lamps dropped from the $12 per bulb assumed in the 1991 plan to $3 assumed in the 2005 plan. It is likely that future innovations will continue this trend and they should be recognized in future uncertainties.

The second paper, by David Goldstein of the Natural Resources Defense Council, describes the methodologies that are "excessively conservative if the goal of policymakers is to meet aggressive climate change emission reduction goals." The paper documents the systematic biases that result in low potentials in energy efficiency. These include: 1) subjecting efficiency measures to a criterion of proof beyond a serious doubt; 2) assuming arbitrary realization factors less than 100 percent due to questions about social acceptance of energy efficiency; 3) implicit assumptions that a lack of research on the cost or feasibility of a measure means that is it excluded from a study; 4) a failure to consider system integration; 5) assumptions that once known efficiency measures are implemented, technological progress ceases and no further improvements are possible; and 6) reliance on projected costs of efficiency without looking at realized costs, which has always been lower whenever data has been available.

[26] The analysis assumes that the energy 7,200 average megawatts of savings when phased in over the past 38 years totaled savings of more than 1.2 billion megawatt hours, divided by utility spending of about $9 billion.

Eighth, the Council projects that electrification of transportation could add 700 to 900 average megawatts of load by 2040. There appears to be significant potential for additional efficiency improvements in these vehicles (see Section 3.3.3.B).

In summary, the challenges for the region are to set realistic targets for energy efficiency and ensure the flexibility to achieve higher savings as they become available. CRITFC calls upon the region to do so.

After 40 years of experience, there are ample results in the Pacific Northwest to demonstrate that improving energy efficiency can reliably save energy. We also know that the Council's targets have been conservative. New technology has repeatedly made conservation more cost effective than estimated by the Council. Finally, the Northwest Power Act calls for energy conservation to be developed as a resource ahead of traditional resources.[27]

For all these reasons, the Council should address all the factors discussed above and increase the conservation targets to continue programs at the levels in the 7th Power Plan and work with BPA and utilities to try to exceed them.

D. Hot Water Heaters

Recommendation 10: the Council, BPA, and utilities should fund the incremental costs of heat pump water heaters to stimulate the adoption of this technology.

Heat pump water heaters are more efficient than conventional systems and provide both energy and capacity savings in new houses. The conversion of existing houses to heat pump water heaters will also provide benefits. The Council's 7th Power Plan estimated that cost-effective conversions from electric resistance to heat pump water heaters would reduce peak demands by 1,250 megawatts during winter (January) and just over 1,850 megawatts in summer (August) by 2035. These systems come with built-in demand reduction capability to help reduce peak loads.

Utility incentive programs would increase market penetration and likely drive down costs. This was the experience with "new technology" such as six-inch wall insulation and R-50 windows in the 1st Power Plan in 1983. BPA and utilities paid the added costs of these measures, suppliers started stocking them, manufactures mass produced them, subcontractors learned to install them, and the costs came down.

Recommendation 11: Utilities and BPA should develop and fund programs to schedule when water heaters operate.

Time of day water heating technology is commercially available. Water pre-heated during the middle of the night, can last through the morning peak use period. This technology can be used in today's hot water heaters, and can be made more effective in replacement tanks, by increasing the size of the water tanks. More sophisticated and easy to use demand-response enabled

[27] 16 U.S.C. § 839; 126 Cong.Rec. H9848 (Rep. Pritchard) ("[The Act] treats energy conservation as a resource, making it the top priority in meeting the region's energy needs. *NRIC and Yakama Nation v. Northwest Power Planning Council,* 35 F.3d 1371, 1378 (9th Cir. 1994).

equipment is also coming onto the market, thanks to state-level standards passed in Oregon and Washington for CTA-2045 compliant water heaters for the residential market. To get the benefits of the peak reduction potential, however, utilities will need to develop customer-centric demand response programs.

3.4.2. Ensure that Utilities Achieve the Targets

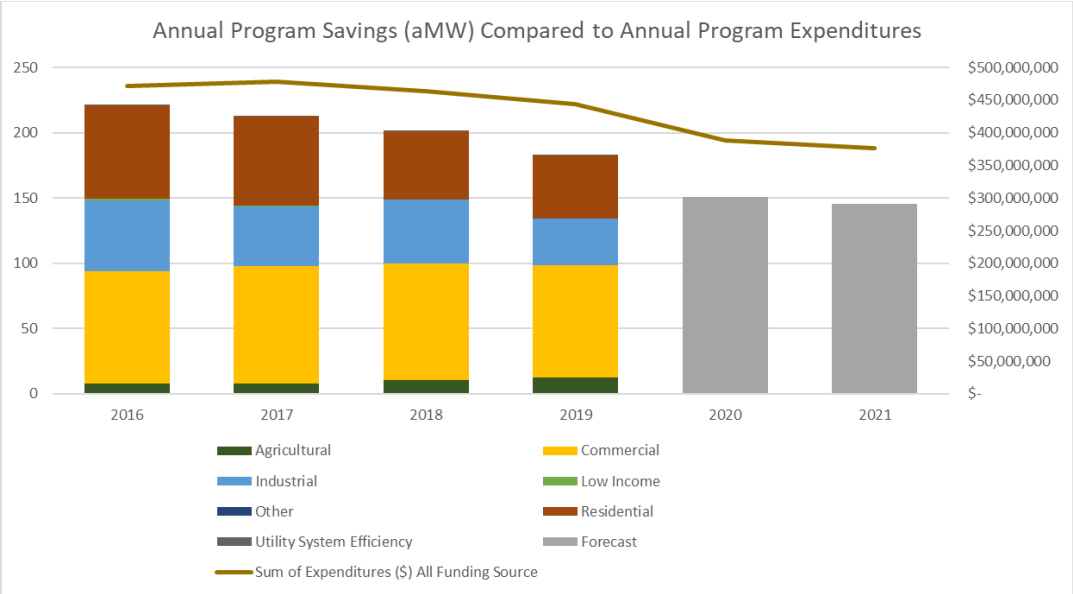
Recommendation 18: The Council should monitor the implementation of energy efficiency programs to ensure that utilities meet the conservation targets.

The NPCC summary of achievements[28] shows the region ended up exceeding 6th Plan targets and is slightly ahead of 7th Plan goals – despite the impact of Covid-19 on programs. The table below shows the region exceeded the NPCC's targets for all energy efficiency activities between 2005 and 2019:

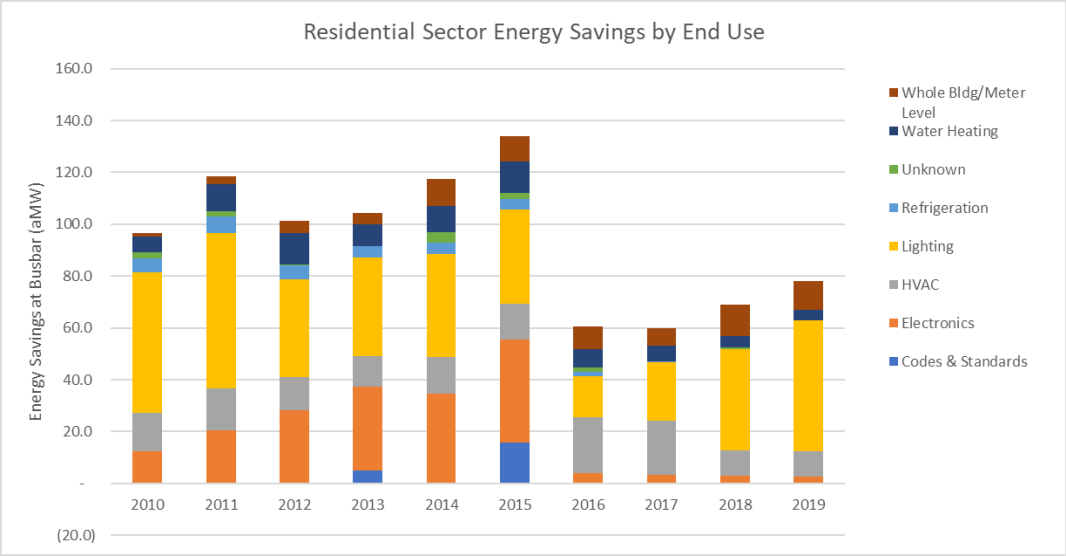
	Year	Cumulative Target (aMW)	Actual Achievements (aMW)	Actual Over/Under Target (aMW)	% Over/Under Target
5th Plan	2005	130	141	11	8%
	2006	265	293	28	11%
	2007	405	500	95	23%
	2008	550	735	185	34%
	2009	700	966	266	38%
	2010	900	1,223	323	36%
6th Plan	2011	1,120	1,503	383	34%
	2012	1,360	1,747	387	28%
	2013	1,620	2,009	389	24%
	2014	1,900	2,249	349	18%
	2015	2,190	2,492	302	14%
	2016	2,375	2,695	320	13%
7th Plan	2017	2,560	2,904	344	13%
	2018	2,790	3,133	343	12%
	2019	3,020	3,349	329	11%

Unfortunately, progress has slowed. The Council figure below shows total funding in 2021 was about $100 million per year less than in 2016 and annual savings declined from approximately 225 average megawatts in 2016 to a projected 145 average megawatts in 2021:[29]

[28] https://rtf.nwcouncil.org/about-rtf/conservation-achievements/2019.
[29] https://nwcouncil.app.box.com/v/2019RCPResults

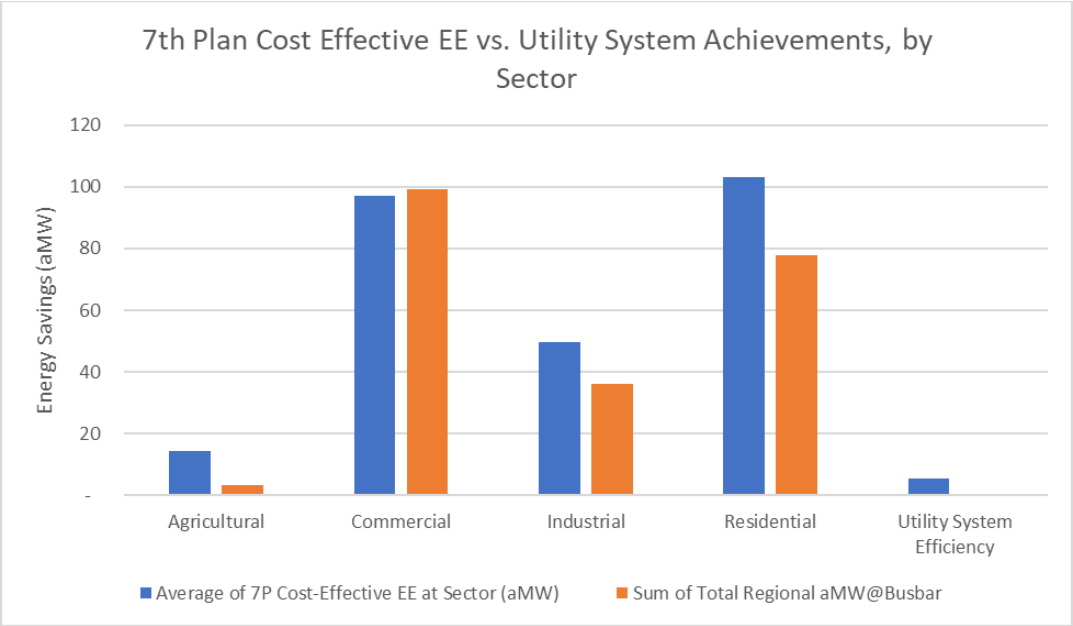


The reductions in energy savings have been significant in the residential sector, with savings for 2016 through 2019 averaging about half the progress in 2015[30]. The chart from the NPCC shows the energy savings, by end use between 2010 and 2019.



The chart below shows that utilities are not meeting NPCC goals in the agricultural, industrial, and residential sector.

[30] NPCC 2019 Regional Conservation Progress Report by the Regional Technical Forum.



Many utilities in the Northwest are national leaders in implementing energy efficiency programs. We applaud their efforts. Some utilities have not embraced this proven, low-cost resource. Failure to achieve these targets means more resources and transmission and distribution lines need to be built. These actions will add costs and present risks to upland resources like First Foods that the tribes are striving to protect. Failure to meet efficiency targets also puts more pressure on the hydroelectric system that has imposed economic resource transfers that have discriminated against the tribes' treaty secured commitments to their fishery resources.

The Council, BPA and PUCs should monitor future implementation to ensure that all utilities are meeting the targets. If the Council finds that some utilities are continuing to impose costs on other consumers, salmon, and other tribal resources, then the Council should impose a surcharge under the provisions of the Northwest Power Act.[31]

CRITFC would support a safe harbor provision to the surcharge requirements. For example, a utility could avoid the surcharge if it had: 1) well designed programs in place in all sectors; 2) offered funding to cover the cost to the consumer of the energy-efficiency improvements up to the costs of the next most expensive resource;[32] 3) had an effective public education program so all customers were aware of the programs; and 4) had committed sufficient funds to implement all requests for the energy efficiency programs.

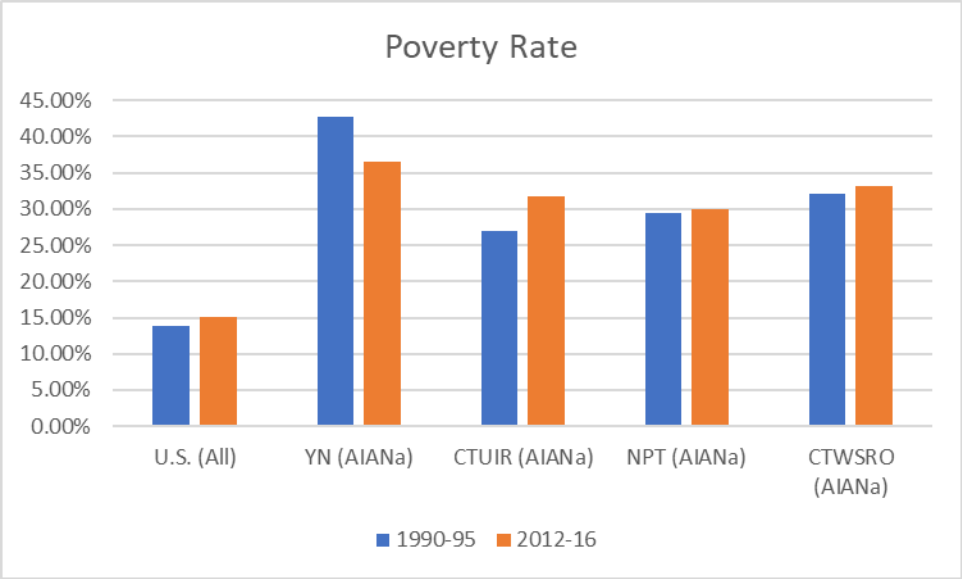
3.4.3. Expand Low-Income Weatherization Programs

[31] Section 4(f)(2) of the Northwest Power Act authorizes the Council to recommend a surcharge of 10 to 50 percent for utilities that do not achieve the model conservation standards in Section 4(f)(1).
[32] The Northwest Power Act requires that the Council design the MCS to produce all power savings that are cost-effective for the region and economically feasible for consumers, taking into account financial assistance from the Bonneville Power Administration and the region's utilities.

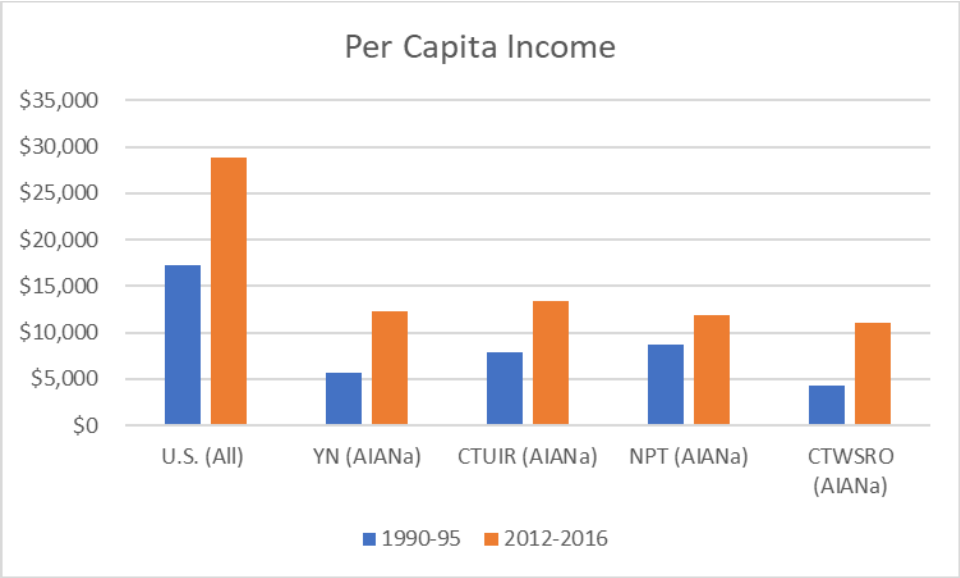
Recommendation 19: All tribal homes and businesses should be fully weatherized by 2025 and all tribal homes and businesses should receive solar panels and battery systems that provide zero net energy by 2030.

Given the long history of damage by the electric power system to the Northwest tribes' resources, CRITFC recommends that energy efficiency and renewable resource programs implemented by private, public, and federal power suppliers give priority to tribal communities. The interim target should be to weatherize all tribal homes and businesses by 2025. Furthermore, all willing tribal homes and businesses should receive solar panels with battery systems and energy efficiency improvements so that these energy efficiency and solar system resources will meet all the energy needs of the building.[33]

Tribal communities include many low-income people. Tribal poverty rates for Columbia River Treaty Tribes are still two to three times the national average. Per capita income is less than half the national average.[34] Data for CRITFC tribes are shown in the next two tables.[35]



[33] Many informal promises were made by federal officials during the 1930s that electricity would be made available to tribal people free of charge after the dams were built.
[34] The 1990-95 data (blue) were obtained from the 1999 Meyer Report, which presented information from the 1990 Special Tribal Run U.S. Census. The 2012-2016 data (orange) were obtained from the Center for Indian Country Development, which is a project of the Federal Reserve Bank of Minneapolis.
[35] YN is the Yakama Nation, CTUIR is the Confederated Tribes of the Umatilla Indian Reservation, NPT is the Nez Perce Tribe, CTWSRO is the Confederated Tribes of the Warm Springs Reservation of Oregon.



The Clean Energy Transformation Act (CETA) in Washington requires utilities to ensure an equitable distribution of benefits from the transition to clean energy for all customers.[36] The act also requires utilities to make programs and funding available for energy assistance to low-income customers.

Oregon requires that the total generating capacity of community solar projects be made available for use by low-income residential customers.

Recommendation 20: Utilities should weatherize and achieve net zero energy for all low-income homes by 2035.

After forty years, too many low-income houses and multi-family buildings still have not been weatherized. People who can least afford it are exposed to higher bills. It is time to solve this problem. Achieving zero net energy will insulate people from higher future costs.

Recommendation 21: Utilities, the Northwest Energy Efficiency Alliance, and other organizations should implement comprehensive programs to improve energy management practices in the commercial and industrial sectors.

Energy efficient commercial buildings and industrial facilities are a source of great potential savings, with the biggest gains in heating, ventilation, and air-conditioning (HVAC) and improved energy management in industrial plants.

Because HVAC systems and smart thermostats are complicated, they need continuing attention to remain efficient and tuned to the tasks for which they are designed. All new buildings should go through a building certification process to assure that they are operating as they were designed and to assure that the operation is efficient.

[36] Chapter 288, Laws of 2019.

Most commercial buildings rely on programmable thermostats that are not always maintained. Many buildings are operated as though occupied continuously. Better scheduling can result in 30-40% savings in many of these buildings. With Smart Grid technologies and strategies that enable one to essentially dispatch loads behind customers' meters, these savings can now be more easily captured. We recommend a concerted regional effort to do so. In Washington state, there is a new building performance standard law that affects most commercial buildings over 50,000 square feet. It will require continuous assessment of operations and that buildings hit certain energy use targets.[37]

Recommendation 36: BPA and utilities should invest in solutions that minimize transmission and distribution expansions.

As discussed above and in more detail in Appendix E, there are significant economic and environmental costs associated with the existing and new transmission and distribution lines.

CRITFC estimates that BPA and four Northwest investor-owned utilities spent approximately $8.8 billion on transmission between 2016 and 2020. Of this total, BPA spent $1.4 billion on transmission capital expenses. BPA is projecting another $2 billion between 2021 and 2025[38] for a ten-year total of $3.4 billion. The funding for expansion of BPA system represents more than half theses total costs. BPA spent $601 million between 2016 and 2020 and is projecting a transmission expansion program totaling $730 million over the next five years.

CRITFC was able to compile distribution and transmission costs from the past five years for four investor-owned utilities in the region that totaled $6.8 billion. The information for the investor-owned utilities did not have details on expansions.[39]

CRITFC could not find enough detail to determine how much of these costs were related to activities that could be reduced or delayed if additional energy efficiency, on-site solar, and peak-demand reduction programs described in this document had been implemented.

If utility spending on transmission and distribution over the next five years is similar to the recent past, the total BPA and investor-owned spending could total $8.8 billion. Spending by other utilities would add to this total. If additional energy efficiency, on-site solar, and peak-demand reduction programs described in this document could reduce the transmission and distribution capital costs by ten percent, it could save consumers approximately $880 million over the next five years. Even a five percent reduction in the construction of new transmission and distribution systems could save consumers about $100 million per year.

The large magnitude of these transmission and distribution costs and the significant potential for savings for consumers and the environment should convince regional energy decision makers to focus on the benefits of reducing these economic and environmental costs. The construction costs are averaged into utility rates, so consumers do not see the magnitude of the expense. The environmental costs often fall on tribal resources (such a First Foods and sacred sites), rural

[37] https://www.commerce.wa.gov/growing-the-economy/energy/buildings/
[38] BPA Historical & Future Capital Spend, page 8 of presentation on Integrated Program Review 2, March 2, 2021.
[39] See Appendix E for details on these costs.

areas, and populations that are not represented in energy siting or ratemaking processes. Investor-owned utilities receive a rate of return on these investments. All these factors may create an incentive to expand these facilities rather than pursue activities that reduce the need for these expensive assets. Therefore, CRITFC recommends that all proposals for transmission and distribution expansions should evaluate the other alternatives described in this Energy Vision that could delay or eliminate the need for the project. BPA and utilities should pursue those alternatives when they reduce costs or cultural and environmental impacts.

BPA and utilities should also implement time-of-use transmission pricing that is based on the cost of adding new facilities. Some of BPA's customers are charged for the highest transmission use in a year; however, these marginal uses are priced at the average cost of the transmission system, not the full cost of meeting peak or the cost of expanding the system.

These efforts to reduce the costs and impacts of transmission and distribution lines will require an interstate approach that addresses the actions of federal and state agencies, utilities, utility regulators, and siting agencies.

Recommendation 39: Federal, state, and local policy makers should develop programs to reduce the use of fossil fuels.

It is impossible to discuss energy without talking about carbon-based fossil fuels such as crude oil, coal, and natural gas. Their products and by-products include petroleum-based fuels (e.g., butane, diesel, kerosene, liquefied natural gas, liquefied petroleum gas, propane, fuel oil), crude oil, natural gas, various types of coal, and methane. From extraction, to conveyance, to consumption, and by-product waste treatment, fossil fuels dominate global energy markets and drive climate change and hazardous waste management. The extraction, transport and use of fossil fuels are generally incompatible with Tribal Nations' ultimate obligations to protect sacred First Foods and precious water.

The fossil fuels life cycle includes points of extraction, conveyance and import or export project siting such as receiver terminals, refineries, and power plants, and finally consumption, usually through a combustion process. At each step to fossil fuel use, the planet and its resources are harmed. While fossil fuel extraction is not a dominating issue in the Columbia River Basin, the region is a target location for fossil fuel transport and export projects. The Basin also suffers from regional and global consumption effects, such as air deposition of mercury from coal plants in Asia.

These developments have placed undue burdens on the backs of the Region's salmon populations.

In the Columbia River Basin, fossil fuel projects include transport terminals, refineries (located on northern Puget Sound native lands), and gas and coal-fired generation plants. In the 1970s, there were proposals for pipelines from northern Puget Sound area to the Midwest. These

proposals would have provided a few dozen jobs offloading supertankers and created significant risks to the environment and communities that depended on it.[40]

In 2005 there were proposals to import liquefied natural gas through ports along the Columbia River (these proposals were later reverted to developing export terminals when fracking in the United States became economical). Later coal companies eyed markets in Asia and rail lines that connected the Powder River Basin with the Pacific Northwest, and by 2012, crude oil companies were considering similar options, finding rail suitably cheaper than pipelines to export large quantities of Bakken crude and Canada oil sands (bitumen) crude. Bitumen's toxic by-product, petroleum coke, is also transported through the Columbia River Gorge.

Transport terminals usually include three separate components: the conveyance that serves the terminal, the terminal itself, and the marine vessels to export the product. These terminals are transitional facilities that cannot operate but for the other transport components. Typical conveyances include rail, barge, trucking, and pipeline. Of these options, rail is the component with the least amount of state, tribal, or federal regulatory oversight. In addition, many states and federal agencies are reluctant to comprehensively analyze the risks transport of fossil fuels poses to human health and the environment, leaving high consequence risks unmitigated. This poses an advantage to project proponents who, in the last decade, have rushed to propose dozens of fossil fuel-by-rail projects, particularly crude-by-rail and most recently, methane and liquefied natural gas by rail.

Export projects do not provide abundant energy to regional markets, but rather burden local resources, increase risks of catastrophic harm, and provide no benefit for affected tribes. Starting in 2010, dozens of fossil fuel transport projects were proposed for the Pacific Northwest, specifically the states of Oregon and Washington, and the province of British Columbia. Regional tribes and First Nations were forced to spend time and resources analyzing and unifying in opposition to this onslaught. Most of the projects were not permitted, due in large part to tribes' coordination with allies in the environmental community, groups such as "Power Past Coal," "Stand Up to Oil," and "Power Past Gas." In the landscape of these victories, a new term was coined, "the thin green line" of the Pacific Northwest.

Besides providing the tribes and public with the only regulatory means to evaluate projects, the terminals themselves can be a problem. In more than one case, terminal projects were proposed for locations impacting sensitive cultural resources, areas that provide salmon spawning or rearing habitat and other aquatic resources or were situated such that they directly impeded tribal treaty fisheries. Most of the terminals lie near water bodies, such as the Columbia River, adding or expanding dock infrastructure that attracts predators – both avian and aquatic – that impact treaty fisheries. Finally, the terminals' operations that involve transfer and storage of fossil fuel products, and these terminals' proximity to water bodies, increases risks of spill and injury to the river.

The variety of conveyances that feed these terminals and refineries all pose unique risks depending on location and product. Fossil fuels are conveyed via pipeline, long-haul truck, rail

[40] In 1977, Senator Warren Magnuson added an amendment to the Marine Mammals Protection Act to ban the construction of an oil superport inside Puget Sound that was designed to deliver crude oil to the Midwest.

car, barge, and marine vessels throughout the Columbia River Basin. Oil and natural gas pipelines create risks of explosions and are often highly destructive to natural areas when constructed and are notoriously leaky during operation. Natural gas pipelines have been proven to pollute the air with methane, volatile organic compounds, and particulate matter. In British Columbia, a proposed pipeline would bring heavy oil sands crude over fragile habitat and to the Salish Sea for transfer to oil tankers. Marine vessels pose their own elevated spill risks and have been shown to impact Southern Resident orcas and tribal fishing.

Rail has been in the Columbia River Basin for a very long time, hauling materials and supporting the regional economy for over a century. In the Columbia River Gorge, the rail lines both sides of the river, the construction and operation of which continues to directly – and often negatively – affect the hydrology and flow of the river. Long trains delay tribal access to fishing sites and create hazards to tribal members trying to exercise their treaty fishing. Adding more rail traffic increases the danger.

The amount of coal hauled through the Columbia River Gorge has been that minimally necessary to serve local generation.[41] When excessively large-scale coal storage and transport projects were proposed in the Pacific Northwest that would have substantially increased the number of coal trains severalfold, the tribes stood against these projects. Even with the smaller number of coal trains, many tribal fishers complained of coal dust in the windy Gorge. Coal dust contains arsenic and polycyclic aromatic hydrocarbons (PAHs), a known carcinogen. High levels of both contaminants have been found in the soil around coal piles, and arsenic can leach into water. Airborne coal dust has been associated with bronchitis, emphysema, and asthma. Burlington Northern Railroad estimates that each coal car loses 500 pounds of dust each trip, with each 100-car train potentially losing 50,000 pounds. With the specter of more coal trains, then, the tribes were adamantly opposed to this additional burden.

Meanwhile, in the Bakken fields of the Dakotas, the United States found itself in possession of large depositions of domestic crude. Oil companies looked west to markets in Asia and considered rail as the simplest form of conveyance to get the product to market. To this point, rail tanker cars had not been tested for light crude such as that from the Bakken fields. In 2013, an oil train derailed in Lac-Megantic, Quebec and exploded, killing forty-seven people and there were continual derailments and explosions, spilling more oil into rivers, lakes, and marine waters than in the previous forty years. New and retrofitted tank cars were developed that decreased the severity of the derailments, but nonetheless, spills occurred on an annual basis. Along with greater risks of high consequence spill events, the increase in oil terminal proposals meant a sharp increase in rail traffic. Most oil trains are made up of more than 100-120 cars, stretching a mile and a half. For the Columbia River, this meant long and numerous oil trains travelling both sides of the river, impeding tribal fishers' access and creating potentially dangerous conditions.

In the past, natural gas has been peddled as a clean-burning fuel less impactful to the environment than coal and crude oil, and a potential "bridge" fuel to move from fossil fuels to renewables. Riding this message, in recent years, the U.S. has become a global leader in natural

[41] In 2020, the PGE Boardman Coal Plant shuttered permanently and was the only coal plant in Oregon. Currently the TransAlta Coal Plant in Centralia, Washington is operating at reduced capacity and is slated for permanent closure in 2025.

gas extraction, mostly through fracking processes. However, fracking is extremely water intensive and when methods do not meet industry standards can contaminate drinking water. When natural gas is produced or transported, methane can leak into the atmosphere. Methane is a potent greenhouse gas, with 34-80 times the warming power of carbon dioxide on a pound-for-pound basis (IPCC 2014).

In Canada, oil sands bitumen extraction is the most polluted and polluting extraction process of any fossil fuel, creating toxic waste and hazardous by-products like petroleum coke. The oil sands are located on Indigenous Nations' territories and extraction has destroyed thousands of acres of natural homelands and habitat.[42]

Overall, new fossil fuel projects have no place within any plan to protect salmon or treaty resources. Mitigation is often unavailable or inadequate, and most projects pose risks of irreparable physical consequences to cultural and natural resources.

[42] See, generally, https://www.theguardian.com/commentisfree/2015/jun/23/canadas-tar-sands-oil-fields-sacred-lands, https://www.nationalgeographic.com/environment/article/alberta-canadas-tar-sands-is-growing-but-indigenous-people-fight-back, https://www.ienearth.org/what-are-the-tar-sands/ (First Nations' subsistence food sources have diminished where habitat and entire ecosystems have been fatally disrupted by oil sands projects).