Northwest **Power** and **Conservation** Council

May 6, 2026

MEMORANDUM

TO: **Council Members**

FROM: **Jennifer Light, Director of Power Planning**

SUBJECT: **Power Plan Work Session**

BACKGROUND:

Presenter: Council staff

Summary: The Council will have a work session on May 13 focused on the Ninth Power Plan development. At this work session, staff will present a range of proposed recommendations for potential inclusion in the draft Ninth Power Plan. This includes proposed elements of the conservation program to be included in the plan, recommendations for resource and power system development, and other recommendations for research and development. Everything presented represents staff's initial proposal for the members' consideration. Staff will work with any member feedback from this discussion to refine the set of recommendations for continued discussion at the late May Council meeting (if necessary) and development of draft Chapters 4 and 5 of the draft Plan.

Relevance: Under the Northwest Power Act, the Council is required to review its power plan no less frequently than once every five years. The Council initiated its review of the power plan in February 2025, with a goal of developing and releasing a draft power plan in July of 2026 and final power plan by November 2026.

Workplan: B. Development of the Ninth Power Plan

Council Work Session: Initial Power Plan Recommendations

May 13, 2026

Power Division Staff

Northwest **Power** and **Conservation** Council

Agenda

- Brief check in on process
- Discussion of proposed resource strategy
- Discussion of proposed supporting recommendations
  - Conservation program elements
  - Demand response
  - Supply side resource development
  - Data centers
  - Transmission and markets
  - Emerging technology
  - Other research and development recommendations

What's Coming Up

It's Been a Busy Month!

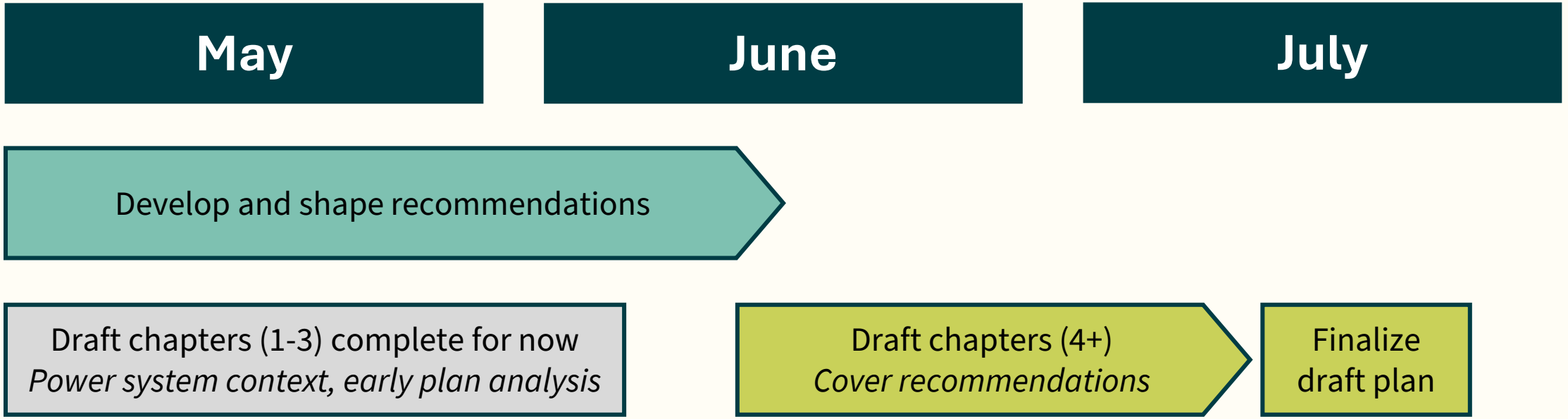
- Council met twice in April to discuss the results from the modeling
- Staff facilitated five advisory committee meetings
  - Combined System Analysis, Resource Adequacy, and Fuels
  - Conservation Resources
  - Demand Response
  - Generating Resources
  - System Analysis
- Staff have also had conversations with outside entities including Bonneville, NEEA, PPC, PNUCC Board, NWEC, Renewable NW, Blue Green Alliance, and more
- This engagement has helped in forming the draft recommendations we will discuss today!

Council Work Sessions

Advisory Committees

Direct Connects

Getting to a Draft Power Plan



Preliminary Resource Strategy for Discussion

What is a Resource Strategy?

- The resource strategy is the core piece of the power plan, setting for a recommendation for new resources and amounts to meet the region's needs
- It directly connects to the Power Act requirements around:
  - "The plan shall set for a general scheme for implementing conservation measures and developing resources … to reduce or meet the Administrator's obligations"
  - This "general scheme" is to give due consideration to environmental quality, compatibility with the existing system protection of fish and wildlife, and other criteria that the Council sets forth
  - Elsewhere, the Act requires the plan provide a forecast of resources and amounts of those resources to meet the Administrator's obligation
- This resource strategy can then be supported by other recommendations

Initial Thinking on Resource Strategy

- Analysis has shown that a portfolio approach will be necessary to provide for adequacy while balancing costs and risks
- Resource strategy will include a portfolio approach to provide a cost-effective solution:
  - Demand side: Conservation, demand response, and voltage regulation
  - Supply side: Renewables, storage, and natural gas
- Information from across the sensitivities will be important for developing a risk informed portfolio

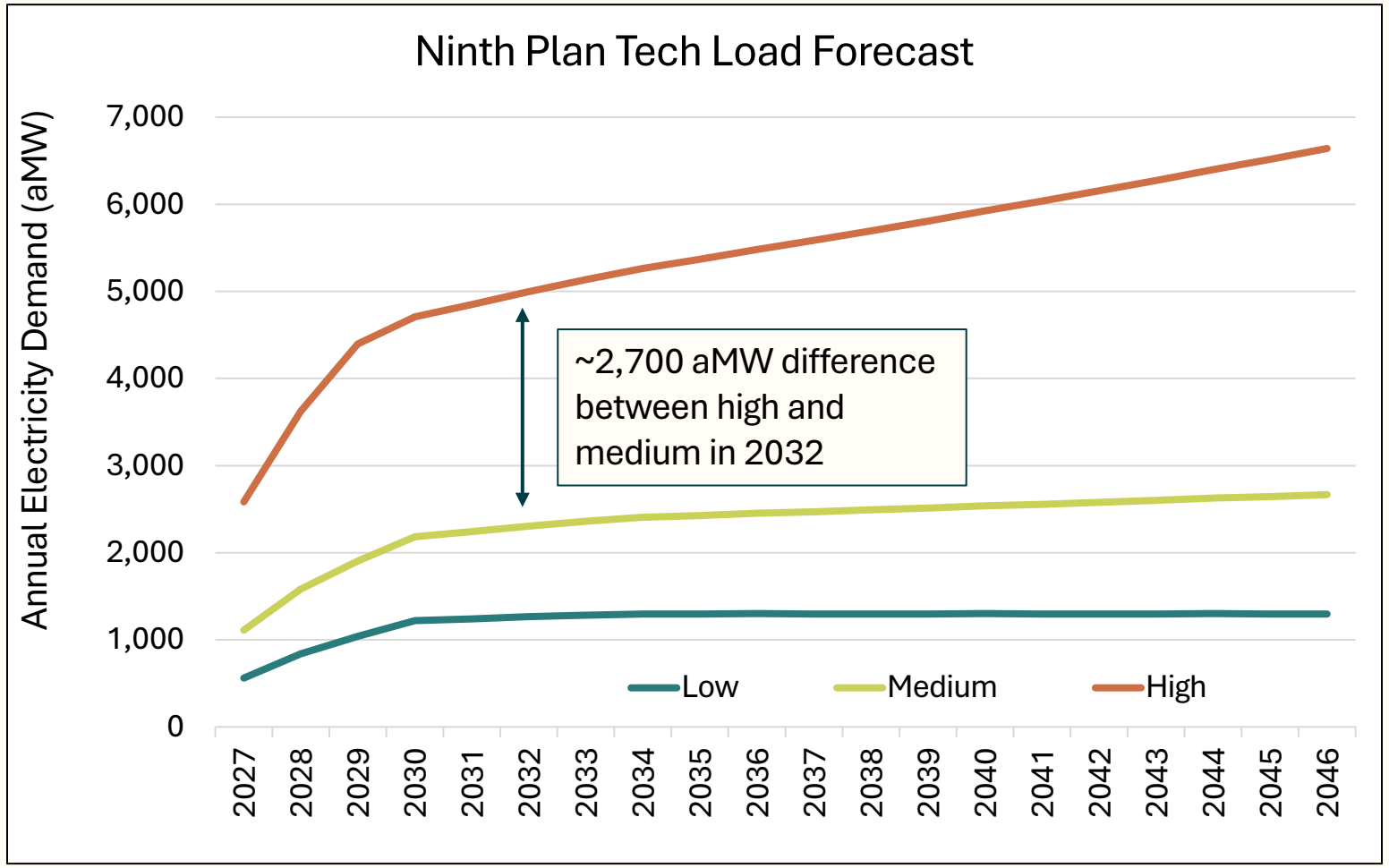
Next Steps on the Strategy

- Power Committee discussed some initial amounts for the resources, but we have more work to do to get to a strategy
- Staff will do some additional analysis to put forward a couple of options for members to discuss
- Goal will be to bring a strategy (or options) to the late May Council meeting
- The focus so far has been on a regional strategy – all the resources needed to provide a cost-effective approach for adequacy – but at that late May meeting we can also discuss how to split this strategy:
  - What portion makes sense for Bonneville?
  - Are there some portion of resources that are not the responsibility of rate-payers, but rather other entities bringing load to the system?

Description of Additional Studies

- Members requested staff do an additional study to provide insight on how the strategy might change with less data center load to plan for (either for adequacy or in total)
- Staff completed two separate studies through 2032 to provide insights
  1) What if some data centers / chip fabs are responsible for their own resource adequacy? This is done by adjusting the adequacy criteria to not include the high data center forecast. The load stays in the model and still impacts general supply and demand.
  2) What if there is lower data center / chip fab load growth? This test removes the load pathways that include the high data center forecast (and adjusts the planning margins to reflet this). This differs from the first sensitivity since it not only reduces adequacy criteria, but it also lowers loads and changes general supply and demand economics.

More About These Two Studies

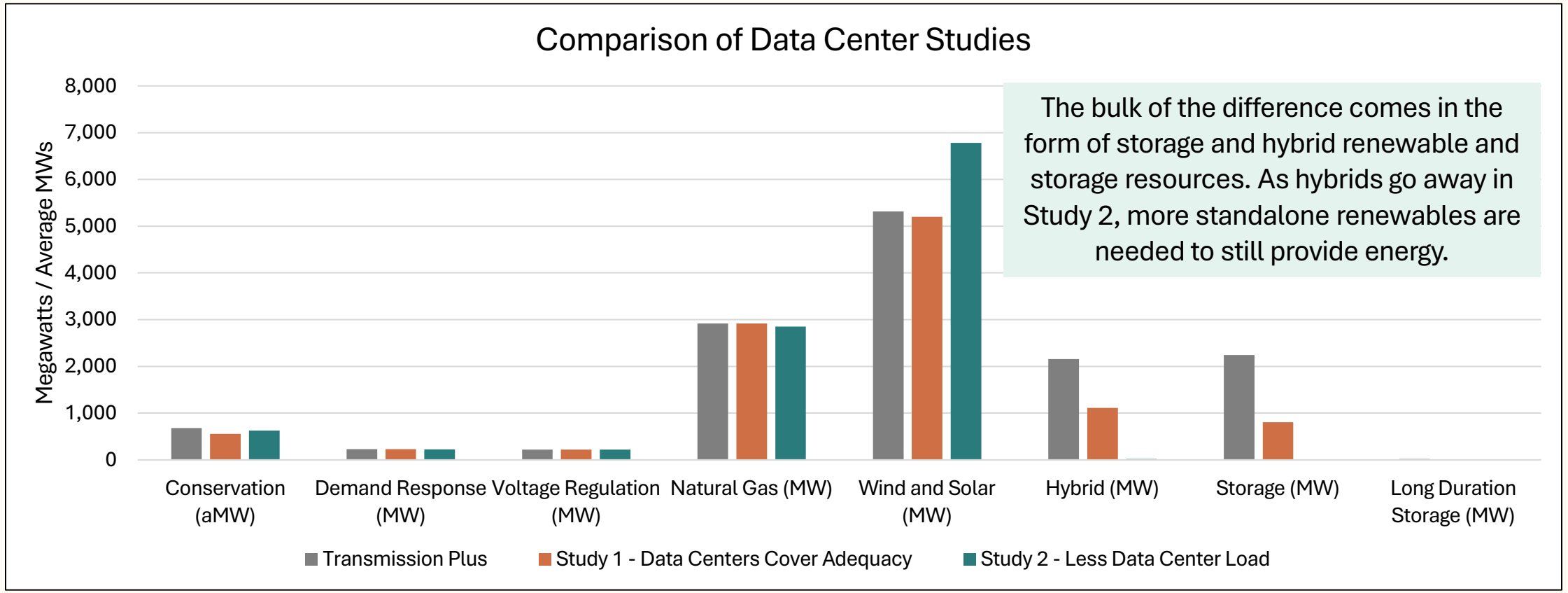


We are focusing on 2032, the end of our action plan period.

1) Study 1 assumes the additional load between medium and high brings their own adequacy resources.

2) Study 2 removes the high forecast (and associated pathways)

Comparison of Buildout by 2032



Key Takeaways

- We see some differences in the builds by 2032, with the largest differences in storage
- In both cases, the planning reserve margins decrease (more so in Study 2), which is driving a smaller storage build
- On the energy side, Study 2 has the lower loads, but is building a similar amount of energy for economics and policy, providing more exports in the winter and reducing the duck curve

Resource	Tx Plus	Study 1	Study 2
Conservation (aMW)	678	555	626
Demand Response (MW)	228	228	224
Voltage Regulation (MW)	222	222	222
Natural Gas (MW)	2,917	2,917	2,850
Wind and Solar (MW)	5,314	5,202	6,780
Hybrid (MW)	2,158	1,110	17
Storage (MW)	2,245	806	0
Long Duration Storage (MW)	20	0	0

Preliminary Supporting Recommendations for Discussion

Role of Recommendations

- In addition to the resource strategy, the Council's plans are to include:
  - Conservation program
  - Model conservation standards (a required element of the energy conservation program)
  - Recommendations for research and development
- The Council has always included supporting recommendations to the resource strategy to cover these requirements, as well as to highlight specific areas that require attention in order to help ensure effective implementation of the policy
- Staff has compiled a suite of proposed supporting recommendations to provide a starting point for discussion and solicit refinement and addition from members

Order of Topics

- Conservation program elements
- Demand response
- Supply side resource development
- Data centers
- Transmission and markets
- Emerging technology
- Other research and development recommendations

Transition Slide

Topic

- **Issue:** This is the challenge that staff (or advisory committee members, or others) have articulated.
- **Recommendation:** This is an initial staff proposal on a recommendation to address this issue.

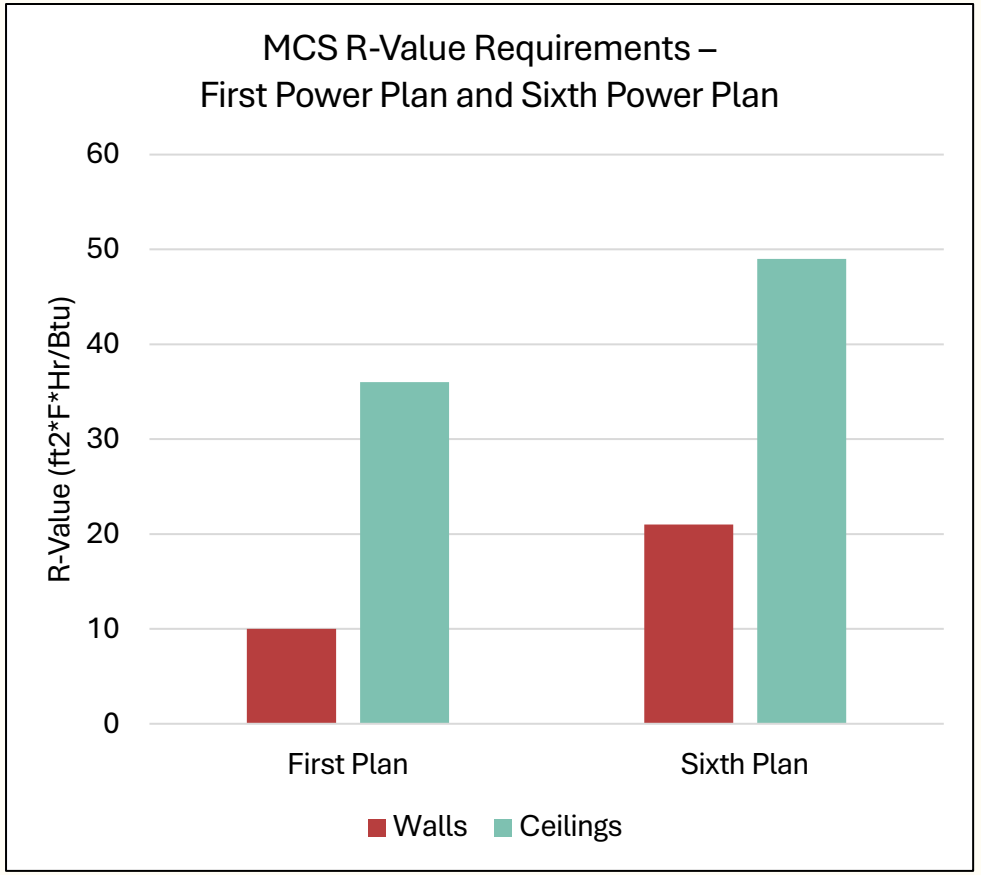
Model Conservation Standards

What are the Model Conservation Standards?

- Section 4(e)(3) requires that the power plan include an energy conservation program, including "model conservation standards"
- Section 4(f)(1) of the Power Act: "Model conservation standards to be included in the plan shall include, but not be limited to, standards applicable to
  - (A) new and existing structures,
  - (B) utility, customer, and governmental conservation programs, and
  - (C) other consumer actions for achieving conservation."
- The Act requires that the MCS be set at levels that:
  - Achieve all regionally cost-effective power savings; and,
  - That are economically feasible for consumers, taking into account financial assistance that may be made available through Bonneville

History of the Model Conservation Standards

- **Plan 1 – Plan 6:** The first six power plans all included building-code specific requirements
- **Seventh Plan** focused on encouraging programs to focus on gaps or difficult areas:
  - Hard to reach markets
  - Distribution efficiency
  - Emerging technologies and industries
- **Eighth Plan** focused on consistency
  - Common state standards
  - No backsliding on standards
  - Efficient electrification (for jurisdictions that have decarbonization goals)



What is the Surcharge Methodology?

- Section 4(f)(2) then gives the Council the authority to recommend to the Administrator a surcharge, and the Administrator may impose a surcharge in accordance with the methodology provided in the plan if the MCS are not met
- Section 4(e)(3)(g) if the Council recommends surcharges, the plan should also include a methodology for calculating surcharges
- The Council plans have typically included the methodology, but not recommend the Administrator invite the surcharge provisions at that time

Recommendations for the Ninth Plan

- Staff is working on some potential ideas for model conservation standards for the Ninth Plan
- Once the Council narrows in on a likely resource strategy, and therefore cost-effective limit for conservation, staff will bring forward recommendations
- Staff will also provide a proposed surcharge methodology, consistent with previous plans

Conservation Program Elements

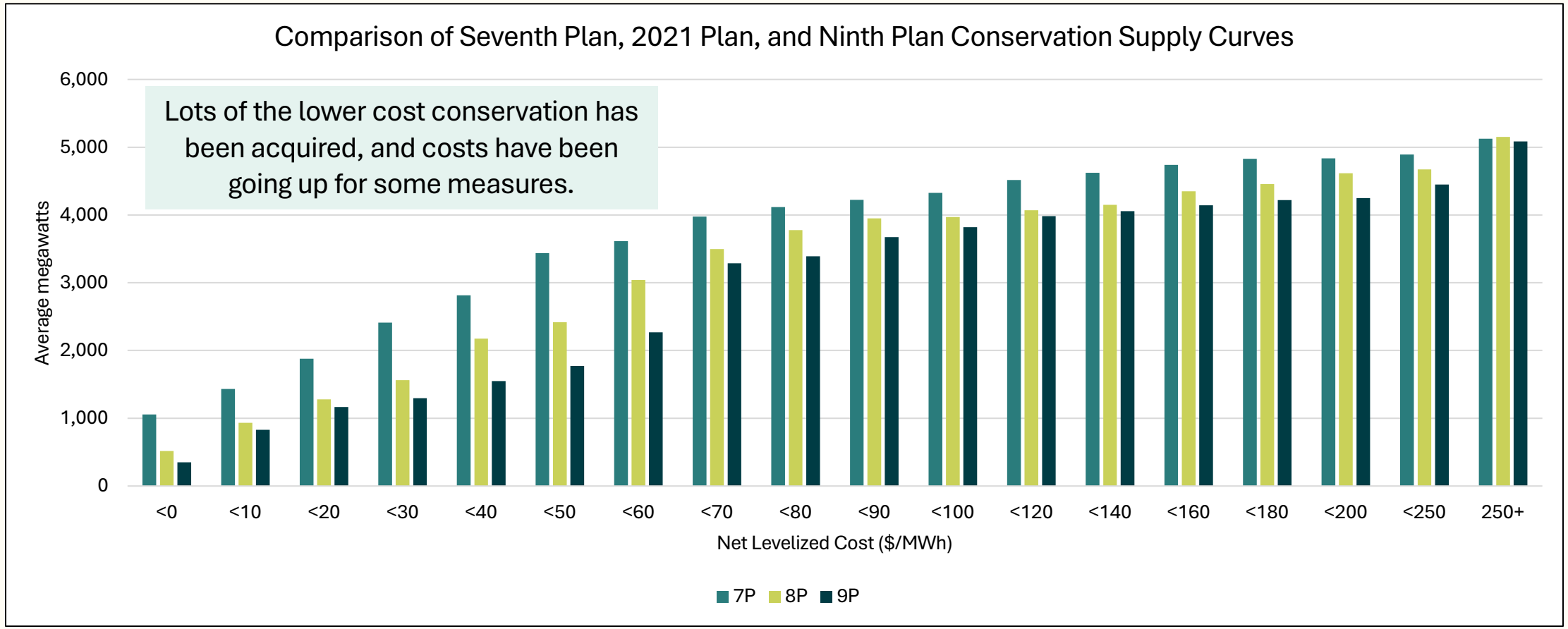
Conservation Costs

Addressing Cost Barriers to Conservation

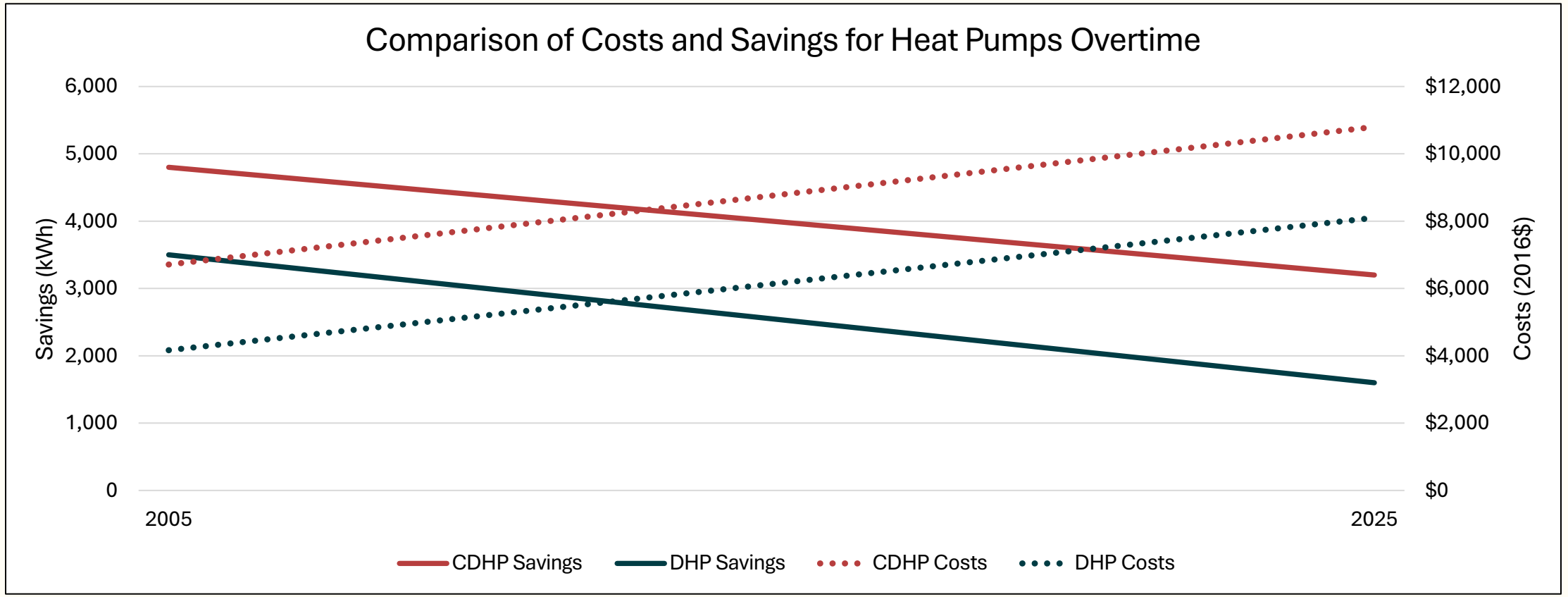
- **Issue:** The 2021 Power Plan first noted that other resources were starting to be more cost-competitive with conservation. This was driven by a mix of things: low-cost conservation being acquired, challenges of bringing costs down for remaining conservation technologies, and declining cost on the supply side. The Ninth Plan continues to show this trend. This is particularly challenging for residential measures that are in some of the highest cost bins and leaving few low-cost options for those customers.

- **Recommendation:** The region should work to understand the barriers to declining costs for conservation and work to address priority technologies with the potential to become more cost-competitive.

Comparison of Supply Curves



Example of Two Residential Measures



Potential Recommendations

- Staff is considering recommendations encouraging the region to prioritize actions that reduce the cost of conservation
  - Conduct research to determine ways to reduce equipment costs, including component analyses to identify cost-savings opportunities
  - Work with manufacturers to produce lower cost versions of equipment and/or increase sales volumes that result in lower costs
  - Investigate ways to make conservation more affordable to consumers
- Reducing the cost of conservation provides more options for more consumers, and ultimately reduces the overall power system costs of adding new resources

Conservation Program Elements

Weatherization

Continue to Pursue Weatherization

- **Issue:** While many homes in the region have been weatherized, there still remain homes that have little to no insulation. The 2021 Power Plan identified this as a priority area for continued investment. While programs have continued to pursue weatherization, gaps remain.

- **Recommendation:** The region should seek to weatherize those homes.

Weatherization Recommendation:
Insulating and Air Sealing Homes Most in Need

- Utilities should implement programs and offer incentives for homes with little to no insulation and/or high air leakage
- Targeted homes should include those with no wall, attic, or floor insulation, single-pane metal-framed windows, and/or air leakage rates that exceed 10 ACH50
- The Ninth Plan supply curves include many different weatherization measures across a wide range in costs
- Those with lowest levelized costs are measures where no or very little insulation exists

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Lower Cost Residential Weatherization Measures in the Ninth Plan Supply Curves

- **<$20/MWh:**
  - Adding low-e storm windows to single-pane windows in multifamily (electric resistance heat)
- **<$40/MWh:**
  - Adding low-e storm windows to single-pane windows in multifamily (heat pump heat)
  - Multifamily wall insulation, R0 to R11 (electric resistance heat)
  - Manufactured home air sealing (electric resistance heat)
  - Single family attic insulation (R0 to R38/49)
- **<$50/MWh:**
  - Multifamily attic insulation, R0 to R19 (ER heat)
  - Single family duct insulation, R0 to R11 (ER heat)
- **<$60/MWh:**
  - Multifamily floor insulation, R0 to R19 (ER heat)
  - Multifamily wall insulation, R0 to R11 (heat pump heat)
- **<$70/MWh:**
  - Multifamily wall insulation, R0 to R11 (heat pump heat)
- **<$100/MWh:**
  - Manufactured home attic insulation, R0 to R22 (ER heat)
  - Manufactured home primary window replacement (single pane to double)
  - Single family attic insulation, R0 to R49 (heat pump)
  - Single family wall insulation, R0 to R11 (ER or HP heat)

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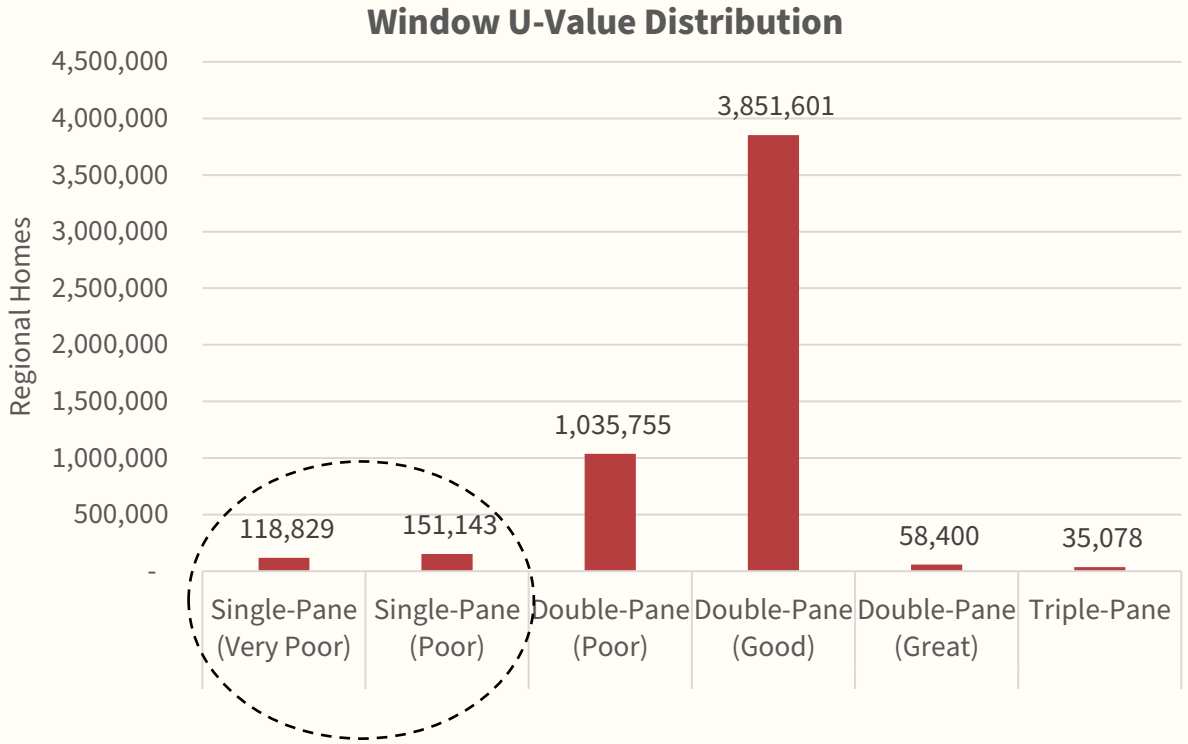
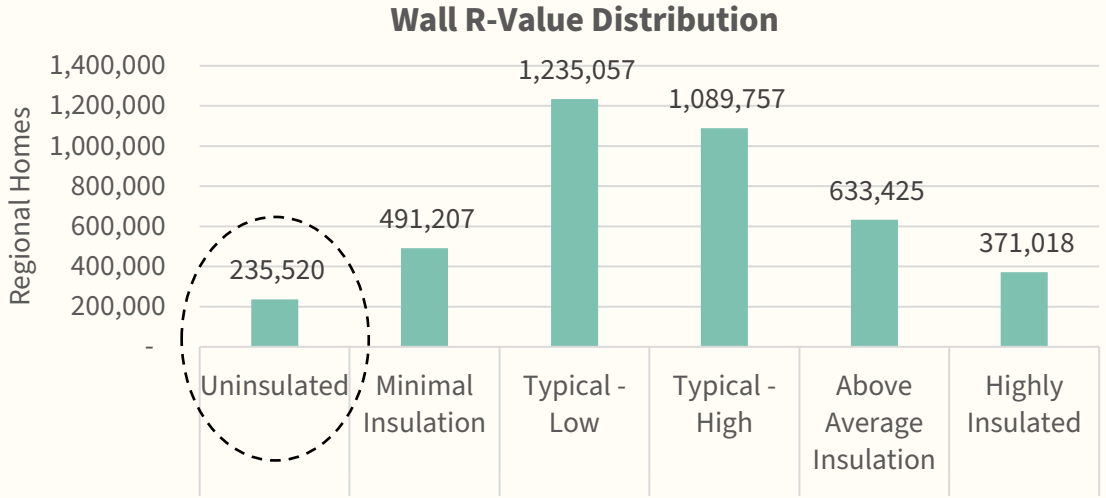
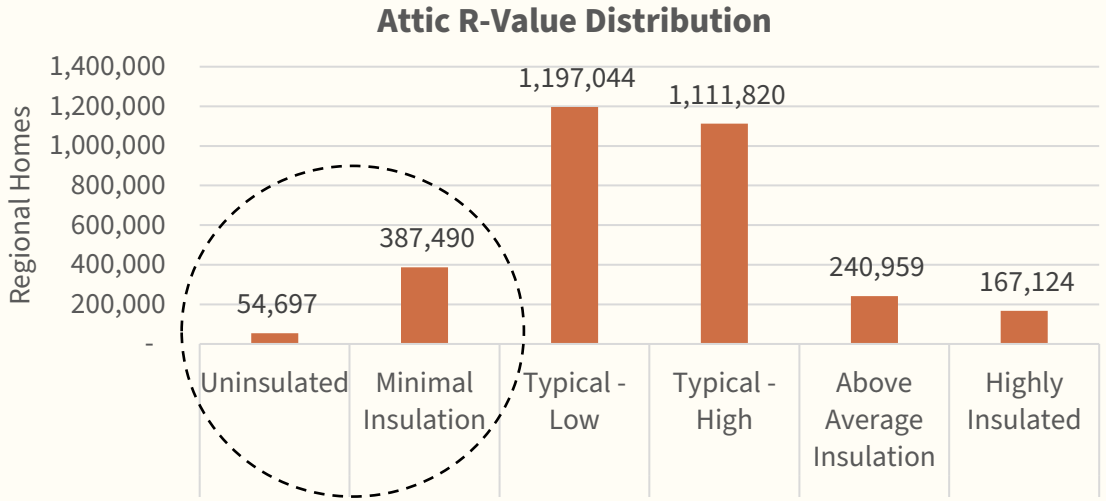
The State of Weatherization in the PNW







Source: Analysis of 2022 NEEA Residential Building Stock Assessment (RBSA).

Conservation Resources Advisory Committee Feedback

- The committee is generally supportive of this goal
- A caution was raised about the difficulty of weatherizing the remaining small percentages of homes
  - Maybe we have already acquired all the achievable weatherization in those homes?
- Another caution is that it could be costly since these homes are more likely to have other construction-related issues

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Conservation Program Elements

Heat Pumps

Address Heat Pump Efficiency Challenges

- **Issue:** Studies have shown that some heat pumps have underperformed relative to the technical capabilities of the equipment. This is driven in large part by the installation and commissioning practices when installing heat pumps.

- **Recommendations:** Staff propose a suite of recommendations targeted at improving the installation of new heat pumps and addressing some of the performance challenges of existing heat pumps.

Heat Pump Recommendation 1:
Weatherizing, Air Sealing, And Duct Sealing to Make Homes "Heat-Pump-Ready"

- **The region, including utility conservation programs, should promote the concept of making homes "heat-pump-ready" before a heat pump installation. This includes making sure that the home meets minimum envelope insulation, air sealing, duct insulation, and duct sealing levels**
- Weatherization, air sealing, and duct improvements can greatly improve the efficiency of heat pumps, in addition to other benefits, such as occupant comfort and home resilience
- In addition to promoting heat-pump-ready homes, utilities should also consider the benefits of whole home approaches that combine weatherization, duct improvements, and heat pump installations in a whole package of measures

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Heat-Pump-Ready Homes

- What are the benefits of weatherizing, air sealing, and improving ducts before a heat pump installation?
  - Greater occupant comfort
  - Greater home resiliency (e.g., during grid outages)
  - Smaller heat pump size needed
  - Reduced reliance on backup/auxiliary heating
  - Lower energy, demand, and utility bills

Recommended Heat-Pump-Ready Home Efficiency Levels

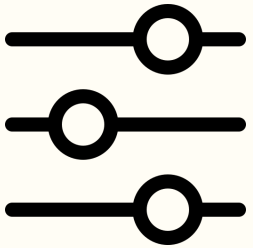
- A table of general guidance on minimum and preferred weatherization levels for installing a heat pump in an existing home in the region
- Can be used as a screening tool to recommend additional weatherization, air sealing, and/or duct improvement measures ahead of, or in conjunction with, a heat pump installation

Element	Item	Recommended Minimum/Preferred Efficiency Level
Building Shell	**Wall Insulation**	Filled wall cavity (~R11 for 2x4 walls, ~R19 for 2x6 walls) or R10 continuous
	Attic/Roof Insulation	**Attics**: R38 cavity minimum, R49-60 preferred **Sloped Ceiling/Roof**: R19 cavity or R15 continuous
	Floor/Foundation Insulation	**Insulated floor**: R19 cavity minimum, R25 preferred **Insulated foundation walls**: R10 continuous minimum, R15 continuous preferred
	Windows	U-0.5 (double-pane) minimum, U-0.3 (double-pane) preferred
	Air Leakage	8 ACH50 (maximum), 5 ACH50 (preferred)
Ducts	**Duct Insulation**	**Rigid duct (unconditioned space)**: R6 minimum, R8 preferred **Flex duct (unconditioned space)**: R4 minimum, R6 preferred
	Duct Leakage	15% leakage to outside maximum; 10% or less preferred
	Duct Airflow	325 CFM/ton minimum, 400 CFM/ton preferred (or manufacturer specification)
	Duct Total External Static Pressure (TESP)	0.8 in. WC maximum; 0.3 to 0.5 in. WC preferred (or manufacturer specification)

Note: Being reviewed by Conservation Resources Advisory Committee and Regional Technical Forum members

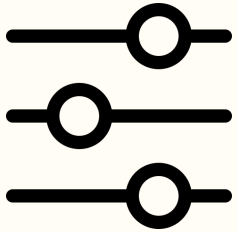
Heat Pump Recommendation 2:
Heat Pump Installation Practices to Minimize Auxiliary Heating

- **The region, including Bonneville and other conservation program operators, should pursue programs that focus on installing new heat pumps using best practices and strategies that minimize the use or need for auxiliary electric resistance heat**
- Such best practices to meet these goals include:
  - performing heat load calculations on every installation to size heat pumps to recommended standards
  - setting critical heat pump controls, like compressor and auxiliary lockout settings, to maximize efficiency
  - educating home occupants on how to operate their systems efficiently



Heat Pump Recommendation 3:
Heat Pump Tune-Up Program Offering

- **The region, including Bonneville and other conservation program operators, should offer programs pursuing heat pump "tune-ups" for existing heat pumps to maximize the benefits of heat pumps to both home occupants and the electric grid**
  - Recent NW data sources suggest that many existing centrally ducted heat pumps in the region may benefit from adjustments to control settings that can improve overall heat pump efficiency
  - Significant auxiliary electric resistance heating leads to both higher electric bill costs to consumers and higher electric demand on the system
  - Should focus on relatively newer ducted heat pump installations (installed within the last two to five years), as these units will likely be in service for another ten years or more



Heat Pump Tune-Up General Program Components

- **Target control settings and recommended setting values:** Primary targeted heat pump settings will include compressor lockout and backup (auxiliary) heat lockout. Other settings affecting performance could include intelligent setback recovery, droop, and emergency heat settings. Default values can be provided.
- **Necessary calculations and/or testing**: Ideally, load calculations and onsite testing (e.g., airflow) would better inform control setting values. For example, a properly-sized heat pump could be controlled to deliver deeper savings than an undersized heat pump.
- **Other tune-up activities to provide additional savings:** While technician is onsite, other O&M activities affecting energy use can be done for additional savings (e.g., verifying refrigerant charge, cleaning coils, etc.)
- **Customer education:** Expectation that customer understands what was done to system and how to keep system operating efficiently.

Heat Pump Tune-Up Checklist

Equipment	Item	Recommended Action
Thermostat	HP (Compressor) Lockout	Disable or set to as low of a temperature as allowed
	Auxiliary Lockout	Set to 35°F as default. May be set lower depending on technician-verified heat pump balance point.
	Night Setback	Verify need for night setback with home occupant. It setback is desired, enable intelligent setback recovery mode, if available.
	Emergency Heat Mode	Verify system is not operating in emergency heat or similar auxiliary-only mode. Educate home occupant on implications of this setting.
	Supply Fan Setting	Check to see if fan is set to On or Auto. Set to Auto, unless occupant desires constant fan.
	Thermostat Compatibility	Check to see if thermostat is compatible with heat pump system (e.g., a third-party thermostat installed on a communicating heat pump system).
Outdoor Unit	Coil Condition	Check to see if coils are clean or dirty. Clean if needed.
	Refrigerant Leaks	Check coil and flare connections (if present) for leaks using ultrasonic leak detector.
	Refrigerant Line Set	Check to see if insulation is in good condition. If not, replace.
	Airflow/Clearance	Clear any debris, such as snow, from outdoor unit. Ensure outdoor unit has proper clearances for airflow. For example, if side discharge, make sure unit is not blowing into a fence or wall.
Indoor (Air Handling) Unit	Airflow	Check airflow using TrueFlow plate. Is airflow close to 400 CFM per ton?
	Filter Condition	Check condition. If dirty, clean or replace.
	Filter Size	Check filter and filter grille size. Filter area should be at least 2 feet for each 400 CFM of airflow.
	Total External Static Pressure (TESP)	Check TESP to make sure it is less than 0.8 in. WC, and ideally near 0.3 to 0.6 in. WC. If greater than 1 in. WC, look for possible causes (e.g., plenum is too small).
	Refrigerant Leaks	Check coil for leaks using an ultrasonic leak detector.
	Coil Condition	Check coil for dust buildup, and clean if needed.
	Air Leaks	Check for air leaks near the air handling unit, such as the cabinet seams or plenum connections.
	Condensate Drain Pans	Was condensate pan and trap installed correctly? Does it need cleaning? Is there a secondary drain pan in the attic? If so, is there a leak sensor?

Note: Being reviewed by Conservation Resources Advisory Committee and Regional Technical Forum members

Conservation Resources Advisory Committee Feedback RE: Heat Pumps

- The committee and regional organizations appear to be very on board with recommendations to improve heat pump installations and reduce auxiliary electric resistance heating
  - This is being jointly worked on by the RTF, Council staff, BPA, NEEA, and others (e.g., The Northwest Heat Pump Symposium, which includes these organizations plus other utilities, heat pump manufacturers, distributors, etc.)
- The committee seems largely in favor of a heat pump tune-up measure
  - Some issues raised, such as, how to target the units that would benefit from this measure most? Is it really the job of utilities to go back and fix units not properly installed outside of programs?
- The committee seems in favor of heat-pump-ready homes as a concept, with some feedback shared on implementation challenges and terminology
  - Implementation challenges: HVAC and insulation contractors tend to be different companies; challenges with timing, financing, etc.
  - Terminology: Is heat-pump-ready the right term? Will people understand what that means?

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Conservation Program Elements

Commercial Building Energy Use Intensity

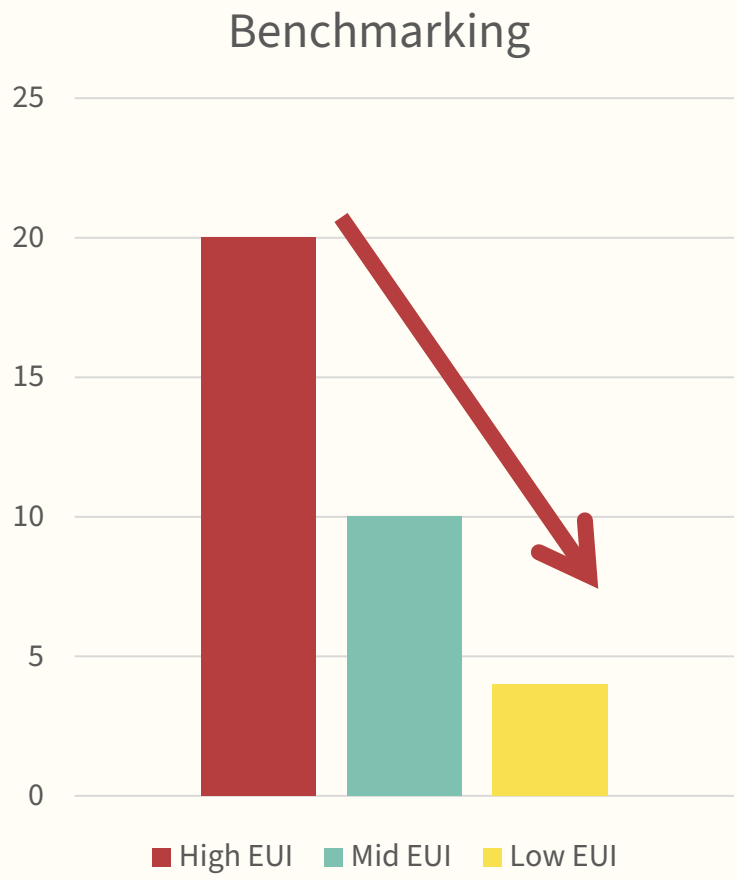
Commercial Building Energy Use Intensity

- **Issue:** There is significant conservation potential remaining in commercial buildings beyond the individual measures defined in the plan.

- **Recommendations:** NEEA, Bonneville, and the utilities should work to acquired this resource through benchmarking data development and performance-based programs.

Whole Building/Benchmarking Recommendations

- Develop robust EUI data set
  - NEEA to develop region-wide benchmarking database
  - Utilities, including BPA, to develop EUI data sets and share with region
  - States and cities to collaborate with NEEA for consistency
  - Develop regional EUI “target” levels (e.g., ASHRAE 100)
- Utilities to develop programs to utilize the benchmarking data
  - Target buildings with lower EUIs
  - Move all commercial buildings to lower EUIs
- NEEA to support regional whole building efforts
  - Reduce cost for whole building measures
    - Understand cost barriers and drivers
    - Develop costs for different pathways and packages
  - Streamline “packages” for whole building conservation



CRAC feedback

- Moving more toward building performance for conservation is a strong and common theme within the CRAC, and they are strongly supportive of these recommendations
- Some concerns were expressed related to duplicating efforts in benchmarking data collection
- Having more and better benchmarking data would support utility program efforts
- Having more and better benchmarking data would be valuable to jurisdictions with building performance standards

Conservation Program Elements

Evaluation

Evaluate Conservation Programs

- **Issue:** Evaluation is a critical to ensuring adequacy. Evaluations provide information to ensure planned savings are realized and provide insights on how to improve program effectiveness. Many programs currently have robust evaluation efforts. Staff believe continued (and increased) emphasis on evaluation is valuable.

- **Recommendations:** Continued investment in conservation evaluation in accordance with the Regional Technical Forum's guidelines, which support consistent and reliable determination of conservation across all measure types.

Economies of Scale through the RTF

	Proven	Planning	Small Saver
RTF Approval	Estimation method and savings values based on reliable data and analysis, considered reliable	Sound engineering or statistical methods / savings values, but not considered reliable	Sound engineering or statistical methods / savings values , but not considered reliable
Technical Potential	Sufficient usefulness and applicability in the region	Sufficient usefulness and applicability in the region	Regional potential savings small <3 aMW or 1 million therms
Evaluation	Delivery verification (i.e., count of units) for a reliable random sample	Comprehensive impact evaluation, includes data collection and analysis in addition to delivery verification	Comprehensive impact evaluation, includes data collection and analysis in addition to delivery verification
Additional Research	No additional research needed by the region	Research strategy required	Savings potential too small to warrant additional research

Only 18% of RTF measures are considered "Proven"

Other Suggestions from CRAC Members

- Utilities should support states in maintaining federal EE standards
- States should consider the adoption of standards for non-Federally regulated products
- The region should continue to test, research, and investigate the representativeness of test procedures for different equipment and recommend updates to relevant industry associations or regulatory bodies as appropriate
- Further develop motors and drives conservation efforts
  - Expansion of programs to promote the adoption of variable speed capabilities and controls across all motor types
  - Development of metrics, codes, and standards that encourage the adoption of variable speed technology in more applications can help offset future load growth

Conservation Program Elements

Rate of Return on Conservation

Rate of Return & Debt for Conservation

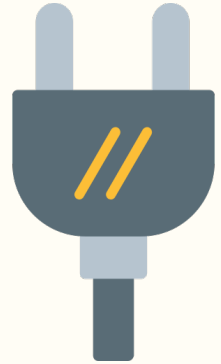
- **Issue:** Today, conservation is treated differently than supply-side resources (wind, gas, batteries, etc.) for resource acquisitions
  - Typically, conservation is purchased in cash, and investor-owned-utilities do not earn a rate-of-return on the investment, whereas supply-side resources can be bought with debt and can earn a rate of return.

- **Recommendation:** Investigate if this different treatment negatively impacts the acquisition of conservation resources

Demand Response

Managing Electrification Loads

Managing Electrification Loads

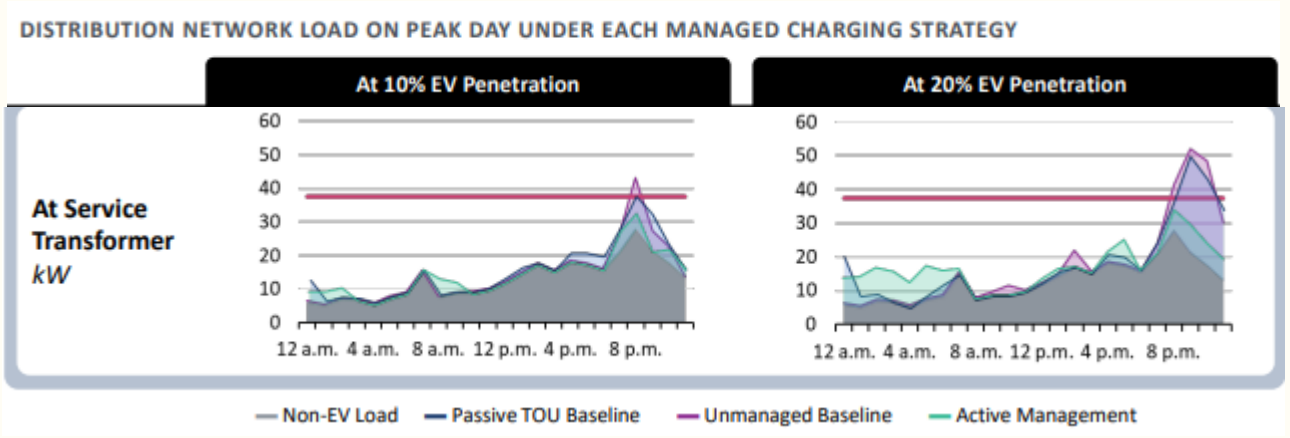


- **Issue:** Electrification can have significant impact on peak load and distribution system reliability. Unmitigated electrification of vehicles and heating can create energy demand spikes that contribute to peak issues and challenge distribution system.

- **Recommendation:** Peak management should be prioritized when approaching electrification in the region. The region should research and gain a deeper understanding of the implications of electrifications on peak and the distribution system as well as the costs and benefits of strategies mitigating impacts on the distribution system. Strategies to minimize these impacts should be pursued.

Vehicle Electrification

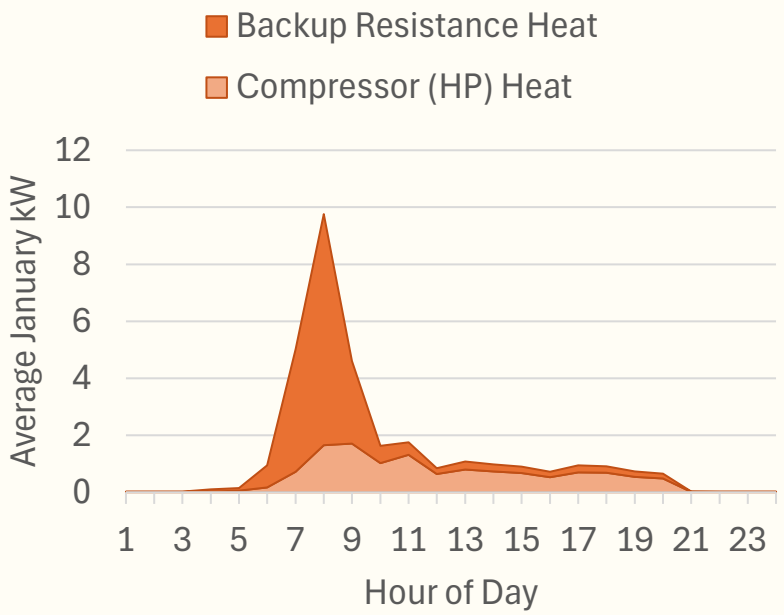
- **Context:** Charging of EVs predominantly occurs in the evening as residents return home and plug in their EV.
  - Given the charging electric draw, most transformers are only able to handle two or three EVs charging simultaneously
- **Issue:** As EV penetration grows in highly localized areas, the distribution system may experience significant strain due to peak coincident charging. If not managed properly this could result in service reliability issues or require costly upgrades.
- **Recommendation:** DR programs will need to ensure their program strategy for EVs, particularly TOU programs, ensures balancing reliability, grid infrastructure needs, and customer charging requirements
  - For example, tiered EV TOU rates that encourage groups of customers on the same transformer to spread out the starting time of charging



Source: Brattle Group

Building Electrification (Heat Pumps)

- **Context:** Installation of backup electric resistance heat is common practice for heat pumps installed in a home with central ducting. In most cases, the systems are not then set up to ensure minimization of backup heating, resulting in signification morning peaks due to nighttime thermostat setbacks.
- **Issue:** As heat pumps continue to gain popularity, if current installation practices remain, there will be significant implications on peaks.
- **Recommendation:** Best practices focused on efficiency and system reliability should be prioritized by jurisdictions focused on electrification, including both for key end uses and building envelope, to minimize peaks from new electric loads and allow for deeper DR savings during peak events.



Source: A site from NEEA's Home Energy Metering Study (HEMS) that sets thermostat back about ten degrees at night.

Demand Response

Improving Planning Data and Assumptions

Improve Demand Response Data

- **Issue:** As the region continues to develop new and enhance existing demand response programs, it will be important to continue to improve the inputs to support future planning and modeling for demand response. Of particular importance will be continuing to gain deeper understanding of the costs and impact timing characteristics of different demand response programs.

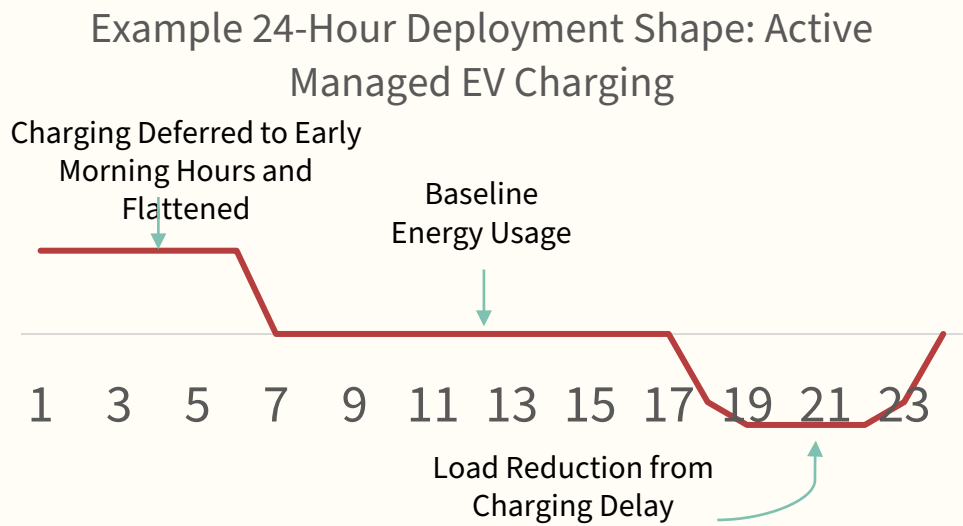
- **Recommendation:** The region should pursue efforts to ensure continued refinement of key inputs for demand response planning, including costs, deployment profiles, and verification of kW estimates through evaluations.

Demand Response Data Assumptions
Costs

- **Develop a consistent cost framework for DR to gain a deeper understanding of the full lifecycle costs of programs**
- Establishing consistent data or a framework for documenting cost for all aspects of demand response programs would allow the region to gain a deeper understanding of the individual drivers for cost variations between programs and across the region.
  - For example, setup costs and programmatic costs for DR programs can vary widely based on where a utility is in the development of their DR portfolio. Some regional DR programs are new and current costs may reflect high initial costs of establishing DR program infrastructure
- Deeper understanding of drivers and the full lifecycle of costs would improve cost estimates for future power plans.

Demand Response Data Assumptions
Impacts

- **Develop a diverse database of deployment profiles defining the size, duration, and timing of load reduction.**
- Ensuring the continued accuracy demand response deployment profiles are critical to modeling for the Plan, particularly as they determine the time and impact of DR in the models and ensure an accurate comparison to other available resources.
- Different program designs, as well as local needs or situations, can result in significant variations and having a diverse portfolio of deployment profiles would ensure continued enhancement of DR in the models and for utilities in the region.



Demand Response Evaluations

- **Recommendation:** To ensure accurate and reliable estimates of kW reduction from DR programs, utilities should rigorously evaluate demand response programs and follow best practices for evaluations.

- Evaluations will also serve to provide deeper understanding of program design and its impacts on participation and savings.

Demand Response

Long Duration Demand Response

Long-Duration Demand Response Products

- **Issue:** The Ninth Plan needs assessment shows a need for resources that can mitigate long-duration events, particularly in the winter.

- **Recommendation:** The region should explore the potential for long-duration demand response offerings that can address adequacy concerns. As a new type of DR option to the region this was not modeled but warrants consideration to meet a need identified in the plan.

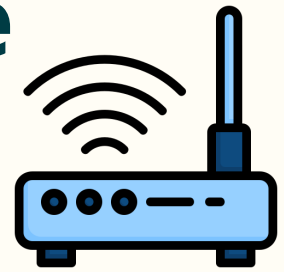
DRAC Feedback

- Some utilities have started developing programs like this and see value in it, recruiting customers that can provide at least 1 MW of load reduction for 24 hours in order to reduce price exposure during high market events
- Other utilities indicate that getting customers to commit to long duration curtailment may be difficult

Demand Response

Control Strategies

Control Standards for Demand Response Technologies



- **Issue:** National organizations have developed a consistent control and communication protocol for demand response with water heating. Narrowing on one communication methodology improves and broadens program deployment and enables DR enrollment at lower costs. However, it is not broadly used in other end uses.

- **Recommendation:** The region should work on establishing and broadening controls and communications standards that can be integrated directly into a number of key DR technologies and equipment.

Supply Side Recommendations

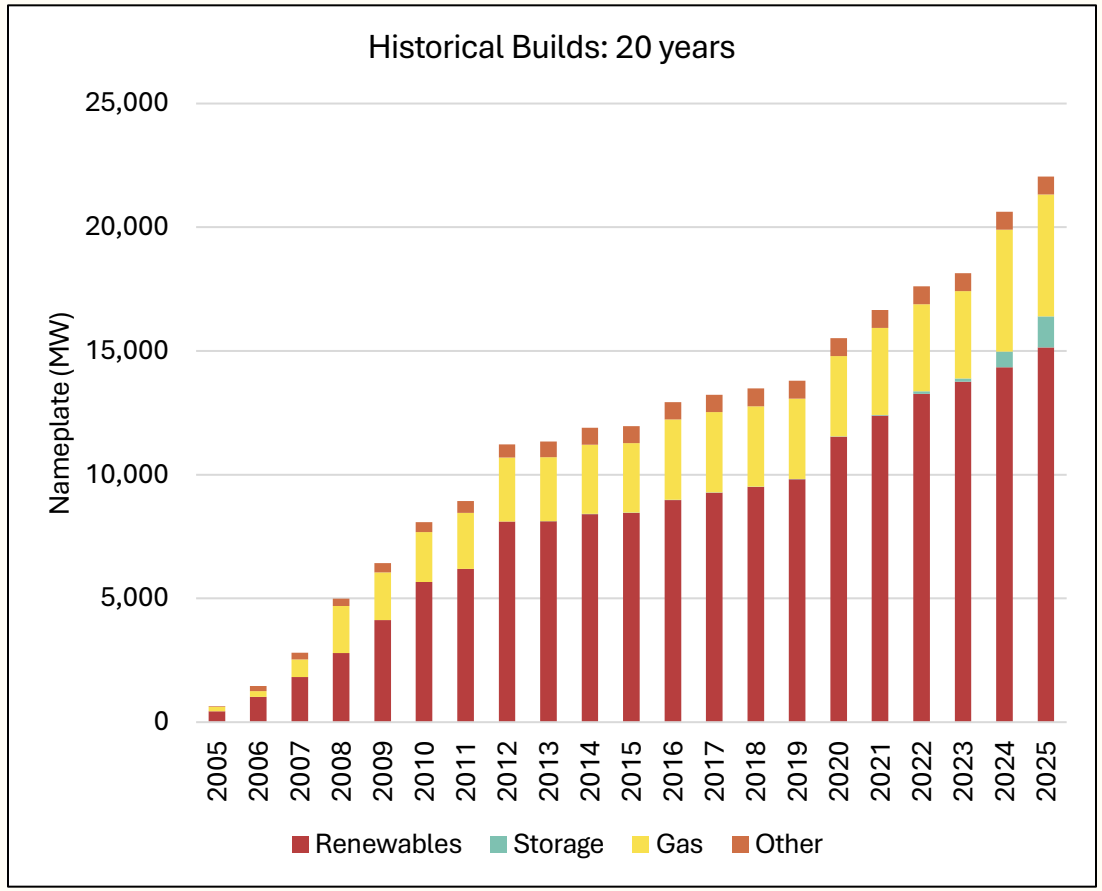
Pace of Development

Increasing Pace of Supply-Side Builds

- **Issue:** With the recent and projected load growth, there is a need for a lot of new resources quickly. At the same time, many people express concerns around the ability to build and timelines are longer than they have been in the past. This is driven by a variety of things:
  - Interconnection queue challenges
  - Permitting timelines
  - Community buy-in

- **Recommendation:** This plan should include language recognizing these challenges and provide some potential paths forward.

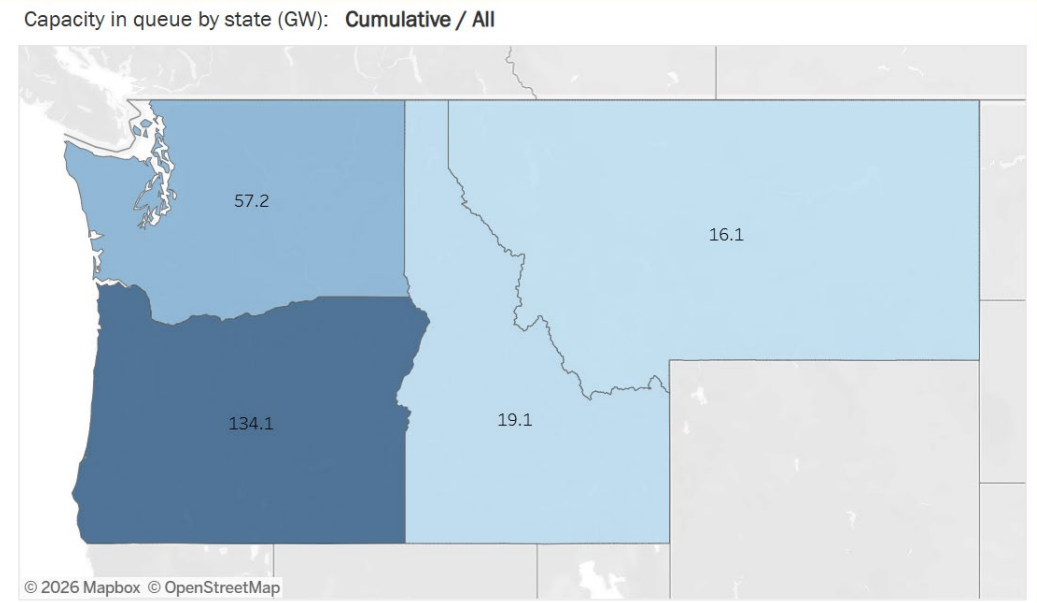
Supply-Side Build Pace: Context



- In the past 20 years the region has built 25,000 MW of new supply-side resources
- Council models are selecting between 30,000 MW to 70,000 MW over the next 20 years

Interconnection Queue

- The interconnection queue is over-full, slow, and a key barrier to getting more resources connected to the grid
- The majority of interconnection queue requests (>70%) are withdrawn
- The median duration that projects spend in queues is almost 4 years for projects built in 2018-2024



Region	*n* (active)	Capacity (GW)
CAISO	638	272.8
ERCOT	1,447	346.1
ISO-NE	399	45.6
MISO	2,213	447.5
NYISO	402	78.5
PJM	1,942	211.5
SPP	643	142.4
Southeast (non-ISO)	1,002	162.5
West (non-ISO)	1,617	583.5

What Has Been Done

- FERC order 2023
  - Has done a lot to raise the barrier of entry into the queue, less clogged with projects that won't get built
- OR Governor Executive Order 25-25, EO25-29 and HB4031
  - HB4084 and HB4020 are also aimed at permitting performance across state government
- WA Executive Order 25-11 and SB 6355
  - Est. WETA, a Washington transmission authority
- CA (and others) streamlined permitting process

What Else Could Be Done?

- Transmission solutions – more later
- Creative citing and land use solutions – more later
- More efficient permitting process
  - Ex. one stop shop through a single state agency
- Plan further out for resource development to ensure resources are online when needed
- Other ideas?

Supply Side Recommendations

Solar Development

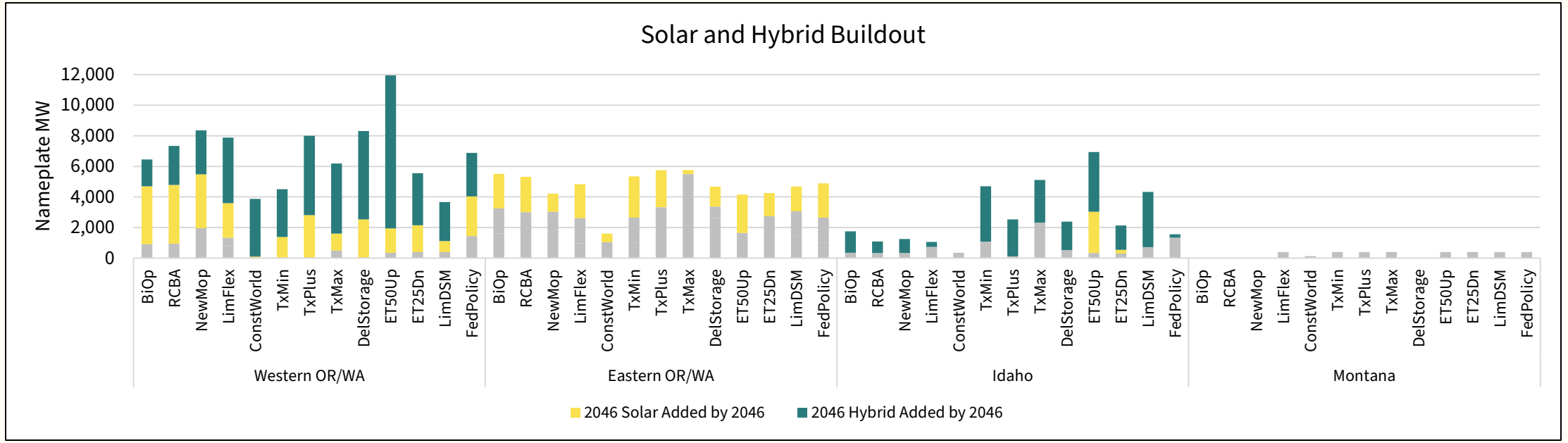
Considerations for Solar Development

- **Issue:** The amount of new renewables requires significant land. Council modeling is showing a lot of solar on the west side, where there is limited land. Broadly, there are questions of land use. The 2021 Plan recognized the need to be "mindful of individual and cumulative impacts when siting new resources so that new renewable resource development is carried out in a manner that also protects the wildlife, fish, and cultural resources of the Pacific Northwest."

- **Recommendation:** Council could include similar language and provide recommendations encouraging creative siting solutions, including different approaches by location depending on the specific needs/challenges of those areas.

Considerations for Solar Development

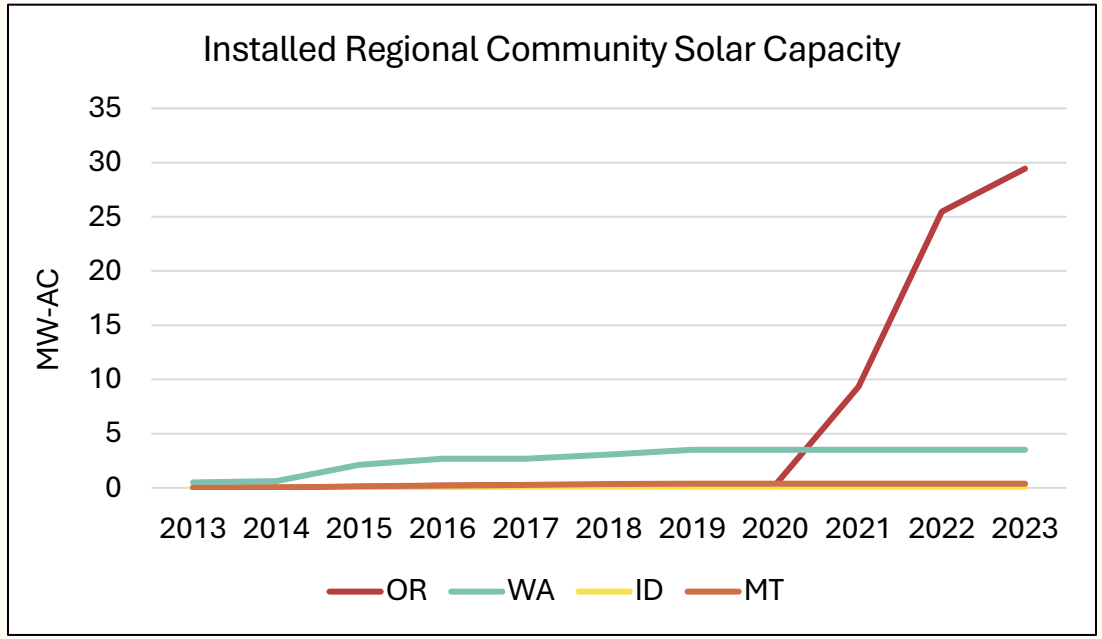
- Seeing lots of solar selected in the west of the region
- Built close to load and to fulfill clean policies but in a part of the region with less transmission and less available land



An Option: Small-Scale Solar

- The region should explore alternative types of solar development including small-scale solar, paired with battery, and agrivoltaics
- In modeling results we're seeing small scale solar get selected in the out years (2038 and 2046) in Western Washington zones, likely to ease some transmission constraints, in about half of the sensitivities
- We model physical transmission constraints, but it's probable that utilities dealing with contractual transmission realities would run into constraints earlier
- We didn't include a small scale solar with storage reference plant, but given the hybrid build results, and the added T&D benefit of storage, this could be worth exploring as well

- Not currently a heavily developed space in the region, but we've seen recent growth especially in Oregon



Another Option: Agrivoltaics

- Renewables can be a land intensive, but they can also be co-located with existing land uses without disruption. Pairing agriculture with renewable generation is one such colocation opportunity.
- In Benton county BrightNight Power is planning a 500 MW solar and storage agrivoltaics plant. Hill Hop renewable power project would combine sheep grazing and solar production on the same footprint.
- This is a potential way to ease resource citing challenges.

Photo Credit: https://brightnightpower.com/what-we-do/our-projects/hop-hill/

Supply Side Recommendations

Hybrid Resources

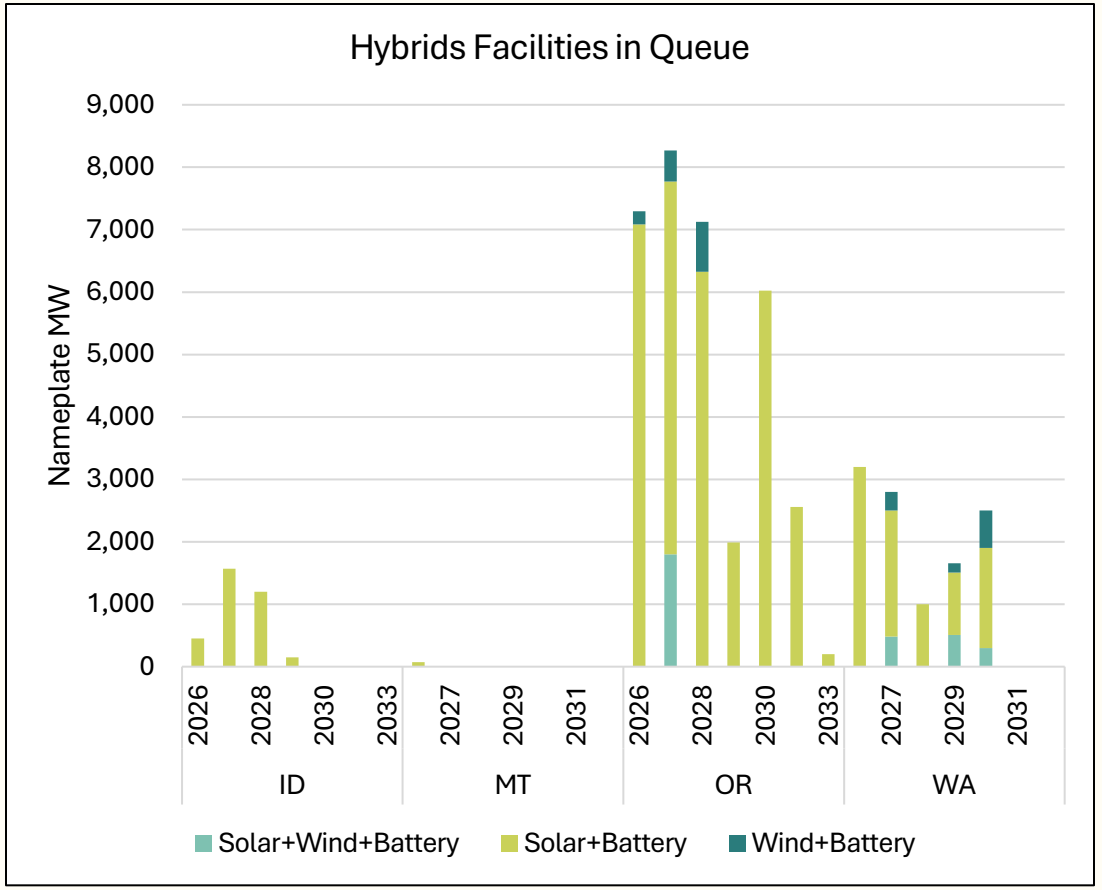
Hybrid Development

- **Issue:** Model results show a preference for hybrid resources that can provide energy, support flexibility, and meet clean policies. The modeling focused on the solar + storage resource only.

- **Recommendation:** Encourage regional entities to explore other co-location solutions for renewables and storage. This could include solar + wind + battery, wind + battery, etc.

Hybrid Development Context

- Hybrid resources can meet a variety of power system needs, while also reducing costs for shared equipment and ease siting and construction
- Wheatridge Renewable Energy Facility:
  - First of its scale hybrid wind solar and battery
  - Some value in wind production often picking up where solar left off
- Most of the planned hybrid resources in the region are solar + storage, but some wind + storage and wind + solar + storage facilities are in the queue



Data from LBNL 's "*Hybrid Power Plants: Status of Operating and Proposed Plants, 2025 Data Update*"

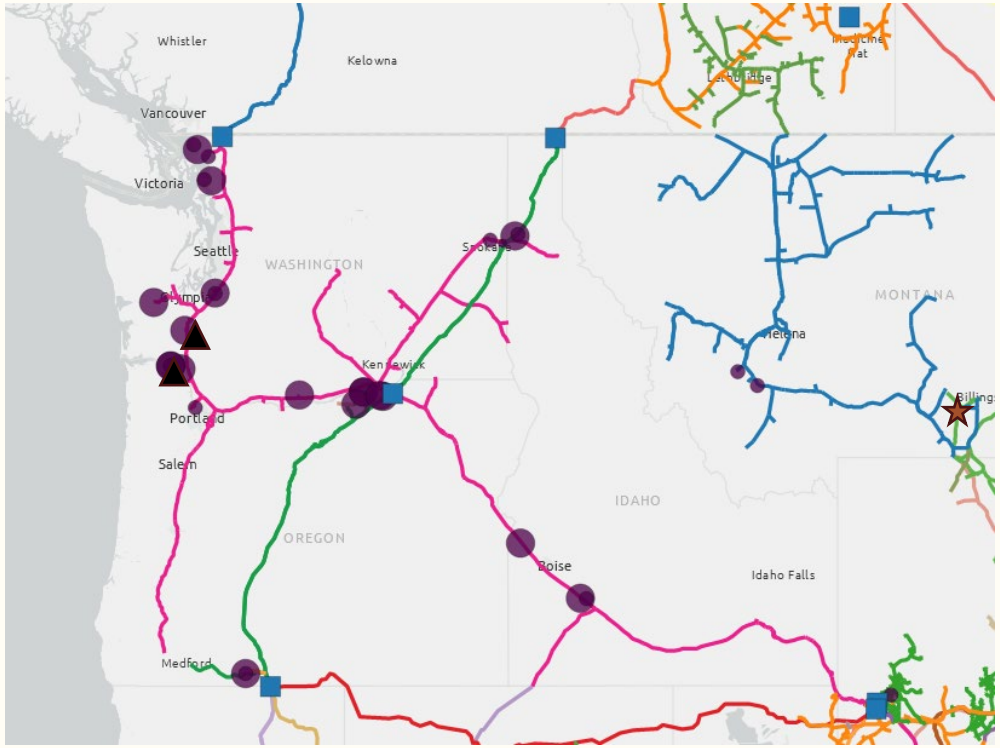
Supply Side Recommendations

Natural Gas Utilization

Better Understanding Gas Fuel Supply

- **Issue:** The natural gas system is running at a high utilization factor. Modeling shows a role for new gas in the system but there could be fuel supply challenges in adding more gas.

- **Recommendation:** Improving understanding gas limits, and solutions to those limits, would be helpful for regional power planning.
  - There is work underway by NWGA/PNUCC that may provide insights into this



The Northwest natural gas pipeline system
▲ = gas storage, ● = gas power plant

map from SNL

Supply Side Recommendations

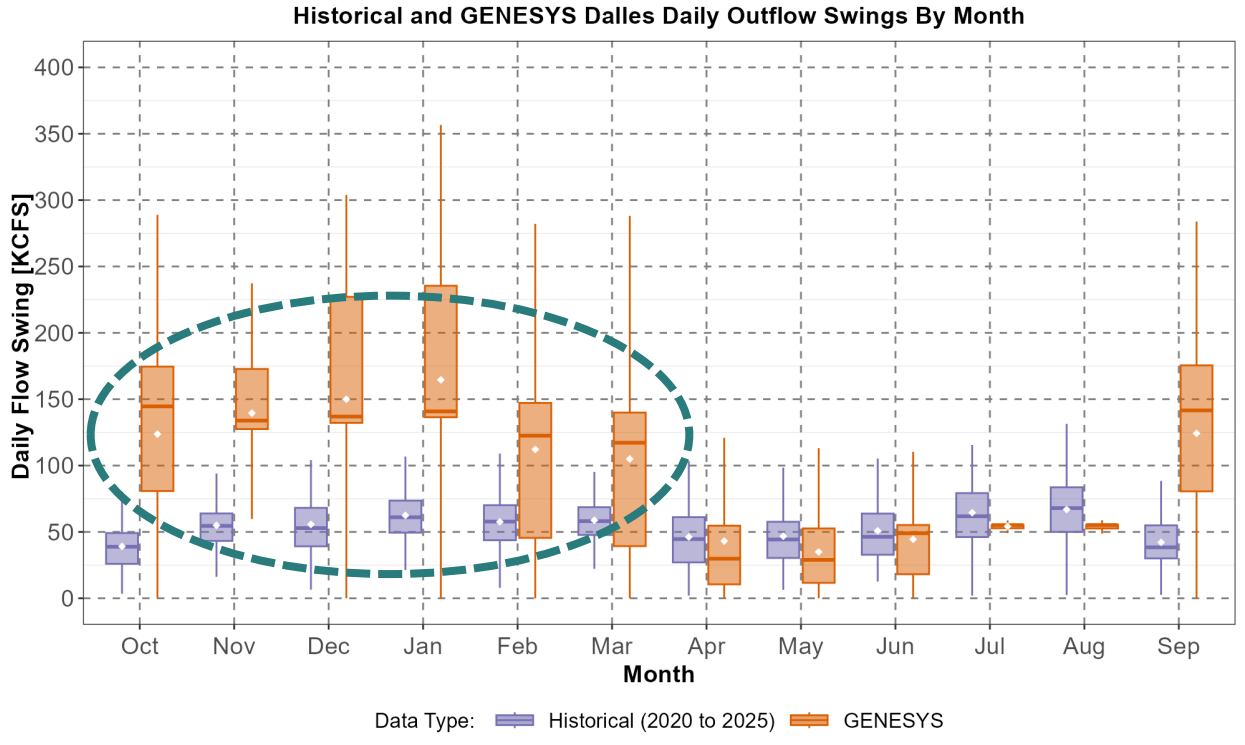
Leverage Flexibility of Existing System

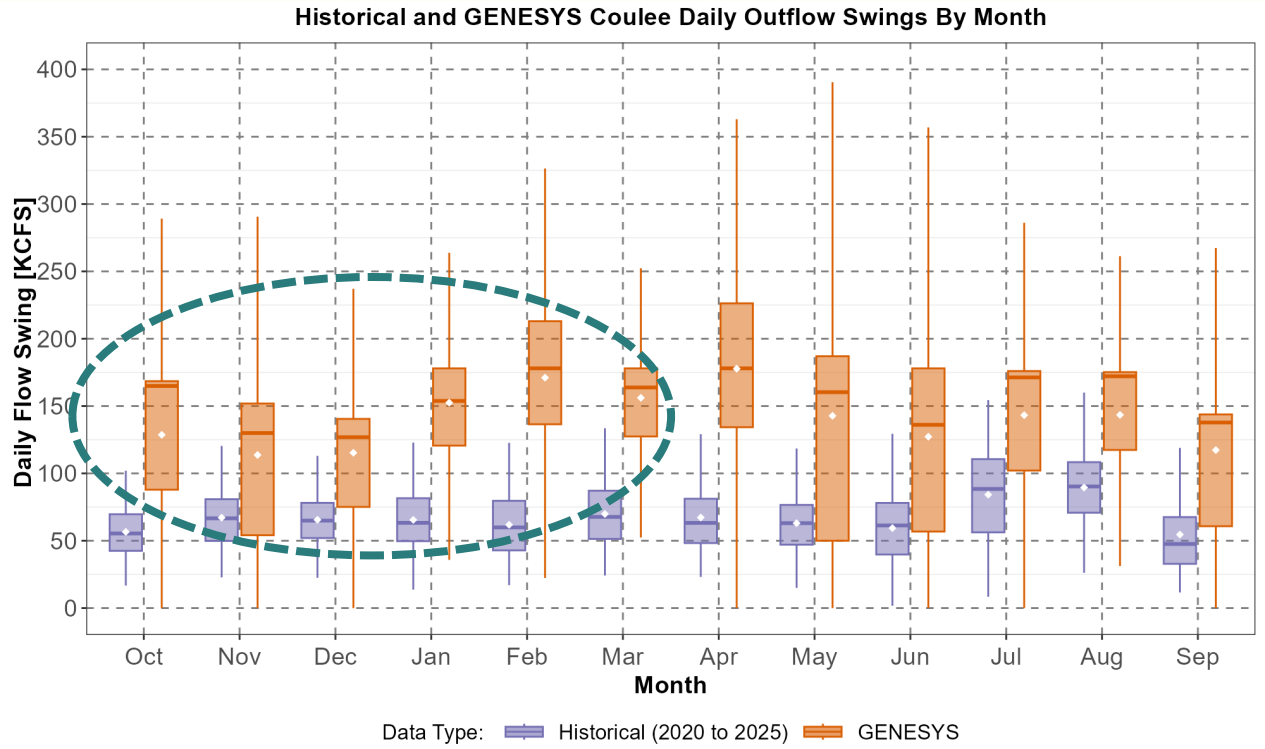
Leverage Flexibility of the Existing Hydro System in Fall and Winter

- **Issue:** Flexibility in the hydro system supports reserves and renewable integration. Council analysis sees greater flexibility is available in the fall/winter (at times it is less needed for fish) than what is currently utilized

- **Recommendation:** The region should explore opportunities to leveraging the hydro system flexibility to a greater extent in fall and winter.

Flexibility Examples from Dalles & Coulee





Outliers removed for simplicity

Data Centers

Data Center Flexibility

Data Center Flexibility

- **Issue:** The model shows near-term adequacy challenges without sufficient supply side resources to meet load. Finding solutions to curtail or shift data center load could both support adequacy in the near-term and help address the long-term power system needs.

- **Recommendation:** Work with the data centers on approaches to providing flexibility, ranging from potential demand response type products to leveraging back-up generation for reserves or emergency resources.

Potential Areas of Recommendation

- Work with data centers on flexible supply on a short-term basis to ensure adequacy
- Set policies to require new large loads to provide flexibility, which could be backup generation or some other type of flexibility
- Improve understanding of what flexibility exists from a demand response perspective
- Improve understanding of the amount and availability of data center backup generation to contribute to system reserves or emergency resources

Data Centers

Conservation Standard

Conservation Standard for Data Centers

- **Issue:** Data centers are a new large load coming to the region. While the hyper scale data centers tend to be built efficiently, there are improvements that could be made for other data centers.

- **Recommendation:** Develop a conservation standard for new data centers to encourage new development to be done so as efficiently as possible. Staff are considering this might make sense for a Model Conservation Standard.

Data Center Metrics

Power Usage Effectiveness

- PUE = Total DC Energy Use/IT Equipment Energy Use
- A PUE of 1.0 means all data center energy is from the IT /server equipment
- Current modern data centers reach PUEs of 1.2

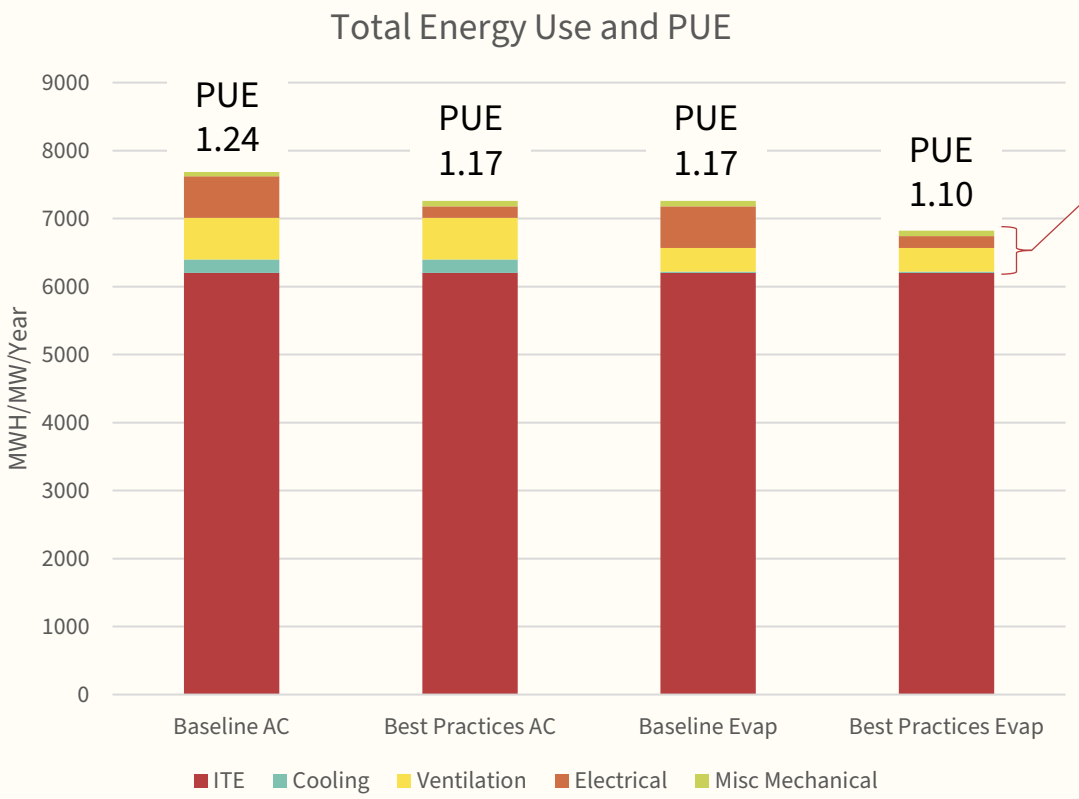
Peak Power Usage Effectiveness

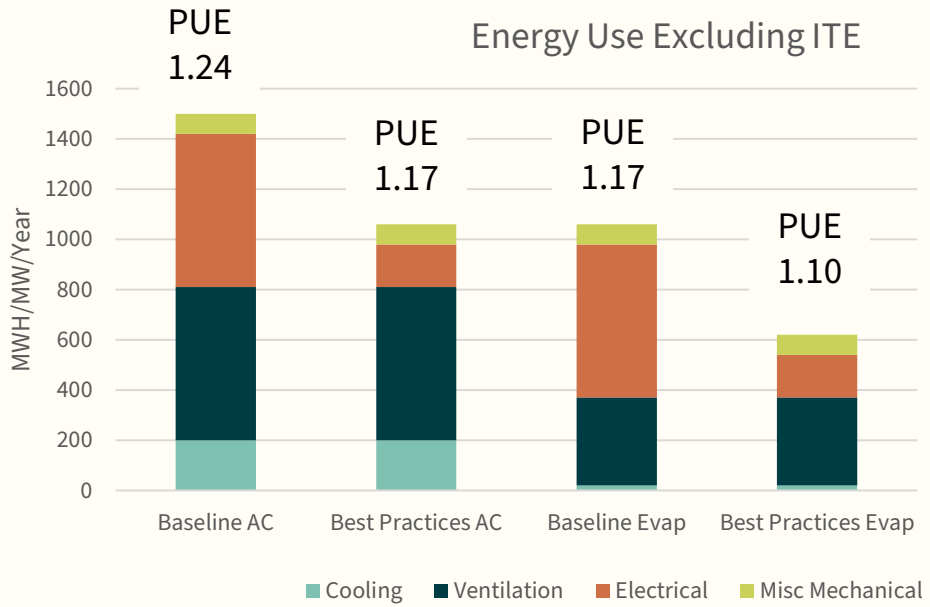
- PPUE = Total peak load (single hour)/IT Peak Load

Water Usage Effectiveness

- Measured in gallons (or liters) consumed per kWh of electricity
- Average is 0.5 gallons per kWh

Power Usage Effectiveness (PUE)





- ITE loads are the same for each case (red bars)
- Cooling loads can vary by climate zone (these are for zone 5 – The Dalles)
- Graph on the right includes MLC and ELC
  - MLC = Mechanical Loss Component
  - ELC = Electrical Loss Component (Excl ITE)
- Misc Mechanical includes lighting, plug loads, pumps, and auxiliary

Data Centers

Stock Assessments

Data Center Stock Assessment

- **Issue:** Data centers represent significant load and load growth in the region. Acquiring enough good data to identify the number of data centers, their end-use equipment, and overall electricity consumption is challenging. These data are necessary for accurate load forecasting as well as identifying conservation potential.

- **Recommendation:** The region, likely NEEA, should conduct a data center stock assessment to acquire the information needed to improve the regional load forecasts and conservation potential assessment.

Data Center Stock Assessment

- NEEA should conduct a data center stock assessment to determine the characteristics data centers that exist in the market today
- Developing data center counts and electricity consumption (where possible) is critical for accurate load forecasting and to avoid double-counting of loads and conservation potential
- Understanding the characteristics, especially the cooling systems of these buildings will enable the Council and utilities to identify conservation potential
- These data can then be used as a foundation for utilities to develop effective conservation programs
- The data will also be important for improving the accuracy of data center load forecasts.

Data Center Stock Assessment Load Forecasting

What

Build out a Database of existing and planned data center/large load projects within the Northwest

1. To include estimates of historic load profiles (MWh and shape) and an estimate of the potential site build-out in terms of demand and timeline
2. To include location – state & balancing authority

Why

Tool to aid long-term load forecasting

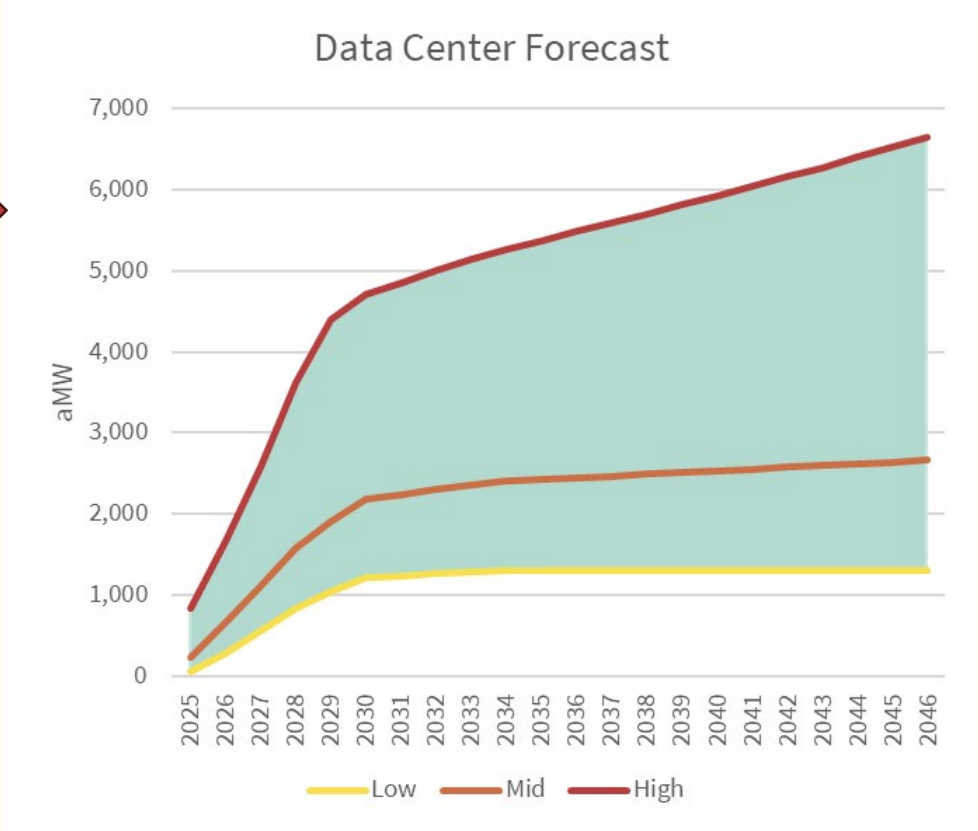
1. Identify and quantify existing data center demand that's embedded within our historic load data sets (which may reside in commercial or industrial sector classifications)
2. Avoid duplication of projects across multiple zones
3. Narrow the band of future forecast uncertainty

Who

NEEA would be the best entity to conduct a stock assessment. Council staff can then use those data along with extensive engagement with utilities via the Demand Forecasting Advisory Committee

Data Center Stock Assessment Load Forecast Context

1. In the forecast model, we created a separate category for data center load growth 2025 onward
2. Three trajectories for data center growth - treated as an exogenous input to the model – the large range or "jaws" is indicative of the high level of uncertainty- which we'd like to reduce in the future
3. Data Center load is embedded in the historic load data sets we use to create the SAE (statistically adjusted end-use) energy models which are the base of our demand forecast
4. We use a zone-specific Data Center variable in the SAE model to account for this demand in order to accurately characterize historic commercial and industrial loads – to avoid inflating non-data center sector growth



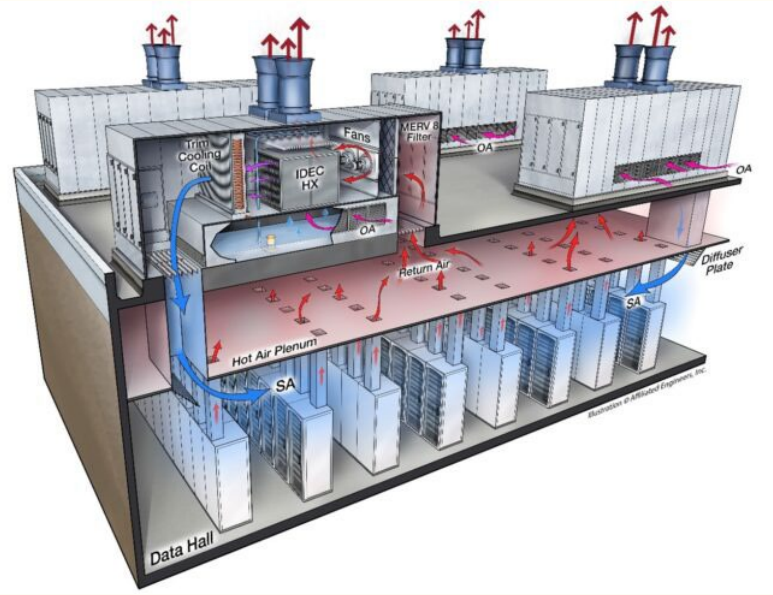
Data Center Retrofit Opportunities

- **Issue:** Utilities in the region have completed a variety conservation projects to improve the efficiency (especially cooling) in existing data centers. Existing older standalone data centers may not have been built with low PUEs in mind, so this group are likely the best target for conservation programs.

- **Recommendation:**, Develop conservation programs to improve the efficiency of data centers with a focus on older, mid-sized data centers. Stock assessment data can be leveraged to identify potential and areas of focus.

Utility Programs for Existing Data Centers

- Utilities in the region have completed numerous conservation projects to improve the efficiency (especially cooling) in existing data centers
- Utilities should develop and offer programs to reduce their cooling and miscellaneous electrical system consumption:
  - Maximize economizer, or free cooling operation
  - Review in update electrical systems such as power supplies, conductors, etc.
  - Consider evaporative cooling systems where appropriate
- Consider developing PUE targets for existing data centers



Transmission

Maximizing the Existing System

Removing Contractual Barriers

- **Issue:** The transmission challenge in the Northwest isn't just the size of the wires, but also having the contractual right to use the transmission. During most hours of the day there is space on the transmission system, but having firm (or conditional firm) transmission is valued to ensure power delivery, and firm transmission availability is low.

- **Recommendation:** Regional discussions on how to better utilizing the transmission system from a contractual perspective, which could help in developing more resources both within the existing and any future expanded system.

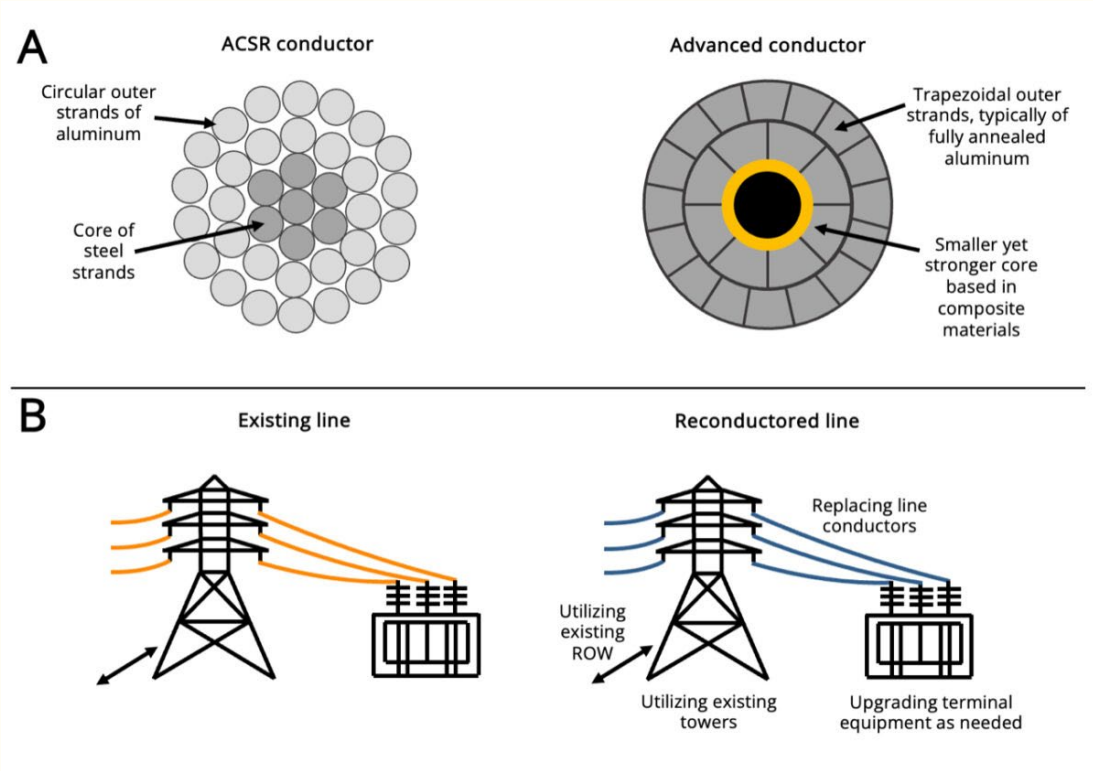
Reconductoring and GETS

- **Issue:** New transmission capacity in the region is needed but investment in new transmission deployment is costly and can take many years to build.

- **Recommendation:** The region should incorporate reconductoring and grid enhancing technologies into transmission planning as a way to quickly unlock additional grid capacity out of the existing system. States and regulators should encourage evaluation of these technologies through policy and permitting reform.

Reconductoring

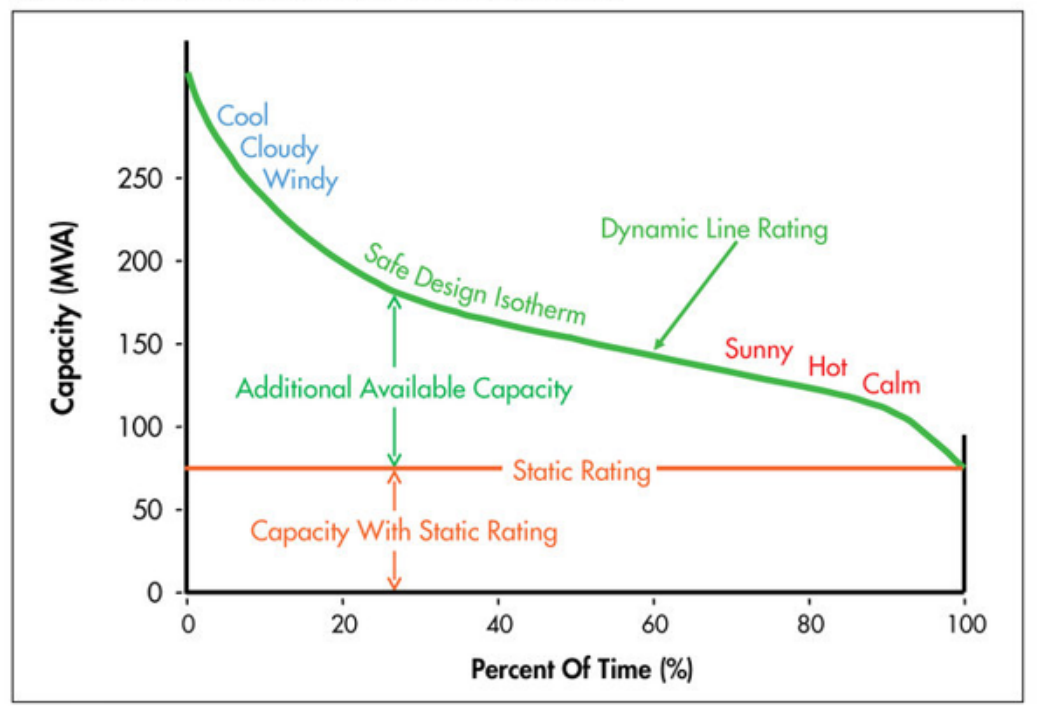
- Replacing steel conductor cores with smaller, lighter composite cores
  - Allows more aluminum (conductive material) to fit in line, increasing carrying capacity ~2x
- 18-36 month deployment timeline makes it attractive for addressing near-term needs
- Idaho National Lab Study estimated ~20% of transmission lines nationally could be viable candidates for reconductoring



Source: National Academy of Sciences

Grid Enhancing Technologies (GETs)

- Hardware and software solutions that are deployed within the existing transmission system, helping increase the capacity, flexibility, and efficiency of the current grid
- An example is dynamic line rating, which uses real-time weather data to dynamically adjust a transmission line's effective capacity
- GETs can increase a line's transmission capacity 15-30% and be deployed in 3-6 months



Source: Valley Group

Transmission

Expanding Transmission Availability

Transmission Expansion

- **Issue:** More transmission capability will be needed across the west to unlock supply and demand diversity and make the most efficient use of resources.
- **Recommendation:** Continue to support and participate in west-wide interregional transmission planning efforts like the WestTEC study to unlock more supply and demand diversity across the west.
  - Recent analytical efforts shows increasing interregional transmission infrastructure can decrease costs west-wide, however it is unclear whether greater connectivity throughout the west significantly decreases costs for the Pacific Northwest region long term
  - However, some announced intraregional projects like Cross-Cascades North and South and upgrades on Path 8 seem to slightly lower regional costs

Markets

Maximizing the Existing System

Reduce Market Seams

- **Issue:** Analysis shows that the region will continue to have a significant exposure to out of region market and heavily reliant on in-region supply/demand diversity for economic exchanges and maintaining seasonal adequacy (especially in the winter). Currently, the west seems to be settling on two day-ahead market and resource adequacy programs.

- **Recommendation:** Regional entities should seek to minimize seam costs that would decrease economic efficiencies and increase costs for the region. Entities should engage in one of the two resource adequacy programs to decrease costs required to maintain resource adequacy.

Distribution System

Continue to Invest in the Distribution System

- **Issue:** Added loads have the potential to strain to the existing distribution system. The region has also experienced extreme events that have caused significant disruption of the distribution system.

- **Recommendation:** While the Council's work focuses on the bulk power system, there may be value a recommendation or two directed at continuing to invest in existing distribution infrastructure.
  - Some of the previous recommendations already touch on the distribution system
  - The Council could also consider language recognizing that much of this buildout might be driven by larger loads, and investment might need to be borne (in part) by those entities

Emerging Technologies

Continue to Invest in Emerging Technologies

- **Issue:** The model sees value in all the emerging technologies provided. The model selected the long-duration and medium duration storage proxy plants in all sensitivities and selected the clean baseload plant in over half of the sensitivities. While the conservation emerging technologies were in the higher cost bins, the model shows value in conservation that can compete with other resources.

- **Recommendation:** The Council should continue to encourage the investment into emerging technologies. These resources will be needed to meet needs, including policy requirements. The Council can choose to be more generic or provide more specific guidance in this recommendation.

Additional Recommendations for Research and Development

Stock Assessments

Continued Investment in Stock Assessments

- **Issue:** The region, through NEEA, has conducted regional stock assessments to provide snapshots the building stock. These stock assessments are critical for estimating energy efficiency for the power plan, tracking overall progress for energy efficiency, load forecasting, grid-flexible readiness, energy efficiency measure development, and numerous other uses.

- **Recommendation:** Stock assessments for residential and commercial sectors, and industrial motor systems should continue to be conducted on a regular basis, preferably every five years.

Stock Assessment Recommendations

- NEEA, with funding from utilities in the region, should continue to develop sector-based stock assessments every five years:
  - Residential building stock assessment
  - Commercial building stock assessment
  - Motor systems stock assessment (MSSA)
- NEEA should continue to assess and expand data collection for multifamily buildings, including both tenant spaces and central building systems
- NEEA is conducting its first MSSA which will cover approximately 4 of the 20 industrial segments. NEEA should continue the MSSA by adding more segments.

Additional Recommendations for Research and Development

Load Forecasting

Load Forecasting Data Sets

- **Issue:** Aligning data and methodology assumptions with regional forecasters once every five years may make it more difficult to spot changing trends in regional loads

- **Recommendation:** Collectively formalizing methodology and appropriate use of available data will allow for more consistency and accuracy in load forecasting efforts in the region.

End Use Data Sets Load Forecasting

What

Formalize a process to produce data sets with estimates of past, current, and future saturation rates and average efficiency levels for end-uses in the region

1. Residential and Commercial sector end-uses
2. By building type: SF, MF, Other, ….
3. By state (ID, MT, OR, WA), and possible by zone

Why

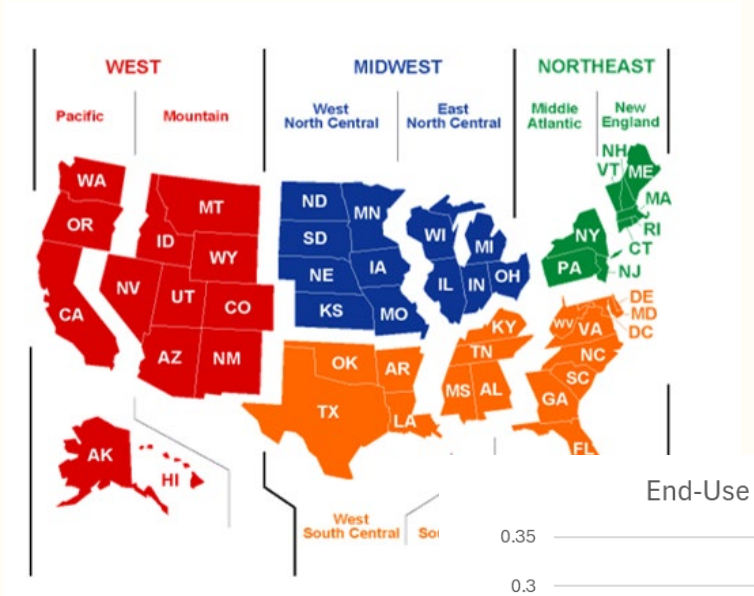
1. Building stock end-use characteristics such as technology, saturation and efficiency are key variables in the Council load forecasting model
2. Understanding how regional building end-use characteristics change over time - reflecting consumer preferences and policy - is important for accurate forecasting
3. Much of the raw data is currently available – this recommendation proposes a formalized process using existing data to produce load forecast friendly data input streams that could be used by many forecasters in the region

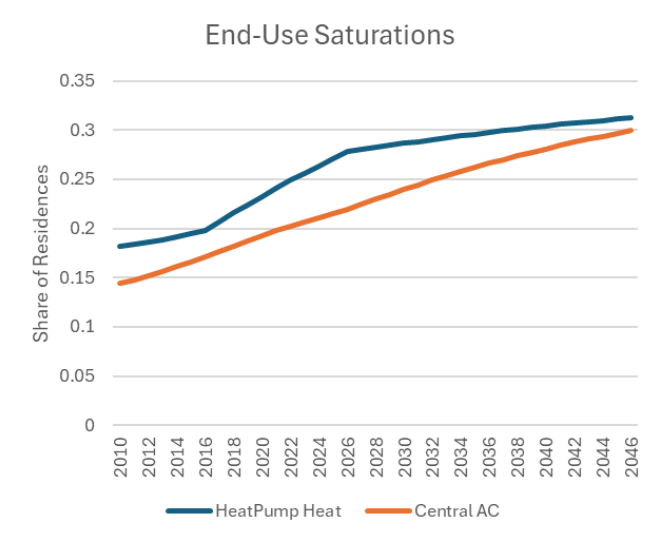
Who

NEEA, Council Staff, and DFAC guidance

Improve End Use Data Sets Load Forecast Context

1. US Energy Information Administration develops end-use data for nine census divisions – but with the Northwest split among two regions
2. The Council has developed end-use estimates for ID,MT, OR, WA utilizing NEEA studies (RBSA, CBSA) in one-off fashion for the plan forecast





Electrification Potential and Data Sets Load Forecasting

Building Electrification

1. Tie into the End-Use data set recommendation for the residential and commercial sectors
2. Enhance focus on the specific building electrification growth centers in terms of end-uses, technologies, equipment installation and set up, and temperature sensitive response

Electric Vehicles

1. Improved identification and characterization of currently embedded electric vehicle load within residential and commercial data sets (LDV, MDV, HDV)
2. Enhance focus on the specific EV load growth centers in terms of vehicles, demand, and charging patterns and peak impacts

Industrial

1. Identify and quantify individual industrial sub-sector electrification efforts
2. Continue study of the potential to apply hydrogen fuel to industrial applications – in particular regionally produced hydrogen

Who

Council, Regional Utilities, National Labs, Universities

Electrification Potential and Data Sets Load Forecasting Context

All three electrification pathways were explored and included in the 9th Plan Load Forecast

1. Building Electrification through high saturations of heat pumps for heating, cooling, and water heating, as well as electric cooking
2. Tow potential trajectories to an electric vehicle transition in the region
3. In-region Hydrogen production – forecast as interruptible demand

Additional Recommendations for Research and Development

Climate Model Data

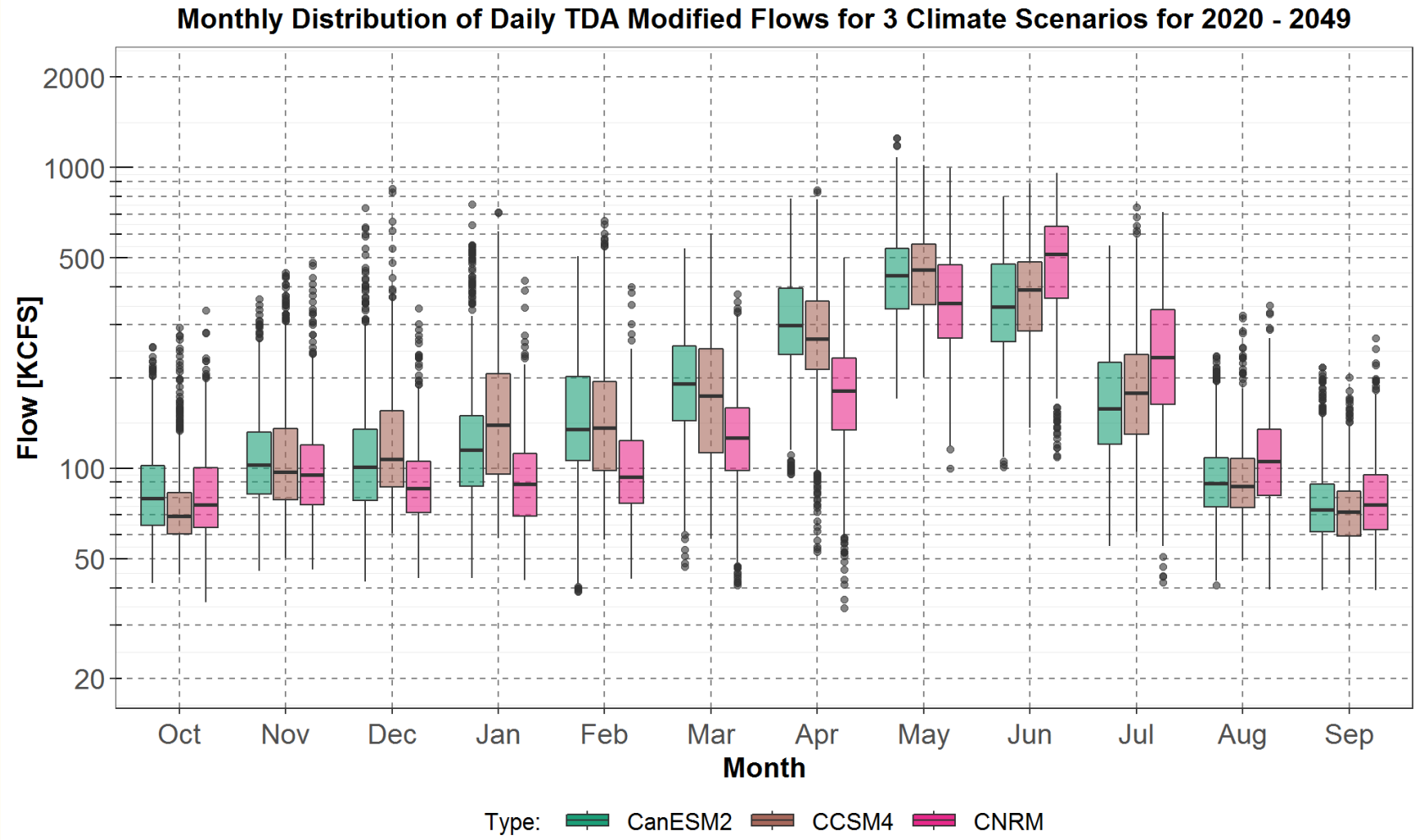
Update Climate Model Datasets

- **Issue:** The Council is using data provided by the River Management Joint Operating Committee (RMJOC) climate-informed temperature and precipitation forecasts based on CMIP5 models from over 10 years ago. There is now a newer vintage of these models (CMIP6), as well as other data that might support an updated analysis. The Climate and Weather Advisory Committee has called for improvements in the climate model data to better reflect more recent models and forecasts.

- **Recommendation:** The Council should engage with climate scientists and regional stakeholders to encourage and support development of a new regional climate model data set and associated downstream data appropriate for use in the Council's simulation models.

Update Climate Model Datasets

- Analysis would involve updating stream flows and loads, as well as coincidence with wind and solar generation
- The climate model selection process would rely on CWAC engagement



Additional Recommendations for Research and Development

Irrigation Data

Update Irrigation Data

- **Issue:** The modified stream flows used in Council models take into account irrigation depletions and return flows, and evaporation effects. These estimates are updated about every 10 years. According to historical trends, the next modified flow data set that incorporates irrigation levels of 2028 is expected to be completed around 2030. However, with enhancements to the Council's modeling suites, there is a need to improve the granularity of data that supports that analysis. One key area is the irrigation demand throughout the basin, with specific focus on the irrigation between each hydro project. While certain data is available, staff relied on methodological simplifications and expert judgement.

- **Recommendation:** Develop updated irrigation demand dataset for withdrawal and returns between hydro projects though increased collaboration with industry and academia, including any linkages to climate-informed conditions in an appropriate approach for each model.

Additional Recommendations for Research and Development

Carbon Pricing

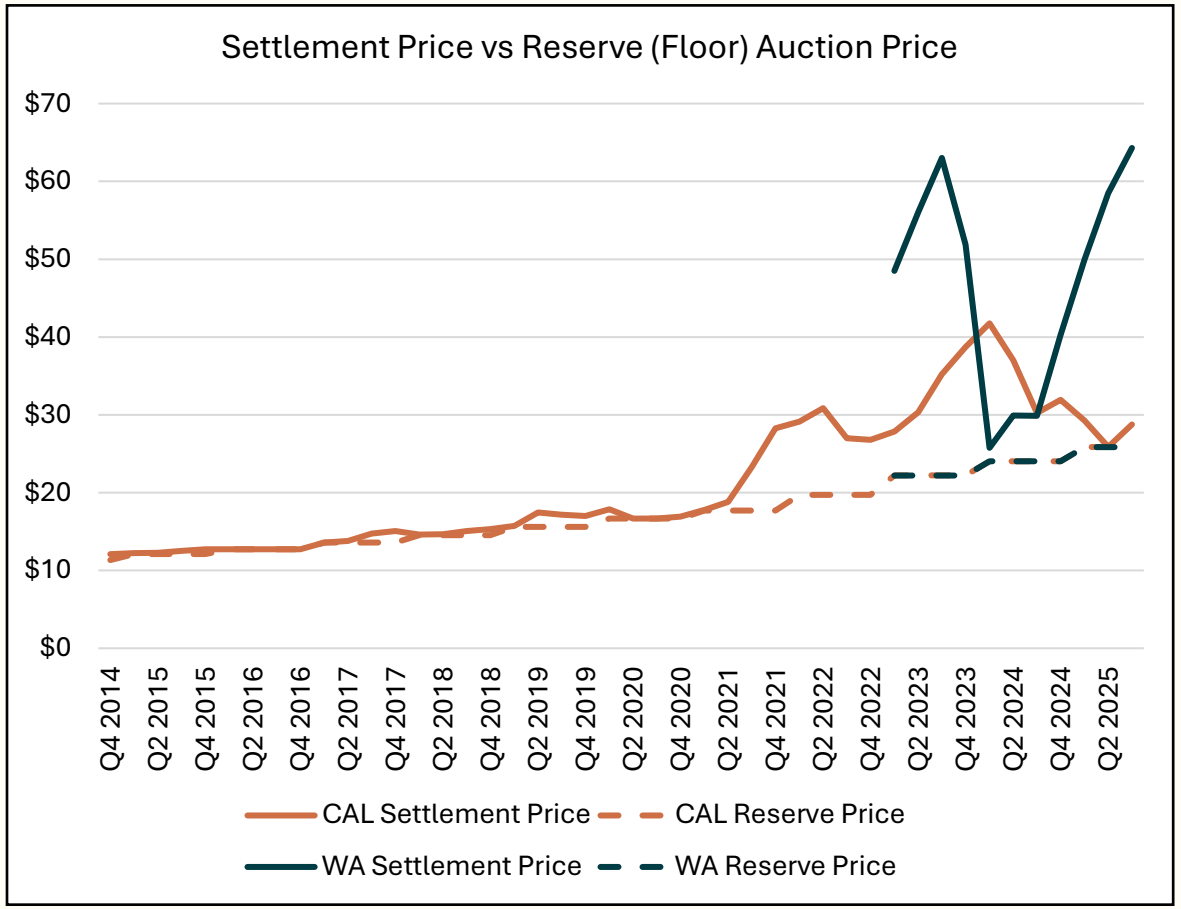
Improve Planning Assumptions Around Carbon Pricing

- **Issue:** In-region carbon allotment auctions are still an emerging market and have significant price volatility in recent history. There is currently no consensus across regional forecasting entities on how to incorporate carbon price forecasts in modeling.

- **Recommendations:** Collaborating with other forecasting entities, continue to research the price utilities face and how it relates to the auction price data. Work with entities on developing an approach for how to incorporate carbon pricing into modeling.

Ninth Plan Carbon Price Approach

- Staff assumed the Auction Floor Price as a conservative approach for regions with auction markets: WA, CA, and Canada
- WA Auctions had limited available data to determine relationship between the Settlement Price and Floor (or Reserve) Price originally set by state policy
  - Since it's inception, the WA Auction's Settlement Price has had significant volatility.
- The CA and Canadian auctions are more mature markets and therefore have more available data to identify trends While the markets are inherently different, the CA auction could be used as a data point that market forces could drive settlement prices back towards the floor



Additional Recommendations for Research and Development

Adequacy

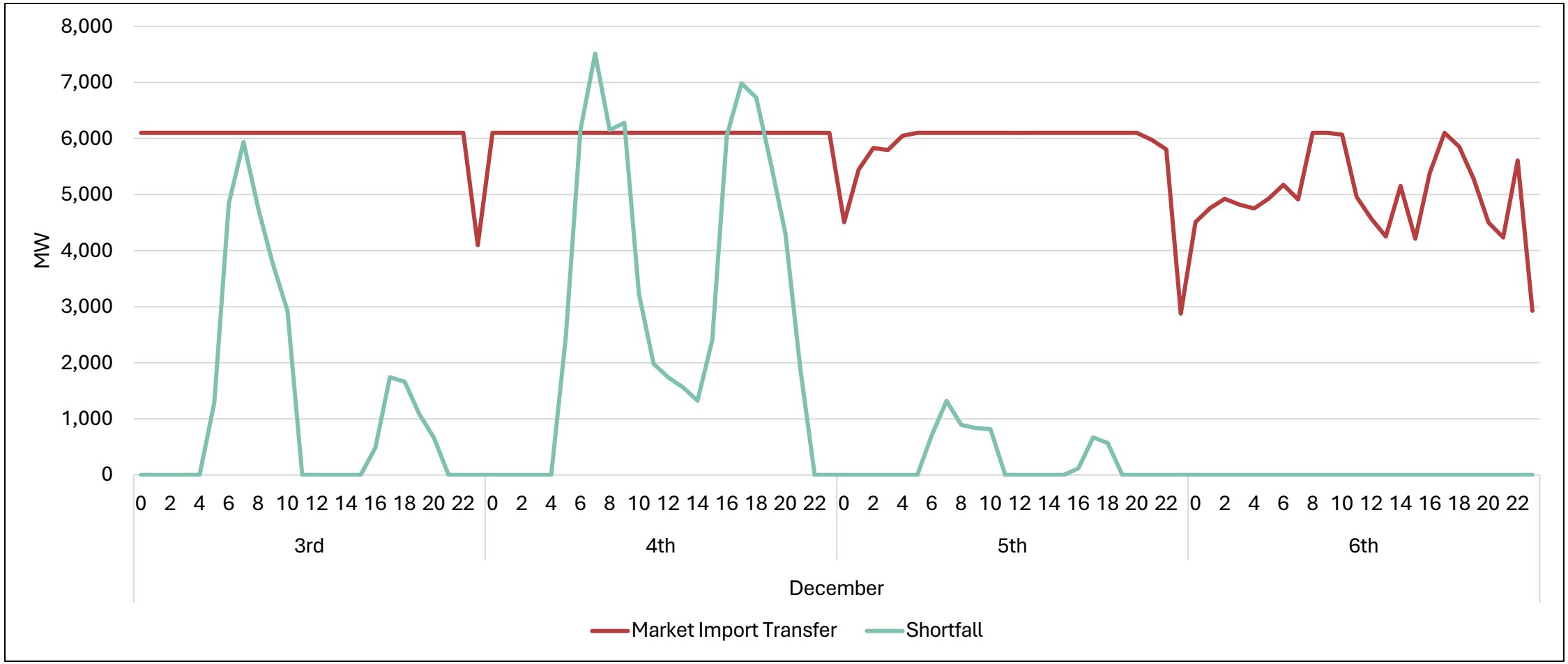
Reevaluate Market Reliance

- **Issue:** The Council uses winter (2,500 MW) and summer (1,250 MW) market reliance limits to hedge against over-relying on the market. This is a philosophical limit in the model and is smaller than the physical transmission capabilities. The RAAC periodically discusses the limits, with perspectives both in favor and against changing them and the current values have remained the same for many years. Recent observed market dynamics (such as MLK weekend storm) spurred renowned interest in reevaluating the limits. In addition, announced upgrades to the transmission system have added additional transfer capacity, and Council has not yet determined how to account for that in the market reliance limit, especially as these could have added implications for the Council's multi-metric adequacy criteria emergency measure thresholds.

- **Recommendation:** Conduct a dedicated reevaluation process to determine the market reliance limits for future Council work and consider how it would influence the adequacy criteria, specifically the emergency measure thresholds.

Winter Market Reliance – Seeing the Impact

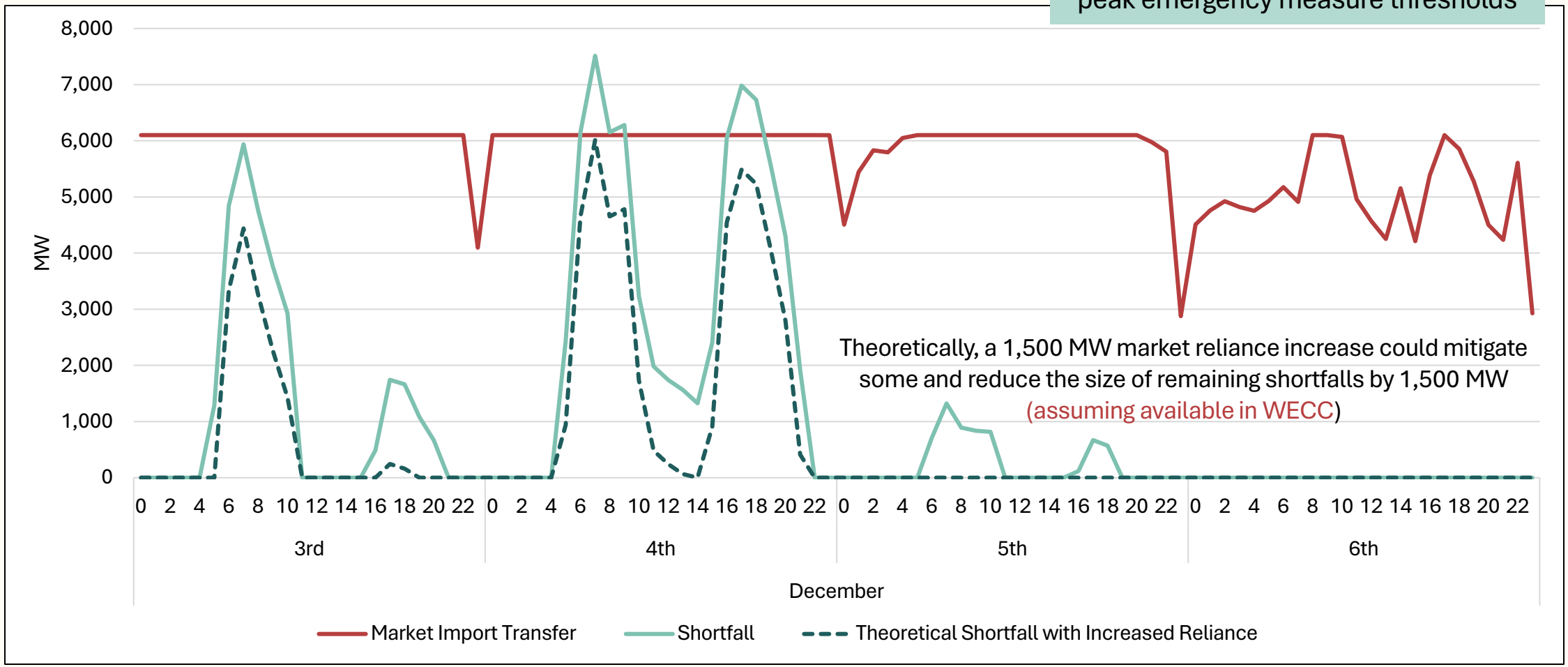
Import transfer of 6,100 MW means 2,500 MW winter limit is reached



Winter Market Reliance – Seeing the Impact

Import transfer of 6,100 MW means 2,500 MW winter limit is reached

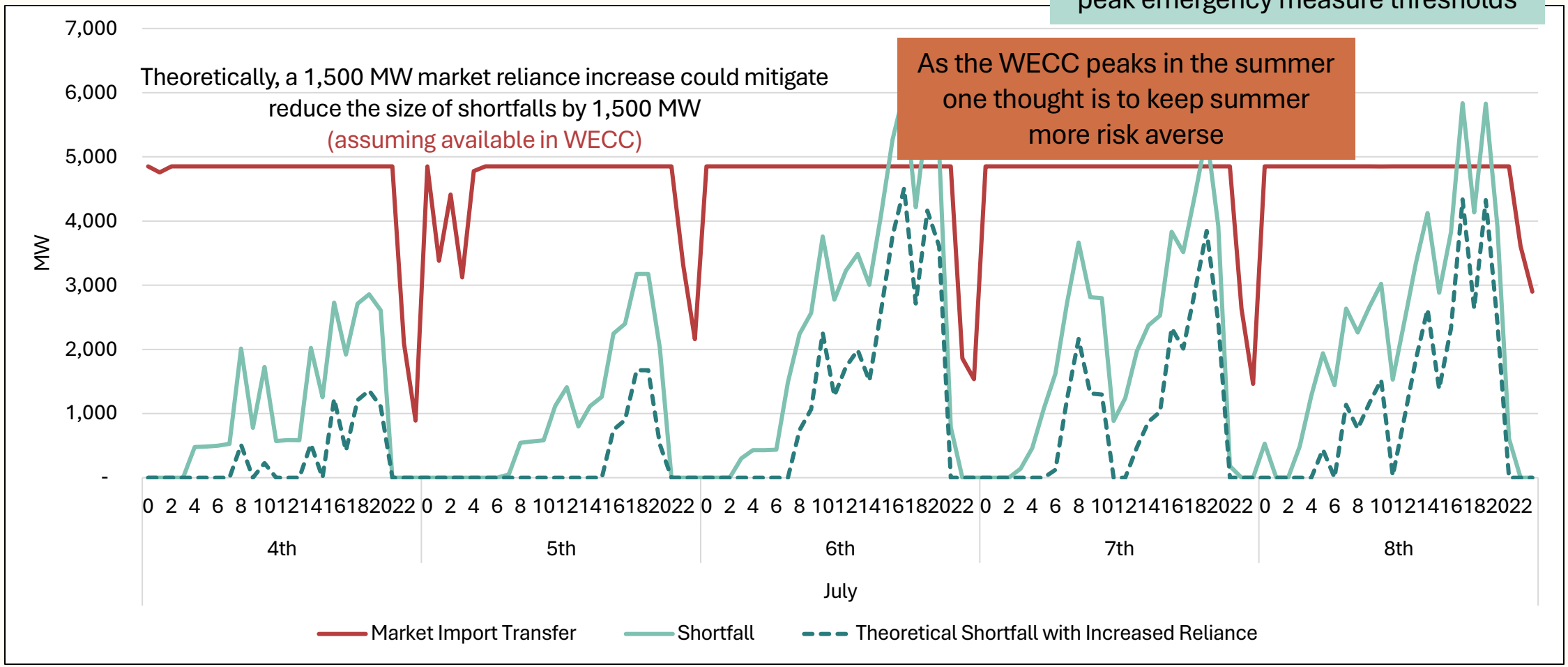
Need to consider potential impact on peak emergency measure thresholds



Summer Market Reliance – Seeing the Impact

Import transfer of 4,850 MW means 1,250 MW summer limit is reached

Need to consider potential impact on peak emergency measure thresholds



Value of Lost Load Analysis

- **Issue:** Council models rely on certain assumptions about the cost of a shortfall ($/MWh) to align the operation of the power system – especially the hydro system – given the myriad obligations to adhere to. This deficit cost is modeled as a unified value across the entire system. However, there is growing attention to the realm of Value of Lost Load (VoLL), which is a related topic to monetizing the impact of shortfalls, and one consideration of the approach is to develop different values for different magnitudes of events

- **Recommendation:** Explore how VoLL assumptions and modeling can be enhanced to fine tune models and improve representation of differentiating shortfalls by magnitude severity

Shortfall Cost in Hydro Modeling Context

- When GENESYS and OptGen simulate the power system, the shortfall cost is a proxy for valuing cost of not serving load
- In any hour, the model determines what is economically preferred - while trying to meet all obligations and hard constraints – and asks if the shortfall cost is cheaper than the costs of other soft system constraints
- This means the penalty structure of the model to determine how best to operate – and when a shortfall is preferred or cannot be avoided – is directly influenced by the deficit cost assumption
- Changes to VoLL would then require fine-tuning of the hydro system penalty values as well to account for the differentiated VoLL approach

Additional Considerations?

Next Steps

- **Late May Meeting:** Continue discussion on recommendations
  - Further refinement on the resource strategy
  - Bonneville specific recommendations
  - Refinement on any recommendations discussed today (as needed)
  - New recommendations identified through discussion with members and outside entities
- **June Council Meeting:** Transition to drafting of the plan
  - Staff propose drafting the Action Plan and conservation program to capture these recommendations as discussed by the Council
  - At the June meeting, Council can review the language collectively, making refinements as needed

Discussion