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

March 4, 2025

MEMORANDUM

TO: **Council Members**

FROM: **Kevin Smit, Manager of Power Planning Resources**

SUBJECT: **Proposed Conservation Resources for the Ninth Plan (Part 1)**

BACKGROUND:

Presenter: Kevin Smit, Christian Douglass

Summary: Conservation, or energy efficiency (EE), is defined as a "resource" given priority by the Northwest Power Act compared with generating resources. This presentation is the first step towards describing how this resource is defined for purposes of building it into our modeling ecosystem. Over the next several months, staff will be developing the conservation "supply curve" which is an accumulation of hundreds of energy efficiency measures each defined by how much energy can be saved, at what cost, and when those savings occur. This presentation will include three primary sections: background (including definitions and brief recap of the EE process); what's new for EE in the Ninth Plan; and a summary of our status to date (including the public review process). Over the next few months, staff will be finalizing all the EE supply curves. These supply curves will then be used by staff as inputs to our OptGen model to ultimately be compared alongside generating resources.

Relevance: Over the past year, the power division has been preparing for the Council's next power plan by conducting research, enhancing tools, and building spreadsheets that contain our EE measure definitions. The resource definitions, including EE resources, are key parameters for conducting the optimization modeling for the

Ninth Power Plan. A robust public process has been (and will be) an integral part of the supply curve development.

Workplan: B.4. Develop demand side supply curves and related assumptions for plan analysis.

More info: Staff presented a Primer on EE in the Ninth Plan in July of last year:

- Supply Curve Primer for EE in the Ninth Plan (July 2024)

1

Agenda

- Background and Definitions
- What's New for the Ninth Plan:
  - Expanded Heat Pump & HVAC Measures
  - EE Bundling Strategies
  - Administrative Costs
  - Deep Retrofits/Whole Building
  - Resilience
  - EVs
  - Data Centers
- Progress to Date:
  - Measures Out for Review
  - Current Supply Curve Snapshots
  - Feedback Process
  - Subcommittee Engagement

2

Background

3

Conservation as a Resource

Conservation (Energy Efficiency) is a resource

Conservation is to be evaluated/valued along side of other generating resources

Conservation is defined as a Resource in the NW Power Act:

Resource *means:*
electric ***power****, including the actual or planned electric power capability of* ***generating*** *facilities,* ***or*** *actual or planned load reduction resulting from direct application of a renewable energy resource by a consumer or from a* ***conservation measure****.* *(3(19))*

4

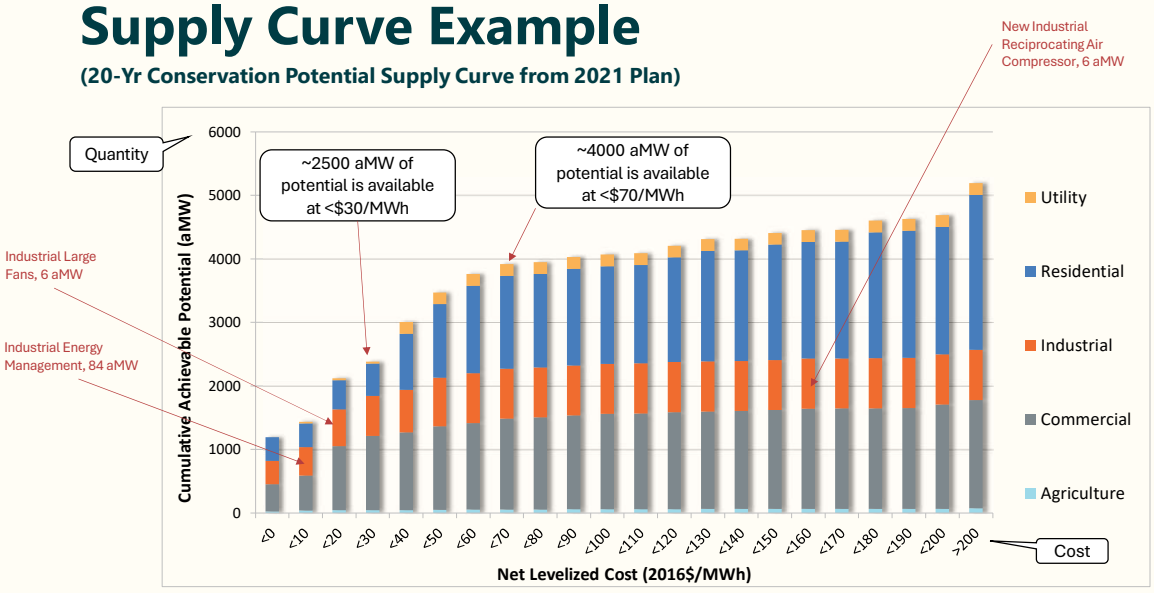
Some Terminology

- Conservation vs. energy-efficiency?
  - The Power Act uses the term "Conservation"
  - We tend to use the term energy-efficiency, but to us they mean the same
- What is an energy-efficiency measure?
  - F&W program uses the term measure and program. We use them differently in the EE world.
  - **An EE measure is any device or technique that results in energy savings** (i.e., if it meets the Power Act definition of Conservation)
- What is an energy-efficiency or Conservation program?
  - The Power Act requires the plan have a "Conservation Program" – includes both an EE target as well as recommended actions
  - Utilities also use the term "Program" to refer to a group of actions they take to encourage customers to adopt an energy efficiency measure(s)
- What is a supply curve? See next slides…

5

Supply Curve Example

(20-Yr Conservation Potential Supply Curve from 2021 Plan)



6

Levelized Cost for EE

- The cost and benefit streams are levelized over the lifetime of the measure
- The final measure is defined by its:
  - Electricity savings (kWh)
  - Levelized cost ($/kWh)
  - Capacity impact (kW)
- Formula:

Costs Included	Benefits Netted Out
Capital & Labor	Deferred T & D Expansion
Annual O&M	Regional Act Credit
Program Administration	Other Fuel Benefits
Periodic Replacement	Non-Energy Impacts

$$\text{NRC Net Levelized Cost} = \frac{PV(Cap\ Cost + \text{Admin Cost} + O\&M - Non\ Energy\ Impacts - Def\ T\&D - Act\ Credit - Other\ Fuel)}{PV(Measure\ kWh\ Savings)}$$

Process Flow – Supply Curve and EE Target

1. Baseline
- What is the current level of consumption? Connects to the end-use load forecast

2. Measures
- Define EE measure cost and energy savings per unit, measure life, and peak capacity savings

Regional Technical Forum (RTF) Produces a Large Portion of this

3. Technical Potential
- Calculate number of units of each measure available
- Multiply savings per unit by number of units

4. Achievable Potential
- Apply achievability rates to the technical potential
- These include 1) total maximum achievability and 2) ramp rates (annual maximum amounts)
- The result is our EE supply curve that goes into OptGen

Running the OptGen and GENESYS Models

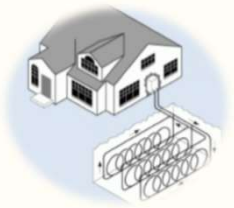
5. Economic Potential
- The amount of EE that is cost-effective is an output of the plan
- The amount of cost-effective EE defines the regional and BPA targets

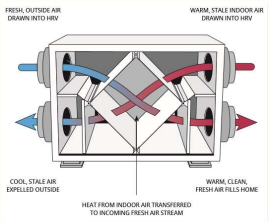
What's New for EE in the Ninth Plan?

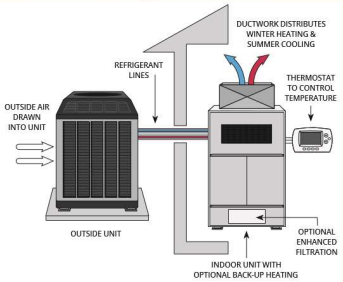
9

Heat Pumps and other Heating, Ventilation and Cooling (HVAC) Technologies

- Planning to update and expand our heat pump and HVAC measure suite, for both the residential and commercial sectors:
  - Ducted and ductless air source heat pumps
  - Ground source ("geothermal") heat pumps
  - Smaller packaged and micro-heat pumps
  - Recommissioning of existing, poorly performing heat pumps
  - Heat Recovery Ventilation (HRV) systems
  - Dedicated Outside Air Systems (DOAS)







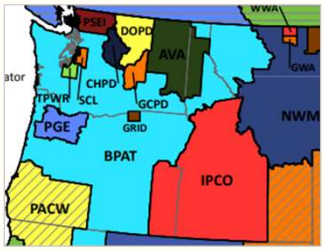
10

New Bundling Strategy

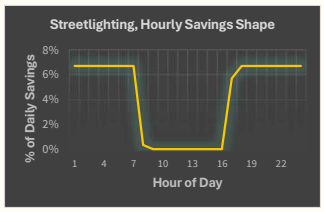
EE measures are typically "bundled" together into larger resource blocks for modeling

Bundling Parameter	New for the 9th Plan?
Cost	No
Location	Yes
Hourly Shape	Yes

Locational Value of EE
Some sub-regions may purchase higher cost EE to mitigate transmission and distribution congestion



Temporal Value of EE
EE that delivers during periods of high market prices and/or high need will likely look more valuable to the system



11

Administrative Costs

- We conducted a study to review and update our administrative cost assumptions for EE
- Historically, we have assumed the admin cost was 20% of the incremental capital cost of the EE measures
- For the ninth plan we are moving to a $/kWh value, differentiated by sector
  - Overall admin costs are higher, especially for residential sector

Admin Cost Review Presentation to CRAC, September 2024

Recommended New EE Administration Costs for the Ninth Power Plan by Sector

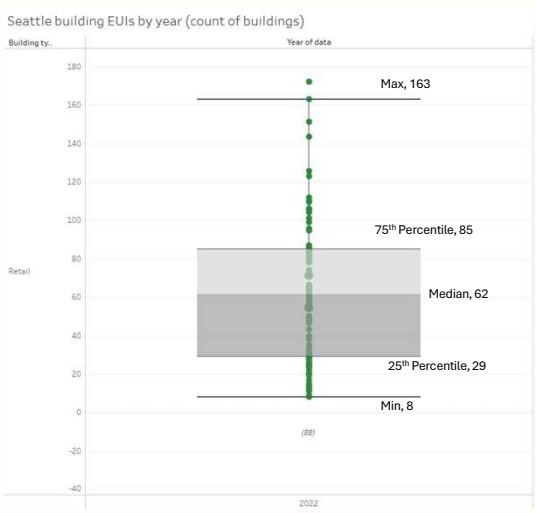
Sector	Admin Cost ($/kWh)
Residential	$0.16
Commercial	$0.13
Industrial	$0.06
Agriculture	$0.12
Distribution System	$0.12

CRAC members are generally in favor of moving in this direction. No method is perfect and this is an improvement

12

Deep Retrofits/Whole Building

- National and local benchmarking programs have resulted in increased availability of Energy Use Intensity (EUI) data (Btu per SF, or kWh per SF)
- The 2021 Plan recommended the region develop an EUI data set and target buildings with high EUIs
  - Council staff hired a contractor to develop this data set
- WA and OR building performance standards
  - Both state standards set commercial building energy intensity targets that require large commercial buildings to reduce their EUIs over time
- Treatment of NW BPSs in the Ninth Plan
  - We will treat these standards similarly to how we treat EE programs
  - Difficult to quantify the impact and timing
  - Some impacts covered in the load forecast
  - Increases in EE ramp rates in the potential assessment
  - May develop a deep retrofit EE measure

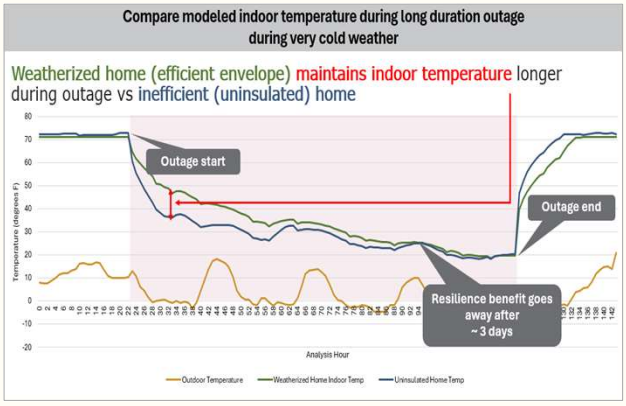


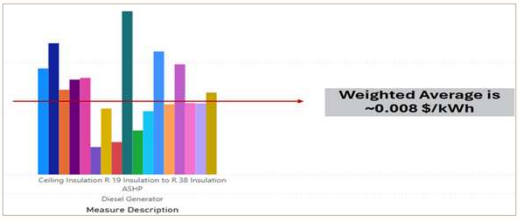
13

Building Resilience

- The RTF has conducted a study to quantify the benefits of added weatherization to a home's resilience
  - Resilience defined as the home's ability to maintain temperature through a power outage
  - Outage occurs during extreme weather events (hot or cold).
- This work is nearly complete; we are reviewing the results to determine how we use the resilience values in the 9th Plan
- CRAC feedback has been mixed
  - Working to address CRAC comments
  - Will using the resulting values
  - Estimate a 1-5% added benefit to weatherization measures

Link to presentation given to CRAC





14

Efficient Electric Vehicles

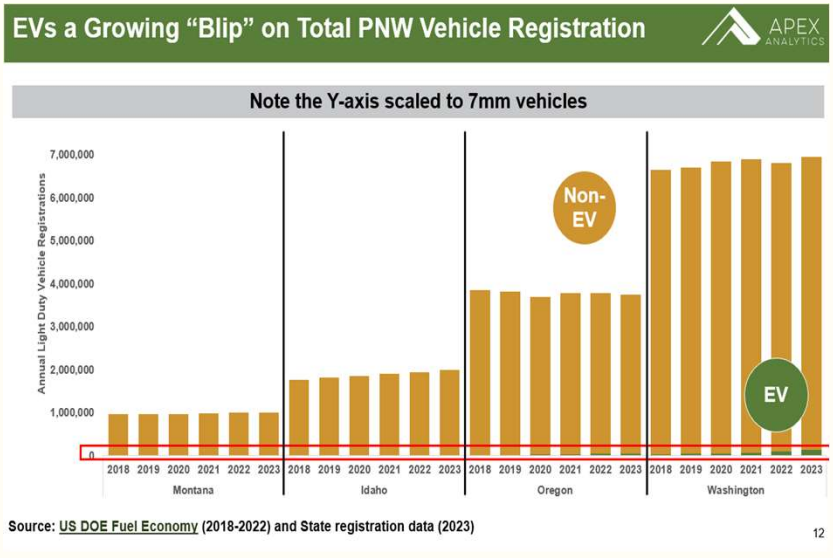
- The RTF contracted Apex Analytics perform a market characterization to assess the potential for defining energy efficiency among passenger class electric vehicles
- Study resulted in a detailed characterization of the market, technology, and assessment of possible EE measure(s)
- The study recommended not pursuing an EE measure at this time and provided suggestions for next steps at the RTF and other interested organizations.

EV Market Characterization Presentation to RTF, February 2024
RTF Follow-up Discussion of Possible Next Steps, December 2024

15

EV Study High Level Findings

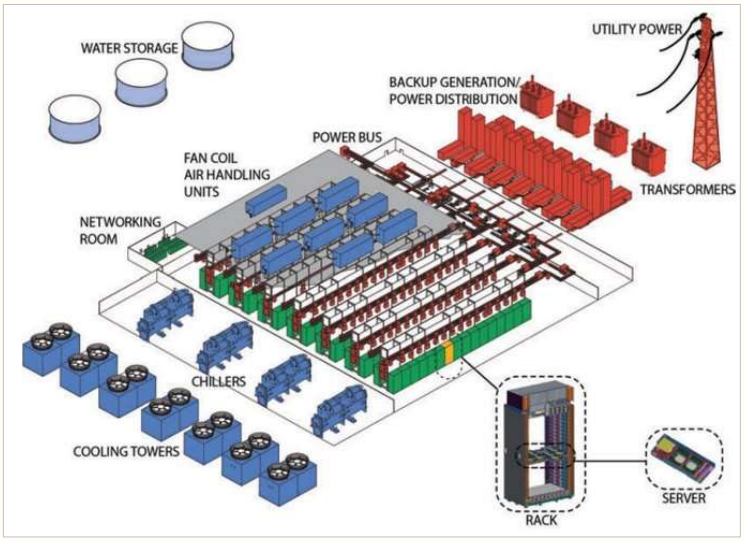
- EVs represent a small part of the vehicles on the road in the Pacific Northwest though significant growth is expected in the coming years.
- Potential methods for identifying efficiency is possible but:
  - Significant uncertainty remains, particularly of real world versus testing data
  - Data reporting inconsistency challenges
  - Rapidly evolving market where findings and data appear to quickly be outdated
- RTF is continuing to explore potential for a measure, while simultaneously researching the commercial class market.



16

Data Center Efficiency

- The RTF contracted DNV to perform a market characterization of data centers, including detailing energy efficiency opportunities.
- Study resulted in a memo and workbook detailing the market by type of data center and providing details regarding existing energy efficiency practices.



Source: DNV Presentation at January 2025 RTF Meeting

17

Data Center Types

- For most data centers electricity is the largest cost and therefore efficiency is typically prioritized in the design of the facility.
- Most of the identified energy efficiency measures are common practice particularly for the mid-sized, large, and hyperscale data centers.

Summary of Potential Energy Efficiency Measures by Data Center Type and Adoption

Energy Efficiency Measures	Embedded	Mid-sized	Large	Hyperscale
Information Technology Equipment/Systems (ex. server virtualization)	Moderate adoption	Widely adopted	N/A-Standard practice	N/A-Standard practice
Environmental Conditions (ex. humidity control)	Moderate adoption	Moderate adoption	Moderate adoption	Moderate adoption
Airflow Management (ex. aisle separation)	Moderate adoption	Widely adopted	Widely adopted	Widely adopted
Cooling Systems (ex. variable speed fan control)	Moderate adoption	Widely adopted	Widely adopted	Widely adopted
Central Cooling Plant (ex. evaporative cooling)	N/A	N/A	Moderate adoption	Moderate adoption
Power Distribution (ex. install modular UPS)	N/A	N/A	Widely adopted	Widely adopted

18

Progress to Date

19

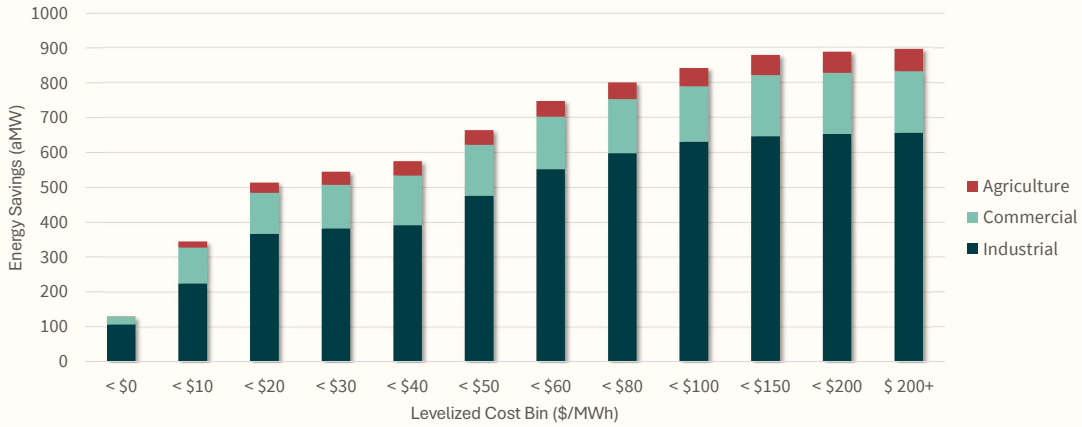
Draft Ninth Plan EE Measures Already Out for Review

Sector	Measure Category	Measures Included	Date Posted	Date, Feedback Requested By
Agriculture	Dairy Measures	Efficient milk vacuum pumps, pre-coolers, transfer pumps, heat recovery, and fans	1/27/25	2/21/25
	Irrigation Efficiency Measures	Conversion to low elevation spray applications (LESA), pressure reduction, variable rate irrigation		
	Irrigation Pumps	Efficient pumps, variable speed drives		
	Other Ag Measures	Energy free stock watering tanks, efficient generator block heaters		
Commercial	Motor Measures	Efficient air compressors, circulator pumps, clean water pumps, fans, and variable speed drives	1/31/25	2/24/25
	Food Service	Efficient ovens, griddles, fryers, hot food holding cabinets, overwrappers, ice makers, and vending machines	2/27/25	3/21/25
Industrial	Motor Measures	Advanced motors, pumps, air compressors, fans, and variable speed drives	1/31/25	2/24/25
	Industrial Retrofit Measures	Efficient water and wastewater treatment, strategic energy management, industry specific process efficiency	2/10/25	3/7/25

20

Snapshot: EE Supply Curve to Date

(Includes Only Draft Measures Completed and Out for Review as of 2/27/25)



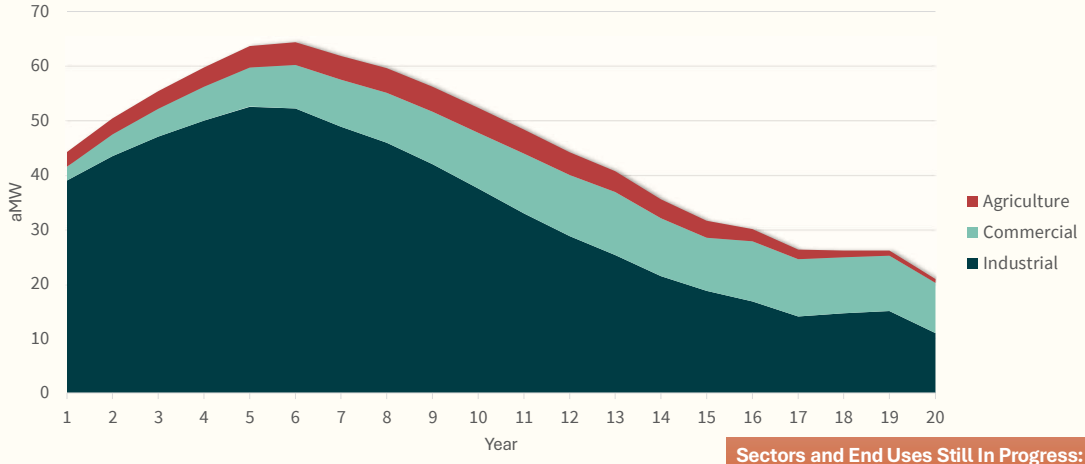
Represents cumulative energy savings over 20-year planning period using draft 9th Plan estimates

Sectors and End Uses Still In Progress:
- All of residential sector (~47% of 2021 Plan)
- Commercial HVAC, water heating, and lighting (~23% of 2021 Plan)

21

Snapshot: Incremental 20-Yr EE to Date

(Includes Only Draft Measures Completed and Out for Review as of 2/27/25)



Sectors and End Uses Still In Progress:
- All of residential sector (~47% of 2021 Plan)
- Commercial HVAC, water heating, and lighting (~23% of 2021 Plan)

22

Supply Curve Review, Feedback Process

EE Measure Tracker

The 9th Northwest Regional Power Plan

Draft Conservation Supply Curve Review

Updated: 2/10/2025

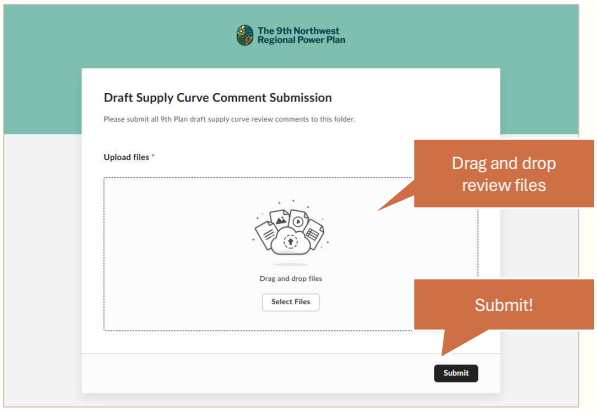
This table provides a summary of draft 9th Power Plan conservation supply curve measures that are ready for review. The table provides links to the appropriate measure and sector potential analysis workbooks, as well as important dates and notes for your review.

Workbooks will be posted on a rolling basis. To provide comments on the draft 9th Plan conservation curve work products, please use this feedback form[2] and upload the form to the online folder here[2]. Reviewers are encouraged to upload feedback forms as they complete each batch of measures.

For more information on the measures in the table below, please see recent presentations on the Council's Conservation Resources Advisory Committee (CRAC) webpage[3].

Sector	Measure Name	Link to Measure Workbook(s)	Link to Sector Potential Workbook	Date, Posted	Date, Review By	Notes for Reviewers
Ag	Forced Circulation Generator Block Heaters	Ag-CircBlockHtr-9P.xlsm	Ag-Potential-9P.xlsb	1/27/25	2/21/25	Same methodology as 2021 Plan. Significant reduction in savings (>50%), due to updated weather input data and updated generator sizing more appropriate for the ag sector. Note: Ag sector forecasted growth still consistent with 2021 Plan, and has not yet been updated.
Ag	Dairy Measures	Ag-Dairy-9P.xlsx		1/27/25	2/21/25	Same methodology as 2021 Plan, with updated inputs and assumptions. Minimal change in ventilation savings. ~20% reduction in refrigeration savings due to

Comment Submission Portal



Conservation Resources Advisory Committee Feedback

- We have had six Conservation Resources Advisory Committee (CRAC) meetings since last August
- CRAC members have been very engaged at the meetings as well as separate discussions outside of the meetings
- BPA contracted with consultants to review our data and assumptions in detail
  - Also, internal BPA review by subject matter experts
- Also receiving significant input and support from the **Regional Technical Forum (RTF)**
  - Primarily Laura Thomas, RTF Manager
  - Contract Analyst Team (CATs)

25

Extra Slides

26

What is Energy Efficiency?
Definition of Conservation Under the Power Act

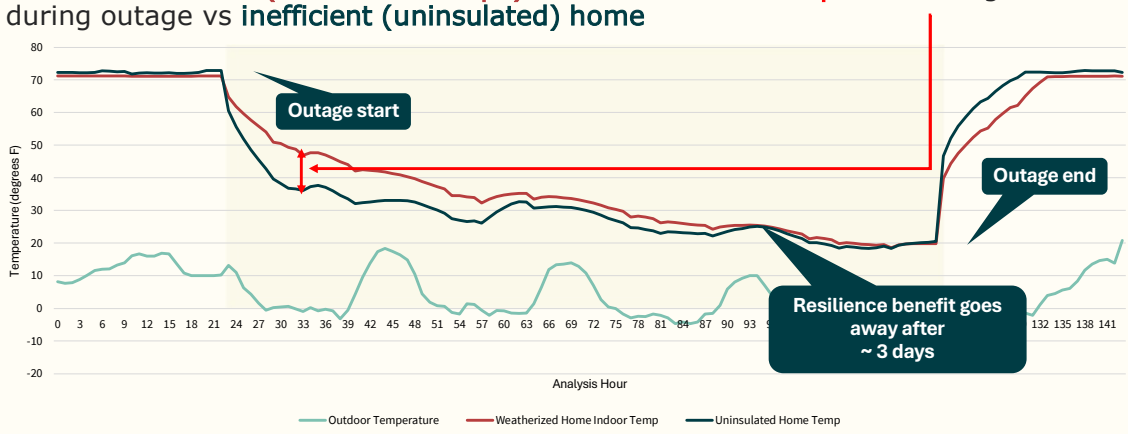
Conservation means any reduction in electric power consumption as a result of increases in the efficiency of energy use, production, or distribution.

1. Does the opportunity reduce electric power consumption?
2. Is the reduction in electric power consumption the result of an increase in efficiency of energy use, production, or distribution?

Also, must be "…reliable and available within the time it is needed…" (From cost-effectiveness definition)

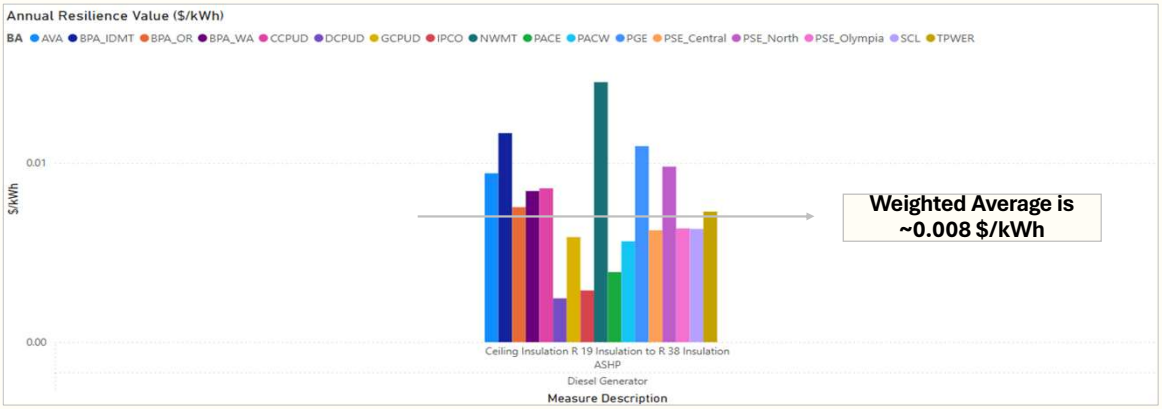
Compare modeled indoor temperature during long duration outage during very cold weather

Weatherized home (efficient envelope) maintains indoor temperature longer during outage vs inefficient (uninsulated) home



Resilience valuation sensitivity (BA Region)

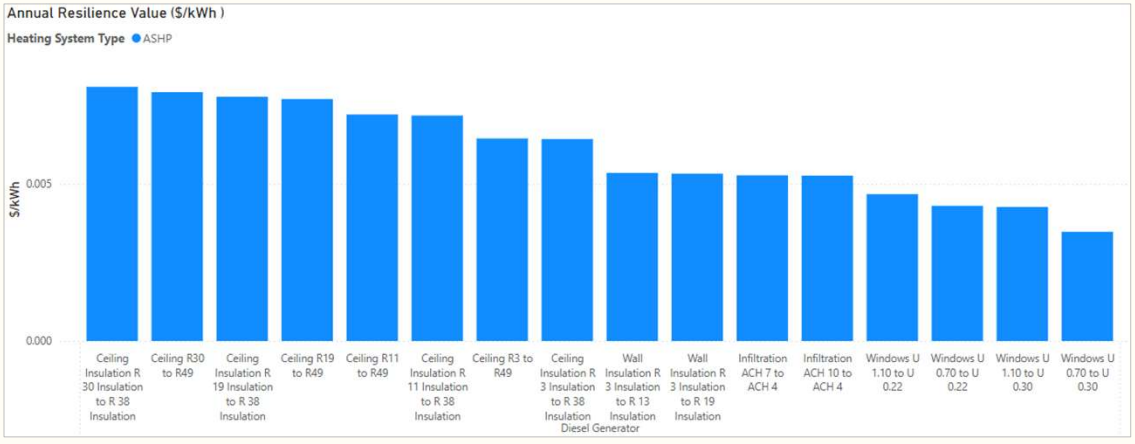
Variability across BAs is driven by annual outage hours (and the temperature in which they occur), climate, and the relative frequency of outage durations (very short outages are excluded from benefits).



29

Resilience valuation sensitivity (Measures)

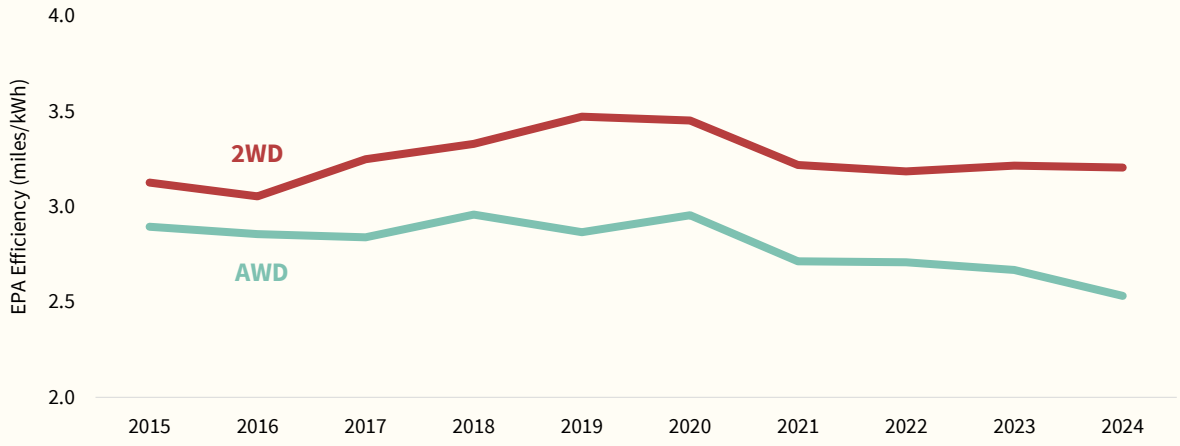
Variability across measures is low. Across measures, higher savings measures provide higher resilience benefits ($/kWh); decreasing benefits across efficiency tiers within the same measure.



30

EPA Class Isn't Perfect: ALL EPA Vehicle Classes Should Have an EV Drive Type

Drive type (single vs dual motor) impacts EV efficiency – same EV model efficiency can vary 10-25%. Currently only trucks and SUVs receive drive type designation.



31