Oregon Department of **ENERGY**



Building Efficiency, Electrification, and DERs Policy Working Group

February 12, 2025

50 YEARS of SERVICE
OREGON DEPARTMENT OF ENERGY

Welcome!

Name

Organization

Snow or Sun?

Background

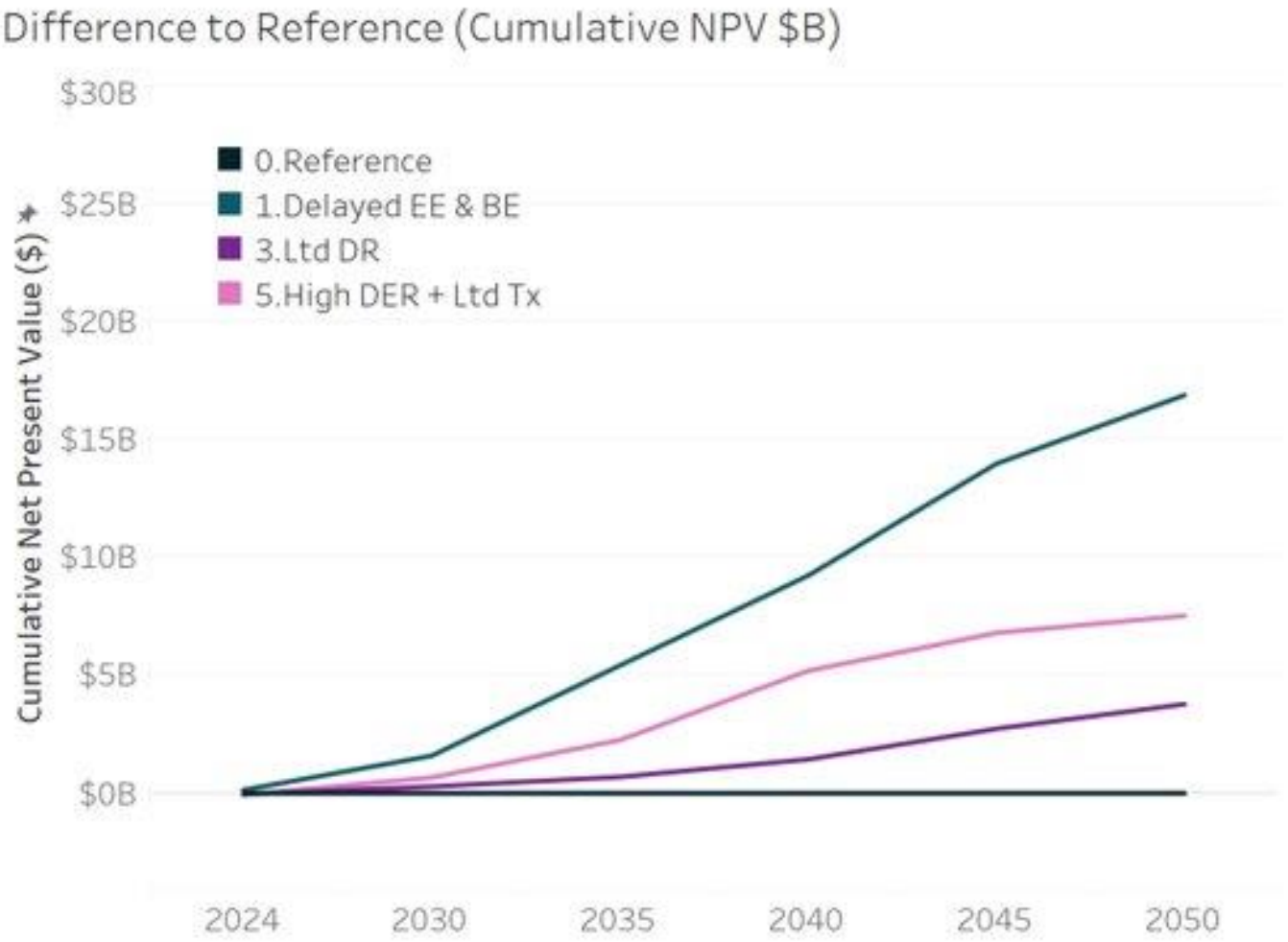
Areas of Primary Interest / Pet Policy?

- Energy Efficiency
- Building Electrification
- Demand Response
- Distributed Energy Resources (DERs)

KEY FINDING

Delayed energy efficiency and building electrification represents the highest cost of all the scenarios that were modeled.

The model demonstrates that a delay of 10 years in energy efficiency and building electrification results in more than $17B in additional costs through 2050.



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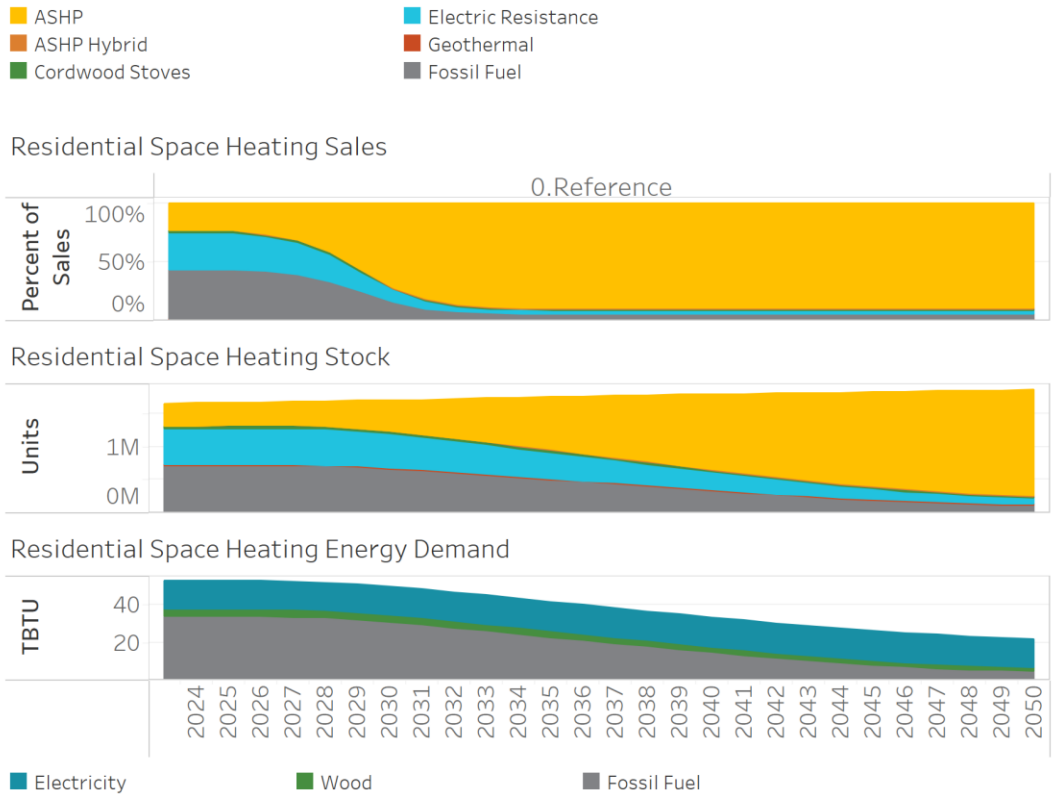
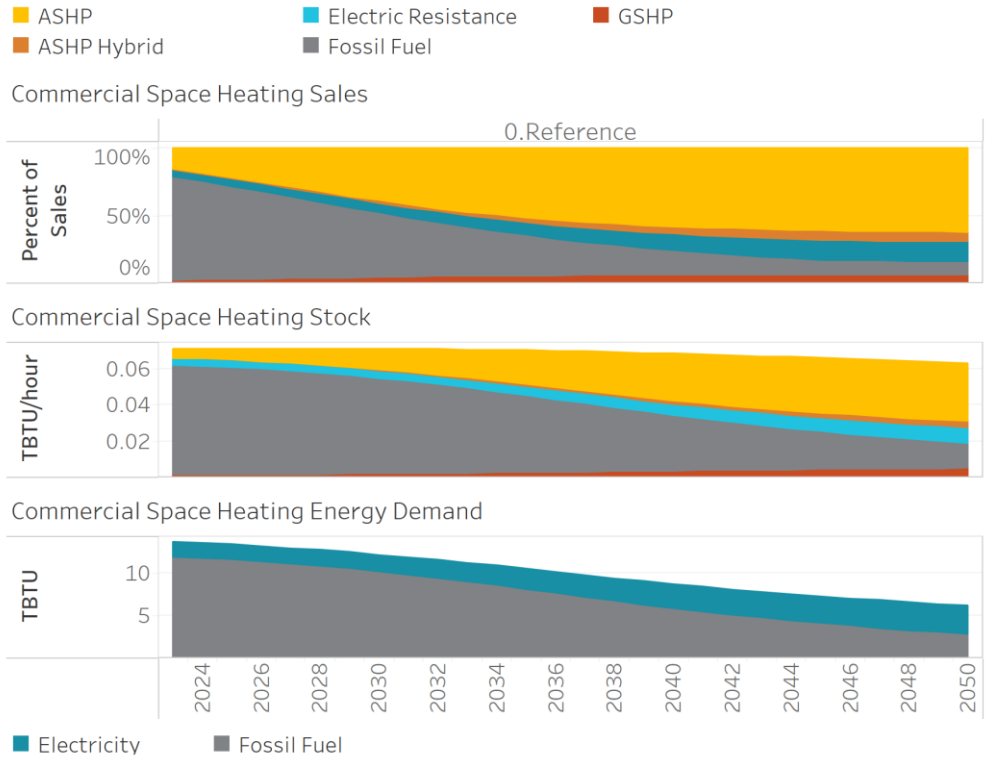
KEY FINDING

Building electrification results in system-wide reductions in energy demand.

Transition from gas furnaces and water heaters to electric heat pumps, doubles electricity demand in residential and small commercial sectors. Continued delivery of weatherization and heat pump efficiency gains reduce overall building energy consumption by 60% by 2050.





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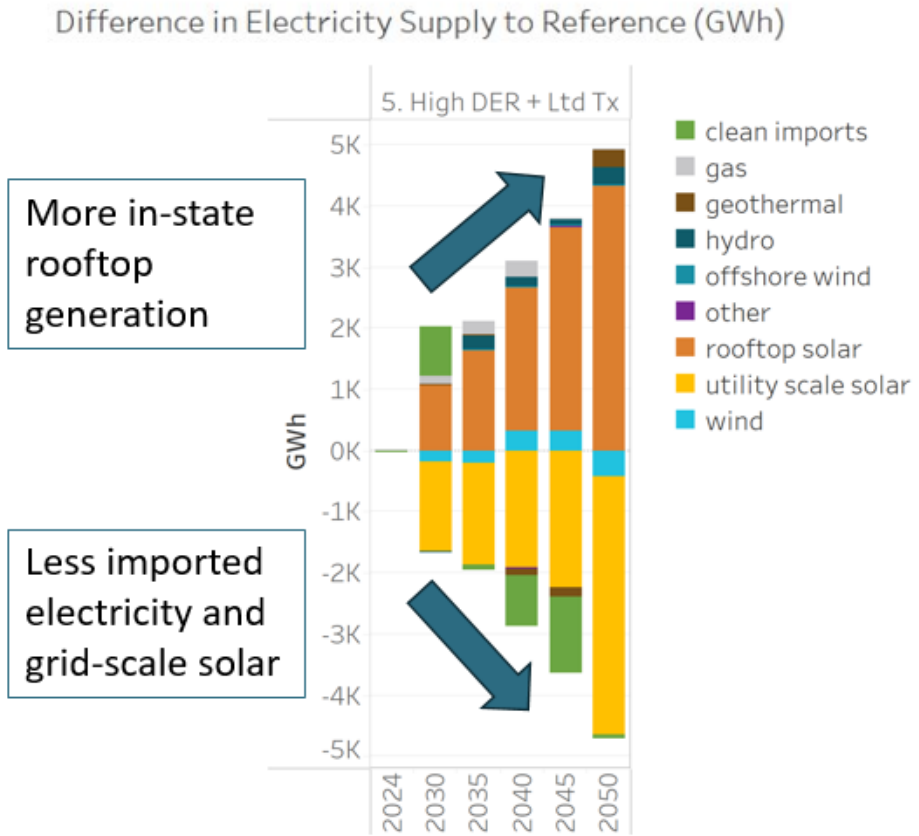
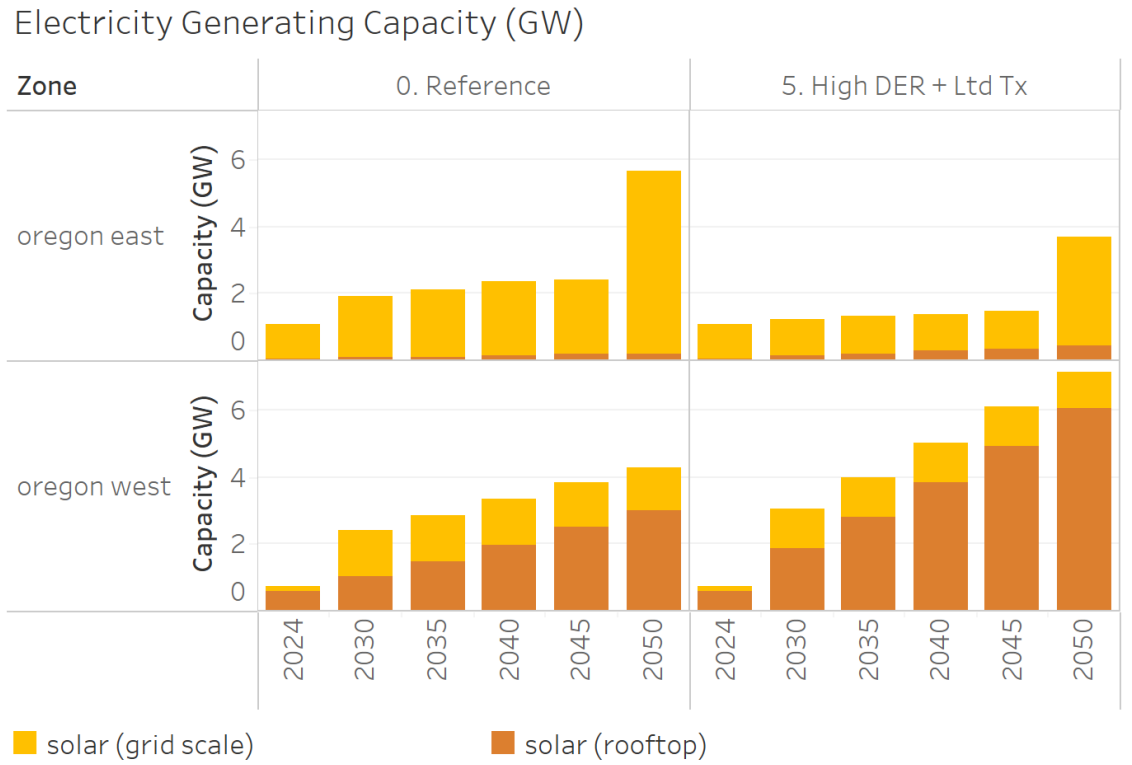
KEY FINDING

Rooftop solar in western Oregon reduces the need for grid-scale solar to be built in eastern Oregon.
An additional 4 GW of westside rooftop solar saves over 2GW of eastside solar and 15 square miles of land.





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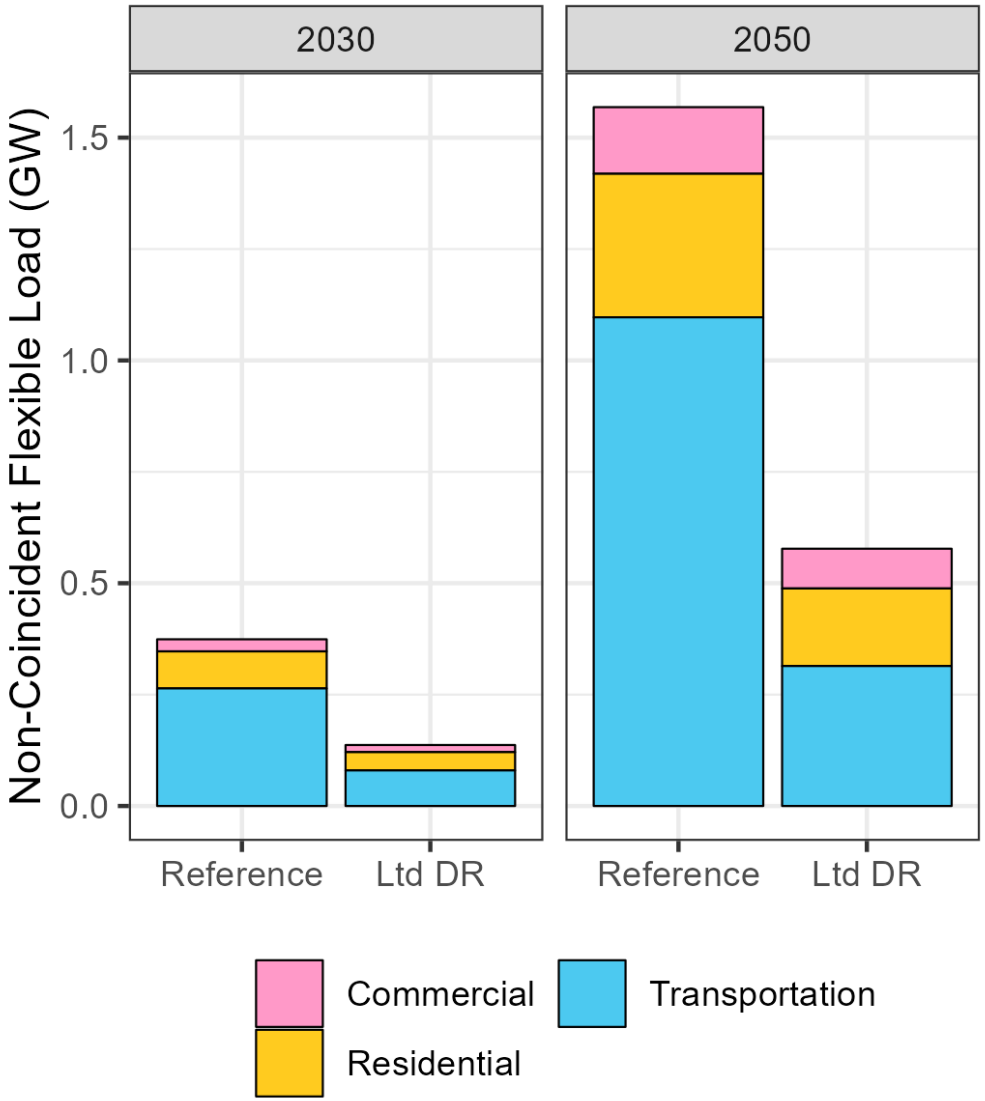
KEY FINDING

Demand response programs reduce future capacity and transmission needs

- Loads associated with managed charging of EVs represent the largest opportunity for demand response
- Reducing peak demands on the grid displaces the most expensive future energy resources
- Limiting demand response in the model results in more west side storage



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SOME EXISTING POLICIES

Some Existing Policies	Source	BE	EE	DR	DER	ORS	OAR	Utility	OPUC	Fed?	EO?
Oregon Energy Efficiency Specialty Code	EO 20-04, ORS 455-496		X			X	X				X
Oregon Residential Specialty Code	EO 20-04, OAR 918-480-0005 and OAR 918-480-0010		X			X	X				X
Oregon Commercial Reach Code	ORS 455.500		X			X	X				
Oregon Residential Reach Code	OAR 918-465-0050		X			X	X				
Bonneville Energy Efficiency Programs	1964 Fed. PNW Cons Power Preference Act	X	X					X		X	
Public Purpose Charge	HB 3141					X			X		
Bonneville / COU contracts	1964 Fed. PNW Cons Power Preference Act	?	?	?	?			X		X	
CAP Agency Weatherization	1976 Fed. Energy Conservation Policy Act		X			X	X			X	
Building Performance Standard	HB 3409		X			X	X				
Home Energy Performance-Based Whole House Rebates (HOMES)	2022 Fed. Inflation Reduction Act		X			X	X			X	
Community Heat Pump Deployment Program	SB 1536	X	X			X	X				
Home Electrification and Appliance Rebates (HEAR or HEEHR)	2022 Fed. Inflation Reduction Act	X	X							X	
EO 20-04 Energy Efficiency Standards	EO-20-04	X	X	X							X
HB 2062Energy Efficiency Standards	HB 2062	X	X	X		X	X				
Voluntary Building Energy Performance Score Systems	HB 2801		X			X	X				
Net Metering	ORS 757.300			?	X	X	X	X			
Solar Property Tax Exemption	ORS 307.175				X	X					
Residential and Commercial Energy Conservation Rules	OAR 860-030-0000 thru -0075						X				
Utility Distribution System Plans	Order No. 20-485	X	X	X	X			X	X		
Designated State Agency Programs	ORS 469.763	X	X			X	X				
PGE Demand Response	Energy Shifting Programs							X	X		
PGE Smart Grid Test Bed	Smart Grid Test Bed | PGE	X		X	X			X	X		
Pacific Power TOU rates	Choices for Homes			X				X	X		

POLICY LANDSCAPE

1. Where do policies live?
    - Statute
    - Oregon Administrative Rules
    - Oregon PUC
    - Utility Programs
    - City or County Programs
    - Other
2. What is the timing of policy recommendation?
    - Our priority is through 2035
3. Are current policies supportive of Oregon energy goals?
4. Are current policies barriers to Oregon energy goals?

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NEXT STEPS

February: Review Model Results and Existing Policies

Office Hours with Modeling Consultant. Dates TBD

March 5, 9:00-12:00, Meeting 2
- Discuss existing policy landscape
- Identify barriers
- Identify policy gaps

March 19, 9:00 -12:00, Meeting 3
- Review barriers and policy gaps
- Review complimentary analysis
- Brainstorm policy concepts

***May 7, 9:00-12:00, Meeting 4**
- Review policy concepts
- Develop policy recommendations

May 21, 9:00-11:00, Meeting 5
- Report out from all working groups

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THANK YOU

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MODELING INPUTS

Reference Scenario

1. Buildings

1.1. Buildings: Stock and Stock Replacement Data

Residential Space Heating	Northwest Energy Efficiency Alliance (NEEA) Residential Building Stock Assessment & Home Energy Score Data*
Commercial Space Heating	NEEA Commercial Building Stock Assessment
Residential Water Heating	NEEA Residential Building Stock Assessment & Home Energy Score Data*
Commercial Water Heating	NEEA Commercial Building Stock Assessment
Residential Building Shells	NEEA Residential Building Stock Assessment & Home Energy Score Data*
Commercial Building Shells	NEEA Commercial Building Stock Assessment
Residential Technology Stock Replacement	Energy Information Administration (EIA) Updated Buildings Sector Appliance and Equipment Costs and Efficiencies (2023)
Commercial Technology Stock Replacement	EIA Annual Energy Outlook Updated Buildings Sector Appliance and Equipment Costs and Efficiencies (2023)
Residential Cooking & Other Appliances	NEEA Residential Building Stock Assessment

**Oregon's Home Energy Score data comes from Earth Advantage*

MODELING INPUTS

Reference Scenario

1.2 Buildings: Key Assumptions and Sources Informing Assumptions

Residential Space Heating	Assume existing policies play out for all space heating technologies 65% electric heat pump sales by 2030; 90% by 2040 **Households with wood stoves: By 2050, 75% air-source heat pump (ASHP) with woodstove hybrid, 20% woodstove only, 5% heat pump only**	**Heat pump sales:** Multi-agency memorandum of understanding (MOU); Oregon's Transformational Integrated Greenhouse Gas Emissions Reduction Project Report (TIGHGER) Langevin, J, et al. (2023). Demand-side solutions in the US building sector could achieve deep emissions reductions and avoid over $100 billion in power sector costs. One Earth, Volume 6, Issue 8, 18 August 2023, Pages 1005-1031. ODOE review of/work with Oregon local wood stove heating replacement assistance programs
Small versus large commercial building split	50/50 split	Portland Salem Medford Building Stock Characterization

Commercial Space Heating	Weighted average of large and small commercial space heating loads, with the following framing:
	
	- Small commercial: follow residential
	- Large commercial:
	  ○ 2030: Electric heat pumps 15% of overall sales; other electric + electric hybrid systems (including hybrid heat pumps) 10% of overall sales
	  ○ 2045: Electric heat pumps 50% of overall sales; other electric + electric hybrid systems (including hybrid heat pumps) 40% of overall sales
		Langevin, J, et al. (2023). Demand-side solutions in the US building sector could achieve deep emissions reductions and avoid over $100 billion in power sector costs. One Earth, Volume 6, Issue 8, 18 August 2023, Pages 1005-1031.

Residential Water Heating	Incorporate Federal Energy Conservation Standards for Consumer Water Heaters (from May 6, 2029) Electric heat pump sales rising to 95% of overall sales by 2045	USDOE's Energy Conservation Standards for Consumer Water Heaters rule

MODELING INPUTS

Reference Scenario

1.2 Buildings: Key Assumptions and Sources Informing Assumptions

Commercial Water Heating	Weighted average of large and small commercial water heating loads, with the following framing:
	
	- Small commercial: follow residential
	- Large commercial:
	  ○ 2035: Electric heat pumps for water heaters 15% of overall sales, other electric technologies 10% of overall sales
	  ○ 2045: Electric heat pumps for water heaters 50% of overall sales, other electric technologies 40% of overall sales
		USDOE's Energy Conservation Standards for Consumer Water Heaters rule

Cooking	95% sales of new appliances are electric by 2035	TIGHGER
Technology stock replacement	Dual gas/electric heat pump systems, differentiated by climate zone, compete with other electric technologies in line with sales shares above	*N/A*
~~Building shells~~ Whole-home retrofits	~~Weatherize 80% of existing commercial and residential home envelopes by 2040 and 95% by 2050.~~ ~~Weatherization measures assumed to achieve a 10% reduction in overall building energy use on average.~~ **3,500 homes a year. Whole home retrofits, represented by the Advanced Envelope Efficiency Package in Evolved Energy Research's "Enhancing Building Efficiency Modeling" report**	2020 OHCS Low Income Weatherization Program Report Evolved Energy Research, Enhancing Building Efficiency Modeling (2024)
Lighting	100% LED sales by 2025	HB 2531

MODELING INPUTS

Reference Scenario

- **Energy Efficiency and Load Flexibility**

Behind the Meter Photovoltaic (BTM PV)	Northwest Power and Conservation Council March 2024 rooftop solar projections	NWPCC 2024 solar rooftop projections https://www.oregonlegislature.gov/bills_laws/ors/ors469a.html
BTM Storage Adoption	Energy Information Administration's (EIA) June 2024 Survey: 10 MW assumed today 42 MW/25 MWh of BTM storage (1% of households install storage systems by 2050; 20% of them participate in offering grid services, 50% of stored energy available	EIA June 2024 Survey Brattle, 2024. California's Virtual Power Potential: How Five Consumer Technologies Could Improve the State's Energy Affordability
Flexible Load Parameters	Space heating loads can be delayed or advanced by 1 hour Water heating loads can be delayed or advanced by up to 2 hours Air conditioning can be delayed or advanced by 1 hour Residential vehicle charging can be delayed by up to 8 hours and commercial vehicle charging up to 3 hours	
V2G	26% V2G for residential EVs by 2050, assuming utilities can discharge battery down to 40% capacity (so use 60% of EV battery)	National Grid - Distribution Future Energy Scenarios regional information
Tech Load Growth	NWPCC Northwest Power Supply Adequacy Assessment for 2029 mid-higher case, with load differentiated across modeling zones	NWPCC Pacific Northwest Power Supply Adequacy Assessment for 2029

MODELING INPUTS

Reference Scenario

- **Energy Efficiency and Load Flexibility**

Demand Response – Households participation	50% of homes with demand response capability are participating in some form of firm demand response program by 2050 for heating, water heating, and air conditioning (linear growth from 2025) Residential EVs: Start at 0, ramp up to 2/3 of residential EVs participate in managed charging by 2030	BPA Demand Response Potential Assessment, 2022-2045 LBNL, The California Demand Response Potential Study (2024) Portland General Electric 2023 Clean Energy Plan and Integrated Resource Plan
Demand Response - Commercial	50% of commercial spaces with demand response capability are participating in some form of firm demand response program by 2050 for heating, water heating, and air conditioning (linear growth from 2025) Commercial EVs: Start at 0, ramp up to 1/3 of commercial EVs participate in managed charging by 2030	BPA Demand Response Potential Assessment, 2022-2045 LBNL, The California Demand Response Potential Study (2024) Portland General Electric 2023 Clean Energy Plan and Integrated Resource Plan
Demand Response - Industrial	Includes dual fuel boilers, thermal energy storage, process flexibility, heating, cooling There is no input assumption. The model will provide insights into the uptake of technologies with flexibility potential over time	*N/A*

MODELING INPUTS

Scenario 1: Delayed Energy Efficiency and Building Electrification

Key Assumptions

	Reference Scenario	Alternative Scenario
Residential Space Heating	Assume existing policies play out for all space heating technologies 65% heat pump sales by 2030; 90% by 2040	Assume existing policies play out for all space heating technologies **65% heat pump sales by 2040; 90% by 2050**
Commercial Space Heating	Weighted average of large and small commercial space heating loads, with the following framing: • Small commercial: follow residential • Large commercial: ○ 2030: Electric heat pumps 15% of overall sales; other electric + electric hybrid systems (including hybrid heat pumps) 10% of overall sales ○ 2045: Electric heat pumps 50% of overall sales; other electric + electric hybrid systems (including hybrid heat pumps) 40% of overall sales	Weighted average of large and small commercial space heating loads, with the following framing: • Small commercial: follow residential • Large commercial: ○ **2040: Electric heat pumps 15% of overall sales; other electric + electric hybrid systems (including hybrid heat pumps) 10% of overall sales** ○ **2055: Electric heat pumps 50% of overall sales; other electric + electric hybrid systems (including hybrid heat pumps) 40% of overall sales**
Residential Water Heating	Incorporate Federal Energy Conservation Standards for Consumer Water Heaters (from May 6, 2029) Electric heat pump sales rising to 95% of overall sales by 2045	Incorporate Federal Energy Conservation Standards for Consumer Water Heaters (from May 6, 2029) **Electric heat pump sales rising to 95% of overall sales by 2055**
Commercial Water Heating	Weighted average of large and small commercial water heating loads, with the following framing: • Small commercial: follow residential • Large commercial: ○ 2035: Electric heat pumps for water heaters 15% of overall sales, other electric technologies 10% of overall sales ○ 2045: Electric heat pumps for water heaters 50% of overall sales, other electric technologies 40% of overall sales	Weighted average of large and small commercial water heating loads, with the following framing: • Small commercial: follow residential • Large commercial: ○ **2045: Electric heat pumps for water heaters 15% of overall sales, other electric technologies 10% of overall sales** ○ **2055: Electric heat pumps for water heaters 50% of overall sales, other electric technologies 40% of overall sales**

MODELING INPUTS

Scenario 3: Limited Demand Response

Key Assumptions

	Reference Scenario	Alternative Scenario
Demand Response – Households participation	50% of homes with demand response capability are participating in some form of firm demand response program by 2050 (linear growth from 2025) Residential EVs: Start at 0, ramp up to 2/3 of residential EVs participate in managed charging by 2030	**5% of homes with demand response capability are participating in some form of firm demand response program by 2050 (linear growth from 2025)** **Residential EVs: Start at 0, ramp up to 20% of residential EVs participate in managed charging by 2030**
Demand Response - Commercial	50% of commercial spaces with demand response capability are participating in some form of firm demand response program (linear growth from 2025) Commercial EVs: Start at 0, ramp up to 1/3 of commercial EVs participate in managed charging by 2030	**5% of commercial spaces with demand response capability are participating in some form of firm demand response program (linear growth from 2025)** **Commercial EVs: No commercial EV participation in managed charging**
Vehicle-to-grid	26% V2G for residential EVs, assuming utilities can discharge battery down to 40% capacity (so use 60% of EV battery)	**No V2G for residential EVs**

MODELING INPUTS

Scenario 5: High Distributed Energy Resources + Limited Transmission

Key Assumptions

	Reference Scenario	Alternative Scenario
Transmission Development	TX and pipeline expansion available from 2035 onwards. B2H comes online 2030.	B2H comes online 2030. **Only reconductoring projects allowed.**
Distributed Energy Resources	NWPCC Forecast for rooftop solar. 42 MW/25 MWh of BTM storage (1% of households install storage systems; 20% of them participate in offering grid services, 50% of stored energy available).	**7GW of rooftop solar. 2.1GW/1.3 GWh participating BTM storage capacity (40% of solar customers with storage, 50% participation, 50% of stored energy available).**
Demand Response: V2G	26% V2G for residential vehicles by 2050	**2/3 V2G for residential vehicles by 2050**