



2025 Gas Integrated Resource Plan
Technical Advisory Committee Meeting No. 8 Agenda
Wednesday, September 25, 2024
Virtual Meeting

Topic	Time (PTZ)	Staff
Feedback from prior TAC	10:30	All
Heat Pump Efficiency	10:40	Tom Pardee
Electrification Costs	11:20	Tom Pardee

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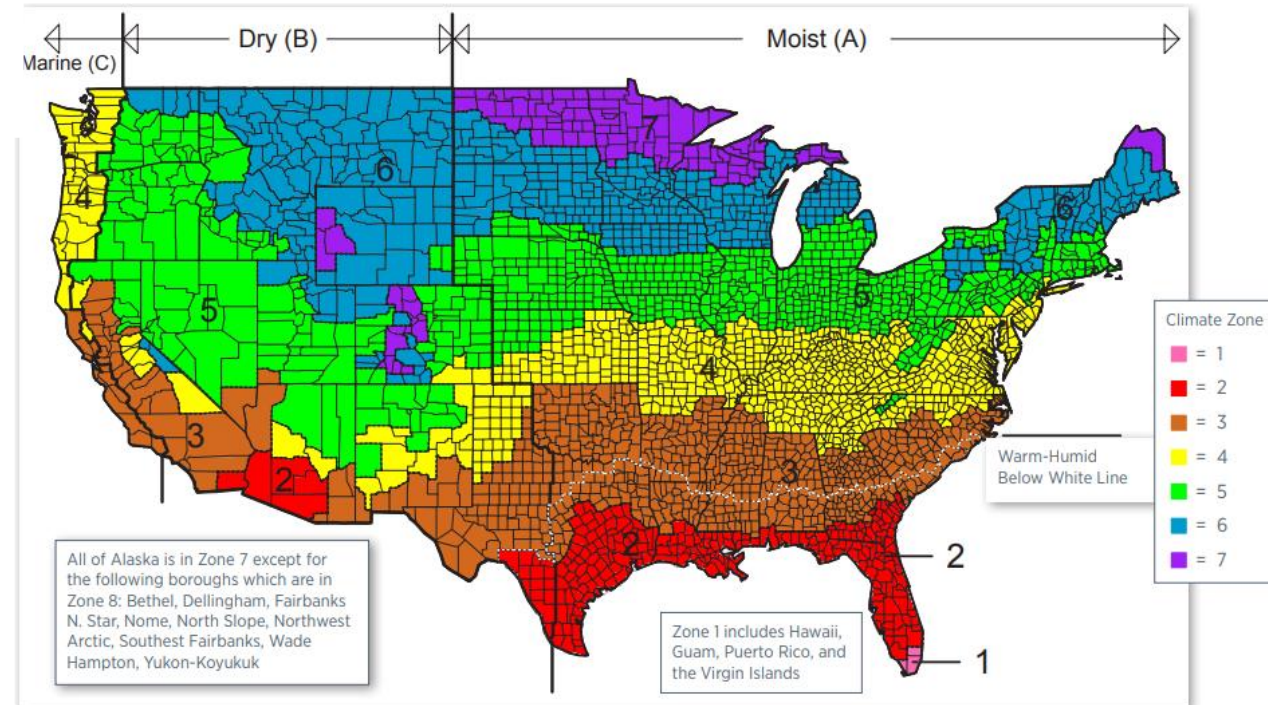
Heat Pump Efficiency

September 25, 2024

Climate Zones

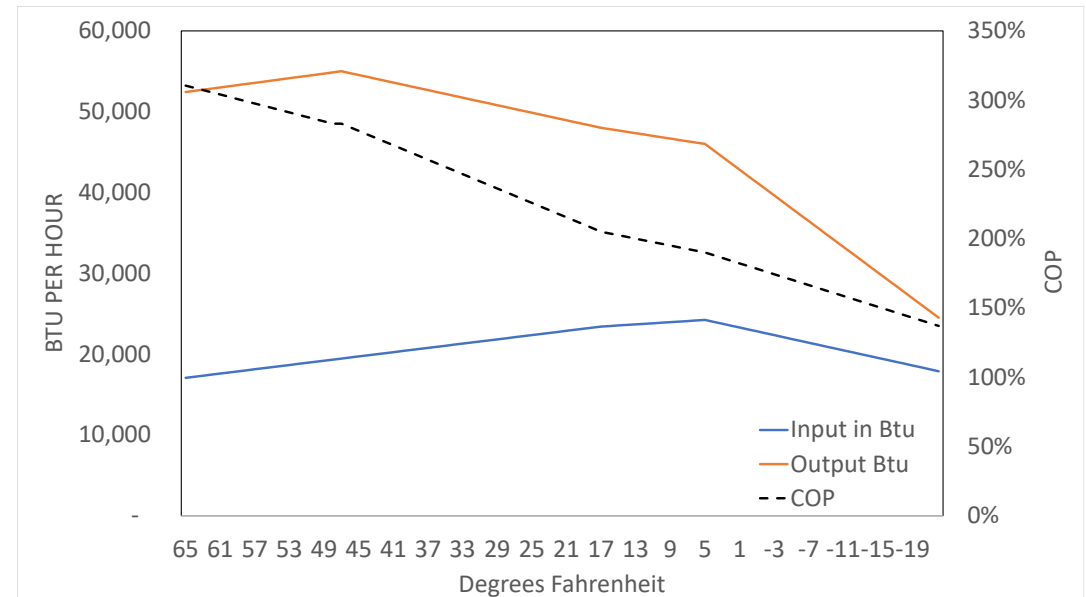
- Avista LDC territory comprises 3 climate zones
 - Climate Zone 4: Roseburg, Medford
 - Climate Zone 5: Klamath Falls, La Grande, Spokane
 - Climate Zone 6: Northern WA and ID
- Climate zones help determine sizing of heat pumps and furnaces

Zone	btu needed per sq. ft
1	35
2	40
3	45
4	50
5	55
6	60



Basic Calculation Considerations of Heat Pumps

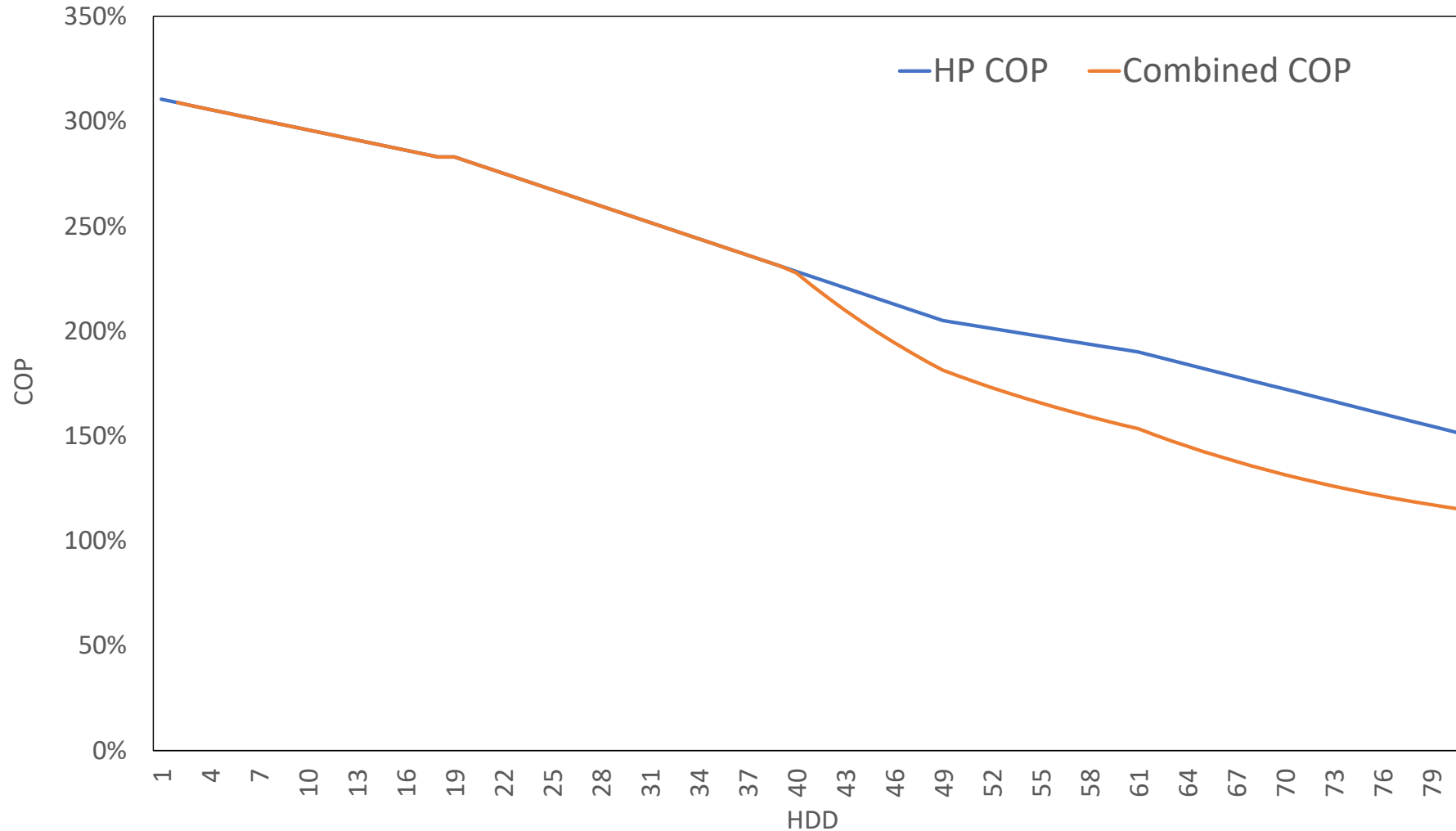
- Output Btu
- Input Btu
- Temperature in Fahrenheit
- Coefficient of Production
- Climate zone
- House size
- Ducted Heat Pump



[ASHP \(neep.org\)](http://neep.org)

1. Heat pumps need a higher air flow rate to provide the same amount of heat from a furnace
2. Higher air flow requires bigger ducts

COP including auxiliary



Detailed Calculation and Considerations

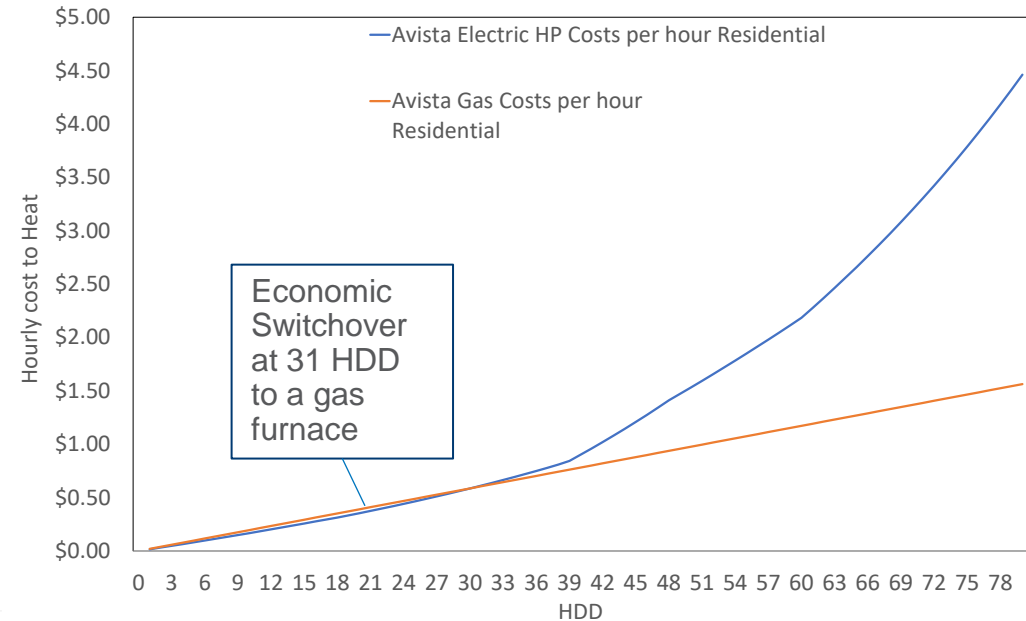
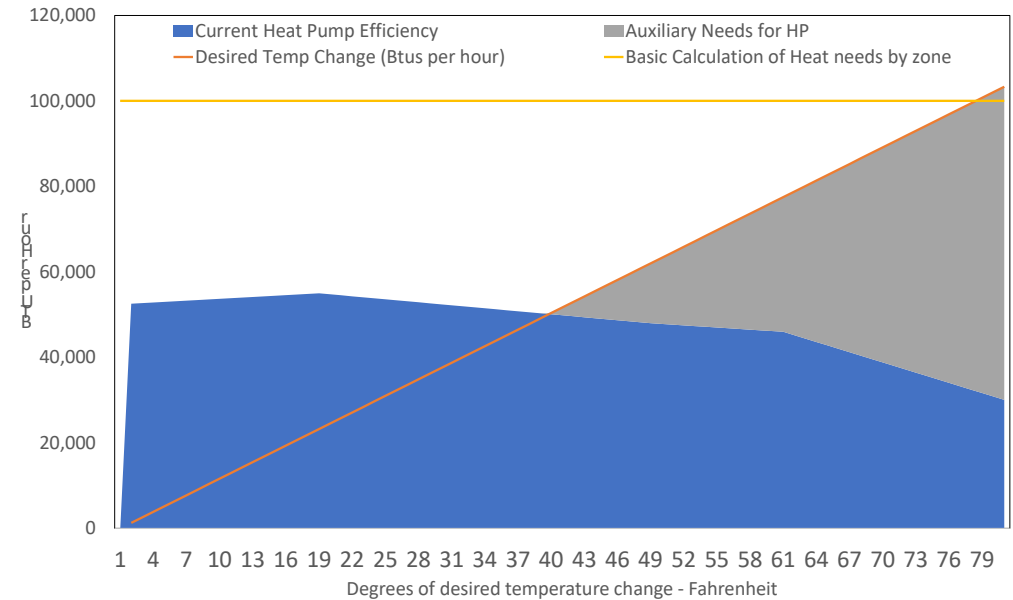
- **Cubic foot of heating volume (L x W x H) of structure**
- Exposure to elements (shade, direct exposure)
- Window glaze (double pane, single pane)
- Room type (kitchen, hall, bedroom)
- **Desired temperature increase**
 - **(desired temperature change) x (cubic feet of space) x.080713 (lbs of air per cubic foot)**
 - Desired temperature change assumes heating begins below 65 degrees Fahrenheit
- **Auxiliary space heating (back up type) – Electric @ 100% efficiency**
- **Rates of electricity (kWh) vs. gas (therm)**
- **Efficiency of heat pump**

Rates of Energy

- The energy rate (kWh or therm) has a great deal of impact on overall costs with switchover temperature
- Although heat pumps provide a great deal of savings of btus, when colder weather occurs the efficiency declines (COP)

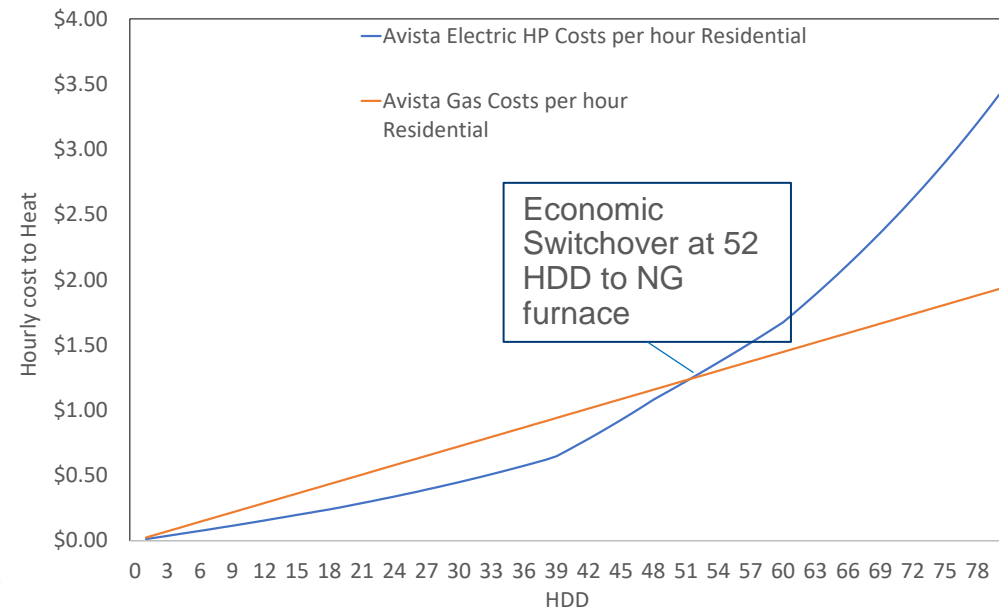
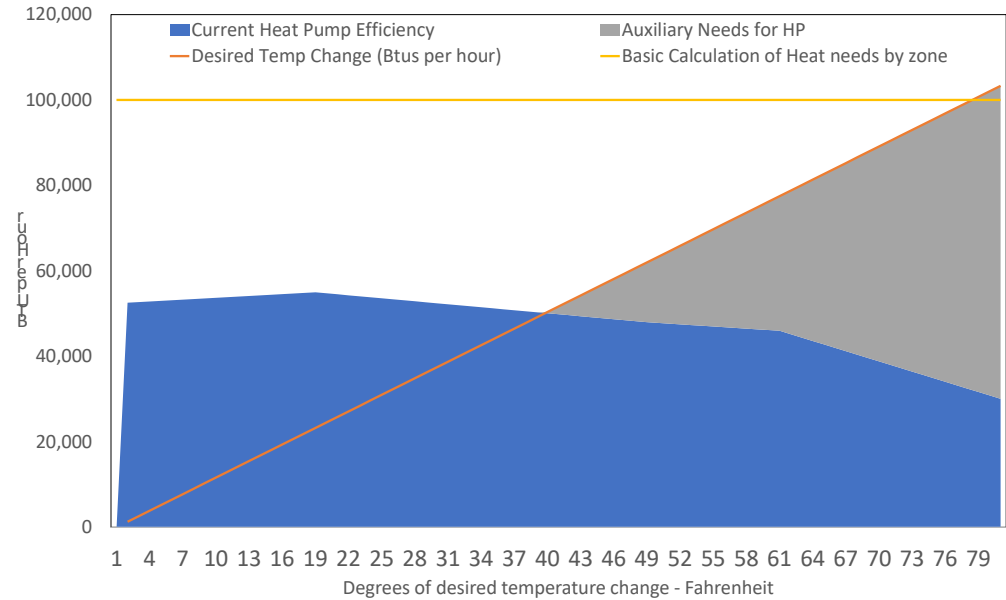
Oregon Example

- Avista 2024 Rate per therm: \$1.26
- 2024 Res Rate per kWh:\$0.13 (blended PAC and City of Ashland)
- 2000 sq. ft. house
- Climate zone 4
- Gas furnace efficiency: 80%



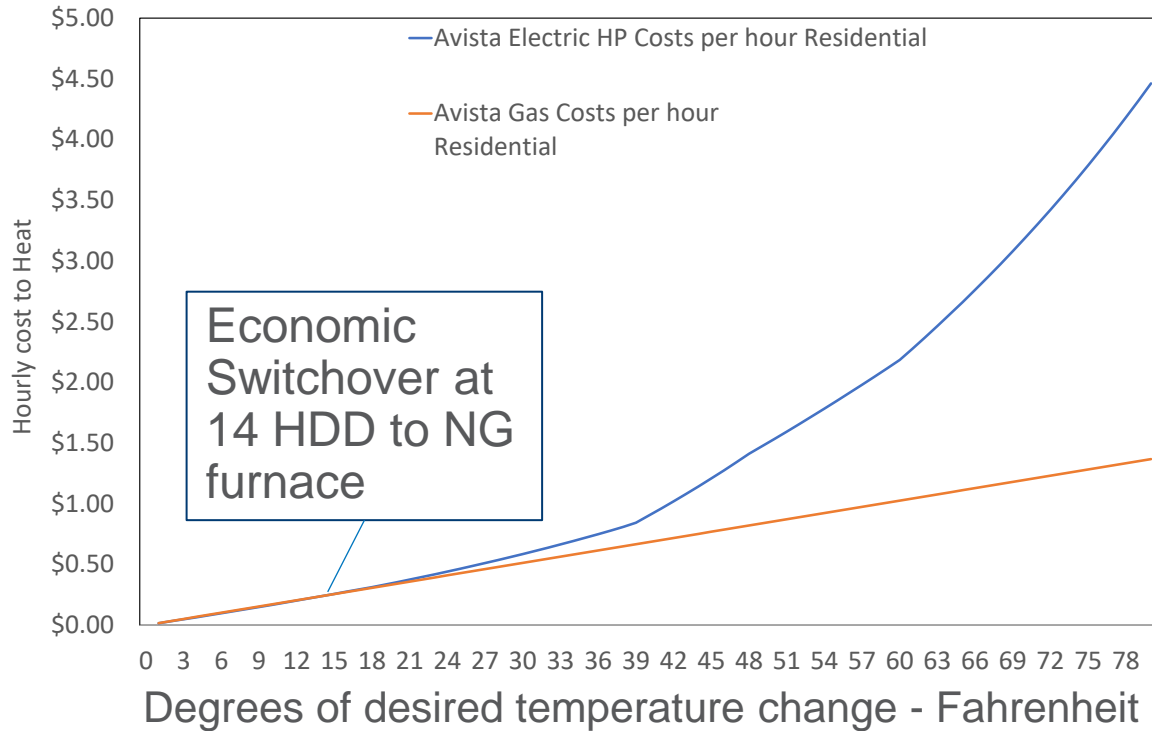
Washington Example

- Avista 2024 Rate per therm: \$1.556
- Avista 2024 Res Rate per kWh: \$0.11582
- 2000 sq. ft. house
- Climate zone 5
- Gas furnace efficiency: 80%

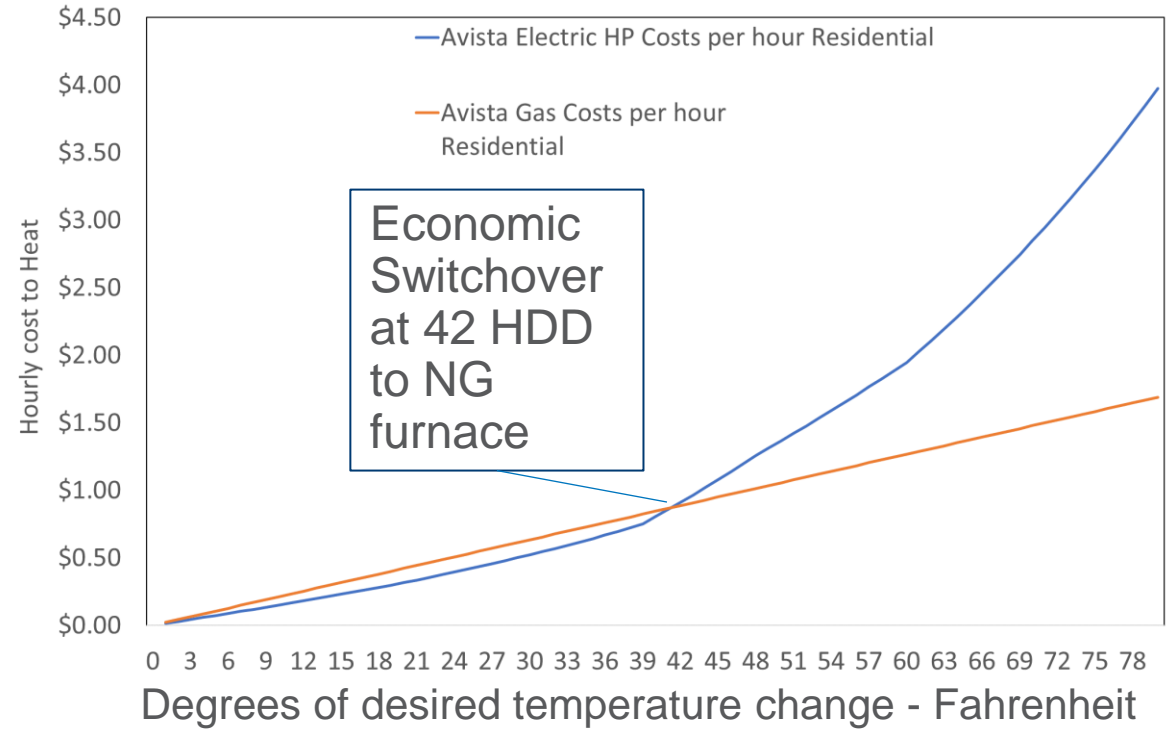


Current Rates with a 95% efficient NG furnace

Oregon

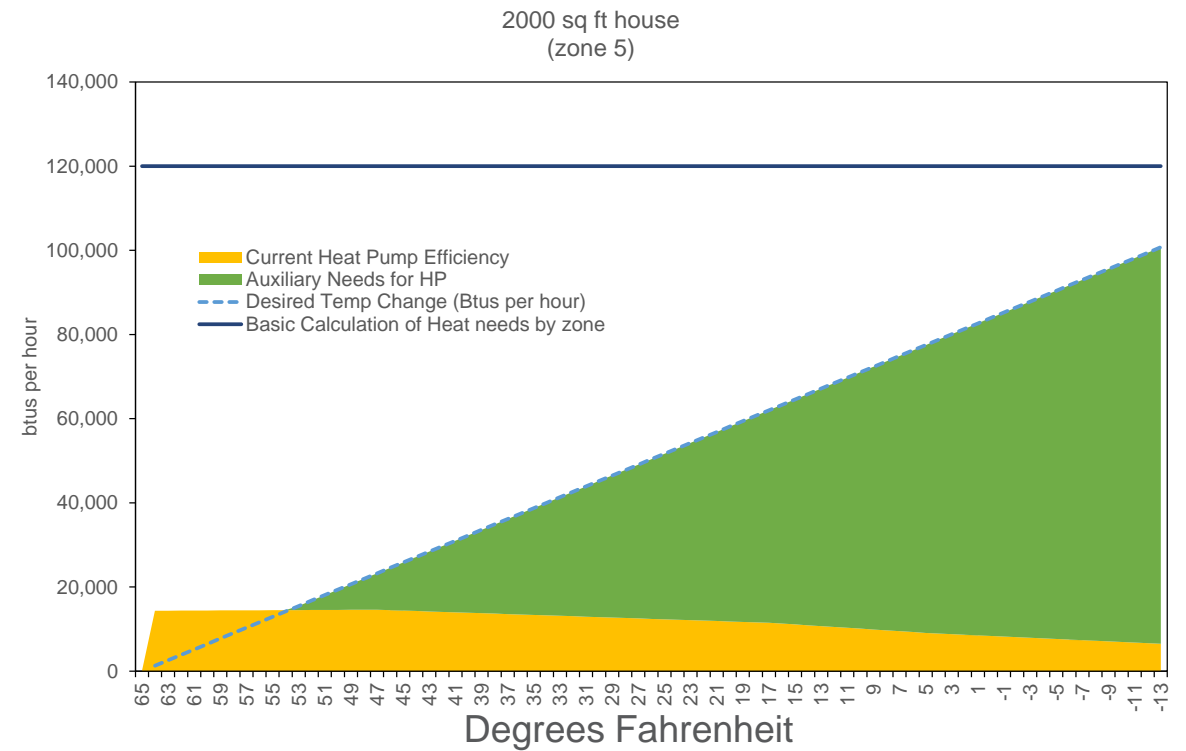
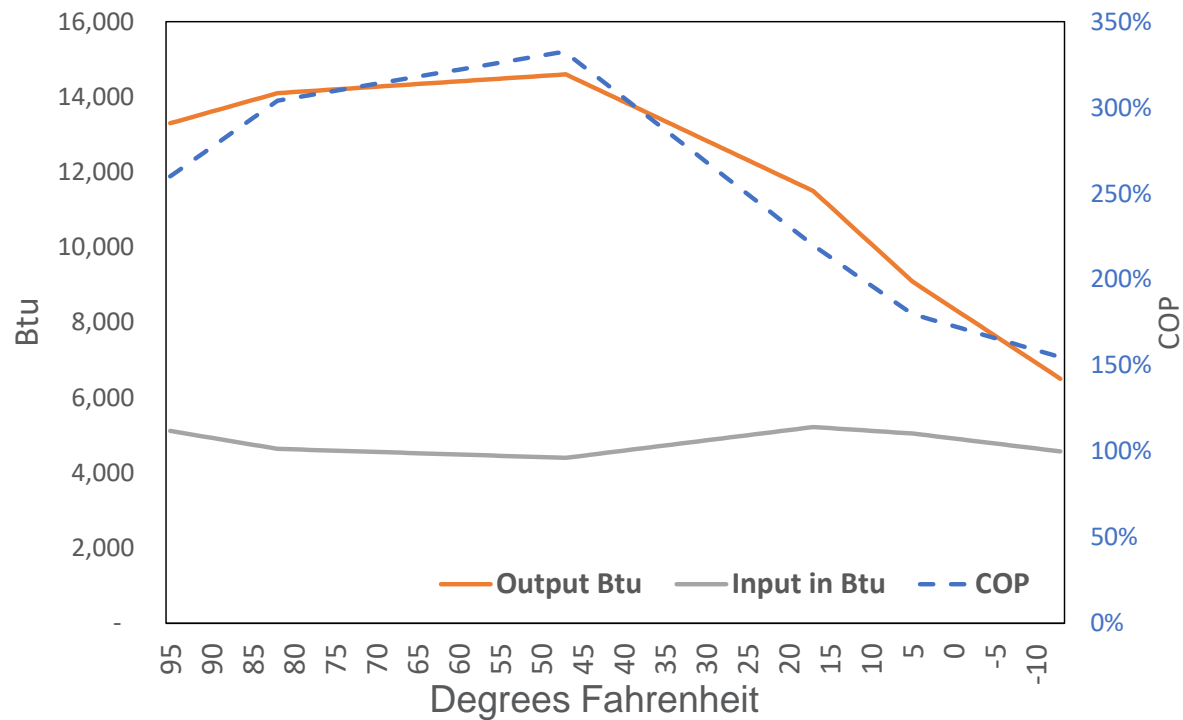


Washington



Single Zone - Ductless

- Smaller area for single units or multiple heat pumps for several areas
- High efficiency
- Cheaper to install



Summary

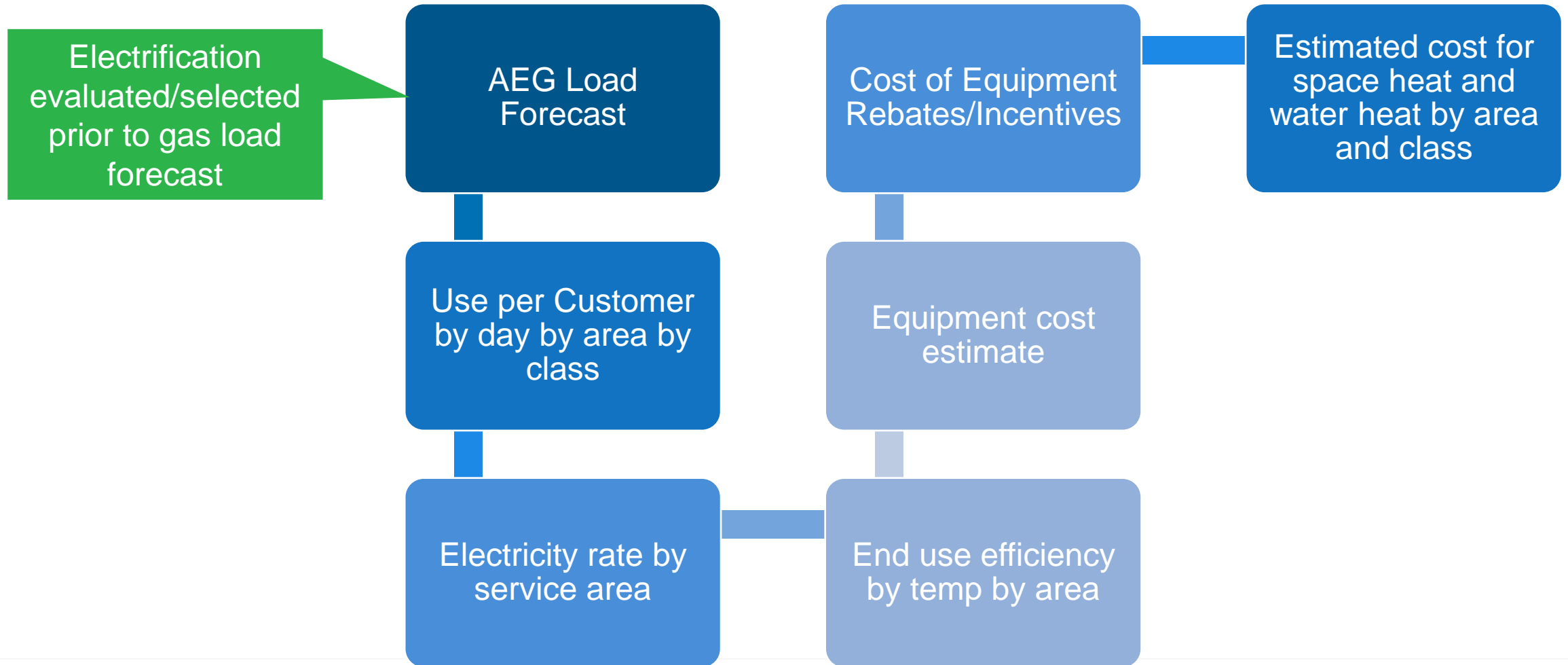
- Heat pumps may be a good alternative depending on climate zone, house size and insulation as a primary source of heating
 - This is magnified in areas of low electricity rates
- Heat pump life cycle is generally less than half of expected life cycle of a gas/electric furnace (Additional capital)
- Heat pumps provide additional benefits like cooling that may be considered when switching to or replacing a furnace
 - This is not considered in this analysis as Gas IRP planning does not consider cooling degree days
- Costs of energy and rates may alter the use of heat pumps for space heating, regardless of efficiency
- Defrost cycles in extreme weather may affect the usability during these cold events
- Costs:
 - depending on the customer type, heavy incentives may be available to help convert to heat pumps
 - If one commodity goes up or down more significantly than the other, the economic switchover temperature will change
 - There are thousands of different heat pumps, costs and related efficiencies so an industry estimate will be used as the assumed price of installation



Electrification Costs

Oregon and Washington

High Level Diagram of Process



Electrification Costs in the CROME Model

- Provides a price elastic response to higher gas costs and compliance to the CCA and CPP
 - Customers were electrified in the end use model prior to the final gas load forecast
- Once a unit is chosen at any point in time within the analysis, it is removed for the remainder of the forecast timeframe
- If electrification is chosen, a program decision and methodology will need to occur as well as a verified cost estimate to electrify:
 - Does Avista pay all costs or partially with electric provider?
 - How do costs get recovered?
 - Do all classes pay for these costs?
 - Trying to model costs and benefits, but not who pays (TRC test in EE)

Clean Energy Targets

Oregon Clean Energy Targets

- Oregon
- In 2021 Oregon State Legislature passed the [Clean Energy Targets bill](#). This bill requires Portland General Electric, PacifiCorp and Electricity Service Suppliers to reduce greenhouse gas emissions from the electricity they provide. The bill also created targets for these companies to reduce the greenhouse gas emissions from electricity sold in Oregon to:
 - 80 percent below baseline emissions levels by 2030;
 - 90 percent below baseline emissions levels by 2035; and
 - 100 percent below baseline emissions levels by 2040

Washington Clean Energy Targets



- **CETA applies to all electric utilities serving retail customers in Washington and sets specific milestones to reach a 100% clean electricity supply.**
- The law requires utilities to phase out coal-fired electricity from their state portfolios by 2025.
- By 2030, their portfolios must be greenhouse gas emissions neutral, which means they may use limited amounts of electricity generated from natural gas if it is offset by other actions.
- By 2045, utilities must supply Washington customers with electricity that is 100% renewable or non-emitting with no provision for offsets.

[CETA Overview - Washington State Department of Commerce](#)

Electric Rates

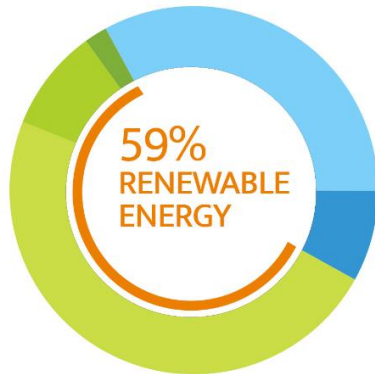
Electric Rate assumptions

- Current Rates for each provider and inflated to 2026 \$ then increased by estimated rate impact for Avista's electric \$ per kWh from Washington territory
 - The resource mix of Avista as compared to Pacific Power is much cleaner so the impacts to Pacific Power would likely be greater than the estimate
 - Pacific Power may use the clean resources from its portfolio to comply with Oregon Clean Energy Targets
- Power provided by BPA is assumed as clean energy and currently in compliance with clean goals
 - BPA does not have any excess power to sell in the event electric loads increase for these electric providers, but for this analysis it is assumed rates will increase by 3% YOY

Washington Electric Provider Rates

- Washington rates are weighted by # of customers for each provider.
- These providers are Avista (81%), Inland Power (10%), Modern Electric (5%) and VERA water and power (4%)

ELECTRICITY GENERATION
RESOURCE MIX
As of Dec. 31, 2022 - Excludes AEL&P



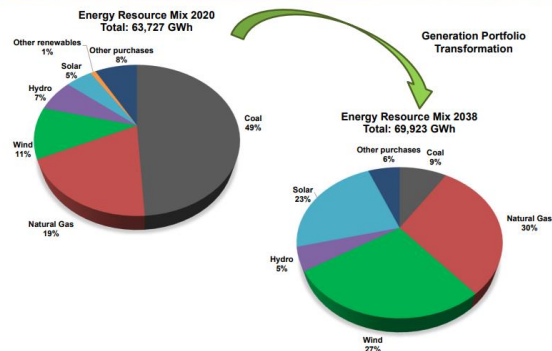
Hydro	48%
Wind	9%
Biomass	2%
Natural Gas	33%
Coal	8%

	VERA	Modern	Inland	Avista	Est.Total E. Wash electric customers with crossover from natural gas territory
WA	13,000	16,000	32,000	254,065	315,065
% of Total Customers	4%	5%	10%	81%	
Current Rates as of June 2024					
Res	\$ 0.07	\$ 0.06	\$ 0.07	\$ 0.09	
Com	\$ 0.07	\$ 0.06	\$ 0.07	\$ 0.14	
Large Com	\$ 0.06	\$ 0.06	\$ 0.06	\$ 0.09	
Weighted Average					Total Estimated Rate
Res	\$ 0.003	\$ 0.003	\$ 0.007	\$ 0.073	\$ 0.086
Com	\$ 0.003	\$ 0.003	\$ 0.007	\$ 0.111	\$ 0.125
Large Com	\$ 0.003	\$ 0.003	\$ 0.006	\$ 0.073	\$ 0.085

Oregon Electric Provider Rates

- Southern Oregon rates are weighted by # of customers from each electric provider.
- These providers are the City of Ashland (12%) and Pacific Power (88%)
- La Grande has a single electric provider. Oregon Trail Electric rates are increased by 3% YOY rather than the yearly increase to meet emissions goals
 - Current Res kWh rate is \$0.068 and Com \$0.07

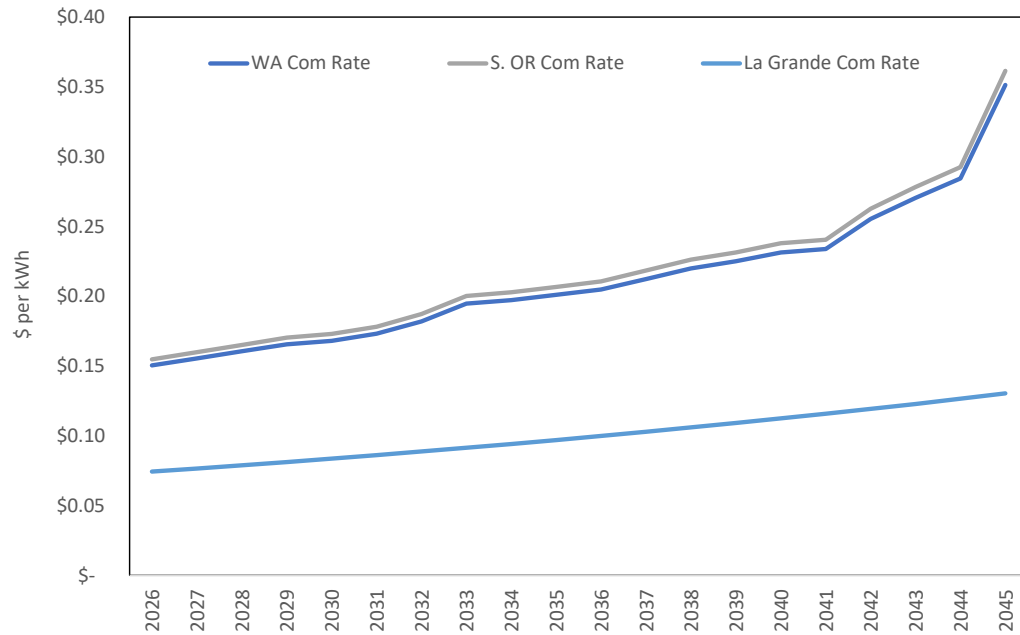
	City of Ashland	Pacific Power	Total Avista Gas Customers S. Oregon
Customers	11,000	83,601	94,601
% of Total Customers	12%	88%	
Current Rates as of June 2024 (\$/kWh)			
Res	\$ 0.08	\$ 0.14	
Com	\$ 0.09	\$ 0.13	
Large Com	\$ 0.09	\$ 0.09	
Weighted Average			
Res	\$ 0.01	\$ 0.12	\$ 0.13
Com	\$ 0.01	\$ 0.12	\$ 0.13
Large Com	\$ 0.01	\$ 0.08	\$ 0.09



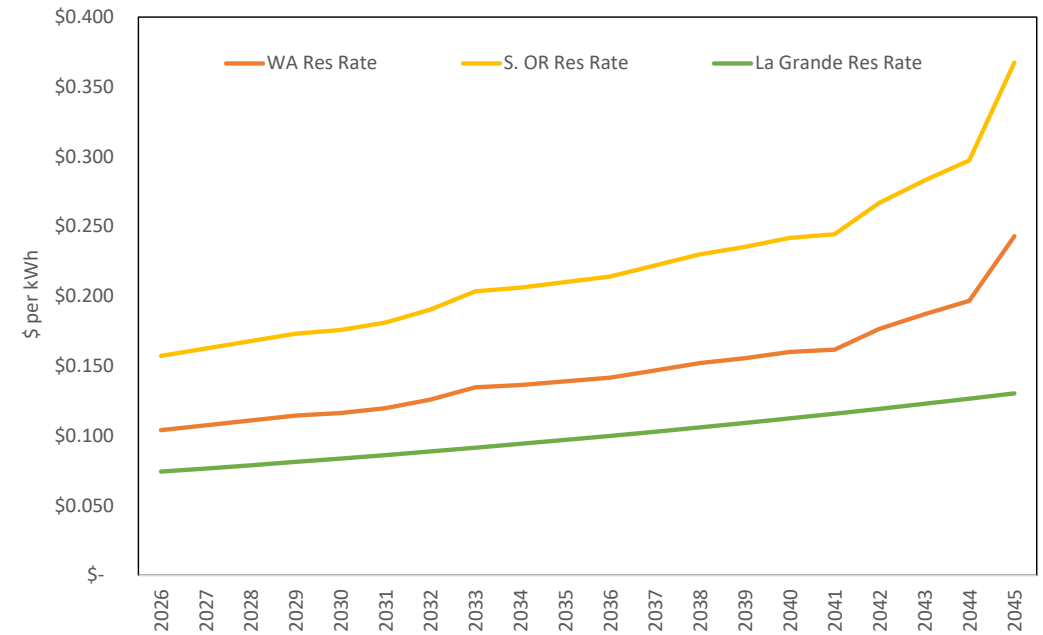
Resources acquired through purchased power agreements, customer partnerships, used for renewable portfolio standard compliance, or for third-party sales of renewable attributes are included in the figures reported.

Electric Rate forecast

Commercial Rate Estimate



Residential Rate Estimate



Equipment Costs and Rebates/Credits

Equipment Costs

- Assumes a 3-ton ducted heat pump is needed for space heat (2,000 sq. ft. house)
- Full electrification cost for all appliances is assumed at \$13,162 (2024 \$)*
 - 3-ton ducted heat pump \$5,993
 - Heat pump water heater \$3,528
 - Electric Range \$2,038
 - Electric Dryer \$1,602
- Costs are assumed less incentives (IRA) and have a 5-year payback period in the form of an average monthly payment (annuity) at 3% interest
- Assumes a 20-year lifespan for all equipment (Heat pumps average between 10-15 years on average)

*Electrifying Buildings – December 2022 rmi.org

IRA Rules

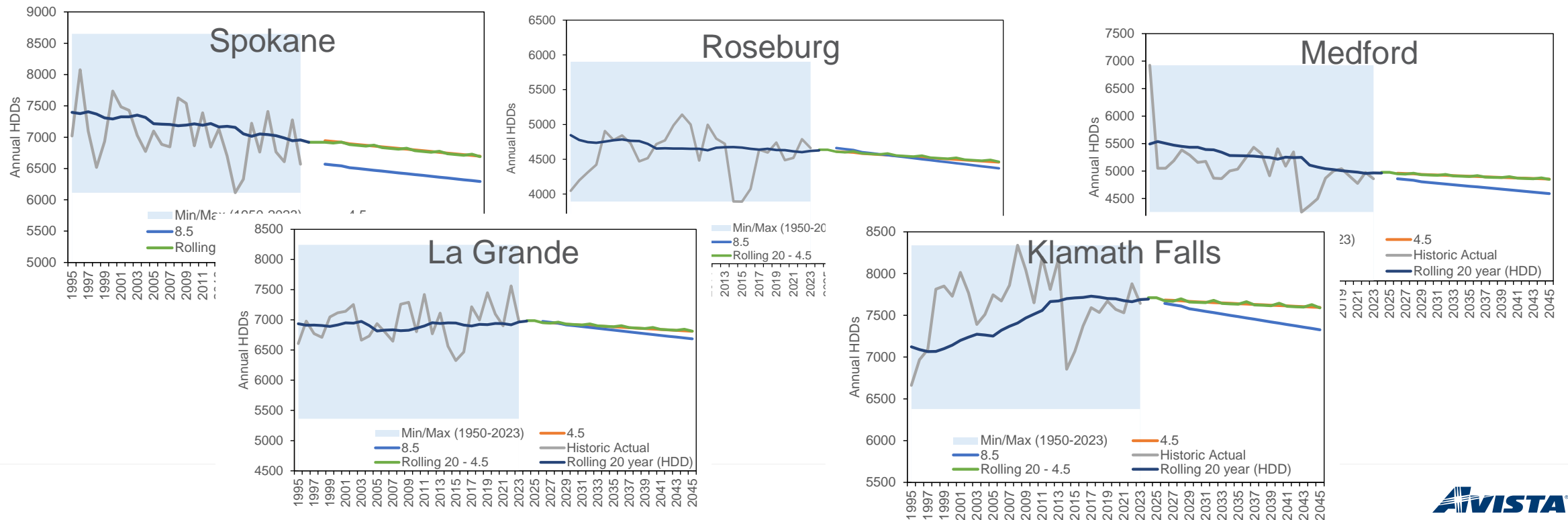
- Depending on income level, rebates for these home efficiency upgrades can be as much as 100% of the costs, up to \$14,000
 - Avista will assume 50% of costs for all residential customers are covered by the IRA or other pathways

Type of Home Energy Project	Maximum Allowed Rebate Amount Per Household Below 80% Area Median Income (AMI)	Maximum Allowed Rebate Amount Per Household Above 80% Area Median Income (AMI)
Home Efficiency Project with at least 20% predicted energy savings	80% of project costs, up to \$4,000*	50% of project costs, up to \$2,000 (maximum of \$200,000 for a multifamily building)
Home Efficiency Project with at least 35% predicted energy savings	80% of project costs, up to \$8,000*	50% of project costs, up to \$4,000 (maximum of \$400,000 for a multifamily building)
Home Electrification Project Qualified Technologies (only households with an income below 150% AMI are eligible)	100% of project costs up to technology cost maximums**; up to \$14,000	50% of project costs, up to technology cost maximums*; up to \$14,000 (households with incomes above 150% AMI are not eligible)

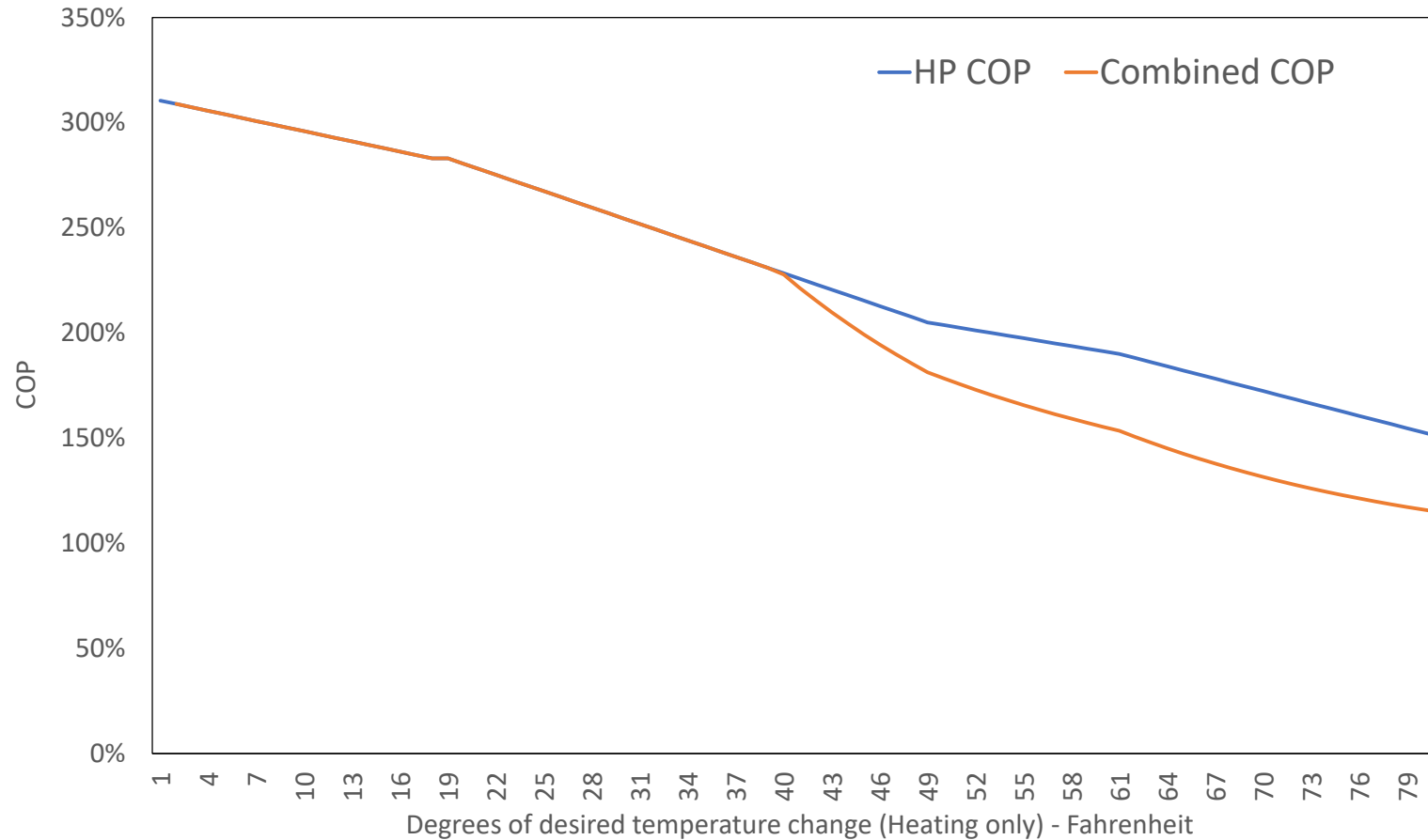
Input

Weather

- RCP 4.5 weather is used at a daily level to estimate energy needs by planning region.
- This is then rolled up to an average monthly level by end use



COP including auxiliary

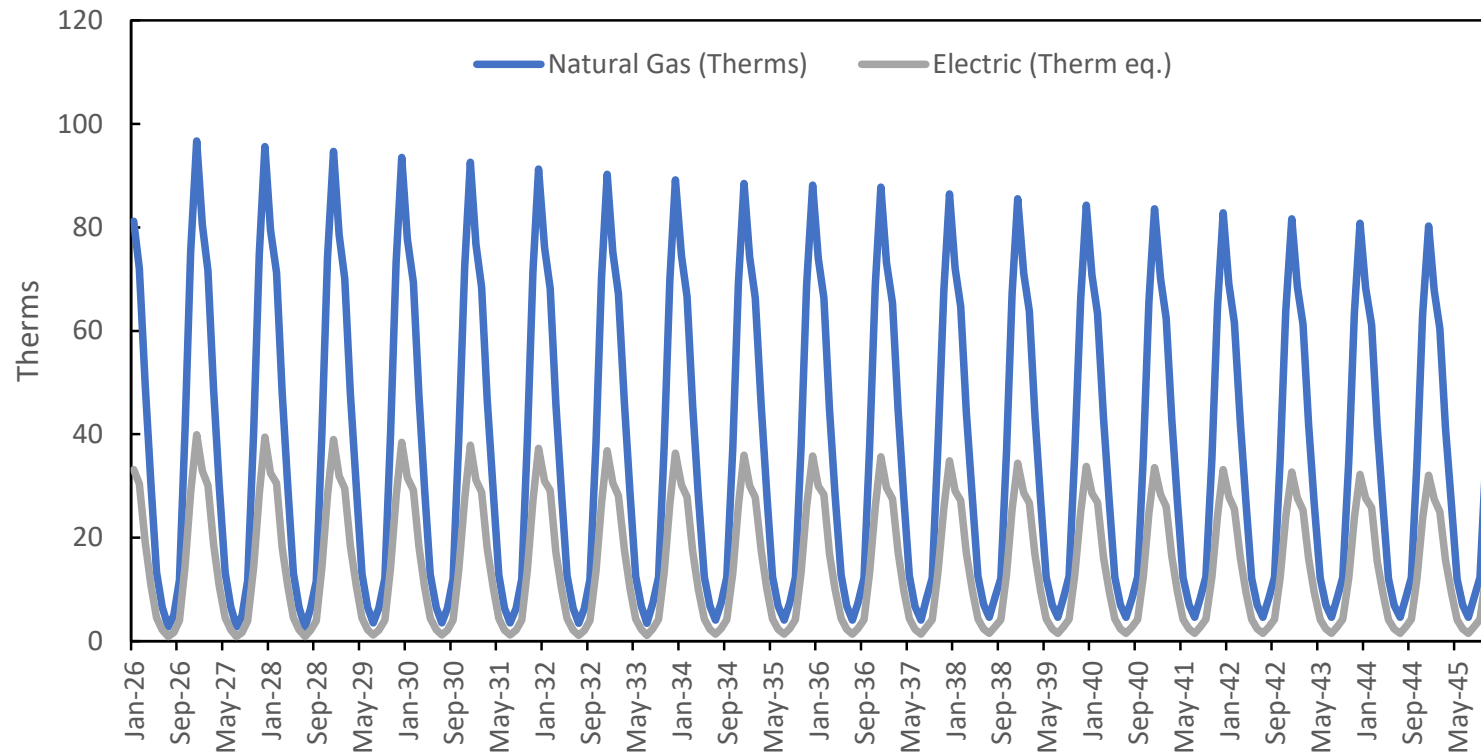


Assumes 100% efficient electric furnace as auxiliary backup heat

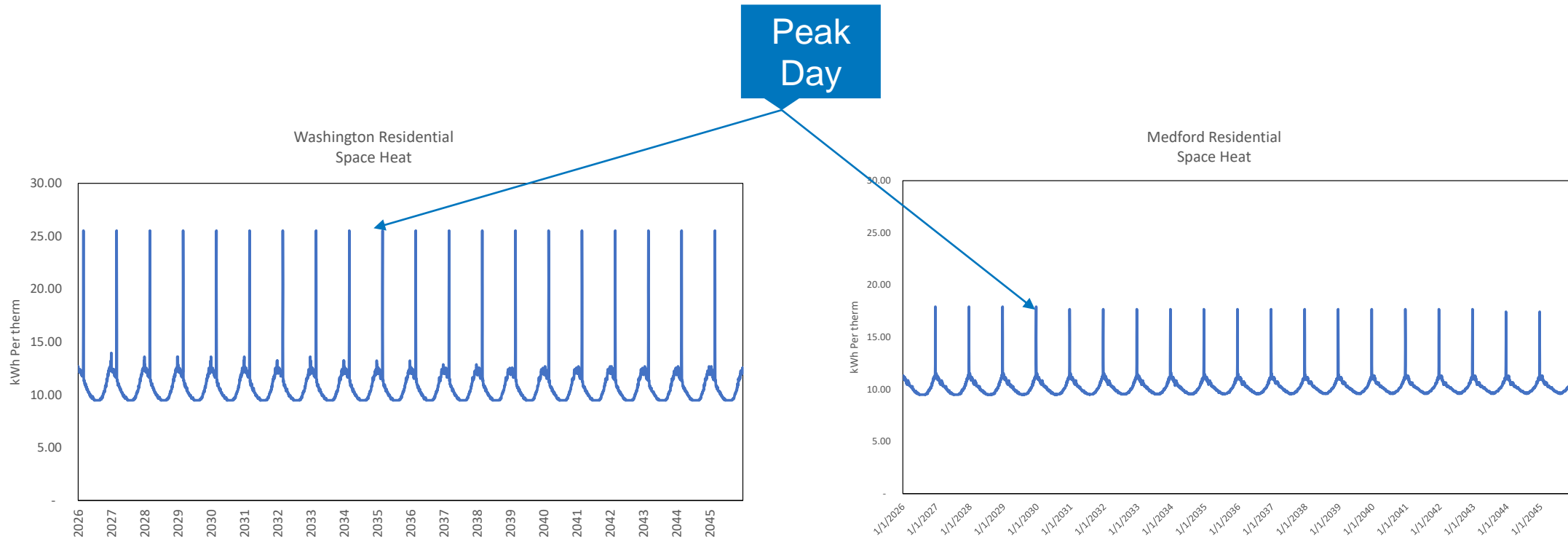
Below 65 degrees Fahrenheit is where heating begins

Use per customer

La Grande
Space Heat



Daily Conversion to kWh



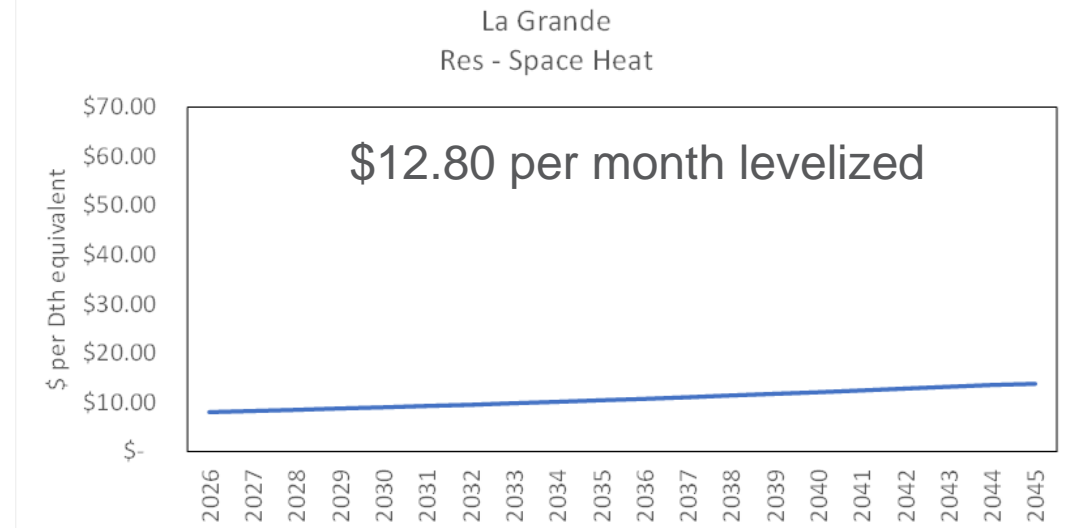
*29.3 kWh per therm of energy

Electrification Cost Estimates

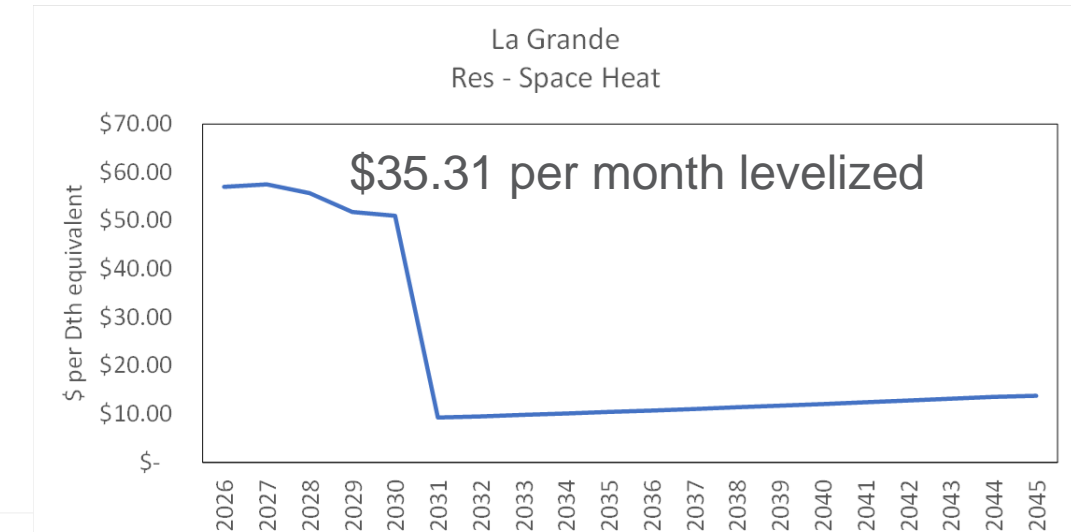
Levelized Cost

- Calculated at 20 year increments
- Includes inflation adjustment for each year
- Current cost of capital is included in levelized costs
 - (6.71% OR, 6.51% WA)
- This is done each year from 2026-2045 to estimate costs for space heating with heat pumps, heat pump water heater, and other (range, dryer)
- Base rates for gas service are not considered as an entire household would require conversion.
 - This analysis allows for individual equipment conversion and does not require entire household gas appliances to convert to electric so a base charge for gas service for remaining appliance is not considered avoided

Example with No Equipment Costs: Levelized beginning in 2026

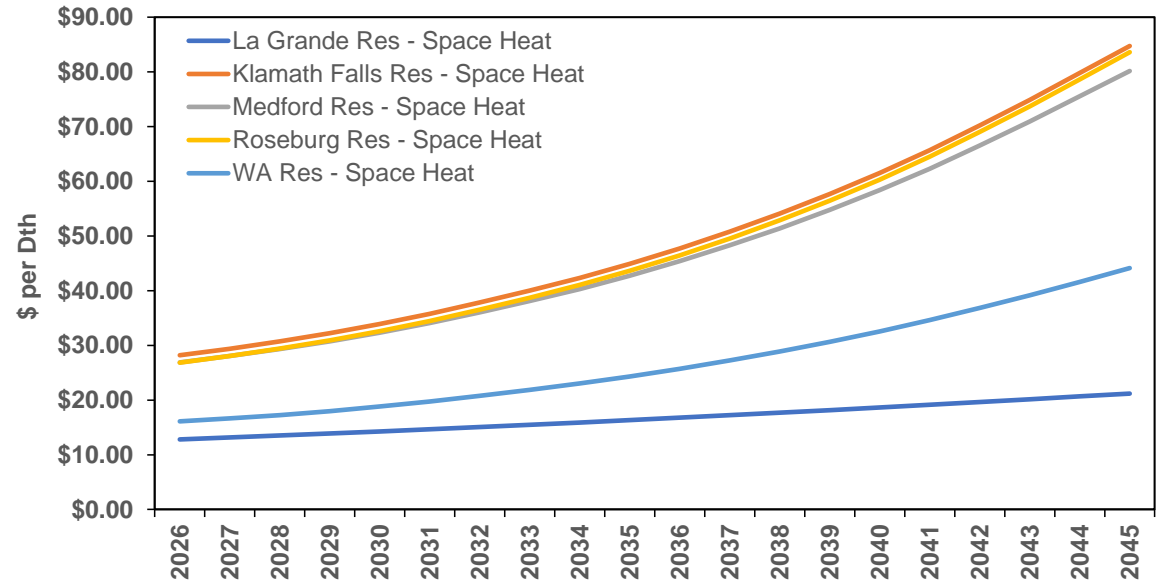
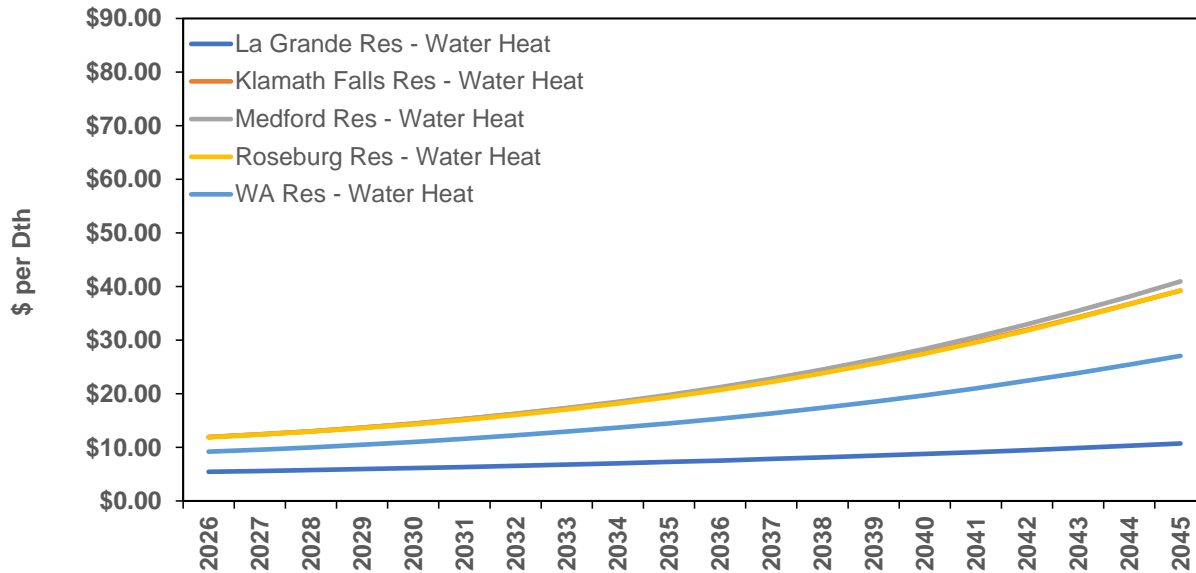


Example with equipment costs: 20 year levelized cost beginning in 2026

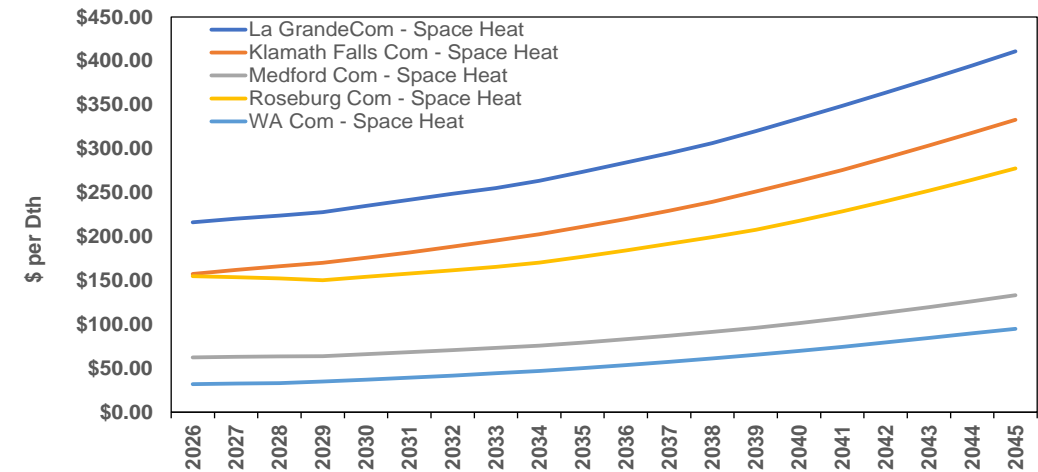
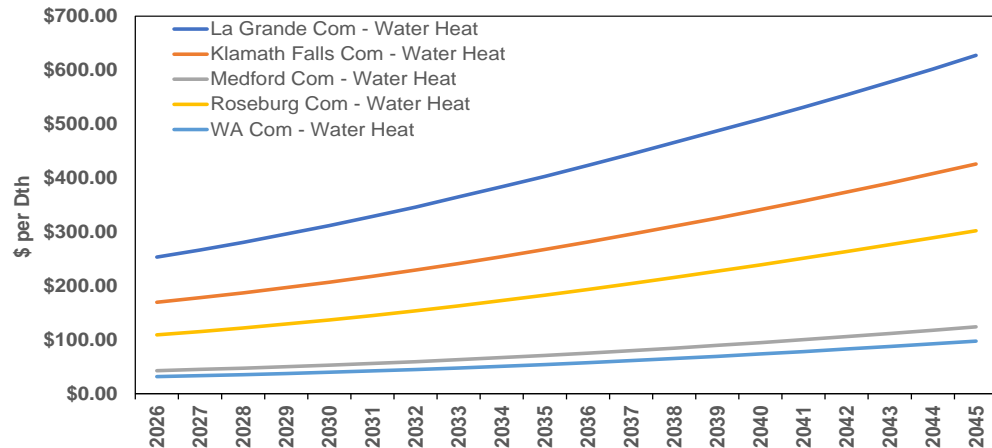
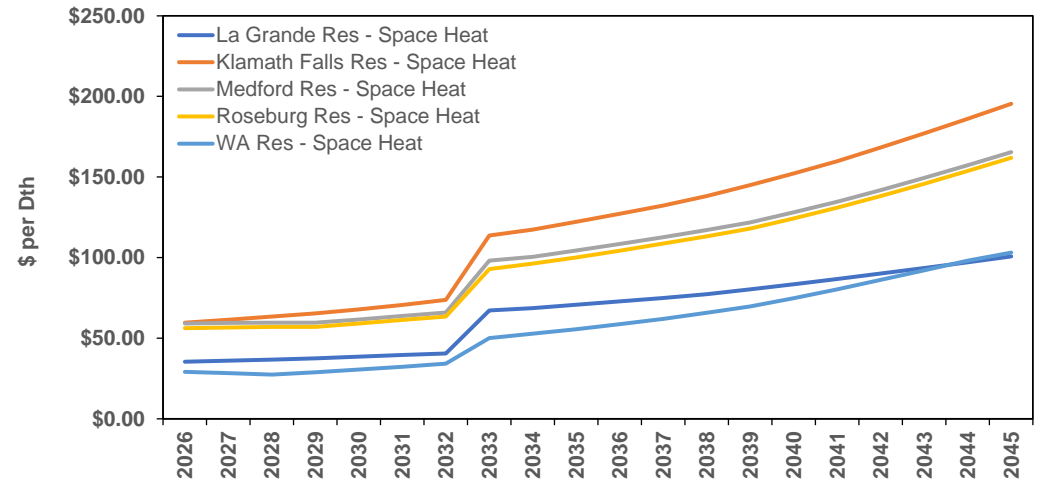
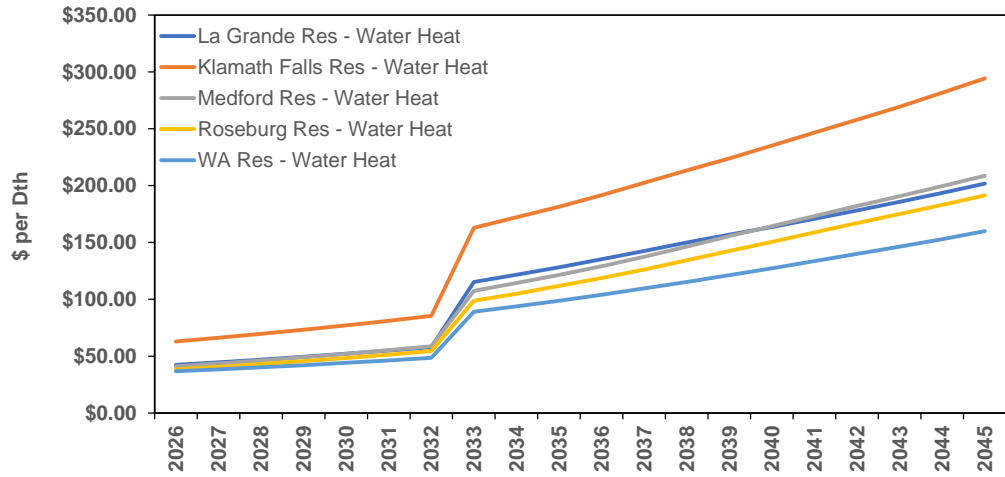


Cost without equipment costs

- Per customer, per month, per end use, without appliance cost



Cost with equipment costs



Questions and/or
Feedback?

Future ways to make this analysis better

- Actual rate forecasts from each electric provider based on their most recent forecast
 - Would likely need help from OPUC and WUTC
- Break down costs by income level to understand incentives available
- Break down costs for retrofit, specifically, to include full installation:
 - Dry wall work
 - Plumbing services to cap gas line
 - Electrical work including upgraded box or new power lines in the house (220v)
 - Permitting fees and time from permitting to installation
- Consider housing stock size
 - This would separate space heating into homes available for ducted and ductless heat pumps