

GSHP WINTER EFFICIENCY

Geothermal heat pumps can offer 100% heating, air conditioning, and domestic hot water. The performance of the system is solely dependent on the entering loop temperature. The most common systems are open and closed loops which are designed to carry an efficiency minimum ranging from 310% for geothermal boilers and 410% for geothermal furnaces.

Energy Star Rating Criteria

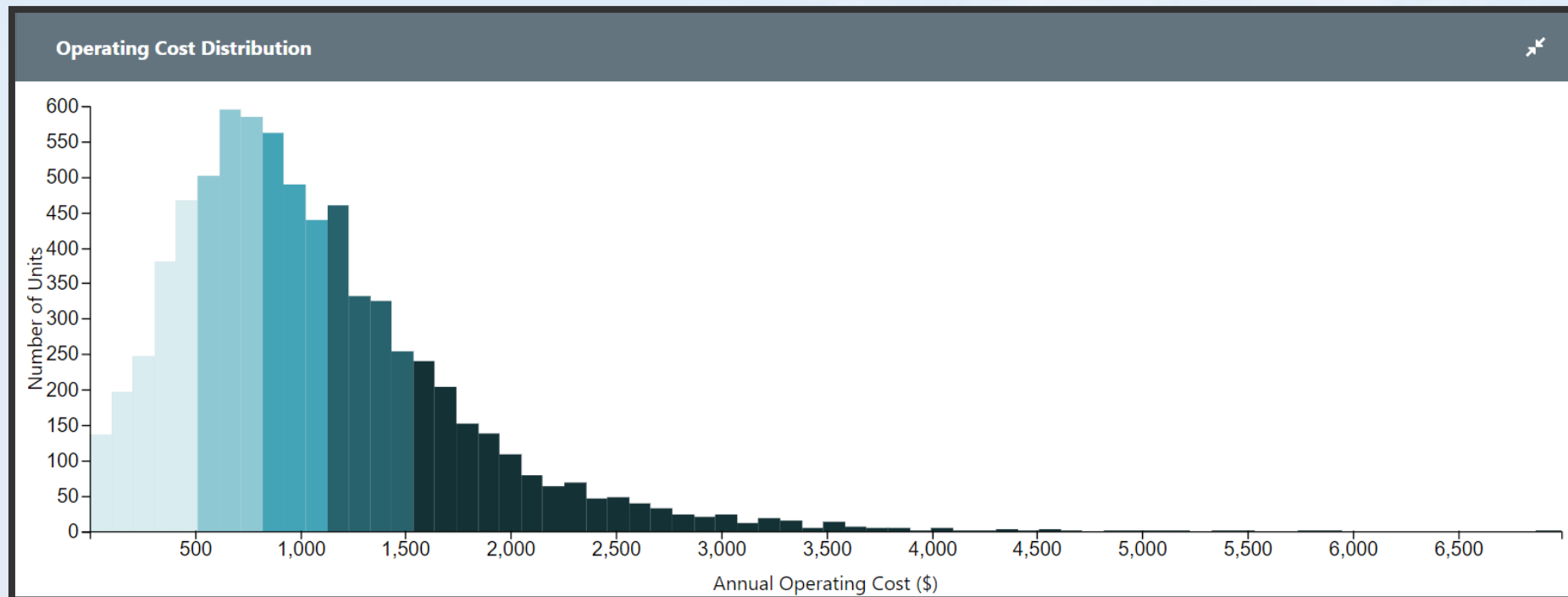
In order for water-source heat pumps to be Energy Star rated they must meet or exceed the minimum efficiency requirements listed below. Tier 3 represents the current minimum efficiency water source heat pumps must have in order to be Energy Star rated.

Tier 3: 1/1/2012 - No Effective End Date Published

Water-to-Air	EER	COP
Ground Loop	17.1	3.6
Ground Water	21.1	4.1
Water-to-Water		
Ground Loop	16.1	3.1
Ground Water	20.1	3.5

GSHP DATA

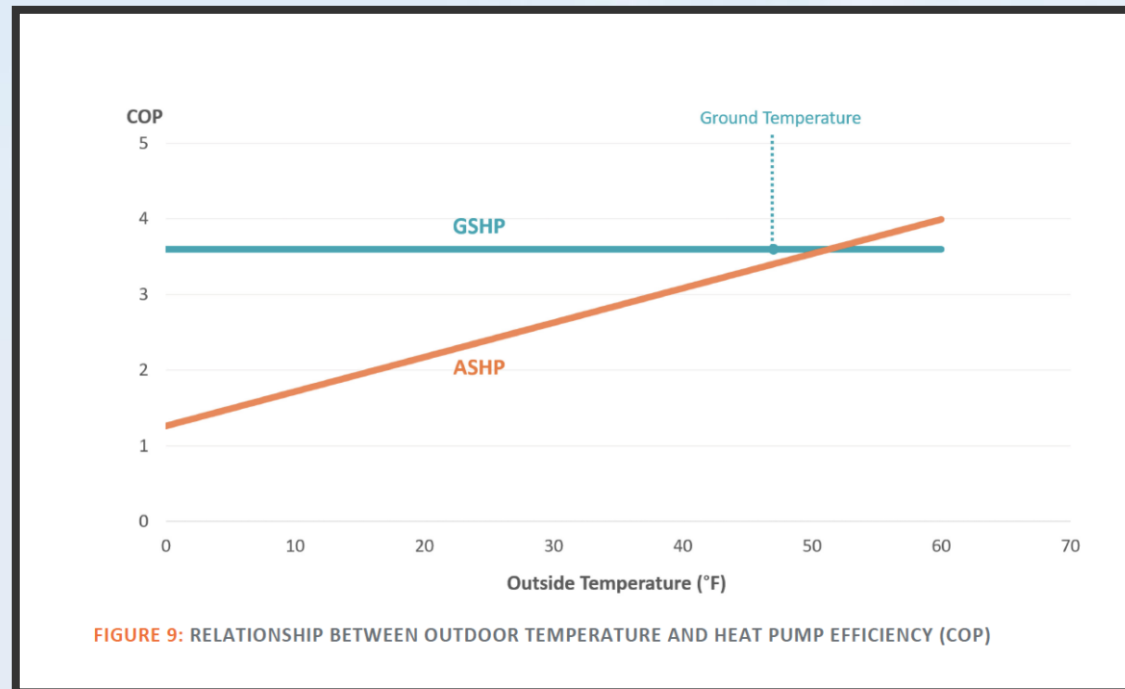
The installed system performance lines up with rated efficiencies when we look at the data. Below is a cost distribution for systems modeled at \$0.20/kWh. **The average geothermal system in MA operates at \$840/year.**



Source: WaterFurnace Symphony Insight

GSHP EFFECT ON THE GRID

As fossil fuel heating and domestic water systems are changed to heat pumps, we will see a change from a July air conditioning peak to a January heating peak between 6am-8am. Since GSHPs are located inside buildings in conditioned space and are not influenced by outdoor seasonal temperatures, they offer the highest efficiency and peak load reduction benefit.



Source: *The Brattle Group, Heating Sector Transformation in Rhode Island: Pathways to Decarbonization by 2050*

[Link to the Brattle Group Report](#)

PEAK LOAD IMPACT

GSHP have the benefit of adding to the base electric load, reducing the summer peak while having the lowest impact on the heating peak of all heat pump technologies. Forecasting models have shown that with aggressive heating sector decarbonization, we could be reaching a winter peak as early as 2035¹. If GSHP are not part of the solution, we can foresee an increase in electric rates.

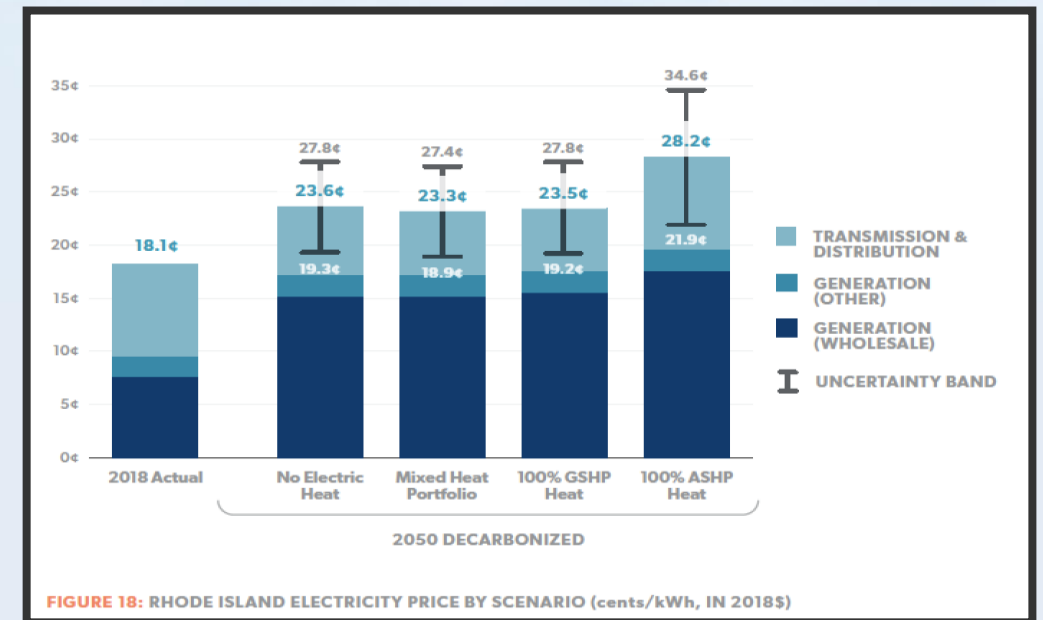
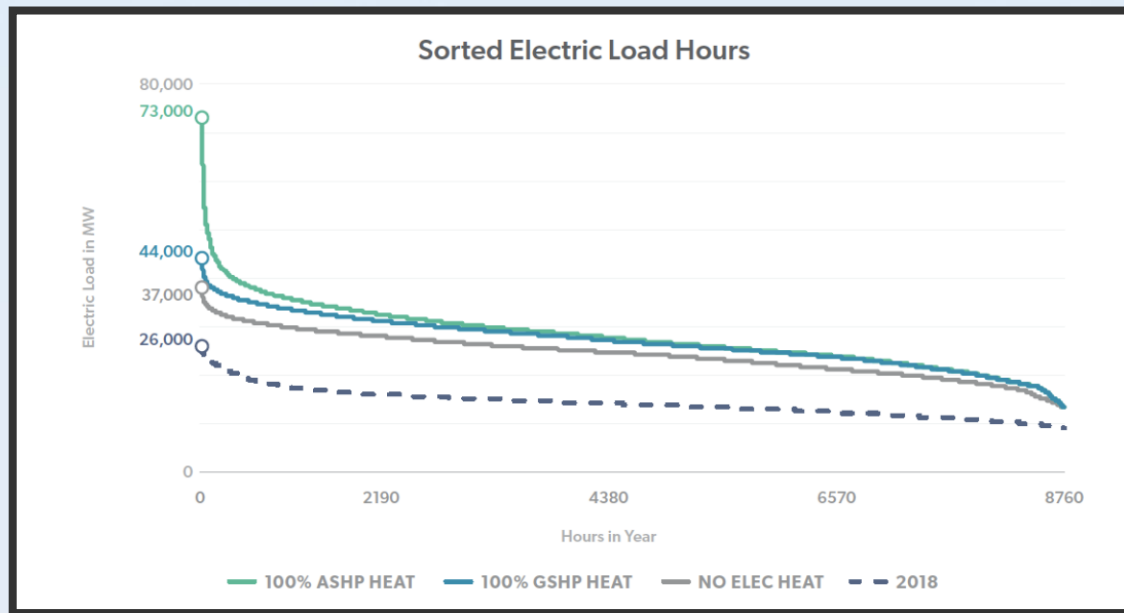


FIGURE 18: RHODE ISLAND ELECTRICITY PRICE BY SCENARIO (cents/kWh, IN 2018\$)

Source: The Brattle Group, Heating Sector Transformation in Rhode Island: Pathways to Decarbonization by 2050

[Link to the Brattle Group Report](#)

1: New York ISO Climate Change Impact Study Phase 1: Long-Term Load Impact (Dec 2019)

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