**August 10, 2023 GMAC Meeting Public Comments**

***Written Comments Submitted in Advance to MA-GMAC@mass.gov***

---

**Submitted Comments**

1. Heather Deese, Senior Director of Policy & Regulatory Affairs for Dandelion Energy (hdeese@dandelionenergy.com) - Received 8/11/23

August 10, 2023

Commissioner Elizabeth Mahony
Department of Energy Resources
Chairperson
Grid Modernization Advisory Committee
100 Cambridge Street
9th Floor
Boston, MA 02114

**Subject: Dandelion Energy Comments to the Grid Modernization Advisory Council**

Thank you for the opportunity to provide comments to inform the work of the Grid Modernization Advisory Council (GMAC). Dandelion is the nation's leading installer of home geothermal heating and cooling. We are a team of 250 people, two-thirds of whom are in the field everyday installing geothermal ground loops and heat pumps for our customers in New York, Connecticut, and Massachusetts.

Geothermal (ground source) heat pumps use a buried closed loop of fluid-filled plastic piping to move heat from the ground into a home during the winter, and move heat from the home into the ground in the summer to provide air conditioning. Ground Source heat pumps provide key climate and efficiency benefits:

- They decrease energy usage for space conditioning in a typical home by 75-80%; and

- They also meet the full heating needs of buildings, even in the coldest climates; so there is no need for dual fuel systems. The ground loop is designed to provide all of the thermal energy needed.

In terms of this Council's charge to advise on the future of the Commonwealth's electric grid, ground source heat pumps can provide multiple benefits in electrifying the building sector with minimal impact on the grid. As a result of accessing the ground as a heat source and sink, geothermal heat pumps are about two times as efficient, and use about half the electricity, as an air source heat pump system on an annual basis. Geothermal heat pumps will also draw a peak load of only one quarter to one third of an air source heat pump system on the coldest winter days.

For example, for a retrofit using a central heat pump for a typical home in Bedford, MA:

- Ground source requires 8,000 kWh/year compared to 18,000 kWh/year for air source, saving 10,000 kWh/year;
- Ground source has a peak load of 3.7 kW compared to 12.7 kW for air source, a decreasing peak usage by 9 kW;

In other words, for every 1,000 homes that have ground source instead of air source heat pumps, that's a 9MW of peak load savings.

| Table 1: Heat Pump Load Comparisons, Bedford MA, 2,500 sq ft | | | | |
|---|---|---|---|---|
| | **GSHP** | **High Efficiency Central ASHP (HSPF-9)** | **GSHP % of ASHP** | **GSHP Savings** |
| **Peak electric demand** | 3.69 kW | 12.65 Kw | 29% | 8.96 kW |
| **Annual electricity use** | 8,262 kWh | 18,345 kWh | 45% | 10,082 kWh |
| **Annual operating cost** | $2,313 | $5,136 | 45% | $2,823 |

Because they increase electric demand without meaningfully increasing peaks or requiring new electric grid infrastructure, ground source heat pumps allow utilities to spread costs and reduce electricity rates for all rate-payers. In New York, these grid benefits have been assessed at $7,000 that accrues to all other rate-payers from each residential system that is installed.[1]

These grid benefits have been analyzed and reported by respected independent experts. For example, RMI released a report earlier this year that found that "geothermal heat pumps use about 80 percent less energy annually than industry-standard fossil fuel furnaces to heat homes in the Midwest. They use four times less electricity on the most extreme cold days than air-source heat pumps and can support limiting peak demand on the utility system during cold snaps or heat waves."[2]

[1] *New Efficiency: New York, Analysis of Residential Heat Pump Potential and Economics*, NYSERDA, January 2019, p., S-3, https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/PPSER/NYSERDA/18-44-HeatPump.pdf

[2] Clean Energy 101: Geothermal Heat Pumps, RMI, March 29, 2023, accessed August 10, 2023, https://rmi.org/clean-energy-101-geothermal-heat-pumps/

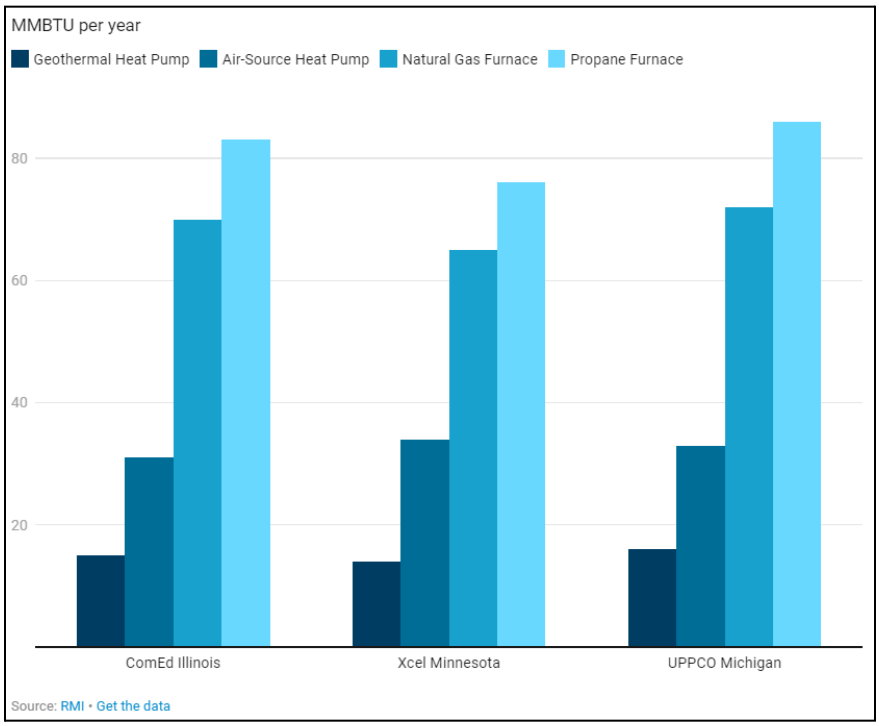


**Figure 1: RMI Analysis of Heat Pump Annual Energy Demand**

Similarly, a Brattle Group study for Rhode Island found that fully electrifying New England using geothermal heat pumps would only minimally impact peak demand and leave energy prices unchanged. This is in contrast to full electrification using air source heat pumps, which would increase peak demand by 94% and lead to "materially higher electricity prices".[3]

Given these benefits, geothermal heating and cooling should play a major role in beneficial electrification for Massachusetts in order to minimize the total generation capacity needed in the future. Multiple studies have shown that one in every four heat pumps installed should be geothermal to help minimize grid infrastructure costs.[4] The Massachusetts Department of Environmental Protection (MassDEP) highlights that the Commonwealth will require approximately 100,000 residential heat pump installations

[3] Heating Sector Transformation in Rhode Island: Pathways to Decarbonization by 2050, The Brattle Group, p. 30-31, https://energy.ri.gov/sites/g/files/xkgbur741/files/documents/HST/RI-HST-Final-Pathways-Report-5-27-20.pdf

[4] The Brattle Group study for Rhode Island modeled 33% of heat pumps as geothermal in their mixed-fuel scenario analysis. The New York Climate Action Council Scoping Plan modeled 22-23% of heat pumps as geothermal heat pumps (see Scoping Plan, Appendix G: Integration Analysis Technical Supplement, Annex 2: Key Drivers and Outputs, December 2021, https://climate.ny.gov/resources/scoping-plan/) and the 2019 Department of Energy GeoVision analysis identified market potential for 28 million geothermal heat pumps installed by 2050 (see https://www.energy.gov/eere/geothermal/geovision).

per year to meet its emissions reduction targets[5] — 25,000 of those should therefore be geothermal heat pumps to help optimize for grid investments and energy efficiency savings.

We encourage the Council to work with the electric distribution companies on incorporating a significant percentage of ground source heat pumps into their 5- and 10-year forecasts and into their assessments of demand through 2050. Thank you for the opportunity to engage with the important work of the GMAC.

Respectfully submitted,

Heather E. Deese
Senior Director, Policy and Regulatory Affairs
Dandelion Energy

[5] Clean Heat Standard Program Design, MassDEP, March 2023, p. 4, https://www.mass.gov/doc/clean-heat-standard-discussion-document/download