



August 12, 2022

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**100 Cambridge Street, Suite 1020**  
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**Subject: Building Code Comments from GeoExchange and Dandelion Energy**

Thank you for the opportunity to comment on the Massachusetts draft Stretch Energy Code ("Stretch Code") and Specialized Municipal Opt-in Code ("Specialized Code"). The Geothermal Exchange Organization ("GeoExchange") and Dandelion Energy support the development of the Stretch Code and Specialized Code as critical pathways towards achieving the building decarbonization and emissions reductions requirements of the 2021 Climate Act.<sup>1</sup> GeoExchange is a non-profit trade association promoting maximum, sustainable growth of the geothermal heat pump industry through advocacy, partnerships, public outreach, and promotion of quality standards. Dandelion is one of the nation's leading providers of home geothermal heating and cooling systems, with a mission to make geothermal heat pumps so inexpensive and easy to install that we enable a widespread shift from fossil heating to renewables.

The Stretch and Specialized codes drafted by the Department of Energy Resources (DOER) provide strong support for building electrification, while still allowing construction design flexibility through multiple pathways. We encourage the Commonwealth to support the adoption of the Stretch Code and Specialized Code through dedicated funding and incentives, and recommend the DOER update the draft codes to better account for the system-wide benefits of geothermal heat pumps (GHP).

**Summary of Comments:**

1. Massachusetts should further promote and encourage geothermal heating and cooling systems in new construction to account for the system-wide grid benefits and savings of geothermal.
2. Sustaining and enhancing financial incentives will be essential in ensuring robust and effective implementation of the Stretch Code and Specialized Code.
3. The Stretch Code should incentivize homeowners to switch to energy efficient heating options such as geothermal heat pumps during alterations and additions.

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<sup>1</sup> "An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy," Senate Bill 9, March 26, 2021.

## **Full Comments and Recommendations:**

### **Benefits of Geothermal Heating and Cooling Systems**

Geothermal heat pump systems have a critical role to play in decarbonizing the building sector and transitioning to an economy run on clean energy, as geothermal is among the **most efficient** ways to heat and cool buildings, according to the U.S. Environmental Protection Agency.<sup>2</sup> It is also the **lowest cost** way for homeowners to heat and cool their homes. As such, geothermal heat pumps represent a key technology for advancing energy affordability and value, supporting the growth of the green economy, and achieving economy-wide decarbonization without meaningfully increasing peak demand. Massachusetts is already a national leader in supporting a robust geothermal market with the MassSave incentive program. The state could, and should, do more to encourage adoption of geothermal heat pumps through the updated stretch code and specialized opt-in code.

Geothermal heat pump systems have the potential to reduce carbon emissions from MA homes by 80% as compared to conventional fuel oil systems and 65% as compared to conventional propane systems,<sup>3</sup> and will typically reduce the Home Energy Rating Score (HERS) for new construction by five points or more when compared to natural gas alternatives. Residents will typically see a 40-50% reduction in total annual energy costs when switching to a geothermal heating and cooling system – factoring in both their savings in fuel and A/C costs they are no longer paying, and the electricity costs to run the heat pump. The majority of Dandelion’s customers finance their geothermal system, and by doing so they can save money from day one as compared to their previous energy bills. While operating costs are low, the upfront installation cost of geothermal presents a barrier to many homeowners.

Geothermal heat pumps also **offer significant grid benefits**; they increase baseload demand, decrease summer peaks, and don’t meaningfully increase winter peaks. This is in contrast to technologies like air source heat pumps, which provide electrification benefits, but also increase peak demand. A study by the Brattle Group found that fully electrifying New England using geothermal heat pumps would only minimally impact peak demand and leave energy prices unchanged.<sup>4</sup> Sensitivity analysis conducted for the New York State Climate Action Council calculated **over \$10 billion in net benefits** by maximizing the use of ground source heat pumps and district heating vs. air source heat pumps. This included a 2.8% decrease in annual electric loads and **a 10.8% decrease in peak electric loads**, yielding significant savings in avoided electric

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<sup>2</sup> “Geothermal Heat Pumps,” Energy Star, U.S. Environmental Protection Agency, accessed June 29, 2022, [https://www.energystar.gov/products/geothermal\\_heat\\_pumps](https://www.energystar.gov/products/geothermal_heat_pumps)

<sup>3</sup> Savings calculated by Dandelion and available on Dandelion’s website: <https://dandelionenergy.com/environmental-impact>

<sup>4</sup> The Brattle Group, Heating Sector Transformation in Rhode Island: Pathways to Decarbonization by 2050, Pages 30-31, <https://www.brattle.com/reports/heating-sector-transformation-in-rhode-island>

infrastructure costs. The analysis highlights that these calculations may shift due to changes in the cost of heat pump technologies and evolution of heat pump performance, so the true benefits may be even greater.<sup>5</sup>

The increased baseload demand provided by geothermal heat pumps also generates additional savings for other electric rate-payers. Geothermal heat pumps increase electric demand without increasing peaks or requiring new electric grid infrastructure, allowing utilities to spread infrastructure costs and reduce electricity rates for all rate-payers. Geothermal systems therefore have the added benefit of effectively underwriting the electric usage of other electric customers and reducing overall costs for all consumers. This is in contrast to other renewable technologies which can reduce overall grid demand and leave other rate-payers, particularly low- and moderate-income households, footing the infrastructure bill to sustain the grid.

## Energy Efficiency and Building Electrification

GeoExchange and Dandelion applaud Massachusetts' incorporation of the International Energy Conservation Code (IECC) 2021 as the basis for its draft building energy codes; by rapidly adopting new IECC code releases, Massachusetts is taking a leading role in supporting energy efficiency and building decarbonization within the construction sector.

We further support the inclusion of multiple pathways to achieve Stretch Code and Specialized Code compliance, as these pathways provide flexibility for home builders and contractors in meeting the code requirements at the lowest overall cost to the homeowner.

1. Massachusetts should further promote and encourage geothermal heating and cooling systems in new construction to account for the system-wide grid benefits and savings of geothermal.

GeoExchange and Dandelion support the various compliance pathways such as the Home Energy Rating Score (HERS), Passive House, and Thermal Energy Demand Intensity (TEDI) requirements in the Stretch Code and Specialized Code. **Compared to natural gas heating and homes with air source heat pumps and propane back-up, geothermal systems can provide five or more HERS points reduction for standard single family homes**, and offer the most efficient option for heating and cooling buildings. Installing a geothermal system during new construction can provide significant savings on the installation costs, and ensures that the energy savings are built into the home from day one. These factors make geothermal a prime choice to meet the Stretch Code and Specialized Code energy efficiency requirements for new construction.

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<sup>5</sup> New York State Climate Action Council Draft Scoping Plan, Appendix G, Integration Analysis Technical Supplement, p. 80, December 2021.

While the HERS and TEDI scores account for the direct efficiency savings of geothermal systems, they do not fully account for the indirect system-wide benefits that geothermal heat pumps also provide. While some home electrification measures, such as air source heat pumps, can significantly increase electric demand during summer and winter peaks, geothermal heat pumps utilize consistent ground temperatures to maximize efficiency and significantly lower peak demand. In addition to the long term efficiency savings reflected in the HERS and TEDI score, geothermal heat pumps therefore provide significant society-wide savings in avoided costs to the overall electric grid. To account for these system-wide benefits, Massachusetts should further promote and encourage geothermal heating and cooling systems in new construction as described below.

2. Sustaining and enhancing financial incentives will be essential in ensuring robust and effective implementation of the Stretch Code and Specialized Code.

The MassSave incentive program has demonstrated significant success in motivating homeowners to invest personal funds, supported by utility and federal incentives, to decarbonize their homes. Sustaining and expanding electrification and energy efficiency incentives for new construction will be essential in ensuring that new home construction can meet the significant demand for more housing stock in Massachusetts while also increasing energy efficiency to meet code requirements. The **MassSave program currently offers dedicated rebates to geothermal heat pumps in retrofits of existing buildings, but not for new construction.** States such as New York, Illinois, and Vermont offer prescriptive rebates for geothermal heat pumps in new construction, and **extending the MassSave prescriptive geothermal heat pump rebate to new construction** would support the electrification of new buildings, align incentives and up-front costs for homebuilders and contractors, and maximize efficiency through geothermal heating and cooling.

Incentives for geothermal heat pumps and energy efficiency measures are particularly important for new construction; while the Stretch Code and Specialized Code set important goals for new construction efficiency, builders nevertheless do not benefit from the long-term operating cost savings and are potentially less motivated to pay higher up-front cost for the most efficient equipment. Homeowners often have less visibility into the long-term potential savings during the homebuying process, and programs to increase the efficiency of new homes will ultimately provide the greatest benefits to Massachusetts homeowners and residents.

While the Specialized Code requires, at a minimum, pre-wiring for future electrification, installing a geothermal system in an existing home is more complex than other electrification steps. New construction is therefore the optimal time to install a geothermal system, minimizing disruption to homeowner heating and cooling and reducing overall costs.

Given long-term natural gas price uncertainty and broader policy trends, fossil fuel burning equipment installed today may also need to be replaced before the end of its useful service life. Gas price volatility, gas infrastructure supply constraints, and future Stretch Code and Specialized Code updates and legislation can all impact the future availability of natural gas, potentially leaving homeowners with the cost burden of a stranded asset in their otherwise modern and efficient home. Decisions made by home builders today will lock-in energy usage for many decades to come, and **strong building codes coupled with supporting incentives** provide an ideal opportunity to ensure adoption of the most efficient systems for heating and cooling new homes.

3. The Stretch Code should incentivize homeowners to switch to energy efficient heating options such as geothermal heat pumps during alterations and additions.

While electrifying new construction plays an important role in building decarbonization, the majority of buildings that will be in operation in 2050 have already been built, and retrofits and alterations will also play a key role in reducing emissions from the building sector. GeoExchange and Dandelion support the requirements within the Stretch Code for alterations and additions to meet more stringent energy efficiency standards than required by the base code. We further recommend that the Stretch Code should credit homes with geothermal heat pumps using the same methodology as for those with solar electric generation.

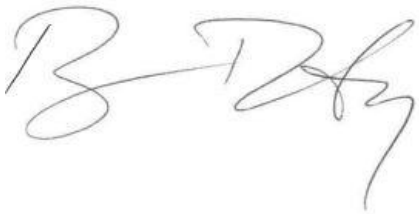
| Recommended Maximum HERS Index Score - Additions and Alterations |                                   |                     |                      |
|--|-----------------------------------|---------------------|----------------------|
| Home Energy Source   | Recommendation for Stretch Code   | Draft Stretch Code  | Current Stretch Code |
| Fossil fuel use in home  | 52 - No solar <i>or</i> GHP       | 52 - No solar       | 65 - No solar        |
|  | 55 - Includes solar <i>or</i> GHP | 55 - Includes solar | 70 - Includes solar  |
| All-electric   | 55 - No solar <i>or</i> GHP       | 55 - No solar       | 70 - No solar        |
|  | 58 - Includes solar <i>or</i> GHP | 58 - Includes solar | 75 - Includes solar  |

Renovations and additions present a significant opportunity for many homeowners to perform energy efficiency improvements, and including geothermal heat pumps as an additional category of incentivized clean energy system will further spur building decarbonization through retrofit activities.

## Conclusion

GeoExchange and Dandelion support the Stretch and Specialized codes, as they promote building electrification while still allowing construction design flexibility through multiple pathways. The DOER should ensure that expanded new construction incentives are available to support homebuilders and homeowners in meeting the requirements of the Stretch Code and Specialized Code, and should update the draft codes to fully account for the system-wide benefits of geothermal heating and cooling.

Respectfully submitted,

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Organization

A handwritten signature in black ink, appearing to read 'H. Deese' with a stylized flourish at the end.

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