

Future Energy Systems Center

System impacts of decarbonization pathways for space heating in cold climates

Project Highlights

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Project motivation and objectives

Motivation

- Residential emissions are 26% of total in New England[1]
- Decarbonizing heat by electrification is essential
- State electrification plans are ambitious
- Stakeholder concerns for system impacts are high, especially in cold climates



Air-source heat pumps will be common method of electrification
(Leon Neal / Getty Images)

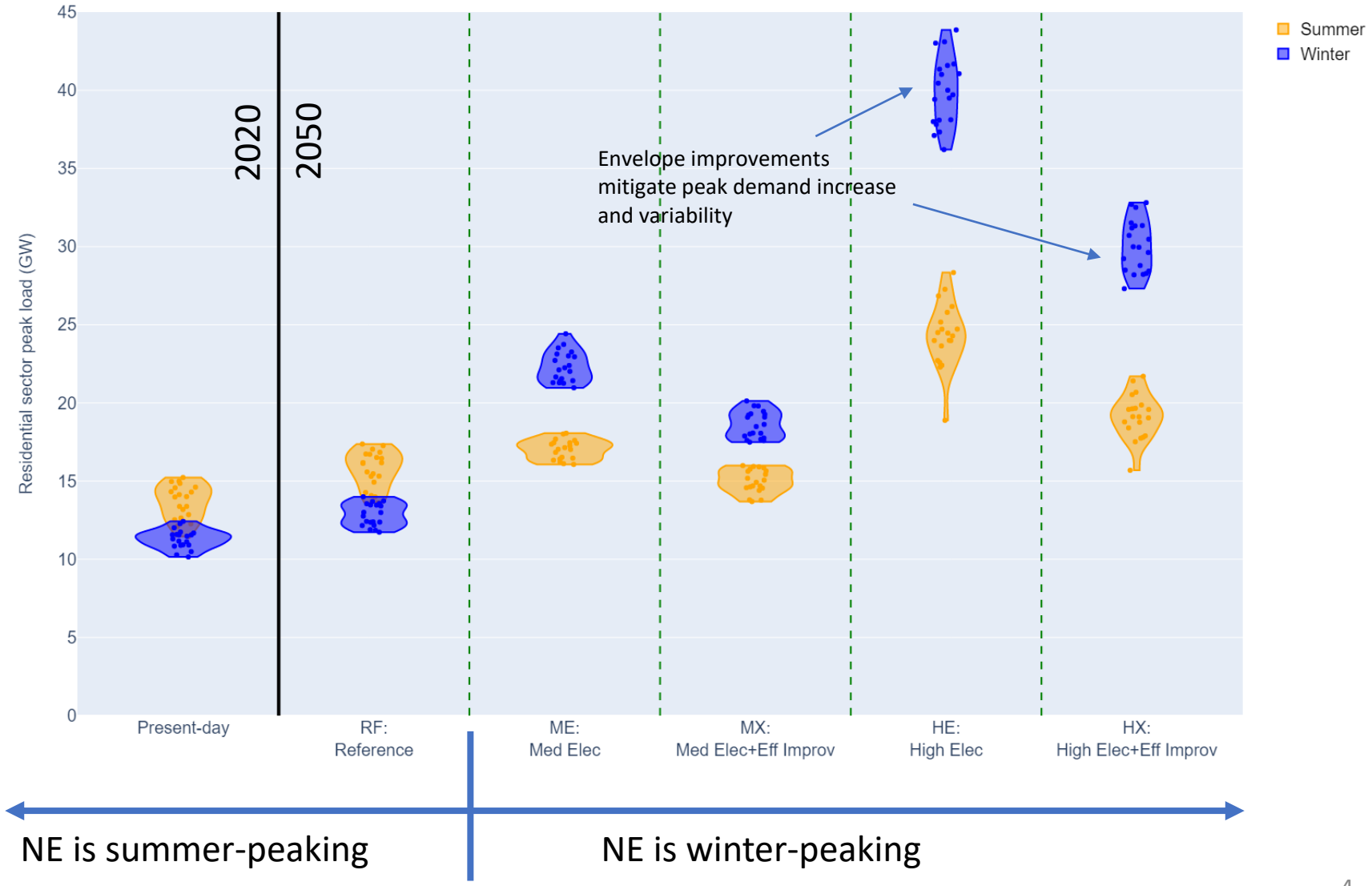
1. Calculated from EIA emissions data for 2019

Objectives

- **What are the regional demand-side effects of residential heat electrification under various adoption scenarios?**
- **How are these impacts sensitive to weather?**
- **What are the implications for power-gas systems?**

Results and Takeaways for 2050 - Demand

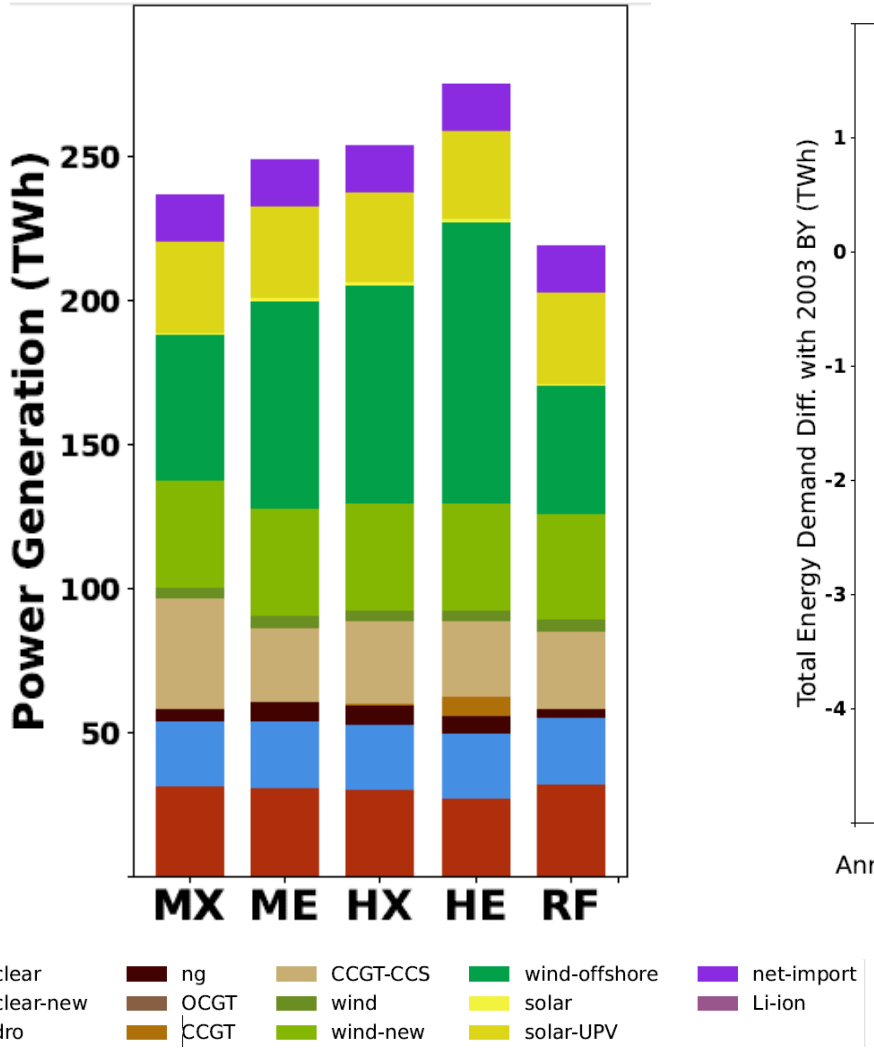
- Demand increase is significant
- Weather-related uncertainty increases with deep electrification

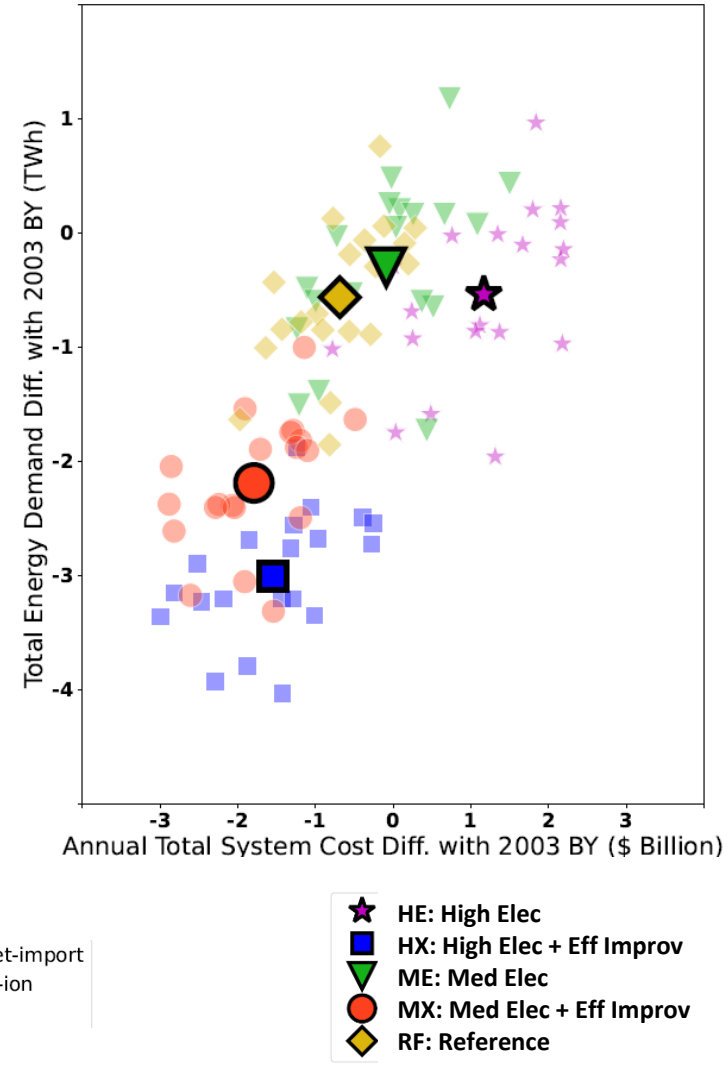


Preliminary results - do not disclose or distribute

Results and Takeaways for 2050 - 80% GHG reduction

- As electrification increases, optimal system relies more on offshore wind and keeps low-carbon firm resources for peaking
- Bulk power-gas system costs for high electrification can be comparable to less aggressive electrification
- Envelope improvements are essential





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