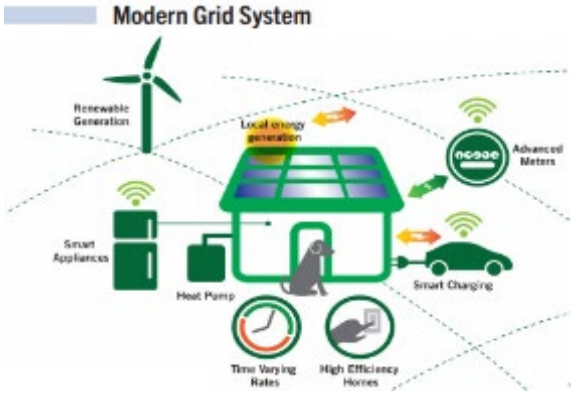
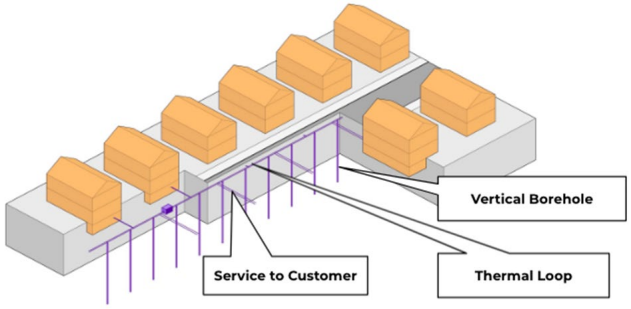
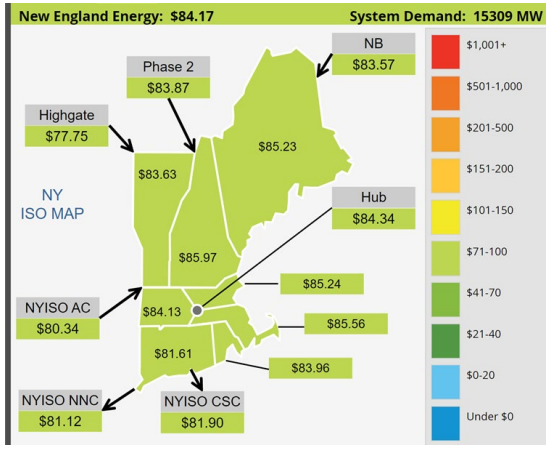
MIT MANAGEMENT

Better Rates for:

Thermal Electrification, Climate, and the Grid



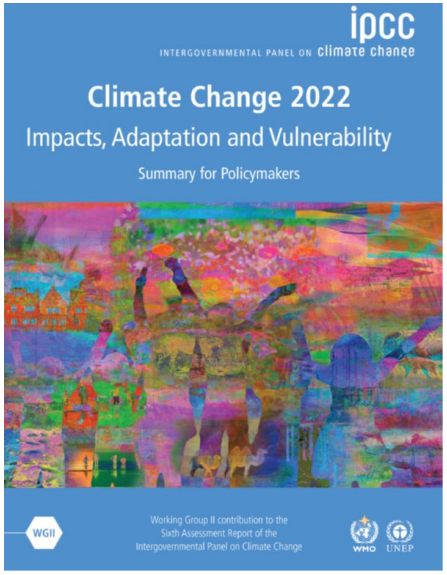




Harvey Michaels
Faculty MIT Sloan Sustainability/System Dynamics Program
Director Clean Heat Transition Project
Affiliate Environmental Solutions Initiative

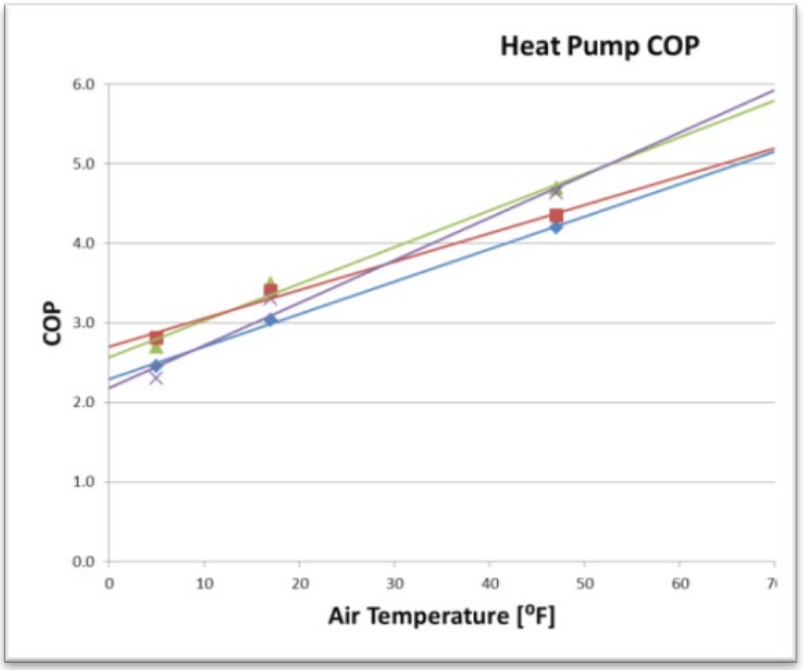
Presented to Restructuring Roundtable March 24, 2023

Building energy → the toughest leg on the Climate Solution Journey



NE Heat Pumps are Necessary + Challenging

Happening → But Not Fast Enough



- **Incentives up to $10,000 per home, plus $2000+ IRA**
- **Small electric rate discounts.**
- **Advisory support**
- **Product screening.**

MIT Clean Heat Transition Project:

John Sterman,
MIT Sloan

En-ROADS –

MIT Climate
Pathways Project

- **Goal: Policy and Business Strategies to *Accelerate Heat Decarbonization.***
  - **Massachusetts and New England as First Case.**
  - **4-5% Heat Pump adoption by 2025; current 1% (ME 5%).**
  - **Thermal efficiency is also important.**

- **Concerns (work in progress):**
  - **Rates: Heat pumps more expensive than gas heat < +/- 35F**

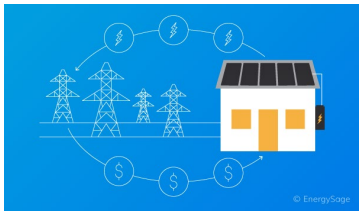
    But Rates higher than True Cost +/- 95% of the time: Energy and T&D
  - **Grid: Heat pumps add 5KW/home to winter grid peak;**

    1 kw available. 20% adoption barrier (5 years)
  - **Equity: Incentives may be *Unaffordable; Inequitable* at scale.**

- **Opportunity: Most Heat Pump homes also have fossil heat – AC-driven demand.**
  - **But not Deep Retrofit, New Homes, Geothermal – *low grid impact.***
  - **Workable with Grid at Scale *if off during Demand Peaks.***
  - **Lower winter emissions (if 85%+ HP)**
  - **Lower operating cost potentially – *much lower true cost.***

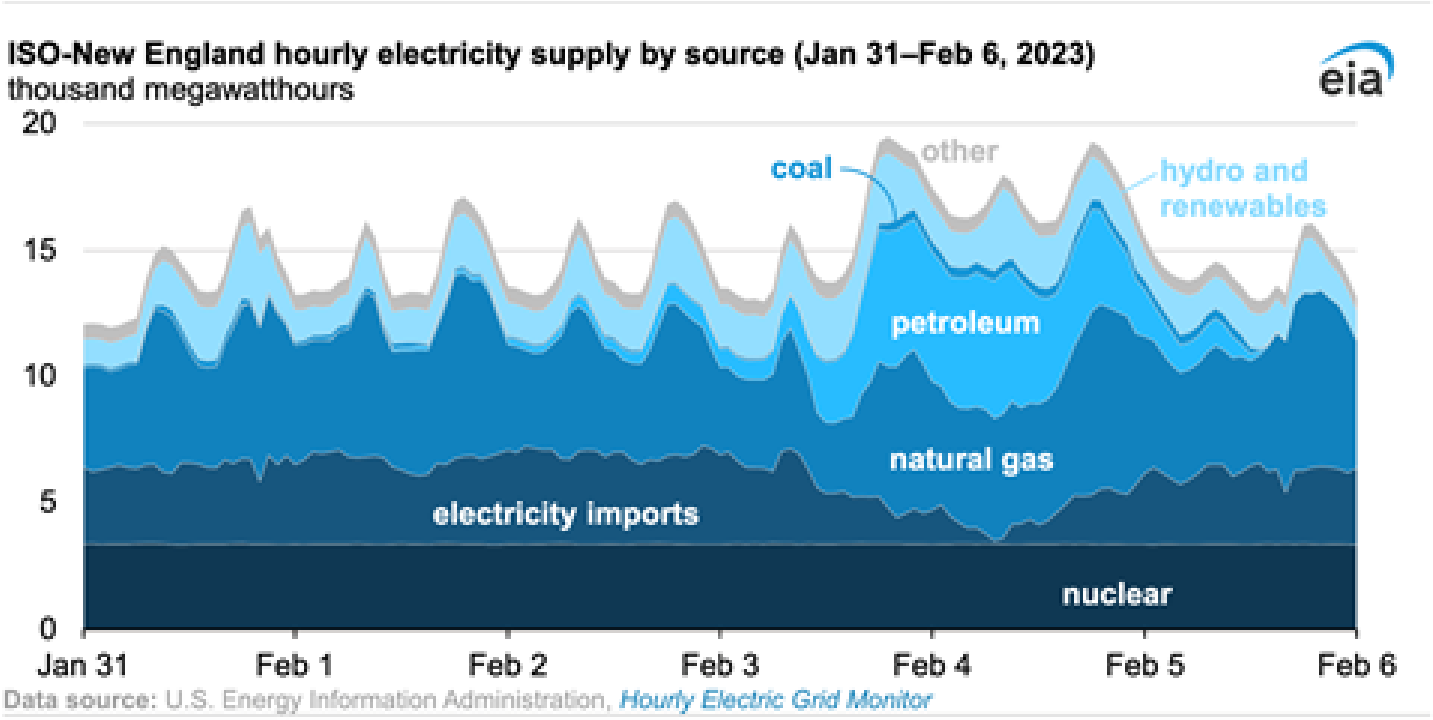
The benefits of *Demand Response* programs:

(a.k.a. *Virtual Peak Power*, or *Flexible Load*)



- Lower demand/lower price
- Flatten load profile reducing costly generation + emissions.
- Reduce generator market power
- Enhance reliability
- Support renewable power intermittancy

EVERSOURCE
CONNECTEDSOLUTIONS



For climate, we need electric prices/rates to heat pumps…

- For adoption: …to be lower than gas heat, *almost all winter, below 40F.*
- For cost equity: …not higher/lower than they need to be.
  - *But they are higher* +/- 95% of the time – both Energy and T&D.
  - *Also too low* on the remaining hours:
    approx. 6-9 AM, 6-9 PM, coldest days. (not always)

How? Restructure electric rates – *let's consider:*

- Cost-based Reduction to 95% of Winter HP Hours: <40F; *IoT/AI enabled*
- Expand Connected Solutions DR to Winter HP – Winter ICAP
  - Help retail electric industry + communities/CCA's find elegant solutions?
- Pay for Mass Save with a carbon tax on gas/oil:
  - *not electric (as now) – at least on electrification.* *Clean Heat Standard*

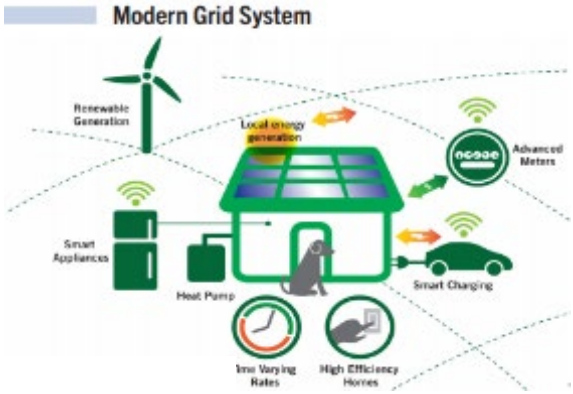
Also - Site-stored renewable fuels, thermal storage tech,
Neighborhood geothermal loops/ GeoGrids

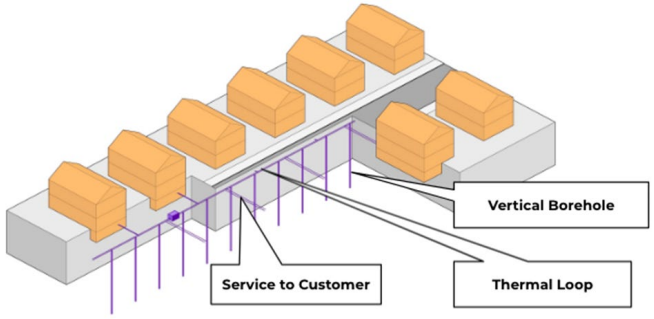
heet MA

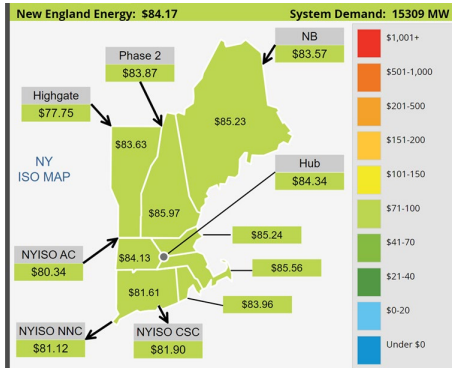
March 24, 2023

Thermal Electrification, Climate, and the Grid

I Wonder; What If; Let's Try!







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