Grid Impact Considerations

New Jersey Resources

Zero Energy Building Collaborative
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Balancing Act to Lower Emissions

Guidance from The Regualtory Assistance Project (RAP)

For electrification to be considered beneficial, it must meet one or more of the following conditions without adversely affecting the other two:

1. Save consumers money over the long run
2. Enable better grid management
3. Reduces negative environmental impacts

Lowering Emissions

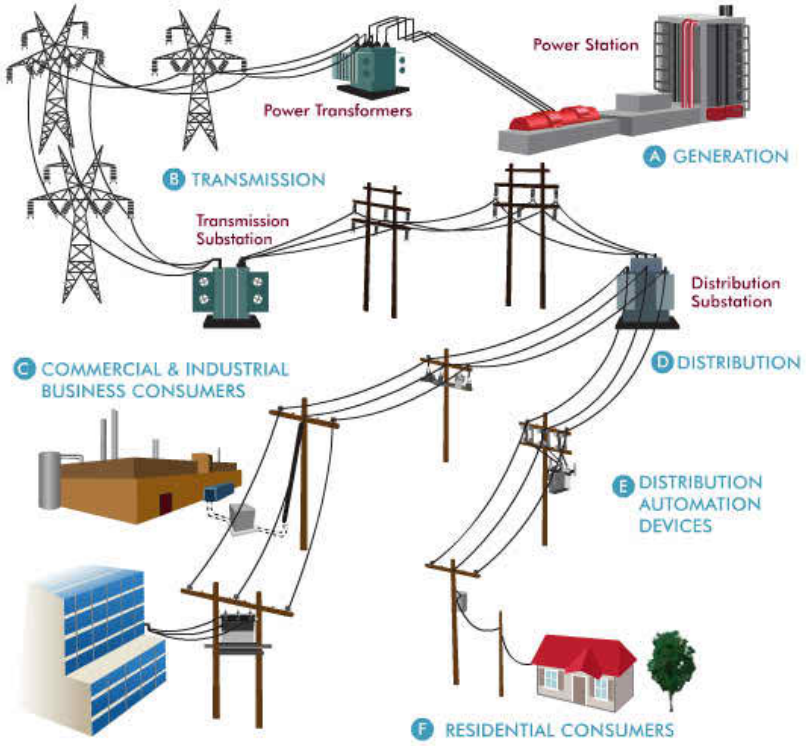
- Energy Efficiency
- Renewable Energy

Increasing Emissions

- Increasing electric load faster than cleaning the grid
- New building load

Considerations of Additional Electric Load

- Reality of PJM markets- how will the additional electric be generated.
  - What are the emissions?
  - What is the cost?
- Reality of EDC distribution system
  - Can it handle the load for each or do you need incremental investment
  - Challenges of siting new infrastructure



Look at incremental impacts not average

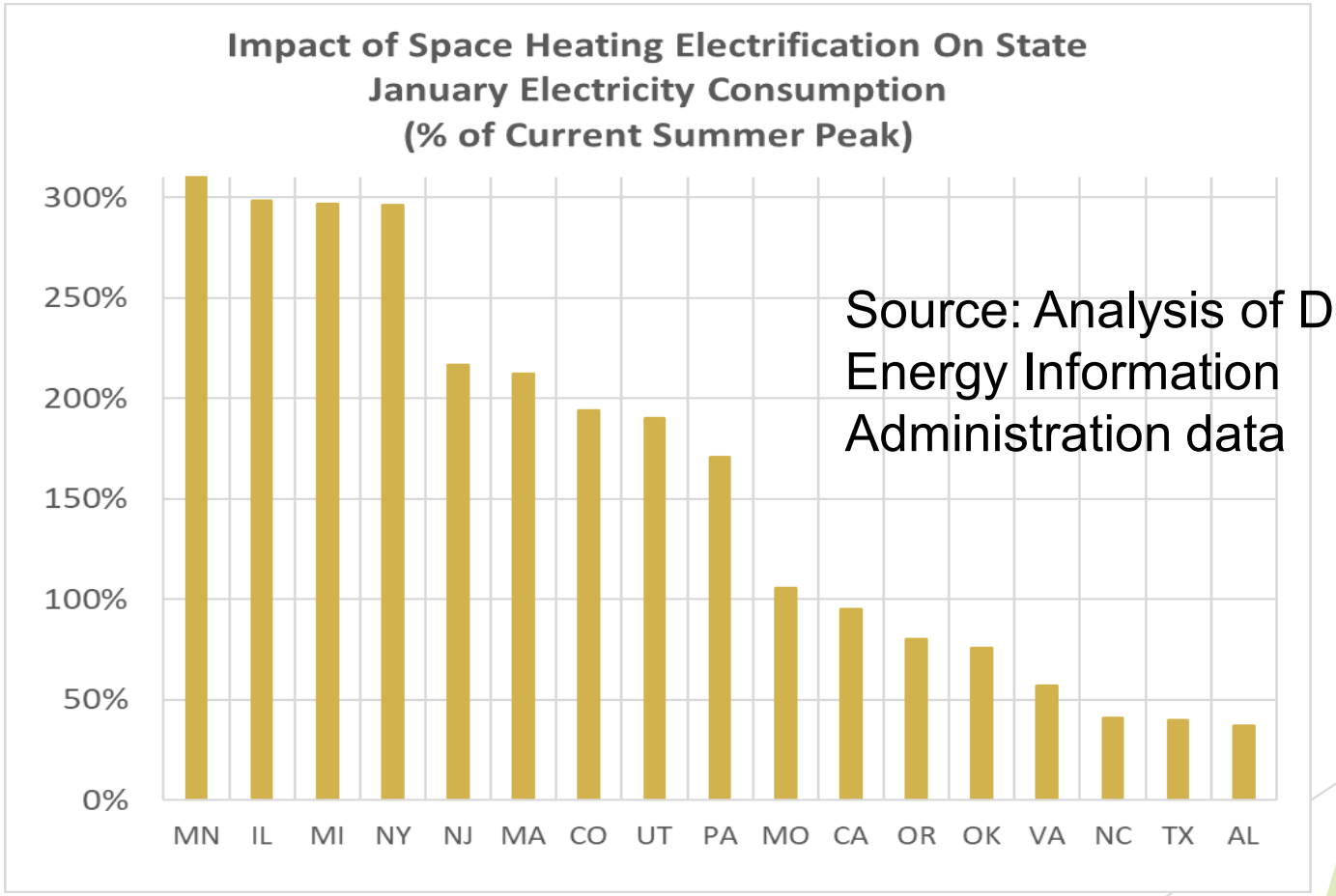
Key Considerations for the Analysis

- Must focus on Peak Day - Not average load-
  - Assumptions on efficiency of electric heat pumps on those Peak Day
- Can't look at average emissions- marginal because it's incremental load
- Role of storage
- What baselines are you comparing it against?
  - standard gas furnace
  - high efficiency furnace
  - natural gas heat pump
- Include strategies that lower gas distribution system emissions

Must do the math and consider all options that help achieve the goals related to lowering emissions, minimizing cost and maintaining reliability

Key Considerations

What if the grid isn't ready?



Source: Analysis of DOE Energy Information Administration data

Natural Gas Heat Pumps

- Primary advantage of THPs is >40% reduction in gas consumption over baselineStudies indicate >1.20 UEF, >140% AFUE feasible*
- Better retention of capacity, efficiency in cold climates**

- Add'l benefits include,typically: Combustion outdoors or sealed, no IAQ concern
- Climate-friendly natural refrigerants (NH3, CO2)
- Multi-function appliance w/ heat recovery

- Key piece in **thermal load decarbonization** puzzle Address low-hanging fruit with system losses, conservation
- THP partial/full retrofit (e.g. GAHP)
- Low-carbon fuels (25% blend shown, higher blends are feasible)

*Glanville, P. et al. *Integrated Gas-fired Heat Pump Water Heaters for Homes: Results of Field Demonstrations and System Modeling*,ASHRAE Transactions . 2020, Vol. 126 Issue 1, p325-332

** Glanville, P. et al. *Demonstration and Simulation of Gas Heat Pump-Driven Residential Combination Space and Water Heating System Performance*,ASHRAE Transactions . 2019, Vol. 125 Issue 1, p264-272