Opportunities and Challenges in Transitioning to an Electric Heating and Transportation Sector

As a counter-narrative to the often-cited utility death spiral, the electrification of the heating and transportation sectors could present an opportunity for utilities and their private-sector counterparts to catalyze deep GHG reductions, reduce energy costs, and promote economic growth.

However, a number of challenging questions must be explored in this transition to greater electrification. This panel brings together utility, regulator, and private-sector stakeholders to explore a number of questions that must be resolved and initiatives that could be pursued, to allow future industry developments towards increased electrification.

Thank you to our generous sponsor!

Morgan Lewis
Panelists

Michael Haggerty
Senior Associate
The Brattle Group

Carine Dumit
Senior Policy Advisor
Tesla

Lauren Regan
Lead Analyst US
National Grid

David Farnsworth
Senior Associate
RAP

David Lis
Director of Market Strategies
NEEP
Panelists

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The Brattle Group

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Utility

nationalgrid
Northeast 80x50 Pathway
Northeast Emissions 1990-2015

Significant progress in the electric sector

Progress in heat

Backsliding in transport

In both NY and NE, the 2030 emissions gap alone is significantly larger than all 2015 emissions from the electric sector.

New England Economy-Wide CO₂ Emissions

<table>
<thead>
<tr>
<th>Year</th>
<th>Electric</th>
<th>Heat</th>
<th>Transport</th>
<th>2015</th>
<th>Gap to 2030 Goal</th>
<th>2030 Goal (-40%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>173</td>
<td>18</td>
<td>4</td>
<td>151</td>
<td>47</td>
<td>104</td>
</tr>
</tbody>
</table>

New York Economy-Wide CO₂ Emissions

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<th>2030 Goal (-40%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>209</td>
<td>35</td>
<td>8</td>
<td>168</td>
<td>43</td>
<td>125</td>
</tr>
</tbody>
</table>

All data from EIA 2017; Combustion emissions only; other GHGs total ~15%
Our 80x50 Pathway is ambitious and comprehensive, with implications for customers, communities, utilities, automakers, and policymakers.

<table>
<thead>
<tr>
<th>Category</th>
<th>40% x 2030</th>
<th>80% x 2050</th>
</tr>
</thead>
</table>
| **Power**  | - Ramp up renewable electricity deployment to achieve 67% zero-carbon electricity supply vs. 45% today | - Zero carbon electricity system  
- Increase large-scale renewables  
- Inter-seasonal energy storage  
- New clean electricity options (gas + CCS, modular nuclear) |
| **Transport** | - Reach more than 10 million light-duty electric vehicles on Northeast roads (50% of all light-duty vehicles) vs. < 75,000 today | - More than 20 million light-duty vehicles (100% of the fleet)  
- Low-carbon heavy duty, rail, and off-road transportation  
- Reductions in vehicle miles traveled |
| **Heat**   | - Double the rate of EE retrofits  
- Triple the rate of oil-to-gas heating conversions  
- Transform the oil-to-electric conversion market (10X scale up) | - Sustain thermal efficiency investment  
- Decarbonize natural gas supply for heating  
- Hybrid gas/electric heating |
Affordable Solutions for Decarbonization

1. Renewable Energy
2. Grid Modernization and Expansion
3. Efficiency & Demand Reduction
4. Transport Electrification
5. Reinforced Gas Distribution System
6. Low-carbon Heat

6 Solutions to Affordably Decarbonize
Panelists

David Farnsworth
Senior Associate
RAP
2016 Rhode Island Peak Energy Demand

Top 1% of hours = $23 million, or 9% of total spend

Top 10% of hours = $67 million, or 26% of total spend
Wind Curtailment Rate

Wind Penetration Rate

Note: Each year, the total reflects only those ISOs for which we have curtailment data.

Note: All curtailment percentages shown represent both forced and economic curtailment.
PJM’s 2012 curtailment estimate is for June through December only.

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Director of Market Strategies
NEEP
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Director of Market Strategies
NEEP
Northeast Energy Efficiency Partnerships

“Assist the Northeast and Mid-Atlantic region to reduce building sector energy consumption 3% per year and carbon emissions 40% by 2030 (relative to 2001)”

Mission
We seek to accelerate regional collaboration to promote advanced energy efficiency and related solutions in homes, buildings, industry, and communities.

Vision
We envision the region's homes, buildings, and communities transformed into efficient, affordable, low-carbon, resilient places to live, work, and play.

Approach
Drive market transformation regionally by fostering collaboration and innovation, developing tools, and disseminating knowledge.
Strategic Electrification Many Benefits
## Market Barriers to Strategic Electrification

<table>
<thead>
<tr>
<th>Awareness Barriers</th>
<th>Supply Chain Barriers</th>
<th>Economic Barriers</th>
<th>Technical &amp; Infrastructure Barriers</th>
<th>Policy &amp; Regulatory Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of consumer awareness/confidence</td>
<td>Insufficient contractor base</td>
<td>High installed costs</td>
<td>Low refurb rates</td>
<td>Fuel switching policies</td>
</tr>
<tr>
<td>Lack of contractor education</td>
<td>Staff training for O&amp;M</td>
<td>Inadequate financing and ROI</td>
<td>Inadequate performance data</td>
<td>Fossil fuel system subsidies</td>
</tr>
<tr>
<td></td>
<td>Inefficient supply chain compared to competitors</td>
<td>Capital constraints</td>
<td>Inadequate EV charging stations</td>
<td>Lack of economy-wide carbon pricing</td>
</tr>
</tbody>
</table>


Electrifying inefficient heating loads could create new winter peaks

- January consumption exceeds August in mid-2030s

- Solutions
  - Thermal efficiency
  - Controls
The Action Plan

1. Establish Goals, Policies, and Programs for Strategic Electrification with Deep Efficiency
2. Build Public-Private Relationships to Accelerate Strategic Electrification Activities
3. Protect Consumers
4. Support Market Development for Key Electrification Pathways
5. Encourage Local Leadership
6. Prioritize Low-Income Consumers as a Near-Term Focus
7. Advance Strategic Electrification with Thermal Efficiency in Homes and Buildings
8. Provide Public and Consumer Outreach and Education
9. Address Grid Preparedness to Effectively Manage New, Dynamic Loads
Decarbonization Context

Energy Efficiency + Renewable Electricity + Strategic Electrification = Pathway To Decarbonization
(80% Reduction in GHG emissions by 2050)
Region’s Aggressive Carbon Reduction Targets

- 10% by 2020
- 80% by 2060
- 30% by 2020
- 80% by 2050
- 25% by 2020
- 50% by 2030
- 80% by 2050
- 25% by 2020
- 80% by 2050
- 10% by 2020
- 80% by 2050
- STABILIZE
- 80% by 2050
- 40% by 2030
- 80% by 2050
- 33% by 2030
- 50% by 2028
- 80% by 2050
- 50% by 2032
- 80% by 2050
Aren’t we on the path to 80% CO2 reductions?

~ half of the needed reduction
Aren’t we on the path to 80% CO2 reductions?

~ half of the needed reduction

Where are all these “other” emissions coming from?
Direct Use of Fossil Fuels (NE/NY)
Advanced Electrification Technologies

Transport
- LDV (Gasoline): 32%
- HDV (Diesel): 7%
- Other: 5%

Industrial
- Other: 6%
- Process: 4%

Commercial
- Water: 8%
- Other: 2%
- Heat: 12%

Residential
- Heat: 18%
- Water: 4%
- Other: 2%