Join conEdison at 4:15 for a one-hour panel discussion on the company’s clean thermal initiatives, including the upcoming conEdison Gas Innovation Program RFI to be released in June 2018.
Renewable Heating and Cooling Workshop: Welcome and Introductions

Helle Gronli, Renewable Thermal Alliance
David Lis, Northeast Energy Efficiency Partnerships
Thank you to our Lead Workshop Sponsors!
And thank you to our workshop sponsors!
Renewable Thermal Alliance - Mission
Catalyze and scale a regional market for Renewable Heating and Cooling through provision of an independent non-profit market building platform for financing solutions
What we do

Engagement & Dialogue
Seed Innovation Grants
Independent Projects
RTA Seed Innovation Grant

**Why**
- Advance the mission of the RTA by supporting seed innovations that build market platforms for low-carbon H&C

**Who**
- For-profit and non-profit organizations
- Multi disciplinary approaches

**What**
- Deliverables that can be made publicly available
- Request funding not in excess of $20,000

**Learn more**
- cbey.yale.edu/programs-research/rta-seeds-innovation-grant
About NEEP
A Regional Energy Efficiency Organization
Northeast Energy Efficiency Partnerships

“Assisting the Northeast & Mid-Atlantic Region in Reducing Total Carbon Emissions 80% by 2050”

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.
Theory of Change

Penetration of ASHPs as Primary Heating System (Northeast/Mid-Atlantic)

- Near Term (2017-2019)
- Medium Term (2020-2024)
- Long Term (2025-2030)

- BAU
- Market Transformation
## Market Transformation Strategies

1. Increase consumer education and awareness

2. Increase installer/builder awareness of, and confidence in, ASHP through expanded training and education

3. Reduce upfront costs of installed systems through robust and aligned promotional programs and the support of alternative business models

4. Mobilize state and local policymakers to expand support for ASHPs

5. Promote advanced control technologies to allow automated coordination among multiple heating systems

6. Enable the promotion of climate-appropriate ASHPs through improved performance metrics

7. Develop more accurate tools to predict energy, cost and GHG savings associated with ASHP installation through collection and analysis of real world performance data
Quick reminders

1. Use Microphones during Q&A
2. Please silence cell phones
3. Presentation slides will posted to Workshop site
4. Public Wifi available
5. Please complete online evaluation following workshop
6. Tweet #RHCW18
# Workshop Agenda - Day 1

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>9:30 am</td>
<td>Welcome and Introduction</td>
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<tr>
<td>9:45 am</td>
<td>Keynote: Alicia Barton</td>
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<tr>
<td>10:30 am</td>
<td>Realizing the Full Value and Related Challenges of Renewable Heating and Cooling to the Energy System</td>
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<tr>
<td>12:00 pm</td>
<td>Lunch</td>
</tr>
<tr>
<td>1:00 pm</td>
<td>Moving Renewable Heating and Cooling Strategies from State Specific to Regional</td>
</tr>
<tr>
<td>2:15 pm</td>
<td>Break</td>
</tr>
<tr>
<td>2:45 pm</td>
<td>Realizing Synergies in Renewable Heating and Cooling</td>
</tr>
<tr>
<td>4:00 pm</td>
<td>Day 1 Debrief</td>
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<td>4:30</td>
<td>Adjourn</td>
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<tr>
<td>4:45</td>
<td>Optional Sessions</td>
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<td>6:00</td>
<td>Reception</td>
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Session 1: Renewable Heating and Cooling in the context of broader Energy and Climate

Keynote Speaker: Alicia Barton, NYSERDA
Session 2: Realizing the Full Value and Related Challenges of Renewable Heating and Cooling to the Energy System

Mike Henderson, ISO New England
Michael Henchen, Rocky Mountain Institute
Courtney Eichhorst, National Grid
Christopher Raup, Con Edison
Emily Lewis, Acadia Center

Moderator: Helle Gronli, Renewable Thermal Alliance
NEEP Renewable Heating & Cooling Workshop

June 18, 2018
What does 40x30 look like?

National Grid has simulated Northeast energy evolution to 2030, spanning ISO-NE and NYISO, comparing cost and GHG emissions of two energy system pathways that meet reliability requirements: a “High RE Only Sensitivity” case and a “40x30 Pathway.”

**High RE Sensitivity**
How far will a “High RE” scenario get us, absent significant electrification?

**40x30 Case**
Build out High RE capacity plus new capacity to meet increased transport and heat electrification. Increase rate of oil-to-gas heat conversions.

Existing policy achieves 25% by 2030.
The “High RE” Sensitivity achieves 30% by 2030.
The “40 x 30” Scenario achieves 40% by 2030.
Implications and Insights

**Implications**

- Current policies and investment trends are **not on track for achieving 2030 or 2050** emissions targets.

- To stay on track for “80 x 50” targets, we not only have to increase the pace of renewable growth but **dramatically transform transport (~50% electrification) and heat (~25% electrified heat, accelerated oil-to-gas conversion)**.
  - Scale up heat pump conversions more than 10x from 25K to 300K annually

- The electric system will move from an era of low load growth to load growth (+15% TWh inc by 2030)

- It will take ~$80B of **additional RE capacity** to support 40% emissions reductions by 2030 across the Northeast (excluding distribution network upgrades).

- Compared to the base case without significant electrification, the National Grid 40x30 pathway would **drive lower electric and gas rates** through higher network throughput and reduced RE curtailment.

**Insights**

- **Ambitious new policies needed across all sectors.** Carbon pricing should apply not just to electricity, but to all fuels.

- **Utilities have an important role** in supporting wider EV adoption and heat decarbonization.

- Performance-based incentives, such as EAMs and PIMs, can help **align the utility business model** with beneficial electrification and economy-wide decarbonization.

- To avoid unnecessary incremental network upgrades, **smarter time-varying rate design** is needed to encourage off-peak charging. AMI is foundational.

- Targeting the highest emitting sectors and fuels first, while optimizing the utilization of existing networks, can help keep electric and gas prices down while decarbonizing the existing networks.
Thank you to our Lead Sponsors!
Session 3: Moving Renewable Heating and Cooling Strategies from State Specific to Regional

Wendy McPherson, NYSERDA
Jeff Howard, Connecticut DEEP
Michael Judge, Massachusetts Department of Energy Resources
Adam Sherman, Biomass Energy Resource Center (VEIC)
Moderator: Neil Veilleux, Meister Consulting Group
This break is brought to you by:
Session 4: Realizing Synergies in Renewable Heating and Cooling

Dan Kelley, Ramboll
Hal Smith, Halco
Peter Skinner, E2G Solar
Maura Adams, Northern Forest Center
Anthony Aebi, Greenhill Contracting
Moderator: John Ciovacco, Aztech Geothermal
Cold Climate
NetZero Buildings
& Heat
Pump/Solar
Thermal Hybrids

The SHW
Revolution is at
our feet & skies
the limit!

6/22/2018
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• SHW & HP backups = good marriage for sustainable design
• Netzero & renovated multifamily projects are a very happy home – find the sweet $$$ spot – fewer SHW & PV panels
• DHW use/person is dropping in NZ and renovated LMI projects
• A-W HPs are not expensive & are easy to install. Geo HPs with the tax credits and NYSERDA support may be competitive now

Solar Thermal – HP Hybrids
My Takeaways Today
HP based SHW backup allows you to:

- Reduce the number of SHW panels while keeping the power load for DHW low
- Reduce the number of PV panels needed because the back up power load is low

Incremental cost analyses

- Three variable analyses
- Cost per extra SHW & PV panels
- Cost of HP back up per kw produced

Sizing the SHW system for a Hybrid system – find the most cost effective sweet spot
SHW – Heat Pump hybrid design
SHW only performance
# Hybrid Performance

Simplified analysis

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<th>Month</th>
<th>Days/mo</th>
<th>Polysun Eaux kwhr</th>
<th>A-W HP COP</th>
<th>w/A-W HP kwhr/mo</th>
<th>w/A-W HP kwhr/day</th>
<th>A-W HP COP</th>
<th>w/geo HP kwhr/day</th>
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Total: 9841 kwhr, 3888.5 kwhr/mo, 3051.7 kwhr/day
What about the worst day?

- Spec for extreme conditions – design day
  - Extended cloudy weather
  - Extended days of very cold temperatures
  - Depleted solar thermal heat vault
  - Higher than average DHW demands

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<th>720</th>
<th>12-1 am</th>
<th>1-2 am</th>
<th>2-3 am</th>
<th>3-4 am</th>
<th>4-5 am</th>
<th>5-6 am</th>
<th>6-7 am</th>
<th>7-8 am</th>
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<td>0.01%</td>
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<td>1 HP contribution btu/hr</td>
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<td>Tankless contribution btu/hr</td>
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<td>100.0%</td>
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**Conclusion:** The tankless is not needed at 720gpd DHW... PNS1-7-18
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Day 1 Debrief

David Lis, NEEP
Day 1 Debrief – Small Group Questions

1. Any key re-elections from Day 1 program?

2. What concepts would you like to dive deeper on tomorrow/into the future?
Optional Workshops

**Win Room**
Find about Con Edison Gas Innovation Program RFI to be released this month.

**Show Room**
Participate in NYSERDA’s active market research (financing workshop)

See you at the reception at 6 p.m. in the hotel restaurant
Adjourn Day 1
This breakfast is brought to you by: