Stone Mountain Technologies, Inc.

Next Generation Heating Innovation

Breaking 100% Efficiency Barrier for Heating

NORA Technical Workshop

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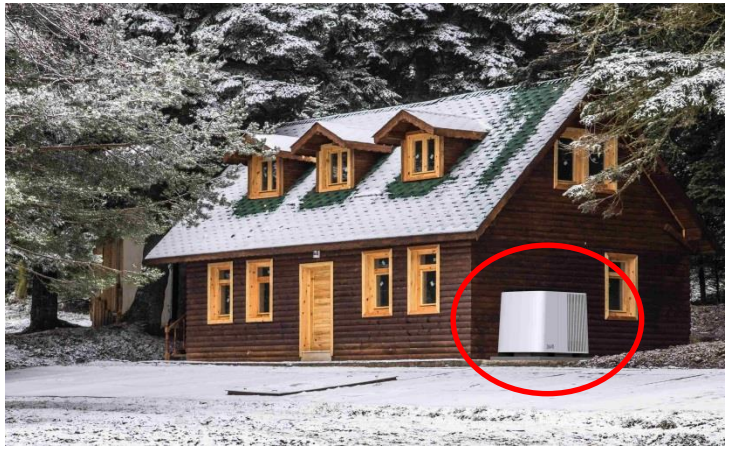
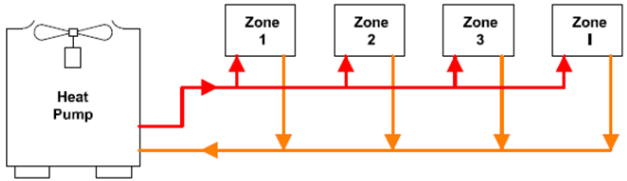
Thermally Driven Heat Pump (TDHP)

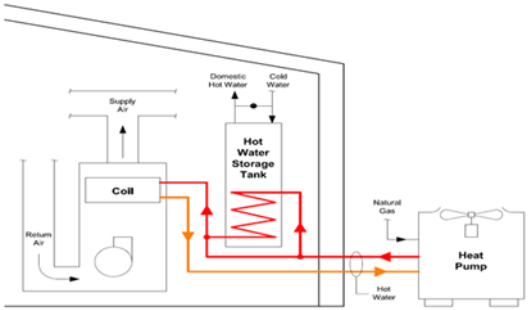
- **Warm Comfort:** useable in all heating system types
- **All Climates**: **perfect for cold weather!**
- **All Fuels:** natural gas, propane, **fuel-oil, bio-fuels**
- **Very High Fuel Efficiency**: 145% (COP)
- **Natural Refrigerant** (GWP = 0)



Many Uses:

- ✓ *Residential Space Heating*
- ✓ *Residential Water-heating*
- ✓ *Commercial Water Heating*
- ✓ *Commercial Space-heating*
- ✓ *Pool Heating*





SMTI Fuel-Fired Absorption Heat Pumps

COP_{HHV} = 1.45 at 47/120°F

- Fuel-Fired, Air to Water Heat Pump
- Condensing
- 4:1 Modulation

- 10,000 to 140,000 Bth Heating Output Models
- 20° F Hydronic Differential

- Outdoor Installation (no venting)
- GWP = 0

Patents Pending

SMTI Prototype Programs, 3rd Party Verification, Field Testing

10 kBth **20 kBth** **80 kBth** **140 kBth**

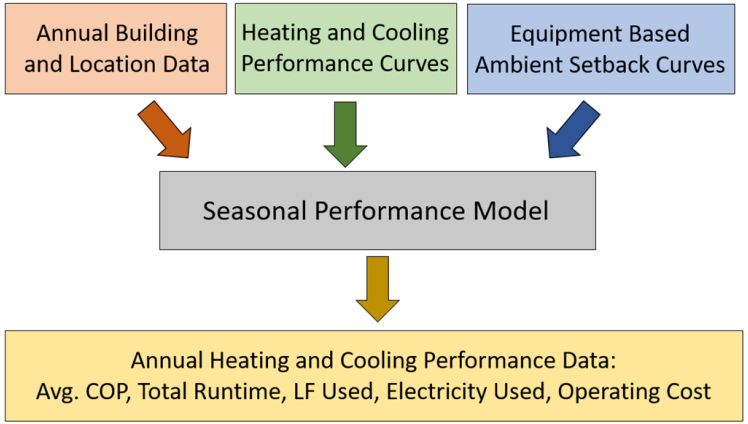
Anything In-Between

gti® U.S. DEPARTMENT OF ENERGY neea NORA NATIONAL OILHEAT RESEARCH ALLIANCE GRDF GAZ RÉSEAU DISTRIBUTION FRANCE ornl OAK RIDGE NATIONAL LABORATORY

21 Field Test Sites, Over 8,000 hours on 80 kBth Life Test Unit

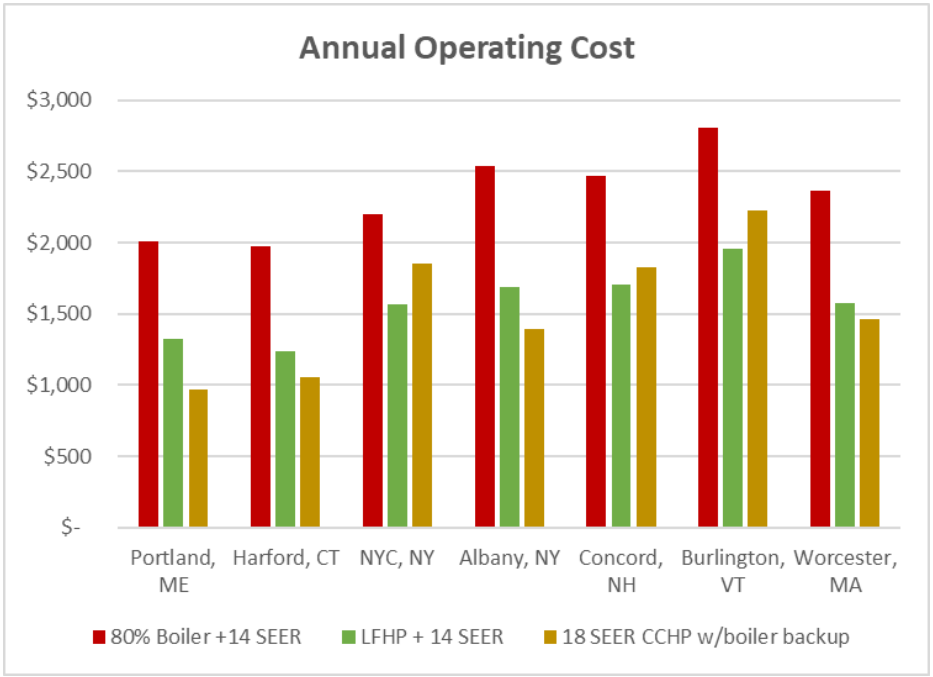
Techno-Economic Modeling

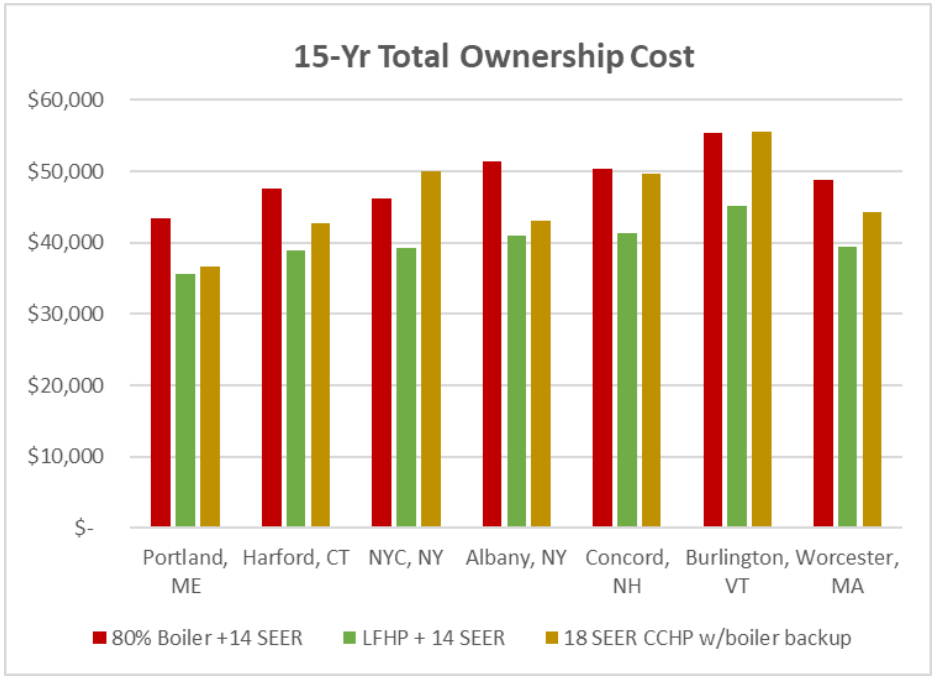
- **Standard Boiler – 80% efficient**
- **Condensing Furnace – 92% efficient**
- **Standard Electric AC – 14 SEER**
- **Standard EHP – 14 SEER/8.2 HSPF**
- **Cold Climate EHP – 18 SEER/12 HSPF**
- **Resistance Heaters – 100% efficient**



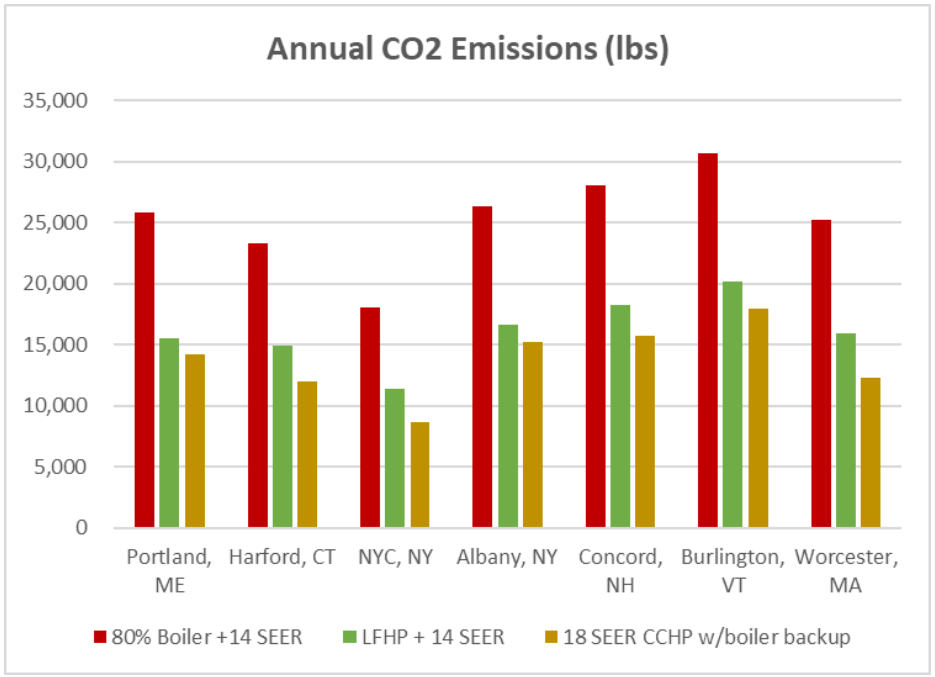
Note: Performance curves for EAC/EHPs taken from published data of commercially available systems

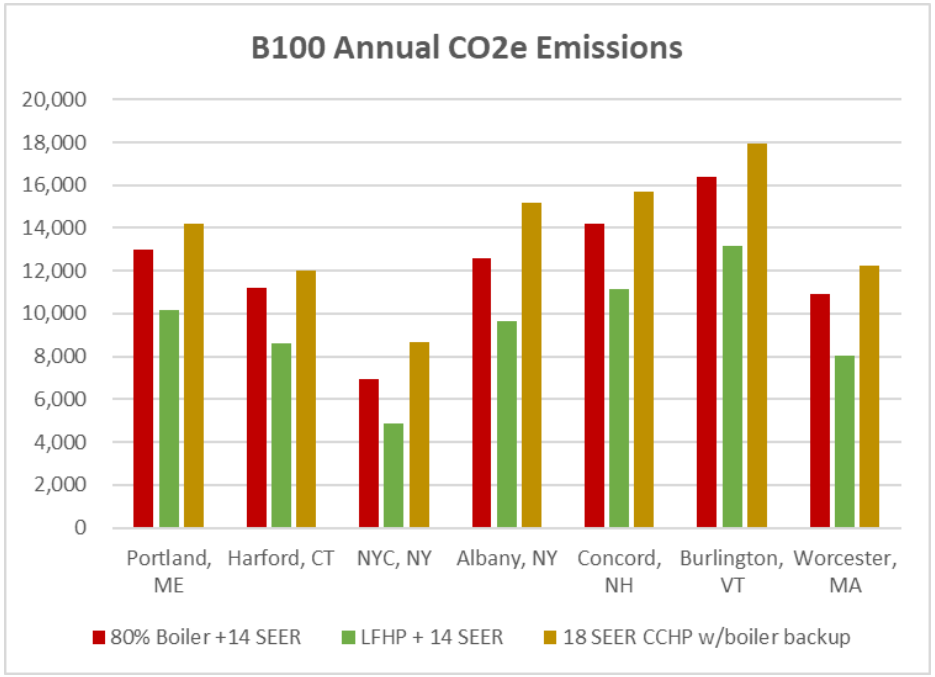
Techno-Economic Modeling





Techno-Economic Modeling





A more economically viable path to decarbonization

All – Electrification (EHPs)

- Prohibitive cost of building out the grid for winter heating loads
- A much higher energy price for consumer
- Who pays for abandoning existing pipeline assets?
- Challenge to retain consumer comfort
- Storage costs expensive

Thermally – Driven Heat Pumps

- Low carbon footprint
- Low operating cost in all important heating climates
- Retains consumer comfort
- Makes use of existing distribution assets
- Good policy route for an economically viable bridge to an all-renewables future

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Next Generation Heating Innovation

- **Game-changing technology for fuel heating appliance markets**
  - *30-50% Savings for Space & Water Heating*
  - *Economically most practical method to decarbonize heating on a mass scale*
  - *Cost-favorable comparison to competing AHPs & other advanced HPs*
- **Realistic pathway to market with differentiated product**
  - *Lowest risk & cost to OEMs (market partner – not a competitor)*
  - *Fastest timeline*
- **SMTI is dedicated to OEM success in the market place**
  - *Product Development – oriented towards high-volume applications and lowest cost to benefit all*
  - *Direct partnerships in Field Tests, Market Research and Development, etc. …*

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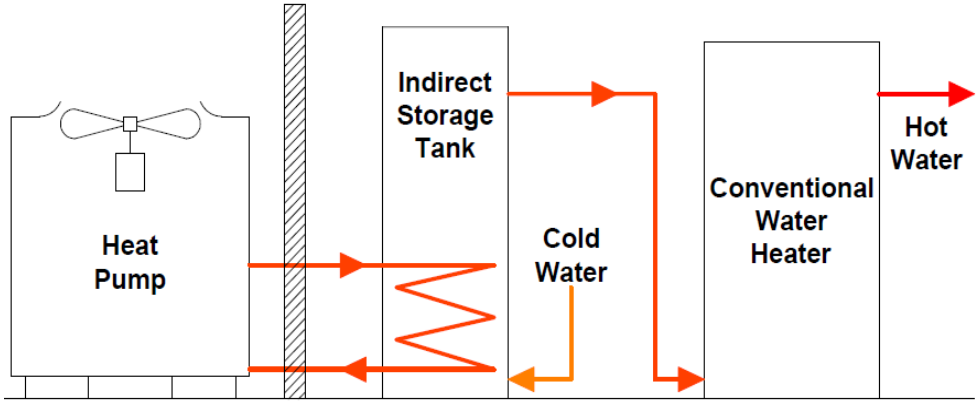
Commercial Water-heating



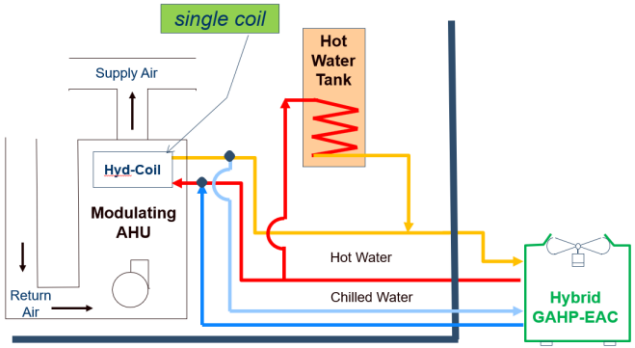
DHW (Food Service, Hospitality, Laundry, etc…)

Strategies:

- *Baseload / Peak load*
- *Extend life of existing tanks*

Heating & Cooling HYBRID

- Project Time: Q2-2019 to Q4-2020
- Scope: Design and prototype “single-box” heating & cooling. Best-in-class thermodynamics (absorption, vapor compression) for all home loads (including DHW). Lowest operating cost and competitive installation.
- Target Market: single-family residential



Patent pending

Multi-family “Combi” Heating

- Project Time: Q4-2017 to Q4-2019
- Location: Chicago, Illinois, USA
- Scope: Retrofit Integration design and Field Testing (140 kBTU AHP)