



# Stor4Build Project Updates

Breaking Barriers:  
Market Transformation in Thermal  
Energy Storage

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# Agenda

- **Overview of the Roadmap for Market, Policy, and Equity for Thermal Energy Storage**
- **Focus on four key market opportunities**
  - Thermal storage with heat pumps in large commercial buildings
    - early results from manufacturer convening around role of TES w/ heat pump systems
  - Thermal storage with heat pumps in residential buildings
  - Utility programming and grid benefits of flexible water heating
  - Thermal storage in district and campus systems
- **Breakout group discussions –key benefits, barriers, and policy strategies for each market segment**
- **Share key discussion points**

# How does expanding the market for thermal storage in buildings support decarbonization goals?

- Reduce on-site combustion sources in buildings
  - Thermal storage can reduce need for fossil back-up
  - Thermal storage can reduce HVAC system footprint and equipment size
- Reduce grid burden from peak loads through flexible demand
  - Goals in roadmaps, policy white papers, and federal plans range from 2x – 4x current demand response capacity from building sector needed by 2030
  - Demand side management often more economical and efficient solution than supply-side investments to balance grid
- Enhance equitability of access to home electrification
  - Efficient and flexible HVAC systems can reduce home energy bills and improve thermal resilience

# Market Adoption Roadmap – themes

- Less about technical challenges
  - although those remain, especially around controls and communication at grid edge
- More about clarifying value propositions within essential market segments in a decarbonizing world
  - in what use cases do we expect benefits to be delivered to buildings, the grid, or society-at-large
  - How do we handle split incentives and reduce risk for “first mover” groups?
- Implementing policy that enables enhanced and more equitable access to benefits
  - utility tariff structures, state/federal decarbonization policy incentives, building/appliances codes and standards

# Market Adoption Roadmap – themes

- Highlight set of leading use cases
  - where additional market transformation efforts could lead to enhanced adoption of TES and delivery of benefits
  - Benefits and strategies will vary by:
    - **Building type** – district, commercial, multifamily, single-family residential
    - **End Use** – space heating, space cooling, water heating
    - **System type** – distributed/single unit vs. centralized
    - **Climate** – very cold, cold, mixed, hot
  - Different stakeholder groups will need to be engaged and centered in conversations, depending on focal market segment and barriers

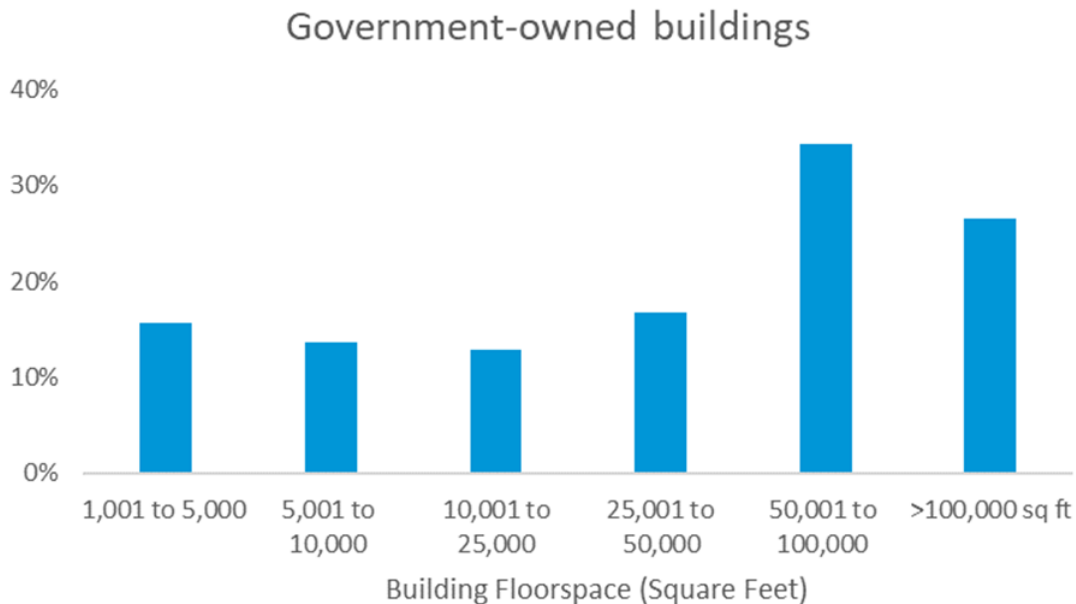
# Key Market Opportunity: Large commercial buildings

## Opportunity:

- TES demonstration projects for heating and cooling in large commercial buildings
- **2% of commercial buildings are responsible for one-third of total sector energy**
  - Government-owned buildings could be a key pathway for demonstration projects

## Potential drivers:

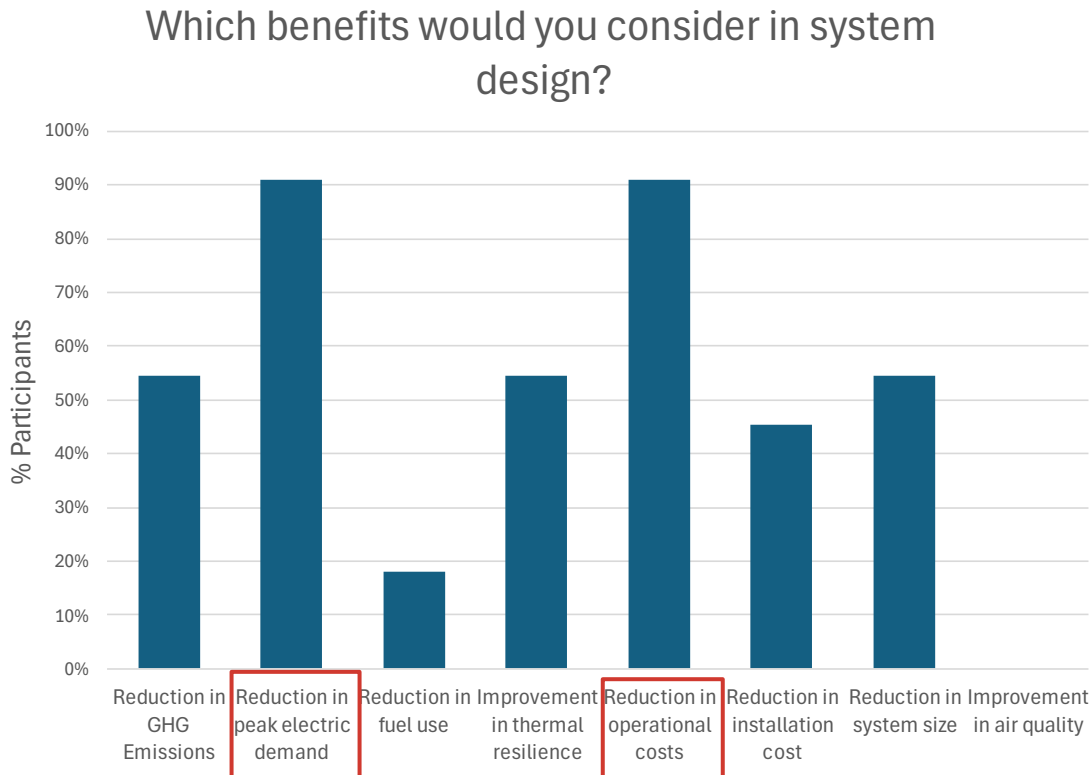
- Building performance standards
- Decarbonization policy goals



Source: [CBECS, EIA](#)

# Convening HP manufacturers – examining role of TES in large commercial buildings

- ACEEE hosted convening heat pump and TES manufacturers
  - 12 companies participated
- **90% of participants considered reduction in peak electric demand and operational costs** to be most important benefits to consider in system design
- Other key findings
  - Need for de-risking early-stage planning of alternative building system designs for engineers
  - Lack of regulatory or economic drivers limit role of TES compared to natural gas



# Key Market Opportunity: Growth of residential heat pump installations

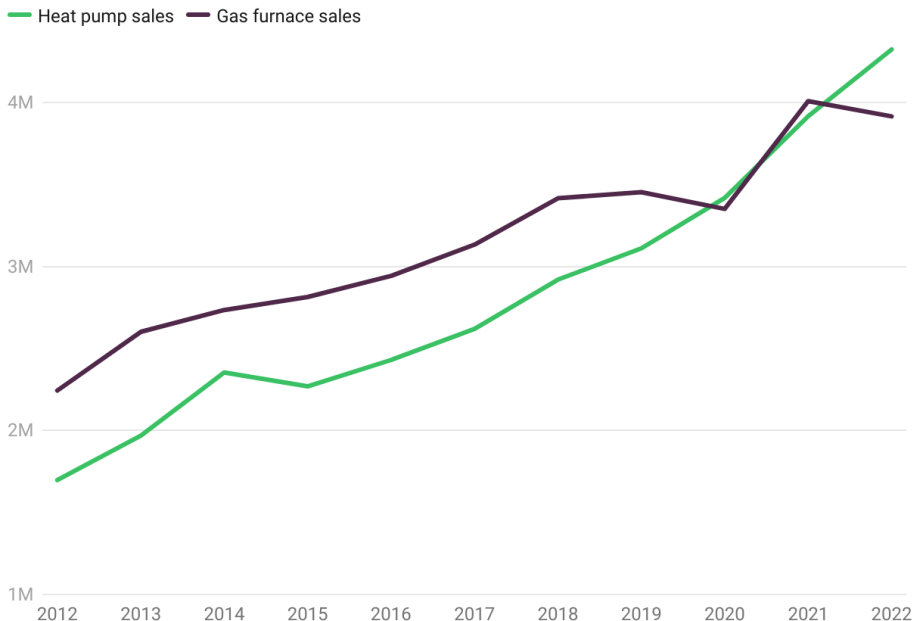
## Opportunity:

- Demand for electrification is driving heat pump adoption
- TES can support heat pump adoption by reducing system size and cost
- Can be an alternative to fuel back-up heat
- Could help mitigate rate impacts of electrification for customers

## Potential drivers:

- Financing support
- Utility rate programs
- State-level climate policies

## Heat pump sales in U.S. surged past gas furnaces in 2022



2022 figures include sales data for Jan–Nov and projected sales for Dec.

Chart: Canary Media • Source: Air-Conditioning, Heating, and Refrigeration Institute

Source: [Canary Media](#)



# Key Market Opportunity: Utility programs for flexible water heating

## Opportunity:

- Water heating is responsible for 18% of residential energy use,  $\frac{1}{4}$  of thermal loads
- Great potential for flexibility capacity, not yet realized
- Need to aggregate networks of flexible residential water heaters to provide TES benefits.

## Potential drivers:

- Improved water heater programming and controls
- Utility rate structures that incentivize participation
  - Identify pathways to scaling utility programs

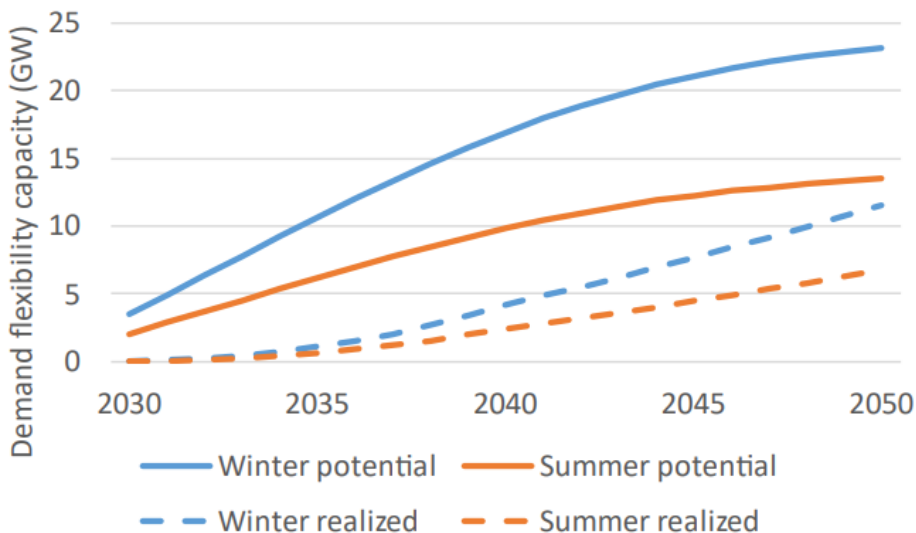


Figure 2. Growth in demand flexibility capacity from all new water heaters and assuming an increasing fraction (up to half) participate in programs

Data source: [Ungar 2023](#), ACEEE

# Key Market Opportunity: Campus and district systems

## Opportunity:

- Centralized TES within district heating and cooling systems
- District heating and cooling systems are becoming increasingly popular as a decarbonization strategy, especially by gas utilities
- The benefits of these systems are increased if they include TES

## Potential drivers:

- Clean heat standards
- Financial incentives
- Demonstration projects

State	Date passed	Details
MA	2021, 2022	Pilots underway
MN	2021, 2024	Gas utilities required to invest in district systems
NY	2022	Pilots mandated for large utilities
CO	2023	Pilots mandated for large utilities
WA	2024	Allows cost recovery for pilots through rates
MD	2024	Pilots mandated for large gas utilities

States are passing legislation that allows or mandates utilities to explore district systems

Source: [Building Decarbonization Coalition](#)

# Group Discussions

Choose which group you would like to join:

1. Thermal storage for large commercial buildings
2. Residential buildings with heat pumps
3. Utility water heater programs
4. Campus and district systems

We will come back together at 9:10am to share ideas!

# Discussion Questions

- What are the most valuable benefits that TES can provide in this market?
- What types of buildings, policy environments, and regional conditions seem most promising?
- Where can we best target case studies and demonstrations to clarify the benefits?
- Who are the stakeholder groups who can activate market demand and help us make progress? How do we engage them?
- What are the priority R&D, policy strategies, or market adoption activities to address these barriers over the next 5 years?

Thank you!

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