

DOCKETED

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New Research Idea Large Scale Residential Heating and Cooling

Please see attached.

Additional submitted attachment is included below.

1. Please provide the name, email, and phone number of the best person to contact should the CEC have additional questions regarding the research concept:

Bradley Meister

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2. Please provide the name of the contact person's organization or affiliation:

CEC

3. Please provide a brief description of the proposed concept that you would like the CEC to consider as part of the EPIC 5 Investment Plan. What is the purpose of the concept, and what would it seek to do? Why are EPIC funds needed to support the concept?

A central system (for a community of residential homes or a community business) that uses a large heat recovery chiller to make both hot water and chill water. There would potentially need to be a large tank to store hot water (and possibly chill water) and a means to provide waste heat to the chill water side of the heat recovery chiller in the winter months. This could be a pond, shallow bore holes into the earth, sewer, solar thermal or even a high efficiency air source heat pump dedicated to the heat input to the chiller water loop. This type of system would require a plan to operate, maintain and periodically upgrade the system. To the best of my knowledge there have not been any innovative community systems like this capable of using low GWP refrigerants installed in California. The system would operate with loops of hot and chill water and also be able to preheat water for domestic use and then use a heat pump water heater to top it off to the right temperature,

4. In accordance with Senate Bill 96i, please describe how the proposed concept will "lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory energy goals." For example, what technical and/or market barriers or customer pain points would the proposed concept address that would lead to increased adoption of clean energy technology or innovation? Where possible, please provide specific cost and performance targets that need to be met for increased industry and consumer acceptance. For scientific analysis and tools, provide more information on what data and information gaps the proposed concept would help fill, and which specific parties or end users would benefit from the results, and for what purpose(s)?

Centralized approach:

Instead of each residential home (or business) having their own heating system, this concept allows for a central plant type system to generate heat with a low GWP refrigerant, enabling economies of scale for utilizing low GWP refrigerants and energy sources that might not be feasible for individual homes or community buildings. Employing high efficiency electric air source and water source heat pumps to extract heat from ambient air, water, or even waste heat, in climates with moderate or even more severe temperatures.

5. Please describe the anticipated outcomes if this research concept is successful, either fully or partially. For example, to what extent would the research reduce technology or ratepayer costs and/or increase performance to improve the overall value proposition of the technology? What is the potential of the innovation at scale? How will the innovation lead to ratepayer benefits in alignment with EPIC's guiding principles to improve safety, ii reliability, iii affordability, iv environmental sustainability, and v equity?

Reduced emissions:

By utilizing potential renewable on site energy sources and optimized system design, this system can significantly reduce greenhouse gas emissions from residential heating and cooling.

Flexibility in energy sources:

Depending on local availability, these systems can incorporate a variety of renewable sources like solar PV, solar thermal, and even waste heat.

Suitable for large residential communities:

High home density in large residential communities makes this type of system particularly efficient as the distribution network can be optimized to minimize heat losses.

Integrating renewable energy sources:

Prioritizing the use of renewable energy sources like solar PV, solar thermal, and even home waste heat generate heat within the central plant.

Energy storage:

Incorporating thermal energy storage above or below ground to manage fluctuations in renewable energy production and peak demand.

Smart grid integration:

Connecting the system to a smart grid to optimize energy usage based on real-time demand and renewable energy availability.

Ultra-Low GWP Refrigerants:

Use of ultra-low global warming potential (GWP) refrigerants, including naturals like CO₂ and Propane or other ultra-low GWP refrigerants like HFO's.

Maintenance:

RCHC would require a plan to maintain and periodically upgrade the larger community heating and cooling system.

6. Describe what quantitative or qualitative metrics or indicators would be used to evaluate the impacts of the proposed research concept.

Cost per MMBtu of heat or ton of cooling delivered to homes or businesses

Comfort during hot or cold periods**Ease of operation**

Please provide references to any information provided in the form that supports the research concept's merits. This can include references to cost targets, technical potential, market barriers, equity benefits, etc.

8. The EPIC 5 Investment Plan must support at least one of five Strategic Goals:

- a. Transportation Electrification
- b. Distributed Energy Resource Integration
- c. Building Decarbonization
- d. Achieving 100 Percent Net-Zero Carbon Emissions and the Coordinated Role of Gas
- e. Climate Adaptation

Please describe in as much detail as possible how your proposed concept would support these goals

This concept primarily supports Building Decarbonization. It could help to decarbonize new residential communities with high efficiency (high COP) heating and cooling systems.