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Affordable, Grid-Responsive Heat Pumps for Californiaâ€™s Building Decarbonization

Additional submitted attachment is included below.

Electric Program Investment Charge 2026–2030 (EPIC 5)
Research Concept Proposal Form

The California Energy Commission (CEC) is currently soliciting research concept ideas and other input for the Electric Program Investment Charge 2026–2030 (EPIC 5) Investment Plan. For those who would like to submit an idea for consideration, please complete this form and submit it to the CEC by **August 8, 2025**. More information about EPIC 5 is available below.
To submit the form, please visit the e-commenting link: https://efiling.energy.ca.gov/EComment/ECommentSelectProceeding.aspx and select the Docket **25-EPIC-01**. Enter your contact information and then use the "choose file" button at the bottom of the page to upload and submit the completed form. Thank you in advance for your input.

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

Name: Mary-Ann Rau

Email: maryann@merinoenergy.com

Phone number: 706-615-4376

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

Merino Energy

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?

Merino Energy proposes the development and demonstration of a next-generation residential heat pump platform to accelerate California's building decarbonization goals. Our recommendation is to provide funding in two phases, targeting two high-impact problems in stages:

Phase 1 will deliver an easy-to-install, efficient heat pump that can be installed faster and more affordably than conventional mini-splits and central heat pumps, without requiring panel upgrades or invasive ductwork.

Phase 2 will integrate energy storage and advanced controls, enabling automated load shifting, peak demand reduction, and short-duration backup heating/cooling during grid outages.

EPIC funding will support design, prototyping, and field validation in diverse California housing types, with a focus on hard-to-electrify segments such as rentals and multifamily buildings. Without funding from EPIC, the funding of these products falls to businesses that may not have financial incentives to integrate features that are best for the grid or low-income residents. This is especially timely considering the rollback of IRA rebates and other federal incentives.

In accordance with Senate Bill 96, 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)?

The concept addresses critical barriers identified in the *CEC 2021 Building Decarbonization Assessment*:

- **Installed cost barrier**: Current ductless heat pumps often exceed $12,000 installed in California. Merino Energy's own assessment of cost exceeds this in dense urban environments, like San Francisco.
- **Grid integration gap**: Most residential HVAC lacks automated demand flexibility.
- **Resilience limitations**: All-electric homes without storage lose thermal control during outages, leading to potential health issues during heat waves.

Target breakthroughs:

- Reduce total installed cost to **<$4,000** without rebates/incentives.
- Achieve installation times of **<4 hours**.
- Deliver **≥1 kW** of automated peak demand reduction per home.
- Provide up to **4 hours** of backup heating/cooling.

The project will generate field data on cost, performance, and grid impacts for integrated HVAC + storage systems, addressing gaps in market and utility planning. Beneficiaries include ratepayers, utilities, aggregators, and policymakers.

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, reliability, affordability, environmental sustainability, and equity?

Merino Energy anticipates the following outcomes:

- **Cost reduction**: Lower installed cost by 60–70% relative to market baseline.
- **Grid benefits**: Reduce peak load and enable residential participation in demand response programs.
- **Resilience**: Provide outage protection during heat waves and extreme weather.
- **Equity**: Enable adoption in rental, multifamily, and disadvantaged community housing.

At scale, deployment to 500,000 homes could yield over 1 GW of peak reduction and avoid ~1.5 million metric tons of CO_2 annually.

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

- Installed cost per system.
- Average installation time.
- Peak load reduction (kW) per event.
- Energy storage utilization rate for load shifting.
- Avoided CO_2 emissions per home per year.
- Customer and installer satisfaction.

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.

1. CEC (2021). *Building Decarbonization Assessment*. CEC-500-2021-054. https://www.energy.ca.gov/publications/2021/california-building-decarbonization-assessment
2. Wilson, E. J. H., Munankarmi, P., Less, B. D., Reyna, J. L., & Rothgeb, S. (2024). *Heat Pumps for All?-Distributions of the Costs and Benefits of Residential Air-Source Heat Pumps in the United States*. Joule, 8(4), 1000–1035. https://doi.org/10.1016/j.joule.2024.01.022
3. Gerke, B. F., Gallo, G., Smith, S. J., Liu, J., Alstone, P., Raghavan, S., Schwartz, P., Piette, M. A., Yin, R., & Stensson, S. (2020, July 14). *The California Demand Response Potential Study, Phase 3: Final Report on the Shift Resource through 2030*. Lawrence Berkeley National Laboratory. DOI: 10.20357/B7MS40. This

report was prepared for the California Public Utilities Commission.
https://www.dret-ca.com/wp-content/uploads/2021/03/ca_dr_potential_study_-_phase_3_-_shift_-_final_report.pdf

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.

Our proposed concept to develop and deploy affordable, grid-responsive heat pumps with integrated storage will help California achieve the following goals:

- **Building Decarbonization**: Accelerates affordable, scalable deployment of heat pumps by reducing cost of installation.
- **Distributed Energy Resource Integration**: Integrates HVAC with behind-the-meter storage for demand flexibility.
- **Climate Adaptation**: Enhances resilience in vulnerable communities, especially in areas like Central Valley which are prone to more grid blackouts during heat waves.

About EPIC

The CEC is one of four EPIC administrators, funding research, development, and demonstrations of clean energy technologies and approaches that will benefit electricity ratepayers of California's three largest investor-owned electric utilities.
EPIC is funded by California utility customers under the auspices of the California Public Utilities Commission.
To learn more about EPIC, visit:
https://www.energy.ca.gov/programs-and-topics/programs/electric-program-investment-charge-epic-program
EPIC 5 documents and event notices will be posted to:
https://www.energy.ca.gov/proceeding/electric-program-investment-charge-2026-2030-investment-plan-epic-5
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