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EPIC Research Concept - Incentives, Targeting and Equity to Electrify Residential Heating and Appliances

Additional submitted attachment is included below.

ELECTRIC PROGRAM INVESTMENT CHARGE 2021-2025 (EPIC 4)
RESEARCH CONCEPT PROPOSAL FORM

The CEC is currently soliciting research concept ideas and other stakeholder input for the EPIC 4 Investment Plan. For those who would like to submit an idea for consideration, we ask that you complete this form and submit it to the CEC by 5:00 p.m. on **July 2, 2021**.

To submit the form, please visit the e-commenting link, https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=20-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 for your input.

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:

Andrew Campbell, acampbell@berkeley.edu, (415)515-4655

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

   Energy Institute at Haas, University of California, Berkeley

3. Please provide a brief description of the proposed concept you would like the CEC to consider as part of the EPIC 4 Investment Plan. What is the purpose of the concept, and what would it seek to do?

   Incentives, Targeting and Equity to Electrify Residential Heating and Appliances. California households burn vast amounts of fossil fuels on-site for space heating -- 460+ billion cubic feet of natural gas annually, the carbon dioxide equivalent of having 5 million cars on the road. Policymakers are increasingly turning to electrification in an effort to meet climate goals. The CEC's EPIC program has supported this transition through awards that have funded heat pumps for multi-family buildings, the use zero- or low-global warming potential refrigerants in heat pumps, combined space and water heating and heat pumps incorporating load-shifting capabilities. Governments are beginning to support this transition through policies such as building codes that limit or prohibit natural gas in new homes. Mostly missing from this discussion, however, is economic analysis. This concept would involve researchers drawing from multiple data sets including on heating choices, energy prices, climate, housing characteristics, and other information and constructing a model of heating choices. The model would be used to determine what incentives or other policies would be most effective, and

potentially vary across regions, neighborhoods or types of homes. The concept should examine the equity implications of electrification policies, showing how economic impacts differ geographically, as well as between homeowners and renters, and for households with different income levels, and provide implications and insight for developing companion policies to address equity concerns.

4. 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 technologies? 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, what data and information gaps would the proposed concept help fill, what specific stakeholders will use the results, and for what purpose(s)?

The Energy Commission's *California Building Decarbonization Assessment* is developing scenarios that would significantly cut greenhouse gas emissions, by more than 40 percent by 2030, through decarbonizing buildings. Pursuing these scenarios will require a massive technological transformation in homes and businesses. Unfortunately, California's market for heat pumps is still immature. Heat pumps are becoming more common, particularly in Southeastern states, but are still rare in California. Other forms of electric heat are rare in California as well. Nationwide, the percentage of homes heating by electricity has grown from 8% to 39% from 1970 to 2018. However, the percentage in California lags far behind. Electric heat is twice as common in states including Oregon, Arizona and Texas. Policymakers and businesses need guidance to stimulate the expansion of electric heat and hot water in California. This research concept will help to prioritize market expansion by identifying the most attractive building types and regions for new heat pump technologies. The concept will, thereby, accelerate technological advancement in this critical area.

The research performed through this initiative should create new data sets, conduct new empirical research and share the results directly with the relevant policymakers and staff at the CEC and CPUC, as well as with relevant industry associations. This stakeholder engagement will put the results into action.

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 costs and/or increase performance to improve the overall value proposition of the technology? What is the potential of the technology at scale?

A successful project will estimate the incentive level necessary to induce electrification for households, including separate estimates based on geography, home ownership, income and demographics. The research will identify the most attractive initial sectors for a policy and market push, as well as the more challenging sectors that may require more policy interventions or higher costs. The benefits of the research can be enumerated in terms of the acceleration of greenhouse gas emissions reductions, greater electrification per incentive dollar, lower incentive costs overall due to better targeting of incentive levels.

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

   The impact of the research can be measured through estimates of the greenhouse gas, pollution and cost reductions that would be achieved by putting policy and market prioritization into effect. The analysis would be highly quantitative and be based on clearly communicated and estimated assumptions.

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

Davis, Lucas. April 2021. "What Matters for Electrification? Evidence from 70 Years of U.S. Home Heating Choices." Energy Institute Working Paper 309.

Davis, Lucas. June 2021. "Evidence of a Homeowner-Renter Gap for Electric Appliances." Energy Institute Working Paper 316.

Kenney, Michael, Nicholas Janusch, Ingrid Neumann, and Mike Jaske. 2021. *Draft California Building Decarbonization* Assessment. California Energy Commission. Publication Number: CEC-400-2021-006-SD.