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Berkeley Lab Comments - Low GWP Heat Pump Draft Solicitationâ€

Please see Berkeley Lab's comments regarding the Low GWP Heat Pump Draft Solicitation attached.

Additional submitted attachment is included below.

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February 16, 2024

Jonah Steinbuck
Director of the Energy Research and Development Division
California Energy Commission
715 P Street
Sacramento, California 95814

Subject: Lawrence Berkeley National Laboratory Comments on Low GWP Heat Pump Draft Solicitation

Director Steinbuck,

Berkeley Lab is pleased to present our comments in response to the following EPIC draft solicitation concept: **Developing Next Generation, All Electric Heat Pumps Using Low Global Warming Potential Refrigerant.**

Nihar Shah, Donghun Kim, and Peter Grant, researchers in the Energy Technologies Area at Berkeley Lab, contributed the following comments:

Question 1: What type of considerations should the CEC consider to encourage participation and achieve project success, and why? Please provide relevant comments regarding other considerations not explicitly listed above.
Berkeley Lab suggests that the CEC ensures coordination and non-duplication of effort between research funded by the U.S. DOE's Building Technologies Office and other funding vehicles including NYSERDA as well as the Global Cooling Efficiency Accelerator launched by the Clean Cooling Collaborative. It is critical to ensure a diverse set of projects covering heat pump demonstrations in common building types (e.g., residential, commercial, schools) across different climate zones in California. Measurement and Verification (M&V) should be required to compare actual performance to expected performance. The produced dataset should also be made available to the public.

It is worth noting that the involvement of R&D groups of major large HVAC OEMs (Original Equipment Manufacturer) are crucial for projects but they are located outside of California. Implementing strict penalties for funds spent outside of California would discourage their participation or restrict their engagement.

Question 2: Are the GWP limits of 150 reasonable for the current state of the art systems? If not, why and what should the limit be? Do the three Project Groups in Section IV of this document address the primary objectives of expanding and

improving heat pump technology? If not, why? Are there alternative pathways or priorities that should be considered?
Berkeley Lab suggests that the CEC follow the HVAC industry response to the revised EU F-gas regulation which effectively bans per- and poly-fluoroalkyl substances and requires HVAC equipment manufacturers responding to the solicitation to include a section in their response to the EU F-gas ruling if they also sell heat pumps in Europe.

Question #4: Are the proposed levels of project funding for each group appropriate to achieve the desired outcomes? If not, why?
b: A minimum 20% match would likely be required with the funding levels listed above, and this requirement would be waived for projects sited in and benefitting Disadvantaged Communities (DACs) and Low-Income Communities (LICs). Is this sufficient to encourage DAC and LIC projects? If not, how could this be improved?
Waiving (or reducing) the 20% cost share requirement for disadvantaged community (DAC) or low-income community (LIC) site demonstrations will likely yield more proposals with DAC or LIC participation.

The following comments are in regards to Group 1: Design and Test Low Voltage, High Efficiency Heat Pump Water Heaters with Low GWP Refrigerants (TRL 3-4)

- High performing low GWP refrigerants are often A2L or A3 with increased flammability concerns. Will this project include/cover advances to improve safety in the unfortunate case of refrigerant leaks (e.g. air ventilation to dilute the refrigerant)?
- “Capability to control the unit to reduce load during the net peak periods” is probably not necessary for this solicitation. California’s JA13 and NEEA’s Advanced Water Heating Specification already require those capabilities. The open research questions are around (1) what the required communication capabilities should be, and 2) how to best leverage the existing capabilities. Those would be very valuable research topics, but could be better addressed in a separate solicitation.
- Will this solicitation also include ways to reduce the cost of technologies?
- The inclusion of one or more heat pump water heater manufacturers is a great way to support more widespread commercialization of technological advances that may arise from this project.
- The inclusion of small commercial buildings would likely increase the number of potential field sites and help research teams put together a more comprehensive project plan/proposal.

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The following comments are in regards to Group 2: Applied Research and Development of Combination Heat Pump for Domestic Hot Water (DHW) and Space Conditioning with low GWP refrigerants (TRL 3-5)

- Berkeley Lab recommends that the CEC consider more specific phrasing related to the expectations around grid interactivity. Systems can be designed to either reduce (a) load in response to demand response events, or (b) operating costs by operating at times when time of use rates are lower. The way the expectations are currently presented would accept either (a) or (b). Expectations for control capabilities that reduce operating cost will likely result in proposals that incorporate energy storage. Systems with storage will also improve efforts to reduce peak period consumption and address issues associated with mid-day PV overgeneration.
- The requirement criteria should include how to address the increased flammability and toxicity of low-GWP refrigerants to ensure safety.
- The requirement criteria should also ask for specifying the target performance for COP and heating capacity during the heating season (e.g., AHRI standard H1, H2 test conditions) and how to achieve the targets.

Berkeley Lab appreciates the opportunity to provide these comments regarding Developing Next Generation, All Electric Heat Pumps Using Low Global Warming Potential Refrigerants. Please do not hesitate to contact us if you need further information about our responses.

Sincerely,
Alecia Ward
Leader, Program and Business Development
Energy Technologies Area
award@lbl.gov