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AEA Response to Low GWP Heat Pump Draft Solicitation

Additional submitted attachment is included below.

AEA Reponses to Low GWP Heat Pump Draft Solicitation Request for Information

Seeking Public Comment: Developing Next Generation, All Electric Heat Pumps Using Low Global Warming Potential Refrigerant

February 15th, 2024

Association for Energy Affordability, Inc (AEA) Responses to QUESTIONS FOR STAKEHOLDERS

CEC staff are seeking responses and comments to the following questions to shape the direction and scope of this solicitation:

1. *What type of considerations should CEC consider to encourage participation and achieve project success, and why? Please provide relevant comments regarding other considerations not explicitly listed above*.

   The CEC should ensure that the field demonstration expectations are aligned with the unique considerations that must be factored when dealing with new and emerging technologies. For groups that require field demonstrations, the CEC should limit the requirement to 1-2 field demonstrations, should provide dedicated funds for tenant/property owner financial incentives for agreeing to have equipment that has not been fully tested installed in their home/building, and for the inconvenience of having to coordinate with the research team and/or have researchers enter their homes. There should also be budget allocated for the removal of the equipment at the end of the study, and tenant incentives as described in question #9. The CEC should also provide support to research teams and instruction to local jurisdictions around permitting of equipment that has not yet been approved for use in CA.

   For all applicable equipment, the capability to control the unit to reduce load during peak hour should follow the most recent and complete version of the CTA standard, and at a minimum CTA-2045B level 2, in terms of commands to test. For products with a resistive element back up, we recommend including some of the optional commands such as the Set Efficiency command. Additionally, projects should be required to include a detailed road map demonstrating how the equipment can (upon full commercialization) include CTA-2045 compatibility to avoid challenges associated with one-off customized control solutions.

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?

For domestic water heating products, 150 is a feasible GWP limit to set as there are currently products available in the US that use refrigerants that are below that limit (e.g., CO2 and R-1234-ZE/YF). However, there are currently no HVAC products using refrigerants with GWPs less than 150 currently in the US market. Propane (R-290) is a common refrigerant used in Europe and Asia and has a GWP of 3. We believe it is important to research and demonstrate R-290 in the US market. Such novel projects will need CEC support to liaise with local building departments to facilitate permitting for the field demonstrations.

3. *What are the near-term and medium-term technical targets (e.g., costs, efficiency, ramp rate, emissions levels) to advance low GWP heat pump technologies to a higher TRL?*
    a. *What should be the starting and target TRLs for these groups?*

For all groups, flexibility should be afforded to teams to propose *either* earlier concept stage products that will require significant product development (TRL 3-5) or products that are in the later stages of development, or are even commercially available outside of the US, but not available in our market and have not been tested and/or demonstrated in the US (TRL 7-9). Historically, demonstrating commercially viable products that are not yet available in the US has helped set the stage for market adoption by familiarizing market actors with the technology and creating comfort levels amongst various stakeholders. Additionally, it is often necessary to make modifications to existing products to make them more suitable for use in the US. These types of demonstration projects have helped manufacturers determine what those modifications should be and better understand the potential US market demand for those products. This, in turn, has enabled them to begin setting up the necessary supply chains.

Currently, the lowest commercially available GWP refrigerant for heat pump HVAC equipment in the US is R-32 with a GWP of 675. We do not think it is worth researching these products, as they are already being developed by multiple manufactures in the US market. Propane (R-290) is a heat pump (DHW & HVAC) refrigerant that already exists and is used widely in the European and Asian markets, but is currently not allowed to be used as a heat pump refrigerant in buildings in the US because it is mildly flammable. However, based on conversations with manufacturers, we believe that there is already momentum for R-290 to be approved for use in the US within the next few years. Given that, we believe it is worthwhile to begin testing these products in the US now.

Products are moving towards more self-contained systems (e.g., air-to-water), which avoid running refrigerant lines from outside to inside a building. Pre-charged systems also help address safety concerns and reduce refrigerant leaks. All of these measures simultaneously improve refrigerant safety and should therefore be considered.

Alternatively, it may be useful to encourage the development of other low-GWP refrigerants to be used in heat pump HVAC. For example, R-1234-ZE/YF has a GWP between 2-10, but is currently only used in DHW equipment.

4. *Are the proposed levels of project funding for each group appropriate to achieve the desired outcomes? If not, why?*

   This is highly dependent on whether the proposed product solutions will need to be developed or whether they will only require modifications and testing for the California market. Additionally, where field demonstrations are required or desired, the number of installations will significantly impact the budget. Therefore, demonstration criteria should be realistic and reasonable, such as demonstrating 1-2 equipment installs; they should not be based on anything like square footage. Additionally, the types of systems proposed should be factored into the demonstration site criteria. For example, in Group 3 there is a very significant difference in cost between a residential system serving a single home or apartment and a commercial system serving a multifamily building. If a central system were being proposed, only a single demonstration site should be required. Research teams could choose to use the funding for additional demonstrations, but should not be required to do so. A suggested quantity or fewer could be a useful approach here.

   a. *What would be the typical range of costs (e.g., capital costs) for the anticipated projects, and could projects leverage CEC funding to encourage private investments?*

      No comment at this time.

   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?*

      We believe this is a reasonable expectation.

5. *Should Group 1 in Section IV also include small commercial? If so, why?*

   No comment at this time.

6. *Should Group 3 in Section IV narrow its focus? e.g., to only residential or only commercial. If so, which one and why?*

We believe that Group 3 should focus on residential only, but that should include multifamily residential. We believe the residential market is where the need is greatest, and residential size products are more likely to be applicable to many commercial applications, whereas traditional commercial scale equipment is rarely used in residential applications. This would allow for smaller units up to 5 tons to be demonstrated in single family homes and/or modularized versions of those units to be used for central system applications in multifamily buildings.

7. *Is four years a feasible project timeline? Are there potential barriers or challenges in implementing the proposed projects in that timeframe?*

   As suggested earlier we believe the CEC should allow for flexibility in starting TRL levels. For those proposing products that are currently at lower TRLs, 4 years will likely not be enough time to complete product development and field demonstration/s, but for those proposing higher TRL starting points, 4 years should be sufficient.

8. *Which end-use sectors, facilities, or communities are expected to be most positively impacted by these types of projects?*

   No comment at this time.

9. *How could this solicitation encourage projects to more fully center equity and community engagement?*

   The CEC should allow for and potentially require that some of the funding be allocated to support participation from property owner and onsite property staff as well as resident engagement for a successful deployment and demonstration project. Onsite management staff are often required to engage in demonstration projects beyond regular work scope, they know the property and the residents the best and are often critical to successful deployment and demonstration. Budgets could include compensation for onsite management staff to support demonstration projects and lead community engagement activities. This could also build capacity in management for future resident engagement. Community engagement is often critical in properly demonstrating and including said populations in the energy transition, and can be integral to the success of the field demonstration itself. For the resident engagement strategy, budget should be available for development and implementation of a residential engagement strategy as well as compensation to residents for participation. Additionally, emergency utility funding should be budgeted for in the event of underperformance, degraded performance over time, or equipment failures that occur during field demonstration. Field demonstrations in occupied buildings, particularly those that house low-income Californians, require some engagement and effort on the part of the resident, and can also result in undue stress and inconvenience. As a result, residents should be compensated fairly for their participation, and processes and resources should be in place to address any issues that arise.