

Harvest Thermal
663 Coventry Rd
Kensington, CA 94707

To: National Association of State Energy Officials
1300 North 17th Street, Suite 1275
Arlington, Virginia 22209

May 18, 2023

Re.: Harvest Thermal Response to NASEO RFI on Implementation Options for IRA Rebate Programs

Harvest Thermal (“Harvest”) is a U.S.-based manufacturer of smart heating, cooling, and hot water technology using thermal energy storage and heat pump technologies to reduce the climate impacts and energy costs of residential space and water heating. We appreciate the opportunity to submit comments on the implementation of the Inflation Reduction Act (IRA) Home Energy Performance-Based Whole-House Rebate Program (HOMES) and the High-Efficiency Electric Home Rebate Program (HEEHR) rebate programs. No proprietary or confidential information is included in our response, it is suitable for public dissemination by NASEO.

Category 2: Program Elements

Company Characteristics

16. Name, contact information, company or organization you represent

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Head of Product and Operations
Harvest Thermal

17. An Overview of your approach to equity, diversity, inclusion, and accessibility (DEIA)

Internally, Harvest Thermal is dedicated to creating an inclusive environment for everyone. We actively seek to hire new employees from diverse backgrounds and ensure that all are treated well and fairly within the company. We do not tolerate harassment of community members in any form and provide resources and a supportive environment to address any such issues.

Externally, a primary design objective for our solution was to make electrification affordable for low-income communities who are most burdened by energy costs, by delivering the lowest energy costs in the industry. We have been named a key vendor to BlocPower to deploy our system in community-based projects they develop.

18. As applicable, a short description and a link to programming that your company is contracted or has been contracted to implement for planning, administering, and/or field delivery of federal or state programs. Note which, if any, provides low- and moderate-income and affordable home energy upgrades, especially with and in disadvantaged communities.

Harvest Thermal has partnered with the Association for Energy Affordability, City of Berkeley, Northern California Land Trust, and California Energy Commission, to retrofit an 8-unit building inhabited by low-income, elderly people of color who previously faced displacement from rising rents. Harvest Thermal will be providing, at discounted costs, our patented thermal battery solution for home heating hot water, lowering the operating cost and emissions profile while improving the air quality and comfort of residents' homes. Funding has been provided by the City of Berkeley's Pilot Climate Equity Fund and Resilient Community Impact Fund. See <https://resiliencitiesnetwork.org/us-communities-receive-resilience-funding/>.

Program Elements

Describe the program elements that is important for State Energy Office consideration. Be as detailed as possible.

We recommend that State Energy Offices design Home Owner Managing Energy Savings (HOMES) and High-Efficiency Electric Home Rebate (HEEHR) programs that are inclusive of new technologies, so they encourage innovation and pave the way for more cost-effective solutions that will help scale equitable building decarbonization. To that end, we start by presenting Harvest Thermal technology as an example of an innovation that has the potential to help decarbonize buildings and the electric grid and should be able to compete on a level playing field with conventional heat pump technologies. We then provide recommendations on how to design innovation-friendly home decarbonization programs.

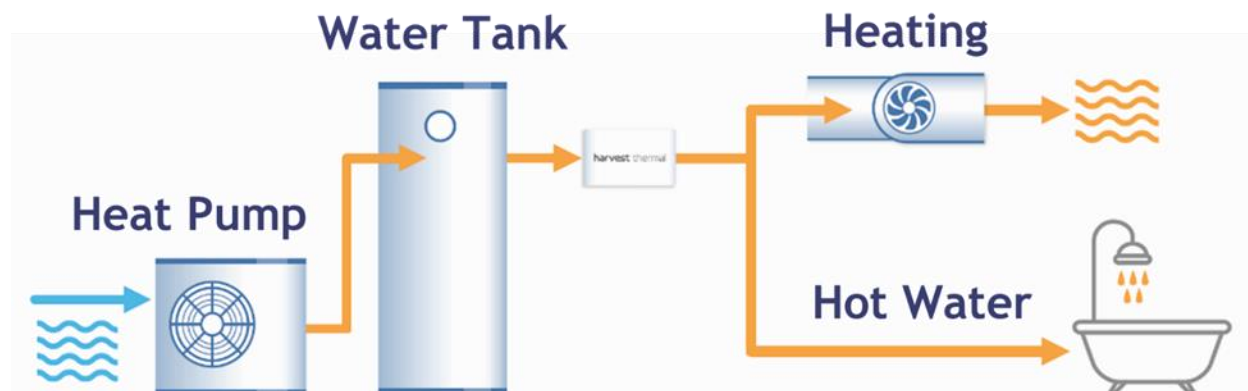
Background on the Harvest Thermal Combined Space Conditioning and Hot Water System

The Harvest Thermal system is a combined space conditioning and water heating system using a single high-efficiency air-to-water heat pump to deliver heating and hot water, and a separate air-to-air heat pump to deliver cooling and supplementary heat. The Harvest system is deployed in residential homes and consists of the following components:

1. A hot water storage tank such as a 119-gallon tank to store 150°F water for use for home heating and hot water use
2. A heat pump that heats water in the storage tank
3. A heat distributor which can be either a water-to-air or water-to-water heat exchanger, for heating delivery as forced air, or to radiant floors or radiators.
4. The Harvest Pod, a smart controller that includes both mechanical controls (sensors, valves, circulator pump) and a smart, grid-connected electronic controller that operates all components in the system. The controller charges the storage tank when electricity is cheapest and cleanest and delivers heat per the home heating needs by managing the water flow rate and return temperature to the heat distributor and back to the storage tank.

harvest thermal

The system provides both heating, cooling, and hot water services to residential buildings as a single system.



By using thermal energy storage to shift load from peak times when electricity is most expensive and highest-carbon to off-peak times when it is cheapest and cleanest, the Harvest system reduces energy costs for consumers and the grid, and reduces greenhouse gas emissions and air pollution.

Using thermal energy storage in this manner is equivalent to pairing a heat pump with electrochemical battery energy storage. However, for thermal applications like heating, cooling, and hot water, thermal energy storage can be more cost-effective than electrochemical battery storage and therefore has the potential to scale and to play a key role in the decarbonization of homes and other buildings.

Barriers to Program Participation

High-Efficiency Electric Home Rebate program design must not inadvertently discourage the innovation needed to make home decarbonization more cost-effective and scalable, helping achieve President Biden's economy-wide decarbonization goals. Innovation could be discouraged if eligibility criteria are set in a prescriptive manner that restricts program access to conventional solutions and excludes innovative technologies that are not yet mainstream.

For example, the Harvest Thermal battery system differs from mainstream heating, ventilation and air-conditioning (HVAC) technology in two significant ways:

1. **Air-to-water heat pump:** most conventional HVAC heat pumps are designed to heat air and are known as "air-to-air" heat pumps. Some technologies like SANCO2, Chiltrix, and SpacePak heat water rather than air and are known as "air-to-water" heat pumps (AWHP). AWHP are not covered by the federal Test Procedure for Central Air Conditioners and Heat Pumps which defines the SEER2 and HSPF2 performance metrics. *Therefore programs that set performance criteria using only SEER2 and HSPF2 metrics de facto exclude air-to-water heat pumps from program eligibility.*
2. **Combination heating and hot water ("combi") system:** there is no test procedure for combi systems that use a heat pump as the heat generator. However, these systems that use a single heat pump for both heating and hot water have the potential to provide a more cost-effective and more efficient solution than most conventional HVAC and heat

pump water heater (HPWH) systems. They may cost more upfront than a standalone HVAC or HPWH system, but less than two separate HVAC and HPWH systems. Given that they provide both heating and hot water services, they should be eligible for both HVAC and HPWH incentives. Limiting rebate eligibility to only one of the two services they provide would place combis at a disadvantage relative to standalone HVAC and HPWH solutions, which would tilt the scale toward these separate solutions, instead of *setting a technology-neutral level-playing field that incentivizes solutions based on the services they provide, not how they provide it.*

Technology-Neutral, Innovation-Friendly Approach to Program Design

High-Efficiency Electric Home Rebate program design should set technology-neutral, performance-based eligibility criteria. It can do so in the following manner:

Heat Pump Energy Efficiency Criteria

In addition to setting SEER2 and HSPF2 requirements for air-to-air heat pumps, programs should set separate requirements for air-to-water heat pumps:

- Air-to-water heat pumps that are water heaters (e.g. SANCO2 and Nyle) must qualify for ENERGY STAR for water heaters.
- Air-to-water heat pumps that are space heaters (e.g. Chiltrix and SpacePak) must meet the requirements of the ENERGY STAR Emerging Tech Award for air-to-water heat pumps.
- Combination systems whose heat generator is a water heater must qualify for ENERGY STAR for water heaters.
- Combination systems whose heat generator is a space heater must meet the requirements of the ENERGY STAR Emerging Tech Award for air-to-water heat pumps.

Combination Heating and Hot Water Systems

Combination systems that provide both heating and hot water services and meet program eligibility criteria are eligible for both heat pump space heating and heat pump water heating rebates.

Thank you for this opportunity to comment and for considering our input.

Sincerely,

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