RENEWABLE THERMAL COLLABORATIVE

Renewable Thermal Collaborative
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This information is provided in response to the Request for Information from the U.S. Department of Energy's (DOE) Energy Storage Demonstration Projects under the Bipartisan Infrastructure Law (BIL) Section 41001 (DE-FOA-0002777).

About the Renewable Thermal Collaborative (RTC)

The Renewable Thermal Collaborative (RTC) serves as the leading coalition for organizations that are committed to scaling up renewable heating and cooling at their facilities and dramatically cutting carbon emissions.[1] RTC members are industrial and commercial thermal energy buyers with ambitious emissions reductions targets who recognize the urgent need to meet the growing demand for renewable heating and cooling in a manner that delivers sustainable, cost-competitive options at scale.

We agree that the BIL (Public Law 117-58) provides a rare opportunity to grow a sustainable, resilient, and equitable economy. The BIL also has strong potential to accelerate DOE's Energy Storage Grand Challenge and the various storage technologies it supports, including electrochemical, mechanical, and thermal storage. Reducing the cost and increasing the availability of longer-duration storage is critical for future grid flexibility and broader U.S. climate goals. Thermal storage applications additionally provide an avenue to decarbonize energy use for heating and cooling for the industrial and buildings sectors. Novel thermal storage technologies are ready for piloting and demonstration as part of BIL's storage programs and show potential to reach even high temperature ranges demanded by the heaviest emitting industrial sectors.

55. Please provide any additional information or input not specifically requested in the questions above that you believe would be valuable to help DOE develop 41001 funding announcements and opportunities, including any specific criteria that DOE may take into consideration in implementing 41001 energy storage programs.

[1] The Renewable Thermal Collaborative was founded in 2017 and is facilitated by the Center for Climate and Energy Solutions, David Gardiner and Associates, and World Wildlife Fund.

It is clear from the Energy Storage Grand Challenge's framework that DOE is supporting a broad range of storage technologies, including thermal applications. Enabling the use of stored energy in forms other than electricity to support decarbonizing industrial processes is also among the possible additional objectives of Pilot Grants under Sec. 41001 of the BIL. This objective provides an opportunity for cross-sectoral decarbonization and could be applied to other aspects of Sec. 41001, including Long-Duration Storage Demonstrations. More broadly, support for thermal storage has strong potential to advance the manufacturing and levelized-cost goals of the Energy Storage Grand Challenge while enhancing grid flexibility.

Various thermal storage applications are ready for piloting and demonstration at the scales envisioned in BIL's storage programs. For example, an emerging class of technologies sometimes referred to as Electrified Thermal Energy Storage can capture intermittent electricity from on-grid and off-grid renewable sources of energy for highly efficient conversion into continuous heat that can be used directly or stored for later use for durations beyond 10 hours. While the precise mechanisms vary, these technologies often deploy insulated storage containers directly at the point of end use that contain commonly available solid materials such as minerals, alloys, and ceramics that rapidly conduct heat through electrical resistance.

Unlike some earlier technologies, such as waste heat and pumped thermal storage projects, Electrified Thermal Energy Storage technologies show potential to reach even high temperature ranges (over 1,100 degrees Celsius) demanded by the most emissions-intensive industrial sectors, such as iron and steel, cement, and chemicals, making them a potential drop-in replacement for fossil fuels. They also show versatility in meeting the various end-use needs, from direct heat to steam and heat transfer fluids. Modularity is of critical importance in meeting the manufacturing and buildings sectors' different temperature and production process needs.

These forms of thermal storage are likely to become both increasingly effective and vital, providing grid stability and arbitrage functions as renewable electricity expands and disparities between peak and off-peak power market values grow. Importantly, various thermal storage applications do not add to peak load on the grid, which is likely to prove advantageous as other sectors increasingly electrify and contribute to higher peak demands. Some markets with large renewable electricity capacity deployments generated by non-dispatchable resources and other sources with low marginal costs have multiple hours of curtailed output. Thermal storage can consume otherwise wasted

electricity in these markets, making it cost-effective and creating an opportunity for emissions reductions. As renewable electricity capacity expands, so too does the potential for emissions reductions from thermal storage.

As many renewable thermal storage technologies do not rely on critical minerals, they are less reliant on foreign supply chains and can grow domestic manufacturing, often with lower overall manufacturing costs relative to some leading battery technologies. Investments in pilot and demonstration projects are crucial to helping these technologies scale in the marketplace.

Energy used for heating and cooling is responsible for about 40 percent of global energy-related greenhouse gas emissions while accounting for about half of U.S. industrial emissions. The commercial and residential building sectors are responsible for 13 percent of U.S. emissions, with most of those emissions created in the use of energy for heating. Thermal storage provides an avenue for cross-sectoral emissions reductions on a cost-competitive basis that supports the duration and flexibility requirements of the future grid. We hope it will be considered as DOE implements the energy storage provisions of the BIL.

The RTC welcomes the opportunity to provide additional insights to DOE regarding thermal storage applications through working groups, discussions, or other forums. Please do not hesitate to reach out to us for further support and information.