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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) Hydrogen Program as Additional Information for DOE to consider as it defines the scope and priorities of its hydrogen initiatives.

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.²

The RTC applauds the Secretary's Energy Earthshot Initiative and the Hydrogen Shot. Developing green hydrogen and reducing deployment costs will be critical to solving climate change and ensuring that the U.S. is a global leader in developing renewable thermal technologies and that U.S. companies secure any competitive advantages from being early adopters of renewable thermal technologies. A focused effort on green hydrogen development can help to overcome technical barriers, reduce costs for deployment, and achieve significant emissions reductions from the industrial and buildings sectors.

Challenges for Green Hydrogen

RTC members have ambitious emissions reductions targets and urgently require renewable solutions for their thermal energy emissions. Green hydrogen is a promising solution but faces numerous barriers that need to be resolved as quickly as possible. Cost and complex technological issues such as how much hydrogen existing systems can use or what

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.

² [RTC members](#) are U.S. and global manufacturers, municipalities, healthcare and university systems, and statewide offices.



replacement equipment may be needed are top barriers. RTC members are also greatly interested in how hydrogen will be delivered. DOE's support of green hydrogen research and development can help to solve these and other challenges thermal energy buyers currently face.

RTC Actions on Green Hydrogen

The RTC and its partners see significant potential for green hydrogen to help decarbonize the industrial and buildings sectors, and are engaged in the topic in the following ways:

- Over the course of the next year, the RTC will develop a green hydrogen technology assessment and launch the Technology Action Plan and Partnership (TAPP).
 - The technology assessment will analyze the potential of green hydrogen in the short-term (by 2030) and the long-term (2050), identify major technical, market, and policy barriers, risks and unintended consequences on climate, sustainable forest and land management, freshwater, biodiversity, etc., as well as implications for local communities, related workforce, and people with disabilities, and provide recommendations for large corporate and institutional buyers.
 - Building upon the technology assessment, the RTC will convene industrial energy buyers, solution providers, and financiers, along with government experts, environmental justice advocates, and labor representatives in a dedicated working group to identify promising technology deployment models, including the creation of essential market instruments and financing tools for green hydrogen, and work together to catalyze green hydrogen pilot projects where possible.
- RTC members are interested in helping to accelerate green hydrogen commercialization and RTC sponsors are working on green hydrogen production. Members and sponsors would be eager to collaborate with the DOE on green hydrogen.
- The RTC engages with partners across the thermal energy value chain – from fuel producers to utilities to thermal energy users – and across industrial sectors.

The RTC welcomes the opportunity to engage with DOE on green hydrogen development and deployment by participating in working groups, connecting DOE with RTC members where appropriate, and providing additional information. We also expect to carry out pilot projects and would be interested in exploring joint opportunities.

Decarbonizing Thermal Energy

Thermal energy is a key component of energy use in the U.S. and around the world, particularly in the industrial sector. In 2019, direct industrial greenhouse gas (GHG) emissions

were 23 percent of total U.S. GHG emissions, making industrial emissions the third largest contributor to U.S. GHG emissions, after the transportation (29 percent) and electricity (25 percent) sectors.³ Industrial thermal energy creates 12.5 percent of GHG pollution in the U.S.⁴ Industry is a significant contributor to GHG emissions around the world as well: industry accounted for 21 percent of global GHG emissions in 2010, with thermal energy for heavy industry alone creating 10 percent of total carbon dioxide emissions.⁵ Many RTC members are global companies and the development of green hydrogen can benefit their facilities in the U.S. and abroad, potentially creating a competitive advantage for the U.S. as other countries seek thermal decarbonization solutions. Reducing fossil fuel use in thermal energy production presents a significant opportunity to reduce GHG emissions in the industrial and buildings sectors.

Considerations for Hydrogen Initiatives

While green hydrogen has the potential to reduce thermal emissions, including industrial emissions, it is critical that the DOE keep in mind the following considerations when developing hydrogen initiatives:

- **Production:** Producing significant quantities of green hydrogen will require corresponding deployment of renewable electricity generation as well as needed transmission. Green hydrogen and its associated infrastructure must be developed following sustainability principles that reduce negative environmental and social externalities and maximize biodiversity and social co-benefits.
- **Transportation:** The existing gas pipeline system may provide a cost-effective way to transport hydrogen, but additional research is required to determine what quantities of hydrogen can be safely transported or what retrofits may be required. Safety measures must be instituted throughout the supply chain to ensure public, worker, and environmental safety.

³ Direct emissions are those that are produced at an industrial facility and do not include indirect emissions associated with electricity use. Direct emissions are produced by burning fuel for power or heat, through chemical reactions, and from leaks from industrial processes or equipment. “Sources of Greenhouse Gas Emissions: Industry,” U.S. Environmental Protection Agency, accessed June 29, 2021, <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>.

⁴ U.S. Environmental Protection Agency, “Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018 – Main Text,” Table ES-3, April 13, 2020, <https://www.epa.gov/sites/production/files/2020-04/documents/us-ghg-inventory-2020-main-text.pdf>.

⁵ “Global Greenhouse Gas Emissions Data,” U.S. Environmental Protection Agency, accessed June 29, 2021, <https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>; “Low-Carbon Heat Solutions for Heavy Industry: Sources, Options, and Costs Today,” J. Friedmann, Z. Fan, and K. Tang, 2017, <https://www.energypolicy.columbia.edu/research/report/low-carbon-heat-solutions-heavy-industry-sources-options-and-costs-today>.



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- **Use:** Using green hydrogen blended with or instead of natural gas for thermal energy provides an opportunity for the industrial and buildings sectors to reduce their emissions, but facilities will need support evaluating what amount of hydrogen their current equipment can use or what retrofits or upgrades may be required. Traceable certificates can allow end users to ensure that they are using green hydrogen.

As noted above, the RTC welcomes the opportunity to provide additional insights to DOE regarding industrial and commercial use of green hydrogen through working groups, discussions, or other forums. Please do not hesitate to reach out to us for further information.