

The Better Climate Challenge Portfolio-level Electrification Working Group (Electrification Working Group) convened more than 20 industrial organizations to discuss pathways for electrification of facilities and techniques to scale from the plant-level to portfolios. These partners, along with DOE technical experts shared electrification strategies, lessons learned, and cost-benefit trade-offs. The group also discussed effective planning techniques to implement electrification strategies. Through roundtable discussions, participants shared experiences, barriers, and best practices for electrification.

Outcomes

The Electrification Working Group explored effective planning techniques and pathways to implement electrification strategies at scale. Working group participants and DOE technical experts collaborated to develop the Facility-Level Electrification Assessment Framework, which organizations can use to identify, evaluate, and implement electrification opportunities in a single facility.

Discussion Topics

Over the course of seven working group meetings, Better Climate Challenge partners provided significant input for the Facility-Level Electrification Assessment Framework based on their expertise developing and implementing electrified technologies in their organizations. The Framework includes sections on:

▶ **Inventory and Portfolio Management**

Proper inventorying provides a better understanding of a facility's existing equipment, design characteristics, and requisite process parameters. It makes it possible to identify emission-intensive systems and helps prioritize systems for evaluation of electrified alternatives.

▶ **Assessing a Facility's Electrification Readiness**

A manufacturing facility's readiness for electrification is determined by several factors, predominantly its electric distribution system's ability to support the added electric load. This can be established by evaluating the hosting capacity of each individual equipment, including transformers, switchgears, etc. Other key factors in determining readiness include a facility's utility rate structure, local grid emissions, floorspace availability, and workforce operations & maintenance capabilities.

▶ **Identifying Strategies for Electrification**

With numerous electric heating technologies commercially available, identifying the best-suited equipment for a specific application involves matching the process requirements with the capability of the technology. Having a foundational understanding of electric systems and staying updated on the emerging developments in the field is key to navigating the rapidly changing environment.

KEY TAKEAWAYS

The Electrification Working Group provided key insights related to electrification as a decarbonization strategy including:

- ▶ Forklifts and electric heat pumps for HVAC applications are seen as low-lift electrification opportunities by many organizations, but process heating applications, including steam generation, are also of high interest for their transformative impact on GHG emissions.
- ▶ Electrification can often yield significant benefits beyond energy and emissions, such as productivity, quality, and resiliency improvements, that can help make the case for higher-cost electrification projects.
- ▶ The most serious barriers to implementing electro-technologies include high capital and operating costs and the need for utility/facility infrastructure upgrades.

▶ Evaluating and Implementing Projects

The different electrification pathways are not only evaluated against each other but also against other decarbonization options in terms of their operating and capital expenses, emissions reduction potential, and other co-benefits (or costs) such as impacts to safety, productivity, quality, etc. Having consistent methodologies and a set of streamlined tools helps evaluate projects effectively.

Partner Highlights

During the Electrification Working Group, participants shared their motivations, strategies, and ongoing work related to electrification projects at their facilities. A few of these projects are highlighted below.

- ▶ **Volvo:** Volvo has implemented induction heating for the treatment of automotive metal components at their Hagerstown, MD facility. Induction heat treatment provides faster production rates, better metallurgical results (higher product quality) and reduced overall emissions.
- ▶ **Saint-Gobain:** In 2023, Saint-Gobain installed an electric furnace to replace natural gas for the drying process in their Fredrikstad, Norway plant, creating the first zero-carbon wallboard manufacturing plant. This is now being replicated in Montreal, Canada, expected to begin operation in 2024. Similar opportunities are being explored across Saint-Gobain facilities in the United States.
- ▶ **Trane Technologies:** Trane Technologies is planning on incorporating heat pumps for various applications including low-temperature process heating and comfort heating/cooling in their new Greenville, SC facility.
- ▶ **Ingersoll Rand:** Ingersoll Rand has electrified their internal transportation equipment (forklifts, lift equipment and guided vehicles) at multiple sites. Electric options produce zero emissions inside the building, require less maintenance, and are quieter and easier to drive. Multiple opportunities to convert natural gas comfort heating systems to heat pumps or electric forced air have also been identified and its installations are being prioritized.

Follow up Activities

Alongside the Electrification Assessment Framework, DOE will publish an Electrification Toolkit that includes various tools to perform an electrification assessment including a Heat Pumps Calculator, Forklifts Calculator, Electrification Readiness Checklist, Facility Inventorying Template, and a Billing Analysis Spreadsheet. Resources may be added as needed to continue to support partner needs, including training modules for identifying and implementing electrification projects.