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STEP DEMO

10 MWE SUPERCRITICAL CO_2 PILOT POWER PLANT

10 MWe SUPERCRITICAL CO_2 PILOT POWER PLANT

Advancing high-efficiency supercritical carbon dioxide (sCO_2) Brayton power cycles for power generation

GTI leads the Supercritical Transformational Electric Power Project (STEP Demo), a $145+ million project funded with $115 million from the U.S. Department of Energy/National Energy Technology Laboratory (U.S. DOE/NETL).

85% reduction in turbomachinery size

STEP Demo will demonstrate a fully integrated functional electricity generating power plant using transformational sCO_2-based power cycle technology with dramatically improved efficiencies, economics, and environmental performance.

The specific objective of the project is to demonstrate the highly efficient Brayton power cycle in a pilot-scale, grid-connected power plant. Compared to conventional steam-based power generation, the sCO_2 Brayton cycle uses CO_2 under high-pressure and high-temperature ("supercritical") conditions as a working fluid. This offers improved efficiency and corresponding lower emissions from fossil power plants.

In addition, the cycle lends itself to highly compact turbomachinery, resulting in lower capital costs, reduced plant size and footprint, and more rapid response to changes in power demand that can occur when integrated with renewable wind or solar power generation.

Developing and maturing the technology at pilot scale will facilitate its commercialization and spur the development of necessary designs, materials, components, operation and control systems, sensors, and understanding and characterization needed for larger-scale sCO_2 power conversion systems.

STATUS: GTI, along with partners GE Global Research (GE) and Southwest Research Institute (SwRI), is designing, building, and operating a 10 MWe supercritical carbon dioxide (sCO_2) pilot power plant at SwRI's campus in San Antonio, Texas with support from U.S. DOE/NETL. Construction started in early 2019 and commissioning is scheduled for 2022.

JOINT INDUSTRY PROGRAM: Commercial partners provide guidance to the operation, have access to project data, and have preferential rights to project IP. Additional partners are welcome.

BENEFITS

- Improved power plant efficiency
- Zero emission configurations
- Reduction in costs, emissions, and water use
- Quick response time

KEY FEATURES

- Lower emissions and water consumption
- Higher efficiencies with zero emission configurations
- Compact turbomachinery
- Lower capital expenditures
- Facilitates and economizes low-carbon power production
- Heat source flexibility
- Allows for easy separation and sequestration of CO_2
- Stable, non-toxic working fluid

APPLICATIONS

- Fossil (coal, natural gas)
- Renewable power (concentrated solar, biomass, geothermal)
- Next-generation nuclear
- Industrial waste heat recovery
- Shipboard propulsion

TEAM

gti — Prime Contractor and System Lead

SwRI Southwest Research Institute — Host Site and Test Operations

GE — Turbomachinery Technology

U.S. Department of Energy

National Energy Technology Laboratory

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Markus Lesemann, Business Development Director, Energy Supply & Conversion, GTI

mlesemann@gti.energy, +1 847.768.0914

1700 S Mount Prospect Road
Des Plaines, IL 60018 USA