www.stepdemo.us

STEP DEMO

10 MW_e SUPERCRITICAL CO_2 PILOT POWER PLANT

10 MW_e SUPERCRITICAL CO_2 PILOT POWER PLANT

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

GTI Energy leads the Supercritical Transformational Electric Power Project (STEP Demo), a $155+ million project funded with $125 million from the U.S. Department of Energy/National Energy Technology Laboratory (U.S. DOE/NETL).

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 10 MWe 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 the STEP pilot will facilitate its commercialization and spur the development of necessary designs, materials, components, operation and control systems, sensors, and result in understandings and characterizations needed for larger-scale sCO_2 power conversion systems.

85% reduction in turbomachinery size

STATUS: GTI Energy, 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. The facility achieved mechanical completion in October 2023, full system commissioning tests started in December 2023, and Simple Cycle Configuration performance testing is expected to be completed in 2024.

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.

FUTURE DEVELOPMENTS:
After project objectives are met, STEP Demo will remain an ongoing testbed for future sCO_2-cycle-based power development. The plant design is flexible and can be reconfigured to accommodate future testing to continue technology optimization and component development.

www.stepdemo.us

Key Features

- Lower emissions and water consumption
- Higher efficiencies
- Compact turbomachinery
- Lower capital expenditures
- Facilitates and economizes low-carbon power production
- Heat source flexibility
- Stable, non-toxic working fluid

Applications

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

Benefits

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

TEAM

GTI ENERGY
Prime Contractor and System Lead

SwRI SOUTHWEST RESEARCH INSTITUTE
Host Site and Test Operations

GE VERNOVA
Turbomachinery Technology

U.S. DEPARTMENT OF ENERGY | NETL NATIONAL ENERGY TECHNOLOGY LABORATORY

Markus Lesemann
Senior Director, Business Development
mlesemann@gti.energy, +1 847.768.0914

1700 S Mount Prospect Road
Des Plaines, IL 60018 USA

8.24