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# 10 MW<sub>E</sub> SUPERCRITICAL CO<sub>2</sub> PILOT POWER PLANT



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## Advancing high-efficiency supercritical carbon dioxide (sCO<sub>2</sub>) Brayton power cycles for power generation

GTI leads the Supercritical Transformational Electric Power Project (STEP Demo), a \$119 million project funded with \$84 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<sub>2</sub>-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<sub>2</sub> Brayton cycle uses CO<sub>2</sub> under high-pressure and high-temperature ("supercritical") conditions as a working fluid. This offers improved efficiency and corresponding lower emissions from fossil power plants.

**85% reduction in turbomachinery size**



Courtesy of GE and SwRI

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<sub>2</sub> 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<sub>2</sub>) pilot power plant at SwRI's campus in San Antonio, Texas with support from U.S. DOE/NETL.

**JOINT INDUSTRY PROGRAM:** Commercial partners provide guidance to the operation and have access to project data. 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<sub>2</sub>
- 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



Turbomachinery Technology



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