Solar Reforming of Carbon Dioxide to Produce Diesel Fuel

DOE NETL Project #DE-FE0002558

Renewable Energy Institute International (REII) Dr. Dennis Schuetzle, Principal Investigator, Sacramento, CA

Major Project Participants

Sandia National Laboratories

PACIFIC RENEWABLE FUELS

DRI Desert Research Institute

QUANTA SERVICES

Pratt & Whitney A United Technologies Company

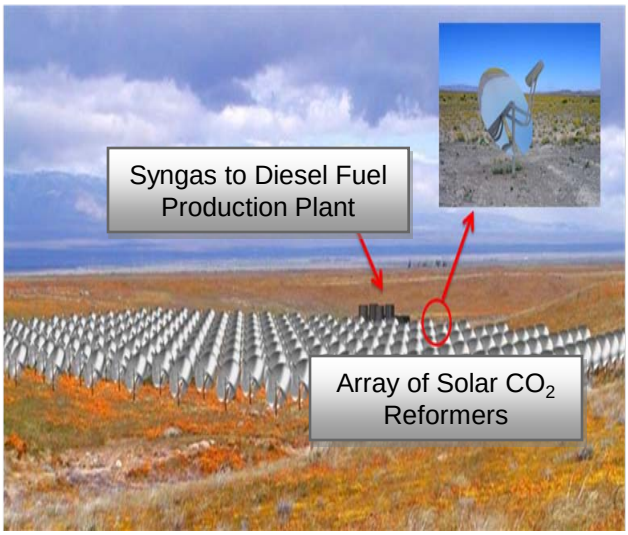
ES

Benefits and Outcomes

- Reduces Greenhouse Gas emissions by profitably turning waste CO_2 into synthetic diesel fuel using concentrating solar energy.
- Enhances U.S. energy security and reduces environmental impacts by displacing petroleum based fuels.
- Utilizes 5.1 lbs. of CO_2 for the production of each gallon of synthetic diesel fuel.
- 90.7% of total CO_2 is used in the total process lifecycle.
- Additional major GHG emissions reductions are achieved by displacing petroleum fuels.
- This technology could supply 16.3% of U.S. petroleum needs by 2030 and create over 100,000 clean energy jobs.

Project Description and Objectives

This project is focused on the demonstration of technologies which utilize waste CO_2 as a feedstock for the production of diesel fuel using concentrating solar energy. A solar reformer system, as shown in the adjacent figure, was successfully demonstrated during the first phase of this project. The next project phase will utilize CO_2 from a power plant to produce a high-quality synthetic diesel fuel. Testing will be carried out to collect essential technical, operational and financial data that will be used for the commercial-scale design, scale-up and reliable deployment of the first commercial solar CO_2 reforming systems.



Commercial Plant Configuration

Technologies and Methods Employed

The system uses a unique solar reforming reactor and catalyst that converts CO_2 rich gas streams into syngas (H_2 and CO) using concentrating solar energy at high energy conversion efficiencies. This syngas is subsequently converted to high-quality synthetic diesel fuel using next generation liquid fuel production processes. Based on a detailed commercial analysis, this technology will be ideal for use with stationary emissions sources and have the potential to sequester up to 2073 million tons of CO_2 per year in the United States. Commercial technologies are projected to be deployed in the 2013-14 time frame at a variety of industrial project sites including coal power plants, natural gas and oxy-combustion power plants, natural gas processing facilities, ethanol plants, cement production plants, municipal landfill sites, and other stationary emission sources.