

## the **ENERGY** lab

# PROJECT FACTS

## **Gasification Technologies**

# Feasibility Studies to Improve Plant Availability and Reduce Total Installed Cost in Integrated Gasification Combined Cycle Plants

## **Background**

Gasification provides the means to turn coal and other carbonaceous solid, liquid and gaseous feedstocks as diverse as refinery residues, biomass, and black liquor into synthesis gas and valuable byproducts that can be used to produce low-emissions power, clean-burning fuels and a wide range of commercial products to support the U.S. economy. Coal gasification can decrease our dependence on oil imports while meeting current and future environmental emission standards. The major challenge in the use of gasification technology is cost; current integrated gasification combined cycle (IGCC) technology is estimated to produce power at a cost higher than that of pulverized coal combustion based on the same coal and site conditions. However, the Department of Energy (DOE) National Energy Technology Laboratory (NETL) Gasification Program supports the development of technologies with the potential to produce electric power with more than 90 percent carbon capture at a cost of electricity (COE) that is lower than the COE for any other coal-fueled power generation technology with carbon capture. The public benefits of the Gasification Program for the U.S. are significant—lower cost power, cleaner environment, lower carbon footprint, less water use, reduced dependence on imports, and additional jobs. Toward this end, NETL is partnering with General Electric Energy (GE Energy) to study the feasibility of improving plant availability and reducing total installed cost in IGCC power plants.

## **Project Description**

The project team will complete five techno-economic studies focused on various aspects of IGCC plants where it is anticipated that technological improvements will substantially improve cost-effectiveness and availability of the plants. For power plants and their components, availability is the percentage of time a plant or unit is capable of operating. Availability is reduced by planned and unplanned maintenance and forced outages. For each study area or technology concept, the team will identify system and component-level requirements; develop designs and materials as required for technical evaluation of the concept; validate and test components/ sub-systems; and develop appropriate operating methodologies, simulations, and control philosophies where applicable. Eastman Chemical Company will be

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### PROJECT DURATION

**Start Date** 10/01/2011

**End Date** 09/30/2014

#### COST

**Total Project Value** \$4,937,219

**DOE/Non-DOE Share** \$3,949,773 / \$987,446



supporting the GE Energy effort for certain technologies by providing consulting for the technical evaluations and technology transfer phases of the project. The five study areas for improvement of the costs and/or availability of IGCC plants are as follows:

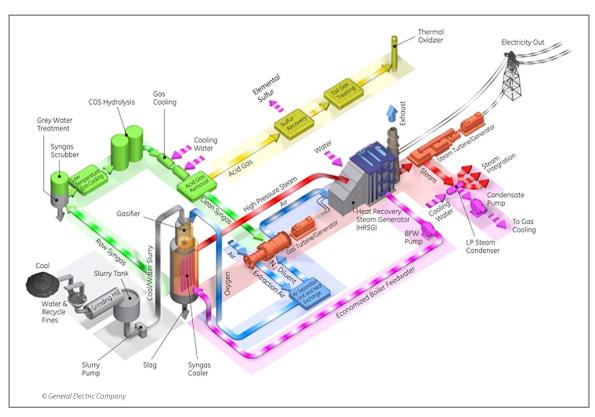
- Integrated Operations Philosophy. This study will address
  equipment sparing, isolation of equipment for maintenance,
  and other means with the goal of reducing the plant's total
  installed cost and/or construction schedule resulting in
  improved operability and accelerated plant maturity.
- Slip Form Components. This study will investigate components or structures that can be slip-formed (e.g., flue gas stacks, cooling tower shells, coal silos) with the goal of reducing the plant's total installed cost and/ or schedule. Conventionally, these structures may be long-lead construction items,
- Modularization of Plant. This study will identify and evaluate components or systems of a plant that can be modularized and/or pre-commissioned with the goal of reducing the plant's total installed cost and/or schedule.
- Fouling Removal System. In this study the team will develop
  a system which will remove the fouling deposits on the heat
  exchanging tubes in the syngas cooler thereby increasing
  efficiency and lowering the cost of electricity of the plant.
- Improved Blow Down System for Slag Handling. This study will focus on an improved system for slag handling that will increase availability and/or decrease the cost of the plant.

## **Goals and Objectives**

The goal of this project is to evaluate the effects of specific technical improvements on total installed cost and availability of IGCC plants through deployment of a multi-faceted approach in technology evaluation, constructability, and design methodology. The main objective is to reduce the time from design to technological maturity and enable plants to reach higher availability in shorter periods of time at lower installed costs. Specific objectives include conducting a technical investigation of technologies that can reduce the total installed cost of an IGCC plant; conducting a technical investigation of conceptual ideas that can improve the availability of an IGCC plant toward the targeted 90 percent without increasing total installed cost; and proposing a technology transfer plan, which will form the basis for future development, testing, and demonstration of conceptual ideas developed from the project.

#### **Benefits**

Successful completion of this project will improve gasification and IGCC plant availability and costs. Lower gasification costs will permit an increase in the use of domestic coal as a source of power and other products, thereby reducing the nation's dependence on imported fossil fuels. The use of gasification rather than conventional coal combustion will increase plant efficiency and reduce negative effects on the environment.



The typical IGCC plant layout offers multiple opportunities to improve availability and affordability. (Courtesy: GE Energy)