

PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Gasification
Technologies

04/2007



IGCC DYNAMIC SIMULATOR AND RESEARCH CENTER

Description

To meet growing demand for education and experience with the analysis, operation, and control of Integrated Gasification Combined Cycle (IGCC) plants, the National Energy Technology Laboratory (NETL) has launched a collaborative R&D project to develop a generic, full-scope, IGCC dynamic simulator for use in establishing a world-class R&D center at West Virginia University's (WVU) National Research Center for Coal and Energy (NRCCE). The IGCC simulator will combine a process/gasification simulator and a power/combined-cycle simulator together in a single dynamic simulation framework for use in research and development as well as engineering studies. The IGCC Dynamic Simulator & Research (DS&R) Center will also offer much-needed plant operation and control demonstrations, onsite training courses, and computer-based training. The DS&R Center will be established under the auspices of the Collaboratory for Process & Dynamic Systems Research (CPDSR) organized between NETL, WVU, the University of Pittsburgh, and Carnegie Mellon University.

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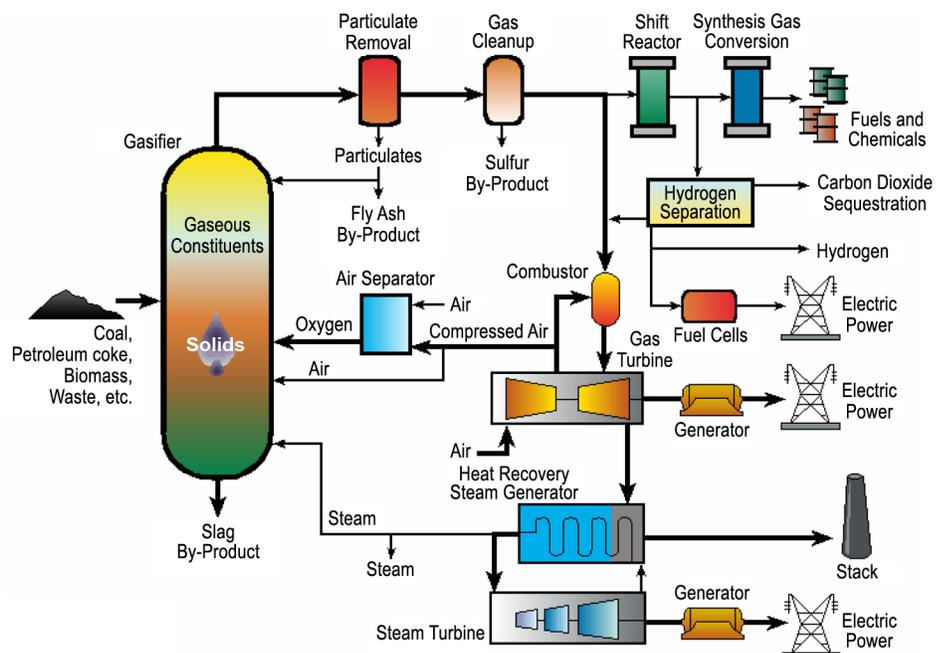
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Integrated Gasification Combined Cycle Plant



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Major Project Phases

The four-year R&D project to develop the generic IGCC dynamic simulator and establish the DS&R Center consists of five consecutive and overlapping phases:

- Phase I – Scoping Study (Completed)
- Phase II – Detailed Planning (Ongoing CPDSR Project – 12 months)
- Phase III – IGCC Dynamic Simulator Development (18-24 months)
- Phase IV – Acceptance Testing/Deployment at DS&R Center (12 months)
- Phase V – Establishment (12 months) and On-going Support of DS&R Center

Primary Project Goals

- Develop and deploy a generic, full-scope, complete-plant IGCC dynamic simulator
- Establish an IGCC DS&R Center to provide research, education, training, and demonstration capabilities for electric utilities, engineering and construction firms, gasifier technology suppliers, NETL system analysts, university engineering research and training communities, and those interested in learning more about IGCC plant operations and control
- Implement strategic R&D collaborations among key IGCC technology partners, including leading training simulator software and service providers
- Form a users' group to promote collaboration between the project team and industry, provide feedback to ensure project team is meeting industry needs, and promote awareness to the energy and process industries

Key Dynamic Simulator Features

- High-fidelity, real-time dynamic model of process-side (gasification) and power-side (combined cycle) for a generic, commercial-scale IGCC plant based on slurry-fed entrained-flow gasification technology
- Full-scope dynamic simulator capabilities including plant startup, shutdown, load following and shedding, response to fuel and ambient variations, control strategy analysis (turbine and gasifier load), malfunctions/trips, alarms, scenarios, trending, snapshots, data historian, and trainee performance monitoring
- Extendable to incorporate additional gasification and gas turbine technologies, as well as new, advanced technologies such as fuel cells and membrane separation systems

Benefits

The impact and benefit of the IGCC DS&R Center is as follows:

- Provides the NETL Collaboratory for Process & Dynamic Systems Research with a world-class IGCC research, training, and education resource at WVU's NRCCE
- Serves a focal point for collaborative IGCC research and development with universities, software and service providers, and the power and energy industries
- Satisfies the growing industry demand for education and experience with the analysis, operation, and control of commercial-scale IGCC plants
- Accelerates the development of advanced process and dynamic systems modeling technology to better achieve the aggressive design, operability, and controllability goals for IGCC power plants as well as poly-generation facilities, including the zero-emission FutureGen power and hydrogen production plant



IGCC Dynamic Simulator and Research Center