System Study for Improved Gas Turbine Performance for Coal IGCC Application
FACT SHEET

I. PROJECT DESCRIPTION

A. Objective:

This study will identify improvements in gas turbine performance for coal Integrated Gasification Combined Cycle (IGCC) application. The study will identify vital gas turbine parameters and quantify their influence in meeting the Turbine Program overall IGCC plant goals of 50% net HHV efficiency, $1000/kW capital cost, and low emissions. Focus will be on air-cooled gas turbines for near-term operation in coal fed oxygen blown IGCC power plants with commercially demonstrated gasification, gas cleaning, & air separation technologies. A roadmap towards achieving the goals of the Turbine Program will be defined, and will provide a total systems-level perspective to identify the development needs and improvements that have the highest impact/ payback to the program.

B. Background/Relevancy:

Background:

In the near term as reliance on natural gas increases and prices escalate opportunities will arise to reinvest in the use of coal, our nations most abundant fossil fuel resource. Estimates suggest that 31 gigawatts of new coal-based power generation will be installed over the next 17 years. The US generates approximately 50% of its power from coal. Much of this added capacity could be based on integrated gasification combined-cycle technology (IGCC). Significant improvements in overall cycle efficiency and cost per unit of power will dramatically reduce generation costs and emissions. This will help provide low-cost, environmentally acceptable power from a domestically abundant low cost fuel.

Relevancy:

Clean, efficient and cost effective coal based power systems depend on advanced power turbine technology to achieve higher levels of efficiency. IGCC technology has been demonstrated to show superiority in both performance and emissions compared with conventional coal power generation technology. However, additional enhancements in IGCC will be needed to gain superiority in life cycle electricity costs. One area of improvement is in the gas turbine portion of the cycle, which is the primary energy conversion device within an IGCC power plant. Increases in gas turbine conversion efficiency of coal derived syngas energy to power and higher utilization of exhaust energy will help drive lower IGCC plant level generating costs.

Meeting of the overall IGCC plant goals of 50% net HHV efficiency, $1000/kW capital cost, and low emissions for a 500 MW coal plant could provide annual generating cost savings of about $50 MM/yr compared to current F-Class IGCC systems and about $20 MM/yr compared to conventional PC technology. Additional enhancements in the area of emitted NOx and SOx could also be realized making IGCC the technology of choice for coal based power production.

C. Period of Performance:

The scheduled project period is January 01, 2004 to March 31, 2005

D. Project Summary:

This 15-month project will identify vital gas turbine parameters and quantify their influence in meeting the DOE Turbine Program overall Integrated Gasification Combined Cycle (IGCC) plant goals of 50% net HHV efficiency, $1000/kW capital cost, and low emissions. The project will analytically evaluate gas turbine conceptual cycle designs and quantify their influence on IGCC plant level performance. The study will also provide information to set the strategy for follow-on Turbine Program phases through identification of future technologies for advancing IGCC gas turbine performance.

A baseline conceptual IGCC system design will be established utilizing current General Electric (GE) F-class gas turbine technology based on a US IGCC site. Confirmation of DOE Turbine Program plant level performance goals would lead into brainstorming of gas turbine cycle concepts to be investigated. Overall

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IGCC system performance model will be constructed utilizing GE in house proprietary software for the gas turbine & steam turbine and commercially available software for the balance of the systems. The model will be exercised through parametric analysis to quantify gas turbine performance impact at IGCC plant system level. Results from the system analysis will be used to identify gas turbine technology improvements for development consideration in future Turbine Program phases.

The proposed program will be performed through the following five major tasks:

1. Overall IGCC Plant Level Requirements Identification
2. Requirements Prioritization & Flow-Down to Gas Turbine Subsystem Level
3. IGCC Conceptual System Analysis
4. Gas Turbine Cycle Options vs. Requirements Evaluation
5. Recommendations for Gas Turbine Technical Improvements

II. PROJECT PARTICIPANTS

A. Prime Participant: General Electric Company, General Electric Power Systems
B. Sub-Award Participants: None

III. PROJECT COSTS

A.	DOE Costs:	$298,336 (60%)
B.	Prime Contractor Cost Sharing:	$198,891 (40%)
C.	Total:	$497,227 (100%)

IV. MAJOR ACCOMPLISHMENTS SINCE BEGINNING OF THE PROJECT

Dates: Accomplishment:

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V. MAJOR ACTIVITIES PLANNED DURING NEXT 6 MONTHS

Planned Activity:

- Program KickOff meeting (30 days of Award)
- Hazardous Substance Plan (30 days of Award)
- Monthly Highlight Status Reports (Monthly)
- Perform an IGCC plant level QFD
- Perform a gas turbine level QFD
- Initiate IGCC plant level performance modeling
- Quarterly Milestone Status Report (Quarterly)
- Financial Status Report (Quarterly)
- Federal Cash Transaction Report (Quarterly)
- Technical Progress Report (Semi-annual)
- Program Fact Sheet (Semi-annual)

VI. ISSUES

No issues have been identified.

VII. ATTACHMENTS

A. Schematic: None

B. Project Schedule

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