

FACT SHEET (42646) Oct. 2006

I. PROJECT PARTICIPANTS

- A. Siemens Power Generation, Inc.
- B. Florida Turbine Technologies, Inc.
- C. Clean Energy Systems, Inc.

II. PROJECT DESCRIPTION

A. Objective(s) – To develop a cost effective and highly efficient turbo machinery system that will work with an oxy-fuel combustor that generates very high temperature CO₂ and steam mixture as the working fluid. After expansion of the working fluid, the CO₂ is captured allowing near-zero emissions of NO_x and carbon. The project will complete conceptual designs of alternate steam cycles and select one cycle for detailed design based on cost and feasibility studies.

B. Relevancy –

1. **Background:** CES, Inc. has an operational oxy-fuel combustor that generates approximately 5 MW power with zero emissions. Under a separate award, working closely with Siemens, CES will develop a pre-commercial scale combustor and demonstrate the feasibility of oxy-fuel combustion with zero emissions. The Siemens program will develop suitable turbo machinery to use this technology to generate power with near zero emissions.
2. **Relevancy:** The project is compatible with DOE goals of developing turbines to utilize high hydrogen fuels and to promote the use of hydrogen derived from coal. The project will also attempt to make significant advances in the power plant efficiencies in striving for efficiencies in the 50% to 60% (HHV) range in the time frame of 2015. High efficiency power production with near-zero emissions using fuel derived from coal are the goals directly supporting DOE long term vision of fossil energy production.

C. Project Summary – Conceptual designs of zero emissions turbo machinery will be developed for baseline, near term and long term plant cycles in Phase 1. After cost and feasibility studies one cycle will be developed further in Phase 2. Design validation and materials development/testing will be accomplished to apply the knowledge base to Phase 3 (sub-scale plant) should DOE decide to award this phase.

D. Period of Performance – Phase 1 - 24 months
Phase 2 - 36 months

III. PROJECT COSTS

	BUDGET PERIOD 1	BUDGET PERIOD 2	TOTAL
A. DOE SHARE	\$ 3,443,464	\$ 12,258,043	\$ 15,701,507
B. RECIPIENT SHARE	\$ 860,867	\$ 5,253,447	\$ 6,114,314
TOTAL	\$ 4,304,331	\$ 17,511,490	\$ 21,815,821

IV. MAJOR ACCOMPLISHMENTS SINCE THE BEGINNING OF THE PROJECT

- Project kickoff meeting was held at DOE-NETL (Morgantown) on November 16, 2005.
- A review of previously published studies on plant cycles was completed in relation to the cycle selection process for the zero emissions turbine program.
- A design interface document common to both Siemens and CES has been developed. The developed document details, in the absence of better parametric models from equipment suppliers, load and energy streams for coal gasification, CO₂ compression and O₂ separation. Such a document allows all involved parties to calculate expected net cycle performance at the same reference conditions and have confidence in establishing the advantage of one cycle over another and validating quoted published performance.
- A Research & Development Implementation (RDI) plan was prepared and submitted to DOE-NETL in March 2006. This plan details the R&D to be undertaken, the strategy to be followed, technical issues, alternative approaches to resolve the issues and the budgets and timeline for execution – task by task.
- A “White Paper” that outlines the expected near term and long term efficiencies was prepared and submitted to DOE-NETL in June 2006. The paper also describes the approach to maximizing the plant cycle efficiency in the long term by simultaneous developments in related technologies.

IV. MAJOR ACCOMPLISHMENTS SINCE THE BEGINNING OF THE PROJECT
(Continued)

- Near term and far term cycles have been developed and their heat balance diagrams are being finalized.
- Conceptual design of the 100% steam turbines and steam/CO₂ mixture operated turbines is about 80% complete.

V. MAJOR ACTIVITIES PLANNED DURING THE NEXT 18 MONTHS

- Complete conceptual designs and hold internal “peer” reviews (Dec 06)
- Perform cost and feasibility studies including an economic model for power generation by the use of oxy-fuel turbines. (March 07)
- Complete risk assessment of turbine design features (March 07)
- Hold a Gate 1 Siemens Power Generation internal review of the program (April 07)
- Design and commission test loop for materials (August 07)
- Develop tools and design methodologies for detailed design (September 07)

VI. ISSUES

None