

Clean Energy Systems, Inc. July 31, 2002  
DE-PS26-02NT41428 1

**PUBLIC ABSTRACT**

Applicant (primary) name: Clean Energy Systems, Inc. (CES)

Applicant's address: 8801 Folsom Blvd., Suite 275 Sacramento CA 95826  
Street City State Zipcode

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**Team Members (if any): Agreements to be signed during Project Definition Phase**

(listing represents only participants Name City State Zipcode  
at time of application, not necessarily  
final team membership)  
Name C ity State Zipcode  
Name City State Zipcode  
(Use continuation sheet if needed.)

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**1. Proposal Title: A 20 MW ZERO EMISSION COAL-FIRED DEMONSTRATION POWER PLANT**

Commercial Application:  New Facilities  Existing Facilities

Other, Specify:

Technology Type: Gasification and Combustion with Full Carbon Capture

Estimated total cost of project:

(May not represent final negotiated costs.)

Total Estimated Cost: \$ 109,860,000

Estimated DOE Share: \$ 54,930,000

Estimated Private Share: \$ 54,930,000

Anticipated Project Site(s): To be determined. Possible sites identified in North Dakota, Oklahoma, Mississippi, Utah, and California  
Location (city, county, etc.) State Zipcode

Type of coal to be used: Dependent upon final site location. Proposal assumes Illinois No. 6, but other coals, including lignite, may be used. Renewable fuel co-firing is also anticipated.

Size or scale of project: 214 short tons/day coal input  
Tons of coal/day input

And/or  
20 MW net electrical output  
Megawatts, Barrels per day, etc.  
Other (if necessary)

Duration of proposed project: 120  
(From date of award) (Months)

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**PRIMARY CONTACT:**

For additional information,

interested parties should contact: Name

Keith Pronske

Position Vice President, Business Development

(916 ) 379-9143

Telephone Number

Clean Energy Systems, Inc.

Company

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Sacramento CA 95826  
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**Alternative Contact:**

Name

Fermin (Vic) Viteri

Position

Chief Technical Officer

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Telephone Number

Company Clean Energy Systems, Inc.

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## **PUBLIC ABSTRACT (cont'd)**

### **Brief description of project:**

Clean Energy Systems, Inc., (CES) has developed a fossil- fueled, zero atmospheric-emission power plant concept that can use gasified coal to produce power without pollution. The California Energy Commission co- funded a proof-of-principle demonstration of a scaled model of the enabling gas generator (110K<sub>w</sub>t ) and the federal Department of Energy's National Energy Technology Laboratory (DOE/NETL) is co- funding the design, fabrication and testing of a 10 M<sub>w</sub>e prototype gas generator. Fabrication is complete and this gas generator will be tested in August and September of 2002. The California Energy Commission has also co-funded a 500 k<sub>w</sub>e natural gas- fired demonstration plant that is currently under construction and scheduled for operation in early 2003. Air Liquide and Mirant Corporation are also project participants.

The goal of this project is to construct a small (20 M<sub>w</sub>e) power plant to demonstrate the CES technology for zero atmospheric-emission power plants using a coal syngas, either alone or co-fired with renewable fuels. Long-term reliability and durability testing will be conducted over a seven- year operating period.

This plant would also demonstrate several critical enabling technologies that will help ensure long-term clean, reliable and affordable electricity. In addition to the CES zero-emission power generation technology, the plant will use advanced steam turbines under development by Elliott Turbomachinery Co., Inc. that are expected to operate at steam conditions of 1500 °F and 1200 psia (high pressure turbine) and 2200 °F and 170 psia (reheat turbine). Further, this plant would demonstrate a gasification technology developed by Westinghouse Plasma Corporation that is currently in use in several waste-to-energy plants. These three technology advancements facilitate new commercial opportunities for zero-emission coal plants, ranging in size from 50 MW to 400 MW.

A specific site has not been selected, although several potential sites have been identified, including locations in North Dakota, Oklahoma, Mississippi, and California. A final site will be selected during the Project Definition Phase in 2003.

The CES system burns a clean hydrocarbon fuel, such as a syngas from coal or biomass, with oxygen to produce a working gas consisting substantially of steam and carbon dioxide. The working fluid is fed into one or more steam turbines, which drive electric generators to create power. The drive gas is taken from the turbine(s) to a condenser/separator, where the steam is cooled to water and the carbon dioxide is separated as a gas. The water is returned to the gas generator to cool the unit and produce more steam. The CES system offers the potential, when burning natural gas or gasified coal, for higher net efficiencies than combined cycle power plants with the added advantage of zero air emissions. But to achieve these higher efficiencies, more advanced steam turbines are required, capable of operating at higher temperatures than today's

turbines. The turbines under development and proposed for this project are an important step forward. With existing steam turbines, however, CES technology still remains feasible and commercially competitive with other forms of clean or renewable energy.

This project will consist of four primary phases: Project Definition Phase, Design Phase, Construction Phase, and Demonstration Phase. Activities to take place during the Project Definition Phase are discussed in the proposal, but the highest priority will be placed on selecting the optimal plant site that takes into account existing coal plant infrastructure and the ability to beneficially use the captured Co<sub>2</sub> for Enhanced Oil or Coal Bed Methane Recovery.

The overall goal of this project is to demonstrate the durability and reliability of a zero-emission coal-fired power plant using CES technology. The anticipated cost of this project is \$109,860,000, consisting of \$2,433,000 during the Project Definition Phase, \$73,711,000 during the Design and Construction Phases, and \$33,716,000 during the demonstration phase. The DOE/NETL funding requested is \$54,930,000, of which \$1,217,000 is required for the Project Definition Phase. The remaining funds would be required in the event all identified milestones in the Statement of Work are achieved during the Project Definition Phase. Matching funds or in-kind contributions will be provided by CES and other partners to be selected during the Project Definition Phase.

A successful project will provide over 50,000 hours of operating experience on the gas generator and related components, demonstrating the durability and reliability of the gas generator, the advanced steam turbines, and Westinghouse's plasma gasification system. Commercial implementation of this technology can eventually lead to net plant efficiencies in excess of 60%, with zero emissions when burning natural gas, and efficiencies of 44% with zero emissions when burning coal.