# PUBLIC ABSTRACT

Applicant (primary) name: Emery Energy Company

Applicant=s address: 444 East 200 South, Salt Lake City, UT 84111
Street City State Zipcode

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Team Members (if any): Reaction Engineering International (REI);
(listing represents only participants Name City State Zipcode
at time of application, not necessarily final team membership) Idaho National Engineering and Environmental Laboratory (INEEL); Saint Gobain Industrial Ceramics; Fluor Daniel; Pinnacle West Capital Corporation; State of Utah, Office of Energy Services

(Use continuation sheet if needed.)

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Proposal Title: Emery Gasifier for Clean Coal Power Applications

Commercial Application: XX New Facilities X Existing Facilities

**9** Other, Specify: _____

Technology Type: Gasification/Synthesis Gas Cleaning

Estimated total cost of project:
(May not represent final negotiated costs.)

Total Estimated Cost: $ 132 million

Estimated DOE Share: $ 66 million

Estimated Private Share: $ 66 million

**PUBLIC ABSTRACT (cont=d)**

Anticipated Project Site(s): To be determined
Location (city, county, etc.) State Zipcode

Location (city, county, etc.) State Zipcode

Location (city, county, etc.) State Zipcode

Type of coal to be used: Bituminous
Primary

Alternate (if any)

Size or scale of project: 575 tons of coal per day
Tons of coal/day input

And/or

70Mwe net
Other (if necessary)

Megawatts, Barrels per day, etc.

Duration of proposed project: 92
(From date of award) (Months)

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PRIMARY CONTACT:

For additional information, interested parties should contact: Name

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President
Position

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Telephone Number

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Company

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City State Zipcode

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Alternative Contact:

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Name

Process Engineer
Position

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Company

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City State Zipcode

## PUBLIC ABSTRACT (cont=d)

## Brief description of project:

Commercial use of coal gasification has been limited by high unit costs related to technical challenges, such as the need for costly and regular replacement of ceramic refractory and burners, costly and energy intensive downstream equipment to clean and condition the synthesis gas (syngas) for the intended use, limited fuel/coal flexibility, high operating costs, and the need for expensive air emission control equipment. Our proposed project addresses these technical challenges and it will position coal gasification technology to become economically competitive with other coal-based power processes and natural gas combined cycle systems, enhancing the acceptability of IGCC systems and support economical use of domestic coal resources.

Emery's oxygen-blown, pressurized gasifier that can operate in slagging or non-slagging modes. It combines both fixed-bed and entrained-flow gasification processes into one vessel, while emphasizing the benefits of each technology type and mitigating their downsides. Emery's phased project has critical go/no go decision points that allow the proper sequential development of the technology to support commercial scale demonstration. The successful development and commercialization of this novel approach will broadly benefit both the coal and power industries by providing highly competitive power prices. Uniquely, the Emery technology will allow for IGCC plants to be built economically at smaller scales (i.e. 70 – 200 MWe) than current commercial coal gasification technologies. Conversely, current gasification technologies required coal-based IGCC to be extremely large to reach economies of scale. This will allow the technology to penetrate a large market related to Brownfield re-powering opportunities, as well as being economically viable for larger scale installations (i.e. >500 MWe).

Principle benefits to be realized for the gasification and coal power industry are based on the novel Emery Gasifier configuration. These features cited below, combined with modest efficiency gains over other gasification processes, result in significant capital and O&M savings, which are key to commercialization and market acceptance.

- Simplify plant configuration and lower capital costs of IGCC plants by >20%
- Reduced wear on ceramic lining, which greatly increases refractory life and mitigates costs associated with refractory replacement
- Develop novel syngas cleaning processes for removal of sulfur, mercury, arsenic and other non-desirable species that could eliminate or reduce the size of traditional downstream gas cleanup – resulting in the ability to significantly lower the capital and O&M costs of gasification plants
- Duel feed capability of both coarse and pulverized coal, greatly enhancing fuel flexibility and creating the ability to co-gasify biomass (a coarse feedstock) with coal
- Produce electric power at rates competitive to other alternatives, including NGCC

This project builds on past pilot plant work conducted in central Utah at our 25-ton/day gasification facility and our recent conceptual design research completed under EERE contract number DE-FC26-01NT41351, Biomass Gasification Feasibility/Modeling Study, in which computer modeling of the proposed gasifier plant design projected overall system performance efficiencies of 40.8% and 53.5%, biomass-to-electricity, respectively, when used in Integrated Gasification Combined Cycle (IGCC) and Integrated Gasification Fuel Cell (IGFC) configurations. Emery also ran 4 coal cases to compare efficiency differences and to identify any process plant changes necessary to support syngas production for the combined cycle power plant using the GE MS6001B turbine. Both GE Power Systems and the INEEL supported modeling and efficiency evaluation during this study. Results showed 42.3% net plant efficiencies when used in relatively small (70MWe) IGCC power plant applications with the GE MS6001B turbine on Bituminous coals. Installations sized to larger gas turbines (i.e. GE "H" frame or Westinghouse turbine developments) will allow for even higher net plant efficiencies.

This project consists of further development necessary to validate recent work and projections and advance this innovative technology from conceptual design to commercialization. The project includes: **PROJECT DEFINITION** (1) Development of an integrated computer model that accounts for all significant interdependent chemical reactions and physical processes to validate gasifier performance; (2) Conducting laboratory bench-scale tests to obtain certain data not available in the literature. The bench-scale test focuses on developing chemical reaction and product characterization data unique to this gasifier configuration to validate models and support the Phase 3 tests; (3) Conducting integrated mockup tests at nominally 150 pounds per hour feed rate to achieve appropriate integration of the heat transfer, fluid flow, and kinetic processes and provide scalable data for pilot plant design; (4) Validate Gasifier Design and Evaluate Overall System Performance in a pilot scale gasifier (~70 tons/day); (5) Financial/economic model to determine best near-term power applications for the technology and selection of final gasifier vessel configuration for the commercial demonstration; **COMMERCIAL DEMONSTRATION**: (6) Design, construction and operation of the demonstration plant (70 MWe; 575 tons of coal/day).