Status of the FutureGen zero emission coal power plant

Montana Energy Conference

October 2005

Overall goal of FutureGen

- The goal of the FutureGen research project is to establish the technical feasibility, economic viability and broad acceptance of co-producing electricity and hydrogen from coal with essentially zero emissions, including carbon (sequestration).

Tomorrow's Energy Plant

FutureGen – The World's 1st Power Plant to:

- Pioneer advanced hydrogen production from coal
- Emit virtually no air pollutants
- Capture and permanently sequester carbon dioxide

FutureGen Goals

- Design, construct and operate a 275 MW prototype plant that produces electricity and hydrogen fuel while sequestering CO_2 at an annual rate of 1-2 million metric tons.
- Sequester at least 90 percent of CO2 initially and up to 100 percent sequestered eventually
- Prove the effectiveness, safety, and permanence of CO_2 sequestration through validating the technology at large scale under real world conditions.
- Establish technology standards and protocols for CO_2 measuring, monitoring, and verification
- Validate the engineering, economic, and environmental viability of advanced coal-based, zero emission technologies for commercial readiness in 2020

FutureGen Systems

Oxygen

Oxygen Membrane

Coal

Fuel

Gasification

Gasifier

Products/ Byproducts Utilization

Gas Cleaning

Gas Stream Cleanup

H_2/CO_2 Separation

CO_2

H_2

Power

High Efficiency Turbine

Fuel Cell

Process Heat/Steam

Electricity

Liquids Conversion

Fuels/Chemicals

Fuels and Chemicals

CO_2 Sequestration

Enhanced Oil Recovery

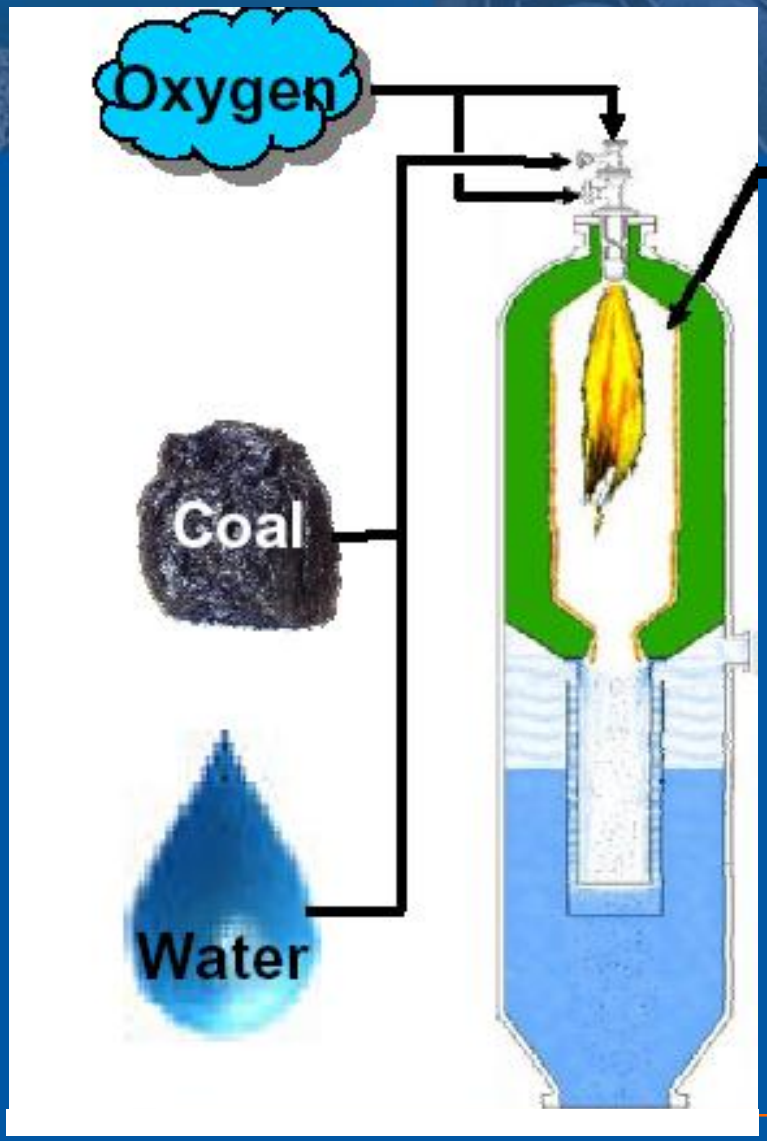
Coal Seams

Saline Reservoir

What is Gasification?

- The gasification process converts any carbon-containing material into synthesis gas, composed primarily of carbon monoxide and hydrogen (commonly referred to as syngas).
- Syngas can be used as a fuel to generate electricity or steam, as a basic chemical building block for a large number of uses in the petrochemical and refining industries, and for the production of hydrogen.
- Gasification adds value to low- or negative-value feedstocks by converting them to marketable fuels and products.

What is Gasification



Extreme Conditions:

- 1,000 psig or more
- 2,600 Deg F
- Corrosive slag and H_2S gas

Products (syngas)

- CO (Carbon Monoxide)
- H_2 (Hydrogen)
- [CO/H_2 ratio can be adjusted]

By-products

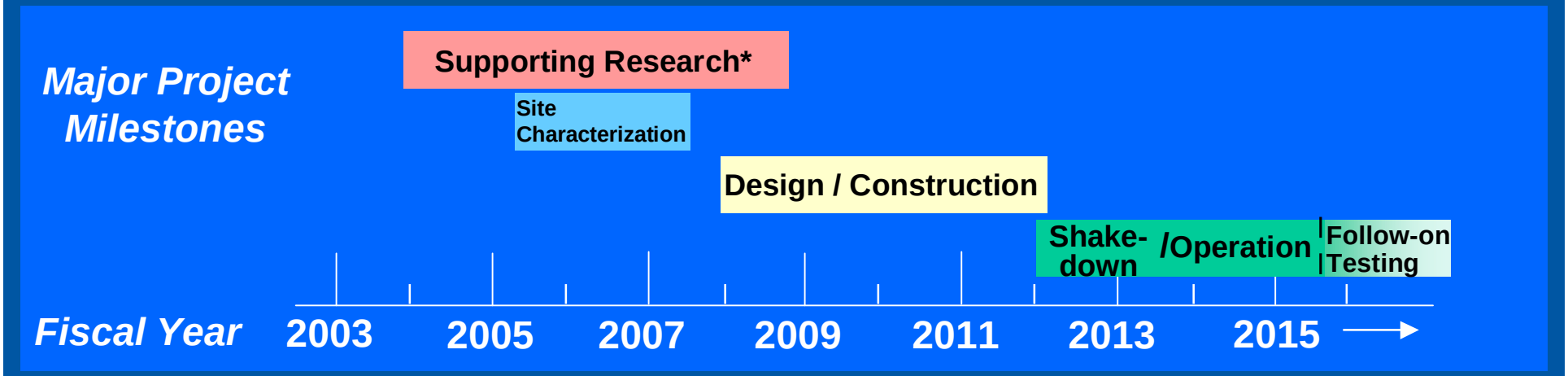
- H_2S (Hydrogen Sulfide)
- CO_2 (Carbon Dioxide)
- Slag (Minerals from Coal)

Gas Clean-Up Before Product Use

Project Schedule - Key Events

Appropriated Funding

- We have received all funds requested to date per our funding profile:
  - We received $9M in FY04
  - We received $18M in FY05
  - We have requested $18M in FY06



* Supporting research includes research embedded in the FutureGen project and additional research in FE's carbon sequestration, IGCC, turbines, and fuel cell R&D programs.

Progress to Date

- February 27, 2003 - Presidential announcement
  - Received strong support from states, industry, international community and some environmentalists
- March 4, 2004 – Submitted FutureGen Program Plan to U.S. Congress
- Secured appropriations for the first two years of project
- Begun Environmental NEPA planning for project
- Base-lined an initial cost estimate using a reference configuration
- Begun preliminary development of guidance on the site selection criteria and process
- Currently in negotiations with the FutureGen Industrial Alliance Inc. to complete a cooperative agreement.
- Actively engaging other countries in discussions for their participation
- First priority for FutureGen is to base-line the plant design and to issue a competitive solicitation for FutureGen site proposals.

FutureGen
Next Steps

- **Once the cooperative agreement is in place with the Alliance:**
  - **Start preliminary design work**
  - **Issue site solicitation by Alliance to identify candidate sites**
  - **Develop test scope for validating FutureGen**
  - **Assess cutting-edge technology readiness for inclusion**
  - **Site selection, site evaluation, and detailed characterization**
  - **Conduct planning activities for permitting process (some preliminary work has already begun)**
  - **Continue NEPA (environmental compliance) activities**

Summary Remarks

- FutureGen is a key research step towards proving the feasibility of a zero-emission coal option.
- The goals are very challenging and it will collectively require our best minds and resources to meet these goals.
- The cooperation and support of all international stakeholders (government, industry, environmental) will be needed for FutureGen to be successful and accepted.
- The potential benefits of a zero-emission coal option are enormous with respect to energy, environmental and economic security.
- We invite your participation in FutureGen

Additional Information

- **MAIN FUTUREGEN WEBSITE**

http://fossil.energy.gov/programs/powersystems/futuregen/

- **GENERAL**

www.netl.doe.gov
www.eia.doe.gov
www.epa.gov
www.climatescience.gov