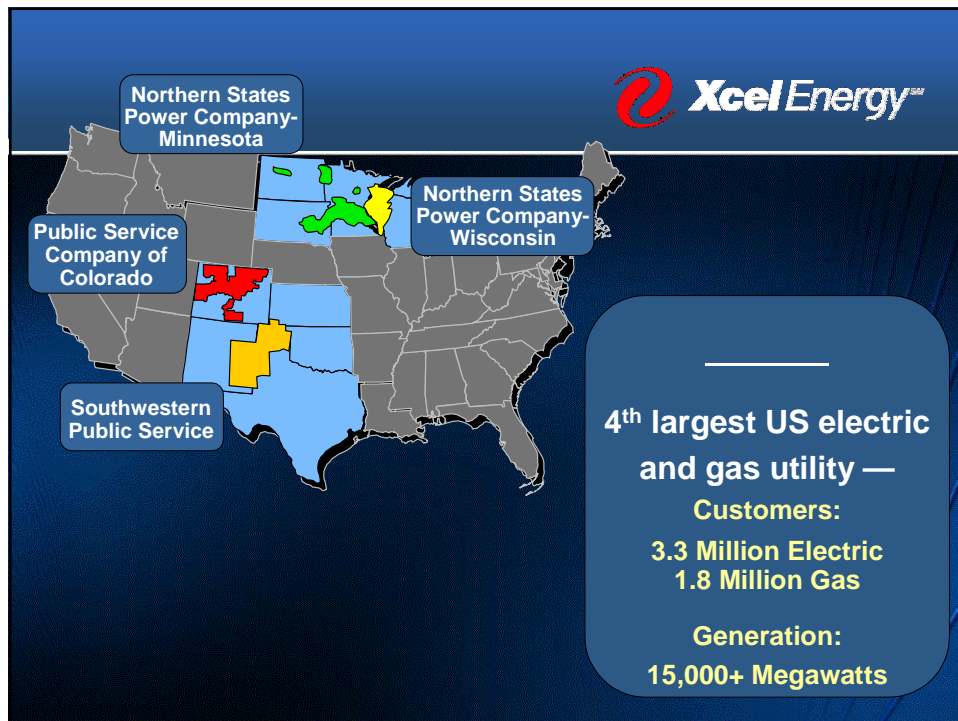


# Colorado IGCC Demonstration Project

## An Overview of Project Concept & Objectives

Prepared by Xcel Energy  
March, 2006



## **IGCC: The Opportunities and the Challenges**

### Opportunities

- Greater potential efficiency than conventional coal plants
- 40-90% improvement in air emissions at lower cost
- Potential CO<sub>2</sub> removal at 40-50% less cost
- Lower water demand
- Reduced solid waste
- Co-generation of hydrogen and other valuable products

### Challenges

- Few IGCC plants in operation
- Current IGCC technology at least 15-20% more costly
- Additional economic penalty with western coals at higher altitude
- No currently operating IGCC plants capture CO<sub>2</sub>

## **Why a Colorado IGCC Demonstration Project?**

- Make abundant coal resources part of future energy mix in environmentally acceptable way
- Reduce reliance on high-cost natural gas
- Demonstrate upgrades in IGCC technology needed to improve efficiency and economics with PRB & other western coals at higher altitudes
- Demonstrate some level of actual CO<sub>2</sub> capture with sequestration or beneficial use as part of IGCC technology implementation

## **A Colorado IGCC Demonstration: How?**

- Pursue *reasonable* step forward considering current state of technology & investment risk
  - Technology not yet competitive for use as a baseload resource on low Btu coal at higher altitudes
  - Focus is on 300 MW technology demonstration (as opposed to 600 MW, >\$1 billion full-scale plant)
- Develop balanced approach providing technology refinement/advancement opportunity but also providing reliable new generation capacity
- Promote participation by multiple parties, including government, to share costs and to maximize gain from project results

## **IGCC Technology: What We Conclude So Far**

- IGCC works at lower altitudes (with caveats)
- IGCC is expensive (all existing commercial projects developed with Government subsidies)
- All current IGCC technology options have advantages & disadvantages and would benefit from further development to gain commercial acceptance & wide deployment by electric utility industry
- “Wild card” in IGCC cost equation is CO<sub>2</sub>, but ...
- No operating IGCC plants include CO<sub>2</sub> capture

## Leading Technology Providers



GE



Shell

ConocoPhillips

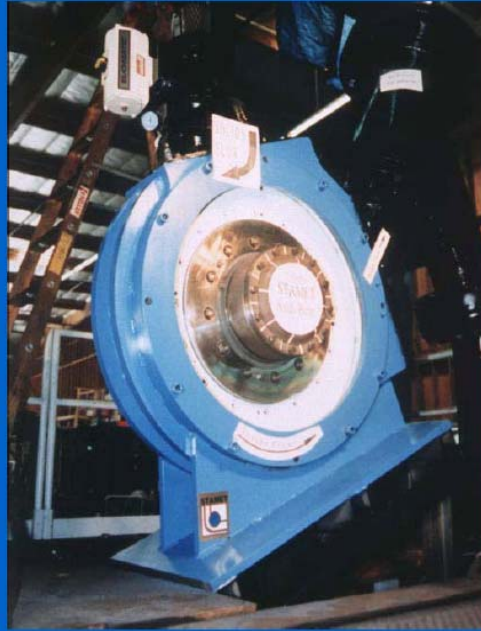


Mitsubishi



## Examples of Technology Issues for a Western IGCC Project

- Dry fuel feed versus slurry feed
- Lock hopper versus continuous Stamet Posimetric Pump
- Gasifier refractory lining versus membrane “water wall”
- Water quench versus syngas cooler (heat exchanger)
- Air separation unit and turbine modifications for high altitude applications

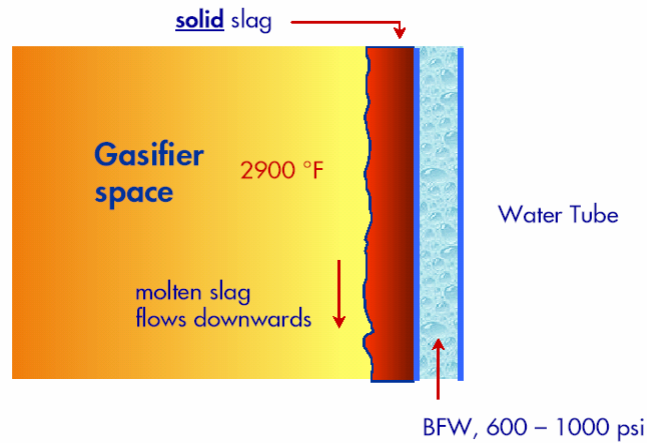


## Stamet Coal Feeding System, Model PCO 0226

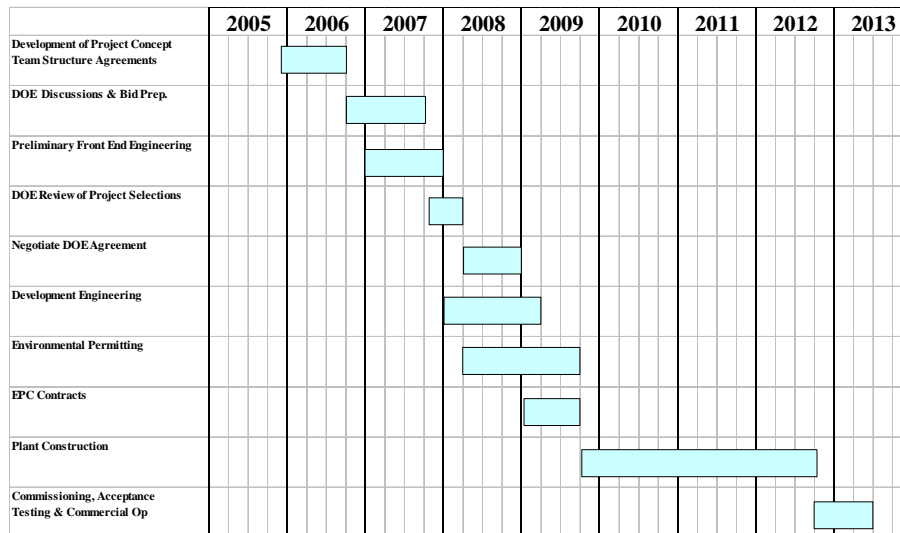
- Developed for US DOE Clean Coal Program
- Feeder achieved record coal injection pressure - over 250 PSI gas environment



### Membrane Wall protected by the slag layer



## Preliminary Project Timeline



## Status of CO IGCC Project Development

- Contract established with EPRI for technical support
- Preliminary meetings held with GE, Shell, ConocoPhillips, & Mitsubishi
- Candidates for demonstration project site being evaluated
- Preliminary discussions held with other utilities and potential project partners
- Initial analysis of CO<sub>2</sub> sequestration/EOR opportunities underway
- Assessing opportunities to obtain federal support
- Pursuing state legislation

## Colorado Legislation

- Colorado House Bill HB 06-1281
  - Establishes program for construction of IGCC demonstration project
    - Using Western coal
    - Less than 350 MW
    - Demonstrates CO2 capture and sequestration
  - State PUC has approval and oversight authority
    - Rider
    - Financing costs during construction
  - Encourages pursuit of federal funds
  - Companion bill provides development money

## Energy Policy Act of 2005 – Western Clean Coal Provision

- Sen. Salazar: Section 413
  - IGCC demonstration project
  - Using western coal
  - At altitude (above 4000 ft)
  - No appropriation
- Other provisions
  - CCPI/Clean Air Coal Program/Future Gen
  - Tax Credits
  - Loan guarantees

## Next Steps:

- Evaluate specific IGCC technology & IGCC advancements to be implemented/tested
- Finalize size and scope of project, and site location
- Begin preliminary front end engineering to determine project cost
- Continue dialogue with potential project partners and establish agreements and structure for western coalition
- Undertake effort to secure funding for project development studies & costs

## Our Prerequisites for an IGCC Demonstration Project

- Identification of a favorable technology and strong commitment from technology provider
- DOE funding at significant level
- Opportunity to demonstrate carbon capture
- Participation by other utilities & partners
- Compatibility with electricity resource plans
- Manageable total cost impact
- Assured favorable cost recovery – legislation
- Appropriate mitigation of technology & operating risks
- Availability of capital to finance project