Coal Gasification 2006

Roadmap to commercialization

'We are developing important bridge technologies such as coal gasification'

Samuel W. Bodman – Secretary of Energy, United States of America

Reference Code: UE CG/06

Publication Date: 5/23/06

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SUMMARY & OVERVIEW

Coal gasification offers one of the most clean and versatile ways to convert the energy contained in coal into electricity, hydrogen, and other sources of power. Turning coal into synthetic gas isn't a new concept, in fact the basic technology dates back to World War II.

During the gasification process, coal is subjected to heat, pressure, and steam - catalysts, breaking the coal down into various gases, mostly hydrogen. The resulting gases can then be burned to generate electricity and the waste heat created by the process used for cogeneration.

Coal gasification plants are cleaner than standard pulverized coal combustion facilities, producing fewer sulfur and nitrogen byproducts, which contribute to smog and acid rain. For this reason, gasification appeals as a way to utilize relatively inexpensive and expansive coal reserves, while reducing the environment impact.

Pioneering coal gasification electric power plants are now operating commercially in the United States and in other nations. These plants produce significant quantities of syngas from a variety of feedstocks and produce a wide variety of products.

The mounting interest in coal gasification technology reflects a convergence of three changes in the electricity generation marketplace. These changes are:

1. The increasing maturity of gasification technology;

2. The extremely low emissions from Integrated Gasification Combined Cycle (IGCC) plants, especially air emissions, and the potential for lower cost control of greenhouse gases than other coal-based systems; and

3. The recent dramatic fluctuations in the costs associated with natural gas based power, which is viewed as a major competitor to coal based power.

While the benefits of IGCC have been demonstrated by many public and private projects, there remain significant barriers to further market penetration of this technology, including:

- Price - the technology is around 20% more expensive than competing alternatives; and

- Technology risk - many of the existing systems don’t have long-term operating histories.

Even with these barriers, interest in coal gasification is at an all-time high in the US because the process has the potential to support a sizeable share of America's future energy needs in an environmentally responsible way.

Gasification permits the utilization of US coal supplies to their fullest potential and the US has more coal than any other country in the world with estimated recoverable reserves of 275 billion tons. This represents approximately 25% of world supply and more than 250 years of supply for domestic consumption. This share of world coal reserves is in sharp contrast to the US share of global oil and natural gas reserves, which are estimated to be less than 2% and 3% respectively.

Power developers, currently faced with rising natural gas prices, increasingly restrictive emissions requirements, and a desire for fuel diversification, are re-examining their power generation portfolios and are looking toward clean coal technologies as a means to alleviate these concerns by producing electricity using US domestic coal resources.

The Clean Coal Power Initiative

To develop new energy technologies, the Bush Administration introduced the Clean Coal Power Initiative (CCPI) in 2002. CCPI is a technology demonstration program that fosters the efficient use of clean coal technologies in new and existing electric power generating facilities in the US. The program provides a forum for the testing of these new technologies prior to full-scale commercialization.

Early CCPI demonstrations focused on technologies that apply to existing power plants and construction of new plants. Later demonstrations are expected to include systems comprising advanced turbines, membranes, fuel cells, gasification processes, hydrogen production, and other technologies.

President Bush's US energy program calls for an additional $2 billion in funding over the next decade for another round of the government's 20 year old Clean Coal Technology Program. This funding is particularly important when one considers that greater than half of the over 1,000 US coal-fired power plants are more than 30 years old and will require replacement over the next 20 years.

The DOE has provided funding for coal gasification projects that have operated successfully for years in Florida and Indiana and have demonstrated the commercial viability of this technology. At the end of 2004 the DOE granted funding for two additional IGCC projects, in Florida and

Minnesota, both of which are expected to further advance industry acceptance of the technology and illustrate its viability.

During President Bush's second term, coal is expected to play a key role in US energy policy. In August 2005, President Bush signed the Energy Policy Act into law. The Act contains significant incentives to support gasification technology research and development and to accelerate commercial deployment of gasification technologies for both power generation and industrial use. The primary incentives for this development include:

- Cost share programs (up to 50% direct grants);
- Investment tax credits (20% of project cost); and
- Federal loan guarantees (up to 80% of project costs) that in some cases (specifically tax credits and loan guarantees) can be used in combination.

Additional financial support for IGCC development came from the Bush Administration's 2006 DOE budget that provides $56.45 million for IGCC research and development, an increase of 23% over the prior fiscal year. In addition, with the President's 'Clear Skies' Initiative requiring 70% reductions of many emissions by 2018, a market for utilizing clean coal technologies over the long term is likely to evolve.

Coal Gasification 2006: Roadmap to commercialization provides an introduction to coal gasification technology and its ability to unlock the huge energy reserves found in coal in an environmentally responsible manner. Working gasification projects in the private and public sector are discussed and recommendations are offered to provide a "roadmap" for the continued successful commercialization of this technology.

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