

Development Planning of Clean Coal Technology as a Sustainable Base-Load Option for Taiwan

Y. -P. Chyou,¹ W. -B. Lee,² J. -B. Wang,¹ M. -C. Kuo,¹ D. -J. Shieh¹ and L. -F. Lin¹

¹ EETC, Institute of Nuclear Energy Research (INER), Lungtan, Taoyuan, TAIWAN

² Lee's Green Tech. Int'l Co. Ltd., Taipei, TAIWAN

Abstract

“Kyoto Protocol,” the outcome of the meeting held from December 1 through 11, 1997 in Kyoto, Japan, where more than 160 nations met to negotiate binding limitations on greenhouse gases for the developed nations, has been activated since February 16, 2005. The worldwide efforts of environmental protection for the sustainable development of human society are expected to impose international pressure on global countries and regions; hence, pre-caution measures should be planned in advance. Fossil fuels will remain the mainstay of energy production well into the 21st century, in which coal reserve may last for about 230 years. However, increased concentrations of carbon dioxide (CO₂) due to carbon emissions are expected unless energy systems reduce the carbon emissions to the atmosphere.

In Taiwan, the CO₂ emissions from domestic coal power (incl. Taipower, IPP & Cogen) account for about 36% of the present national total, while the power generation capacity by 2020 will consist of 46+ % coal-fired plants. Hence, it would be necessary to introduce sustainable base-load (BL) options for power utility industry, in order to preserve the continuous development of society and the balance among environment, energy, and economy (3E). Integrated Gasification Combined-Cycle (IGCC) with carbon capture option, namely sustainable IGCC or SIGCC, seems to be an ideal candidate to fulfill the requirement for the aforementioned situation.

To comply with the current national technology R&D policy, a task force has been commissioned within the Institute of Nuclear Energy Research (INER) since 2001, to forge the mid- and long-term technology project planning; then, an integrated program on energy technologies has been undertaken at INER since 2003. In 2005, brainstorming discussions have been conducted for the conceptual development of sustainable BL options. By the year-end, the National Science Council (NSC) granted a project to INER for a feasibility study on sustainable clean coal technology for domestic BL options. The scope of the project consists of a feasibility study on SIGCC and indigenous R&D activities. The latter will include the following fields: (1) simulation for system integration and process design, (2) hot gas clean-up (HGCU) technologies, (3) CO₂ separation technologies and (4) gasification of multiple fuels. It is hoped that the outcome of this study will not only provide expertise to guide the governmental decision-making processes for new-era energy policy, but also promote domestic energy industry. Further details about the planning and approaches will be illustrated in the full text.