
Forum

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Environmentally Sustainable Technology Transfer of Coal-Fired Energy Techniques: Canada and Asia

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Environmental problems, and our efforts to cope with them, are increasingly viewed in an international context. There is now a corresponding need for more international trade in technologies that will result in cleaner, more efficient energy systems and reduced environmental damage. This need presents an opportunity for Canada. However, to respond to it effectively, we must quickly develop a better formulated policy on trade and the environment.

"Earth Summit," the United Nations Conference on Environment and Development (UNCED) to be held in Brazil in 1992, is an important example of the opportunities for international communication in this area. It will be one of the most important global events in the post-war era, a major international forum at which governments will state their positions on environmental preservation, clean-up and retro-fitting, environmentally acceptable technology transfer, sustainable development, and other issues. In the lead-up to this conference, Canadian business people, non-governmental organizations involved in economic development, civil servants, and consultants should work on clarifying

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our country's approach to environmental trade, development, and technology transfer.

Coal-fired energy production is one area in which Canada's abilities will allow it to play an important role. The purpose of this note is to discuss the scope for Canada-Asia trade related to investment in coal-fired energy.

Challenge and Coordination

The planned expansion of electrical generation capacity in Asia over the next two decades presents significant opportunities and challenges for Canadian companies. We can help reduce the increase in CO₂ emissions by the transfer of efficient coal-based electrical generation technology. Potential efficiency gains in Asian developing countries dwarf the incremental improvements available within Canada. By concentrating on upgrading in developing Asia, both environmental and economic benefits can be realized. However, business dealings and technology transfer with developing nations are often fraught with complexity and difficulties. Therefore, for Canadians to get the most from these Asian opportunities, a coordinated approach is needed to offer the developing nations complete packages that include hardware, training, financing and on-going support, i.e., complete systems.

Other advanced countries around the Pacific Rim are responding to these same opportunities by forming coordinating committees. The Australian Coal Trade and Technology Committee (ACTT) was established "for the purpose of filling gaps identified in Australia's overall effort in their thermal energy sector. It was meant to provide a forum for an exchange of views between organizations pursuing export generation systems in the context of energy cooperation, particularly in the Asia-Pacific region." Another important initiative, the Japanese Committee for Pacific Coal Flow (JAPAC), has similar objectives. Both Japan and Australia recognize that individual companies need a coordinating mechanism if they are to realize these potential opportunities in Asia-Pacific over the next two decades.

This is the time to consider a similar strategy for Canada. Realistically, Canada will take a relatively smaller share of the overall business associated with Asian electricity expansion. Japanese companies will account for the majority of the contracts awarded while European, American and Australian firms will also be present in the region. Canada is a less visible player, but through a Canadian industry coordinating committee, contact could be made with the Japanese and Australian committees in the hope of playing some role in larger projects.

There may be more than short-term commercial benefits derived from such associations. Canada, which has good

Market niches for Canada

conventional combustion technology, is lagging somewhat in the case of more advanced technologies. We stand to gain in those areas as a result of participation in larger trade groups.

Canada should concentrate on market niches, narrowing our efforts to those technological areas in which we consider ourselves to be leaders or to have special skills. One such area is the rehabilitation of old power plants with the application of newer technologies. Another area where Canada could play an important role is in the training of Asia-Pacific engineers and managers. Canadian utilities are well-suited to provide the management training and know-how needed by developing countries and formal training programs could be set up. Canada also has expertise on the production side of the coal industry as well as in the transportation and shipping sector, and these skills should be promoted.

Review of Opportunities

To assess the potential opportunities, a review of coal-fired electrical generating capacity in the Asia-Pacific region has been made.¹ For purposes of discussion, the region is divided into three groups according to stages and rates of economic development.

The ASEAN countries and Hong Kong

Group I

The first group reviewed consists of the ASEAN countries (Indonesia, Malaysia, Philippines, Singapore and Thailand, but excluding Brunei) and Hong Kong. These countries have been characterized by very rapid economic growth and represent an area of the Asia-Pacific region where expansion of electricity generation is expected to be most extensive. With continued development over the next decade, there will be significant business opportunities in ASEAN for foreign firms. Some of these countries have a 'build, operate and transfer' (BOT) policy which encourages foreign investment. The World Bank and the Asian Development Bank have been actively involved in the region, as have the Japanese. Following are some country-specific examples illustrating the market potential.

HONG KONG

Hong Kong has undergone a remarkable oil substitution program. With the rapid introduction of coal, the fuel mix has shifted drastically, away from a heavy dependence on oil. In 1987, coal accounted for roughly 95% of total electric generation. Power sales have increased more than 50% during the last decade and

^{1/} See Econolynx International Ltd. (1991) *Report on the Potential and Mechanisms for Coal-Based Electrical Generation Technology Transfer Project* (Ottawa: Energy, Mines and Resources Canada).

annual average energy demand is expected to grow by 7% per year to 2000, resulting in a doubling of demand.

INDONESIA

The National Energy Plan conservatively assumes average demand for energy will increase by 13-14% per year throughout the 1990s in Java. This projection is based on an average growth in demand of 14% in the period 1968-1985. At current growth rates, analysts suggest that urban centres may experience power shortages as soon as this year. New emission standards are being introduced in 1991 which will — for now — affect new operations, but not existing power stations. Retrofitting requirements are likely to follow soon.

PHILIPPINES

The National Power Corporation has fallen far short of meeting demand for power. Many businesses experience brownouts for four to six working hours a day, resulting in millions of dollars in lost output daily. It is believed that these shortages reduced economic growth by 1.1% in 1990. In 1988, the Power Development Program (PDP) was outlined, calling for the addition of 3200 MW of coal-fired capacity in the period 1989-2000. It is hoped that coal-fired capacity will increase from 6.3% of total capacity in 1989 to almost 30% in 2000.

THAILAND

Electricity demand is dominated by Thailand's rapidly expanding industrial requirements. Industrial demand grew by 15% in 1988 and capacity reserve margins dipped to 3% from the recommended level of 15%. Conservatively, demand is expected to increase by 10% per year into the early 1990s. Growth in employment and incomes will result in increased consumer energy demand. A fifteen-year plan to 2002 calls for 8300 MW of added capacity through 24 projects. No standards exist for NO_x or SO_x emissions but there is, however, a powerful environmental lobby that must be considered in future development plans.

Group II

Countries with lower rates of economic growth

The second group includes Bangladesh, China, India, Pakistan, and Sri Lanka, states with lower recent and predicted rates of economic growth. With rapidly growing demand and huge indigenous coal reserves, significant expansions are planned in China and India. It must be added, however, that these markets have been fully financed in the past and have now come to expect such financial packages. In this respect, they are considered *spoiled markets* and may be difficult for Canadian companies to enter. There are modest plans for coal-fired development in Pa-

kistan over the next decade, but in the smaller economies of Bangladesh and Sri Lanka, forecast expansion is quite small.

CHINA

Official electricity forecasts anticipate annual growth of around 7% to 2000 and beyond, indicating production of over 1.1 trillion kilowatt-hours in 2000, more than doubling existing output. In order to meet this forecast production target, China will need to increase its generating capacity by over 130 GW. Coal-firing capacity is forecast to provide well over half of the projected additions (up to 80 GW). While, traditionally, domestic technology has been emphasized, a number of power plant construction projects have recently been undertaken as joint ventures with western companies using imported technologies. As part of the rapid expansion of generating capacity, the government has allowed various financing techniques with foreign companies to boost foreign investment and speed construction.

INDIA

Between 1987 and 1995, the Indian Central Electricity Authority (CEA) plans to construct 38 GW of capacity, 25 GW of which will consist of coal-fired plants. The CEA is concentrating particularly on the development by 1993 of seven 'super' coal-fired plants to be located near large mines. Almost all oil-fired capacity was converted to coal-firing during the 1970s, and a policy to reduce oil-based capacity is still supported. Foreign governmental and international organizations such as the World Bank and the Asian Development Bank have been active in financing new power generating projects in India.

Group III

Countries at advanced stages of growth with strong environmental controls

We have put the advanced states of South Korea and Taiwan into a third group. Both countries have significant plans for coal-based capacity additions to the year 2000. At the same time, both have large nuclear capacities and are exploring the possibility of further expansion of this type. Stringent environmental controls are in place and strong environmental groups are present.

SOUTH KOREA

Forecast annual growth in demand has been set at about 7% to 1996, requiring an increase in capacity of about 6000 MW by that year. Seven coal fired units of 500 MW each are planned for commissioning between 1993 and 1996 and will account for all capacity increases in the early 1990s.

TAIWAN, REPUBLIC OF CHINA

Continued high rates of growth in the industrial sector are pro-

jected into the 1990s. Industrial electricity demand is forecast to grow at 6%, a rate unchanged since 1986. The long range power development programme calls for capacity to increase almost 90% by 2000. The coal-fired expansion program will bring 13 new units on stream by 2000, adding 7750 MW to the total installed capacity. Emission standards have been set for NO_x, SO_x, and particulates. An environmental assessment program was established to examine proposed power plants and address public concern over environmental impact.

Total Capacity

The *good news* is that total generating capacity for the Asia region will nearly double by the turn of the century, reaching almost 850,000 MW. Total coal-fired capacity is forecast to rise from 127,000 MW in 1987 (30% of total) to 328,000 MW by the year 2000 (40% of total). The *bad news* is that the planned increase of 200,000 MW could generate an extra 1.5 billion tons of CO₂ per year using present pulverized coal-fired boilers. New technologies will be necessary to reduce this amount.

Industrialized countries can make an important contribution to global clean air by ensuring that pollution control devices are implemented throughout Asia. If emissions of CO₂, NO_x, and SO_x are to be reduced, new technologies must be made available by countries such as Canada. The consequences of continued emissions will not be limited to Asia but will instead be felt on a global scale.

These types of problems are now being recognized by the world's business community and are reflected in the formation of the new Geneva-based Business Council for Sustainable Development. The BCSD brings together over forty top business leaders from around the world. Through its Executive Director, J. Hugh Faulkner, BCSD reports directly to Maurice Strong, Secretary General of the UNCED. The BCSD has organized a series of meetings with local officials and business leaders in the Asia-Pacific region, Latin America, and Africa to provide valuable insights and perspectives during the run-up to the Brazil conference in Rio de Janeiro. It is clear that the issue of technology transfer or "technological cooperation" is of great importance to any environmental strategies adopted by the industrialized world. At the same time, however, the business community cannot lose sight of the significant opportunities that will be associated with the sustainable development of the developing world. Concerted action — in line with these initiatives — is now required of both Canadian public and private interests.