Innovative Approaches to Financing Environmentally Sustainable Energy Development in Northeast Asia Executive Summary

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Innovative Approaches to Financing Environmentally Sustainable Energy Development in Northeast AsiaHossein Razavi
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EXECUTIVE SUMMARY

This report examines the emerging methods of financing power investments in the countries of Northeast Asia (Japan, China, Taiwan, South Korea and North Korea) to assess the availability of funds for future investment requirements, and to investigate the impact of financing on environmental sustainability of energy development in these countries. It also identifies opportunities for using innovative methods of financing to reinforce sustainable energy development and provides several proposals for international cooperation in dealing with financial challenges in the energy sector of the region.

- Emerging Trends in Financing Power Sector Investments

Investment requirements of the power sector in Northeast Asia is projected at an average rate of $72 billion per year over the next 15 years. This huge requirement has raised concern about the ability of the power entities to mobilize the necessary finance, and has triggered substantial changes

in methods of financing.

In Japan, the power industry is dominated by 10 private companies, each having a monopoly in its own jurisdiction of service. These companies apparently have no problem funding the required power investments. Still an amendment to the Electricity Law was enacted in January 1996 to permit participation of the independent power producers (IPP) in the sector. The objective of this amendment is to increase competition in an otherwise monopolistic industry. The new provision has been received well by the Japanese private companies which have submitted numerous bids to build cogenerators and independent power plants. The government is still cautious not to give too large of the share to IPPs.

In China, the power sector is dominated by 30 provincial power enterprises which were in the past supported by the central government. It has now been recognized that future investments cannot be funded by conventional sources of finance. Accordingly, drastic reforms have been introduced to make the provincial enterprises responsible for their own survival, and to permit the private sector to invest in power generation. As a result, the new methods and sources of finance seem to have provided sufficient resources to fund future investments. The country's first Electricity Law was enacted in April 1996. Private sector's bids to construct new plants have by far exceeded the formal target of 20 percent set by the government for private sector share of investment in new generating capacity.

In Taiwan, power sector is dominated by one state entity-Taiwan Power Company (or Taipower). Although the initial discussion about permitting IPPs was geared towards introducing competition in the sector, it has now been recognized that IPPs are needed in order to meet the huge investment needs of the future. Accordingly, the government has opened up the sector to IPPs which are permitted to build any type of plant. The policy change has been very well received by private companies which have submitted numerous bids to build new plants.

In South Korea, power sector is dominated by one state entity-Korea Electric Power Corporation (KEPCO). Until a few years ago, the government could not justify opening the sector to IPPs because KEPCO was known as a very efficient company which could also access sufficient internal and external funds to meet the future investment requirements. Only in the last few years it has become evident that KEPCO is no longer able to meet the financial needs of future investments. Accordingly, the government opened the sector to IPPs in 1996 to build a limited share of non-nuclear generating capacity. There was an overwhelming response to the bidding process conducted in mid-1996. The government is now convinced that there is much more room to rely on IPPs and is revising the corresponding targets**.**

In North Korea, the power sector's installed capacity is estimated at 11,000 MW and split nearly evenly between coal-fired and hydroelectric plants. The power plants and the transmission/distribution facilities are in serious need of rehabilitation, retrofitting and upgrading. However, financing of the required investment is very difficult because domestic financial resources are limited due to the economy's poor conditions. Furthermore, external finance is not available due to the country's isolation from most of the world. There is, nevertheless, a program of international assistance to help North Korea build new nuclear plants. This program was formulated in 1994 under an agreement with the United States that North Korea would freeze its own nuclear program in exchange for 2 x 1,000 MW new light water reactors. The construction of these plants is financed primarily by Japan and south Korea. The agreement also includes a provision to supply North Korea with 500,000 tons/year of heavy fuel oil to meet the energy needs of North Korea until the new reactors become operational.

- Impact of New Methods of Finance on Sustainability of Energy Development

The emerging methods of financing power investments are likely to enable the countries in the region (North Korea being an exception) to mobilize the required funds and to meet the future power needs of these countries. However, the new methods of financing are also likely to have some undesirable impacts on sustainablity of energy development in the region. The undesirable impacts stem from the changes in the decision-making processes and incentives. First, the governments will lose their tight grip over energy policy. Thus, some of the projects and targets which had been set by governments in line with national priorities may not be achievable any longer. Second, the vast number of emerging IPPs will be based on the financial incentives of private investors which normally aim at projects with short payback period. The undesirable impacts will be primarily in two areas: (a) The mix of power generating capacity; and (b) energy conservation programs.

The Impact on the Mix of Generating Capacity. If left to a free market mechanism, the mix of generating capacity would shift from nuclear and hydroelectricity to thermal power plants. Within the thermal group, natural gas would be developed if available. When reaching the limit of gas availability, the emphasis would shift to coal and perhaps oil-fired plants. The plant technology would be chosen to minimize the up-front investments while meeting the mandatory emission standards. Thus, the main source of power would be by default conventional coal-based plants, while nuclear, hydro, imported gas, and clean-coal technology would receive insufficient attention.

In the countries of Northeast Asia, the government policy will continue to influence the mix of generating capacity and prevent it from being limited to thermal plants. In Japan and South Korea, the governments are likely to manage the fuel mix and enforce the diversified targets set by the national energy policy. In China, the government's control over the fuel mix will be substantially reduced. Hydropower and clean-coal technology are likely to be adversely affected. In Taiwan, the political momentum has shifted to IPPs and to providing the bidders with the flexibility to choose the type of plant they want to build. Nuclear options are likely to suffer a serious set-back. Natural gas is presently a favored option. However, it could suffer when gas requirements reach the capacity of import facilities. At such a juncture, expansion of gas imports would require substantial up-front investment and may not be attractive to private investors.

The Impact on Energy Conservation. There are a number of arguments and counter-arguments about the possible failure of a free market system in optimizing energy use, and the need for government support for energy conservation programs. It is, nevertheless, generally accepted that energy would not be used at an efficient level if (a) energy prices do not reflect the full economic and environmental costs; and (b) imperfect capital markets and deficiency in the availability of information cause under-investment in energy conservation.

The countries of Northeast Asia have taken energy conservation seriously. In Japan, energy conservation has been, by all accounts, a success story and can provide useful lessons for other countries. In South Korea, energy conservation has been relatively successful and will continue to receive considerable attention. In China, there has been some significant progress in improving energy efficiency but the program is seriously threatened by the new market incentives. In North Korea, energy efficiency has received some political attention but lacks an effective means of implementation.

- The Use of Innovative Methods of Finance in Improving Sustainability

Most methods of power sector financing in the countries of Northeast Asia are innovative. Countries in the region are among the world pioneers in drawing upon resources of emerging capital markets, private finance and private investment. However, due to their short track record, the impact of these methods on various aspects of development are not fully known. Thus, as the countries in the region experience with these methods, some undesirable impacts may become evident. To remedy these impacts, one may have to modify the present methods or introduce other innovative methods of financing to offset the undesirable impacts.

Considering the emerging trends in the region, there are four areas in need of immediate attention.

a. **Premium for Use of Imported Gas**. As mentioned previously, the new incentive systems are likely to have an adverse effect on nuclear, hydro, and imported gas. The nuclear option is likely to remain political and is likely to receive attention from the government of each country. The hydro option has to be dealt with on a case-by-case basis, due to the specific parameters of each project. However, the gas option can be addressed in a more generally applicable framework. It would require a financial system, and correspondingly a modified bidding process to encourage private bidders to take account of the environmental benefits of gas and to invest in gas import and gas-based power generation. The main target countries will be China, Taiwan, and in the longer term, North Korea.

b. **Reducing Risk in Using Clean-Coal Technology**. The use of clean-coal technology in the region has very large potential benefits. However, these technologies are mostly new and some untested on a large commercial scale. Application of these technologies in the region is now limited due to uncertainties about the cost and operational performance of plants using such technologies. There is a need to devise a financial system which can reduce the risk based on insurance, guarantees and other methods of risk mitigation. The target countries would be China, Taiwan, South Korea, and at a later stage, North Korea.

c. **Providing Financial Incentives for Energy Conservation in China**. In China, energy conservation offers significant potential gains in both economic and environmental terms. The government has established, during the last 10 to 15 years, a solid program of physical control systems, financial support, R & D, information dissemination and training. Also, substantial progress has been made through more objective energy pricing induced by the recent market reforms. However, the same market reforms have caused a gradual dismantling of the energy conservation program, mostly because the government is withdrawing its support and leaving it to the market to take care of the matter. The challenge is to redirect the program to the new market environment before it loses its powerful ingredients.

d. **Providing Technical and Financial Assistance to the Energy Sector in North Korea.** The power and the industrial sectors in North Korea are in serious need of rehabilitation and retro-fitting. These improvements are expected to be very cost effective. Nevertheless, the required investments are not undertaken because of institutional, technical, and financial constraints. A program of assistance to deal with these constraints would be of tremendous value to North Korea and could even be justified on the basis of regional and global environmental benefits. The program should initially concentrate on the rehabilitation needs of the power sector.

- Prospects for International Cooperation

In all of the above areas, there are excellent prospects for international cooperation. More specifically, the following synergies can offer significant mutual benefits:

a. In regard to encouraging natural gas imports, the Japanese new approach to the regional energy policy becomes relevant. Japan has now expanded its concerns about energy security and environment beyond its borders. Accordingly, it is willing to support gas imports to the region because they would serve both concerns. In addition, Japan has significant comparative advantage due to its dominance in the LNG market and its ability to provide financial support.

b. In regard to clean-coal technology, both Japan and the United States have invested heavily in the development of these technologies. So far these investments have not resulted in noticeable return because the developed technologies have not been adopted on a commercial scale. The largest potential market for these technologies is the Asia region. Thus, marketing the technologies in China would serve the U.S. and Japanese commercial interests as well as local and regional environmental goals.

c. In regard to energy conservation in China, a combination of the Japanese and U.S. experience would provide an almost ideal approach to the matter. The Japanese experience offers very strong policy and technical contents while the U.S. experience is in institutional and market-oriented financial incentives. The donor community may be willing to contribute to financing the energy conservation efforts based on regional and environmental benefits, and perhaps, within the framework of Joint Implementation.

d. With regard to technical and financial assistance to North Korea, international cooperation can be of mutual benefit because energy efficiency improvement fits in the philosophy of self-reliance to which North Korea adheres religiously, and offers significant potentials for reducing regional and global environmental damages, which appeals to many countries in the international donor community. Again, the donor community may also be willing to finance the required investments within the framework of Joint Implementation.

- Proposals for Further Research

In the area of innovative financing, the past experience is limited. There is, therefore, substantial room for research, conceptualization and preparation of new ideas. Among rather numerous concerns, the following represent the most critical needs for future research:

a. **Development of financial incentives to encourage gas imports**. This research should cover (a) the possibility that Japanese assistance can lead to substainable effects, and (b) the changes to the IPP bidding procedures which would encourage investment in gas imports.

b. **Structuring guarantee instruments for reducing risk in adopting clean-coal technologies**. The research should cover (a) an exploration of the possibilities of cooperation between the U.S. and Japan in marketing the technologies, (b) an assessment of the amount of risk which should be mitigated, (c) development of a guarantee instrument to mitigate risk, and (d) the possibility of building a US sponsored demonstration IGCC plant in China.

c. **Redesigning the financial incentives for energy conservation in China.** The research should cover (a) an assessment of applicability of Japanese and U.S. experiences, (b) development of a revised financial system which can function in a free market environment; and (c) the interest of the donor community to finance selected activities.

d. **Preparation for the formation of an ad hoc international financial agency to provide assistance for rehabilitation of the power sector in North Korea.** The research should cover (a) the interest of the donor community to support the cause, (b) the option of expanding the mandate of Korea Peninsula Energy Development Organization (KEDO), and (c) the viability of

creating a new ad hoc agency to serve the function.

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