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Options For Rehabilitation of Energy System & Energy Security & Energy Planning in DPR of Korea

DPRK Delegation

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The most important task for the sustainable development of the economy is to realize the rehabilitation of existing energy systems and to ensure its long-term safety in the DPRK.

In recent years, the government has taken new steps to improve the economic management in order to promote sustainable development of the economy in line with new circumstances.

It creates favorable conditions and the environment for further policies and activities of the DPRK to rehabilitate and furthermore revitalize the economy as a whole. The overall objective in the energy sector is to increase the production of energy based on domestic resources while satisfying the environmental concerns and improve the demand side management and secure sustainable development of the energy system.

1. Rehabilitation of the Energy System

The Transformation Sector

We will concentrate capital investment in the transformation sector in order to increase the energy

production decisively. Because most of the existing thermal and hydro-power plants have operated far beyond their lifecycles and have been operated until now without technical reconstruction, the equipment is outdated and its efficiency went down dramatically. Now, we are producing 50MW steam turbines and 120MW hydraulic turbines, yet they are of low efficiency because of outdated technology. Worse still, owing to abnormal climatic conditions in recent years, the water level of reservoirs has become low and hydro-power plants are not operating at full capacity.

In the transmission and distribution sector, we still operate a lot of transformers and circuit breakers, which are beyond their life times.

In the production of the primary energy of our country, coal accounts for about 70 percent. Because of the complicated structure of coal bed, it is very difficult to mechanize coal hewing works. Dozens of pits remain flooded from the damage caused by heavy rain. In the past decade, the production of coal and electricity has dwindled due to several reasons, but it is now returning to what it used to be.

Options for the reconstruction of the transformation sector are as follows;

Thermal power plants

- to restore the existing processes to their original state, so that coal-thermal power plants can operate at full capacity;
- to put in place new processes based on advanced combustion technology from abroad;
- Hydro-power plants
- to improve the efficiency of existing hydraulic turbines up to 90-93 percent;
- to habilitate and consolidate the auxiliary facilities and structures;
- to build new additional hydro-power capacity;

Our country still has rich potential of hydro-power development. The State plans to build new capacity of about 600MW in the next few years by pushing forward medium and large hydro-power plant projects.

Transmission and distribution

We are planning;

- to replace the old facilities which are over life-time;
- to arrange and integrate the networks of transmission and distribution;
- to decrease the transmission loss by stepping up the voltage level of the grid.

In addition, we are going to try to prevent system accidents and normalize the supply of electricity by introducing advanced electric power supervision and control devices.

Prospectively, we will realize super high-voltage transmission and exchange electric power with neighboring countries.

Now, our country's related organizations are conducting a feasibility study on the integration of electric networks in the Northeast Asian region.

Coal production sector

We are planning;

- to provide coal mines with powerful draining facilities as well as high head pumps to draw up the water out of the flooded pits and restore the destroyed pits;
- to raise the mining rate of coal by modernizing the equipment of the coal mine machine factories and by providing sufficient tunneling, mining and carrying facilities which are suitable to the condition of our country's coal mining;

Above all, we are going to nominate one or two coal mines as model units of modernization and gradually reconstruct and modernize all the other coal mines.

Demand side management

In 1998, the state adopted "The Law on Energy Management" aiming at the rational use of energy.

Industrial sector

Industrial energy consumption accounts for about 50 percent of total energy consumption. Especially, the energy intensity in the energy intensive industry such as steel and iron, chemical and building materials is very high as compared with the advanced level. We will improve the efficiency of energy facilities including boilers and industrial furnaces to save above 5million tons of coal equivalent, annually.

Household and Commercial sector

The present proposals to raise energy end-use efficiency are to replace traditional lighting by the compact fluorescent light and to introduce efficient heating systems and energy saving stoves in the urban and rural areas.

Besides, the DPRK is planning to establish ESCO for implementing demonstration contract projects to small enterprises and commercial consumers by introducing experiences of European countries.

Renewable Energy Development

Renewable energy development has been taken as a major part of energy, environment and ecology construction in DPR of Korea. DPR of Korea has a great potential for renewable energy development. Most of the westers seashore of the country is suitable for installing large size wind turbines. The annual average wind speed is above 4.5 m/s in 18% of the territory and it is expected to have an installed capacity of more than 4,000 megawatts of wind-generated electricity. Annual average solar irradiation is about 1200kwh/m2 and 55~60% of days per year are clear. Recently, the government has decided to construct a test-solar building of fifty households in Pyongyang.

To solve the rural energy and protect environment pollution, the state has paid great attention to the development of biogas technology since 1980.

Now, a lot of biogas digesters in rural areas are being constructed under the support of the state. The west seashore of the DPRK is one of the well-known tidal zone in the world. The average difference between high and low tide is 4~6 m.

Tidal potential capable of the development is estimated at about 19TWh.

Options of renewable energy development in DPRK are as follows.

- **Make the key-investment for developing wind energy as Power sources**
  - to re-explore and assess the wind resource including off-shore
  - to build the prototype wind farm
  - to establish the wind turbine production line from abroad
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- **Promote the development and utilization of solar energy**
  - to install the stand-alone PV generation systems for households
  - to build the solar collector factory
  - to construct the passive and active solar buildings
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- **Activate the biomass technology development**
  - to establish the waste water treatment technology by the anaerobic digestion
  - to build decentralized biomass power stations in rural areas
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- **Make an advance in tidal energy development**
  - to build 2MW prototype tidal power plant in South Hwanghae province
  - to investigate the site for 20MW tidal power plant and complete the construction design
- It is a consistent policy of the state to actively encourage the construction of decentralized small hydro-power stations and we will launch the nation-wide movement of building small hydro-power stations.
- **Study on the renewable energy market and enforce the related policy**
  - to provide the financial support for demonstration projects
  - to take comprehensive measures covering sectors of central administration, economy, law, technology and education for the promotion of the renewable energy development.
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2. Energy Security

Coal which is one of the primary energy resources in our country is getting inferior in quality and the condition of mining become more unfavorable. It makes the prospect of meeting the long term energy demand gloomy. The main path to ensure the long term energy security in the DPRK is to realize the diversification of the energy resource use, while gradually decreasing the coal share in the total primary energy. To ensure the long-term security of energy in the future, our country will promote the exploration and development of crude oil and build nuclear power plants based on the abundant uranium resource to gradually raise the share of nuclear power generation in the production of electricity. And our country will develop, introduce and extend new and renewable energy technologies including wind, solar and biomass energy, co-generation and fuel cells. In addition, we will further our efforts to bring natural gas to our country under the regional and international support.

3. Energy Planning

In the past years, series of efforts have been made for the case study of national energy system, energy policy making and rational energy management. The tools used in the national energy planning were macro-energy models mainly based on classic methodology.

But because these models wore some deficiencies in synthetic analysis and performing properly functions, we were facing difficulties in the forecast of energy demand and supply. Owing to some conditional restrictions, there are many guesses in the collection of the data related to energy system and it led to severe influences on the reliability of energy future forecast. DPR of Korea introduced softwares such as EFOM-ENV in 1998 and LEAP in 2000 to establish scientific energy models. By using the tools, some energy scenarios adoptable to the national economy have been simulated.

We paid in particular attention to the application of a flexible LEAP. For the last 3 years, the experts of Non-Conventional Energy Development Center succeeded in converting LEAP English version to Korean version, that helprd to overcome the language barrier for its domestic introduction.

We have now started in the works of modeling national energy system based on LEAP.

Objective of LEAP modeling is

- to create a default area of a national energy system
- to establish a national energy database
- to create a national energy strategy

We will make further efforts to adapt LEAP with consideration to the specific reality of our country.

The main barrier in the activities of the DPRK for the rehabilitation of its energy system and energy security is the lack of funds and technologies. Many technicians and specialists engaged in the energy sector do not have a lot of experience in the introduction of advanced technology and the management of energy systems. But these problems could be gradually solved through training and study tours of the related technicians and specialists, technical transfer and project realization. The DPR of Korea will take several innovative steps in the future to attract financial loans for the rehabilitation of its energy system.

The combination of the correct policy of the DPRK is to establish an efficient, stable and sustainable energy system. If we were to combine our people's steady efforts with the international co-operation with Northeast Asian countries should get good results.
