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Socialist Republic of Viet Nam

**The Study on National Energy Master Plan  
in Viet Nam**

**Final Report  
(Summary)**

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**THE INSTITUTE OF ENERGY ECONOMICS, JAPAN**

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## Preface to Summary

This report is a summary of the JICA Study on National Energy Master Plan of Vietnam conducted since December 2006. The principal report consists of four parts, namely, Part 1 Current Energy Trend and Energy Policy, Part 2 Energy Outlook of Vietnam through 2025, Part 3 Draft for National Energy Master Plan and Part 4 Database and Analytical Tools. This summary focuses on current issues and required measures in the field of energy, illustrating gist of Part 1 through Part 3. Explanation on Part 4 on technical aspects of analytical tools is omitted. As structure of the analytical tool is briefly touched upon in Chapter 2, for more detail information, please refer to Part 4 of the principal report and technical manuals, or directly check the models on computer.

Since the turn of the century, Vietnam has kept high and steady economic growth. This trend will continue to the future. Then, if we look into elements of economic growth such as capital, labor force, technology and materials, the most worried factor worldwide is stable supply of energy. Vietnam produces domestic coal, oil and gas, and has been a net energy exporting nation to date. However, as energy consumption continues increasing along with economic growth, domestic energy production is anticipated to peak out gradually. Vietnam will turn into a net energy importing country around 2015. Another problem is impact on environment to be incurred by increasing use of energy and materials. To cope with these issues, construction of energy efficient economy and lower fossil fuel energy structure shall become the fundamental elements of the energy policy.

For example, in the BAU case assuming the current trend, primary energy demand will increase from 28 million toe in 2005 to over 161 million toe in 2025. Per capita energy consumption in 2025 will be 1.6 toe, which is substantially higher than the trend among ASEAN countries, and the import dependence of energy supply would come close to 50% by 2025. In view of the serious projection in the BAU outlook, we decided to adopt *Reference Case* scenario with enhanced energy conservation where the energy consumption of Vietnam would be 10% lower in 2015 and 25% plus lower in 2025 compared with the BAU case. In the Reference case, the primary energy consumption will be 117 million toe and import dependence would reduce to 31% in 2025.

Vietnamese economy will grow 5-fold in coming 20 years and, despite enhanced energy efficiency and conservation, energy consumption will still grow 4.3-fold. It is meaningless to illustrate future picture of such rapidly growing society only on trend analysis. Future would not be, and should not be a copy of the past. World trend will change and technology will progress greatly toward solution of the energy and environmental problems. In considering policies for future, it is necessary to recognize such global current and draw up a *grand design of future* with regard to what kind of society, what type of economy Vietnam should build. In this Study, we have constructed a comprehensive energy balance model as an analytical tool for such study and also developed framework and concepts to formulate of National Energy Master Plan.

As emphasized in the recent IEA report, the world requires soonest actions on energy and environmental problems. We hope that National Energy Master Plan of Vietnam will be established as soon as possible after thorough and intensive discussion on this proposal.



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# **Chapter 1 Energy Demand and Supply Situation and Viewpoints and Objectives of National Energy Master Plan**

## **1.1 Viewpoints and Objectives of National Energy Master Plan**

### **Energy Situation of Vietnam Facing Turning point**

Among ten ASEAN countries, the Socialist Republic of Viet Nam (hereinafter called as “Vietnam”), spreading over 300,000 square kilometers and having over 84 million people, is the second largest country after Indonesia in terms of population. However, its per capita GDP was US\$724 in 2006, being positioned among the late developing group of ASEAN. Its per capita energy consumption is also low at 0.3 tons in oil equivalent (toe). On the supply side, Vietnam yields various kinds of domestic energy such as coal, oil, natural gas, hydro and renewable energies, and has maintained a self-sufficient energy structure to date.

Looking to 2025, however, while its energy demand continues to grow to sustain the country’s socio-economic development, signal on increase of indigenous energy supply will be turning from green to yellow. In ten years from now, Vietnam may become a net oil importing country and will also begin import of electricity and coal. The energy structure of Vietnam is going to change substantially.

In Vietnam, the Five Year Socio-economic Development Plans were set forth and used to date as the indicator for economic development. In the energy sector, individual organizations responsible for electric power, coal and oil & gas have set forth development plans. However, these plans have had tendencies to reflect strong development aspirations of individual sectors with insufficient collaboration among them and, by no means, provided a central pillar to assure an optimized energy demand/supply plan from the viewpoint of national economy.

While energy consumption increases along with economic growth, long lead-time, high technology and huge amount of funds are necessary to construct the energy supply system. To orient energy consumption toward rational direction, long term endeavour that require technology and fund is also necessary. For Vietnam, aiming at poverty reduction and sustainable socio-economic development, realizing secured supply, optimum distribution and rational utilization of energy are the important policy objectives.

In order to materialize sustainable economic development in the era of violent energy circumstance, the country needs a firm and powerful energy plan. It is an urgent issue to establish a comprehensive energy plan, which is positioned above the sectoral development plans aiming at optimal energy distribution with integrated and efficient use. Based on such background, possibility of formulating the National Energy Master Plan has been discussed in Vietnam, which shall envisage a certain long period such as 20 years. Thus, this Study is planned to assist its formulation.

### **Analytical Tools and Technology Transfer**

Availability of meaningful data is the first problem when we start a study on energy in developing countries. In this study, we first conducted collection and compilation of the existing data, and then

conducted an energy demand survey to supplement necessary data to a least extent. Then, we constructed a database to effectively utilize them. However, data collected to date is far from sufficient and a sustainable data collection system is yet to be established.

Then, based on these data and using econometric methods, we constructed the demand forecasting model and the energy demand/supply optimization model. The energy demand forecasting model is made using the analytical software *Simple-E*, which is developed by The Institute of Energy Economics, Japan (IEEJ) and provided free of charge. This model is for conduct of regression analysis and logical aggregation of energy demand. The energy supply/demand optimization model is divided into the electric power block and the general block. For the analysis of the electric power block, the PD-PAT model developed by Tokyo Electric Company is used. For the general block, a new Supply/Demand Optimization Model was constructed as a LP model using the Linear Programming software GAMS, which is available on the market. The general block model implement optimization analysis incorporating the outcome of the PD-PAT analysis, and also produces summary report sheets and annual energy balance tables. The combination of such sub-models is the standard configuration used by IEA for its World Energy Outlook and by IEEJ for its World/Asia Energy Outlook.

Technologies and skills on the above have been transferred to the counterparts through training courses and on-the-job training during the course of the study. These tools and their manuals are separately provided to the counterpart. We expect that, from now on, Vietnamese experts will conduct maintenance and improvement of the database and the models by themselves.

## **Objectives of National Energy Master Plan**

In compiling the draft National Energy Master Plan, we aimed at constructing clear and comprehensive long-term plan based on the following principles.

1) Formulation of an energy plan consistent and coherent with the objective of the Socio-economic Development Plan

2) Clear explanation of the relation between the assumptions and/or hypothesis and the outcome

3) Clear indication of priority in policy selection and project implementation

4) Drawing up roadmaps clearly showing the decision-making milestones

5) Compilation of efficient implementation programs

In this study, the 20 years up to 2025 are divided into two phases, and the roles of the Master Plan are defined as follows.

Phase-1 (2006-2015): To provide basis for preparing plans and policies for action

Phase-2 (2016-2025): To provide basis for considering the standard path and policy options

The main objective for the first ten years will be updating and inter-sectoral coordination of the ongoing projects such as oil field construction based on the proved reserve, synchronized development of gas fields and gas fired power station, adjustment of refinery construction plan and etc. In the second ten years, however, circumstance surrounding energy may change substantially. Oil and gas reserves may change subject to result of extensive exploration. International circumstance shall change. Technology will advance. Thus, we may have wider scope for selecting policy options,

economic reform, life style change and so on. It would be possible to select policies for economic reform, energy conservation and etc. from among various options. It is desirable to formulate flexible energy policies considering the differences in the background relating to the time span to be covered.

In formulating the National Energy Master Plan, the most important element we should keep in mind is the fact that our future would not be and should not be a copy of the past. The size of the Vietnamese economy will expand five fold in the coming twenty years. That is, four fifth of the Vietnamese economy in twenty years from now shall be built from now on, and it should be defined in a *Grand Design* how we should build the future society. We should note that a better Master Plan would be constructed through extensive discussion by all the stakeholders on the *grand design* of our future from the energy viewpoint.

**1.2 Economic Development and Energy Trend**

**Remarkable Economic Development (Annual Growth Rate: 7.6%)**

Remarkable economic development has been achieved in Vietnam through adoption of "Doi Moi (the Reform)" policy since 1986, implementing several "Socio-Economic Development Plans." According to the "Statistical Yearbook 2006" by GSO, the real term economic growth rate for the period of 1990~2005 was 7.55%/year; RGDP increased from VND 132 Trillion to VND 393 Trillion and recorded 8.43% growth in 2005.

During the period of 1990-2005, Manufacturing and Mining sector recorded the highest growth rate at 11.72% among demand sectors followed by Transportation and Communication sector at 9.24%, Commerce and Trade sector at 8.42%, Service and others sector at 6.80% and "Agriculture and forestry industry" recorded the lowest growth rate at 2.76%.

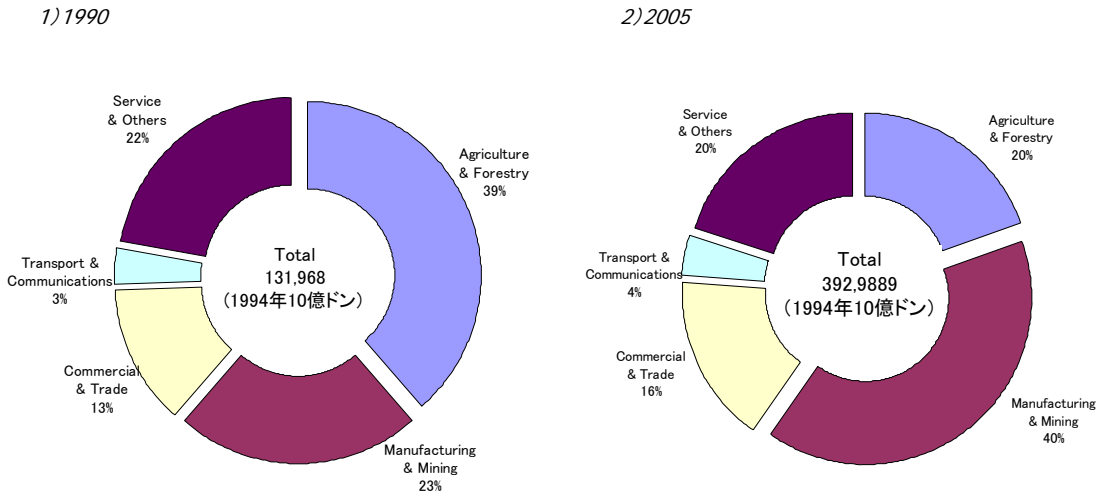


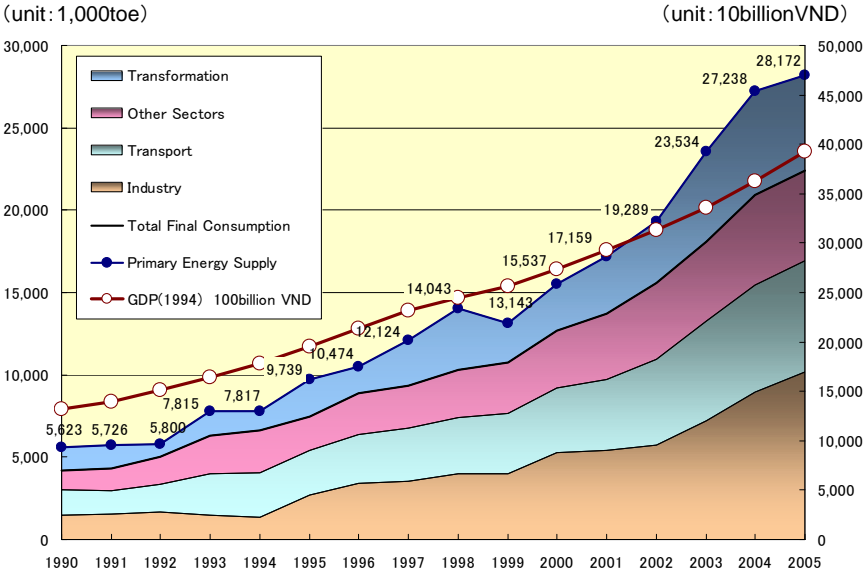
Figure 1.2-1 Economic Structural Changes (1990-2005)

Share of the agriculture and forestry industry in the Vietnamese economy decreased from 39% in 1990 to 20% in 2005, while the manufacturing and mining industry increased its share from 23 to 40%. During the same period, transportation and communication sector increased its share from 3 to 4%, the commerce and trading sector from 13 to 16%, while the service sector decreased from 22% to 20%. As the share of transportation and communication sector is increasing gradually, it is still very small.

**Socio-Economic Development Plan (2006-2010)**

Socio-Economic Development plans have set out direction of economic development of the country. Numerical targets in the latest “The Socio-Economic Development Plan 2006-2010” are as follows.

- The economic development: The economic size in 2010 shall expand up to 2.1 times or more of 2000 and the per capita GDP shall increase to 1,050-1,100 dollars.
- Economic growth rate: 7.5-8.0% (2006-2010 years)  
(Agriculture 3.0-3.2%, Industry 9.5-10.2% and Service 7.7-8.2%)
- Share of GDP: Agriculture about 16%, Industry 43-44%, and Service 40-41%  
(Judging from the record for 2005, the industrial sector has overshot the target while the service sector is in short of the target.)
- Foreign Direct Investment (FDI): 24 billion dollars



(source) [National Energy Database (under compiling)]

Figure 1.2-2 Economic Development and Trend of Energy Consumption

**Primary Energy Supply centering on Fossil Fuel and Export/Import of Energy**

The total domestic energy production in 2005 was 45.97 Mtoe in which coal was 18.90Mtoe, crude oil 18.86Mtoe, natural gas 1.84Mtoe and hydropower 1.39Mtoe. The average annual growth rate of energy production between 1990 and 2005 was 14.8% in which oil and gas production was highest at 16.0% followed by coal at 14.3%. In the energy production mix, share of coal was 41.1%, oil 41.0%,

gas 14.7% and hydropower 3.0%. The real economic growth rate was 7.55% in the same period. As a result, the GDP elasticity of the energy production recorded extremely high value of 2.0.

Energy export in 2005 increased greatly. Vietnam exported 18 million tons of crude oil and 14.7 million tons of coal in 2005. Revenue from energy export was about eight billion dollars, increased by 33% from 2004, and accounted for about 25% of the total export earnings.

On the other hand, most petroleum products are imported to cover the domestic demand because oil refinery doesn't exist in the country yet. Petroleum product import was 12.12 Mtoe in 2005. Thus, the net energy export (export - import) in 2005 was 18.2 Mtoe.

### **Feature of growing electric power demand and final energy consumption**

In 2005, the total final energy consumption was 21.8 Mtoe, and the annual average growth rate for the period 1990-2005 reached 11.6%. During the same period, electricity consumption recorded annual 14.2% growth, while coal consumption 11.6% and oil and gas consumption 11.4%. Compared to the GDP annual growth rate (7.55%), the GDP elasticity were very high being 1.9 for electricity, 1.5 for coal and 1.5 for oil and gas.

In the energy consumption mix by sectors, industry sector shared 44.0%, transport sector 29.7%, residential sector 16.2%, service sector 7.7% and agricultural sector 2.4%. In the energy consumption mix by energy sources, petroleum products shared 51.5%, coal 27.4%, electricity 17.5% and natural gas 3.6%. The rate of electrification (the share of power consumption over the total final energy consumption) as one of the important indices of people's living standard was 17.5%. It is a little bit low, but almost at the same level compared with other Asian countries. It decreases to 7.6%, if "non-commercial energy" consumed in large quantities in Vietnam (Energy Balances of Non-OECD Countries of IEA) were added to the denominator.

The intensity of commercial energy consumption in Vietnam was 616kgOE/\$1,000 GDP (in 1994 dollars), which was 1.5 times that of Thailand and twice the world average. The average primary energy consumption per person was 360kgOE/person in 2005, and the final energy consumption was 264kgOE/person. The per capita energy consumption was about 1/5 of the world average.

## **1.3 Current Status and Issues of Energy Demand and Supply by Sector**

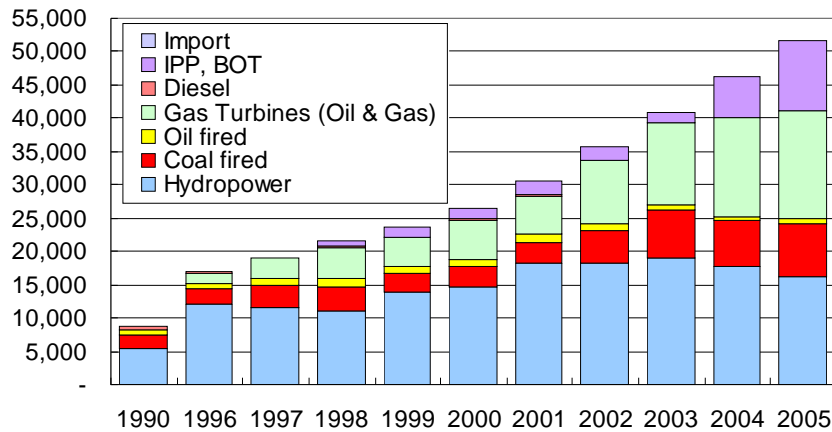
### **Power Sector**

#### *Serious Supply Balance with Risk of Black Out*

With an average annual growth of power demand between 1996 and 2005 accounting for 15%, power demand in 2005 recorded 45,600GWh that is 3.4 times larger than 1996. Peak demand has also more than tripled, coming up to 10,500 MW from 3,200MW. In order to meet the rapidly growing demand, Vietnam's power industry has struggled to expand and improve the power system through power resource development, enhancement of high voltage transmission lines connecting the country's three regions (north, center and south) and reduction of transmission and distribution losses (T&D losses). In particular, power resource development was facilitated not only by EVN's (Electricity of Vietnam) own investment but also under BOT (Build-Operate-Transfer) and IPP

(Independent Power Producer) schemes through private capital participations. As a result, IPP/BOT share in the total installed capacity of 11,300 MW in 2005 has come to 22%.

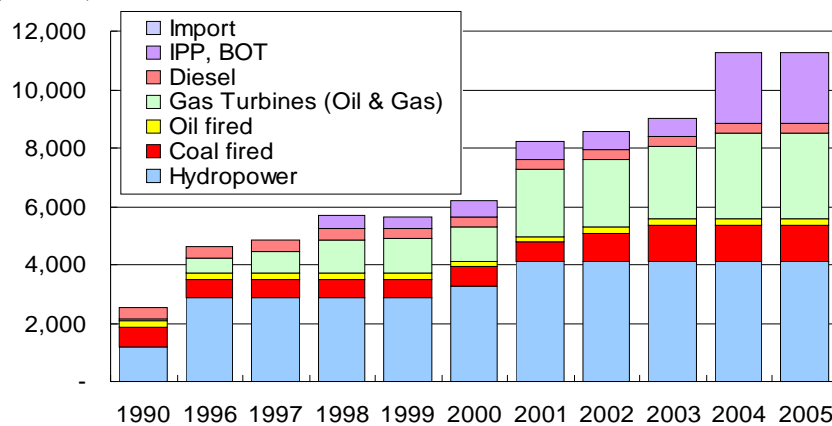
(unit: GWh=1,000MWh)



(source) Made from EVN, Annual Reports

Figure 1.3-1 Power Generation Mix by Source

(unit: MW)



(source) Made from EVN, Annual Reports

Figure 1.3-2 Installed Capacity Mix

EVN has also completed the a parallel, second north-south 500 kV lines of total 3,232 km as of 2005, and strengthened power transfer capabilities among the regions. Power import from Yunnan Province and Guanxi Autonomous Region in China has started through 110/220 kV lines. T&D losses fell sharply from 21.4% in 1995 to 11.78% in 2005.

Despite these considerable efforts, serious power shortages did appear during the summer of 2005 and even the office of Prime Minister experienced the power cut off. During that period from May to July, power shortage was estimated at 800-1,300 MW and the whole northern region including Hanoi faced load shedding for several weeks. A part of the reasons of this power shortage was the decrease of hydropower output due to drought conditions, but a main and fundamental reason was a lack of reserve margin against peak demand.



### *Excessive Electric Power Development plan*

Draft of the 6<sup>th</sup> Power Development Plan (PDP6) was revised substantially upward following the comment by Prime Minister Ngyuen Tan Dzung that demand growing scenario should be examined considering recent rapid improvement of rural electrification, growing electricity consumption per capita, acceleration of foreign investment and high economic growth of recent years, a growth rate of each case was reset at a higher rate.

As a result, the installed capacity for 2025 was revised to reach 180GW, 18-fold of the present capacity. This capacity compares to about 2/3 of 274GW, the present Japan's total power generation capacity. When the plan is to be executed, it should be reviewed from a more realistic viewpoint as the revision may have been derived on political consideration assuming higher demand estimate to move forward the Power Development Plan.

### *Improving Energy Efficiency and Necessity of Demand Side Management*

Improvement of energy efficiency and DSM (Demand Side Management) are the effective measures approaching from demand side to control the rising power demand.

Transmission and distribution losses of the national grid have been improved steadily over the last decade to 11.8% in 2005 from 21.4% in 1995. To further decrease technical losses and improve the power supply reliability, expansion of 500/220/110 kV transmission lines and rehabilitation of aging distribution lines are planned. Target of transmission and distribution losses is set at 9% in 2010.

Thermal efficiencies in thermal power plants are highly plant specific. Old and inefficient power plants are to be shutdown in turn on condition that supply capacities are sufficiently secured by promoting high efficiency thermal power projects. New, large-scale combined-cycle natural gas based power plants such as Phu My Complex incorporate world-class technology and provide high thermal efficiency of almost 50% by achieving plant operation rate of more than 95% with rated operation.

In order to disseminate DSM aiming at load curve leveling, time-of-day electricity tariff system has been adopted. Time slot is classified into three categories, i.e. peak hours (18-22), off-peak hours (22-4) and normal hours (4-18). In the case of power tariff for industrial use (more than 110 kV), tariff of peak hours is set at 1,590 VND/kWh that is three times larger than off peak hours of 425 VND/kWh (excluding VAT).

### *Issues of Power Sector (Power Source Development)*

A fundamental issue in the power resource development plan is the excessive dependence on coal thermal powers. Considering exploitation of all the hydropower potentials are to be completed by 2015, a power resource development plan shall achieve the best mix of various energy resources while keeping the energy security. Issues of each power resource by fuel type are explained in this section.

#### *a) Nuclear Power*

As for the nuclear power generation development plan, the Pre-F/S had been carried out, and the report was submitted to Prime Minister in September 2005 and approved in August 2007. In developing nuclear power, though technology transfer is necessary, no other serious issue would be

anticipated on the technical side as nuclear technology is well matured nowadays. Other challenges may be on nuclear safety, cooperation with the international society, capacity development and public acceptance.

The Government of Vietnam has issued “Long term strategy on peaceful utilization of nuclear energy until 2020”<sup>1</sup> as a Prime Minister Decision in January 2006. Its strategies are 1) to start operation by 2020, 2) to select the best partners on both technical and operational viewpoints, 3) to project the domestically produced nuclear equipment in the future including auxiliary equipment and nuclear fuel, and 4) MOST (Ministry of Science and Technology) should lead the strategic development of nuclear energy in cooperation with related Ministries and authorities.

#### *b) Coal Power*

Coal thermal is the main energy resource of power sector in Vietnam. While coal consumption at power plants in 2006 accounts for only 10% of the total consumption of 45 million tons, coal use is expected to increase substantially in future. Therefore, the most important issue is to secure stable supply of coal for power generation developing coal exploitation and transportation plan reflecting the future increase of coal consumption for power plants.

#### *c) Gas Power*

Excessive dependence on coal is undesirable on the energy security while there is a limit in the domestic coal production. The gas-fired station is considered as the anchor demand in the natural gas development while the gas is promising domestic resources following coal. Therefore, it is necessary to develop gas fields, gas pipeline and gas-fired station consistently. Establishing the comprehensive plan is required because a large development fund and a very long time are needed to this end.

#### *Challenges of Power Sector (Power Sector Reform and Securing Fund)*

Creation of power market and foreign and domestic private sector participation in the power resource development are expected to facilitate the effective and efficient management of power sector. About 50% of the total new generation capacity is to be developed by private capital through IPP or BOT scheme. In inviting private investors to the power sector is the key for success. To this end, it is necessary to solve issues of poor financial and technology capabilities of private capitals and the institutional design on electricity trading with high transparency.

Another important issue is to satisfy both free competition and stable electricity supply. Electricity supply is a universal service requiring huge capital resources and periods in the infrastructure development. If infrastructure development is fully made by market-driven, development tends to be delayed. This tendency is often observed in the countries where free competition has been introduced. Therefore, while improving the investment environment and entrusting the market-driven development by private sector, MOIT and EVN shall make overall middle and long-term development strategy and commit its implementation with the nationwide energy balance, energy security and global environment in mind.

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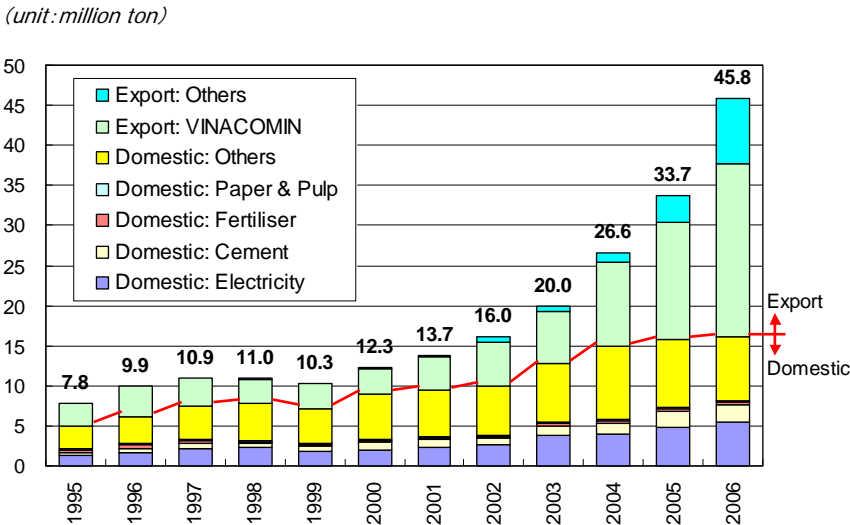
<sup>1</sup> Prime minister decision No.01/2006/QĐ-TTg; Chapter-1: Current status and future possibility of nuclear energy development, Chapter-2: Policy, objective and significance of nuclear energy utilization in Vietnam, Chapter-3: Measures for achieving the long term strategy

At the same time, it is a big issue how to secure the development fund. Electricity tariff reform is considered as the main method of the funding now. It directly relates to sales and collection of funds, moreover, it relates to power purchase price of BOT/IPP generation companies that leads to the attraction of private investors. It is currently planned to realize the tariff level that is consistent with costs of infrastructure development and O&M in 2010. With fulfilling the accountability to the public, tariff reform shall be properly implemented in accordance with the set schedule and, at the same time, social consideration to the poor is required under the increasing pressure of their economic burden.

**Coal Sector**

*Rapidly Increased Coal Export*

Coal demand increased 15.3% a year from 7.8 million tons in total in 1995 to 38 million tons in 2006. In particular export increased by about 19 million tons during the same period, and the annual average growth rate reached 20.3%. The main domestic coal demand sectors are power sector, construction materials sector and cement industry. It is expected that coal demand in power sector increases greatly in future. Export for China has increased rapidly since 2002. Current main destinations for export are China and Japan; high grade coal for steel and general industry is exported to Japan and low grade coal for power generation to China.



(source) VINACOMIN, "Master Plan on Coal Development for Vietnam in Period 2006-2015 with Expectation to 2025," December 2006

Figure 1.3-3 Coal Demand Trend

*Coal Supply Mainly by VINACOMIN*

The clean coal supply also increased by 31 million tons from 8.2 million tons in 1995 to 38.9 million tons in 2006 at an annual average growth rate of 15.3%. During the same period, state corporations increased supply by 28.6 million tons (average increase rate 14.9% a year), while other suppliers 2.2 million tons (22%). As a result, the supply ratio by state corporations including the

Vietnam National Coal Corporation (hereinafter referenced to as VINACOAL) and the Vietnam National Coal and Mineral Industries Group (hereinafter referred to as VINACOMIN) is still high in 2006 at 94%. On the other hand, total coal import was about 400,000 tons in which the coking coal for Vietnam Steel Corporation (VINASTEEL) was about 100,000 tons and the steam coal for IPP in the southern parts about 300,000 tons.

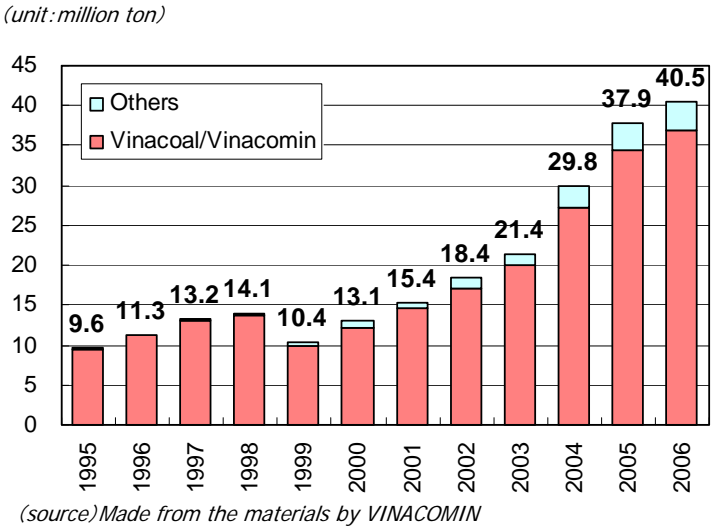


Figure 1.3-4 Coal Supply Trend

*Challenges of Coal Sector (Coal Resource Development)*

The mineable coal reserves of 3.39 billion tons excluding peat include 530 million tons of the sub-bituminous coal of the Red River Delta region that seems difficult to mine economically. Therefore, the realistic mineable coal reserves will be reduced to about 2.87 billion tons, and the R/P ratio then declines to about 70 years. Assuming the recoverable ratio at 70%, the recoverable reserves will further reduce to 2 billion tons and the R/P to 45 years. Therefore, as the mining depth getting deeper, it is necessary to increase the mineable reserves conducting detail geological exploration on the deep layers.

Vietnamese government and NEDO have jointly conducted a survey on the geological exploration of the Red River Delta coalfield from 1998 to 2003. Considering factors such as weak rock strata, necessary countermeasures against rock pressure and mine water, the mining cost seems to be considerably high. VINACOMIN is also examining possibility of mining the Red River field jointly with foreign companies applying deep mining and/or underground gasification technology. However, neither of them would be feasible at present and we cannot expect much from this field.

*Challenges of Coal Sector (Increase of Production Cost and Coal Price)*

The central government has been in principle deciding the coal price until 2006. It has been suppressed to a considerably low level as the average coal price until 2003 was based on sum of the coal production cost plus about 6% of profit. Domestic coal price was between 1/2 and 1/3 of international market prices and the balance between the average coal price and the domestic coal price

was covered by earnings from coal export. Average coal price remains at a high level than the production cost since prices in the global metallurgical coal market including the coal for PCI (pulverized coal injection for blast furnace) rose reflecting the worldwide tight situation of metallurgical coal supply and demand after 2004. On the other hand, the mining cost has been rising every year, and will rise further when underground mining will become main method in future. In addition, it is not free from cost rising on fuel cost, capital cost, and labor cost, etc., which requires further improvement of production efficiency.

Coal price will rise to reflect increase of the mining cost if the coal price in the domestic market is completely deregulated. Then, it will also be exposed to competition with international steaming coal.

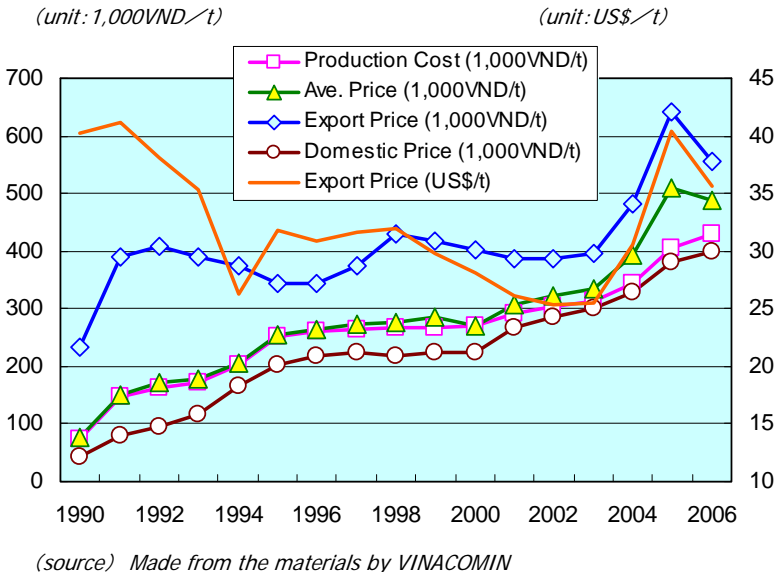


Figure 1.3-5 Coal Price Trend in Vietnam

*Challenges of Coal Sector (Secure of Imported Coal)*

EVN and IPP plan to install many coal-fired stations. In the southern part and central part, they plan to import coal from overseas such as Indonesian and Australian as these areas are remote from the Quang Ninh coal field. Import coals should be brought in by ocean going vessels, but there is no good port with sufficient water depth around the power plant construction sites in the central and southern provinces. It is necessary to prepare such ports to accommodate importing cargoes. In the southern region, especially because it is difficult to accommodate larger vessels as coastal water is shallow, expansion of the existing canals and/or construction of offshore sea-berth are planned to allow smaller ships to transship and delivery the cargo. In Vietnam, there is no firm with experience of big volume coal import and the coal import has to start from ground zero. Thus, it is required to establish a good relationship with foreign coal producers, try investment in overseas assets and construct stable supply system of import coal.

## **Oil Sector**

### *From Net Exporter to Net Importer*

The domestic upstream activities for oil and gas exploration and development are conducted by the Vietnam Oil & Gas Company (Petrovietnam). Under the Doi Moi policy, the state company aggressively promoted nation's oil and gas activities in the 1990s opening offshore petroleum blocks and inviting foreign oil companies. As a result, Vietnam achieved substantial oil production increase and become a net oil exporting country.

Looking at the oil production trend in Vietnam, the main oil field "Bach Ho" seems to be passing the peak and starting decline in its production. As new oil production is starting at newly developed fields such as Rong, Dai Hung, Rang Dong, Ruby, Su Tu Den, both total production and export hit a peak in 2004, and began to decrease in 2005-6

While Vietnam produces crude oil, no refinery exists in the country. Thus, the country's oil products supply fully relies on import. Transport fuel shares a substantial portion of it, as gasoline and diesel oil shares 30% and 50%, respectively. Among the petroleum products, jet fuel in transport sector and kerosene in commercial /residential sectors remain levelling off, while demand on diesel oil in the transport and industrial sectors as well as gasoline is increasing steadily. In particular, LPG consumption in industrial, commercial and residential sectors is growing fast, causing rapid increase of production and import.

Import license of petroleum product is controlled by the government, and eleven (11) companies are at present authorized to import petroleum products. Petrolimex is the biggest downstream player among them sharing more than 50% of the total oil product import. The sales amount of the company is evenly distributed among three sectors, which are direct sales to large industrial customers, wholesale to agents and retail marketing.

Prices of petroleum products have doubled in the recent three years reflecting the steep price oil hike in the international market. Natural gas is supplied to the Phu My power station and other limited users in the adjacent area such as a fertilizer plant. Prices of natural gas are set at low level less than half of the Henry Hub or Asian LNG import price.

### *Issues of Oil Sector (Resource Development and Oil Import)*

With recent high oil price, some of smaller oil fields which were ranked as non-feasible before are becoming commercially feasible in the present market. Therefore, it is preferable to conduct re-evaluation of the realistic recoverable reserve figures reflecting recent higher prices, maybe applying stepwise approaches corresponding to different price scenarios to utilize nation's hydrocarbon resources to the maximum extent.

In a mid/long term future, Vietnam will become a net oil importing country, and the realistic import origin will be the Middle East. Then, it is an important requirement to construct harbors able to accept VLCC class tankers considering an efficient crude oil import. Since oil import from the Middle East depends upon sea transport, it will be required to consider the sea lane security and to maintain the good-relationship with countries located along the sea transport route. In addition, in consideration of increased dependence on import oil, it is also needed to establish the Strategic Petroleum Reserve facilities and operating system.

### *Issues of Oil Sector (Oil Demand Countermeasure and Oil Refinery)*

Petroleum product demand in Vietnam in 2025 is forecast to be three times bigger than the current level, which would not be fully supplied with the domestic resources. At the same time, from the viewpoint of national income, the revenue obtained by the crude oil export is diminishing as expense by the energy import increases. Therefore, it is one of the important policy objectives to utilize the indigenous resources as efficient as possible and curb the import at a minimal level.

Also oil refinery construction is underway to decrease the import dependence as oil products are almost imported at present. The first refinery with capacity plan at around 148,000 barrels per day is now under construction in Dung Quat, Quang Ngai province in the central part, and scheduled to complete in February, 2009. It at first receives domestic crude oil and high-sulfur imported crude oil will be introduced up to 15% as the feedstock after 2020. The second refinery is to be located at Nghi Son, 200km south of Hanoi, having 140,000BPD or 7 million TPA to start up in 2015. Low sulfur domestic crude and high sulfur imported oil will be introduced evenly.

The third refinery planned in the southern part will have the same capacity as the second one, combined with basic chemical plants in the refinery down stream to form a complex.

Ultimately, total 15 million tons of petroleum products excluding LPG will be supplied to the market. Efficient logistics linking these supply points and major markets in Vietnam (HCM in the south, Hanoi in the north, etc.) will be the issue to be considered in the downstream sector such as system for smooth efficient distribution and storage of products.

The Petroleum Law of Vietnam issued in 1993 and amended in 2000 emphasizes on the activities of upstream operation, while description on the middle/down-stream activities seems to be relatively lean. Therefore, it would be appropriate to amplify the relevant sections to promote investment of foreign capitals and private sectors into the field of petroleum refining or petrochemicals

## **Natural Gas Sector**

### *Gas consumption mainly for Power Generation and Cheap Gas Price*

Natural gas production in Vietnam became substantial in the 1990s. At the beginning, associated gas shared majority in the production, while non-associated gas production increased after production started from Lan Tay gas fields in the Nam Con Son basin in 2000. It is a remarkable feature of Vietnam that more than 80% of gas is used for power generation. As for gas consumption in Industrial sub-sectors, almost a half is used in the chemical sub-sector mostly for fertilizer (ammonia/urea) production.

Gas price differs among sectors in the current domestic trade<sup>2</sup>, i.e., 2.5-3.8 USD/MMBtu for power generation, 1.5-2.0 USD/MMBtu for fertilizer production, and 3.0-4.6 USD/MMBtu for food processing, etc. Especially, users of the fertilizer production sector request lower price. The government approves this request paying make-up to Petrovietnam out of the revenue of sale for the power sector. This is may be because the power sector is able to accept higher gas price, since they can dilute it with other power sources and/or pass it on to the end-users.

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<sup>2</sup> Hoang Thi Phuong, "Policies and solutions for gas market development in Vietnam", GASEX Conference in Beijing, China 2006

### *Challenges of Gas Sector (Gas Resource Development and Possibility of Import)*

In addition to the gas fields to be developed in the southern region, increase of the domestic natural gas resources are expected in the unexplored areas such as Tonkin Gulf and offshore Central region. As there is a case that development is withheld since the preliminary exploration outcome indicates that high carbon dioxide (CO<sub>2</sub>) content in the produced gas, best available technologies to process/treat such gas shall be applied for effective utilization of the stranded resources. Vietnam has to depend on import from neighboring countries in addition to these new, domestic resources for the increasing demand. It is conceivable to import natural gas from neighboring countries, i.e., the joint development area with Malaysia and Thailand in the South-West offshore region, or potentially from Cambodia. LNG import becomes an objective to study in the long run, too

### *Challenges of Gas Sector (Gas Demand Countermeasures)*

The role of gas-based power-plant is important in the gas field development, since its committed gas demand should be regarded as the anchor demand when gas fields are developed. Thus, in the natural gas power station development plan, it is necessary to consider it not only for optimization of the power source mix but also for the national energy structure appropriation.

Immediate issues in the natural gas sector in Vietnam are how to develop gas transportation and delivery system and how to program promotion and diversification of demand. As a huge increase of natural gas demand is expected in Vietnam, it is required to properly guide the potential demand and thus develop new outlets. To this end, it is desirable to implement effective measures such as systematic construction and expansion of trunk and delivery pipelines, gas utilization campaign for new plants and buildings, fuel conversion at existing facilities and new effective utilization technologies such as Natural Gas Vehicles and co-generation.

## **Renewable Energy**

### *Renewable Energy Use Relatively Lower against its Potential*

The most basic use of renewable energy in Vietnam is biomass for heat. Fuelwood, agricultural residue and animal waste are used as heat source of households. Small hydro and bagasse is used for power generation, though their generation in 2005 was only 265.57GWh, which was approx. 0.5% of the total power generation (51769.68GWh) in Vietnam

Table 1.3-1 Targets of Renewable Energy Development

Items	Numerical Target
Share of renewable energy in total commercial primary energy	• 2010 : 2% (0.9 million TOE)
	• 2020 : 3.4% (3 million TOE)
	• 2050 : 7% (22 million TOE)
Renewable energy power development	• 2010 : 3%
	• 2020 : 4% (8-9 billion kWh)
	• 2050 : 10% (60-80 billion kWh)
Use of hot water by solar-energy equipment in Public works and services (hospitals, school and university, governmental offices, restaurants, etc.)	• 10%
Hydro power development	• 2010 : 35,000 million kWh (Addition of 10,000 million kWh)
	• 2020 : 60,000-65,000 million kWh (Addition of 15,000-20,000 million kWh)
	• After 2020 : 70,000-80,000 million kWh
Energy supply in islands and mountainous area	• Use of commercial energy for heating : 50% by 2010, 80% by 2020, from existing 30%
	• Rural Electrification Rate : 90% by 2010, almost 100% by 2020

(source) Ministry of Industry: National Energy Policy (Draft), 2005



Looking at the renewable energy potential and current use, the proportion of renewable energy use is low compared to the potential, although accuracy is not high in evaluating each energy resource.

### Challenges in Renewable Energy Supply

Table 2.3-2 shows the challenges in each renewable energy supply from the energy potential.

Table 1.3-2 Issues and challenges of Renewable Energy supply

	Solar	Wind	Small Hydro	Biomass		Geothermal	Tidal
				Electricity	Biofuel		
Potential	2MW	600MW, 2,200MW, 22,400MW	Over 2,300MW, 8-9billion kWh	250-400MW	—	180-340MW	—
Issues and subjects	<ul style="list-style-type: none"> <li>•High initial cost</li> <li>•Small capacity and failure</li> </ul>	<ul style="list-style-type: none"> <li>•Accurate potential has not been grasped</li> <li>•There is no grid-connected wind power plant</li> </ul>	<ul style="list-style-type: none"> <li>•Depletion of small hydro potential in the future</li> </ul>	<ul style="list-style-type: none"> <li>•【Bagasse】 Stable procurement of sugarcane</li> <li>•【Rice Husk】 Effective collection of rice husk</li> </ul>	<ul style="list-style-type: none"> <li>•Accurate potential has not been grasped</li> <li>• Establishment of the national biofuel development plan</li> </ul>	<ul style="list-style-type: none"> <li>•Low profitability</li> </ul>	<ul style="list-style-type: none"> <li>•Accurate potential has not been grasped</li> <li>•Cost increase by transmission line construction</li> <li>•Unstable power generation</li> <li>•Environmental impact caused by tidal power plant has not been grasped</li> </ul>

### Issues in Renewable Energy Dissemination

Issues in renewable energy dissemination are divided into following three.

#### 1) Establishment of Development Plan of each Renewable Energy

IE has been producing the new master plan on renewable energy resources in Vietnam (finished at the end of 2008). However, the contents of the master plan are wide-ranging, and the research period and budget is limited. Therefore, it is necessary to review the master plan and implement a supplemental potential survey and establish development plans on each energy source as appropriate, in order to facilitate the development of “New” renewable energies such as wind and biomass.

#### 2) Effective Use of Biomass Resources

Vietnam is an agricultural country, and there are huge amount of biomass resources such as bagasse, rice husk and rice straws. Most of biomass resources are used as heat source, while power generation (about 50MW) use in central and southern areas is exceptionally.

Also, Bio-Fuel is considered as the most possible measure of effective use of biomass resources. In May 2007, “Development of Bio-Fuels in the Period up to 2015, Outlook to 2020” was submitted and is under approval process by the prime minister.

For achievement of effective use of the biomass resources, it is necessary to take the following measures.

- Stable supply of biomass resources, which is balanced with needs for food supply
- Technology Development in energy conversion (Biomass to Fuel, Electricity, etc.)
- Establishment of Bio-Fuel distribution system
- Coordination between related ministries in Vietnam
- Support from Foreign Countries and Introduction of Private Capitals

### *3) Introduction of Incentives for Renewable Energy Power Development*

The fundamental policy on the introduction and dissemination of renewable energy as power resource is now being formulated as a result that a long term renewable energy development targets as power source is set in the National Energy Policy by MOIT and that the promotion of renewable energy as power source is planned by the Prime Minister's decision as referred before.

At present, there are no specific incentives for renewable energy promotion such as advantageous electricity purchase price for renewable energy and obligation of power producers to purchase/produce certain percent of electricity sold from renewable energy power. In addition, when the electricity market is established, which is planned to start from 2009 as part of the electricity sector reform, each power producing companies will be put in a competitive environment. Because renewable energy power is less competitive in price than conventional power, the installation of renewable energy is expected to slow down unless effective incentives.

## **Energy Conservation and Energy Efficiency**

### *Potential of Energy Conservation*

Energy Efficiency and Conservation (EE&C) technologies were introduced in Vietnam since the 1990s as a part of technical and financial assistance programs conducted by international organizations, principally from The Netherlands, Germany, Japan and other countries. This introduction was followed by the implementation of projects addressing the rational use of energy in the cement and ceramics industry sectors and coal fired thermal power plants, together with demand side management (DSM) programs. These projects underpinned the transfer of related technologies and their successful application, and also were the basis for the formulation of government policies to promote energy conservation programs. Since 2003 the efficiency improvement and rational use of energy have been included as a key item in the Policy on Energy Sector Development (2005, at that time MOI, now MOIT), and activities on EE&C have continued to date.

The Primary Energy Consumption per GDP decreased from 1.351 (toe /US\$1,000) in 1995 to 1.218 in 2004. However, in 2004, this indicator was between 0.5 and 1.0 in other Asian countries and only 0.108 in Japan. Therefore it is considered that the potential for energy saving on primary energy is high in Vietnam.

### *Challenges in Energy Conservation*

- 1) Lack of policy and administrative framework for the promotion of energy efficiency and conservation.
- 2) Inadequate data and analysis on potential energy efficiency improvements, cost and benefits of EE&C opportunities and low-cost measures, and also limited information on technologies and programs that have been adopted elsewhere.
- 3) High project development costs, due to extensive audits and technical studies required to properly determine investment requirements and to ensure appropriate project formulation. There are also financial risks on projects that are developed with limited planning and using technologies and equipment that had not been thoroughly tested under Vietnamese conditions.
- 4) Affordable financing is limited due to lack of commercial lending practices in Vietnam. Also

weakness of the banking sector, relatively small investments assigned for EE & C projects and limited credit available for the residential projects are barriers for the creation of suitable financial instruments.

- 5) Limited interest from end-users partly because their attention is focused on other business priorities. Other issues influencing their interest are the limited financial significance sometimes assigned to the reduction of operating costs derived from energy saving implementation, and that the benefits derived from energy saving projects are owned by municipal agencies.
- 6) Limited availability of local EE&C equipment, due to the low domestic demand for these products and the restricted manufacturing capability in provincial areas in Vietnam. These issues altogether have discouraged any sizeable investment in energy efficiency measures.

## **Energy Database**

### *Database by General Statistics Office*

General Statistics Office (GSO) is acting based on Statistical Law, and all the enterprises, the organizations, and individuals including the state company and the private company adjust the object of this law. Expenditure necessary for the statistical research is financed by a national budget.

GSO is conducting “Annual Enterprise Survey” by questionnaire sheets every year and publishes Statistical Yearbook based on this survey. At present, GSO is conducting monthly survey of main industries including energy sector (oil, gas, coal, power, etc.) to make up IIP (Indices of Industrial Production) statistics funded by JICA (Japan International Cooperation Agency). Projected production, actual production, shipment, internal consumption, ending inventory, and shipment value are mentioned in this monthly questionnaire (refer to Attachment-2). It is possible to collect energy supply and demand data of main industries by preparing a questionnaire sheet like the above questionnaire sheet.

### *Establishment of Socio-Economic Data and Energy Data*

Socioeconomic data stored in the JICA energy database created by the study team are picked up from GSO Statistical Yearbook and these data is necessary for energy demand forecast model. However, GSO Statistics Yearbook doesn't include data on number of vehicles and floor space, which are very important to estimate energy consumption by transport and commercial sectors. Energy data for oil, gas, coal, and power sectors are compiled based on energy demand survey conducted by INDUTECH (Chemical And Industrial Safety Technology Institute) last fiscal year. Data items of the JICA energy database are same as that of IEA (International Energy Agency) energy balance table. However, there are some issues as follows.

- There is no stock change data except coal sector.
- Energy supply data of petroleum products and electricity are not classified by sub-sector.
- Unit of original data of petroleum products and natural gas was not unified. For example, Natural gas is in BCM and 1,000ton, Petroleum products in ktoe and kton.
- There is no time series data on renewable energy.
- Energy consumption data of transport sector are not classified by sub-sector such as road, rail,

airplane and ship.

- There is no briquette data such as coal consumption and briquette production because VINACOMIN does not supply coal to briquette plants. It is unknown from where briquette factories obtain supply of coal.
- Some data don't follow ISIC (International Standard Industrial Classification).

#### *Challenges in Maintenance of Energy Statistics*

Social and economic data are publicly disclosed by GSO. However, data and information in energy sector are very poor. Government organization that administrates energy issues in Vietnam is Energy and Petroleum Department, the Ministry of Industry and Trade. Though this department is reviewing energy plans such as oil, gas, coal, electricity, and renewable energy, there is a lack of staff for handling energy statistics. In order to promote energy statistics, it is necessary to establish a new organization for energy database.

Other issue concerned is a lack of experience for processing of energy statistics. To promote Vietnamese energy statistics, it is necessary to examine and establish statistics processing procedure. To this end, it would be appropriate to ask for technical assistances from international organizations and developed countries.

### **1.4 Energy Policy Framework and Implementation System**

#### **Political Targets in National Energy Policy (Strategy)**

The targets of the energy policy are summarized in the National Energy Policy as follows.

“Reasonable and effective exploitation and use of domestic energy resources; Supplying sufficient energy with high quality, reasonable prices to the socio-economic development; Ensuring national energy security; Diversification of investment and business forms in energy field, step by step establishment of competitive energy market; Promotion of renewable energy resource development in order to meet energy demand, especially in the remote, mountainous, island areas; Fast, effective and sustainable development of energy sector in combination with environmental protection”.

##### *1) Targets in Energy Resource Development:*

###### •Oil and gas:

Increasing annual reserve by about 30-50 million m<sup>3</sup> of OE (oil equivalent), the proven reserves shall be 1.3 - 1.4 billion m<sup>3</sup> of OE by 2010. By 2020, the reserves shall be proven for the whole continental shelf and important economic areas at the depth of 400 m and at promising deep water areas with depth of 400-1000 m.

###### •Coal:

Completion of exploration of coal reserves in the depth of 300 m to 1000 m, and detailed exploration of coal basin of Red river delta will be carried out. By 2015, exploration of coal reserves in Red river delta will be completed.

###### •Hydropower:

Add 10 billion kWh of hydropower by 2010 and 15-20 billion kWh by 2020.

###### •Uranium:

By 2010, about 8000 tons of  $U_3O_8$  of C1+C2 reserves will be identified and by 2020, with reliable data on  $U_3O_8$  reserves, resources will be available for the country

## *2) Securing Domestic Primary Energy Supply:*

By 2010, about 47.5-49.5 million toe and by 2020, about 91-100 million toe, in which

### **Hydropower:**

About 35 billion kWh of hydropower in 2010, 60-65 billion kWh in 2020, and 70-80 billion kWh after 2020.

### **Coal production:**

Coal production will reach 35-40 million tons in 2010, 50-60 million tons in 2010, in which a portion is exploited in Khoai Chau (Hung Yen province), and coal production will be increased to 200 million tons in 2050.

### **Oil and Gas:**

The oil and gas production in the period 2006-2010 is about 25-30 million tons/year; 31-34 million tons/year in 2011-2015 and about 34-35 million tons/year in 2016-2015.

## *3) Securing National Energy Security*

The policy measures to secure the national energy security are as follows.

- High priority is given to the energy security.
- The preferential policy concerning the development activity is adopted, and the domestic energy production is increased by a sustainable method.
- Development and use of domestic energy resources are promoted, and dependence on the oil import is decreased.
- An enough power supply is secured through systematic implementation of the national power development strategy and plan, and maintaining an appropriate reserve capacity.
- Carry out study for replacing petroleum products in order to reduce dependence on oil.
- Study on development of nuclear energy sector and construction of nuclear power plants. Coordinating with the international organizations in development of nuclear energy, gradually manage technology and development of nuclear energy for peace purpose.
- Research on renewable energy development, gradually increasing share of renewable energy.

The Government will have preferential policy for renewable energy development.

## *4) Energy Conservation and Energy Efficiency (EC&EE)*

Energy Conservation & Energy Efficiency means “Reduction of energy consumption through policies of energy conservation and energy efficiency will reduce burden on energy import, saving foreign currencies. Besides, it also contributes in increasing national energy security.” The energy conservation policy and the policy instruments are as follows.

### *a) Policy on Energy Conservation and Energy Efficiency*

- Priority is given to the development of low energy intensity sectors
- Development of finance/taxation policies to encourage energy conservation
- Promulgation of national standards on energy consumption rates for equipment, means which use energy

#### *b) Measures of energy conservation and energy efficiency (EC&EE)*

- Industry and construction sector:
  - Application of technological measures, management improvement, repairing and rehabilitation of equipment, renovation, upgrading of equipment, replacement of low efficient equipment.
  - Technology renovation, use of modern high energy efficient equipment.
  - Application of energy saving and energy efficiency measures in design, investment and construction of buildings.
  - Implementation of DSM programs
- Transportation sector:
  - Increasing transport of passengers and goods by railways, water way instead of road transport.
  - Carry out research on subway train systems, trolley-bus over the ground in Hanoi and Ho Chi Minh cities.
  - Development and upgrading the road networks: car road, water way, railway and oil pipeline system.
    - Application of preferential policies on taxation, investment in order to develop distribution and transport means which use LPG or compressed gas.

#### *5) Environmental Protection in Energy Activity*

The environmental protection in energy activity instituted the revision of "Environmental standards" and strengthening of "Capacity building" and "Propaganda".

- Strengthening environmental management, increasing qualifications of the staff, investment in testing.
- Amendments of environmental standards and development of long term targets on environment in compliance with the regional and international standards on environment
- Integration of energy development with the environmental protection
- Making investment support, giving privileges on taxation for energy projects such as renewable energy, use of residues from agriculture, forestry, municipal wastes for electricity generation; using cleaner fuels instead of petroleum products in transport etc.
- Enhancing propaganda, education on dissemination of knowledge, inspection, monitoring of environment
- Diversification of financial resources, encouraging attraction of foreign finance for environmental protection
- Active participation in CDM, contribution in global environment protection and securing state and enterprise benefits in implementation of CDM

#### *6) Organizational Reform and Establishment of Competitive Energy Market*

The purpose of establishment of the competing energy market institutes the following policies as "The energy market will be established in order to encourage competition between units operating in energy field, facilitating favorable conditions for energy enterprises to attract local and foreign financial resources, fast and sustainable development of energy sector".

- Amendments, new development of legal documents for energy sector
- Promotion of administration reform; separating state management functions from the production -

business management functions

- The exclusion of State monopoly through implementing pilot equitization and expansion of equitization of energy enterprises. There will be suitable mechanisms for attracting the investors, especially foreigners to buy the equities of energy projects
- Development of models and step by step to establish energy market suitable to the socio-economic conditions of Vietnam

### *7) Creating capital resources for energy development*

To execute such many projects and policies, the creation of various capital sources like enhancement of own funds, issuing domestic bonds, introduction of ODA, carrying out the equitization and attracting FDI are proposed.

- Ensuring self -finance for investment - development through increasing efficiency, effectiveness of energy sector
- Increasing finance resources by issuing domestic bonds
- Perfecting policies, mechanisms for attracting foreign finances: ODA loans, non-ODA loans, issuing bonds overseas for energy development
- Carrying out the equitization of energy enterprises in which the state doesn't keep 100 % capital.
- Attracting foreign direct investment (FDI) in development of energy projects

Specific fields will be allowed for 100 % of foreign investment and the foreign investors can invest in exploration, exploitation, processing and distribution, selling of oil, gas, distribution of electricity

### *8) Energy Prices*

Energy prices may come to be decided based on the market mechanism as the present pricing regulation by the State is gradually abolished. Control on the energy production and consumption will be implemented through the taxation policy and the monetary policy.

#### *a) Coal Price :*

In the period without competitive coal market, coal selling prices to large coal consumers (electricity, cement, paper, fertilizer industries) shall be managed by the State in the principle that all cost will be recovered and reasonable profits will be set for the coal sector. Coal selling price to individual consumers in the country and export coal prices will be set according to the market prices.

#### *b) Crude Oil Price :*

The prices of crude oil to be exported and supplied to refineries shall be regulated in compliance with the international oil prices

#### *c) Petroleum Product Price :*

- The state will set the ceiling retail prices and orientations for some main petroleum products (gasoline, oils), the enterprises will make decision on retail prices
- In case the international oil prices strongly fluctuate, the State will apply necessary intervention measures such as using national stockpiling, adjustment of prices or orientation of taxation.

#### *d) LPG Price :*

- LPG prices are determined according to the market prices. The State will manage through taxation policies, regulation.
- Application of preferential taxation for production enterprises in order to encourage domestic LPG

production, gradually replacing the import

*e) Natural Gas Price :*

- The state will set principles for gas pricing, benefits allocation, costs, receivable for the State etc. when gas field is discovered. These principles will be specified in the oil - gas contracts.
- The gas prices will be determined based on the minimum gas price (calculated according to production costs) and maximal gas price (acceptable price by consumers).
- The natural gas prices will be set based on the market mechanism. The gas consumers will directly negotiate with gas producers. For gas used as raw materials such as for fertilizers (nitrogenous), the State shall not subsidize to the producers or allow cross subsidy between consumers. If necessary, price subsidy is applied only for final products.

*f) Electric Power Rate Policy :*

- The electricity prices shall be so determined that investors will get reasonable profits, saving energy resources, using renewable energies which don't make environmental pollution, contributing in socio-economic development, especially in rural, mountainous and island areas
- Encouraging saving electricity and electricity efficiency
- Implementing reasonable cross price subsidy between customer classes. Reducing and towards eliminating the cross price subsidy between production costs and electricity prices in residential sector, contributing in promotion of production and increasing competition of the enterprises
- Ensuring self determination rights on electricity buying and selling prices within the tariff schedules specified by the State for sellers and buyers in the electricity market
- Ensuring legal rights and benefits of electricity units and electricity users

*9) Development of Renewable Energy Resources*

The measures, policies for development of renewable energy resources include the following:

- Organizing surveys, evaluation of potential renewable energy resources, preparation of master plan on renewable energy development
- The share of renewable electricity in power generation companies:  
It shall account for 3 % in 2010, 5 % in 2020 and 10 % in 2040.
- Coordination, integration of renewable energy development programs with other rural development programs such as rural electrification, forest plantation, poverty alleviation and hunger elimination, clean water programs etc

*10) International Cooperation and Energy Importation and Exportation*

- Priority is given to supply of enough coal for domestic demand and efficient, reasonable coal export with set-out production target for each period. Coal can be exported from the north and imported to central and southern regions; the coal import, export shall be implemented based on general economic effectiveness of the national economy. Coordination with Laos in development of coal mines and coal fired power plants in Laos for importing electricity to Vietnam
- Study on hiring for crude oil refining instead of exporting crude oil and importing of petroleum products from the regional market.
- Preparation of development plan for refineries in order to reduce dependence on importing of petroleum products and cooperation with other countries in construction and operation of



strategic oil stockpiling system.

- Implementing interconnection of power systems and gas pipelines in ASEAN region.

## **Decision Making Process of Energy Policy**

The energy policy making process goes through the next five steps.

### First step:

Each ministry and agency asks for industries under its management to draw and submit strategy, plan and/or conceptual design of the policy. The main organizations are as follows.

- 1) Institute of Strategy Development
- 2) Institute of Energy
- 3) Vietnam Atomic Energy Commission (Nuclear Power Energy Policy)
- 4) Other Organizations (Petrovietnam, Vinacomin, EVN)

### Second step:

Policies compiled by industry shall be submitted to MOIT.

### Third step:

MOIT submits the draft of law, ordinance or regulation to the government.

### Fourth step:

The government informs this to the Political Bureau.

### Fifth step:

The government submits the draft to the National Assembly, as appropriate, and obtains approval.

The government shall promulgate and execute them after legislation. The policy formally approved through such process becomes the strategy and plan of MOIT as well as the government.

The detail policy making process at each energy sector is as follows.

#### *1) Coal sector*

MOIT examines and drafts the coal strategy and the Prime Minister approves it. In case of the master plan, VINACOMIN and MIICJSC draft and MOIT examines it, and then the Prime Minister approves it. In addition, for the coal prices, VINACOMIN submits the draft, MOIT and MPI examine them, and then the Prime Minister approves, while the coal price except for the power sector is decided according to direct negotiation between VINACOMIN and larger users since 2007. After 2008, EVN (electric power company) and VINACOMIN will negotiate to decide the coal price for the power sector, though examination by MOIT and MOF and approval by the Prime Minister are necessary.

#### *2) Oil and gas sector*

The process is similar as above that Petrovietnam makes a strategy of oil and the gas sector, MOIT and MPI examine it, and the Prime Minister approves it. As the oil and gas sector "Master plan" was reported in February 2007 that the Political Bureau had already approved it, the Prime Minister's approval has not been obtained yet. For oil and gas price, the procedure requires that Petrovietnam sets the draft, MOIT and MOF examine it and then the Prime Minister approves it. In the "National Energy Policy" currently waiting for approval, it is stipulated that the prices of crude oil and major

petroleum products may be decided in conformity to the international crude oil prices and within the upper limit of a price band.

### *3) Power sector*

For the power sector, MOIT examines and drafts the strategy and the Prime Minister approves it. As for the master plan, EVN and IE draft, MOIT and MPI examine, and the Prime Minister approves it. Besides this, IE and the consultant compile "Regional plan" and MOI examines and approves it.

In pricing, Electricity Regulatory Authority of Vietnam (ERAV) proposes the electricity tariffs, and MOIT and MOF examine the draft and the Prime Minister approves it.

Though MOIT basically takes charge of making the Strategy of each energy sector, Petrovietnam is in charge of making strategy of oil and gas sector. As for the master plan, it is a process that each enterprise (VINACOMIN, Petrovietnam and EVN), the related laboratory (IE) or the consultant drafts "Master Plan" of each sector, and the Prime Minister approves it after examination of MOIT and MPI.

### *4) Energy conservation and renewable energy policies*

A policy making process of energy conservation and renewable energy is as follows. MOIT, responsible for these policies, nominates consultant (IE of EVN will be nominated) for policy making at first. The consultant submits the study to MOIT. The submitted draft plan shall be examined at the National Appraisal Commission and adjusted as appropriate. Finally, MOIT submits it as their own plan to the Government and the Prime Minister approves it.

It is not certain in the above observation at which stage coordination among energy sectors is conducted, but such coordination may be inadequate at present. Strategies and Master plans of individual energy sectors may be being set out without thorough consultation with other sectors, making it difficult to re-adjust afterwards. This background may have required formulation of the National Energy Master Plan.

Similarly on pricing, though decision making procedure is set out from drafting, examination through approval, it is uncertain at which stage the relationship among prices of coal, oil and gas, and the electricity tariffs is coordinated.

In the above context, it is required to urgently set out the National Energy Master Plan to coordinate sectoral development plans and pricing policies from national viewpoint toward formulation of a comprehensive energy policy.