

Part 3 Draft for National Energy Master Plan

Chapter 8 Direction and Goals the National Energy Master Plan

8.1 Goals of Socio-economic Development

8.1.1 Modernization of the Society with Sustained Development

The Vietnamese economy has kept high economic growth of over annual 8% in these years and the per capita GDP reached US\$724 in 2006, though the country is still among the late developing group of the ASEAN countries. It is aimed to increase same to US\$1,100 under the current Socio-economic Development Plan. As this plan aiming at annual 8.5% growth looks very ambitious, Vietnam has great potential for development as the per capita income is still low and agricultural population ratio is high. If we look to the fact that the economic differences with ASEAN countries and China are the cause of the current high FDI inflow and thus the driver of the high economic growth, this trend may continue well into the future. To materialize this, of course, it is necessary to prepare the circumstance to further promote the inflow of technology and fund, and securing stable energy supply that is essential for economic activity should be an important element of the strategy for such long-term development.

From the above viewpoint, the economic growth scenario in this study is set forth that the Vietnamese economy will continue to grow at the current trend of annual 8.5% by 2020 and then slightly slowdown to 8.0%. Consequently, the average economic growth rate will be 8.5% for Phase-1 period of 2006 through 2015, 8.2% for Phase-2 period of 2016 through 2025 and 8.4% for the entire projection period.

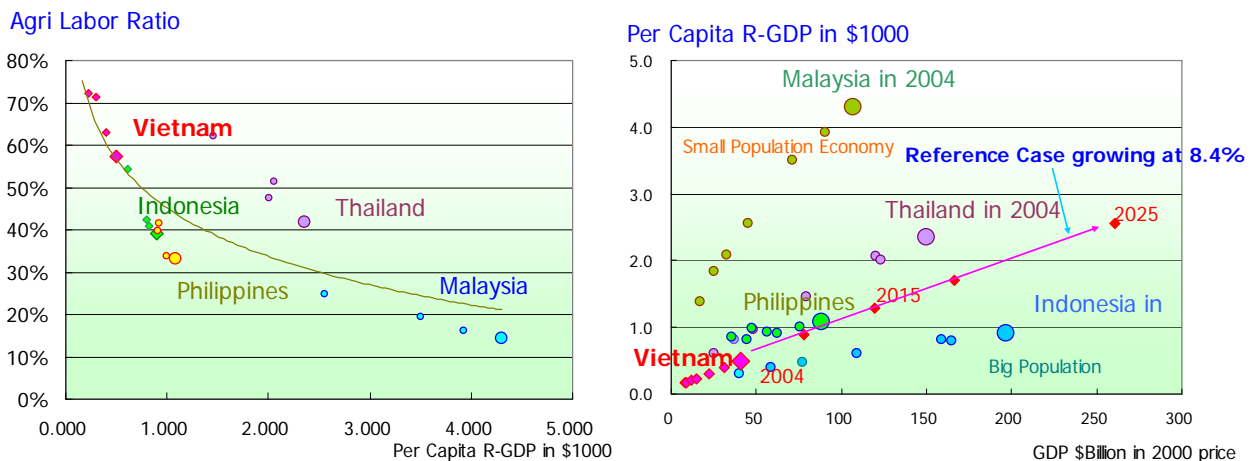


Figure 8.1-1 Economic Outlook of Vietnam

The above scenario is compared to the current positions of ASEAN countries in Figure 8.1-1. By the end of Phase-1 or 2015, Vietnam will catch up the current Philippine in terms of per capita GDP, and exceed it in aggregate GDP amount.²⁷ Further, by the end of Phase-2 or 2025, Vietnam will catch up the current Thailand in terms of per capita GDP, and exceed it in aggregate GDP amount.

²⁷ These figures are shown in 2005 price, while the nominal per capita GDP would reach \$1,100 in 2010, \$1,900 in 2015 and \$6,200 in 2025.

Thus, in the coming 20 years time, the Vietnamese economy will reach the current level of economy and living standard of the leading ASEAN countries and shall have achieved substantial modernization.

In the same period, the size of the economy will expand five-fold in real term and sixteen (16)-fold in nominal term. That means most of the economic activities in 2025 shall be constructed newly from now. The future should not be a copy of the past. In particular, when we talk about future of such fast expanding economy, it is important not to simply extend the past trend but to invite thorough discussion on desirable industry structure and life style, and set forth a *Grand Design* of our future.

8.1.2 Industrial Structure with Priority on Added values

In the long-term economic development scenario of Vietnam, it is expected that general manufacturing industry mainly comprising processing and IT sectors, and commercial, transportation and service industries would lead the economic development. The agricultural and fishery industry would reduce its share over the total GDP from the current 25%, though the sector GDP would increase in absolute value. The mining industry would increase its share up to 2015 mainly with increase in coal production, but then its share would decline due to resource constraints. In the manufacturing industry, in place of the energy intensive material industries, high value-added type industries are expected to become the driving force of the economy.

Table 8.1-1 Outlook of Vietnamese Industrial Structure

Industry Structure	2000	2005	2010	2015	2020	2025
	%	%	%	%	%	%
Agriculture & Forestry	24.5	20.9	16.7	13.6	11.2	9.5
Mining	9.6	10.5	11.4	11.5	10.5	9.0
Manufacturing Light	6.0	5.3	7.0	9.5	12.9	15.3
Manufacturing Heavy	6.7	9.0	9.0	9.1	9.0	8.7
<i>(Ratio of Heavy Industry)</i>	<i>52.9</i>	<i>63.0</i>	<i>56.1</i>	<i>49.0</i>	<i>40.9</i>	<i>36.1</i>
Commercial & Trade	14.2	13.6	14.7	15.8	17.1	18.6
Transport and Communication	3.9	4.4	4.9	5.5	6.3	7.1
Service & Others	35.0	36.3	36.3	35.0	33.1	31.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

At present, GDP and energy consumption records of the service and the public sectors are not divided in the Vietnamese statistics.²⁸ It is expected, however, while the public sector would become slimmer, the commercial sector and the service sector (which is separated from the public sector) would grow substantially along with the development of the market economy.

²⁸ For the purpose to discuss how such changes in economic structure would affect future energy trend, current energy consumption data on sub-sectors of the manufacturing industry is also insufficient. In order to analyze the energy consumption trend and/or energy conservation potentials, it is necessary to conduct more comprehensive energy consumption survey and prepare statistics with wider coverage.

8.2 Long-term Energy Supply/Demand Plan

8.2.1 Energy Demand Outlook

Amid its high economic development, Vietnam is coming into the stage to require substantial amount of material and energy to construct the nation, develop socio-economic infrastructure and improve living standard. Because of this, if we extrapolate the past trend, energy demand grows faster than GDP and its GDP elasticity exceeds 1.0. The same phenomena were seen in the past during the development processes of Japan and Korea. However, to realize sustainable development under the circumstance that the world energy supply is turning tighter as the energy demand by emerging countries with mega population such as China and India growing fast, it is necessary for Vietnam to establish its development strategy that makes it possible to avoid the situation that energy demand increase would become serious constraints.

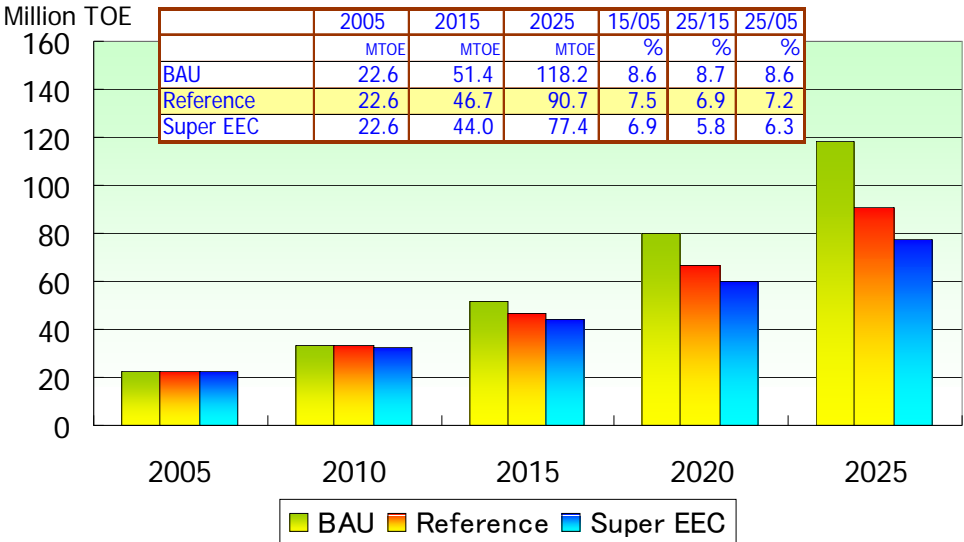


Figure 8.2-1 Outlook of Final Energy Demand

Under the circumstance, as discussed in Chapter 5, we set out the standard scenario (Reference Case) for the draft National Energy Master Plan that, compared to the BAU Case to be based on the current trend, energy conservation efforts should be enhanced to curb demand increase. Even in this case, the final energy demand would increase four-fold by 2025. If possible, it is desirable to realize Super EEC. As shown in Figure 4.2-1, the effect of EEC would appear cumulatively as time lapses, and persevering efforts shall be required to realize it.

Energy consumption will increase in every sector of the economy such as fuel consumption for power generation to accommodate the increasing electricity demand, industrial fuel reflecting economic growth, energy consumption of the residential and commercial sector induced by modernization of life, motor fuel with expanding car ownership. Along with modernization, electricity and oil will increasingly share the core part of energy demand, and the electricity ratio over the total commercial energy demand will steadily increase. Gas demand will also increase as it is

clean and convenient for use. Coal consumption will also increase in the industrial sector, while it may decline in the household sector. The non-commercial energy currently sharing 1/3 of the energy consumption would not decrease in absolute volume, but will sharply decrease its share.

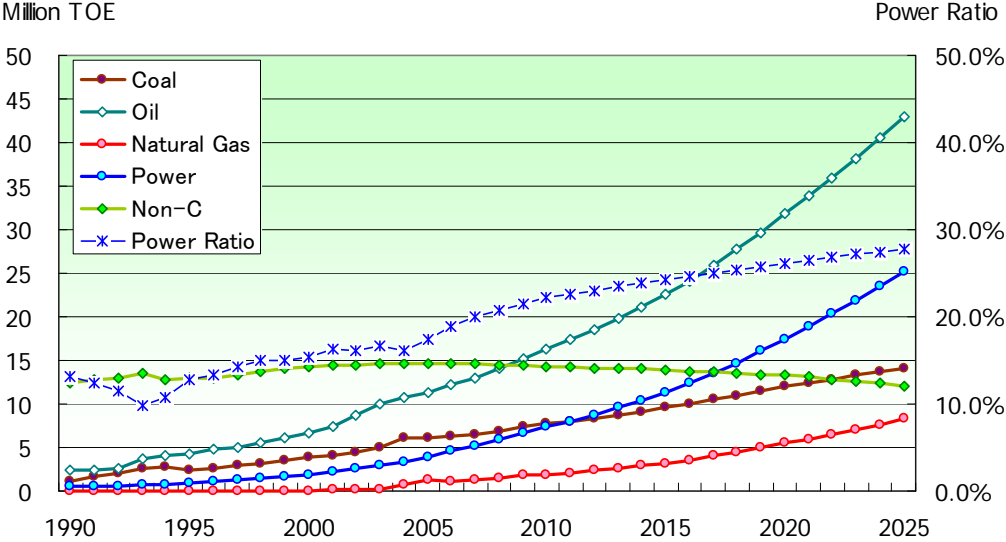


Figure 8.2-2 Final Energy Demand by Energy Type

Table 8.2-1 Final Energy Demand Outlook

	2005	2010	2015	2020	2025	15/05	25/15	25/05
	MTOE	MTOE	MTOE	MTOE	MTOE	%	%	%
Coal	6.1	7.7	9.6	12.0	14.1	4.5	4.0	4.2
Oil (incl. LPG)	11.3	16.2	22.6	31.8	43.0	7.2	6.6	6.9
Natural Gas	1.3	1.9	3.2	5.5	8.3	9.8	10.0	9.9
Electricity	3.9	7.4	11.4	17.5	25.2	11.2	8.3	9.8
Commercial Energy	22.6	33.2	46.7	66.9	90.7	7.5	6.9	7.2
Non-Commercial	14.7	14.3	13.9	13.3	12.1	-0.6	-1.4	-1.0
Total	37.3	47.5	60.6	80.2	102.8	5.0	5.4	5.2
	%	%	%	%	%	%	%	%
Coal	27.1	23.2	20.4	18.0	15.5	-2.8	-2.7	-2.7
Oil (incl. LPG)	49.9	48.9	48.4	47.6	47.4	-0.3	-0.2	-0.3
Natural Gas	5.6	5.8	6.9	8.3	9.2	2.1	3.0	2.6
Electricity	17.4	22.2	24.3	26.2	27.8	3.4	1.4	2.4
Commercial Energy	100.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0
Non-Commercial	65.0	43.1	29.8	19.9	13.4	-7.5	-7.7	-7.6
Electricity Ratio	17.4%	22.2%	24.3%	26.2%	27.8%	3.4	1.4	2.4

The above energy outlook is compared with the trends in ASEAN countries in Figure 4.2-3. As substantial energy conservation efforts are considered in this outlook, per capita energy consumption in comparison with per capita GDP is considerably lower than the previous forecasts made in Vietnam. As a result, in terms of total energy consumption, the demand forecast of the Reference Case slightly undershoots the trend of ASEAN countries. However, while substantially lower than the previous forecasts, electricity demand trend of Vietnam still overshoot the ASEAN trend considerably.

At present, power shortage remains in Vietnam and electricity demand is thought to grow faster than

the trend of ASEAN countries. As this plan aims at substantial slow down of demand expanding speed with enhanced energy conservation, reflecting fast income increase brought by economic growth, the per capita annual electricity consumption would triple from the current 550 kWh to 1430 kWh in 2015, and further double to 2,880kWh in 2025. In Vietnam, electricity has been supplied at cheaper tariff based on the abundant hydropower while supply system of other modern energies such as petroleum products and city gas were poor.. It is one of the important energy issues how to improve the resultant high electricity consumption rate.

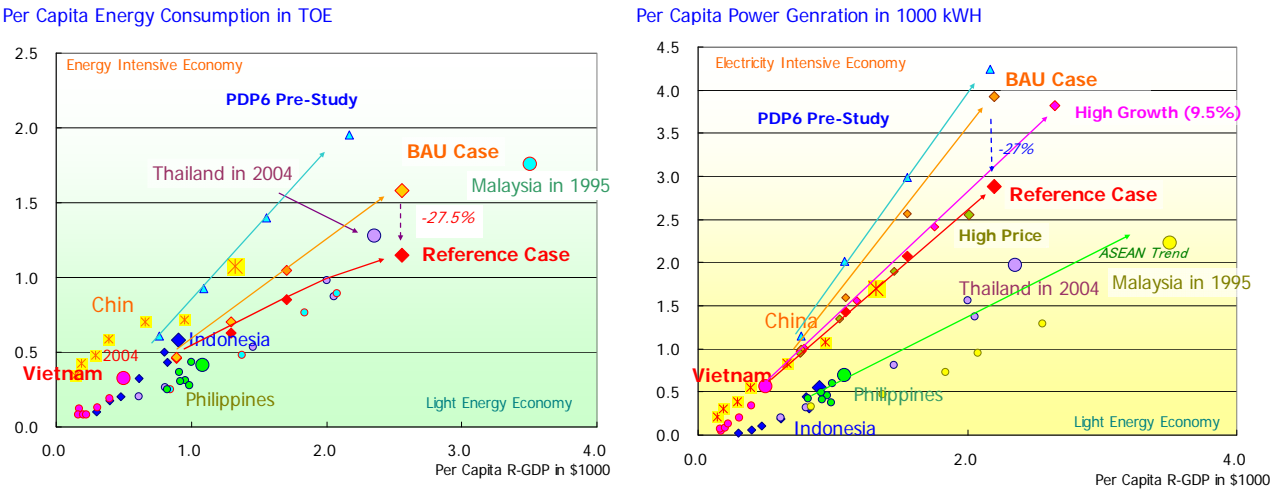


Figure 8.2-3 International Comparison of Energy Demand

Table 8.2-2 Final Energy Demand by Sector

	2005	2010	2015	2020	2025	05-15	15-25	05-25
	kTOE	kTOE	kTOE	kTOE	kTOE	%	%	%
<i>Final Demand (excl. Non-Com)</i>	22,590	33,199	46,717	66,880	90,655	7.5	6.9	7.2
Agriculture	570	716	830	946	1,159	3.8	3.4	3.6
Industry	10,549	15,540	23,038	35,705	49,957	8.1	8.0	8.1
Materials	5,626	8,903	14,452	24,822	36,661	9.9	9.8	9.8
Non-materials	4,922	6,638	8,586	10,883	13,296	5.7	4.5	5.1
Transportation	6,687	9,592	12,708	16,549	20,781	6.6	5.0	5.8
Commercial & Services	1,322	1,874	2,410	2,974	3,868	6.2	4.8	5.5
Residential & Others	3,462	5,477	7,731	10,706	14,890	8.4	6.8	7.6
Composition	%	%	%	%	%			
Agriculture	2.5	2.2	1.8	1.4	1.3			
Industry	46.7	46.8	49.3	53.4	55.1			
Materials	24.9	26.8	30.9	37.1	40.4			
Non-materials	21.8	20.0	18.4	16.3	14.7			
Transportation	29.6	28.9	27.2	24.7	22.9			
Commercial & Services	5.9	5.6	5.2	4.4	4.3			
Residential & Others	15.3	16.5	16.5	16.0	16.4			
Total	100.0	100.0	100.0	100.0	100.0			

In the other sectors, large increases are forecast in the less energy intensive general manufacturing industry and the residential and commercial sectors. It is because the high value-added type industries such as processing and high-tech will lead the future economic growth rather than the energy intensive heavy industries. In these general manufacturing industries, however, although

energy intensity is low, its energy demand growth rate will be highest among sectors reaching almost annual 10%. In these industries where energy is not the main input, electricity and gas will be preferred as they are clean and convenient for use. Then, we should take note that energy conservation might not be given priorities.

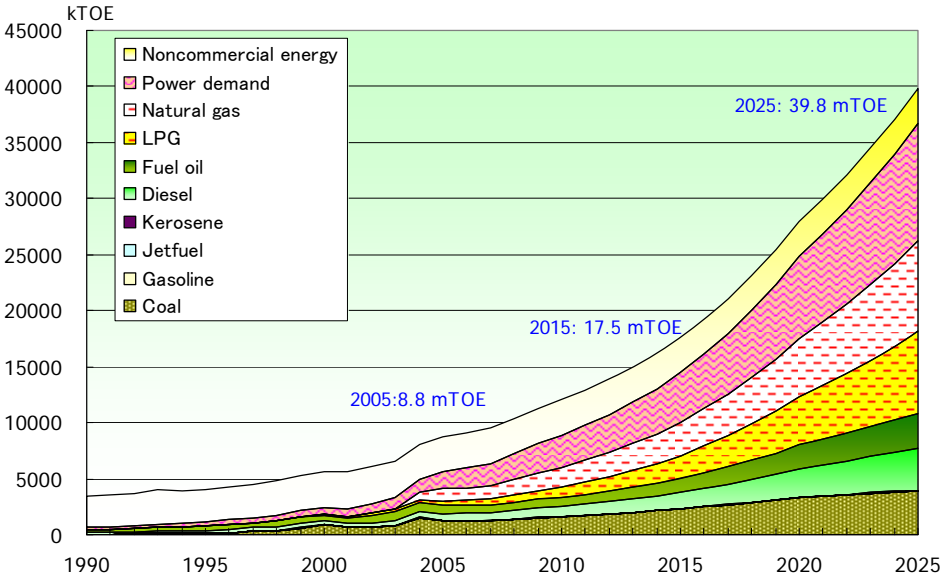


Figure 8.2-4 Energy Consumption by Non-Energy Intensive Industry

As shown in Figure 8.2-4, electricity and gas (natural gas + LPG) consumption is forecast to increase overwhelmingly in this sector, it is a serious problem how to supply them. As its cause, we should note here that, as the size of the economy expands 2.3 fold in the first ten years and 5 fold in the twenty years, a huge number of new factories and offices will be built one after another. In other words, the share of the existing factories and offices over the economic activities will reduce below 40% in 2015 and 20% in 2025. If we consider the depreciation and replacement, the ratio would be much less. In this context, we should consider the future development plans rather than simply projecting the past trend in forecasting the energy consumption of each sector. It is important to draw the *Grand Design* of the industry structure with regard to what type of economic structure Vietnam should aim at and which sector Vietnam should give priority in the future economic development.

8.2.2 Long-term Energy Supply Outlook

Based on the above forecast of the final energy consumption, the primary energy supply excluding the non-commercial energy would increase during the Phase-1 period up to 2015 from 28.2 million toe in 2005 to 58.2 million toe in 2015 or 2.1 fold, and further expand double in the Pahse-2 up to 2025 to reach 117 million toe. Fossil fuels such as coal, oil and gas are supposed to supply the major portion of it. It is not easy to materialize such huge increase of energy supply. On top of it, the big structural change facing Vietnam is that the country is going to shift from an energy exporting to an energy importing country.

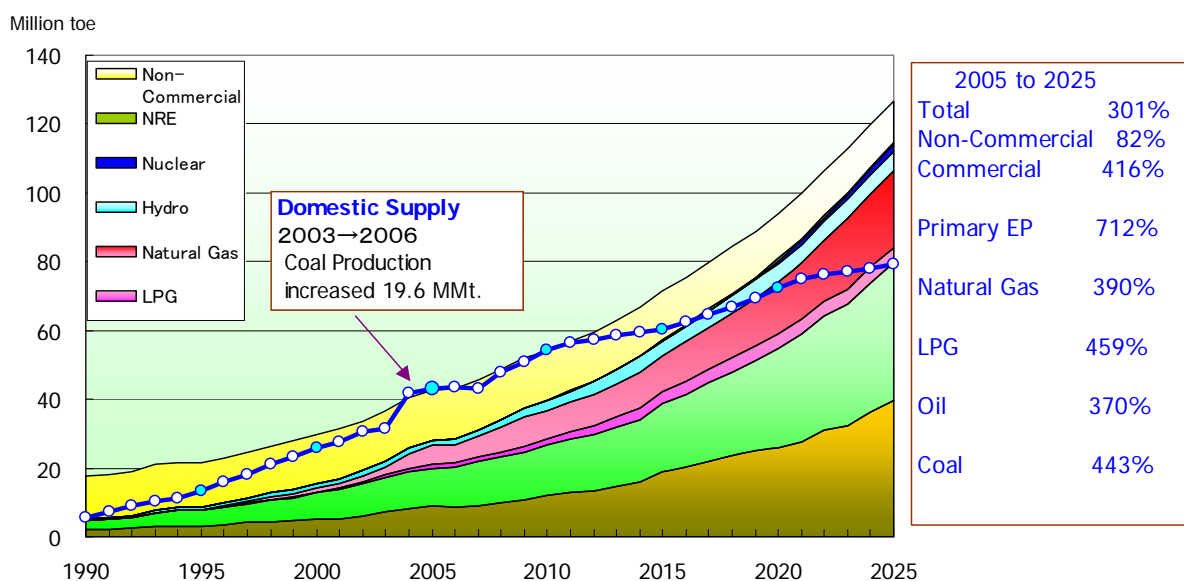


Figure 8.2-5 Primary Energy Consumption of Vietnam (Reference Case)

At present, Vietnam is a net energy exporting country selling coal and crude oils in the international market. However, while the domestic energy demand is forecast to increase dramatically, the indigenous energy production would be maturing due to constraints of the energy resources. As a result, Vietnam is anticipated to turn into an energy net import country at around 2015 as follows.

- 1) With relatively ample resources, the coal production will increase from the present 37 million tons (of which 21 million tons are exported) to 50 million tons in 2015 and 58 – 67.5 million tons in later years. By 2015, however, the domestic coal demand would increase to 50 million tons and catch up the domestic production and after then exceed it. In addition, since the domestic coal is produced in the northern region and that the use of anthracite for thermal power generation is questionable considering its quality benefit, coal import for power generation would start in the southern region even before the end of Phase-1 period up to 2015.

Table 8.2-3 Import Dependence Ratio of Energy

	2005	2010	2015	2020	2025
Net Import	MTOE	MTOE	MTOE	MTOE	MTOE
Coal	-9.2	-12.1	-9.5	-7.5	0.9
Oil	-7.5	-3.5	5.7	14.6	26.8
Natural Gas	0.0	0.0	0.0	0.0	6.2
Power	0.0	0.4	0.7	2.1	2.1
Total	-16.6	-15.1	-3.1	9.2	36.0
Import Ratio	%	%	%	%	%
Reference	-58.8%	-37.6%	-5.3%	11.1%	30.8%
BAU	-58.8%	-35.9%	4.3%	27.3%	49.8%

- 2) At present, Vietnam does not have an oil refinery and is importing all the petroleum products for

domestic use. The first refinery in Vietnam will start operation at Dung Quat in 2009, but the petroleum product supply from the refinery would remain at around 70% of the total domestic requirement; the rest should still be imported. Thus, construction of the second and third refineries may need to be advanced with due consideration on the composition of the future petroleum product demand. Vietnam is a net oil exporting country at present. However, assuming the present proved reserves and the discovery trend, its crude oil production is expected to remain more or less at the current level during the projection period. Thus, Vietnam is anticipated to turn into a net oil importing country around 2010.

3) Natural gas fields in Vietnam are relatively small in size and limited in resources. Currently natural gas is used for power generation and fertilizer production in the southern region, but its share in the total primary energy consumption is merely 5%. In recent years, however, backed by the soaring international natural gas price in line with the crude oil price hike, several new fields have been discovered and the natural gas reserve is on the increasing trend. Utilizing these newly developed fields, natural gas consumption may increase its share among the primary energy sources to 15% by 2015. Natural gas production is projected to remain at 15 - 16 billion cubic meters per year unless there were any additional big discoveries. Thus, it is highly possible that the potential gas demand would exceed the foregoing production level in earlier years of Phase-2 period. If the natural gas demand continues to increase further, it is necessary to consider import of same via piped gas or LNG.

Table 8.2-4 Primary Energy Supply of Vietnam (Reference Case)

	2005	2010	2015	2020	2025	15/05	25/15	25/05
	MTOE	MTOE	MTOE	MTOE	MTOE	%	%	%
Coal	8.9	12.1	18.8	26.0	39.6	7.7	7.7	7.7
Oil	11.1	14.5	19.9	28.8	40.2	6.0	7.3	6.6
LPG	1.0	2.0	3.6	4.3	4.4	14.2	2.0	7.9
Natural Gas	5.7	7.9	10.2	14.8	22.3	6.0	8.1	7.0
Hydro	1.4	3.0	4.5	5.5	5.5	12.4	2.0	7.1
NRE	0.1	0.2	0.4	0.7	0.9	20.2	8.3	14.1
Nuclear	0.0	0.0	0.0	0.9	2.1	***	***	***
Total	28.2	40.1	58.2	83.1	117.1	7.5	7.2	7.4
	%	%	%	%	%	%	%	%
Coal	31.7	30.3	32.3	31.3	33.8	0.6	1.5	2.1
Oil	39.3	36.2	34.2	34.6	34.3	-5.2	0.1	-5.0
LPG	3.4	4.9	6.3	5.2	3.8	2.8	-2.5	0.4
Natural Gas	20.3	19.7	17.5	17.8	19.1	-2.8	1.5	-1.3
Hydro	5.0	7.4	7.7	6.6	4.7	2.8	-3.1	-0.3
NRE	0.2	0.5	0.7	0.8	0.8	0.5	0.1	0.5
Nuclear	0.0	0.0	0.1	1.1	1.8	0.1	1.7	1.8
Total	100.0	100.0	100.0	100.0	100.0	***	***	***

As explained above, Vietnam may be able to maintain its position as an energy exporting country during Phase-1 period, though it would turn into a net energy importing country in Phase-2 and its import dependence would further deteriorates as the domestic energy demand increases. In the BAU

case, it would increase closer to 50% by 2025. This is a very serious issue in view of stable energy supply as well as national security. In this consideration, the Reference Case is set forth in this study in which energy conservation should be thoroughly promoted and the energy import dependence should be controlled at around 1/3 in 2025. Nevertheless, the increasing trend of import dependence continues in the background. We need to project the long-term energy plan with a definite assumption that the energy structure of Vietnam shall turn into an import dependent type.

8.2.3 Issues relating to Energy Supply

(1) Energy Demand/Supply Balance and Energy Security

The biggest challenge in the energy field for Vietnam is how to secure sufficient supply against rapidly increasing demand. If the country would be able to supply them with domestic resources only as it does presently, issues may be limited only to set out rational development plans of domestic resources. However, as observed above, its energy structure will change into import dependent and Vietnamese energy market will become more associated with the international market. Then, it will become serious issues how to work with them and how to ensure energy security under such circumstance.

Then, the first and foremost important point is that demand trend would give an extremely big impact on the energy supply balance. As shown in the Figure 8.2-6 and Table 8.2-5, differences in the long-term economic growth rates give considerable impact on the energy demand trend, and hence energy import requirement. Economic development would, of course, bring about great benefit to the nation and people. However, if social balance or stability would be threatened in the aspect of energy supply or environment protection, it would be a substantial loss. In this sense, high economic growth exceeding the Reference Case in this study would be deemed as excessively fast.

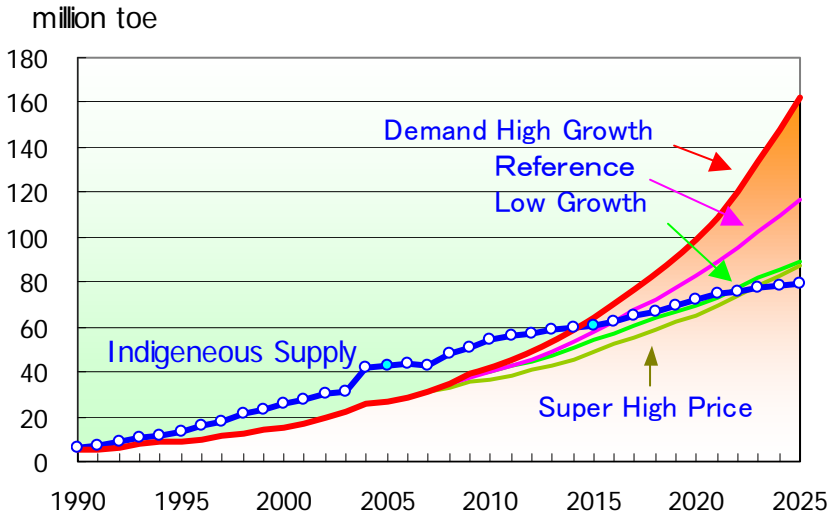


Figure 8.2-6 Energy Demand Trend and Energy Import

On the other hand, the world oil price has broken through the \$100/barrel marker in early 2008 to make energy issues more and more serious. In its adverse effect, economic growth of Vietnam would pace down and higher energy price would depress the demand increase. Then, the timing when

Vietnam would become a net energy import country, estimated to be around 2015 in the Reference Case, would be deferred to 2022, and the net import quantity in 2025 may remain at merely 6 million tons in oil equivalent.²⁹ We should take note that, by slowing down economic growth and/or strengthening energy conservation like this, burden on the energy security issues could be considerably eased and sufficient time may be gained for establishing mitigation measures.

Table 8.2-5 Economic Growth Scenario and Energy Supply Balance

Case	GDP		Demand				Import Ratio			
	GR		2015		2025		2015		2025	
	%	Mtoe	%	Mtoe	%	Mtoe	%	Mtoe	%	
High Growth	8.4	64.5	111	162.5	139	2.6	4.3	85.5	49.8	
Reference	8.4	58.2	100	117.1	100	-3.1	-5.3	36.0	30.8	
Low Growth	7.4	54.6	94	89.2	76	-7.1	-13.0	10.5	11.8	
Super High Price	7.4	49.2	84	86.9	74	-10.8	-21.9	6.1	7.0	

Then, let us investigate the import dependence by energy source. As shown in Table 8.2-6, for 2015, coal is in a net exporting position in all cases examined here, while oil is in a net importing position in all cases. Though natural gas export is not considered in this study, demand is well below the potential supply availability at this point. Then in 2025, coal turns into a net importing position even in the Reference Case. Increase of oil import dependence accelerates. Domestic supply of natural gas falls short of demand and requires import.

Table 8.2-6 Import Dependence Ratio by Energy Type

Case	2015				2025			
	Coal	Oil	Gas	Total	Coal	Oil	Gas	Total
	%	%	%	%	%	%	%	%
High Growth	-9.0	12.0	0.0	2.6	16.9	27.6	6.9	49.8
Reference	-16.3	9.9	0.0	-3.1	0.8	22.9	5.3	30.8
Low Growth	-22.5	8.3	0.0	-7.1	-13.1	22.0	0.5	11.8
Super High Price	-29.4	6.1	0.0	-10.8	-14.8	19.3	0.0	7.0

From the above analysis, directions of energy export/import balance by energy type may be summarized as below.

- a. With regard to oil, assuming the current estimation of recoverable reserves and future production profile, it seems impossible to avoid increase of import dependence starting in an early stage. Therefore, in addition to accelerating domestic exploration, it is essential to urgently establish a strategy how to secure oil import from abroad.
- b. With regard to coal, about 60% of its demand is used in the power sector, and the difference in the coal requirement in study cases is derived from different electricity demands. Although coal

²⁹ In case the average economic growth rate slows down below 7% per annum, Vietnamese energy supply balance in 2025 will remain in a net exporting position. In this case, however, oil balance is in a net importing position while coal balance continues net exporting position so that the total balance remains as net exporting.

import will begin in an early stage in the central and southern provinces because of their location remote from the northern coal producing provinces, if energy demand growth were controlled a little bit moderate, overall availability of domestic coal is sufficient in case of emergency incident. In addition, should the import dependency of coal be reduced through introduction of nuclear power, anxiety on the energy security with regard to coal supply would be substantially eased.

- c. With regard to natural gas, current estimation indicates that supply deficit would start around 2020. However, substantial potential reserves are expected in the southern and western waters and, pending outcome of the future exploration, there is a possibility that sufficient gas supply could be secured beyond 2025. Natural gas is different from oil in its difficulty of market development. Therefore, if firm scopes were shown on market development and/or transportation infrastructure construction, natural gas exploration could be substantially accelerated. Thus, it is recommended to set forth at an early time a master plan on natural gas market development, in particular considering the situation explained under item (2) and (3) below.

From the above investigation, the first priority should be given to consideration of stable procurement of oil in the effort to ensure energy security. Candidate policy measures may be, as discussed more in detail in the next chapter, creation of strategic oil reserve, development of stable import channel, enhancement of biofuel development, etc. Appropriate supply strategy should also be studied in the coal and natural gas sector examining their demand tendencies. In view that a long lead-time is necessary for development of nuclear power stations and natural gas market infrastructure, it is desirable to draw up roadmaps for these development plans and commence policy actions at an earliest timing.

(2) Power Demand and Primary Energy Supply

In the power sector, very aggressive development of hydro and nuclear station is planned in order to cope with the rapid demand growth and the power supply from these sectors will increase seven-fold by 2025. However, since the potential of hydro development is limited and a long lead time is necessary in terms of preparation of the construction sites, mobilization of technology and fund arrangement to implement power source development, we should not draw a future picture excessively dependent on the hydro and nuclear sectors. As a result, the most part of the incremental electricity demand needs to be supplied by thermal power burning coal and natural gas. Among others, use of the imported coal is forecast to increase substantially reflecting its ample availability at reasonable price in the international market.

As discussed above, it is necessary in Vietnam to construct huge facilities such as power stations, trunk transmission lines and fuel receiving terminals, which will give substantial impacts on environment and regional society. Therefore, promoting various projects aiming at social modernization, it is very important to conduct pre-studies on development plans and mitigations measures and pay appropriate considerations through consultations and adjustment with stakeholders to implement harmonized economic construction.

(3) LPG Supply

Demand for oil and gas will also increase. In the residential and commercial sector, energy

consumption will increase induced by improvement of living standard and modernization of life stimulated by increases of personal income thanks to the economic growth. It is widely observed in Vietnam that use of LPG is developing fast in the commercial and residential sectors as well as in the less energy intensive general industries. As LPG is a fuel easy for transport and use and friendly for environment, if we apply the current trend, the LPG demand would increase four-fold by 2015 and nine-fold by 2025. Since its domestic supply is limited, the rest has to be imported. However, the LPG supply in the international market is unstable and its price is quite vulnerable.

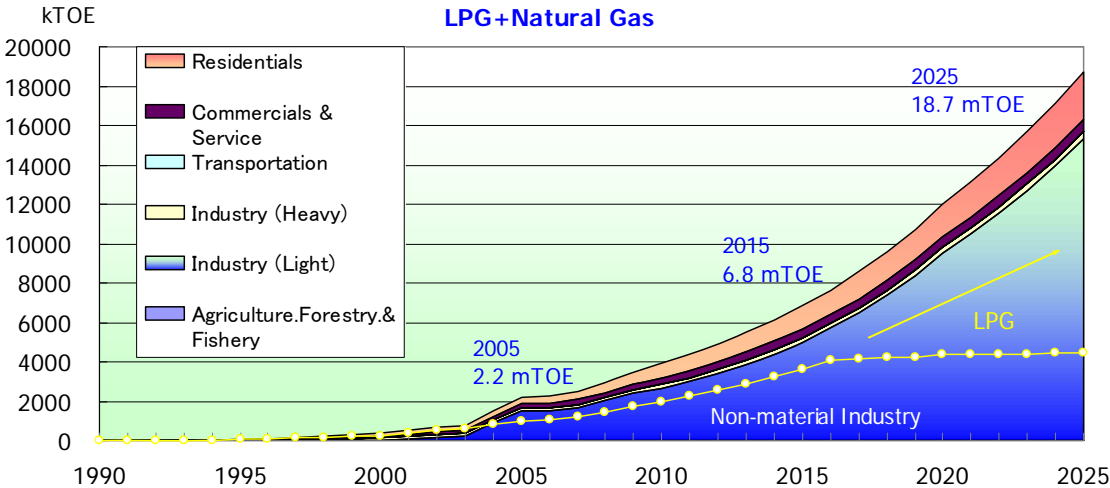


Figure 8.2-7 Potential demand of "LPG + Natural Gas" and LPG supply

Under the circumstance, considering that increase of LPG supply would sooner or later face constraints, we need to establish appropriate alternative supply policies such as below.

- 1) Priorities of LPG supply should be given to the household and the services sectors where use of LPG is most beneficial in modernizing life standard and improving health of housewives (to be in line with the UN Millennium Project).
- 2) Natural gas delivery network should be constructed utilizing the domestic natural gas production and/or imported piped gas or LNG to accommodate energy demand in metropolitan areas and industrial zones.
- 3) In the industrial sector where large-scale investments are possible, the energy supply best mix should be considered including use of coal, petroleum products like burning kerosene or gas oil and natural gas.

(4) Middle Distillate Supply

In the motor fuel sector of Vietnam, in particular gasoline, motorbike is widely used as the major transportation vehicle likewise in neighboring Thailand. The total number of motorbike has exceeded 20 million units in 2006 and its diffusion ratio has reached the world top level of one for four persons. Thus, motorbike will become saturated sooner or later but passenger car will start increasing instead. Nevertheless, during the projection period of this plan, the total number of passenger car would remain at around 3 million units and thus the gasoline consumption would increase at a moderate rate.

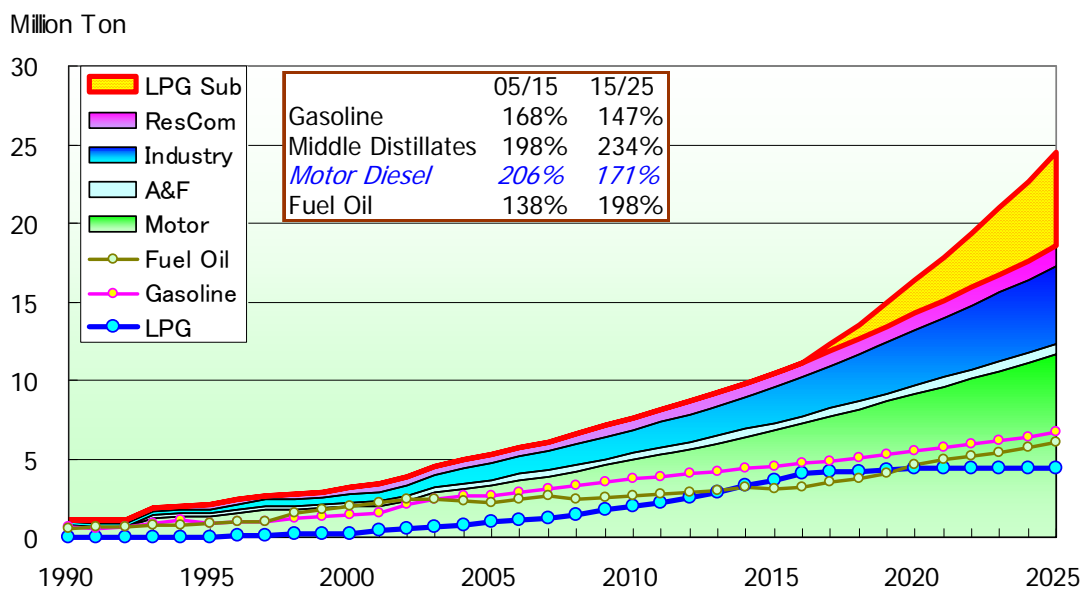


Figure 8.2-8 Petroleum Demand Trend

These trends are illustrated in Figure 8.2-8. The gasoline demand increase in Phase-1 period is forecast to progress at annual 5.5% and in Phase-2 at 4.0%, while the diesel gas oil demand for motor vehicle use is forecast at 7.9% and 5.5%, respectively. Another unique factor is the above mentioned LPG substitute. If this demand were to be supplied by middle distillates like burning kerosene or gas oil considering their convenience for handling and transportation, the total middle distillate demand would increase at 7.9% and 8.3%, respectively, climbing up 4.7-fold by 2025. In particular after 2015 when LPG supply constraints would become apparent, there is a possibility that steep demand increase of middle distillates would occur as shown in Figure 8.2-8. As mentioned before, it is necessary to further investigate into the demand movement of this section and possible solutions to accommodate it.

8.2.4 Important Issues relating to Energy

As explained above, it is anticipated that in the coming 20 years there will be unprecedented structural changes such as rapid increase of energy demand and change of the energy structure into import dependent. Assuming these drastic changes in the energy circumstance, issues and fundamental measures to be studied toward stable energy supply may be summarized as follows.

1) Rapid Increase of Energy Demand

(1) Energy Demand

- Accurate grasp of the actual energy consumption and the demand trend
- Promotion of energy efficiency and conservation
- Establishment of proper environment policy on energy consumption

(2) Supply Side

- Enhancement of domestic energy resource development

- Securing stable supply of energy import: diversification of energy types and geographical (or geopolitical) distribution of energy sources
- Construction of domestic energy infrastructure and transportation system possible to efficiently accommodate the larger scale demand
- Strict environment protection at energy related facilities

2) Increase of Energy Import

- (1) Establishment of a desirable and realistic energy import plan
- (2) Development of energy import channels
- (3) Construction and upgrading of energy import infrastructure
- (4) Reinforcement of energy security measures

3) Fluctuation of Energy Price

- (1) Internationalization of the domestic energy prices in line with increase of import dependence
- (2) Examination of energy taxation and/or proper energy price policy with relief measures for socially weak people.

4) Efficient Energy Market to Support Larger Demand (Market Design)

- (1) Equitization of energy entities
- (2) Marketization of the energy sector and proper rules for participation of private firms
- (3) Proper rules for price setting in the market

5) Fund to implement Energy Policies

- (1) Taxation on energy such as petroleum products
- (2) Establishment of a system to enhance capital inflow via international scheme such as CDM
- (3) Efficient utilization of ODA/PPP in the sub-commercial areas

8.3 Fundamental Energy Policy in the National Energy Master Plan

Looking to the coming 20 years, Vietnam is anticipated to undergo unprecedented changes in the field of energy such as substantial increase of energy demand and shifting to an energy import dependent structure. To cope with these challenges, it is necessary to think of the energy issues giving due consideration on the balance between the economic growth speed and energy demand increase, a long lead time necessary to prepare energy supply system, impact of high energy price on to the society, environmental burden to be incurred by consuming more energy, and so on. In order to adapt to such changes and realize sustained socio-economic development, the following five policies shall be set forth as the fundamental objectives of the National Energy Master Plan.

- 1) Promotion of energy efficiency and conservation
- 2) Construction of reliable and efficient energy supply system
- 3) Securing stable energy import and reinforcement of energy security
- 4) Energy sector reform and modernization of energy market
- 5) Establishment of measures to raise fund necessary for implementation of energy policies

The gist of the above policies is summarized below, while the roadmap to implement them will be discussed in Chapter 9 and individual action plans as candidate will be proposed in Chapter 10.

8.3.1 Promotion of energy efficiency and conservation

Energy is an essential material for daily life and industrial activities. However, in order to realize sustainable economic growth for long term under the circumstance that the world supply/demand balance of fossil fuel is tightening, it is necessary for Vietnam at first to implement thorough energy efficiency and conservation. If the country would follow the current trend, the energy consumption of Vietnam would increase from the present 28 million tons in oil equivalent (toe) in 2005 to 70 million toe in 2015 and 170 million toe in 2025 as estimated for the BAU Case. This shall be reduced as shown in the Reference Case as below.

- 1) During Phase-1, the energy demand should be reduced by 10% to 62 million toe in 2015
- 2) During Phase-2, energy conservation efforts should be accelerated to realize 30% demand reduction to 120 million toe in 2025.

The increasing speed of Vietnamese energy consumption, which is much faster than the trend of leading ASEAN countries, should be controlled down to the level of the latter, and an energy efficient society should be created. Measures to implement energy conservation will be discussed in the next chapter.

8.3.2 Construction of reliable and efficient energy supply system

Even after substantial efforts of energy conservation, the energy consumption of Vietnam will still increase by 2.1 fold by 2015 and 4.2 fold by 2025. In order to assure steady economic growth, it is necessary to construct a reliable and efficient energy supply system to certainly deliver necessary energies to the consumers. This work shall be developed with due consideration on the following elements.

- 1) In construction of the energy system, a long lead-time is necessary from site selection to facility completion. From this viewpoint, it is desirable to make a rule to formulate the National Energy Master Plan every five years with an intermediate rolling review.
- 2) The energy system of the nation should be designed and built in a suitable style considering the long and narrow national geography spreading north to south as well as linkage with the markets of neighboring countries and the regional distribution of energy resources.
- 3) The economics of scale works considerably in energy supply system. An efficient system should be constructed in view of its long-term benefit, considering the markets of the neighboring countries within the scope of construction plans.
- 4) The roles of the government and private sectors should be clearly defined and the vital power of the private sector should be effectively introduced.
- 5) Construction of energy system generally includes large projects that would give substantial impacts on environment and regional society. Therefore, in promoting them, harmonized development plans should be prepared conducting assessment of impacts on environment and regional societies through good coordination with stakeholders.

8.3.3 Securing stable energy import and reinforcement of energy security

As the energy demand increases, its import dependence would increase. Then, it is necessary to pay attention to the supply characteristics of each energy source; for example, in case of oil the international oil market is well developed but oil would be exposed to fierce price fluctuation, in case of natural gas a closed system is the basic structure and a long lead time and mutual trust between seller and buyer are the fundamental principles, greater geopolitical consideration is required for oil but it is less needed for coal, also greater consideration is needed on international political atmosphere for introduction of nuclear power, and so on. In case of supply by import that requires long haul transportation, economics of scale works to a substantial extent. In consideration on these elements, the following policies should be implemented.

- 1) Energy diversification policy should be pursued with due attention on the supply characteristics of each energy
- 2) Based on the characteristics of each energy market, respective procurement strategies should be established giving particular consideration on required quality, environment and energy security in addition to economics. Then, it is also necessary to establish the country's presence in the international market and among import channels.
- 3) It is necessary to construct energy import infrastructure with careful investigation on the regional demand distribution and the applicable economics of scale.
- 4) It is necessary to establish an energy security measure to mitigate the impact of abrupt changes in the international market. Practically speaking, it is to materialize national strategic oil stock piling taking account of the characteristics of oil in wider and easy use and convenience in storage and transportation.
- 5) The roles of the government and private sectors should be clearly defined and the private sector activities should be effectively introduced.

8.3.4 Energy sector reform and modernization of energy market

The energy sector of Vietnam maintains old characters inherited from the previous system, inefficient and wasteful, but is yet to develop sufficient power to support high economic growth. Frequent blackouts and unstable fuel supply system are embarrassing issues for Vietnam in promoting industrialization and modernization of life. In order to ensure sustainable development of economy and society, it is necessary to implement energy sector reform and modernization for the purpose of stable supply and efficient use of energy based on peer review of the world trend. In materializing this, it is desirable to create an open and efficient energy market adopting market principles/mechanisms to the maximum extent, setting out strategies of the reform taking account of points stipulated below. At this point, we should take note that, in the past experience of the world market liberalization, serious market failures have been experienced even in the United States and Europe, where political neglect of simple economic principles caused collapse of the energy supply systems elsewhere. It is extremely important to observe the simple economic principles in the course of setting out market rules.

- 1) Clearly define the role of the government sector to set forth the market rule and that of the private sector as players, and set out fair and transparent transaction rules.

- 2) Liberate the energy market stepwise and promote participation of efficient players. However, to protect national interest, it is important to keep strong national players that could endure rough waves of the international market. To this end, it would be a realistic approach to reform the existing national energy entities into market oriented efficient players. Any entity intending to newly participate should qualify against certain criteria on abilities to conduct safe and efficient business, financial capability, risk control ability, consideration on safety and environment, and so on subject to the foregoing principles.
- 3) Establish the energy market price in line with the procurement of energy from the international market. As a result, judging from the recent international market trend, energy prices may be considerably increased. However, we should note that it is impossible to keep low prices allowing wasteful use for a long period as the country is going to be energy import dependent. Consideration on socially weak people shall be changed to a form other than implicit subsidies as lower energy price in due course.

8.3.5 Establishment of measures to raise fund necessary for implementation of energy policies

Though it may be possible to some extent to realize efficient energy use and conservation, environment protection and construction of energy supply system depending on the private sector, there are many cases where discrepancies may exist between the social objectives and commerciality, and hence project economics falls in a gray zone. It is often observed during the early stage of economic development that required projects are short of commerciality or too huge to mobilize private capitals. In such cases, we can not expect positive investments by the private sector and/or from abroad. Then, the national of Vietnam should implement such policy by their own efforts. From this view point, under a national consensus, it is required that the government should take an initiative to guide the economy toward the desirable direction, and/or construct necessary infrastructure. To implement such policy, it is necessary to establish a firm financial platform. To this end, the following actions should be taken.

- 1) Determine the list of work plans relating to energy, environment and transportation system that the government sector should prepare.
- 2) Identify the necessary amount to implement these plans.
- 3) Establish fund generation system through such as taxation on energy like gasoline tax.

Toward materialization of the comprehensive energy policy as examined above, it is necessary to establish appropriate organizations equipped with following functions.

- 1) Establish the policy planning and implementing organization with centred responsibility and attach collaboration linkage among relevant ministries and offices
- 2) Construct the *Grand Design* of the socio-economic development with core principles on energy efficiency and conservation, and formulation of the National Energy Master Plan based on this principle.
- 3) Prepare laws and regulations and implementation system to implement the principal policies

under the National Energy Master Plan

- 4) In particular, prepare policy plans, laws and regulations to implement energy efficiency and conservation.

It is strongly recommended to create the above mentioned organization, implement urgent policies, and set out laws and regulations in accordance with the National Energy Master Plan proposed hereunder.

The above discussion in mind, we will discuss in Chapters 9 and 10 on the roadmap of the fundamental energy policies and action plans toward major policy objectives.