Table 6-2-58b Changes of gas sales prices and gas demand between with the four policy measures and without the measures(Low Case) (%)

Case	Policy	User sectors	2010	2015	2020	2025
Low	Without Policy	Industry	6.37	7.29	8.48	9.45
		Commercial	7.45	8.52	9.92	11.05
		Residential	8.28	9.47	11.02	12.27
		Transportation	6.87	7.86	9.14	10.19
		Prices for power	6.21	7.10	8.26	9.21
Low Option 1	With Policy	Industry	6.34	7.25	8.44	9.40
		Commercial	7.41	8.48	9.87	10.99
		Residential	8.23	9.42	10.96	12.21
		Transportation	6.83	7.82	9.10	10.14
		Prices for power	6.18	7.07	8.22	9.16
Low Option 2	With Policy	Industry	6.04	6.90	8.04	8.95
		Commercial	7.05	8.07	9.39	10.46
		Residential	7.84	8.97	10.44	11.63
		Transportation	6.51	7.44	8.66	9.65
		Prices for power	5.88	6.73	7.83	8.72

(Note) "With policy" shows FIRR including the four policy measures.

① The High Case / Option1 cannot decrease the gas sales prices so that the FIRR does not reach the critical level of 12%.

② In the High Case / Option 2, we can decrease FIRR from 12.1% to 12.0% with a 0.1% price decrease to the original price level.

③In the Low Case / Option 1, we can decrease FIRR from 12.2% to 12.0% by 0.5% price down to the original price level.

④In the Low Case / Option 2, we can decrease FIRR from 14.3% to 12.0% with a 5.3% price to the original price level.

(8) Evaluation of Economic Analysis

In natural gas-related businesses, LNG import duty, machines/material import duty, property tax, value added tax, corporate tax, business tax, withholding tax, etc., are levied. These taxes are inputted to government revenues. Therefore, it is expected that the economic analyses have IRRs of a higher value than that of the financial analyses.

As shown in the following table, the total project sector (including LNG, pipeline, and power sectors) in Luzon has a higher EIRR at over 23%. We can say that the EIRRs are sufficiently high, which we can often see in energy-related projects.

However, the EIRRs of Areas C-M and D remain at 10-15%, which is not so high. Therefore, it may be possible if the project in Areas C-M and D can get major support from the government.

In the economic analysis, the market exchange rate is used in the analysis instead of the shadow exchange rate, because we estimate that the shadow exchange rate and the market exchange rate in the future Philippine economy are little different. In addition, the secondary economic effects of natural gas utilization are not included in the analysis.

Table 6-2-59 Economic internal rate of return in Luzon area

Sectors	High/Option 1	High/Option 2	Low/Option 1	Low/Option 2
LNG	19.6%	19.7%	20.6%	20.6%
Pipeline	15.7%	16.5%	16.4%	18.5%
Power	21.9%	21.9%	32.7%	32.7%
Total	23.3%	23.5%	30.3%	30.9%

Table 6-2-60 Economic internal rate of return in Areas C-M & D

Sectors	C-M/High	C-M/Low	D/High	D/Low
LNG	18.2%	17.9%	18.1%	17.9%
Pipeline	Infeasible	Infeasible	Infeasible	Infeasible
Power	Infeasible	Infeasible	Infeasible	Infeasible
Total	10.7%	15.4%	10.0%	14.6%

(9) Effects on the Philippine Economy

By implementing gas-related projects, the nominal GDP increases 0.3-0.5% in the High Case /Option 2 and 0.1-0.6% in the Low Case / Option 2, compared to the nominal GDP forecasted in the macro-economic model in Chapter 4.

The Government revenue with the national gas project increases 0.2-0.6% in the High Case / Option 2 and 0.1-0.9% in the Low / Option 2, compared to the case without the project. The government revenue without the project is forecasted in the macro-economic model mentioned above.

The un-employment rate in 2025 decreases 0.7% in the High Case / Option2 and 1.8% in the Low Case/Option 2, compared to that without a project. Un-employment rate with the project in 2025 is 4.0% in the High Case, which can be compared to 4.7% without the project. And, the rate in the Low Case in 2025 is 3.9%, which can be compared to 4.7% without the project.

Table 6-2-61 Effects on the Philippine economy of natural gas use

(High and Low Cases / Option 2)

		Unit	2010	2015	2020	2025
GDP	Without	Billion peso	14,059	21,210	32,550	49,104
High/Option2	With	Billion peso	14,107	21,296	32,691	49,343
		%	0.3%	0.4%	0.4%	0.5%
Low /Option2	Without	Billion peso	11,518	16,886	25,174	36,888
	With	Billion peso	11,529	16,948	25,325	37,119
		%	0.1%	0.4%	0.6%	0.6%
Govt. revenue	Without	Billion peso	2,515	3,786	5,795	8,716
High/Option2	With	Billion peso	2,521	3,801	5,825	8,771
		%	0.2%	0.4%	0.5%	0.6%
Low/Option2	Without	Billion peso	2,060	3,014	4,482	6,548
	With	Billion peso	2,062	3,026	4,518	6,606
		%	0.1%	0.4%	0.8%	0.9%
Un-employment	Without	%	9.6	8.3	6.6	4.7
High/Option2	With	%	8.5	7.3	5.8	4.0
		%	-1.1	-1.0	-0.8	-0.7
Low/Option2	Without	%	9.6	8.3	6.6	4.7
	With	%	8.7	7.3	5.6	3.9
		%	-0.9	-1.0	-1.0	-1.8

(Note1) "Without" values are those forecasted in the macro-model when the gas projects are not implemented

(Note2)"With" values are those calculated in economic and financial analyses when the gas projects are implemented.

(Note3) Each up rate = (With/Without— 1)*100

6-2-4 Project Finance

(1) Business Organization and Financing

Finance for existing or new businesses in existing companies is called "Corporate finance". The companies certify the repayment of the loans in corporate finance. Generally, monetary facilities do not take big risks on corporate finance. Most finance from commercial banks is corporate finance.

Meanwhile, finance for independent projects is called "Project finance." The repayment capability of project finance is based on project cash flow. Then loan risk of monetary facilities is generally high in project finance compared to corporate finance. Surveillance of monetary facilities for project finance is therefore sometimes severe.

Public finance is prepared to finance industrial development and social development. Development banks in each country and international development facilities have

public finance roles. In particular, World Bank, IFC, Asia Development Bank (ADB), and Japan Bank of International Cooperation (JBIC), which are public finance facilities have provided financing and technical assistance for project development in the Philippines until now. The public finances sometimes provide low interest loans and establish loan syndicate organizations. Some commercial banks do not participate in any project without the participation of international development facilities (World Bank and JBIC).

As already mentioned in the previous chapter, the FIRR of the pipeline project does not exceed 12% without soft loans and tax credits from the Philippine government. When implementing the pipeline project, it is appropriate for the project to ask for financing and technical assistance from international development facilities.

(2) Risk Assessment for Project Finance

The mother companies of the projects, the government and the related organizations guarantee the repayment of project finance (principal loan and the interest payable) to the banks and the development agencies that supply project finance, until starting the operation of the project. After the project starts up, the project finance (principal loan and the interest payable) is repaid from project cash flow.

In the project finance, finance risk should not be borne only by the banks and the project. Finance risk has to be borne by all of the related organizations and persons. Organizations and persons include state government, local governments, investors, monetary facilities, project managers, and project labors. They are responsible for the items in the following table. The following Table 6-2-63 is activities of the related organization in a project.

Table 6-2-62 Risk assessment of project finance

Organizations & Persons	Risks
State government	Hedge exchange rate risk
Local government	Stabilization of raw material supply
Investor	Deregulation of dividend conditions
Monetary facility	Deregulation of interest rate and loan conditions
Project manager	Suitable wage for management
Project labor	Proper execution of tasks

The typical project organization for creating a project is shown in the following figure.

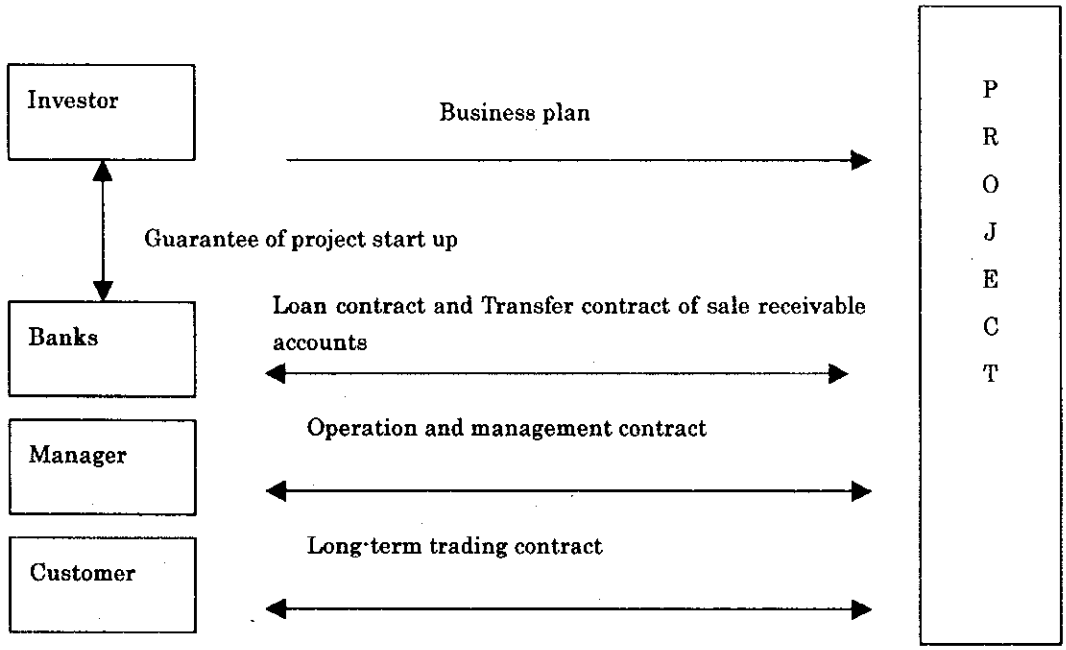

Figure 6-2-3 Activities of related organizations in a project

The roles and contract contents of the related organizations in the project are follows;

① Most project planning is performed by investors in the project. The investors are required to make a "Guarantee of project start up" contract for banks and development agencies.

② At the same time, the project organization makes "Capital loan contracts" with the monetary facilities that supplied the loan.

③ The project organization which manages and operates project functions, is established. The project entity makes the contracts required to the related organizations

④ The project organization makes a contract for "Transfer sale receivable accounts of the project".

⑤ For the management of the project, the project organization and the customers make a long-term trading contract.

The typical cash flow for creating a project is shown in the following figure.

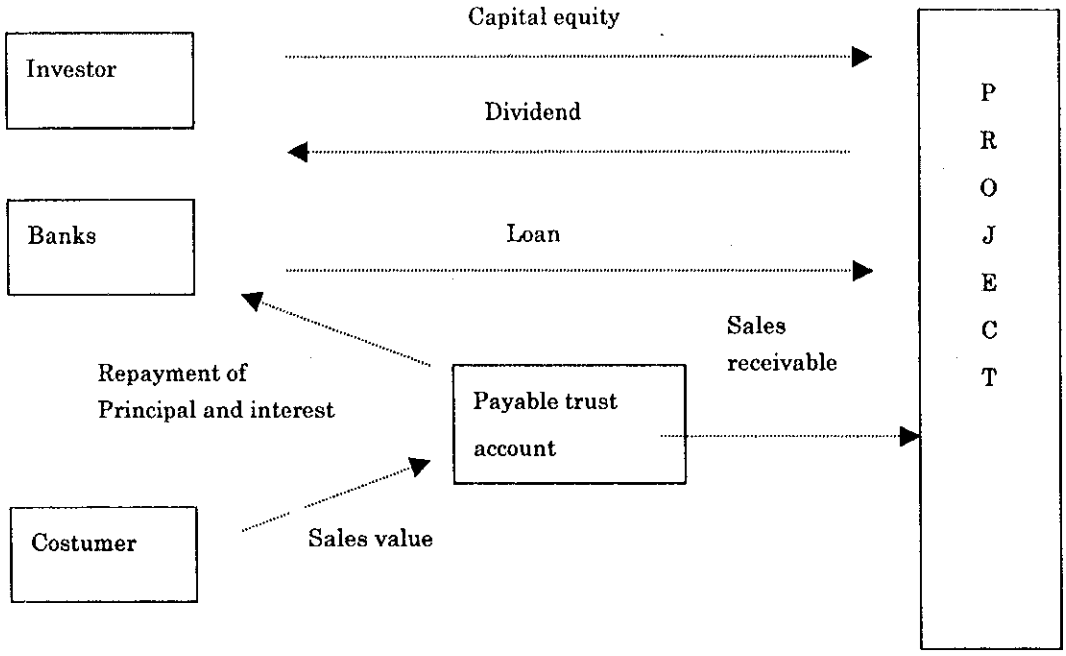

Figure 6-2-4 Cash flow of related organization in a project

The cash flow in the related organization of the project is follows:

① Investors fund capital equity for the project. The project organization distributes dividends to the investors.
② The monetary facilities make loans to the project, and the loans are supplied to the project to achieve construction of the project.
③ The customers have to pay their liabilities through the bank account of the project.
④ The monetary facilities receive their accounts payable through the bank account of the project.
⑤ The project receives sales revenues and account receivables through the bank account.

When the project is organized by private companies, we call the major investors "Sponsors." Whether the project is realized or not depends on the cooperation of the sponsor. Ten it is said that the project is determined by financing power, technical assistance ability, and enthusiasm of the sponsor. When the government selects private companies for carrying out the pipeline project, it is required to survey the previous records of the private companies.

(3) Loan Conditions of Monetary Facilities

The surveillance of the commercial banks and international development facilities is targeted at checking the sustainability and repayment capability of the project, not to achieve the high profitability of the project. It is important for the project to have reliability and stability in its construction, sales, and procurement activities. In the pipeline project, the following preparations are required for clearing the surveillance criteria of the monetary facilities.

① A gas supply contract between a pipeline company and a gas supply company, and a gas sales contract with gas user company are required before starting the project. This means guaranteeing that the gas flowing through the pipeline can all be sold.

② Regarding the purchasing of gas from a gas producer, Agreement of both sides, the pipeline company and the gas producers, is required. It is important that a change of gas cost can be calculated in line with changing crude oil prices and other related factors by the agreement.

③ One of the economic problems in the Philippines is the devaluation of exchange rate. (about half over the past five years) Peso exchange rate to US$ has continuously declined. This has caused inflation of material prices throughout the country, especially, for sales prices and purchasing costs based on the dollar. In this case, sometimes power users change power resources from public suppliers to auto-producers.

④ As the risk of project finance is larger than that of the corporate finance, the following inspection of the project finance is more severe than those of corporate finance.

Validity of applications for capital investment
Engineering capability
Validity of purchasing order conditions
Capability for financing and loan repayment
Safe guarantee for loan principal and repayment
Validity of exchange rate forecasting
Validity of gas purchasing cost
Validity of relationship of sales price and sales volume
Validity of maintenance cost

⑤ All contracts related to establishing the project are inspected by bank creditors. It means project finance is high risk.

⑥ It can be considered that commercial banks will not make long-term loans for project finance in the Philippines without an international development loan or a JBIC loan.

⑦ The following table shows the loan conditions of international development agencies.

Table 6-2-63 The loan conditions of international development agencies

Agencies	Formula	Past records	Loan periods
IBRD	LIBOR+spread	6.4% Jan-Jun 98	15 - 20
IFC	Market rate		3 - 13
ADB	LIBOR+spread	6.0 - 6.8% as of April 98	10 - 30
JBIC		1.3 - 2.0% as of June 2001	Max 10

IBRD: International Bank for Reconstruction and Development (World Bank)
IFC : International Finance Corporation
ADB: Asia Development Bank
JBIC: Japan Bank for International Cooperation

⑧ The BOT system appears to be a messiah for a country with a capital shortage. The system is promoted by international development facilities. However, it seems that the system has to be applied under stable exchange rates. In the Philippines, the current exchange rate of the peso against the US dollar is half that five years ago. For companies and organizations required to make payments on a dollar basis, there is a double expense. Companies like IPP in the Philippines selling and purchasing on a dollar basis. However, it is possible that the pipeline business prompted by this project will have the problem mentioned above, because the gas pipeline business will adopt a business structure with payment on a dollar basis and income on a peso basis. Regarding the pipeline business for the above reason, it is considered that international development banks included JIBC will strictly inspect the financial structure of the pipeline business. At the same time, the pipeline business cannot expect to receive soft loans without a stabilization of the exchange rate of the Philippine peso. Then the market of the pipeline business has to target local companies to pay the natural gas fee as customers.

(5) Required Capital Funds for Pipeline Project

The required capital funds are US$795million for The High Case Option1, US$786million for The High Case/Option2, US$311million for Low-Option1 and US$289million for The Low Case/Option2. The said capital funds in each case include inflation each year.

Table6-2-64 Equipment investment values for each case

(Million US$)

Case / Option	Total of investment	Own capital 25% of the total	Long-term loan 75% of the total
High / Option 1	795	199	596
High / Option 2	788	197	589
Low / Option 1	311	78	233
Low / Option 2	289	72	217

The high-pressure pipelines for gas transmission, which have enough capacities to be able to supply future gas demand, are built at the beginning of the pipeline construction. However low- and medium-pressure pipelines are built step-wise to meet gas demand year by year.

6-3 Environmental Evaluation

6-3-1 Current Regulations (mainly Atmosphere)

Natural gas itself is a clean energy. Introducing natural gas is also expected one of the countermeasures for global warming.

The environmental regulations in the Philippines were established in the 1960s. In parallel with economic growth in recent years, some environmental issues have become problems. The Philippine government has revised the environmental standards to modernize and provide implementation rules and regulation, and is making improvements to environmental countermeasures to make them much more efficient. The priority for the environment has recently been shifting from water pollution to TSP (Total Specific Particle Matters). On the other hand, there is a focus on protecting mangroves by achieving a sustainable ecosystem, because mangroves have been lost with economic growth in local areas.

The Clean Air Act was written in 1999. The emission standards of each source by energy use are regulated by the IRR (Implementing Rules and Regulation for RA 8749). The emissions of SOx, NOx, TSP and other toxic substances are strictly regulated by the IRR. Besides, the IRR obliges requires each emission source to have environmental compliance programs and to satisfy the regulations established by the Law.

The regulations are of the same level as those in Japan. Every emission source is requested to be in compliance.

The designation of attainment and non-attainment areas under the law is now underway. Environmental monitoring data collection such as the concentration on the ground is now being implemented. After evaluating the data collected, the attainment and non-attainment areas (Air Shed) will be designated and further reviewed with further measurements.

The IRR includes basic obligations for those who exhaust environmental pollution. After designating the Air Shed, the government will start to evaluate the sources in the Air Shed to comply with the rule regulated by the Law and the IRR. The sources are requested by the government officials to submit a compliance plan if they are defined as not being in compliance with the regulation. The government officials are now preparing and beginning monitoring to designate the Air Shed. It will take several

years to implement the compliance plan for the sources after designating the Air Shed and investigating if sources comply with the Law or not.

It is expected that the Air Shed will be designated only around NCR for the present and other areas will be decided as attainment areas. The Air Shed around NCR will extend from the east side of ridgeline on Bataan peninsula to Batangas area, including NCR, as one air shed. This area will be reviewed with the progress of the monitoring investigation (from DNER, EMB, visiting survey).

The most urgent environmental problem in the Philippines is to reduce TSP pollution in NCR, especially from black smoke emitted by Jeepneys using a second diesel engine. The special project of ADB has already been implemented with co-operation from several authorities including DOE, the counterpart of the Study.

The project insists that establishment of an automobile inspection system is a top priority. They expect the efficient reduction of black smoke from Jeepneys through the inspection system.

NGV is also expected to be a countermeasure to reduce traffic air pollution in NCR. The government authorities insist introducing NGV for the transport system represents effective use of domestic natural gas resources with an effective reduction of traffic air pollution in NCR, killing two birds with one stone.

6-3-2 Fuels Substitution

Generally, introducing clean energy is one countermeasure for reducing air pollution. Substituting natural gas for current energies is an essential countermeasure for reducing SOx emissions with the reduction of greenhouse gases.

Reducing air pollutant emissions by substituting NG is estimated based on the emission factors of each energy carrier.

The estimation basically depends on the IPCC code, which is easily obtained on the Internet. The code has been revised to a special model reflecting the actual energy demand/supply situation in the Philippines.

(1) Definition of Baseline

The baseline for the estimation, which is the initial point for estimating improvements, contains the latest on-going project, the Camago/Malampaya project, which includes newly built power stations. The Study includes increasing domestic natural gas after the Camago/Malampaya project and importing LNG for projected increase NG demand.

The energy demand/supply projection on the baseline is based on 5.27% GDP growth rate as a 25-year average for high case and 4.64% for low case (ref. 4-3).

(2) Estimated Substitution with Natural Gas (High Case)

1) Electricity Sector (High Case)

On the Baseline, natural gas consumption in the electricity sector is supplied only from Camago/Malamoaya gas field, therefore, the growth in demand for electricity is assumed to be fulfilled by increasing coal-fired and oil-fired thermal generation with the same share as under the current situation (ref. 4-4).

Figure 6-3-1 shows the forecasted fuel consumption for the electricity sector on the baseline in high case. Natural gas consumption for generation is 4,900ktoe/y, which is the maximum supply from the Camago/Malampaya project. Its share is about 16% of the total in 2025.

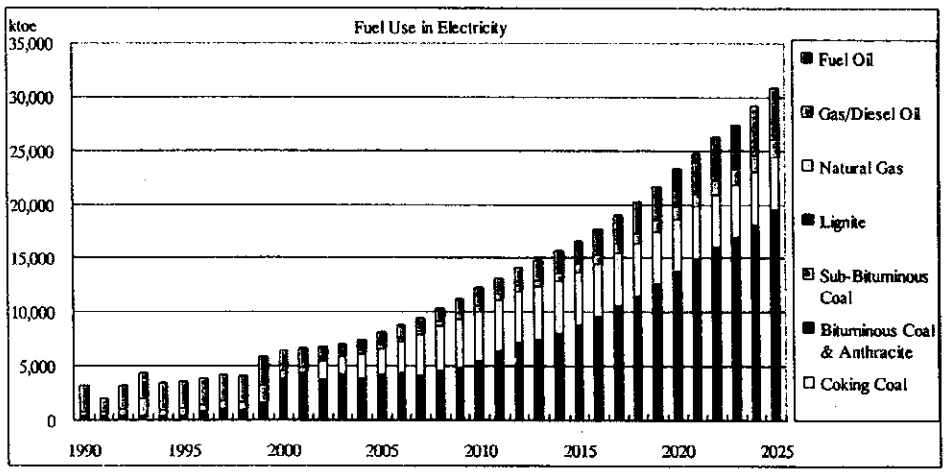

Figure 6-3-1 Forecast of Fuel Consumption for Generation on Baseline (High Case)

The forecast for natural gas consumption in the electricity sector is described in 4-4. Figure 6-3-2 shows the results. As a result of the Study, gas demand exceeding the production capacity of domestic gas will be fulfilled by the imported LNG. The natural

gas consumption in generation will be 12,000ktoe/y in 2025, that will be 45% of total fuel consumption.

Fuel consumption in the Study is estimated to be less than the baseline, because of the larger share of the gas turbine combined cycle system, which brings higher generating efficiency than the baseline.

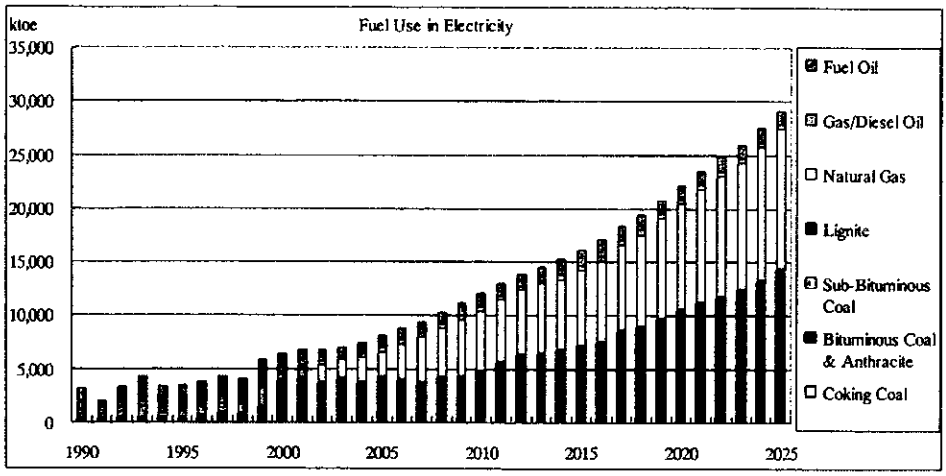

Figure 6-3-2 Forecast of Fuel Consumption for Generation on the Study (High Case)

2) Final Energy Consumption Sectors (High Case)

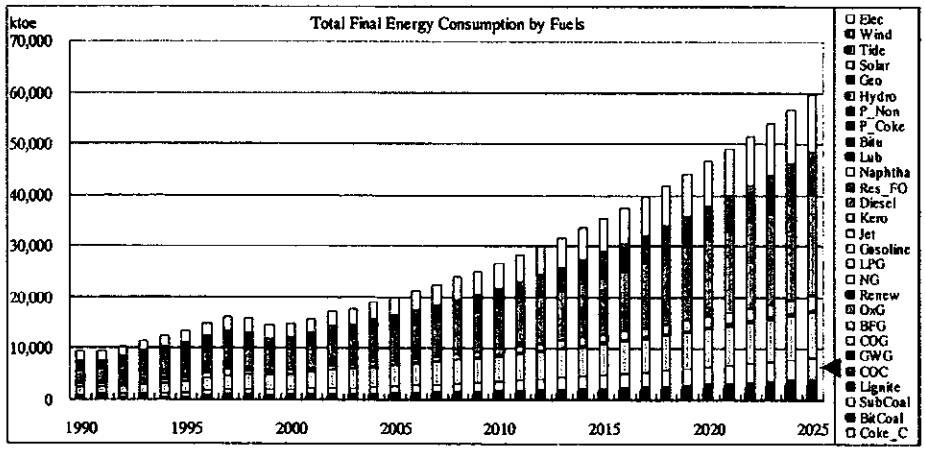

Figure 6-3-3 Forecast of Final Energy Consumption on Baseline (High Case)

The forecast of final energy consumption is described in 4-3, and Figure 6-3-3 shows the trend as the baseline. Figure 6-3-4 shows the forecast of final energy consumption after substitution with NG based on the Study. It explains that some LPG and kerosene are converted to natural gas.

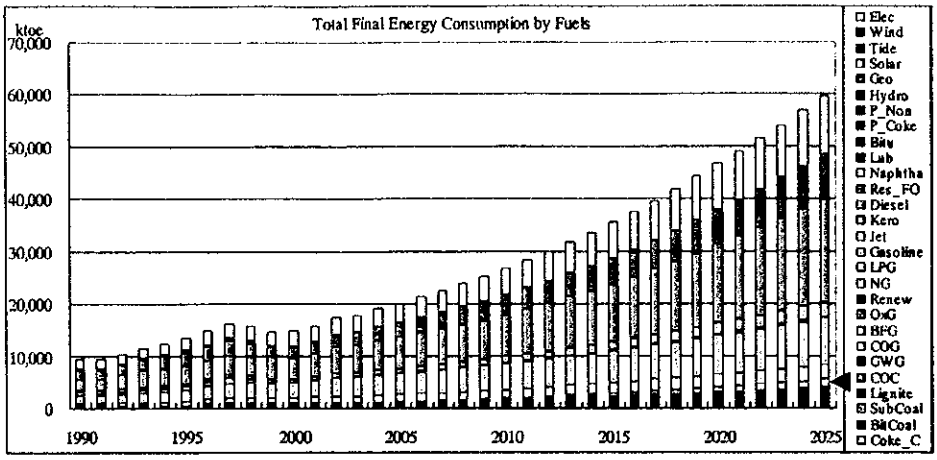

Figure 6-3-4 Forecast of Final Energy Consumption on the Study (High Case)

(2) Estimated Substitution with Natural Gas (Low Case)

1) Electricity Sector (Low Case)

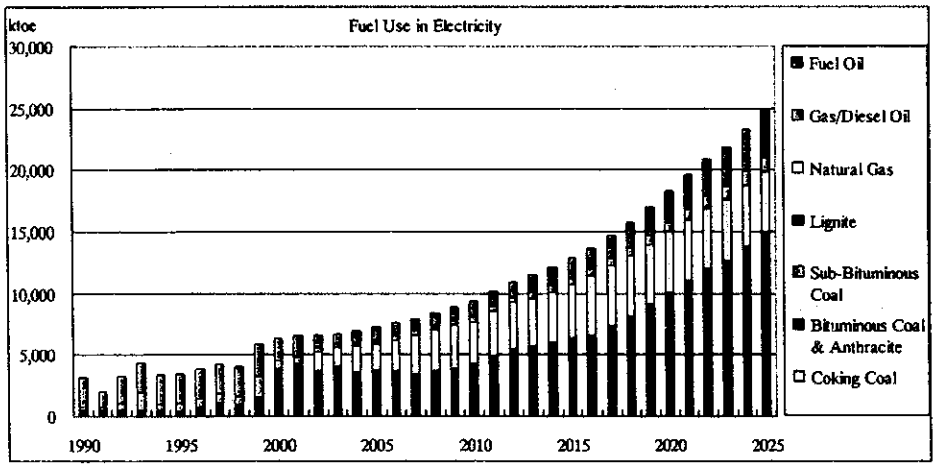

Figure 6-3-5 Forecast of Fuel Consumption for Generation on Baseline (Low Case)

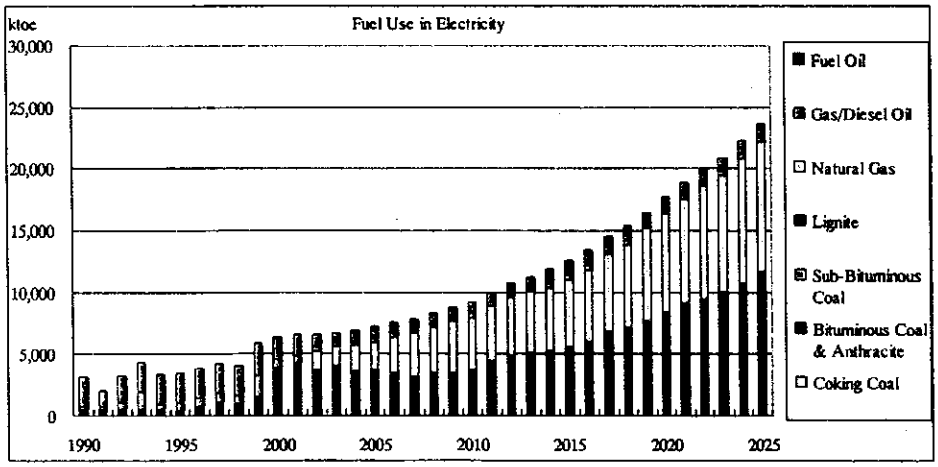

Figure 6-3-6 Forecast of Fuel Consumption for Generation on the Study (Low Case)

The Low Case has also the same tendency as high case. The results are shown in Figure 6-3-5 and 6-3-6.

Natural gas consumption for generation is the same as high case, its share is about 19.6% of the total in 2025. As a result of the Study, the natural gas consumption in generation will be 10,500ktoe/y in 2025, that will be 44.6% of total fuel consumption.

2) Final Energy Consumption Sectors (Low Case)

Natural gas consumption on baseline is shown in Figure 6-3-7 and Figure 6-3-8 on the Study. It also explains that some LPG and kerosene are converted to natural gas in low case.

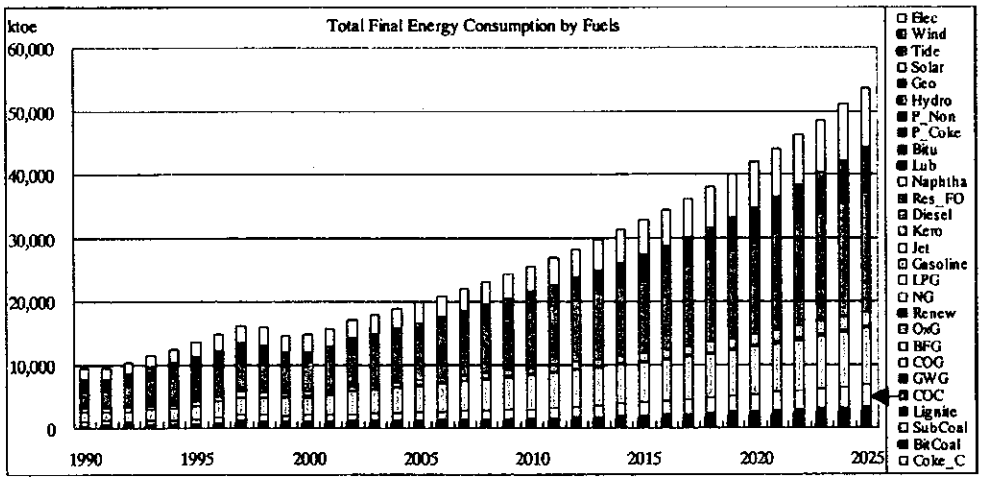

Figure 6-3-7 Forecast of Final Energy Consumption on Baseline (Low Case)

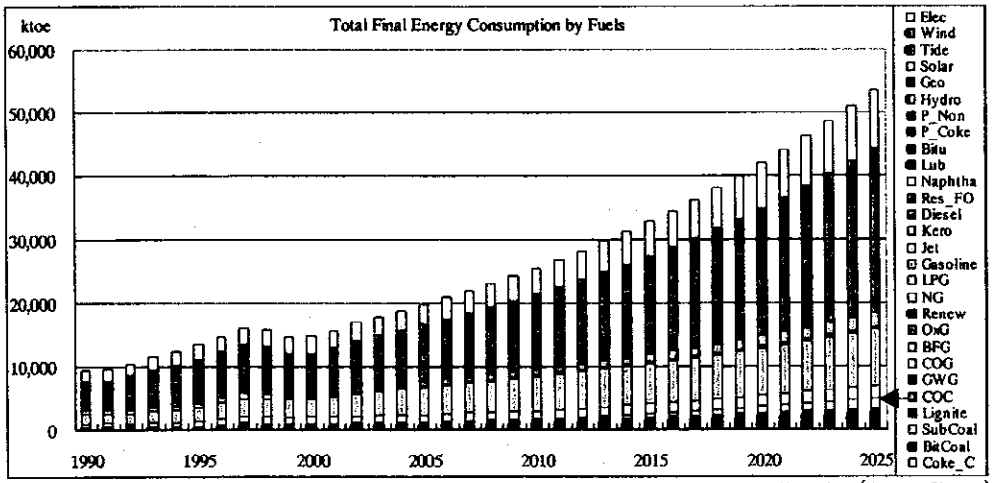

Figure 6-3-8 Forecast of Final Energy Consumption on the Study (Low Case)

6-3-3 Improving Carbon Dioxide Emissions

Reducing environmental emissions by substituting natural gas for current energy use is estimated by the environmental model applied correspondingly under the IPCC code, based on actual demand described in 6-1.

The model consists two parts. One is for the baseline and the other is for the Study. Each has two files. One is the energy balance data and the other is the calculation sheet for environmental emissions. The model estimates carbon emission (carbon and carbon dioxide), sulfur dioxide and nitrogen oxide by a fiscal year until 2025, and also makes a historical table from 1990 to 2025.

The results of the estimation for the primary domestic energy supply and electricity sectors are shown in the following figures.

(1) Improving CO_2 Emission on the Primary Energy Supply (High Case)

The CO_2 emissions on the baseline in high case are shown in Figure 6-3-9. Figure 6-3-10 shows those after the Study.

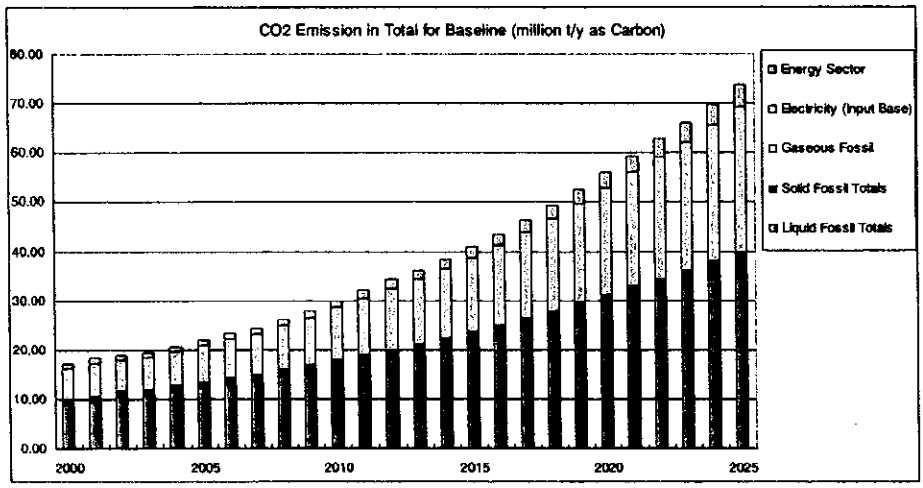

Figure 6-3-9 CO_2 Emissions for the Primary Energy Supply on Baseline (High Case)

The carbon emissions of final consumption on the baseline in high case are estimated to be 73.74 million ton (Mt)/y (as carbon) in 2025. The improvement in the Study is estimated to be −1.15Mt/y from a decrease in petroleum product consumption, +1.02 Mt/y from an increase in natural gas consumption, with a balance of 0.13Mt/y as the reduction of carbon emissions.

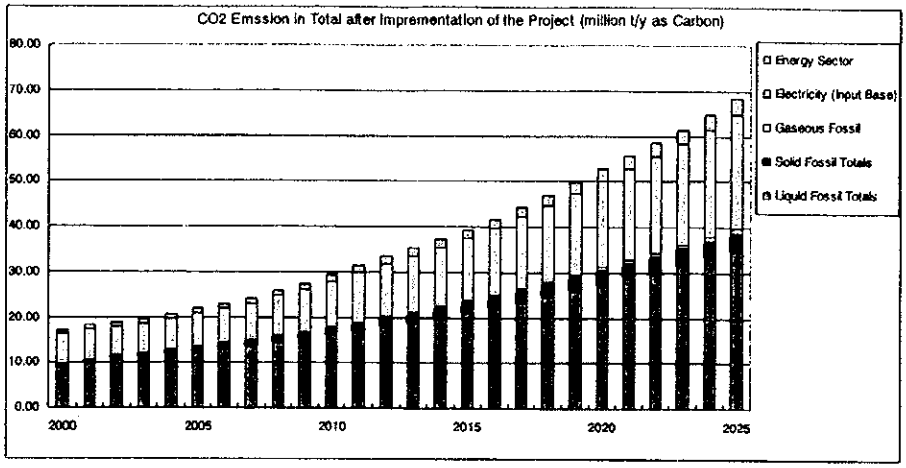

Figure 6-3-10 CO_2 Emissions for the Primary Energy Supply on the Study (High Case)

Figures 6-3-11 and 6-3-12 provide more detail for the electricity sector than Figure 6-3-9 and Figure 6-3-10.

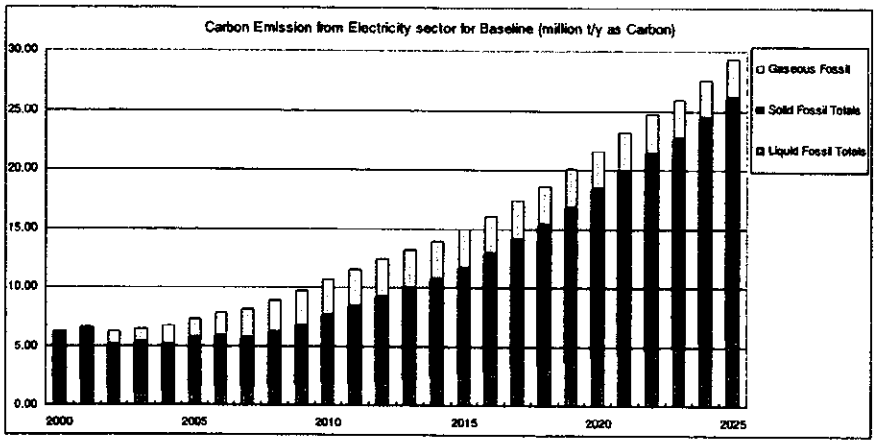

Figure 6-3-11 Carbon Emissions from Electricity Sector on Baseline(High Case)

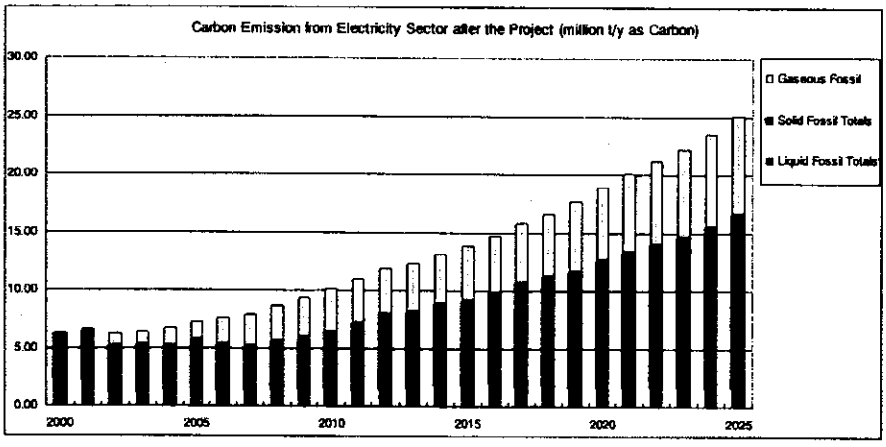

Figure 6-3-12 Carbon Emissions from Electricity Sector on the Study(High Case)

In the electricity sector, the emissions are estimated to be −4.08Mt/y from a decrease in petroleum product comsumption, −5.37Mt/y from a decrease in coal consumption, +5.16Mt/y from a increase of natural gas consumption, with a balance of 4.30Mt/y as reduction of carbon emissions. As a result, the reduction of carbon emissions found by the Study is estimated to be 5.33Mt/y (as carbon, reduction ratio is 7.23%), including 0.9Mt/y for the reduction in the refinery sector, compared to the baseline.

These figures explain the reduction of carbon emissions by changing the composition of fuels by converting to natural gas in the electricity sector.

The estimation is summarized in Table 6-3-1 (on baseline) and Table 6-3-2 (on the Study).

Table 6-3-1 Carbon Emissions on Baseline (High Case) (Mt/y as Carbon)

			2000	2005	2010	2015	2020	2025
Liquid Fossil	Primary Fuels	Crude Oil	0.00	0.00	0.00	0.00	0.00	0.00
		Natural Gas Liquids	0.00	0.00	0.00	0.00	0.00	0.00
	Secondary Fuels	Gasoline	2.19	3.16	4.19	5.06	6.04	7.28
		Jet Kerosene	0.08	0.10	0.14	0.19	0.25	0.32
		Kerosene	0.52	0.65	0.84	1.05	1.32	1.61
		Gas/Diesel Oil	3.28	5.00	7.48	9.92	13.00	17.06
		Residual Fuel Oil	1.92	2.51	3.43	4.58	6.12	7.98
		LPG	0.72	0.90	1.17	1.48	1.88	2.33
Liquid Fossil Totals			**8.71**	**12.33**	**17.25**	**22.29**	**28.61**	**36.58**
Solid Fossil	Primary Fuels	Anthracite	0.00	0.00	0.00	0.00	0.00	0.00
		Coking Coal	0.00	0.00	0.00	0.00	0.00	0.00
		Other Bit. Coal	0.96	1.26	1.72	2.31	3.09	4.04
	Secondary Fuels	Coke Oven/Gas Coke	0.15	0.20	0.27	0.36	0.48	0.63
Solid Fossil Totals			**1.11**	**1.46**	**1.99**	**2.67**	**3.57**	**4.67**
Gaseous Fossil		**Natural Gas(Dry)**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Total			**9.82**	**13.78**	**19.24**	**24.95**	**32.19**	**41.25**
Electricity (Input Base)			6.71	8.04	11.12	14.44	20.42	27.00
Energy Sector			0.99	1.18	1.52	2.12	3.12	4.23
TOTAL			***17.52***	***23.01***	***31.88***	***41.51***	***55.72***	***72.48***

Table 6-3-2 Carbon Emissions on the Study (High Case) (Mt/y as Carbon)

			2000	2005	2010	2015	2020	2025
Liquid Fossil	Primary Fuels	Crude Oil	0.00	0.00	0.00	0.00	0.00	0.00
		Natural Gas Liquids	0.00	0.00	0.00	0.00	0.00	0.00
	Secondary Fuels	Gasoline	2.19	3.16	4.19	5.06	6.04	7.28
		Jet Kerosene	0.08	0.10	0.14	0.19	0.25	0.32
		Kerosene	0.52	0.65	0.83	1.02	1.27	1.54
		Gas/Diesel Oil	3.28	5.00	7.48	9.92	13.00	17.06
		Residual Fuel Oil	1.92	2.51	3.43	4.58	6.12	7.98
		LPG	0.72	0.90	1.03	1.11	1.18	1.26
Liquid Fossil Totals			**8.71**	**12.33**	**17.10**	**21.88**	**27.86**	**35.43**
Solid Fossil	Primary Fuels	Anthracite	0.00	0.00	0.00	0.00	0.00	0.00
		Coking Coal	0.00	0.00	0.00	0.00	0.00	0.00
		Other Bit. Coal	0.96	1.26	1.72	2.31	3.09	4.04
	Secondary Fuels	Coke Oven/Gas Coke	0.15	0.20	0.27	0.36	0.48	0.63
Solid Fossil Totals			**1.11**	**1.46**	**1.99**	**2.67**	**3.57**	**4.67**
Gaseous Fossil		**Natural Gas(Dry)**	**0.00**	**0.00**	**0.13**	**0.36**	**0.67**	**1.02**
Total			**9.82**	**13.78**	**19.23**	**24.91**	**32.10**	**41.12**
Electricity (Input Base)			6.71	8.04	10.54	13.37	18.03	23.20
Energy Sector			0.99	1.18	1.40	1.89	2.62	3.43
TOTAL			***17.52***	***23.01***	***31.17***	***40.17***	***52.75***	***67.75***

(2) Improving CO_2 Emission on the Primary Energy Supply (Low Case)

The CO_2 emissions on the baseline in low case are shown in Figure 6-3-13. Figure 6-3-14 shows those after the Study.

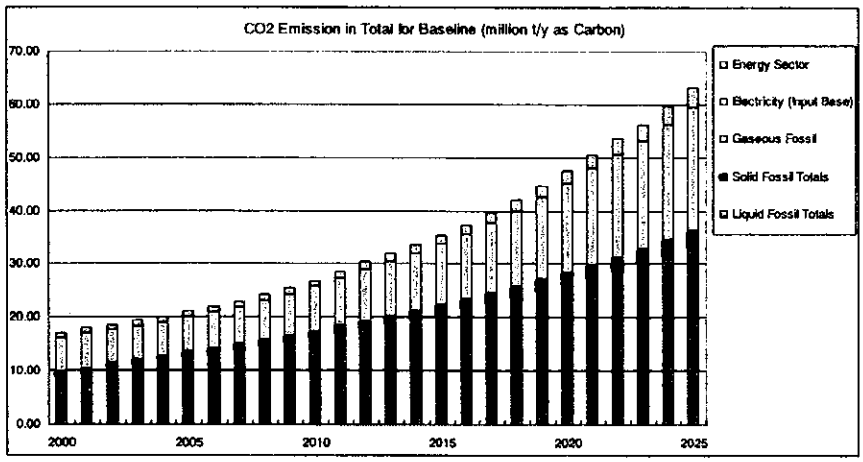

Figure 6-3-13 CO_2 Emissions for the Primary Energy Supply on Baseline (Low Case)

The carbon emissions of final consumption on the baseline in low case are estimated to be 63.13 million ton (Mt)/y (as carbon) in 2025. The improvement in the Study is estimated to be −1.15Mt/y from a decrease in petroleum product consumption, +1.02

Mt/y from an increase in natural gas consumption, with a balance of 0.13Mt/y as the reduction of carbon emissions as well as high case.

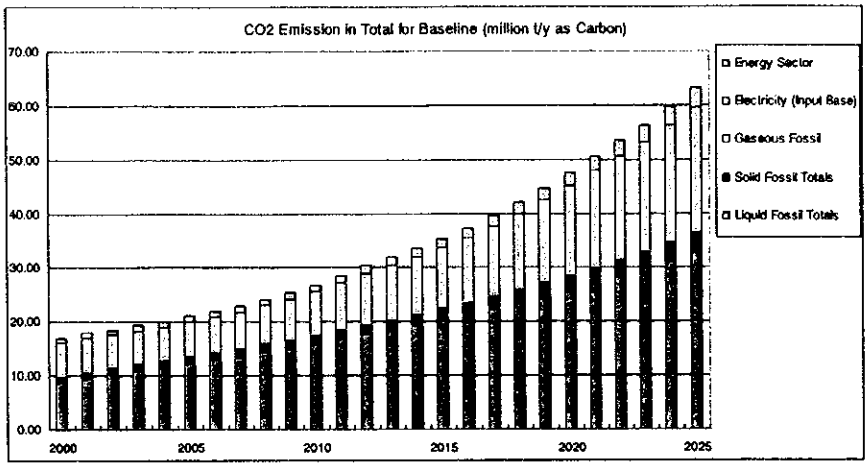

Figure 6-3-14 CO_2 Emissions for the Primary Energy Supply on the Study (Low Case)

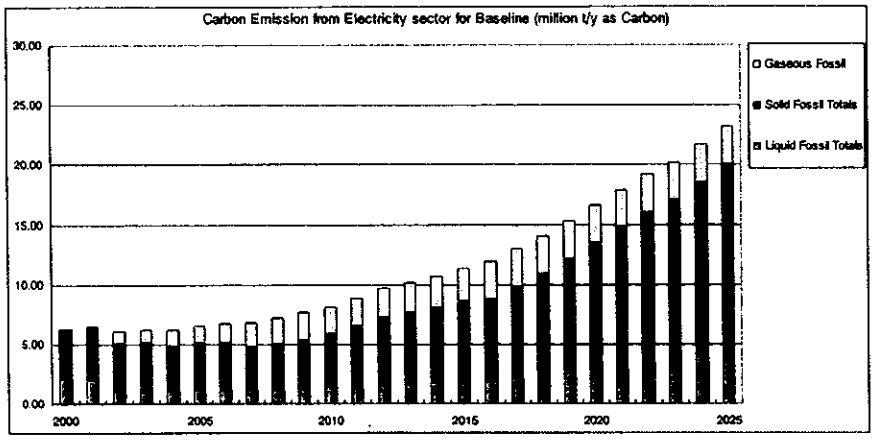

Figure 6-3-15 Carbon Emissions from Electricity Sector on Baseline(Low Case)

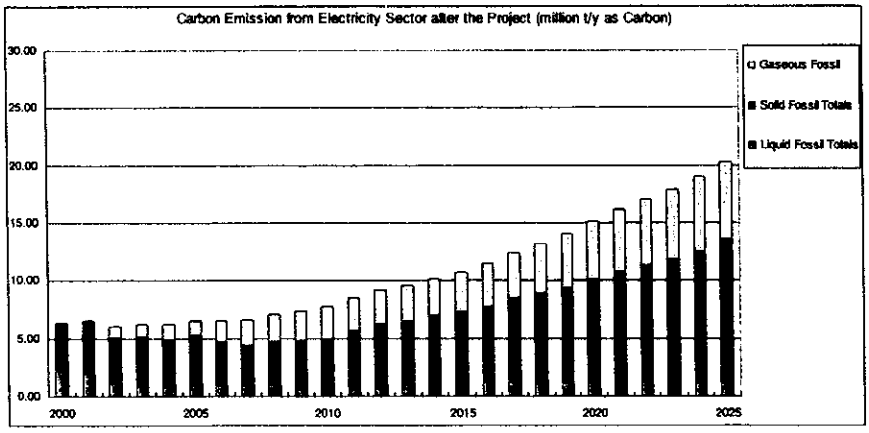

Figure 6-3-16 Carbon Emissions from Electricity Sector on the Study(Low Case)

Figures 6-3-15 and 6-3-16 provide more detail for the electricity sector than Figure 6-3-13 and Figure 6-3-14.

In the electricity sector, the emissions are estimated to be −3.08Mt/y from a decrease in petroleum product comsumption, −3.50Mt/y from a decrease in coal consumption, +3.62Mt/y from a increase of natural gas consumption, with a balance of 3.62Mt/y as reduction of carbon emissions. As a result, the reduction of carbon emissions found by the Study is estimated to be 3.68Mt/y (as carbon, reduction ratio is 5.83%), including 0.6Mt/y for the reduction in the refinery sector, compared to the baseline.

These figures explain the reduction of carbon emissions by changing the composition of fuels by converting to natural gas in the electricity sector.

The estimation is summarized in Table 6-3-3 (on baseline) and Table 6-3-4 (on the Study).

Table 6-3-3 Carbon Emissions on Baseline (Low Case) (Mt/y as Carbon)

			2000	2005	2010	2015	2020	2025
Liquid Fossil	Primary Fuels	Crude Oil	0.00	0.00	0.00	0.00	0.00	0.00
		Natural Gas Liquids	0.00	0.00	0.00	0.00	0.00	0.00
	Secondary Fuels	Gasoline	2.18	3.23	4.10	4.79	5.61	6.72
		Jet Kerosene	0.08	0.09	0.12	0.15	0.20	0.25
		Kerosene	0.55	0.64	0.79	1.10	1.47	1.85
		Gas/Diesel Oil	3.30	5.13	7.12	9.15	11.72	15.32
		Residual Fuel Oil	1.92	2.26	2.75	3.62	4.77	6.16
		LPG	0.74	0.87	1.07	1.48	1.97	2.49
Liquid Fossil Totals			**8.77**	**12.22**	**15.95**	**20.29**	**25.74**	**32.78**
Solid Fossil	Primary Fuels	Anthracite	0.00	0.00	0.00	0.00	0.00	0.00
		Coking Coal	0.00	0.00	0.00	0.00	0.00	0.00
		Other Bit. Coal	0.96	1.13	1.38	1.82	2.40	3.11
	Secondary Fuels	Coke Oven/Gas Coke	0.15	0.18	0.22	0.28	0.38	0.49
Solid Fossil Totals			**1.11**	**1.31**	**1.60**	**2.10**	**2.78**	**3.60**
Gaseous Fossil		**Natural Gas(Dry)**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Total		**9.88**	**13.53**	**17.55**	**22.39**	**28.52**	**36.38**	**41.25**
Electricity (Input Base)			6.28	6.54	8.13	11.34	16.63	23.21
Energy Sector			0.95	1.02	1.19	1.69	2.49	3.55
TOTAL			***17.11***	***21.09***	***26.87***	***35.42***	***47.64***	***63.13***

Table 6-3-4 Carbon Emissions on the Study (Low Case) (Mt/y as Carbon)

			2000	2005	2010	2015	2020	2025
Liquid Fossil	Primary Fuels	Crude Oil	0.00	0.00	0.00	0.00	0.00	0.00
		Natural Gas Liquids	0.00	0.00	0.00	0.00	0.00	0.00
	Secondary Fuels	Gasoline	2.18	3.23	4.10	4.79	5.61	6.72
		Jet Kerosene	0.08	0.09	0.12	0.15	0.20	0.25
		Kerosene	0.55	0.64	0.79	1.07	1.42	1.77
		Gas/Diesel Oil	3.30	5.13	7.12	9.15	11.72	15.32
		Residual Fuel Oil	1.92	2.26	2.75	3.62	4.77	6.16
		LPG	0.74	0.87	0.94	1.10	1.26	1.42
Liquid Fossil Totals			**8.77**	**12.22**	**15.81**	**19.88**	**24.98**	**31.63**
Solid Fossil	Primary Fuels	Anthracite	0.00	0.00	0.00	0.00	0.00	0.00
		Coking Coal	0.00	0.00	0.00	0.00	0.00	0.00
		Other Bit. Coal	0.96	1.13	1.38	1.82	2.40	3.11
	Secondary Fuels	Coke Oven/Gas Coke	0.15	0.18	0.22	0.28	0.38	0.49
Solid Fossil Totals			**1.11**	**1.31**	**1.60**	**2.10**	**2.78**	**3.60**
Gaseous Fossil		**Natural Gas(Dry)**	**0.00**	**0.00**	**0.13**	**0.36**	**0.67**	**1.02**
Total		**9.88**	**13.53**	**17.53**	**22.35**	**28.43**	**36.25**	**41.12**
Electricity (Input Base)			6.28	6.54	7.71	10.71	15.13	20.25
Energy Sector			0.95	1.02	1.10	1.55	2.20	2.95
TOTAL			***17.11***	***21.09***	***26.34***	***34.61***	***45.76***	***59.45***

6-3-4 Improvements in the Emissions of Sulfur Oxides

The largest reduction of pollutant emission by converting the current energy to natural gas is due to sulfur oxides. Sulfur oxide emissions are estimated assuming no flue gas de-sulfur facilities, and 17.3% of total sulfur oxides emissions will be reduced by substitution by 2025 in high case.

The trend of sulfur oxides emissions is shown in Figures 6-3-17 and 6-3-18.

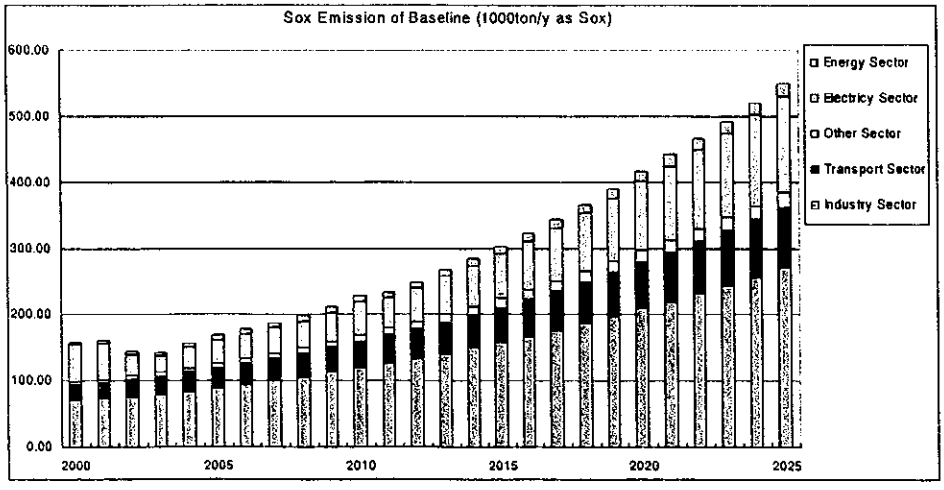

Figure 6-3-17 Sulfur Oxides Emissions on Baseline (High Case)

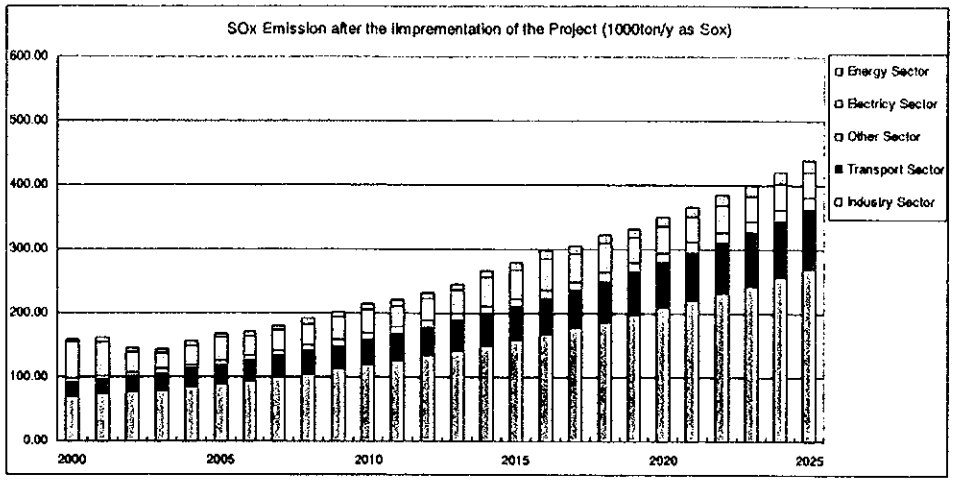

Figure 6-3-18 Sulfur Oxides Emissions on the Study (High Case)

Sulfur oxide emissions from the electricity sector are estimated at 146,000t/y for 2025 as the baseline and 40,900t/y in the Study, it is around a 72% reduction overall. This will have a strong impact compared to the cost of installing flue gas treatment facilities.

On the other hand, 17.3% of total sulfur oxides emissions will be reduced by substitution by 2025 in high case. And sulfur oxide emissions from the electricity sector are estimated at 112,000t/y for 2025 as the baseline and 33,100t/y in the Study, it is around a 70.5% reduction overall. This will have a strong impact compared to the cost of installing flue gas treatment facilities.

The results in low case are shown in Figures 6-3-19 and 6-3-20.

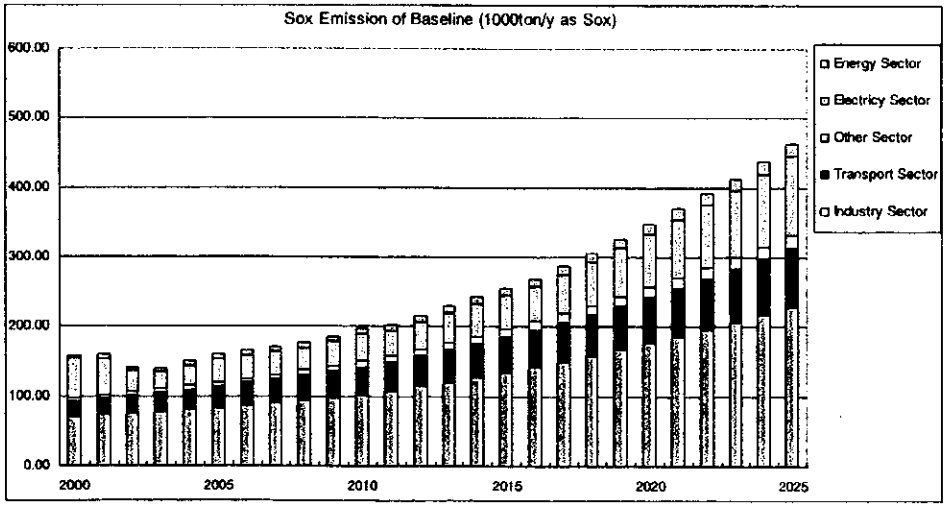

Figure 6-3-19 Sulfur Oxides Emissions on Baseline (Low Case)

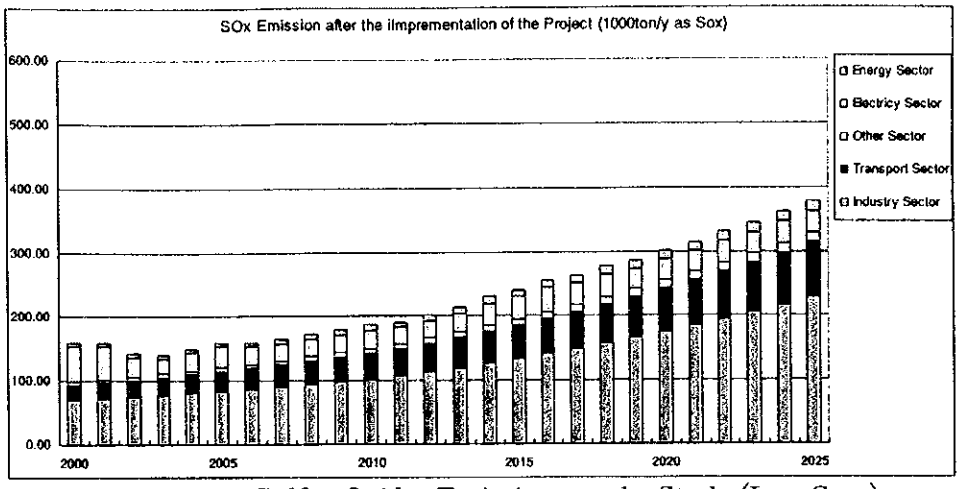

Figure 6-3-20 Sulfur Oxides Emissions on the Study (Low Case)

6-3-5 Current Situation of Environmental Control when Installing Pipeline Network

There is no unified regulatory control on gas pipeline installations. It is inevitable to negotiate honestly with every local government individually to get public acceptance of the project in advance.

The actual project, now in its preliminary stage, needs extensive negotiations with every local authority and leaders on community issues, environmental protection, rights, and compensation. The negotiations will be varied and complex.

6-3-6 International Co-operation for Global Environmental Issues

Japan has already carried out an investigation of global warming issues for developing countries from a future CDM (Clean Development Mechanism) and JI (Joint Implementation) point of view. The Study is also expected to see a reduction of GHG (greenhouse gases). But, the reduction of GHG will be slightly smaller than the other countermeasures, such as rationalization of energy use, including improving productivity, because the reduction achieved by the Study is simply expected from fuel conversion alone.

The future economic growth in the Philippines will be mainly based on the growth of light industries such as fish and agricultural processing industries, electronics industries and commercial sector including transportation businesses, not by energy-intensive heavy industries.

From this viewpoint, suitable issues for international co-operation on CDM and JI in the Philippines will be total productivity improvement of economic activities, low emissions of transportation equipment, and protection of natural environmental resources.

6-4 Socio-economic Effects

In the Philippines, many NGO, PO or NPO have been active in various sectors, including regional development plans and programs, and it is very common for people or residents to join the planning process of regional developments.

Accordingly, in implementing gas-related development programs, supply system formations in particular, it is necessary for related organizations and companies to try to disclose information and to accept people joining the planning process from the initial stage.

6-5 Comprehensive Evaluation

First, there is no major difference between the two scenarios in the effects of gas-related businesses on the Philippine economy. Specifically, we can see no major difference in EIRR (total), economic growth, government revenues, and employment, although the Gas Promotion Scenario is slightly superior to the Gas Use Scenario in criteria other than EIRR (total).

Looking at the EIRR in the gas pipeline sector, however, it is higher in the Gas Promotion Scenario than that in the Gas Use Scenario, which, we can say, means the former is more desirable than the latter, considering the importance of gas supply in the country in the future.

Second, on environment and safety, we can see no difference between the two Scenarios.

Third, on socio-economic effects, it might be rather difficult for gas-related businesses to acquire public acceptance for the construction of LNG terminals and laying pipelines. However, there is no difference in the difficulty between the Scenarios.

Fourth, there is no difference between the Scenarios in securing a stable supply of gas.

In summary, we can say that the Gas Promotion Scenario is the superior in terms of economic benefits, but can see no difference between two Scenarios in other criteria (Table 6-5-1).

We, however, consider that it is reasonable for the Philippine government to implement the policy measures proposed in the Gas Promotion Scenario, taking into account the results of the financial analysis, showing that gas-related businesses cannot be profitable in the Gas Use Scenario.

Table 6-5-1 Comprehensive Evaluation of the Scenarios

	EIRR	GDP	Employment	Government budget	Environment	Public acceptance
High Case (Option 2)						
Gas Use Scenario	*LNG: 19.7% *Pipeline: 16.5% *Power: 21.9% *Total: 23.5%				*CO2: -7.2% in power sector. *SOx: -17.3% in non-power and -72.0% in power.	*Laying pipelines to and/or through NCR and other sub-areas may be dificult.
Gas Promotion Scenario	*LNG: 18.0% *Pipeline: 17.3% *Power: 22.5% *Total: 23.5%	*Growth rate: From +0.3% to +0.5%	*Rate of unemployment: -0.7% to -1.1% per annum	*Govern. revenue: +0.2% to +0.6% per annum	*CO2: -7.2% in power sector. *SOx: -17.3% in non-power and -72.0% in power.	*Laying pipelines to and/or through NCR and other sub-areas may be dificult.

Chapter 7 A Master Plan for Promoting Gas Use

7-1 High Case

7-1-1 Gas Promotion Scenario (Option 2)

We have selected the Gas Promotion Scenario to be incorporated in the master plan for promoting gas use in the High Case.

On the gas demand side of this scenario, the construction of the following gas fired power plants is assumed for the period from 2001 to 2012.

2005 :	San Pascual (300MW)
2008 :	Sucat (300MW)
2009 :	Sucat (300MW)
	A power plant (300MW) in Bataan area
2010 :	A power plant (300MW) in Batangas area
2011 :	A power plant (900MW) in Bataan area

In addition, we assume gas filling stations for NGV will be commercially operated in NCR by 2006.

On the supply side, we assume a gas pipeline will be laid from Tabangao to NCR by 2006 to meet gas demand in Sucat power plant and the gas filling stations.

A LNG terminal will be constructed in Bataan by 2009 to supply LNG to power plants built in the area. In addition, investment will be made for constructing another LNG terminal in Batangas, which will be commissioned in 2013.

In this section, we consider a master plan, which shows a ten-year program for the construction of pipelines and LNG terminals, investments and financing, development of manpower, and policy measures to be implemented to accomplish the targets shown in the schedules mentioned above. Furthermore, we propose priority projects, which should be implemented preferably in the near future to make the master plan effective and efficient.

7-1-2 An Action Plan (2001 to 2012)

(1) Construction

1) Pipelines

A pipeline from Tabangao to NCR needs to have been laid by 2005 so that it can start operation in 2006.

Accordingly, an implementing entity (a private company having a construction permit given by the government) should determine the plan for construction including the pipeline route, and should start design works at the latest by 2002. At the same time, it should start buying the R.O.W. land according to the route to be finalized by the end of 2004.

From 2004, it should start construction of transmission (high pressure) and distribution (low and middle pressure) lines, along with continued purchases of the land. After that, the construction of pipelines should be continued according to the following schedule.

2005: Construction of transmission and distribution lines to Cavite, in addition to NCR.
2006 to 2012: Construction of distribution lines to NCR and Cavite

2) LNG terminals

LNG terminals are to start their operations on Bataan peninsula in 2000, which should have been constructed by each preceding year.

An implementing entity (a private company having a construction permit given by the government) for the LNG project should determine its plan and start to make the detailed design of the LNG terminal (and a LNG power plant) at the latest by 2004. At the same time, it should continue various administrative measures and buy the necessary land to be finalized by the end of 2004.

It should start constructing the terminal in 2006 to be completed by the end of 2008.

(2) Investments and financing

1) Investments

a) Pipelines

Investments will be as large as US$62.5 and US$78.1 million in 2004 and 2005, respectively, because construction of a pipeline from Tabangao to NCR will start at the latest by 2004 and its part of a transmission line will be constructed in 2004 and 2005. After that, they will fluctuate between US$25.0 and US$32.0 million, because the targets of investments will shift to part of the distribution lines (Investments are shown in the nominal price. Hereinafter the same).

b) LNG terminals

Investments in the LNG project will be US$10.8, US$11.0, and US$11.2 million in 2006, 2007, and 2008, respectively.

2) Financing

We assume that investments in LNG terminals will be financed in the following: 25% by own capital, 25% by borrowing from commercial banks, 25% by borrowing from an international financial institution (IFI-A) (with interest rate of 2%), and 25% by borrowing from IFI-B (with interest rate 7%).

In comparison, we assume that investments in gas pipelines will be financed in the following: 25% by own capital and 75% by borrowing from IFI-A (with interest rate of 2%).

The LNG and pipeline sectors should finalize their negotiations for borrowings at latest by around the preceding year of investments starting as mentioned above.

(3) Policy and Institutional Measures

1) Preparation of laws and regulations

- Implementing Rules and Regulations (IRR) (DOE)
  ---- To prepare IRR for transmission and distribution lines from 2001 to 2004.
- Integrated laws and institutions (DOE)
  ---- To prepare "One-stop Legal System Guideline" from 2005 to 2006 and "Integrated Natural Gas Law" from 2008 to 2010.
- Gas tariff system (DOE and ERC)
  ---- To define tariff regulator and systems from 2002 to 2003.

- Industry structure (DOE)
  ···· To define transmission and distribution entities and others by the end of 2003.

2) Implementation of economic and financial incentives

- Comprehensive studies on economic and financial incentives (DOE, DOF, and DTI (BOI))
  ···· To conclude incentives for development and competitiveness, integrated fiscal incentive policy, and others by the end of 2004.
- Special Gas Fund (DOE, DOF, and DTI (BOI))
  ···· To establish it through inter-department adjustments by the end of 2002.
- NGV initiatives (DOE) ···· To establish NGV policy for implementation including incentives by the end of 2004.

3) Establishment of communication networks

- Public and inter-departmental communications (DOE)
  ···· To form a national gas association which, jointly with the government, communicates to and from the international gas community.

4) Education

- Local government education (DOE)
  ···· To educate local governments to achieve public acceptance of pipelines, in particular.
- Vocational education (DOE)
  ···· To publish texts for energy and gas to be employed by schools and universities.

(4) Development of Manpower

1) Pipelines

We assume that around 240 persons will be needed for constructing transmission pipelines each in 2004 and 2005, and that around 100 persons will be needed for constructing distribution lines each in the following years.

In addition, persons necessary for operation and maintenance will number around 240 in 2006 and 660 in 2012, for instance, including manpower necessary for marketing gas

to the industrial, commercial, and residential sectors.

2) LNG terminals

We assume, for the LNG project, that around 400 persons will be needed for constructing the terminals each year and around 100 persons also for operation and maintenance each year.

3) Administrative measures and others

Manpower will be needed for proceeding with administrative measures related to the gas industry in the central and local governments, in addition to those mentioned on pipelines and LNG above. They include those for planning, approvals and permits, environment and safety, etc. on gas use and supply.

In addition, manpower will be needed for establishing information networks between the governments and gas-related industrial circles, as well as between those and international gas-related organizations

More specifically, manpower should be trained for the preparation of laws and regulations and the implementation of economic and financial incentives in the following (Table 7-1-1).

a) Preparation of laws and regulations

i) Implementing rules and regulations (IRR) (DOE)

For preparing IRR from 2002 to 2004, DOE staff will have been trained at the latest around by the end of 2002.

We assume that DOE will need to entrust outside consultants with the preparation of IRR, therefore, the staff will be trained for them to get the ability for their entrusting.

The staff in DOE will belong to a section or group newly established in DOE as proposed in Chapter 3, which consists of one senior staff (having more than fifteen year experiences), two middle class staff (having five to fourteen year experiences), and one junior staff (having less than five year experiences).

Finally, they will be trained by foreign experts in the Philippines and in self-development through using reports and books.

ii) Integrated laws and institutions (DOE)

For preparing "One-stop Legal System Guideline" from 2005 to 2006 and "Integrated Natural Gas Law" from 2008 to 2010, DOE staff will have been trained at the latest around by the end of 2003 and 2007, respectively.

We assume that a project team will be formed in DOE; therefore, the staff will be trained to get the ability necessary for preparing the laws and regulations for themselves.

Each staff will consist of one senior staff, three middle class staff, and four junior staff, who will collaborate with the group mentioned above.

Finally, they, at least some of them, will be trained in foreign countries and in self-development through using reports and books.

iii) Gas tariff system (DOE and ERC)

For defining tariff regulator and systems from 2002 to 2003, DOE and ERC staff will have been trained at the latest around by the end of 2002.

We assume that DOE and ERC will need to entrust outside consultants with the preparation of the system; therefore, the staff will be trained for them to get the ability necessary for their entrusting.

A part of the staff will be the same as those in the group newly established in DOE and others will be selected in ERC.

Finally, they will be trained by foreign experts in the Philippines and in self-development through using reports and books.

b) Implementation of economic and financial incentives

i) Comprehensive studies on economic and financial incentives (DOE, DOF, and DTI(BOI))

For concluding the incentives for development and competitiveness, integrated fiscal incentive policy, and others by the end of 2004, the staff will have been trained at the latest around by the end of 2002.

We assume that DOE, DOF, and DTI (BOI) will form a project team, respectively; the staff will be trained to get the ability necessary for concluding the incentives for themselves.

The staff of each Department will consist of one senior staff, three middle class staff, and four junior staff, who will collaborate with the group in DOE mentioned above.

Finally, they, at least some of them, will be trained in foreign countries and in self-development through using many kinds of publications.

ii) Special Gas Fund(DOE, DOF, and DTI(BOI))

For establishing the fund through inter-department adjustment by the end of 2002, the staff will have been trained at the latest around by the middle of 2002.

We assume that DOE, DOF, and DTI (BOI) will need to entrust outside consultants with the preparation of SGF; therefore, the staff will be trained for them to get the ability for their entrusting.

The staff will be the same as a new group mentioned in a)– i) above in DOE and similar groups will be formed by DOF and DTI (BOI).

Finally, they will be trained by foreign experts in the Philippines and in self-development through using reports and books.

iii) NGV initiatives (DOE)

For establishing NGV policy for implementation including incentives by the end of 2004, the staff will have been trained at the latest around by the end of 2002.

We assume that DOE will form a project team; the staff will be trained to get the ability necessary for concluding the incentives for themselves.

The staff will be the same as a project team mentioned in b)– i) above in DOE, who will collaborate with the group mentioned above.

Finally, they, at least some of them, will be trained in foreign countries and in self-development through using many kinds of publications.

Table 7-1-1 How to train manpower (On policies and regulations)

	Time of implementation	Time of training	Who and how to implement	Responsible Dept.	Staff (Note 1)	How to train
<Laws and regulations>						
IRR	* 2002 – 2004	* By the end of 02	* Entrust foreign consultants	* DOE	* S 1; M 2; J 1	* Foreign experts * publications
Integrated laws & regulations						
* One-stop Legal System Guideline	* 2005 – 2006	* By the end of 03	* Project team	* DOE	* S 1; M 3; J 4	* Trained in foreign countries * publications
* Integrated Natural Gas Law	* 2008 – 2010	* By the end of 07	* Project team	* DOE	* S 1; M 3; J 4	* Trained in foreign countries * publications
Gas tariff system	* 2002 – 2003	* By the end of 02	* Entrust foreign consultants	* DOE * ERC	* S 1; M 2; J 1	* Foreign experts * publication s
<Incentives>						
Incentives	* 2002 – 2004	* By the end of 02	* Project team	* DOE * DOF * DTI	* S 1; M 3; J4	* Trained in foreign countries * publications
Special Gas Fund	* 2001 – 2002	* By the middle of 02	* Entrust foreign consultants	* DOE * DOF * DTI	* S 1; M 2; J 1	* Foreign experts * publications
NGV initiatives	* 2002 – 2004	* By the end of 02	* Project team	* DOE	* S 1; M 3; J4	* Trained in foreign countries * publications

(Note) S: Senior, M: Middle, J: Junior

7-1-3 Proposals of Priority Projects

(1) Construction of Tabangao - Sucat pipeline

1) Outline of the project

---- To construct a pipeline from Tabangao, where domestic gas is to be landed, to Sucat, where we assume that a gas-fired power plant will be reconstructed after the

currently operating oil-fired plant has been decommissioned by the end of 2001(Commissioning in 2006).

-- Length: 90 km

-- Pipe diameter: 16, 12 inch

2) Importance of the project

- A pipeline can be constructed with economic viability, if it supplies gas to a power plant, because gas demand for power generation is usually large enough for the pipeline to be operated economically.
- This line will pass through areas where there is a large potential demand for gas, including that in industrial parks.
- This line can easily reach NCR by being extended from Sucat.
- This line can contribute to improving the environment through fuel conversion from fuel oil to gas in Sucat.

3) Necessary investments

- US$64.6 million (Transmission line) (In 2000 price. Hereinafter the same)

4) Period for completion

- Design and other preparations: 2 years
- Administrative and local procedures: 1 year (included in 2 years above)
- Construction: 2 years
- Total: Around 4 years

5) Profitability

The profitability of this project has been proved by the financial analysis for the Gas Promotion Scenario already made.

(2) Construction of a LNG terminal in Limay / Mariveles area in Bataan

1) Outline of the project

---- To construct a LNG terminal to supply gas to a gas-fired power plant, which will be constructed in Limay / Marivelles area and to consumers in NCR and its surrounding areas (Commissioning in 2009).

Table 7-1-2 Outline of the LNG Project in Bataan (High Case)

Nominal annual LNG quantity	4 million t/y
Jetty	1 unit
LNG storage tanks	140,000 kl×4 units
LNG vaporizers	150 t/h×7 units

2) Importance of the project

- This terminal will supply LNG to a power plant, which will have to be built to meet increased power demand during and after 2009.
- The power plant will contribute to the diversification of power sources, which have been concentrated in Batangas area, by sending electric power to NCR through an offshore power transmission line constructed from Bataan to NCR.
- In addition to a gas pipeline from Batangas area, an offshore gas pipeline, which we assume will be laid from Bataan to NCR, can meet increased gas demand in NCR and its surrounding areas.

Furthermore, we have to point out the following important matters common to this pipeline and another one, which is mentioned below.

- The construction of this pipeline can improve the security of gas supply by diversifying gas supply origins to NCR, which has a large potential demand, in adding one more pipeline to the already existing line from Batangas to NCR.
- It can contribute to improving the gas pipeline sector's competitiveness in purchasing gas by its having plural gas purchasing methods.
- It can contribute to increasing employment, because 400 persons will be needed for its construction and a maximum of 140 persons for its operation and maintenance.

3) Necessary investments

- US$514 million (Total investments until 2025)

4) Period for completion

- Design and other preparations: 1 year
- Administrative and local procedures: 1 year (included in 1 year above)
- Construction: 3 years
- Total: Around 4 years

5) Profitability

The profitability of this project has been proved by the financial analysis for the Gas Promotion Scenario already made.

(3) Construction of Gas Filling Stations for NGV in NCR area

1) Outline of the project

---- To construct gas filling stations in NCR area (Commissioning in 2006).

2) Importance of the project

- PM (Particulate Matter) contained in emissions from diesel cars is said to be the most harmful to the health among air pollutants. Many taxies and jeepneys (and buses) are powered by diesel engines, and they usually operate long distances, emitting large volumes of PM. Accordingly, conversion of these vehicles to NGV can contribute to decreasing PM emissions, and, at the same time, such pollutants as NOx, SOx, and CO2.
- A pipeline supplying gas to filling stations for NGV will also supply gas to customers in the commercial and residential sectors, resulting in gas use in these sectors.

4) Necessary investments

- Around US$500 thousand per one filling station

5) Period for completion

- Design and other preparations: 1 year
- Administrative and local procedures: 1 year
- Construction: 0.5 years
- Total: Around 3 years

6) Profitability

Profitability does not matter, because this project will be implemented as a model project by the government.

(4) Construction of a LNG terminal in Batangas area

1) Outline of the project

---- To construct an LNG terminal to supply gas to a gas-fired power plant, which

will be constructed in Batangas area and to consumers situated along the pipeline from Batangas to NCR (Commissioning in 2013).

Table 7-1-3 Outline of the LNG Project in Batangas (High Case)

Nominal annual LNG quantity	3 million t/y
Jetty	1 unit
LNG storage tanks	140,000×3 units
LNG vaporizers	150 t/h×5 units

2) Importance of the project

- This terminal will supply LNG to a power plant, which will have to be built to meet increased power demand during and after 2013.
- This terminal can supply gas to the power and other sectors, substitute for gas supply from Camago/Malampaya, if it is interrupted by an equipment failure or natural disaster.
- When the gas supply from Camago/Malampaya has been finalized, this terminal can play the role of a substitute supply source of gas to contribute to the long-term stable supply of gas.

3) Necessary investments

- US$491 million

4) Period for completion

- Design and other preparations: 1 year
- Administrative and local procedures: 1 year
- Construction: 3 years
- Total: Around 5 years

5) Profitability

The profitability of this project has been proved by the financial analysis for the Gas Promotion Scenario already made.

(5) Construction of an Offshore Pipeline from Bataan to NCR

1) Outline of the project

---- To construct an offshore pipeline from Bataan, where a LNG terminal is to be

located, to NCR (Commissioning in 2016).

-- Length: 38 km

-- Pipe diameter: 12 inch.

2) Importance of the project

- This pipeline will be constructed after gas supplied by the pipeline mentioned above has been used by a gradually growing number of customers, mainly in NCR and its surrounding areas.
- Thus, it can contribute to the stable supply of gas to these and new customers by providing another gas origin, which means the establishment of a system with dual supply sources (domestic and imported gas) and dual supply origins (two LNG terminals).

3) Necessary investments

US$18.2 million

4) Period for completion

- Design and other preparations: 2 years
- Administrative and local procedures: 1 year
- Construction: 1 years
- Total: Around 4 years

5) Profitability

The profitability of this project has been proved by the financial analysis for the Gas Promotion Scenario already made.

Table 7-1-4 Action Plan (High Case)

		Specific items	Implementing entities	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Demand & supply															
Demand for gas	Domestic gas (Power plants)				*Commissioning of Santa Rita, San Lorenzo and Ilijan			*Commissioning of San Pascual			*Commissioning of Sucat (300MW)	*Commissioning of Sucat (300MW)	*Commissioning of 300MW p. p. in Batangas		
	Domestic gas (Others)/ Imported gas								*NOV filling stations	*NOV filling stations	*NOV filling stations	*NOV filling stations	*NOV filling stations	*NOV filling stations	*NOV filling stations
	Imported gas (Power plants)											*Commissioning of 300MW p. p. in Bataan		*Commissioning of 900MW p. p. in Bataan	
Gas supply system	Pipelines								*Commencing of a pipeline from Tabangao to NCR						
	LNG											*Commissioning of an LNG terminal in Bataan			
Action plan															
Construction works	Pipelines	Feasibility studies	Private sector	*Planning/Design	*Planning/Design	*Preparation									
		Administrative measures	Private sector			*Purchase of R.O.W Land	*Purchase of R.O.W Land								
		Construction works	Private sector				* Construction of transmission PL/ DistributionPL(NCR)	*Construction of TransmissionPL/DistributionPL (NCR/Batangas-Cavite)	*Construction of DistributionPL(NCR/Batangas-Cavite)	*Construction of DistributionPL(NCR/Batangas-Cavite)	*Construction of DistributionPL(NCR/Batangas-Cavite)	*Construction of DistributionPL(NCR/Batangas-Cavite)	*Construction of DistributionPL(NCR/Batangas-Cavite)	*Construction of DistributionPL(NCR/Batangas-Cavite)	*Construction of DistributionPL(NCR/Batangas-Cavite)
		Operation	Private sector						*Operation of Transmission PL(Batangas-NCR)	*Operation of DistributionPL(NCR/Batangas-Cavite)	*Operation of DistributionPL(NCR/Batangas-Cavite)	*Operation of DistributionPL(NCR/Batangas-Cavite)	*Operation of DistributionPL(NCR/Batangas-Cavite)	*Operation of DistributionPL(NCR/Batangas-Cavite)	*Operation of DistributionPL(NCR/Batangas-Cavite)
	LNG	Feasibility studies	Private sector												
		Design	Private sector				*Basic Design	*Detail Design							
		Administrative measures	Private sector					*Application of authority							
		Construction works	Private sector												
Investment (Million US$)(+)	Pipelines	Construction works	Private sector				62.5	78.1	27.1	24.7	25.1	25.5	31.7	32.2	31.5
	LNG (*)	Construction works	Private sector						108.3	109.9	111.5		114.9	116.6	118.4
Financing	Pipelines	Construction works	Private sector												
	LNG (*)	Construction works	Private sector												
Man power (Persons)	Pipelines	Construction works	Private sector				239	239							
		Operation & maintenance	Private sector						240	291	342	394	481	569	657
	LNG (*)	Construction works	Private sector						400	400	400				
		Operation & maintenance	Private sector									100	100	100	100
Promotional policy measures		Implementing Rules and Regulations	Government (DOE)	Transmission (draft)	Transmission & distribution	Transmission & distribution	Distribution & gas use								
		Legal Systems for Natural Gas	Government (DOE)					One-stop Legal System Guideline				Integrated Natural Gas Law			
		Tariff system	Government (DOE, ERC)		Define tariff regulator and systems										
		Industry structure	Government (DOE, etc.)		Define transmission and distribution entities, etc.										
		Special Gas Fund Account	Government (DOE, DOF)	Inter-departmental adjustment											
		Incentives for development and competitiveness improvement	Government (DOE, DOF, DTI)		Inter-departmental adjustment										
		Integrated fiscal incentive policy	Government (DOE)		Integrate pioneer industry incentives and Special Gas Fund initiative for an integrated incentive plan										
		NGV Initiative	Government (DOE)	Detailed NGV study and preparation		Trial NGVs and stations		(Begin expanding NGVs)							
		Project implementing studies			Detailed feasibility studies on project implementation										
		Technology Transfer			Gas public utility operations										
		Public and inter-departmental communications	Government (DOE)		Form a national gas association which, jointly with the government, communicates to and from the nation and international gas community				(continue)						
		Local government education	Government (DOE)		Appeal public acceptance for pipelines										
		Vocational education	Government (DOE)		Publish texts for energy and gas to be employed by schools and universities. Ask ADB and foreign government for technology transfer										

(*) An LNG terminal will be commissioning in Batangas in 2013.

(+) Nominal price.

7-2 Low Case

7-2-1 Gas Use Scenario (Option 2)

We have selected the Gas Use Scenario to be incorporated in the master plan for promoting gas use in the Low Case.

On the gas demand side of this scenario, the construction of the following gas fired power plants is assumed for the period from 2001 to 2012.

2005 : San Pascual (300MW)
2012 : Sucat (600MW)

In addition, we assume gas filling stations for NGV will be commercially operated in NCR by 2006.

On the supply side, we assume a gas pipeline will be laid from Tabangao to NCR by 2006 to meet gas demand in Sucat power plant and the gas filling stations.

On the other hand, no LNG terminal and LNG-fired power plant will be commissioning during this period, although they will be under construction. The first LNG terminal will be constructed in Bataan by 2013.

In this section, we consider a master plan, which shows a ten-year program for the construction of pipelines and LNG terminals, investments and financing, development of manpower, and policy measures to be implemented to accomplish the targets shown in the schedules mentioned above. Furthermore, we propose priority projects, which should be implemented preferably in the near future to make the master plan effective and efficient.

7-2-2 An Action Plan (2001 to 2012)

(1) Construction

1) Pipelines

A pipeline from Tabangao to NCR needs to have been laid by 2005 so that it can start operation in 2006.

Accordingly, an implementing entity (a private company having a construction permit given by the government) should determine the plan for construction including the pipeline route, and should start design works at the latest by 2002. At the same time, it should start buying the R.O.W. land according to the route to be finalized by the end of 2004.

From 2004, it should start construction of transmission (high pressure) and distribution (low and middle pressure) lines, along with continued purchases of the land. After that, the construction of pipelines should be continued according to the following schedule.

2005: Construction of transmission and distribution lines to Cavite, in addition to NCR.
2006 to 2012: Construction of distribution lines to NCR and Cavite

2) LNG terminals

A LNG terminal is to start its operation on Bataan peninsula in 2013, which should have been constructed by the preceding year.

An implementing entity (a private company having a construction permit given by the government) for the LNG project should determine its plan and start to make the detailed design of the LNG terminal (and a LNG power plant) at the latest by 2008. At the same time, it should continue various administrative measures and buy the necessary land to be finalized by the end of 2009.

It should start constructing the terminal in 2010 to be completed by the end of 2012.

(2) Investments and financing

1) Investments

a) Pipelines

Investments will be as large as US$35.7 and US$44.7 million in 2004 and 2005, respectively, because construction of a pipeline from Tabangao to NCR will start at the latest by 2004 and its part of a transmission line will be constructed in 2004 and 2005. After that, excluding 2011, they will fluctuate between US$7.1 and US$9.1 million, because the targets of investments will shift to part of the distribution lines. In 2011, however, investments will be as large as US$29.0 million, because construction of a transmission pipeline from NCR to Bataan will start in the year (Investments are

shown in 2000 price. Hereinafter the same).

b) LNG terminals

Investments in the LNG project will be US$11.2, US$11.3, and US$11.5 million in 2010, 2011, and 2012, respectively.

2) Financing

We assume that investments in LNG terminals will be financed in the following: 25% by own capital, 25% by borrowing from commercial banks, 25% by borrowing from an international financial institution (IFI-A) (with interest rate of 2%), and 25% by borrowing from IFI-B (with interest rate 7%).

In comparison, we assume that investments on gas pipelines will be financed in the following: 25% by own capital and 75% by borrowing from IFI-A (with interest rate of 2%).

The LNG and pipeline sectors should finalize their negotiations for borrowings at latest by around the preceding year of investments starting as mentioned above.

(3) Policy and Institutional Measures

1) Preparation of laws and regulations

- Implementing Rules and Regulations (IRR) (DOE)
  ---- To prepare IRR for transmission lines and distribution from 2001 to 2004.
- Integrated laws and institutions (DOE)
  ---- To prepare "One-stop Legal System Guideline" from 2005 to 2006 and "Integrated Natural Gas Law" from 2008 to 2010.
- Gas tariff system (DOE and ERC)
  ---- To define tariff regulator and systems from 2002 to 2003.
- Industry structure (DOE)
  ---- To define transmission and distribution entities and others by the end of 2002.

2) Implementation of economic and financial incentives

- Comprehensive studies on economic and financial incentives (DOE, DOF, and DTI (BOI))

···· To conclude incentives for development and competitiveness, integrated fiscal incentive policy, and others by the end of 2003.

- Special Gas Fund (DOE, DOF, and DTI (BOI))
  ···· To establish it through inter-department adjustments by the end of 2002.
- NGV initiatives (DOE)
  ···· To establish NGV policy for implementation including incentives by the end of 2004.

3) Establishment of communication networks

- Public and inter-departmental communications (DOE)
  ···· To form a national gas association which, jointly with the government, communicates to and from the international gas community.

4) Education

- Local government education (DOE)
  ···· To educate local governments to achieve public acceptance of pipelines, in particular.
- Vocational education (DOE)
  ···· To publish texts for energy and gas to be employed by schools and universities.

(4) Development of Manpower

1) Pipelines

We assume that around 240 persons will be needed for constructing transmission pipelines each in 2004 and 2005, and that around 50 persons will be needed for constructing distribution lines each in the following years.

In addition, persons necessary for operation and maintenance will number around 123 in 2006 and 250 in 2012, for instance, including manpower necessary for marketing gas to the industrial, commercial, and residential sectors.

2) LNG terminals

We assume, for the LNG project, that around 400 persons will be needed for constructing the terminals each year and around 100 persons also for operation and maintenance each year.

3) Administrative measures and others

Manpower will be needed for proceeding with administrative measures related to the gas industry in the central and local governments, in addition to those mentioned on pipelines and LNG above. They include those for planning, approvals and permits, environment and safety, etc. on gas use and supply.

In addition, manpower will be needed for establishing information networks between the governments and gas-related industrial circles, as well as between those and international gas-related organizations

More specifically, manpower should be trained for the preparation of laws and regulations and the implementation of economic and financial incentives in the following (Table 7-2-1).

a) Preparation of laws and regulations

i) Implementing rules and regulations (IRR)(DOE)

For preparing IRR from 2002 to 2004, DOE staff will have been trained at the latest around by the end of 2002.

We assume that DOE will need to entrust outside consultants with the preparation of IRR; therefore, the staff will be trained for them to get the ability for their entrusting.

The staff will belong to a section or group newly established in DOE as proposed in Chapter 3, consisting of one senior staff (having more than fifteen year experiences), two middle class staff (having five to fourteen year experiences), and one junior staff (having less than five year experiences).

Finally, they will be trained by foreign experts in the Philippines and in self-development through using reports and books.

ii) Integrated laws and institutions (DOE)

For preparing "One-stop Legal System Guideline" from 2005 to 2006 and "Integrated Natural Gas Law" from 2008 to 2010, DOE staff will have been trained at the latest around by the end of 2003 and 2007, respectively.

We assume that a project team will be formed in DOE; the staff will be trained to get

the ability necessary for preparing the laws and regulations for themselves.

The staff will consist of one senior staff, three middle class staff, and four junior staff, who will collaborate with the group mentioned above.

Finally, they, at least some of them, will be trained in foreign countries and in self-development through using reports and books.

iii) Gas tariff system (DOE and ERC)

For defining tariff regulator and systems from 2002 to 2003, DOE and ERC staff will have been trained at the latest around by the end of 2002.

We assume that DOE and ERC will need to entrust outside consultants with the preparation of the system; therefore, the staff will be trained for them to get the ability necessary for their entrusting.
A part of the staff will be the same as those in the group newly established in DOE and others will be selected in ERC.

Finally, they will be trained by foreign experts in the Philippines and in self-development through using reports and books.

b) Implementation of economic and financial incentives

i) Comprehensive studies on economic and financial incentives (DOE, DOF, and DTI (BOI))

For concluding the incentives for development and competitiveness, integrated fiscal incentive policy, and others by the end of 2003, the staff will have been trained at the latest around by the end of 2002.

We assume that DOE, DOF, and DTI (BOI) will form a project team, respectively; the staff will be trained to get the ability necessary for concluding the incentives for themselves.

Each staff will consist of one senior staff, three middle class staff, and four junior staff, who will collaborate with the group mentioned above.

Finally, they, at least some of them, will be trained in foreign countries and in

self-development through using many kinds of publications.

ii) Special Gas Fund (DOE, DOF, and DTI (BOI))

For establishing the fund through inter-department adjustment by the end of 2003, the staff will have been trained at the latest around by the middle of 2002.

We assume that DOE, DOF, and DTI (BOI) will need to entrust outside consultants with the preparation of IRR; therefore, the staff will be trained for them to get the ability for their entrusting.

The staff will be the same as a new group mentioned in a)– i) above in DOE and similar groups will be formed by DOF and DTI (BOI).

Finally, they will be trained by foreign experts in the Philippines and in self-development through using reports and books.

iii) NGV initiatives (DOE)

For establishing NGV policy for implementation including incentives by the end of 2004, the staff will have been trained at the latest around by the end of 2002.

We assume that DOE will form a project team; therefore, the staff will be trained to get the ability necessary for concluding the incentives for themselves.

The staff will be the same as a project team mentioned in b)– i) above in DOE, who will collaborate with the group mentioned above.

Finally, they, at least some of them, will be trained in foreign countries and in self-development through using many kinds of publications.

Table 7-2-1 How to train manpower (On policies and regulations)

	Time of implementation	Time of training	Who and how to implement	Responsible Dept.	Staff (Note 1)	How to train
<Laws and regulations>						
IRR	* 2002 – 2004	* By the end of 02	* Entrust foreign consultants	* DOE	* S 1; M 2; J 1	* Foreign experts * publications
Integrated laws & regulations						
* One-stop Legal System Guideline	* 2005 – 2006	* By the end of 03	* Project team	* DOE	* S 1; M 3; J 4	* Trained in foreign countries * publications
* Integrated Natural Gas Law	* 2008 – 2010	* By the end of 07	* Project team	* DOE	* S 1; M 3; J 4	* Trained in foreign countries * publications
Gas tariff system	* 2002 – 2003	* By the end of 02	* Entrust foreign consultants	* DOE * ERC	* S 1; M 2; J 1	* Foreign experts * publications
<Incentives>						
Incentives	* 2002 – 2004	* By the end of 02	* Project team	* DOE * DOF * DTI	* S 1; M 3; J4	* Trained in foreign countries * publications
Special Gas Fund	* 2001 – 2002	* By the middle of 02	* Entrust foreign consultants	* DOE * DOF * DTI	* S 1; M 2; J 1	* Foreign experts * publications
NGV initiatives	* 2002 – 2004	* By the end of 02	* Project team	* DOE	* S 1; M 3; J4	* Trained in foreign countries * publications

(Note) S: Senior, M: Middle, J: Junior

7-2-3 Proposals of Priority Projects

(1) Construction of Tabangao - Sucat pipeline

1) Outline of the project

---- To construct a pipeline from Tabangao, where domestic gas is to be landed, to

Sucat, where we assume that a gas-fired power plant will be reconstructed after the currently operating oil-fired plant has been decommissioned by the end of 2001(Commissioning in 2006).

-- Length: 90 km

-- Pipe diameter: 16, 12 inch

2) Importance of the project

- A pipeline can be constructed with economic viability, if it supplies gas to a power plant, because gas demand for power generation is usually large enough for the pipeline to be operated economically.
- This line will pass through areas where there is a large potential demand for gas, including that in industrial parks.
- This line can easily reach NCR by being extended from Sucat.
- This line can contribute to improving the environment through fuel conversion from fuel oil to gas in Sucat.

3) Necessary investments

- US59.6 million

4) Period for completion

- Design and other preparations: 2 years
- Administrative and local procedures: 1 year (included in 2 years above)
- Construction: 2 years
- Total: Around 4 years

5) Profitability

The profitability of this project has been proved by the financial analysis for the Gas Use Scenario already made.

(2) Construction of a LNG terminal in Limay / Mariveles area in Bataan

1) Outline of the project

---- To construct an LNG terminal to supply gas to a gas-fired power plant, which will be constructed in Limay / Marivelles area and to consumers in NCR and its surrounding areas (Commissioning in 2013).

Table 7-2-2 Outline of the LNG Project in Bataan (Low Case)

Nominal annual LNG quantity	4 million t/y
Jetty	1 unit
LNG storage tanks	140,000 kl×4 units
LNG vaporizers	150 t/h×7 units

2) Importance of the project

- This terminal will supply LNG to a power plant, which will have to be built to meet increased power demand during and after 2013.
- The power plant will contribute to the diversification of power sources, which have been concentrated in Batangas area, by sending electric power to NCR through an offshore power transmission line constructed from Bataan to NCR.
- In addition to a gas pipeline from Batangas area, an offshore gas pipeline, which we assume will be laid from Bataan to NCR, can meet increased gas demand in NCR and its surrounding areas.

Furthermore, we have to point out the following important matters common to this pipeline and another one, which is mentioned below.

- The construction of this pipeline can improve the security of gas supply by diversifying gas supply origins to NCR, which has a large potential demand, in adding one more pipeline to the already existing line from Batangas to NCR.
- It can contribute to improving the gas pipeline sector's competitiveness in purchasing gas by its having plural gas purchasing methods.
- It can contribute to increasing employment, because 400 persons will be needed for its construction and a maximum of 140 persons for its operation and maintenance.

3) Necessary investments

- US$491 million

4) Period for completion

- Design and other preparations: 1 year
- Administrative and local procedures: 1 year (included in 1 year above)
- Construction: 3 years
- Total: Around 4 years

5) Profitability

The profitability of this project has been proved by the financial analysis for the Gas Use Scenario already made.

(3) Construction of Gas Filling Stations for NGV in NCR area

1) Outline of the project

---- To construct gas filling stations in NCR area (Commissioning in 2006).

2) Importance of the project

- PM (Particulate Matter) contained in emissions from diesel cars is said to be the most harmful to the health among air pollutants. Many taxies and jeepneys (and buses) are powered by diesel engines, and they usually operate long distances, emitting large volumes of PM. Accordingly, conversion of these vehicles to NGV can contribute to decreasing PM emissions, and, at the same time, such pollutants as NOx, SOx, and CO2.
- A pipeline supplying gas to filling stations for NGV will also supply gas to customers in the commercial and residential sectors, resulting in gas use in these sectors.

3) Necessary investments

- Around US$500 thousand per one filling station

4) Period for completion

- Design and other preparations: 1 year
- Administrative and local procedures: 1 year
- Construction: 0.5 years
- Total: Around 3 years

5) Profitability

Profitability does not matter, because this project will be implemented as a model project by the government.

(4) Construction of an Offshore Pipeline from Bataan to NCR

1) Outline of the project

---- To construct an offshore pipeline from Bataan, where a LNG terminal is to be located, to NCR (Commissioning in 2012).

-- Length: 38 km

-- Pipe diameter: 12 inch.

2) Importance of the project

- This pipeline will be constructed after gas supplied by the pipeline mentioned above has been used by a gradually growing number of customers, mainly in NCR and its surrounding areas.
- Thus, it can contribute to the stable supply of gas to these and new customers by providing another gas origin, which means the establishment of a system with dual supply sources (domestic and imported gas) and dual supply origins (two LNG terminals).

3) Necessary investments

US$18.2 million

4) Period for completion

- Design and other preparations: 2 years
- Administrative and local procedures: 1 year
- Construction: 1 years
- Total: Around 4 years

5) Profitability

The profitability of this project has been proved by the financial analysis for the Gas Use Scenario already made.

Table 7-2-3 Action Plan (Low Case)

		Specific items	Implementing entities	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Demand & supply															
Demand for gas	Domestic gas (Power plants)				*Commissioning of Santa Rita, San Lorenzo and Ilijan			*Commissioning of San Pascual							*Commissioning of Sucat (600MW)
	Domestic gas (Others)								*NGV filling stations	*NGV filling stations	*NGV filling stations	*NGV filling stations	*NGV filling stations	*NGV filling stations	*NGV filling stations
Gas supply system	Pipelines								*Commissioning of 4 pipeline from Tabangao to NCR						
Action plan															
Construction works	Pipelines	Feasibility studies	Private sector	*Planning/Design	*Planning/Design	*Preparation									
		Administrative measures	Private sector			*Purchase of R.O.W Land	*Purchase of R.O.W Land								
		Construction works	Private sector				*Construction of transmissionPL/ DistributionPL(NCR)	*Construction of Transmission-PL/DistributionPL (NCR/Batangas-Cavite)	*Construction of DistributionPL(NCR/Batangas-Cavite)	*Construction of DistributionPL(NCR/Batangas-Cavite)	*Construction of DistributionPL(NCR/Batangas-Cavite)	*Construction of DistributionPL(NCR/Batangas-Cavite)	*Construction of DistributionPL(NCR/Batangas-Cavite)	*Construction of DistributionPL(NCR/Batangas-Cavite)	*Construction of DistributionPL(NCR/Batangas-Cavite)
		Operation	Private sector						*Operation of Transmission PL(Batangas-NCR)	*Operation of DistributionPL(NCR/Batangas-Cavite)	*Operation of DistributionPL(NCR/Batangas-Cavite)	*Operation of DistributionPL(NCR/Batangas-Cavite)	*Operation of DistributionPL(NCR/Batangas-Cavite)	*Operation of DistributionPL(NCR/Batangas-Cavite)	*Operation of DistributionPL(NCR/Batangas-Cavite)
	LNG (*)	Feasibility studies	Private sector												
		Design	Private sector								*Basic Design	*Detail Design			
		Administrative measures	Private sector									*Application of authority			
		Construction works	Private sector												
Investment (Million US$)(+)	Pipelines	Construction works	Private sector				33.7	44.7	7.8	7.1	7.2	7.2	44.6	48.2	12.6
	LNG (*)	Construction works	Private sector										111.9	113.2	114.6
Financing	Pipelines	Construction works	Private sector												
	LNG (*)	Construction works	Private sector												
Man power (Persons)	Pipelines	Construction works	Private sector				239	239							
		Operation & maintenance	Private sector						240	291	342	394	481	569	657
	LNG (*)	Construction works	Private sector										400	400	400
		Operation & maintenance	Private sector												
Promotional policy measures		Implementing Rules and Regulations	Government (DOE)	Transmission	Transmission & distribution	Transmission & distribution	Distribution & gas use								
		Legal Systems for Natural Gas	Government (DOE)					One-stop Legal System Guideline				Integrated Natural Gas Law			
		Tariff system	Government (DOE, ERC)		Define tariff regulator and systems										
		Industry structure	Government (DOE, etc.)		Define transmission and distribution entities, etc.										
		Special Gas Fund Account	Government (DOE, DOF)	Inter-departmental adjustment											
		Incentives for development and competitiveness improvement	Government (DOE, DOF, DTI)		Inter-departmental adjustment										
		Integrated fiscal incentive policy	Government (DOE)		Integrate pioneer industry incentives and Special Gas Fund initiative for an integrated incentive plan										
		NGV Initiative	Government (DOE)	Detailed NGV study and preparation		Trial NGVs and stations		(Begin expanding NGVs)							
		Project implementing studies			Detailed feasibility studies on project implementation										
		Technology Transfer			One public utility operations										
		Public and inter-departmental communications	Government (DOE)		Form a national gas association which, jointly with the government, communicates to and from the nation and international gas community				(continue)						
		Local government education	Government (DOE)		Appeal public acceptance for pipelines										
		Vocational education	Government (DOE)		Publish texts for energy and gas to be employed by schools and universities. Ask ADB and foreign government for technology transfer.										

(*) An LNG terminal will be commissioning in Batean in 2013.
(+) Nominal price.

7-3 Other Issues to be Studied

It is essential for the Philippine government to take measures necessary for effectively and efficiently implementing the Action Plan and the Priority Projects mentioned above, after considering them more thoroughly and concretely.

Important issues to be considered for implementation are as follows:

(1) Considerations at the level of feasibility study

We think that the following studies at the level of a feasibility study should be done based on this Study, which has been done at the level of a master plan study.

1) Estimation of potential gas demand
In this study, we established two cases ···· the High and Low Cases ····, for which economic growth rates and energy prices are incorporated, to estimate potential gas demand (In Chapter 2).

To estimate potential gas demand when actually laying pipelines, however, it is not only necessary for us to make forecasts or assumptions of demand more thoroughly and concretely, but also to grasp current energy use in target sectors and areas using data and information that reflect the actual conditions of energy use more completely.

2) Evaluation of pipeline routes
In this Study, to select the optimum pipeline route, we established two supply options (In Chapter 5) to conclude that Option 2, which includes the offshore pipeline across the Manila Bay, is superior to Option 1, by evaluating them in terms of costs/benefit ratio and the financial internal rate of return (FIRR) (In Chapter 6).

The difference between the costs/benefit ratio and FIRR, however, is not necessarily as large for the two Options. Accordingly, we think that, when actually laying pipelines in the future, the costs/benefit ratio and FIRR should be investigated more deeply using the results of the study mentioned in 1) above.

(2) Considerations at the level of master plan study

Next, we think that studies on regional development plans for Areas L-2, and L-3 should be done at the level of a master plan study to supplement this Study.

Some studies, including JICA studies[1), 2)] have already been done on the regional development plans for the areas.

The master plan for the Southern Luzon (CALABARZON) area was originally planned by the Department of Trade and Industry, aiming at the industrialization of areas neighboring Metro Manila, into which population and investments had been concentrated. A JICA study report, which was finalized in October 1991, proposed plans for the development of ports and harbors including the Batangas port, as well as those for roads and highways including the Southern highway, in addition to those for urban and rural development, social development, and environmental management.

The master plan for the Central Luzon area had basically the same aim as that of the plan for the Southern Luzon above. Another JICA study report, which was finalized in September 1995, proposed plans for the re-development of Clark and Subic, both of which had been returned by the U.S. early in 1990s, and that for the Central Luzon highway, which was planned to connect Subic, Clark, and Tarlac.

The reasons we insist upon the necessity of doing additional studies on regional development for Areas L-2 and L-3 are as follows:

First, we have proposed in this study the construction of pipelines, LNG terminals, and LNG-fired power plants in the near future in these areas, all of which occupy a major part of the two areas mentioned above, respectively. Naturally, these projects will possibly have effects and impacts on regional development in these areas. Accordingly, we consider that the economic, social, and environmental effects and impacts of these projects should be more deeply examined than have been done in this study

Second, we consider that, if we look at only the period to 2010 targeted by the two JICA studies mentioned above, plans proposed in the studies should be reviewed, taking into account new projects that have been implemented or planned until recently, as well as

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1) Japan International Cooperation Agency (JICA), *The Master Plan Study on the Project CALABARZON*, October 1991

2) JICA, *The Master Plan Study for Central Luzon Development Programs*, September 1995

recent developments related to formulating the plans, including, for instance, current and future economy of the Philippines and prospects for global energy prices.

Third, we consider that plans in the JICA studies should be reviewed as those that will target the period to 2025, because projects proposed in this study target the period to 2025.

In addition, we think that these reviews will contribute to promoting gas use in the Philippines through, for instance, an improved estimate of potential gas demand in consuming sectors, which is indispensable for preparing plans for constructing pipelines.