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STAFF APPRAISAL REPORT

THAILAND

NATURAL GAS DEVELOPMENT PROJECT

November 5, 1979

Energy Department (Petroleum Projects)  
East Asia and Pacific Regional Office

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CURRENCY EQUIVALENTS

1 Baht = US\$0.05

20 Baht = US\$1.00

FISCAL YEAR

October 1 to September 30

WEIGHTS AND MEASURES

MW = Megawatt (thousand kilowatts)  
KWh = Kilowatt hours (=2,978 kcals)  
GWh = Gigawatt hours (million kilowatt hours)  
MMSCFD = Million standard cubic feet per day  
MCF = Thousand cubic feet  
tcf = Trillion cubic feet  
TOE = Tonnes oil equivalent ( $10.415 \times 10^6$  kcals)  
kcal = Kilocalories (1 Kcal = 3.97 Btu)  
bbl = Barrels (approximately 6.6 barrels per tonne fuel oil)  
Btu/cuft = British Thermal Units per cubic foot  
km = Kilometer (0.62 miles)

PRINCIPAL ABBREVIATIONS AND ACRONYMS USED

LPG = Liquefied Petroleum Gases  
NGOT = Natural Gas Organization of Thailand  
TORC = Thailand Oil Refining Company  
EGAT = Electricity Generating Authority of Thailand  
OFO = Oil and Fuel Organization  
PAT = Petroleum Authority of Thailand  
MEA = Metropolitan Electricity Authority  
PEA = Provincial Electricity Authority  
NEA = National Energy Administration  
NESDB = National Economic and Social Development Board  
TP = Texas Pacific Oil Company

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MAP

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## THAILAND

### I. ENERGY SECTOR

#### ENERGY CONTEXT

1.01 Thailand is almost completely dependent on imported crude oil to meet its petroleum requirements. Consumption of oil products is currently about 184,000 barrels/day and accounts for almost 70 percent of Thailand's total primary energy requirements. Oil price movements during this decade have had severe repercussions on the Thai economy. Thailand's net energy import bill increased from Baht 2,800 million (US\$140 million) in 1972 to an estimated Baht 19,500 million (US\$950 million) in 1977, forming 22 percent of imports and taking 29% of export earnings, almost twice the 1971 proportion. The 1979 increases will make this position much worse.

1.02 An important element of the Government's energy strategy in the past decade has been to encourage foreign oil companies to step up their exploration activity for indigenous oil and gas resources. The first fruit of this effort has been two sizable gas finds in the Gulf of Thailand by Union Oil and Texas Pacific, both US oil companies. Union Oil is also testing a smaller structure nearer to shore. Development of these natural gas finds is estimated to be capable of providing 20% of Thailand's energy requirements by 1985, providing the major part of fuel needs for power and industry, and will help stem the rapid rise in Thailand's net import bill. The proposed Bank loan (US\$107.0 million) would part finance the development of a natural gas pipeline system to take the gas from the offshore platforms to the major consumers.

#### ENERGY RESOURCES

1.03 Thailand's main indigenous sources of energy have been fuelwood/charcoal, hydroelectricity, bagasse, lignite and paddy husks, which, in 1977 supplied 17%, 7%, 6%, 2% and 0.3%, respectively, of total energy consumption. Of these, there are minor exports of fuel wood/charcoal and minor imports of hydro and coal. Petroleum accounted for the remaining 68% of total energy consumption. Except for a very minor oil field there is no domestic production of either crude oil or natural gas. Thailand's current petroleum requirements are met by imported crudes--which are refined in Thailand--as well as by an increasing proportion of imported petroleum products.

#### Non-Hydrocarbon Resources

1.04 Total hydro potential on Thailand's own rivers is about 9300 MW of which two-thirds appear to be economic. Of this 910 MW 1/ are now in operation and a further 2200 MW will be constructed during the 1980's. The potential on the international rivers at 20,000 MW is unlikely to be exploited until agreement is reached with Burma (Salween) or Laos (Mekong). The lignite prospects also represent a major potential energy source for Thailand and economically recoverable reserves at Mae Moh may be as much as 650 million

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1/ Excluding the Nam Ngum hydro station in Laos.

tons and may ultimately be capable of supporting 2000 MW of electricity generating capacity. The Krabi and Li lignite mines have 10 and 14 million tons of proven recoverable reserves respectively, and Krabi has a potential of a further 90 million tons not yet proven. Charcoal and fuelwood are used by the domestic market, but there is little prospect for significant increased use because of problems of deforestation. Prospecting for geothermal resources and uranium is at an early stage.

### Hydrocarbon Resources

1.05 The only onshore petroleum resources which have been brought into production are located at Fang in Northern Thailand and yield less than 20,000 tons annually (less than 0.3% of total petroleum consumption). The Mae Soon reserves at Fang are 90% depleted. Thailand has 2,500 million tons of oil shale reserves at Mae Sot in Tak province which have been well known for years; there are also 15 million tons in Lamphoon province. The oil shale reserves are found in remote locations and are unlikely to be developed in the foreseeable future because of their relatively high production costs.

1.06 The recent discovery of natural gas and further lignite deposits will change the resource position substantially, although at this stage their full extent cannot be known with certainty. The proven gas reserves are located offshore in the Gulf of Thailand and are in two structures: the "A" Structure has been delineated by Union Oil and its gas is already under contract to the Petroleum Authority of Thailand (PTT); the "B" Structure is being delineated by Texas Pacific Oil Company and a contract is currently being negotiated. The two fields are located 425 and 595 km offshore respectively. Preliminary estimates put the "A" Structure proven and probable reserves of the Union Group (Union Oil and South East Asia Petroleum Exploration Company) at 1.8 trillion cubic feet, with a delivery capability of 200-250 million cubic feet per day for nearly 20 years. The heat content of the gas is good despite 15% carbon dioxide content. The proven and probable reserves of the Texas Pacific Group (Texas Pacific, Canadian Superior and Highland) are 5.8 trillion cubic feet, but have an inferior heat content. A third area, the Kaphong and Platong structures, is being tested by Union Oil, but no firm reserve estimates are yet available.

1.07 None of the structures planned for development stretch into the offshore areas disputed with Cambodia or Vietnam. Some of the smaller structures do cross into the disputed areas. Several other gas reserves have been discovered in the Gulf of Thailand but have not been delineated. Oil shows have been small. Additionally, there is a number of structures which have not been tested but which cover a substantial area.

1.08 Overall, the drilling activity undertaken throughout the 1970's has met with a relatively high success rate (1 to 3). Consultants' reports indicate that there are good grounds to believe that further gas potential remains to be detected in the Gulf of Thailand. The Government's ability to stimulate further exploration activity will increase the probability of further petroleum discoveries.

1.09 In the Andaman Sea 11 wells were drilled by 2 companies. All were dry and all concessions except one were relinquished.

1.10 Three companies presently hold on-shore concessions: Meridien Oil Corporation of Texas (near the Laotian border), ESSO (in the north-east) and Shell in the central region north of Bangkok. The concessions for the latter two companies were granted in February 1979 and involved substantial signature bonuses. One applicant (Terra Marine) was not awarded any license.

SUPPLY AND DEMAND PATTERNS

1.11 Over the last 17 years commercial energy consumption (petroleum, hydro and lignite) has increased on average by 14% per annum from 1.2 million tonnes of oil equivalent (TOE) 1/ in 1960 to 10.6 million TOE in 1977. GDP increased over this period by 7-1/2% per annum, a relationship for commercial energy of 1.85 to 1 which is normal for countries at this stage in their development. The ratio has fallen substantially during the last few years. Commercial energy use per capita increased during the 1970's at 2-1/4 times the rate of growth in per capita GDP. Some 68% of Thailand's energy needs are met from oil products, a proportion which has been virtually constant in recent years. Recent data is summarized below (Table 1).

Table 1

Consumption of Primary Energy in Thailand 1970-1977

(Million Metric Tonnes of Fuel Oil Equivalent)

	1970	1973	1975	1977	Average Annual Increase in Demand 1970-77
Energy Petroleum Products	4.5 (61%)	7.5 (70%)	7.5 (65%)	9.4 (68%)	11.0%
Hydroelectricity	0.5 (7%)	0.6 (5%)	1.0 (9%)	1.0 (7%)	10.1%
Coal/Lignite	0.1 (2%)	0.1 (1%)	0.2 (2%)	0.2 (2%)	6.7%
Bagasse and paddy husk	0.3 (4%)	0.4 (4%)	0.6 (5%)	0.8 (6%)	17.4%
Charcoal and Fuelwood	2.0 (26%)	2.1 (20%)	2.2 (19%)	2.3 (17%)	2.2%
Total	7.4 (100%)	10.7 (100%)	11.5 (100%)	13.7 (100%)	9.2%

1/ 1 T.O.E. =  $10.415 \times 10^6$  kcals and 1 KWh = 2,978 kcals.

1.12 The largest demand for petroleum is transportation (43% of all petroleum products). Diesel oil is the major petroleum product consumed, forming 34% of petroleum demand with 48% being consumed in transportation and 31% in agriculture. Fuel oil is the next major petroleum product (33%) with the power sector and manufacturing sector accounting for 54% and 43% of demand respectively. The rates of growth for LPG and fuel oil at 17% and 12% have been particularly marked during the 1970's. A major part of the fuel oil growth has been for electricity, the growth rate for the other sectors being only 6%. Quantities of LPG consumed are small. Detailed demand by sector is below (Table 2).

1.13 The country's refineries have increased in capacity from 42,000 barrels/day in 1966 to 166,000 barrels/day in 1972, and operate at 100% of nominal capacity; there have been no capacity increases since 1972. Because of the extent of their cracking facilities, the fuel oil fractions of the TORC and ESSO refineries are 18% and 31%, respectively, while the Summit refinery, which like TORC is a large fully integrated operation, produces as much as 46% fuel oil fraction; a fourth refinery is a minor operation of 1,000 bbl/day refining indigenous crude. The proportion of products refined in Thailand has fallen from 97% in 1972 to 85% in 1977, and will continue to fall until a refinery expansion takes place. The principal imported products are diesel oil and fuel oil which represented 23% and 20% respectively in 1977 of total consumption of these products with imports of 15,000 and 12,000 barrels/day. Production of other products is close to the national demand and imports/exports are small.

Table 2

Consumption of Petroleum for Energy Use, 1971-1977

Thousands barrels/day

	Agri- culture	Construc- tion	Manufac- turing	Electricity/ Water	Transport	Commerce (incl. domestic)	Total
<u>LPG</u>							
1971	-	-	-	-	-	1.6	1.6
1975	-	-	-	-	-	3.4	3.4
1977	-	-	-	-	-	4.2	4.2
Annual incr.	-	-	-	-	-	17%	17%
<u>Gasolines</u>							
1971	-	0.1	0.6	0.1	19.7	1.4	21.9
1975	-	-	0.3	0.5	28.3	1.3	30.4
1977	-	0.1	0.5	0.1	35.1	1.8	37.6
Annual incr.	-	-	-3%	-	10%	4%	9%
<u>Kerosene</u>							
1971	-	-	0.3	-	0.6	2.4	3.3
1975	-	-	0.4	-	0.6	2.6	3.6
1977	-	-	0.2	-	0.3	4.4	4.9
Annual incr.	-	-	10%	-	-9%	11%	7%
<u>Jet Fuel</u>							
1971	-	-	-	-	8.3	-	8.3
1975	-	-	-	-	14.4	-	14.4
1977	-	-	-	-	13.2	-	13.2
Annual incr.	-	-	-	-	8%	-	8%
<u>Diesel Oil</u>							
1971	13.7	2.5	3.8	2.6	20.4	1.5	44.5
1975	16.5	0.7	6.1	1.1	21.5	3.5	49.4
1977	19.5	1.7	5.9	1.4	30.0	4.4	62.9
Annual incr.	6%	-7%	8%	-10%	7%	19%	6%
<u>Fuel Oil</u>							
1971	-	0.1	17.5	11.2	1.2	0.8	30.8
1975	0.1	-	20.4	20.2	1.2	3.7	45.6
1977	-	0.1	25.8	33.1	0.5	1.3	60.8
Annual incr.	-	-	7%	20%	-16%	8%	12%
<u>Total - All Products</u>							
1971	13.7	2.7	22.2	13.9	50.2	7.7	110.4
1975	16.6	0.7	27.2	21.8	66.0	14.5	146.8
1977	19.5	1.9	32.4	34.6	79.1	16.1	183.6
Annual Incr.	6%	-6%	6%	16%	8%	13%	9%

1.14 The major fuel oil user, the state electricity undertaking (EGAT), has had difficulty in obtaining sufficient fuel oil to meet its rapidly growing needs. More hydro-electricity has been generated than has been merited by hydrological conditions, with the consequence that hydroelectricity generation in the next few years is likely to be below the longer term capacity. Power generation has grown by 16% per annum from 4,800 GWh in 1971 to 10,950 GWh in 1977. Installed capacity at end-1977 had grown to 2,740 MW. Of this capacity, 33% is hydro, 2% is lignite-fired and the remainder is fired by oil products. Approximately 76% of the oil-fired capacity is at South Bangkok and 13% is at North Bangkok.

DEVELOPMENT PROSPECTS

1.15 The discovery of the natural gas reserves and the extensions to the lignite deposits represent a major turning point in Thailand's energy picture. The opportunity now exists for making a substantial reduction in Thailand's dependence on energy imports for the duration of the 1980s. Further substantial hydrocarbon discoveries, or development of the international hydro-electricity prospects, are essential to maintain this position through the 1990s.

1.16 The basic projections, developed by the Bank, are as below. They are based on a high industrial sector growth rate slightly less than that experienced since 1973, and assume development of the two proven gas fields (500 MMSCFD) and the lignite resources. Indigenous energy is expected to grow by 9 million tons over the ten years to 1990, and to grow from 32% to 43% of total energy requirements.

Table 3  
Demand for Energy, 1980-1990

Million tons fuel oil equivalent	1980	1985	1990	Average Annual Growth
Petroleum Products <u>1/</u>	12.5	15.1	19.2	4%
Natural Gas	-	3.4	4.1	
Natural Gas Condensate	-	0.5	0.3	
Sub-total	12.5	19.0	23.6	7%
Hydroelectricity	1.0	1.5	2.1	8%
Coal/lignite	0.5	1.3	2.9	19%
Bagasse and paddy husk	0.9	0.9	0.9	-
Charcoal and fuelwood	2.3	2.5	2.7	1%
Other	-	-	0.5	
	17.2	25.2	32.7	7%

1/ For energy use

1.17 It will be seen that, despite the tremendous increase in the use of Thailand's own energy resources, the annual demand for oil products is expected to grow by 7 million tons over the decade, equivalent to 140,000 barrels/day. Growth in demand for diesel oil and gasoline accounts for 75% of the increase. By contrast, growth in fuel oil demand, which is strongly affected by the development of natural gas, lignite and hydroelectricity, averages only 2% and is only 10% of the overall growth.

1.18 These trends are compared to the output from Thailand's three refineries should they expand as proposed by the refiners, that is, essentially duplicating existing facilities plus the addition of a cracking unit at the Summit Refinery. Output and exports/imports are summarized below on the basis that the high industrial sector demand will be sustained. Should there be any significant slow down in industry, the deficit of residual fuel oil shown below would be eliminated and could readily become a surplus. This surplus would be difficult to dispose of without taking a loss on the equivalent crude oil price and consequently could inhibit the development of indigenous energy resources.

Table 4

<u>Thousands barrels/day</u>	<u>Refinery output</u>		<u>Exports (-) and Imports (+)</u>	
	1977	1984	1985	1990
LPG	4.1	10.2	-1.5	+3.8
Gasoline	36.5	79.3	-10.2	+13.2
Kerosene/Jet fuel	17.7	38.5	-18.0	-16.3
Diesel	48.2	100.8	+19.1	+52.2
Fuel oil	<u>48.7</u>	<u>74.5</u>	<u>+11.3</u>	<u>+24.9</u>
	<u>155.2</u> *	<u>303.3</u>	<u>+0.7</u>	<u>+77.8</u>

As indicated in the above table, the proposed refinery expansions do not achieve a good match with demand. Very substantial product imports and exports are still necessary. Thailand needs a more balanced refinery output which will minimize its dependency on imported distillate products, especially diesel oil, and at the same time avoid the production of excessive amounts of residual fuel oil. A study needs to be made of (i) the country's future petroleum products demand in the light of the natural gas and lignite supplies coming into the energy market; and (ii) how the refineries should be expanded to meet this need most economically. There is also a need for a gas utilization study as discussed below.

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\* Production of bitumen and refinery losses amount to 11,000 barrels/day.

1.19 A refinery expansion study will be included in the project in view of the close interrelationship between petroleum products and natural gas. The refinery expansion study would comprise, inter alia:

- (i) the preparation of computer software for the analysis of refinery economics and operations;
- (ii) the development of optimal expansion modes for the refineries; and
- (iii) the review of pricing structures for refinery products with a view to relating these prices to policy objectives.

1.20 Initially the electricity industry is expected to absorb 90% of the supply at Bang Pakong and South Bangkok, both of which will be able to operate on either oil or gas. The 125 enterprises along the pipeline route between Sattahip and Bangkok are expected to use the remaining 10% (current use: 200,000 tons of oil per year, equivalent to 22 MMSCFD). In view of the size of the proven and probable reserves, this use in electricity will not interfere with longer term plans for possible higher value uses. Other energy demands which could be met by gas include further supplies to power stations and to industry around Bangkok and at Saraburi. Possibilities which do not impact on the fuel oil position include LPG extraction, petrochemicals, ammonia and sponge iron reduction and amount to 200 MMSCFD. The undertaking of a gas utilization study covering the above issues will be discussed with PTT at negotiations and agreement on the timing and terms of reference will be reached at that time.

#### SECTOR ORGANIZATION

1.21 The private sector has had a predominant role in the exploration, refining and marketing of oil products in Thailand. The only major state enterprise in the oil and gas sector is the Petroleum Authority of Thailand (PTT). Except in relation to refining, the roles of the public and private sectors have been essentially complementary, there being little competition surrounding their respective roles in the sector. PTT has recently taken over the functions and staff of the Natural Gas Organization of Thailand (NGOT) and the Oil Fuel Organization (OFO).

#### Exploration and Production

1.22 Two overseas groups, those headed by Union Oil and Texas Pacific, are active in the Gulf of Thailand in the search for oil and gas, and have found substantial gas reserves. Union's reserves will be sold to PTT at its offshore production platforms, and it is expected that the Texas Pacific contract will be similar. Other overseas groups also have licenses offshore and onshore.

### Refining

1.23 In oil refining 99% of Thailand's 166,000 bbl/day capacity is operated by three private enterprise companies. The Thailand Oil Refining Company (TORC), in which Shell is a major participant along with private Thai interests, and which has 39% of the country's capacity, is due to become the property of the Government in 1981 under the terms of a previous expansion permit. The Summit refinery, also 39% of total capacity, is owned by the Government and leased to Summit Industrial Corporation, there being 12 years of the lease remaining. Caltex has recently shown an interest in this refinery. The Esso refinery constitutes 21% of capacity and the remaining 1% is operated by the Ministry of Defense. The future ownership of all of the refineries is a major issue in the discussions on possible refinery expansion and its financing. Preliminary reports suggest that the TORC refinery will have substantial state participation and will be the first to be expanded, but as yet this is unconfirmed.

### Marketing

1.24 Retail oil product marketing is in the hands of essentially the same organizations as refining, plus Caltex. Shell and Esso are the two largest retailers, supplied by their own refineries. Summit operates on a more limited scale, supplying also the Government's marketing outlet, (PTT) and Caltex. A new company, Samsanpunwang, has been established recently and primarily sells fuel oil.

### Gas Transmission

1.25 The Office of Natural Gas of PTT is responsible for the transmission, treatment and distribution of Thailand's natural gas resulting from the discoveries in the Gulf of Thailand but is not exploring for petroleum itself (see Chapter IV).

### Electricity Generation and Distribution

1.26 The Electricity Generating Authority of Thailand (EGAT) is the largest state-owned enterprise and comes under the jurisdiction of the Prime Minister's Office. In addition to power generation through hydro, thermal and -- potentially -- nuclear plants, EGAT is responsible for exploration and development for lignite for use in power plants. Retail distribution of electricity is controlled by the Metropolitan Electricity Authority (MEA) and the Provincial Electricity Authority (PEA).

### Government Coordination of the Sector

1.27 At present there is no ministry currently responsible for coordinating overall policy in the sector. The present organization is complex. Important decisions having a bearing on petroleum and broader energy issues are normally entrusted to a number of ad-hoc subcommittees. The result is a slow decision making process, but one which works adequately in most respects. The area particularly needing strengthening is energy planning, which will be addressed through the energy master plan study. During negotiations the

Government will be asked to consult with the Bank before undertaking any institutional reorganization of the energy sector affecting natural gas operations.

1.28 The Petroleum Authority of Thailand (PTT) presently comes under the jurisdiction of the ministries of Industry and Defense and becomes the sole responsibility of the Ministry of Industry by the end of 1980. The Department of Mineral Resources of the Ministry of Industry has responsibility for all mineral exploitation activities including the search for oil and gas both onshore and offshore, and the licensing of the exploration and production activities. The industrial arm of the Ministry of Industry is directly involved in setting ex-refinery prices and taxation policy. The Ministry of Commerce sets margins between ex-refinery and retail prices. The Cabinet and the Legislative Council also take a direct interest in the establishment of petroleum products taxes and prices. Complementing the above Government organization, the Ministry of Defense has its own energy activities, which are eventually to be absorbed into PTT. The Ministry has its own energy department, and has a small oil field and refinery at Fang.

1.29 The Prime Minister's Office, through the National Energy Administration (NEA) has responsibility for overall energy planning. NEA has been operational for only a few years and has initially concentrated on data collection. NEA has commissioned a number of studies in the energy and related sectors, including refinery expansion and industrial projects. It is currently discussing with the Asian Development Bank a study for an overall energy master plan, which is scheduled to begin during 1979. The Prime Minister's Office is also responsible for EGAT. The Ministry of the Interior is responsible for MEA and PEA. A newly formed Ministry of Science, Technology and Energy will be responsible for non-conventional energy.

### Government Controls

1.30 The state enterprises are subject to close Government control. The Government appoints their Boards, is responsible for their budgets, their investment programs and their borrowings. All large capital investments have to be approved by the National Economic and Social Development Board (NESDB) and all borrowings by the Treasury. Purchasing and employment procedures are similar to the Government's own and the Government approves tariffs. The state power companies operate satisfactorily in this environment. They are well managed and generally are profitable. PTT is expected to function similarly once it has streamlined its procedures. During negotiations the Government will be requested to ensure the collaboration of its appropriate agencies in the energy sector in formulating and implementing national energy policies.

1.31 In the private sector controls also exist. The Government determines prices. Investments are subject to permits issued by the Ministry of Industry; special concessions must be issued by the Board of Investment. The Government also takes the lion's share of refinery profits through a system by which it receives the higher of a turnover tax (about 2-1/2%) or a 65% company tax on profits. Exploration and production require licenses from the Ministry of Industry.

SECTOR INVESTMENT AND FINANCING

1.32 Total capital investment in Thailand is running at about US\$4.8 billion annually which is about 26% of GDP. About two-thirds of the investment is in the private sector and 1/3 public sector. The private/public split has been constant through most of the 1970's, as has the proportion of GDP devoted to capital investment. Of the US\$1.5 billion public sector investment, US\$0.9 billion is by central and local government in areas such as highways and agriculture and US\$0.6 billion is by the state enterprises, i.e. 12-1/2% of the national capital investment. In the last year for which data is available (1977) the three state power organizations invested US\$230 million (38% of the state enterprise total), water 18%, telephones 14%, and 30% on other activities. State investment in oil refineries and the Oil and Fuel Organization was only US\$2 million.

1.33 The investment now envisaged for energy is large in itself and in relation to the Thai economy. The major public sector investments in gas, lignite and hydro are expected to be substantially greater than in the past, as is investment in thermal power plants and in distribution. The private sector investments in developing the offshore gas fields will also be extremely large. Latest energy sector estimates are:

	<u>\$ million</u>	<u>Years</u>
Onshore exploration	180	1979 - 89
Gas field developments	740	1978 - 84
Natural gas pipeline	700	1979 - 83
Lignite	300	1979 - 85
Power	8,200	1979 - 88
Refineries	500	1981 - 84
LPG plant	70	1985 or later

1.34 The level of energy investment in each year will depend on the rate of development of the present gas finds and future petroleum discoveries. Based on present plans, the peak year for capital investment in energy is likely to be 1980. Financing of the energy sector varies according to who is making the investment. EGAT's funds are expected to be 33% from its own and local sources, 3% suppliers credits, 52% from foreign loans and international agencies and 12% from the Government. Hydroelectricity forms one third of the power investment program. PTT has no earnings and consequently the pipeline funding is likely to be almost entirely from loans (para 2.20). The financing of the Union gas field developments are likely to be from internal sources and the Texas Pacific development is likely to be financed through borrowings.

1.35 Preliminary assessments show that the proposed investment program is reasonable.

## SECTOR POLICIES

### Resource Development

#### (a) Sector Legislation

1.36 Development of Thailand's petroleum resources is governed by the Petroleum Act of 1971. A Petroleum Committee consisting mainly of representatives of the various Government Departments advises the Minister on all aspects of the award, amendment or renewal of concessions and related matters. Exploration permits are limited to eight years, subject to one possible renewal. Fifty percent of the area is to be relinquished after five years. Production permits are for thirty years with the possibility of a ten year extension. Transfers between licensees are possible subject to the agreement of the Council of Ministers. Exploration permits include obligatory work programs which are negotiated individually with each group. Only one offshore permit - one of the Texas Pacific concession blocks containing the 'B' Structure - gives the option of Government participation in field development.

1.37 Concessionaires are entitled to sell any crude oil at market prices. Natural gas is to be sold at an agreed price which will give a reasonable profit. The legislation prohibits the state from nationalizing the concessionaire's property and, except in a national emergency, from restricting the export of petroleum.

#### (b) Tax Regime

1.38 Thailand is in the process of updating its petroleum tax laws to make them compatible with the US system whilst retaining Thai policy objectives. Under present <sup>1/</sup> legislation, companies producing oil and gas are exempt from taxes other than petroleum income tax, royalties and fees, where applicable. Royalties are calculated at 12-1/2% of the well-head price and are payable in cash or kind, at the Government's discretion. Under the revised system 50% of the royalty would be allowed as a tax credit, but cannot be carried forward. Petroleum income taxes are levied in two parts, together amounting to 50% of net profits. Downstream operations, in the same way as non-petroleum businesses, are taxed under the general revenue code. Capital allowances are detailed by royal decree. Losses may be carried forward for up to ten years. Taxes are to be paid within five months of the end of the company's accounting period. The implications of the tax regime on the project are discussed in Annex 3.01.

### Pricing

#### (a) Ex-Refinery Prices

1.39 The basis for establishing ex-refinery prices for petroleum products in Thailand has broadly been f.o.b. ex-refinery prices of equivalent products in Singapore. Thai refineries are profitable with this pricing

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<sup>1/</sup> Petroleum Income Tax Act 1971.

basis despite the price controls and the severe tax system. The current ex-refinery prices are as below. Singapore spot market prices are shown alongside for comparison, although because of the volatile nature of spot markets and the recent rapid rise in price levels such comparisons must be treated with caution.

	<u>Unit of</u> <u>Income</u>	<u>Thai ex-</u> <u>refinery</u>	<u>Singapore /1</u> <u>November 78</u>	<u>Singapore /1</u> <u>June 79</u>	<u>Singapore /1</u> <u>July 79</u>
LPG	Gallon	53.6c	34.5c	45.0c	45.0c
Premium Gasoline	Gallon	70.6c	46.3c	59.9c	68.6c
Regular Gasoline	Gallon	67.3c	41.8c	55.4c	65.6c
Kerosene	Gallon	67.6c	41.5c	55.5c	65.4c
Diesel	Gallon	64.9c	39.3c	52.9c	63.1c
Fuel Oil	Barrel	\$20.18	\$11.60	\$15.40	\$19.20

/1 Shell Pulau Bukom.

The overall refinery prices are adequate to ensure a minimum financial position for the refineries. However, it is important for the prices of the various products to bear an appropriate relationship between themselves so as to ensure the right economic incentives for the refiners to match their output to the national needs, in particular in relation to the refinery expansions the incentives for producing fuel oil need to be minimized and encouragement needs to be given to the production of more diesel.

(b) Consumer Prices

1.40 Prior to 1973, consumer prices of petroleum products were based on ex-refinery prices which closely approximated import parity. Following the 1973 oil price increase, domestic prices of all products were raised on five separate occasions between July 1973 and February 1974; between February 1974 and March 1977 domestic prices changes were minimal. Consumer pricing policy was guided in this period by a Government strategy aimed at shielding Thailand's economy from the potentially disruptive effects that might be caused by an immediate adjustment to import parity following each of the increases in international crude oil prices. Concurrently, in 1976 and 1977 consumption of refined products grew on average at a rate of 11% per year, following two years of virtually zero growth. In March 1977 the Government announced an across the board 10-16 percent price increase for all types of oil products. This was followed by other price adjustments in March and December 1978, March and July 1979. Current Thai retail prices are shown below and are to be compared with the equivalent retail price levels in other oil importing Asian countries as well as in Europe and the United States. The prices quoted as comparators are prior to the surge in prices during the current year.

	<u>Regular Gasoline</u> US\$/gallon	<u>Diesel</u> US\$/gallon	<u>Fuel Oil</u> US\$/bbl
Thailand - July 79	1.41	0.92	23.1
Thailand - Feb 79	0.97	0.57	13.2
Philippines	0.82	0.62	17.0
Pakistan	1.39	0.70	9.0
Malaysia	1.01	0.39	
France	1.73	1.13	14.7
U.S.A.	0.64		

1.41 Further increases will be necessary as international petroleum prices change. In the context of increasing traffic congestion and pollution in Bangkok, the issue of gasoline pricing is one that requires careful examination. Furthermore, the retail price of diesel oil merits special attention in view of its key role in the economy and the probable supply difficulties in the 1980's. To avoid subsidies in the energy sector it is important that the price for EGAT's natural gas be closely related to international fuel oil prices throughout the 1980's. The determination of appropriate prices between PTT and EGAT will be agreed during negotiations (see also paragraph 5.02).

(c) Fiscal Revenues

1.42 Two taxes--an excise tax and a business/municipal tax, are levied on petroleum products. The taxes are levied primarily on the sale of gasoline; tax margins are lower for diesel and much lower for fuel oil, in keeping with the Government policy of maintaining relatively lower consumer prices in the important industrial sectors. Excise taxes on gasoline were maintained at approximately the same level from 1973 (i.e. 1.00 Baht/liter or US\$0.20/gallon) until March 1978 when the excise tax on gasoline was increased to 1.83 Baht/liter (or US\$0.37/gallon); excise taxes on diesel, however, have been reduced progressively by more than 50% from their level in 1973, and have almost been eliminated for fuel oil. Total excise revenues from petroleum products remained virtually constant in 1973, 1974 and 1975 but increased sharply in 1976 with the increased level of consumption of petroleum products and increased further in 1977 and 1978 to 75% above the 1974 level. In these years they comprised approximately 30% of total excise tax revenues, down from an average of 40% in the early 1970's.

ROLE OF THE BANK

1.43 The Bank has had a longstanding involvement in helping to develop the power sector. It has made nine loans to the Electricity Generating Authority of Thailand totalling US\$362 million, it has made an engineering loan (US\$4.9 million) for the first phase of the development of Thailand's natural gas potential, and is planning assistance for the further development of Thailand's lignite resources. Thailand's natural gas potential and lignite resources are closely related to the development of a least cost solution for meeting future electricity demand. An optimum energy development strategy must also take into account macroeconomic considerations (with the heavy demand of energy investments on resources), and energy pricing considerations,

as well as the Government's desire to maintain an adequate level of exploration activity (in the Gulf of Thailand and in onshore areas) with the objective of detecting crude oil. The proposed energy master plan which is scheduled to be completed during 1981 will examine a number of these issues. The Bank will be closely associated with this study.

1.44 The Bank has been associated with Thailand's program to exploit the natural gas discoveries in the Gulf of Thailand since mid-1976. Its initial role centered on identifying and coordinating basic studies and activities necessary for project preparation, assisting with terms of reference for consultants to carry out such studies, and advising the Government in setting up a national gas entity responsible for the construction and operation of a gas pipeline and distribution system. The principal objectives were to ensure that: (a) a market existed for the gas and that it was economically feasible to bring the gas to this market; (b) the Government obtained competent technical and legal advice in its negotiations with Union Oil and Texas Pacific for the purchase of the gas; (c) adequate gas reserves were proved and certified by an independent expert appraiser before making any construction commitments; and (d) the necessary institutional arrangements were made to carry on a gas transport, distribution and sales operation. Over the next three years during the construction of the pipeline and throughout the early years of operation, there will be a continuing need for the Bank's presence in working with PTT on future project preparation. In addition, the Bank's presence will help ensure better financial terms.

1.45 Over the last three years, the Bank has built up an effective working relationship with NGOT and PTT; but also with the Government ministries and agencies responsible for the development of Thailand's indigenous energy resources, and with the two successful oil companies. It is important that this role be continued during the coming years.

## II. THE PROJECT

### BACKGROUND

2.01 By late 1977 it was apparent from drilling results and market studies that a project to utilize the Gulf of Thailand gas would make a major contribution to Thailand's economy and that it should be implemented as soon as possible. In view of this, the Government requested that the Bank consider an engineering loan to accelerate completion of the project. The engineering project was appraised in October 1977 and a US\$4.9 million loan was negotiated during February 27 to March 2, 1978. Board presentation was delayed until July 11, 1978 because negotiations with Union Oil went more slowly than had been anticipated. The loan became effective on September 25, 1978 and covers project engineering and preliminary implementation services, financial management services, reserves appraisals, advisory services and training. NGOT selected Fluor Ocean Services, a division of the Fluor Corporation (USA) for the engineering and implementation services and Chase Manhattan Asia Ltd. for the financial services. Training assistance and miscellaneous advisory services were provided by retired executives in the U.S. gas industry

assigned to NGOT by International Executive Services. Selected NGOT personnel were also assigned to Fluor and to DeGolyer and MacNaughton (reservoir consultants) for training. The British Gas Corporation has provided technical and legal advice during gas contract negotiations. The US\$4.9 million loan covering the foreign exchange cost of these services is expected to be fully disbursed by October/November 1979 and would be refinanced under the proposed loan.

#### GAS RESERVES AND DELIVERIES

2.02 Union Oil's (and its partner South East Asia Petroleum Exploration Co.) commercial discovery is located in what is known as the "A" Structure field. The field is an elongated cigar shaped structure about 25 km long by 5 km wide, with the long axis being in a roughly north-south direction. It is located about 425 km south of Sattahip in the central portion of the Gulf of Thailand where the water depth averages about 210 feet. (See Map IBRD 13476R). Gas production along with some condensate comes from relatively thin sandstone reservoirs lying between 5,000 and 9,000 feet below the Gulf.

2.03 In addition to three wells drilled before the gas contract negotiations, Union Oil has drilled an additional 4 wells to delineate the productive zone and to provide the necessary geophysical and other reservoir data to estimate the field's gas reserves. A condition of the gas contract was that 1.0 trillion cubic feet (tcf) of proved recoverable reserves must be established and certified by an independent reservoir evaluation, the results of which must be agreed to by both parties before the contract becomes effective. The reserves evaluation was made by DeGolyer and MacNaughton and a report (March 1, 1979) of their findings set recoverable proved reserves at 1.1 tcf and recoverable probable reserves at 0.4 tcf. Union Oil and PTT have both accepted these values. The gas contract obligated Union Oil to deliver and PTT to purchase certain quantities of gas 36 months following agreement on the proved reserves quantity. However, PTT and Union Oil have agreed to an earlier date and larger initial deliveries. Gas deliveries and purchases are now expected to begin on October 1, 1981. Deliveries for the first contract year have been set at 200 MMSCFD and 250 MMSCFD thereafter, with provisions for yearly adjustments of the quantity as the reservoir is depleted. The field is expected to have a production life of about 20 years.

2.04 Union Oil has subsequently drilled two additional delineation wells. The first, on the eastern flank of the structure, missed the gas bearing zone. However, the second, on the south end of the long axis, extended the proved area substantially. DeGolyer and MacNaughton's certification now places proved recoverable reserves at 1.58 tcf and probable at 0.22 tcf.

2.05 The Texas Pacific discovery is located in a concession area, shared with Canadian Superior Oil Co. and Highland Inc., in what is known as the "B" Structure field. It is located about 170 km southeast of the "A" Structure in the northern portion of the Malay Basin where water depth averages about 245 feet. Natural gas deposits with little or no condensate are found in numerous sandstone reservoirs at depths ranging between 3,200 and 8,800 feet below the Gulf. The field is much larger than the "A" Structure. Its full areal extent has not yet been determined from the wells drilled so far.

2.06 Texas Pacific has drilled 10 wells into the structure, and all have been successful. DeGolyer and MacNaughton have made a reserves evaluation of the field based on the data provided by these ten wells. The report of their findings (March 1, 1979) estimates the proved recoverable reserves at 1.3 tcf and the probable recoverable reserves at 4.5 tcf. Negotiations are under way between PTT and Texas Pacific for gas delivery and purchase to begin 45 months after the date of signing. Delivery quantities for the first and second contract year are 150 MMSCFD, 200 MMSCFD for the third year and 250 MMSCFD thereafter with provisions for adjusting the amount for reservoir reserves.

2.07 Union Oil is in the process of delineating and proving reserves in two gas bearing structures (Kaphong and Platong) approximately 60 km north of its "A" Structure field and 40 km to the east of the pipeline route. Five wells have been drilled, and indications are that the fields contain about 0.5 tcf of recoverable reserves capable of an initial production rate of 100 MMSCFD. Negotiations for the recovery of these reserves are expected to begin during late 1979. Depending on the time required to reach a sales agreement, gas deliveries could start some time in 1983.

#### PROJECT DESCRIPTION

2.08 The project financed by the proposed loan constitutes the initial phase in exploiting Thailand's natural gas reserves and comprises a pipeline system to transport and distribute gas from Union Oil's "A" Structure field to consumers in the Bangkok area. Pipe diameters have been optimized on the basis of a total design flow rate of 500 MMSCFD, one half coming from the "A" Structure field and the other half from the "B" Structure field, with the capability of expanding the capacity to beyond 700 MMSCFD. A pipeline sized for the "A" Structure reserves alone would have been slightly smaller and would have cost about \$60 million (12%) less, but would have had to be duplicated when the "B" Structure reserves became available. Should for some unforeseen reason the Texas Pacific "B" Structure reserves not be connected in the near future, the proposed pipeline from the "A" Structure will be economic (para. 3.08) and be the basis for a financially sound operation. The project (the "A" Structure Phase only) includes the items listed below (see Map IBRD 13476R). During negotiations assurance would be sought that consultants satisfactory to the Bank and Borrower would be engaged in carrying out the related project activities included in the list.

#### Pipeline

- (a) a 34" submarine buried pipeline from Union Oil's production platform to landfall near Sattahip having a total length of approximately 425 km and provisions for future underwater tie-ins at two additional production sites and one intermediate compressor station. Metering and scraper launching and receiving facilities would be located on the Union Oil platform;

- (b) a 34" buried pipeline from landfall to a terminal near Sattahip and a 28" buried pipeline from the terminal to the Bang Pakong and South Bangkok power plants covering a distance of approximately 170 km;

Infrastructure

- (c) an onshore terminal consisting of facilities for:
- scraper receiving and launching and slug catching
  - metering
  - hydrocarbon dew point control
  - condensate handling and storage
  - office and other buildings, personnel housing and support
  - provisions for a future compressor station and a future gas processing plant
- (d) a distribution system from the 28" trunk line by various sized laterals to the consumers;
- (e) an operations center near Bang Pakong to house PTT's operational and maintenance functions along with the necessary personnel housing and support facilities;
- (f) a communication system consisting of:
- onshore voice communication between all operational and maintenance units by VHF radio system
  - offshore voice communication by means of a single sideband radio system
  - onshore data communication by VHF splinter frequency radio
  - telephone circuit
  - possible future tie-in to a satellite communication system;
- (g) a supervisory control system to provide data acquisition and display, control and safety monitoring capabilities through a radio link with the various remote units; and
- (h) a cathodic protection system for the onshore and offshore piping.

Consultancy Services

- (a) engineering, procurement, project management, construction supervision, start-up and commissioning services by consultants;

- (b) training of PTT staff in the various skills required in a natural gas pipeline transportation and distribution organization and new operations and responsibilities assumed under the PTT Act;
- (c) advisory services by outside consultants in areas of finance and technical assistance;
- (d) consultancy services for carrying out a gas utilization and refinery expansion study (paras 1.19 and 1.20); and
- (e) energy conservation studies including energy audit, an investment program for energy saving, policies for energy demand management and future investment in energy including non-conventional sources.

2.09 Considering Thailand's urgent energy needs, it can be expected that the pipeline system will be extended in the near future to the "B" Structure and also, by a lateral from the main pipeline, to the Kaphong and Platong Structures. The timing of these system expansions will depend on the progress made with contract negotiations. On gas becoming available, provision has been made in the proposed loan to finance their engineering costs should any savings result from the present allocations. For the purpose of evaluating the financial and economic impact of the "B" Structure Phase, it has been assumed that contract gas deliveries would begin on October 1, 1983. This date corresponds to contract signing on January 1, 1980 and allows a three month "running in" or debugging period similar to the "A" Structure Phase schedule. The major "B" Structure Phase components are listed below. There is insufficient data at this time to include the Kaphong/Platong Phase.

- (a) a 32" submarine, buried and cathodically protected pipeline from Union Oil's platform to Texas Pacific's having a total length of about 170 km;
- (b) scraper launching and metering facilities on the Texas Pacific platform;
- (c) tie-in to the supervisory control system; and
- (d) a compressor station at the onshore terminal.

#### UNION OIL'S DEVELOPMENT PROJECT

2.10 Based on the latest reservoir study by DeGolyer and MacNaughton, it is estimated that five platforms each containing seven dual completion wells will be required to develop the gas production from the "A" Structure field. The gas will be produced from an upper and a lower zone through two tubing strings and collected through a system of flow lines at a central platform. At the platform condensate will be removed from the gas, and it will then be metered and tied into the PTT pipeline. Along with PTT's scraper and metering facilities, the platform will contain condensate handling and storage, corrosion and hydrate inhibitor injection and helicopter landing facilities. Additional operating facilities will include a flare system and

a mooring system for a tanker or barge to collect and transport condensate to one of the Bangkok refineries. The capital investment required for developing the "A" Structure field was estimated to be around US\$320 million in 1978.

#### TEXAS PACIFIC'S DEVELOPMENT PROJECT

2.11 A recent DeGolyer and MacNaughton reservoir study estimates that to develop a production rate of 250 MMSCFD from the "B" Structure field will require 5 platforms containing 10 wells each. Production will be from dual completion wells similar to the "A" Structure wells except that the reservoir will be divided into more than two producing zones. This will require periodic recompletion of the wells, normally three times during the life of the well, as production is shifted from zone to zone. The gas will be gathered by a system of flow lines to a main platform containing the required processing and compression facilities and the tie-in to PTT's pipeline. The main platform equipment will be similar to that on Union Oil's, and it will in addition include dehydration, hydrocarbon dew point control, compression and ancillary equipment along with operator housing and support facilities. There will also be similar flaring and condensate shipping provisions. An estimated investment of US\$420 million is required for developing the "B" Structure field.

#### STATUS OF PROJECT PREPARATION

2.12 All project preparation activities have been completed. Decca Survey Ltd. and Hunting Surveys and Consultants Ltd. completed a marine survey of the offshore pipeline route in December 1977 and Thai Engineering Consultants finished a survey of the land portion at about the same time. Pipeline Technologists supervised both surveys. Fluor has completed the optimization and preliminary engineering studies, the findings and conclusions of which were contained in a report issued in September 1978. Prequalification and procurement documents for long delivery items have been prepared and contracts for these items are expected to be awarded in October 1979. Chase Manhattan has issued its report covering the economic and financial evaluation of the project and the financing plan. Land and right-of-way acquisition is proceeding satisfactorily.

#### PROJECT IMPLEMENTATION

2.13 PTT would have overall responsibility and control over the project. Negotiations are currently under way with Fluor, engineering consultants, for the execution of the project through the commissioning and start-up stages. The consultants would provide all the necessary project management services including procurement and construction supervision. Fluor, a major international engineering and construction firm has the experience and competence to carry out the project successfully. Appropriate PTT staff would participate in the project implementation activities as part of the training program.

2.14 The offshore and onshore pipelines would be constructed by international contractors. With the possible exception of the communication and supervisory control system, the infrastructure construction contracts are most likely to go to local Thai firms. Construction activities are scheduled to begin in January 1980. Annex 2.02 shows the master program schedule for the project.

2.15 The Union Oil sales agreement obligates PTT to take or pay for 200 MMSCFD of gas per day (approximately \$240,000 in 1978 US dollars) for the first contract year expected to begin October 1, 1981. Much of the front end cushion originally included in the project schedule has been used up by various administrative delays. The project schedule is still a realistic one which can be maintained without resorting to costly crash program measures. However, in forthcoming months the schedule will require prompt and expedient responses to approval requests and other input required by the project management consultant from PTT and government agencies involved in the project.

2.16 In view of the critical importance of completing the project on schedule, the Bank considers it essential that PTT institute a system of progress review and an action plan to monitor and maintain the project schedule. The chief objective should be to identify and highlight potential delays and fix responsibility for corrective actions. The Bank has called this to PTT's attention. During negotiations, agreement would be reached on the format and frequency of progress reports to the Bank, and the implementation of a satisfactory project control system.

#### PROJECT COSTS

2.17 The "A" Structure Phase is estimated to cost US\$482 million of which US\$308 million or 64% represents the foreign exchange component. A physical contingency of 10% was applied to all costs. The basic project cost estimate is in 1978 US dollars. Local costs were escalated at 9% per year over the project duration. An average price contingency of 6.5% per year was added to the foreign cost of equipment, materials and civil works except for the line pipe, offshore pipelaying and pipe coating and wrapping. The cost of these items was not inflated since firm quotations and a survey of construction costs trends indicate that their price is not expected to increase during the period they are to be procured. Project engineering management and construction supervision costs are based on 5,000 man months using an average of US\$7,100 per man month for expatriate personnel based at home, US\$8,600 per man month for expatriate personnel based in Thailand and US\$1,900 per man month for Thai engineering firms participating in the project, plus a profit fee estimated at US\$4.0 million.

2.18 The cost estimate is based on critical materials and service contracts being placed no later than October, 1979 and that the present project schedule will be maintained. (See paras. 2.16 and 2.17). Any delays in the schedule affecting critical milestones would require trade-offs of money for time and could increase costs substantially depending on the nature of the delays. The following table gives a breakdown of the "A" Structure Phase estimated costs.

"A" STRUCTURE PHASE

	<u>Local</u>	<u>FE</u>	<u>Total</u>	<u>Local</u>	<u>FE</u>	<u>Total</u>
	<u>--In Baht</u>	<u>Millions--</u>		<u>---In US\$</u>	<u>Millions--</u>	
Land and Right-of-Way	80	-	80	4.0	-	4.0
<u>Materials and Equipment</u>						
Line pipe	-	1,800	1,800	-	90.0	90.0
Cathodic protection	-	40	40	-	2.0	2.0
Valves and fittings	-	172	172	-	8.6	8.6
Dew point control	-	64	64	-	3.2	3.2
Infrastructure	100	192	292	5.0	9.6	14.6
Spare parts	-	14	14	-	0.7	0.7
Sub Total	100	2,282	2,382	5.0	114.1	119.1
<u>Contracts</u>						
Pipe coating	444	680	1,124	22.2	34.0	56.2
Offshore pipe laying	320	1,600	1,920	16.0	80.0	96.0
Onshore pipe laying	240	200	440	12.0	10.0	22.0
Sub Total	1,004	2,480	3,484	50.2	124.0	174.2
<u>Other costs</u>						
Indirect project costs	120	50	170	6.0	2.5	8.5
Mobilization and demobilization	32	80	112	1.6	4.0	5.6
Freight	58	160	218	2.9	8.0	10.9
Taxes	1300	-	1300	65.0	-	65.0
Owners overhead	52	-	52	2.6	-	2.6
Start-up expenses	20	40	60	1.0	2.0	3.0
Sub Total	1582	330	1912	79.1	16.5	95.6
<u>Project Engineering and Management Services</u>						
Project engineering & Mgmt.	-	80	80	-	4.0	4.0
Engineering loan	-	98	98	-	4.9	4.9
Construction supervision	84	156	240	4.2	7.8	12.0
Sub Total	84	334	418	4.2	16.7	20.9
<u>Consultant and Training</u>						
Training	6	10	16	0.3	0.5	0.8
Advisory services	2	10	12	0.1	0.5	0.6
Technical Assistance and Studies	2	46	48	0.1	2.3	2.4
Sub Total	10	66	76	0.5	3.3	3.8
Basic project estimate	2,860	5,492	8,312	143.0	274.6	417.6
Physical contingency	290	548	838	14.5	27.4	41.9
Price contingency	330	120	450	16.5	6.0	22.5
Estimated project cost	3,480	6,160	9,640	174.0	308.0	482.0

2.19 A firm estimate of the "B" Structure Phase cannot be made until a sales agreement is reached with Texas Pacific and details of Texas Pacific's and PTT's responsibilities are settled. For the present, it is estimated that the cost will be approximately US\$220 million based on the assumption that Texas Pacific will supply the offshore gas compression and treatment facilities. On this basis, the total cost of the pipeline system extended to the "B" Structure is estimated to be US\$702 million of which approximately US\$460 million or 66% would be in foreign costs. Including interest during construction, the total cost is US\$736 million. The total investment excluding the Kaphong/Platong Phase by the oil companies and PTT is estimated to be US\$1,440 million without interest during construction.

Interest During Construction (in US\$ million)

	<u>"A" Structure Phase</u>	<u>"B" Structure Phase</u>
IBRD	- 7	-
Others	- <u>25</u>	<u>2</u>
Total	32	2

PROJECT FINANCING PLAN

2.20 PTT's lack of previous operations results in the Government being the only possible source of equity finance prior to operations. This creates considerable difficulties as the Government has been trying to limit its expenditure and cut its budgetary deficits. Diversion of resources to this project would interfere with the overall development strategy and divert funds from the poverty alleviation programs. Consequently, PTT will be financed almost entirely by borrowing except for land and taxes. This is acceptable provided the contractual risks are passed on to EGAT. Moreover, in a short time PTT will have substantial retained earnings which can be passed on to the Government when not required by PTT.

2.21 Funding of the project is expected to be as indicated in the following table:

	<u>Int. Cash</u> <u>Generation</u>	<u>Gov't.</u>	<u>Export</u> <u>Credits</u>	<u>IBRD</u>	<u>Com.</u> <u>Banks</u>	<u>Total</u>
(In US\$ Million)						
Land	-	4.0	-	-		4.0
Line pipe and ancillaries	-	-	90.0	-	29.1	119.1
Pipe coating	-	-	27.5	-	28.7	56.2
Offshore pipelaying	-	-	29.5	66.5	-	96.0
Onshore pipelaying	-	-	7.0	15.0	-	22.0
Other costs	-	65.0	-	-	30.6	95.6
Project engineering and management	-	-	12.0	8.9	-	20.9
Consultants and training	-	-	-	3.5	0.3	3.8
Interest during construction	-	-	-	7.0	25.0	32.0
Physical contingency	-	6.5	14.0	6.1	15.3	41.9
Price contingency	-	1.5	-	-	21.0	22.5
"A" Structure Phase (including interest during construction)	-	77.0	180.0	107.0	150.0	514.0
"B" Structure Phase (including interest during construction)	<u>38.0</u>	<u>28.0</u>	<u>109.0</u>	<u>-</u>	<u>47.0</u>	<u>222.0</u>
<b>Total</b>	<u>38.0</u>	<u>105.0</u>	<u>289.0</u>	<u>107.0</u>	<u>197.0</u>	<u>736.0</u>

The plan is based on the Government providing equity from the national budget to pay for land, rights of way and taxes. The US\$77 million (including contingencies) sum equates with the capital taxes payable on the project by PTT, plus land and rights of way. Agreement on the Government's input will be sought at negotiations.

2.22 The proposed Bank loan of US\$107.0 million, including US\$4.9 million to cover refinancing of the engineering loan, would be made to PTT at the current lending rate for 20 years including 5 years of grace. The loan would be equal to 20% of the "A" Structure Phase cost and 14% with the "B" Structure Phase included; the percentages of the respective foreign exchange costs would be 34% and 20%. By the time the loan is signed, PTT will have disbursed approximately US\$3.0 million for project design, consultants and training. It is proposed that expenditures incurred after the engineering loan has been drawn down be retroactively financed from the proposed loan.

2.23 The financial plan recommended by Chase Manhattan is to take the maximum loans possible from the international financial institutions and the export credit agencies and to fund the balance from commercial sources in Japan and Europe. Discussions with the export credit agencies in the United States, Japan and Western Europe have indicated that any Thai purchases in these countries for the project will be funded through the appropriate export credit agencies. A condition of loan effectiveness would be that appropriate commitments for export credits had been arranged.

2.24 The commercial loan market open to PTT was investigated in depth by Chase. They found that there would be no difficulty in syndicating a yen loan with leading Japanese banks on fixed interest terms and a floating rate Eurodollar loan from western banks. Most of these commercial funds would be to finance local currency costs. Commercial loans are also available to finance foreign currency costs for those cases where export credit finance is not available. The commercial loans and export credits would be linked to the Bank's loan through cross-default provisions. A US\$40 million revolving credit has been arranged from a Japanese bank to finance capital payments in advance of receiving the various tranches of the overseas loans. The revolving credit would also provide working capital needs. The first tranche of the commercial loan will not be needed before May 31, 1980. The timing and amount of the commercial loan will be agreed at negotiations.

#### PROCUREMENT AND DISBURSEMENT

2.25 The offshore and onshore pipe laying contracts to be partially financed from proceeds of the proposed loan would be procured through international competitive bidding in accordance with the Bank's guidelines. PTT has been instructed by its Board of Directors that all other project imports, insofar as practical, should be procured through international competitive bidding. This practice has been followed in all procurement activities so far. To avoid delay in the completion of the project advance contracting is necessary for long lead time items: line pipe (US\$90 million), pipe fittings and valves (US\$8 million) and the pipe wrap and coating contract (US\$56 million). These items are being procured through international competitive bidding but are not included in the items financed by the Bank loan. Requests for financing were included in the bid documents, and it is expected that export credits will finance the major portion (80-85%) of the foreign exchange costs. Commercial loans will finance the balance. Retroactive financing will be limited to US\$3 million (para. 2.22).

2.26 The proposed Bank loan would be applied to "A" Structure Phase expenditures. It would be disbursed as indicated below. Funds have been allocated to items normally not eligible for financing by other lending institutions and the pipelaying contracts. Any savings from the present allocations would be used to fund engineering services for subsequent phases should satisfactory sales agreements be entered into in time.

		<u>Amount Allocated</u> <u>US\$ million</u> <u>Equivalent</u>	<u>% of</u> <u>Expenditure</u>
(1)	Offshore pipeplaying contract	66.5	70%
(2)	Onshore pipelaying contract	15.0	70%
(3)	Refinance of Loan S-10 TH	4.9	100%
(4)	Project design	4.0	100%
(5)	Training	0.5	100% of foreign exchange
(6)	Technical assistance and studies	3.0	100%
(7)	Interest during construction	7.0	Amounts due
(8)	Unallocated	<u>6.1</u>	
	Total	<u>107.0</u>	

2.27 The loan should be fully disbursed by the third quarter of 1983. The closing date would be December 31, 1983. Annex 2.01 gives the estimated disbursement schedule.

#### TRAINING

2.28 PTT is staffed by well educated and competent personnel, but none of them is experienced in the operation and maintenance of a pipeline system. Training of selected staff in areas such as gas technology, engineering, project management and reservoir sciences has been in progress since granting of the engineering loan. The time is approaching when training emphasis will have to switch to the more practical aspects of pipeline operations. PTT recognizes this need and has agreed to appoint a qualified consultant from an operating pipeline company to set up and administrate a training program covering all facets of operating a high pressure natural gas pipeline and distribution system. The training would include a period of on-the-job assignments with a natural gas pipeline company for a group of key operating personnel.

2.29 As part of the training program, PTT should appoint a qualified member of its own staff to work with the training consultant. The objective would be for the PTT member eventually to assume the responsibilities of training officer for the organization. Considering the large probable reserves in the "B" Structure field and the good prospects for additional discoveries, PTT's activities in gas distribution and processing can be expected to expand over the years. An appropriate on-going training program would be a continuing need.

2.30 During negotiations PTT would be requested to review its training plans with the Bank and give assurance that a satisfactory training program would be initiated by March 1, 1980. In order to prepare the training program a training consultant is expected to be appointed by December 1, 1979.

#### ECOLOGY AND SAFETY

2.31 The proposed gas development project does not pose serious ecological problems. PTT with the assistance of its consultants is preparing an environmental protection program to cover construction and operation of the pipeline. The Environmental Impact Division of the Thai National Environmental Board has issued guidelines to PTT for the preparation of an environmental impact statement. A draft copy of the statement has been forwarded to the Bank for review. The Thai guidelines require PTT to have an environmental protection staff (presently anticipated to consist of three specialists) in its organization. It should be added that the project should improve air quality in the South Bangkok area by making a clean burning sulfur free fuel available in place of the sulfur bearing soot producing fuel oil now consumed.

2.32 Gas pipelines generally have a good safety record. Both the onshore and offshore portions will be buried to a depth providing at least three feet of cover to minimize accidental damage. The supervisory control system will monitor operating conditions and provide adequate warning and shutdown functions during deviations from safe limits. As in all similar installations, a main concern will be operator errors and the maintenance of critical operating equipment and the cathodic protection system. PTT's training program will include due emphasis on the importance of safety and preventive maintenance.

#### LAND AND RIGHT-OF-WAY

2.33 The pipeline traverses an area of private farmland, and the operations center and terminal are located on privately held land as well. PTT, using its power of eminent domain, has initiated the necessary legal action to acquire the land and rights of way needed for the project.

#### PROJECT RISKS

2.34 Offshore petroleum developments carry risks which can be minimized but not entirely eliminated. The natural gas project faces geological and operational risks; it carries risks of costly delays in completion, in the market not being sufficient, and in the dependence placed by Thailand on a single pipeline. The risks are discussed below; none is considered a significant deterrent to the project.

2.35 Both concessionaries and a competent independent reservoir consultant have evaluated the natural gas reserves allocated to the project. Although these evaluations are intended to be, and normally are, conservative, there is always a chance that a field will not live up to expectations. The project is to a large extent protected from this geological risk in that no account has been taken in the economic assessment of the very substantial "B" Structure probable reserves. Total proven and probable reserves are about five times the level needed to make the project economic.

2.36 Offshore oil and gas development poses construction and operational risks not encountered onshore. However, the industry has developed technics and technology to reduce them to acceptable levels, even in severe environments like the North Sea. By comparison, the Gulf of Thailand offers relatively few technical challenges by way of water depths and weather conditions. Furthermore, PTT has appointed experienced consultants for the design and implementation of the project, and only contractors with extensive offshore experience will be employed for construction of all the offshore facilities. Both Union Oil and Texas Pacific are experienced natural gas producers.

2.37 A delay in project completion is not anticipated, but there is always a chance that unforeseen circumstances, such as accidents and abnormal weather, will impede progress. Failure to accept contract deliveries on the expected October 1, 1981 contract date would cost PTT about US\$240,000 per day. The risk of a cost overrun in the Union phase of the project is small as the major contracts will be let this year on fixed price terms.

### III. ECONOMIC ASPECTS OF DEVELOPMENT

#### BACKGROUND

3.01 This chapter discusses the cash outlays and overall benefits to Thailand from the offshore gas development, and examines the implications on Thailand's economy. The alternative to developing the gas fields is increased fuel oil consumption, there are no other practicable alternatives within this time frame.

3.02 The offshore gas fields will be developed by Union Oil and Texas Pacific, and the gas will be transported to the ultimate consumers by PTT. The extent to which they share in the profits will depend on precisely how they allocate the task of building certain of the facilities and on the terms of their gas supply contracts. Union and Texas Pacific will be responsible for development of their respective fields and for ensuring that the gas is delivered to PTT in the right quantity, quality and pressure. PTT's responsibility will be to take the gas at the offshore platforms and deliver it to its customers at various points in Thailand. In relation to the Texas Pacific gas the responsibility for offshore compression has yet to be agreed.

3.03 PTT and the Union Group signed a gas supply contract for the "A" Structure on September 28, 1978. As a result of a contract modification in May 1979 Union are obligated to supply, and PTT is obligated to accept or pay for, 200 million cubic feet per day (MMSCFD) of natural gas for the year running from October 1981 to September 1982, and 250 MMSCFD for subsequent years. At 1976 price levels the agreed price, based on 250 MMSCFD, was US\$1.045 per million Btu (i.e. per thousand cubic feet at 1000 Btu/cu ft). Price escalation was based 40% on Singapore fuel oil prices and 30% on Thai wholesale and 30% on US export prices, with a lag of a little over one year. Effectiveness of the contract was dependent on two events, (1) the proving of 1 trillion cubic feet of recoverable reserves - which was achieved in March 1979, and (2) approval by the US Internal Revenue Service of the eligibility

of Thai tax payments as credits against US taxes. This latter problem is expected to be overcome by October 1979 and is discussed more fully in Annex 3.01. Its solution is a condition of loan effectiveness. On the assumption that a favorable ruling is eventually received, both the purchaser and Union will make substantial profits from this contract. As discussed subsequently, the economic rate of return for the Kingdom of Thailand on the Union "A" Structure part of the project is about 53%.

3.04 A gas supply contract between PTT and the Texas Pacific Group is currently under discussion. Most issues have been resolved and the major difference between the two sides is price, related to which is the responsibility for compression and dehydration at the platform. The form of contract would be similar to that with Union, but with a slower build up to the 250 MMSCFD production level. Provisional price escalation clauses are based entirely on cost factors. Texas Pacific also will need IRS approval of the eligibility of Thai taxes as foreign tax credits. The profitability of the Texas Pacific gas development will be less than that for Union, principally because of the lower gas quality and the lack of condensates. The extent to which the two parties benefit will depend on the contract.

#### THE MARKET

3.05 The 250 MMSCFD from each of the "A" and "B" Structures can be absorbed by the Thai energy market. The major part of the gas would be used in the dual-fired power plants at Bang Pakong and South Bangkok. The remainder of the gas will be to supply industry along the pipeline route. It is not expected that the major energy demands of industrial customers in Bangkok and to the north will be satisfied from either of these two structures.

#### DEVELOPMENT AND OPERATING COSTS

3.06 The capital cost of the project is US\$482 million for the "A" Structure Phase and US\$220 million for the "B" Structure Phase. The economic analysis takes account also of the EGAT costs (US\$15 million) for converting its power plants. The taxes payable by PTT on imports and on construction of the pipeline (US\$73 million) have been excluded. Annual costs will be US\$105-135 million as the net of tax gas purchase costs and US\$4 million in operating costs, taking both phases together.

#### VALUE OF PRODUCTION

3.07 The value of the production is taken as the value of the fuel oil which will no longer have to be imported into Thailand. No attempt has been made to quantify the proportion of higher-value fuels which will also be displaced. The current market for fuel oil is strongly influenced by the aftermath of the Iranian crisis and the political restraints placed on oil production. The November 1978 delivered cost was \$85 per tonne, equivalent to \$2.10 per thousand cubic feet of 1,000 Btu/cuft gas. By June 1979 the delivered cost was \$110 per tonne (\$15.40 per barrel in Singapore, equivalent to \$2.75 per MCF delivered). The annual cost of fuel oil which would have to be imported in the absence of this project is as follows, based on production of 250 MMSCFD each by Union Oil and Texas Pacific.

Annual Import Savings  
(US\$ Millions)

<u>Value of Gas per MCF</u>	<u>\$2.75</u>
Union Production	263
Texas Pacific production	<u>208</u>
	471

Singapore fuel oil prices are below the latest OPEC levels and further increases in Singapore can be expected. No reduction is envisaged from the June 1979 price and accordingly \$2.75/MCF is an appropriate base price for the economic evaluation.

PROJECT PROFITABILITY

(a) Economic Rate of Return

3.08 The economic value of the project is dependent on three major variables, the value of the gas, the existence of a contract with Texas Pacific, and the price payable to them. The rates of return at constant prices are summarized below and show a minimum and maximum position for the Texas Pacific price. The rate of return for the project with Union gas only is shown in order to indicate the strength of the intermediate position. It will be noticed that the rate of return is not unduly sensitive to the Texas Pacific supplies or their cost in view of their size, their relatively late onstream date, their slow build-up and a high rate of discount which gives little weight to later years. The rates of return have been strongly influenced by the recent rise in the import parity of fuel oil which has increased the value of the gas and increased the tax payments in respect of condensate income, whilst at the same time the purchase price of the gas has been shielded by the price escalation clause.

	<u>Rate of Return</u>
<u>Value of Gas per MCF</u>	<u>\$2.75</u>
<u>Union plus Texas Pacific with</u>	
(a) TP at Union price	49%
(b) TP at \$1.75 per MCF	48%
<u>Union alone</u>	53%
Marginal return from Texas Pacific	40%

The 48% overall return indicated for Texas Pacific gas costing \$1.75 per MCF and gas valued at the June 1979 price of \$2.75 per MCF is considered to be a 'worst case' position.

(b) Pay-Back Period

3.09 On a discounted basis at 10% the pay-back period after start-up is 3 years which is good for a pipeline project, and the project pays for itself 4 times during its lifetime. On an undiscounted basis the pay-back period is 2 years.

(c) Net Present Value

3.10 The sensitivity of the project to the value of the gas is confirmed by the net present value calculations (discount rate 10% in real terms for the 20 year life of the project). The economic advantage of contracting the Texas Pacific gas becomes more evident from this presentation.

Net Present value at 10% (1978 base)  
(US\$ Millions)

<u>Gas value</u>	<u>\$2.75/MCF</u>
Union plus Texas Pacific with	
(a) TP at Union price	1,900
(b) TP at \$1.75/MCF	1,800
Union alone	1,250

(d) Unit Cost Comparison

3.11 The capital and operating costs of the natural gas pipeline, using a 10% discount rate, approximate 43c per MCF in 1978 prices. The cost per MCF for Union alone and the extra cost for delivering Texas Pacific gas are both close to this figure. Using this transportation cost the purchase price of the gas can be compared directly with the fuel oil equivalent. In relation to the Union gas, a transportation cost of \$0.43 added to a gas purchase cost of \$1.18 gives a cost of \$1.61 at the offtake from PTT's pipeline, which is about 2/3 of the fuel oil equivalent. The benefit from the Texas Pacific gas will depend on the final agreement on prices but will give a margin of 20 to 30%.

BENEFITS TO THE ECONOMY

3.12 The natural gas project will benefit the economy in a number of ways. The return on the investment at over 40% has already been noted. The major benefit will be to the foreign exchange position. There will also be advantages in security, in technology, in employment and in the environment, as discussed below. Based on 1978 prices, the project will produce a net foreign exchange gain of about \$150 million a year. Of this, \$95 million is expected from the Union part of the project and about \$55 million from the Texas Pacific portion. These figures take account of the cost of gas, tax payments, PTT's costs and the import savings. On mid-1979 oil price levels the net savings would be \$300 million (\$200 million Union, \$100 million

TP). The borrowing program associated with the project will ensure that the national foreign exchange benefits each year and that all foreign exchange requirements are met from overseas sources.

3.13 In addition to the substantial foreign exchange advantages Thailand will gain substantially from the security of indigenous energy supplies. In the first place, a major domestic source of energy will protect the economy from shortages such as those experienced by Thailand in 1979, and will ensure a reliable fuel supply for the nation's power plants. Secondly, the country will benefit from the price stability built into the contracts. The price escalation in the Union contract is based only 40% on fuel oil and 60% is related to other indices. In view of the damage which oil price increases can cause to the economy the protection given by these clauses is substantial.

3.14 As a result of the Project, PTT is expected to generate profits of \$150 to \$200 million per year in the late 1980's, which should rise further by the end of the century. It is unlikely that PTT will require a significant part of these funds and consequently the Government will be in receipt of substantial income from this source. At the same time, the Government will be receiving \$200 million a year or more in income taxes and royalties from Union and Texas Pacific.

3.15 The engineering consultancy services include a major training program for PTT's staff, and will result in a substantial transfer of technology to Thai nationals. The natural gas system will be operated by Thai workpeople who had no previous knowledge of a natural gas undertaking. A total staff complement of 270 is planned. In addition, the onshore pipe-laying and pipewrap will provide temporary employment for local labor.

3.16 The natural gas is free of sulfur and consequently will have a favorable impact on the atmospheric pollution in South Bangkok and in maintaining the clean air around Bang Pakong. The lack of sulfur will reduce EGAT's operating costs although no attempt has been made to quantify these.

#### IV. THE BENEFICIARY

##### ORGANIZATION AND OBJECTIVES

4.01 The Bank loan will be made to PTT with the usual Government guarantee. PTT was established by the Petroleum Authority of Thailand Act dated December 20, 1978 and published in the Government Gazette on December 28, 1978 when it became law. PTT has the legal status of a juristic person. Its objective is to engage in and promote petroleum business, including all matters concerned with or related to petroleum business. Petroleum business is defined to encompass all activities related to the petroleum and the petrochemical industries. The Minister of Defense and the Minister of Industry are jointly in charge of the PTT Act for a period of two years after the date of effectiveness (December 28, 1978). After the two year period, the Minister of Industry assumes sole responsibility.

4.02 PTT's Board of Directors is appointed by the Council of Ministers. The Board comprises a chairman and a maximum of ten directors: one each appointed from the Ministries of Defense, Finance, Commerce, Industry, and the Juridical Council and a maximum of five others. The Governor of PTT, who is its chief executive officer, is the Secretary of the Board. The Board is presently chaired by the Prime Minister, and the directors appointed so far are the Ministers of Commerce, Communications and Industry, the Deputy Minister of Industry and the Secretary General of the National Security Council. In addition to the Governor there are three Deputy Governors responsible for administration, operations, and technology and planning respectively.

4.03 On July 15, 1979 PTT took over NGOT including its staff of approximately 100 employees. NGOT had been formed in 1977 to assume primary responsibility for the transmission and distribution of Thailand's natural gas discoveries. The natural gas operations formerly assigned to NGOT will be carried out by the Office of Natural Gas which will be an operationally independent unit, with its own separate accounts, within PTT. The Office will be headed by a director whose appointment will be made in consultation with the Bank and who will report directly to the Governor of PTT. During the construction of the pipeline system, the former NGOT project implementation group will report to the Deputy Governor for operations. However, during 1980 it will become necessary for PTT to prepare for the operational role of the Office of Natural Gas. Operating and maintenance personnel will have to be recruited and training programs instituted. During negotiations PTT will be requested to furnish a staffing plan of the Office of Natural Gas by June 30, 1980 for the Bank's review and comment.

4.04 During September PTT took over the Oil Fuel Organization and its 2,000 employees, and before the end of 1980, it will take over the Ministry of Defense Energy Department. The latter includes the Fang oil field and refinery, employing approximately 500 people. In addition, PTT will manage the Government's participation in the refineries. Plans for expanding the TORC refinery are expected to be finalized before end 1979, and the Government expects to have a substantial interest in the expanded unit. The Esso and Summit refinery expansions will follow later, but the timing and Government (PTT) participation is not yet known. Esso has full ownership of the present refinery and the Summit refinery is leased (expiring in 1989) from the Government.

4.05 As indicated above, PTT's role in the petroleum sector will undergo a dramatic transition in scope and diversity over the next few years, and its management problems can be expected to increase accordingly. PTT is fully aware of this and has agreed to institute, with the assistance of consultants as needed, appropriate management procedures and a management information system.

#### ACCOUNTING, AUDITING AND INSURANCE

4.06 On the advice of the International Executive Services Corps advisers, The Office of Natural Gas's financial accounts are modelled on U.S. gas utility principles. Accounts have been satisfactorily prepared for the first

two fiscal years. Separate accounts will be prepared for each of PTT's major activities. No difficulty is envisaged in maintaining these standards. In accordance with the standard practice in Thailand for state enterprises, the audit will be performed by the National Audit Office. In view of the National Audit Office's lack of previous audit experience in the gas sector, it is recommended that one of the major international accounting firms be retained as financial consultants to cooperate with the Audit Office and issue a separate report on the annual accounts. Agreement will be sought during negotiations for the audited accounts of both PTT and the Office of Natural Gas to be submitted to the Bank within six months after the end of each financial year, and for the consultancy arrangement outlined.

4.07 PTT will carry adequate third party insurance in line with industry practices, and will ensure that builder's risk insurance is in effect for each contract. Fluor will advise on what other insurances should be taken out. PTT's insurance plans will be discussed with PTT during negotiations.

## V. FINANCES

### OVERALL FINANCIAL POSITION

5.01 PTT is a new entity with no trading experience. Its financial structure, policies, contracts, etc. are still being determined. Given satisfactory resolution of these, PTT can become a sound and financially viable organization. The principal financial requirements are:

- (i) a sound project financing plan as outlined in Chapter II;
- (ii) an adequate margin between the purchase price of Texas Pacific gas and the onward selling prices to EGAT;
- (iii) a contract with EGAT for the sale of natural gas which passes on the take-or-pay obligations and price adjustments automatically; and
- (iv) adoption of sound corporate and financial policies and appropriate investment criteria.

5.02 The most significant features of the gas purchase contract with Union and that under negotiation with Texas Pacific are (1) that the gas is bought on a take-or-pay basis, i.e., PTT has to pay for the gas whether taken or not, (2) there is an automatic cost escalation clause under which the price payable by PTT increases each year in relation to certain published indices and (3) their price level as compared with international prices. In view of the major influence of EGAT on the quantity contracted it is essential that these factors (take-or-pay, automatic price adjustment and an appropriate price level) feature in the contract between PTT and EGAT. It has already been agreed that EGAT will take the gas on a take-or-pay basis from the first contract date in the Union contract, although load factors and other details

have yet to be settled. A price of US\$1.90 per MCF in 1978 price terms (90% of the then international fuel oil price) has also been agreed, and should be satisfactory for PTT's purposes providing there is no major cost overrun and providing the Texas Pacific price is close to that agreed with Union. It is also beneficial to EGAT. The price payable by EGAT may need to be reconsidered when agreement is reached with Texas Pacific. The remaining issue, price adjustment, has not been agreed between PTT and EGAT. During negotiations the Government would be asked to agree that the price to be paid by EGAT to PTT for gas supplies would not be less than 90% of the international fuel oil price. A mechanism would be discussed at negotiations for the implementation of the pricing arrangements. EGAT itself should be in a satisfactory financial position provided that it meets the financial covenants agreed earlier this year for the Bang Pakong project (Loan No. 1690-TH). A satisfactory agreement with EGAT covering these points will be a condition of loan effectiveness.

5.03 Achievement of a suitable gas supply contract with EGAT and the cash flow management (as described subsequently) will ensure that the Office of Natural Gas will be in a sound financial position within a few years. While the natural gas operations are expected to have the dominant effect on PTT's overall profits, the Oil and Fuel Organization and the prospective refinery interests will both have a noticeable impact on turnover, cash flow and the asset base. In view of the present position in relation to the transfer from the Ministry of Defense and the fluid position in relation to refinery expansions, it is impractical to incorporate them into any meaningful financial forecast or conventional financial covenant. Instead, PTT will be requested to adopt a statement of corporate and financial objectives covering the commercial nature of the enterprise, the need for a positive real rate of return overall, the need for adequate debt service coverage, the adoption of separate pricing, financial and economic policies for each of its operating arms and the preparation of corporate plans. The Bank would review these aspects annually with PTT. At negotiations the Government will be asked to furnish its views from time to time to the Bank regarding PTT's corporate plans, objectives and forecasts.

#### REVENUE POSITION

5.04 The revenue account for the Office of Natural Gas is projected as below, based on development of the "A" and "B" Structures. It is based on a general annual inflation rate of 7%. The cost of gas assumes a 1978 Texas Pacific price of US\$1.50/MCF. It also takes specific account to date of the various factors entering into the escalation for the Union Oil gas supply, and assumes a regular price adjustment with EGAT. On a DCF basis, the rate of return over the period to 2000 is 15% at constant prices.

OFFICE OF NATURAL GAS REVENUE ACCOUNT

<u>US\$ million</u>	<u>1979-81</u>	<u>1982-86</u>	<u>1987-90</u>
Gas sales income	-	<u>1,812</u>	<u>2,695</u>
Cost of gas	-	1,133	1,743
Operating costs	-	19	23
Depreciation	-	<u>193</u>	<u>234</u>
	-	<u>1,345</u>	<u>2,000</u>
Net income before interest	-	467	695
Interest	<u>34</u>	<u>219</u>	<u>116</u>
Net profit	-34	248	579
Operating ratio	-	.74	.74
Rate of return on revalued assets	-	13%	22%

The above figures are sensitive to the major assumptions on general inflation, Texas Pacific price level, price adjustment etc. Alternative forecasts are in the working papers. Whilst they show a wide range of results, the overall position is satisfactory in all cases.

FINANCIAL POSITION

5.05 The projected balance sheets are based on the financing plan discussed above including the Government input of a further \$77 million for the A Structure and \$28 million for the B Structure, for which assurance would be sought during negotiations. The fixed assets have been revalued at 7% per annum in the same way as allowed for the revenue expenses. Substantial cash surpluses are expected after 1985, which after meeting the needs of the Office of Natural Gas and PTT, would be available to the Government for development projects. During negotiations PTT would be asked to agree that surplus funds from gas operations would only be applied for other purposes after ensuring that sufficient funds are available for meeting the Office's operational debt service and investment requirements.

Office of Natural Gas Balance Sheet at September 30

<u>US\$ million</u>	<u>1981</u>	<u>1986</u>	<u>1990</u>
Fixed assets	513	987	1,294
Less: depreciation	<u>-</u>	<u>217</u>	<u>543</u>
Net fixed assets	513	770	751
Debtors	-	42	61
Cash	<u>-</u>	<u>224</u>	<u>848</u>
Net assets	<u>513</u>	<u>1,036</u>	<u>1,660</u>
Equity and profits	43	319	898
Revaluation reserve	13	261	476
Loans	405	428	246
Creditors	<u>52</u>	<u>28</u>	<u>40</u>
	<u>513</u>	<u>1,036</u>	<u>1,660</u>
Debt/Equity	88/12	43/57	15/85
Quick ratio	-	9.5	22.7

The debt/equity position is expected to reach 60/40 by 1985 and to improve each year thereafter. Nevertheless during negotiations, assurances would be obtained from PTT that no long-term debt will be incurred in respect to the Office of Natural Gas without prior agreement by the Bank, unless the Office's internal cash generation for each future year would cover any future year's maximum debt service on all debt at least 1.2 times from 1982-1985 and 1.5 times thereafter.

FUNDS FLOW

5.06 The funds flow projections, as with the revenue account and balance sheet, reflect the debt-financing package outlined above. In the same way as the other projections, it is particularly sensitive to the general level of inflation and the pricing arrangements with Texas Pacific and EGAT. The revolving credit is assumed to be replenished at the end of each fiscal year. Lower inflation rates result in lower profits and lead to a requirement for short-term funding.

Office of Natural Gas Flow of Funds Projection

<u>US\$ million</u>	<u>1979-81</u>	<u>1982-86</u>	<u>1987-90</u>
Net income before interest	-	467	695
Depreciation	-	193	234
Loans	405	164	-
Government	77	28	-
Creditors	<u>52</u>	<u>-24</u>	<u>12</u>
	<u>534</u>	<u>828</u>	<u>941</u>
Capital expenditure	500	202	-
Debtors	-	42	19
Debt service	34	360	298
Increase in cash balance	<u>-</u>	<u>224</u>	<u>624</u>
	<u>534</u>	<u>828</u>	<u>941</u>
Debt service coverage	-	1.8	3.1

In view of the schedule expected for the first loan repayments (1983 for the commercial loans, 1984 export credits, 1985 World Bank) the debt service coverage is satisfactory for 1982 onwards. On the assumptions used, in no year does debt service coverage fall below 1.5.

INTERMEDIATE POSITION WITH UNION ONLY

5.07 In view of the possibility of delay in signing with Texas Pacific, detailed projections have been made for the Office of Natural Gas finances on the basis of Union supplies alone. The situation shown in these projections (Annex 4.04) is sound. Key figure for 1986, for comparison, are:

	<u>Union only</u>	<u>Union + Texas Pacific</u>
Accumulated profit	\$186 millions	\$214 millions
Debt Equity	41/59	43/57
Quick ratio	16.9	9.5
Rate of return	18%	17%
Operating ratio	0.70	0.74
Debt service coverage	2.1	2.1

The closeness of the two sets of figures is a direct result of the price used for the Texas Pacific gas purchase and the margin between this and the selling price to EGAT. Alternative assumptions on these could increase or reduce the figures significantly.

VI. RECOMMENDATIONS

- 6.01 During negotiations assurance was obtained from PTT that:
- (a) a gas utilization study, a refinery study and an energy audit would be carried out in accordance with terms of reference and a time schedule satisfactory to the Bank (paras. 1.19 and 1.20);
  - (b) a management information system relating to the petroleum sector would be installed (para. 4.05);
  - (c) a progress report would be forwarded to the Bank at agreed intervals and a project control system would be implemented (para. 2.16);
  - (d) it would complete its proposals on its future organization and staffing program for the Office of Natural Gas by June 30, 1980 (para. 4.03);
  - (e) audited accounts for both PTT and its Office of Natural Gas would be submitted to the Bank within six months of the end of each financial year and suitable financial consultants will be appointed (para. 4.06);
  - (f) no long-term debt would be incurred by the Office of Natural Gas without prior agreement by the Bank unless a debt service coverage of 1.2 times would be achieved for 1982 through 1985 and 1.5 times thereafter (para. 5.05);
  - (g) a satisfactory training program would be initiated by March 1, 1980 (para. 2.30);
  - (h) surplus funds from gas operations would only be applied for other purposes after ensuring sufficient funds for requirements of the Office of Natural Gas (para. 5.05);
  - (i) consultants satisfactory to the Borrower and Bank would be engaged in carrying out the Project (para. 2.08).
  - (j) it would adopt a statement of corporate and financial objectives (para 5.03); and
  - (k) commercial loans totalling US\$75 million would be arranged by May 31, 1980 and a further US\$80 million by May 31, 1981 (para. 2.24).

6.02 Assurance was obtained during negotiations that:

- (a) the Government would provide funds in the form of equity to finance land purchases and taxes (para. 2.21);
- (b) the Government would from time to time give its views to the Bank regarding PTT's corporate plans and objectives (para. 5.03);
- (c) the Government would forward its proposal to the Bank for review and comment before undertaking any institutional reorganization affecting natural gas operations (para. 1.27); and
- (d) the Government would ensure collaboration between its agencies in respect of formulating and implementing national energy policies (para. 1.30).

6.03 Conditions of loan effectiveness would be that:

- (a) the appropriate commitments for export credits have been arranged (para. 2.24);
- (b) the EGAT contract has been duly executed by both PTT and EGAT (para. 5.02); and
- (c) the Union Oil contract has come into effect without any restrictions (para. 3.03).

6.04 With satisfactory resolution of the items outlined above, the project constitutes a suitable basis for a Bank loan of US\$107.0 million including retroactive financing of US\$3.0 million engineering and consulting services and refinancing of the US\$4.9 million engineering loan (S-10TH).

THAILAND

NATURAL GAS DEVELOPMENT PROJECT

Gas Supply and Demand Forecasts

The proven gas reserves would support 250 MMSCFD from both the Union and Texas Pacific structures, equivalent together to 470 MMSCFD at 1,000 Btu/cuft. This gas would supply a proportion of the EGAT demand and meet the industrial demand along the pipeline route. Over 100 MMSCFD of EGAT demand will be met by fuel oil.

The Texas Pacific structure should be capable of supporting an increased output and the Union structures nearer to the shore look promising. At this stage only rough forecasts can be made of the likely production from an enlarged Texas Pacific structure and from new structures. The 166 MMSCFD shown below is a conservative estimate.

Additional energy demands exist around Bangkok and at Saraburi 100 km. to the north-east of Bangkok. Satisfaction of these demands is dependent on both the discovery of additional reserves and resolution of the fuel oil problem. Their potential gas demand is shown below as additional industrial demand.

Possible gas supply and demand is as below. The quantities have been standardized at a calorific value of 1000 Btu/cuft.

<u>MMSCFD</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1990</u>
<u>Supply</u>							
Union 'A'	210	262	262	262	262	262	262
Texas Pacific 'B'	-	-	124	124	166	208	208
<hr/>							
Basic Supply	210	262	386	386	428	470	470
Additional Supplies	-	-	83	83	166	166	166
<hr/>							
Potential Supply	210	262	469	469	594	636	636
<hr/>							
<u>Demand</u>							
EGAT	296	414	532	532	556	556	581
Industry (along pipeline route)	29	32	35	39	41	44	48
<hr/>							
Basic Demand	325	446	567	571	597	600	629
Additional Industrial Demand	153	160	168	172	178	182	194
Potential Use as LPG	-	-	-	-	-	54	60
<hr/>							
	478	606	735	743	775	836	883
<hr/>							
Basic deficit (basic demand less basic supply)	115	184	181	185	169	130	159

The above do not take account of the non-energy uses of natural gas. Studies have already been undertaken on the possibility of petrochemicals, ammonia and sponge iron reduction, together totalling 128 MMSCFD. These together with the LPG extraction, do not affect the fuel oil issue. The necessary study of the alternative uses of gas is to be financed as part of the project.

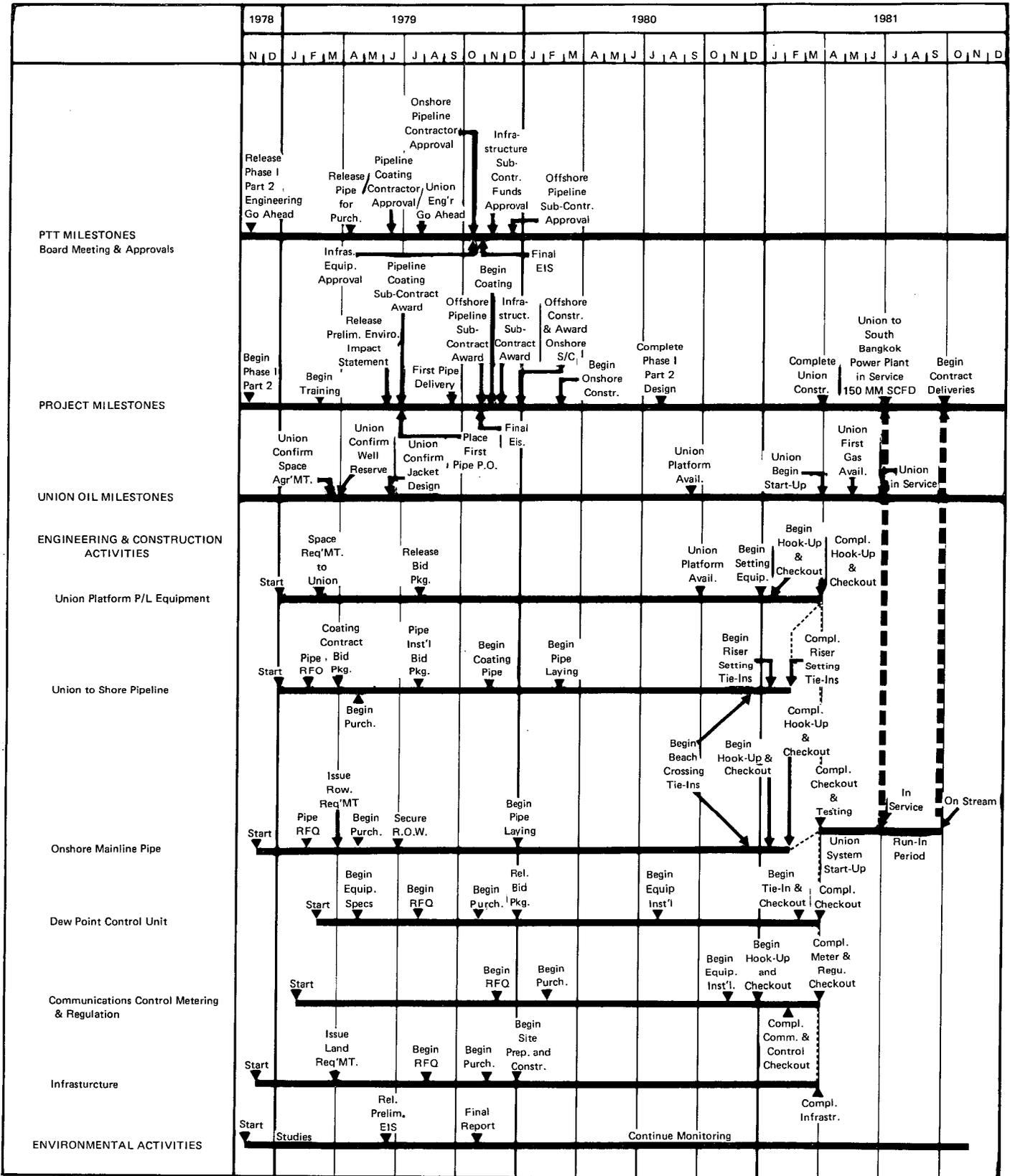
THAILAND

NATURAL GAS DEVELOPMENT PROJECT

Estimated Schedule of Disbursements

<u>IBRD Fiscal Year and Quarter</u>	<u>Cumulative Disbursement at End of Quarter (US\$'000)</u>
<u>1979/80</u>	
March 31, 1980	4,900
June 30, 1980	19,000
<u>1980/81</u>	
September 30, 1980	38,000
December 31, 1981	53,000
March 31, 1981	68,000
June 30, 1981	83,000
<u>1981/82</u>	
September 30, 1981	97,000
December 31, 1981	98,000
March 31, 1982	99,000
June 30, 1982	100,000
<u>1982/83</u>	
September 30, 1982	101,000
December 31, 1982	103,000
March 31, 1983	105,000
June 30, 1983	106,000
<u>1983/84</u>	
September 30, 1983	107,000

THAILAND  
NATURAL GAS DEVELOPMENT PROJECT  
MASTER PROGRAM SCHEDULE PHASE I



THAILAND

NATURAL GAS DEVELOPMENT PROJECT

The Union Oil Contract and the Tax Letter

1. Union and PTT signed a side letter relating to taxation of even date (28 September 1978) with the gas purchase contract. The aim of this letter was to ensure that Union's tax payments in Thailand are allowed as credits against United States taxes.
2. The letter provided that Union would seek a ruling from the Internal Revenue Service of the United States on the compatibility of Thai taxes and US taxes. The gas purchase contract would be activated on receipt of a favorable ruling and, by an amendment dated 4 May 1979, the first contract date would be 28 months after receipt of a favorable ruling and the completion by Thailand of any necessary action (e.g., a favorable ruling on 1st October 1979 and passing of legislation in Thailand on 1st December 1979 would lead to a contract commencement date of 1st April 1982, six months after the date of 1st October 1981 which would apply in the absence of the tax letter). Receipt or expectation of an unfavorable ruling led to cancellation of the obligations on both Union and PTT including possible cancellation of the gas supply contract.
3. The September 1978 letter was cancelled and superseded by a letter dated July 20, 1979 which provided for the gas supply contract to be activated once the Thai tax law was amended to make it compatible with US tax laws in a form agreed between the Government and Union Oil. Union Oil would thereby take the risk on whether Thai tax payments were creditable in the USA. At the same time the letter sets the contract delivery date 24 months after the changes to the Thai legislation become law. The proposed changes would have the effect of bringing Thai law closer to that in a number of other countries and would have no fiscal effect on Thailand.
4. It is understood that the changes in the Thai law are likely to be made in October 1979. PTT will then consider whether to shorten the period for commencement of gas deliveries.
5. Union Oil submitted the proposed changes to the US Internal Revenue Service on September 11, 1978. It is not known when the ruling might be made, however it is worth noting that applications relating to other countries have taken several years.

**PTT GAS PROJECT**  
**KINGDOM OF THAILAND - CASH FLOW ANALYSIS**  
**IN MILLIONS OF DOLLARS**

ANNEX 3.02  
Page 1 of 2

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
VALUE OF GAS PER MMBTU	-	2.40	3.30	3.55	3.78	4.04	4.33	4.63	4.95	5.30
TEXAS PRODUCTION	-	-	-	-	-	-	150.00	150.00	200.00	250.00
UNION PRODUCTION	-	-	-	-	200.00	250.00	250.00	250.00	250.00	250.00
VALUE OF GAS	-	-	-	-	289.19	386.35	510.84	653.17	773.29	908.23
INCOME TAXES PAID	-	-	-	-	-	68.79	71.29	85.85	98.81	160.89
ROYALTIES ON GAS AND CONDENSATE	-	-	-	-	15.25	18.73	32.00	38.29	41.31	49.09
TOTAL INFLOWS, KINGDOM OF THAILAND	-	-	-	-	304.44	468.87	714.13	773.31	913.41	1,118.33
TOTAL FIXED ASSETS INCREASE	-	4.90	219.10	411.00	60.00	7.00	-	-	-	-
LESS TAXES PAID ON FIXED ASSETS	-	-	(32.00)	(57.00)	(12.00)	-	-	-	-	-
COST OF GAS	-	-	-	-	122.12	149.87	256.24	274.30	330.22	392.62
OPERATING COSTS	-	-	-	-	2.50	2.60	4.40	4.60	4.90	5.24
COST OF CHANGE OF BOILER TYPE	-	-	15.00	-	-	-	-	-	-	-
INCREASE IN MINIMUM WORKING CAPITAL	-	(0.81)	(35.21)	(31.95)	21.55	(2.37)	(27.85)	(5.29)	(15.55)	(17.19)
TOTAL OUTFLOWS, KINGDOM OF THAILAND	-	4.09	166.89	322.45	194.17	157.10	282.81	273.61	319.59	380.67
TOTAL CASHFLOW, KINGDOM OF THAILAND	-	(4.09)	(166.89)	(322.45)	110.27	311.77	481.32	499.70	593.82	737.66
DISCOUNTED CASHFLOW, KINGDOM OF THAILAND	-	(3.50)	(121.91)	(201.33)	58.85	142.20	187.64	166.50	169.11	179.53
ACCUMULATED DISCOUNTED CASHFLOW	-	(3.50)	(125.41)	(326.74)	(267.89)	(125.69)	61.95	228.45	397.56	577.11

RETURN ON INVESTMENT = 48%

1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.67	6.07	6.49	6.94	7.43	7.95	8.51	9.11	9.75	10.43	11.16	11.94	12.78
250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00
250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00
971.65	1,040.20	1,112.18	1,189.29	1,273.26	1,362.37	1,458.34	1,561.16	1,670.83	1,787.36	1,912.46	2,046.13	2,190.08
190.23	198.89	196.98	196.28	198.58	207.59	219.97	232.15	245.83	261.35	275.19	292.24	305.02
52.51	56.15	60.09	64.29	68.84	73.56	78.71	84.23	90.14	96.38	103.20	110.40	118.15
1,214.39	1,295.24	1,369.25	1,449.86	1,540.68	1,643.52	1,757.02	1,877.54	2,006.77	2,145.09	2,290.85	2,448.77	2,613.25
-	-	-	-	-	-	-	-	-	-	-	-	-
420.00	449.11	480.76	514.26	550.47	588.69	629.77	673.81	720.92	771.21	825.51	883.28	945.27
5.61	6.00	6.42	6.87	7.35	7.86	8.41	9.00	9.63	10.30	11.02	11.79	12.62
(8.04)	(8.64)	(9.08)	(9.70)	(10.39)	(11.25)	(11.94)	(12.88)	(13.83)	(14.78)	(15.81)	(16.79)	(18.06)
417.57	446.47	478.10	511.43	547.43	585.30	626.24	669.93	716.72	766.73	820.72	878.25	939.83
796.82	848.77	891.15	938.43	993.25	1,058.22	1,130.78	1,207.61	1,290.05	1,378.36	1,470.13	1,570.52	1,673.42
165.77	150.92	135.43	121.89	110.27	100.41	91.71	83.71	76.43	69.80	63.63	58.10	52.91
742.88	893.80	1,029.23	1,151.12	1,261.39	1,361.80	1,453.51	1,537.22	1,613.65	1,683.45	1,747.08	1,805.18	1,858.09

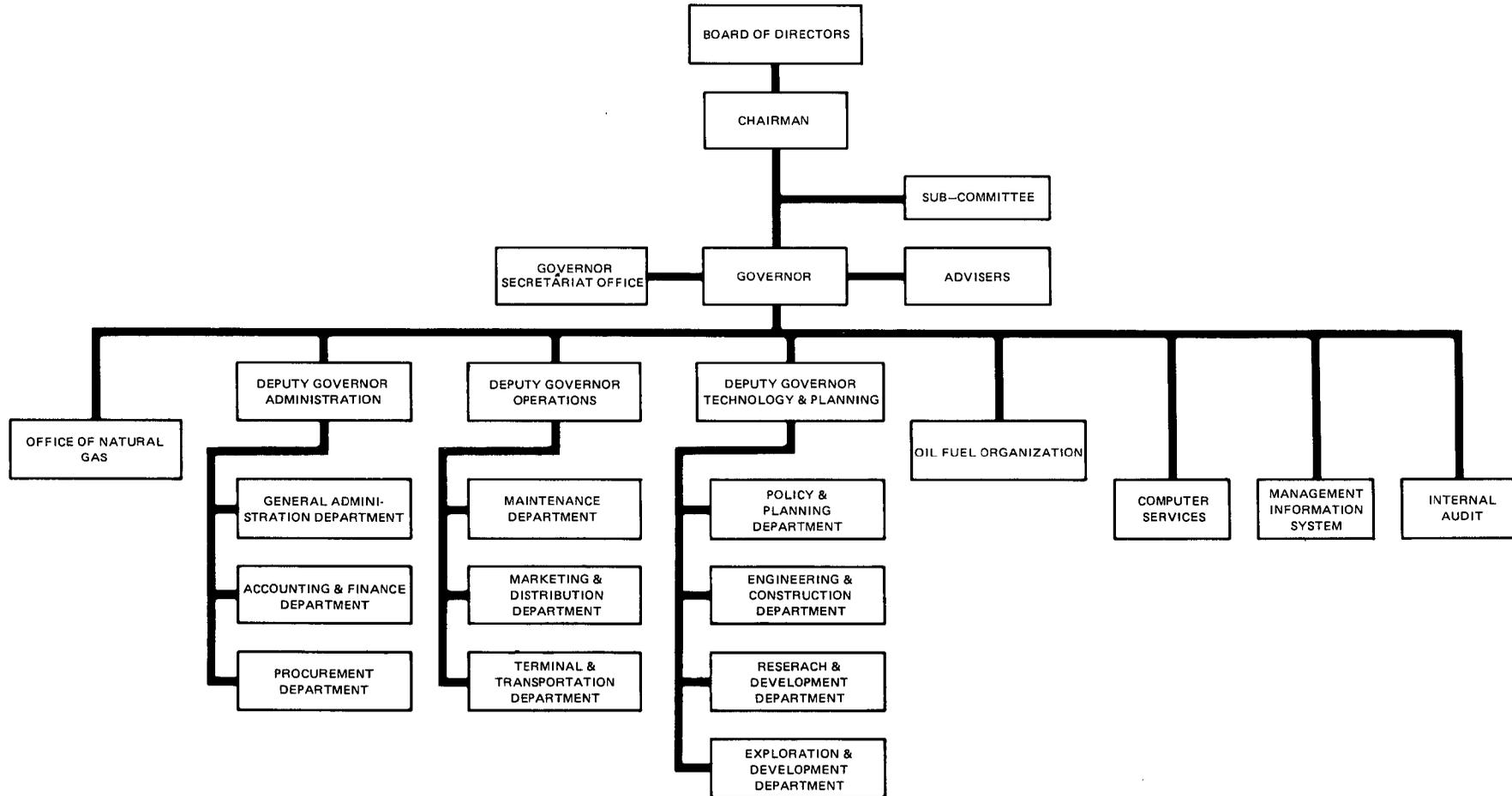
PTT GAS PROJECT  
KINGDOM OF THAILAND - CASH FLOW ANALYSIS  
IN MILLIONS OF DOLLARS

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
VALUE OF GAS PER MMBTU	2.40	3.30	3.53	3.78	4.04	4.33	4.63	4.95	5.30	5.67	6.09
TEXAS PRODUCTION	-	-	-	-	-	-	-	-	-	-	-
UNION PRODUCTION	-	-	-	200.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00
VALUE OF GAS	-	-	-	289.19	386.35	414.04	442.77	473.37	506.84	542.22	580.07
INCOME TAXES PAID	-	-	-	-	63.79	71.29	85.85	98.81	116.10	124.68	135.73
ROYALTIES ON GAS AND CONDENSATE	-	-	-	15.25	18.73	20.01	21.45	22.98	24.57	26.29	28.11
TOTAL INFLOWS, KINGDOM OF THAILAND	-	-	-	304.84	468.87	505.38	550.07	595.16	647.51	693.19	735.36
TOTAL FIXED ASSETS INCREASE	4.90	179.10	276.00	16.00	6.00	-	-	-	-	-	-
LESS TAXES PAID ON FIXED ASSETS	-	(32.00)	(37.00)	(4.00)	-	-	-	-	-	-	-
COST OF GAS	-	-	-	122.12	149.87	160.36	171.60	183.59	196.46	210.21	224.93
OPERATING COSTS	-	-	-	2.50	2.60	4.40	4.60	4.90	5.24	5.61	6.00
COST OF CHANGE OF BOILER TYPE	-	15.00	-	-	-	-	-	-	-	-	-
INCREASE IN MINIMUM WORKING CAPITAL	(0.81)	(28.64)	(15.93)	6.59	(9.44)	(2.47)	(3.51)	(3.84)	(4.04)	(4.37)	(4.71)
TOTAL OUTFLOWS, KINGDOM OF THAILAND	4.09	133.46	223.07	143.21	149.03	162.29	172.69	184.65	197.66	211.45	226.22
TOTAL CASHFLOW, KINGDOM OF THAILAND	(4.09)	(133.46)	(223.07)	161.25	319.84	343.09	377.38	410.51	449.85	481.74	509.14
DISCOUNTED CASHFLOW, KINGDOM OF THAILAND	(3.50)	(97.50)	(139.28)	86.04	145.88	133.75	125.74	116.91	109.49	100.22	90.53
ACCUMULATED DISCOUNTED CASHFLOW	(3.50)	(101.00)	(240.28)	(154.24)	(8.36)	125.39	251.13	368.04	477.53	577.75	668.28

RETURN ON INVESTMENT = 53%

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00
620.64	663.67	710.53	750.26	813.81	871.19	932.39	997.42	1,067.23	1,141.82	1,222.15	
128.54	132.68	136.93	141.08	148.25	152.46	160.30	168.43	172.11	180.27	183.65	
30.08	32.20	34.47	36.83	39.42	42.20	45.14	48.29	51.70	55.30	59.17	
779.30	828.55	881.93	938.17	1,001.48	1,065.85	1,137.83	1,214.14	1,291.04	1,377.39	1,464.97	
240.67	257.51	275.54	294.83	315.46	337.54	361.17	386.46	413.50	442.46	473.43	
6.42	6.87	7.35	7.86	8.41	9.00	9.63	10.30	11.02	11.79	12.62	
(4.93)	(5.28)	(5.63)	(6.13)	(6.50)	(7.00)	(7.52)	(8.05)	(8.58)	(9.13)	(9.81)	
242.15	259.10	277.26	296.56	317.37	339.54	363.28	388.71	415.94	445.12	476.24	
537.14	569.45	604.67	641.61	684.11	726.31	774.55	825.43	875.10	932.27	988.73	
81.63	73.97	67.13	60.88	55.48	50.35	45.89	41.80	37.87	34.49	31.26	
749.91	823.88	891.01	951.89	1,007.37	1,057.72	1,103.61	1,145.41	1,183.28	1,217.77	1,249.03	

THAILAND  
NATURAL GAS DEVELOPMENT PROJECT  
ORGANIZATION CHART OF THE PETROLEUM AUTHORITY OF THAILAND



THAILAND

NATURAL GAS DEVELOPMENT PROJECT

Notes and Assumptions on Financial Statements

General

1. In common with other Thai state enterprises, the financial year for PTT and the Office of Natural Gas runs from the previous October through September.
2. The accounts will follow the normal accounting principles of US gas utilities.
3. No assessment has been made of likely transfers of surplus cash to the Government.

Revenue Account

1. Inflation for gas purchase costs to fiscal 1980 has been based on contract terms for the Union gas. Gas costs are assumed to inflate at 7% thereafter. Inflation on the sale price is assumed to parallel that for the purchase price. Inflation of operating costs has been estimated to be 7%.
2. Production is based on the contract with Union and the draft contract with Texas Pacific as discussed in paragraph 2.06 and heat content has been taken at 1,048 Btu/cuft for Union gas and 830 Btu/cuft for Texas Pacific. No LPG extraction is allowed for.
3. Operating costs are as estimated by Fluor. They are on the basis that Texas Pacific will provide compression as provided in the draft contract.
4. Depreciation has been based on a 20 year life. Replacement cost is based on 7% inflation.
5. Interest has been based on 8% for IBRD loans, 8% for Export-Import bank loans and 10-1/2% for commercial bank loans.

Flow of Funds

1. Capital expenditure is based on Fluor's best estimate (50% confidence level) of capital costs and possible price levels for the major "A" Structure Phase contracts, plus physical contingencies and general inflation (where appropriate) estimated by Bank staff. "B" Structure Phase costs are as estimated by Fluor.

2. Debt repayments are based on first repayment in 1983 for the commercial loans, 1984 for the export credits and 1985 for the Bank loan. Repayment periods assumed are 12 years for the commercial loans, 12 years for export credits and 15 years for the Bank loan. The revolving credit is assumed replenished at 30th September each year.
3. Working capital requirements are based on one month's sales income and one week's cash needs less one month's cost of gas and two month's capital payments.

PTT GAS PROJECT  
REVENUE ACCOUNT  
IN MILLIONS OF DOLLARS  
ESCALATED COSTS

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
TEXAS PACIFIC GAS COST	-	1.50	1.61	1.72	1.84	1.97	2.11	2.26	2.42	2.59
UNION GAS COST TO 75	-	-	1.4541	1.7013	1.8203	1.9478	2.0842	2.2300	2.3861	2.5531
UNION GAS COST 76 - 150	-	-	1.2975	1.5180	1.6243	1.7380	1.8597	1.9899	2.1292	2.2782
UNION GAS COST 151 - 200	-	-	0.9732	1.1386	1.2183	1.3036	1.3949	1.4925	1.5970	1.7088
UNION GAS COST 201 UP	-	-	0.7494	0.8768	0.9382	1.0040	1.0741	1.1493	1.2298	1.3159
UNION PRODUCTION, MMCFD	-	-	-	-	200.00	250.00	250.00	250.00	250.00	250.00
TEXAS PRODUCTION, MMCFD	-	-	-	-	-	-	150.00	150.00	200.00	250.00
TOTAL PRODUCTION, MMCFD	-	-	-	-	200.00	250.00	400.00	400.00	450.00	500.00
SELLING PRICE	-	1.90	2.01	2.36	2.52	2.70	2.89	3.09	3.31	3.54
CALORIFIC VALUE, UNION GAS	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00
CALORIFIC VALUE, TEXAS GAS	830.00	830.00	830.00	830.00	830.00	830.00	830.00	830.00	830.00	830.00
	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
INCOME SALE OF GAS	-	-	-	-	192.79	258.20	407.70	435.92	517.09	606.64
COST OF GAS	-	-	-	-	122.12	149.87	256.24	274.30	330.22	392.62
OPERATING COSTS	-	-	-	-	2.50	2.60	4.40	4.60	4.90	5.24
DEPRECIATION CHARGE	-	-	-	-	26.10	28.25	43.25	46.12	49.34	52.80
NET INCOME BEFORE INTEREST	-	-	-	-	42.07	77.48	103.81	110.90	132.63	155.98
INTEREST CHARGE	-	3.02	6.83	24.25	41.93	48.01	46.62	43.05	39.18	35.17
NET INCOME AFTER INTEREST	-	(3.02)	(6.83)	(24.25)	0.14	29.47	57.19	67.85	93.45	120.81
	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
OPERATING RATIO	-	-	-	-	0.78	0.70	0.75	0.75	0.74	0.74

PTT GAS PROJECT  
REVENUE ACCOUNT  
IN MILLIONS OF DOLLARS  
ESCALATED COSTS

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
TEXAS PACIFIC GAS COST	2.77	2.96	3.17	3.39	3.63	3.88	4.15	4.44	4.75	5.08
UNION GAS COST TO 75	2.7318	2.9230	3.1276	3.3465	3.5808	3.8315	4.0997	4.3867	4.6938	5.0224
UNION GAS COST 76 - 150	2.4377	2.6083	2.7909	2.9863	3.1953	3.4190	3.6583	3.9144	4.1884	4.4816
UNION GAS COST 151 - 200	1.8284	1.9564	2.0933	2.2398	2.3966	2.5644	2.7439	2.9360	3.1415	3.3614
UNION GAS COST 201 UP	1.4080	1.5066	1.6121	1.7249	1.8456	1.9748	2.1130	2.2609	2.4192	2.5885
UNION PRODUCTION, MMCFD	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00
TEXAS PRODUCTION, MMCFD	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00
TOTAL PRODUCTION, MMCFD	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00
SELLING PRICE	3.79	4.06	4.34	4.64	4.96	5.31	5.68	6.08	6.51	6.97
CALORIFIC VALUE, UNION GAS	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00
CALORIFIC VALUE, TEXAS GAS	830.00	830.00	830.00	830.00	830.00	830.00	830.00	830.00	830.00	830.00
	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
INCOME SALE OF GAS	649.49	695.75	743.73	795.14	849.98	909.97	973.37	1,041.91	1,115.60	1,194.43
COST OF GAS	420.00	449.11	480.76	514.26	550.47	588.69	629.77	673.81	720.92	771.21
OPERATING COSTS	5.61	6.00	6.42	6.87	7.35	7.86	8.41	9.00	9.63	10.30
DEPRECIATION CHARGE	56.49	60.45	64.69	69.22	74.06	79.24	84.79	90.72	97.07	103.87
NET INCOME BEFORE INTEREST	167.39	180.19	191.86	204.79	218.10	234.18	250.40	268.38	287.98	309.05
INTEREST CHARGE	31.15	27.14	23.13	19.12	15.10	11.09	7.08	3.82	2.28	1.71
NET INCOME AFTER INTEREST	136.24	153.05	168.73	185.67	203.00	223.09	243.32	264.56	285.70	307.34
	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
OPERATING RATIO	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74

PTT GAS PROJECT  
REVENUE ACCOUNT  
IN MILLIONS OF DOLLARS  
ESCALATED COSTS

	1998	1999	2000
TEXAS PACIFIC GAS COST	5.44	5.82	6.23
UNION GAS COST TO 75	5.3740	5.7502	6.1527
UNION GAS COST 76 - 150	4.7953	5.1310	5.4902
UNION GAS COST 151 - 200	3.5967	3.8485	4.1179
UNION GAS COST 201 UP	2.7697	2.9636	3.1711
UNION PRODUCTION, MMCFD	250.00	250.00	250.00
TEXAS PRODUCTION, MMCFD	250.00	250.00	250.00
TOTAL PRODUCTION, MMCFD	500.00	500.00	500.00
SELLING PRICE	7.46	7.98	8.54
CALORIFIC VALUE, UNION GAS	1,048.00	1,048.00	1,048.00
CALORIFIC VALUE, TEXAS GAS	830.00	830.00	830.00
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INCOME SALE OF GAS	1,278.40	1,367.52	1,463.48
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COST OF GAS	825.51	883.25	945.27
OPERATING COSTS	11.02	11.79	12.62
DEPRECIATION CHARGE	111.14	118.92	127.24
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NET INCOME BEFORE INTEREST	330.73	353.56	378.35
INTEREST CHARGE	1.14	0.57	0.14
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NET INCOME AFTER INTEREST	329.59	352.99	378.21
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OPERATING RATIO	0.74	0.74	0.74

PTT GAS PROJECT  
BALANCE SHEET  
IN MILLIONS OF DOLLARS  
ESCALATED COSTS

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
GROSS FIXED ASSETS, REVALUED	-	4.90	184.00	513.00	700.00	799.00	865.00	922.35	986.91	1,056.00	1,129.92
LESS ACCUMULATED DEPRECIATION	-	-	-	-	(26.10)	(56.18)	(103.36)	(156.72)	(217.03)	(285.02)	(361.46)
NET REVALUED FIXED ASSETS	-	4.90	184.00	513.00	673.90	742.82	761.64	765.63	769.88	770.98	768.46
CASH	-	-	-	-	5.78	7.75	57.90	128.78	223.84	349.58	495.38
ACCOUNTS RECEIVABLE	-	-	-	-	15.85	21.22	33.51	35.83	42.50	49.86	53.38
TOTAL ASSETS	-	4.90	184.00	513.00	695.53	771.79	853.05	930.24	1,036.22	1,170.42	1,317.22
EQUITY CAPITAL	-	1.10	40.00	77.00	105.00	105.00	105.00	105.00	105.00	105.00	105.00
REVALUATION RESERVE	-	-	-	13.00	49.00	96.17	157.24	207.35	260.94	314.84	368.81
ACCUMULATED RETAINED EARNINGS	-	(3.02)	(9.85)	(34.10)	(33.96)	(4.49)	52.70	120.55	214.00	334.81	471.05
TOTAL EQUITY	-	(1.92)	30.15	55.90	120.04	196.68	314.94	432.90	579.94	754.65	944.86
LONG TERM DEBT	-	-	-	-	-	-	-	-	-	-	-
WORLD BANK	-	4.90	38.00	97.00	101.00	107.00	107.00	103.43	96.30	89.17	82.03
EXXIM	-	-	69.00	192.00	267.00	289.00	265.83	241.67	217.50	193.33	169.17
COMMERCIAL SYNDICATION	-	1.12	17.42	116.16	172.43	158.06	143.69	129.32	114.95	100.58	86.21
LONG TERM DEBT	-	6.02	124.42	405.16	540.43	554.06	516.52	474.42	428.75	383.08	337.41
SHORT TERM DEBT	-	-	-	-	-	0.30	-	-	-	-	-
ACCOUNTS PAYABLE	-	0.81	29.44	51.95	35.06	20.75	21.59	22.92	27.54	32.70	34.98
TOTAL LIABILITIES	-	6.83	153.86	457.11	575.49	575.11	538.11	497.34	456.29	415.78	372.39
TOTAL LIABILITIES AND EQUITY	-	4.91	184.01	513.01	695.53	771.79	853.05	930.24	1,036.23	1,170.43	1,317.25
DEBT EQUITY RATIO	-	1.47	0.80	0.88	0.82	0.74	0.62	0.52	0.43	0.34	0.26
CURRENT RATIO	-	-	-	-	0.62	1.40	4.23	7.18	9.67	12.22	15.69
RETURN ON AVERAGE NET ASSETS (%)	-	-	-	-	7.09	10.94	13.80	14.52	17.28	20.25	21.75

PTT GAS PROJECT  
BALANCE SHEET  
IN MILLIONS OF DOLLARS  
ESCALATED COSTS

	1989	1990	1991	1992	1993	1994	1995	1996	1997
GROSS FIXED ASSETS, REVALUED	1,209.01	1,293.64	1,384.20	1,481.10	1,584.78	1,695.72	1,814.42	1,941.43	2,077.33
LESS ACCUMULATED DEPRECIATION	(447.21)	(543.20)	(650.44)	(770.03)	(903.17)	(1,051.18)	(1,215.48)	(1,397.63)	(1,599.33)
NET REVALUED FIXED ASSETS	761.80	750.44	733.76	711.07	681.61	644.54	598.94	543.80	478.00
CASH	661.82	848.26	1,056.04	1,285.93	1,540.85	1,821.51	2,143.53	2,517.04	2,918.82
ACCOUNTS RECEIVABLE	57.18	61.13	65.35	69.86	74.79	80.00	85.64	91.69	98.17
TOTAL ASSETS	1,480.80	1,659.83	1,855.15	2,066.86	2,297.25	2,546.05	2,828.11	3,152.53	3,494.99
EQUITY CAPITAL	105.00	105.00	105.00	105.00	105.00	105.00	105.00	105.00	105.00
REVALUATION RESERVE	422.60	475.93	528.47	579.84	629.62	677.34	722.46	764.39	802.46
ACCUMULATED RETAINED EARNINGS	624.10	792.83	978.50	1,181.50	1,404.59	1,647.91	1,912.47	2,198.17	2,505.51
TOTAL EQUITY	1,151.70	1,373.76	1,611.97	1,866.34	2,139.21	2,430.25	2,739.93	3,067.56	3,412.97
LONG TERM DEBT									
WORLD BANK	74.90	67.77	60.63	53.50	46.37	39.23	32.10	24.97	17.83
EXXIM	145.00	120.83	96.67	72.50	48.33	24.17	-	-	-
COMMERCIAL SYNDICATION	71.85	57.48	43.11	28.74	14.37	-	-	-	-
LONG TERM DEBT	291.75	246.08	200.41	154.74	109.07	63.40	32.10	24.97	17.83
SHORT TERM DEBT	-	-	-	-	-	-	-	-	-
ACCOUNTS PAYABLE	37.41	40.04	42.83	45.85	49.03	52.45	56.12	60.05	64.23
TOTAL LIABILITIES	329.16	286.12	243.24	200.59	158.10	115.85	88.22	85.02	82.06
TOTAL LIABILITIES AND EQUITY	1,480.86	1,659.88	1,855.21	2,066.93	2,297.31	2,546.10	2,828.15	3,152.58	3,495.03
DEBT EQUITY RATIO	0.20	0.15	0.11	0.08	0.05	0.03	0.01	0.01	0.01
CURRENT RATIO	19.22	22.71	26.18	29.57	32.95	36.25	39.72	43.44	46.97
RETURN ON AVERAGE NET ASSETS (%)	23.55	25.37	27.60	30.19	33.63	37.76	43.17	50.40	60.49

FTT GAS PROJECT  
BALANCE SHEET  
IN MILLIONS OF DOLLARS  
ESCALATED COSTS

	1998	1999	2000
GROSS FIXED ASSETS, REVALUED	2,222.75	2,378.34	2,544.83
LESS ACCUMULATED DEPRECIATION	(1,822.42)	(2,068.91)	(2,340.97)
NET REVALUED FIXED ASSETS	400.33	309.43	203.86
CASH	3,350.04	3,812.31	4,311.46
ACCOUNTS RECEIVABLE	105.07	112.40	120.29
TOTAL ASSETS	3,855.44	4,234.14	4,635.61
EQUITY CAPITAL	105.00	105.00	105.00
REVALUATION RESERVE	835.93	863.95	885.62
ACCUMULATED RETAINED EARNINGS	2,835.10	3,188.09	3,566.30
TOTAL EQUITY	3,776.03	4,157.04	4,556.92
LONG TERM DEBT			
WORLD BANK	10.70	3.57	-
EXXIM	-	-	-
COMMERCIAL SYNDICATION	-	-	-
LONG TERM DEBT	10.70	3.57	-
SHORT TERM DEBT	-	-	-
ACCOUNTS PAYABLE	68.76	73.56	78.73
TOTAL LIABILITIES	79.46	77.13	78.73
TOTAL LIABILITIES AND EQUITY	3,855.49	4,234.17	4,635.65
DEBT EQUITY RATIO	-	-	-
CURRENT RATIO	50.25	53.35	56.29
RETURN ON AVERAGE NET ASSETS (%)	75.31	99.63	147.42

PTT GAS PROJECT  
SOURCE AND APPLICATION OF FUNDS  
IN MILLION OF DOLLARS  
ESCALATED COSTS

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
INCOME BEFORE INTEREST	-	-	-	-	42.07	77.48	103.81	110.90	132.63	155.98	167.39	180.19
DEPRECIATION	-	-	-	-	26.10	28.25	43.25	46.12	49.34	52.80	56.49	60.45
INTERNAL CASH GENERATION	-	-	-	-	68.17	105.73	147.06	157.02	181.97	208.78	223.88	240.64
CHANGE IN ACCOUNTS PAYABLE	-	0.81	28.63	22.51	(16.89)	(14.31)	0.84	1.33	4.62	5.16	2.28	2.43
WORLD BANK DRAW DOWN	-	4.90	33.10	59.00	4.00	6.00	-	-	-	-	-	-
EXXIM DRAW DOWN	-	-	69.00	123.00	75.00	22.00	1.00	-	-	-	-	-
COMMERCIAL SYNDICATION DRAW DOWN	-	1.12	16.29	98.74	56.27	-	-	-	-	-	-	-
SHORT TERM DRAWDOWN	-	-	-	-	-	0.30	-	-	-	-	-	-
INCREASE IN EQUITY	-	1.10	38.90	37.00	28.00	-	-	-	-	-	-	-
TOTAL SOURCES	-	7.12	157.29	317.74	231.44	134.03	148.06	157.02	181.97	208.78	223.88	240.64
CAPITAL EXPENDITURE	-	4.90	179.10	316.00	151.00	50.00	1.00	-	-	-	-	-
LOAN REPAYMENT	-	-	-	-	-	-	-	3.57	7.13	7.13	7.13	7.13
WORLD BANK	-	-	-	-	-	-	-	24.17	24.17	24.17	24.17	24.17
EXXIM	-	-	-	-	-	-	14.37	14.37	14.37	14.37	14.37	14.37
SYNDICATION	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL REPAYMENT LONG TERM DEBT	-	-	-	-	-	14.37	38.54	42.11	45.67	45.67	45.67	45.67
REPAYMENT SHORT TERM DEBT	-	-	-	-	-	-	0.30	-	-	-	-	-
INTEREST ON LOANS	-	3.02	6.83	24.25	41.93	48.01	46.62	43.05	39.18	35.17	31.15	27.14
TOTAL DEBT SERVICE	-	3.02	6.83	24.25	41.93	62.38	85.46	85.16	84.85	80.84	76.82	72.81
CHANGE IN CASH BALANCE	-	-	-	-	5.78	1.97	50.15	70.88	95.06	125.74	145.80	166.44
CHANGE IN ACCOUNTS RECEIVABLE	-	-	-	-	15.85	5.37	12.29	2.32	6.67	7.36	3.52	3.80
TOTAL APPLICATIONS	-	7.11	157.30	317.74	231.45	134.03	148.06	157.03	181.96	208.78	223.86	240.62
DEBT SERVICE COVERAGE	-	-	-	-	1.63	1.69	1.72	1.84	2.14	2.58	2.91	3.30

PTT GAS PROJECT  
SOURCE AND APPLICATION OF FUNDS  
IN MILLION OF DOLLARS  
ESCALATED COSTS

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
INCOME BEFORE INTEREST	191.86	204.79	218.10	234.18	250.40	268.38	287.98	309.05	330.73	353.56	378.35
DEPRECIATION	64.69	69.22	74.06	79.24	84.79	90.72	97.07	103.87	111.14	118.92	127.24
INTERNAL CASH GENERATION	256.55	274.01	292.16	313.42	335.19	359.10	385.05	412.92	441.87	472.48	505.59
CHANGE IN ACCOUNTS PAYABLE	2.63	2.79	3.02	3.18	3.42	3.67	3.93	4.18	4.53	4.80	5.17
WORLD BANK DRAW DOWN	-	-	-	-	-	-	-	-	-	-	-
EXXIM DRAW DOWN	-	-	-	-	-	-	-	-	-	-	-
COMMERCIAL SYNDICATION DRAW DOWN	-	-	-	-	-	-	-	-	-	-	-
SHORT TERM DRAWDOWN	-	-	-	-	-	-	-	-	-	-	-
INCREASE IN EQUITY	-	-	-	-	-	-	-	-	-	-	-
TOTAL SOURCES	256.55	274.01	292.16	313.42	335.19	359.10	385.05	412.92	441.87	472.48	505.59
CAPITAL EXPENDITURE	-	-	-	-	-	-	-	-	-	-	-
LOAN REPAYMENT	-	-	-	-	-	-	-	-	-	-	-
WORLD BANK	7.13	7.13	7.13	7.13	7.13	7.13	7.13	7.13	7.13	7.13	3.57
EXXIM	24.17	24.17	24.17	24.17	24.17	24.17	-	-	-	-	-
SYNDICATION	14.37	14.37	14.37	14.37	14.37	-	-	-	-	-	-
TOTAL REPAYMENT LONG TERM DEBT	45.67	45.67	45.67	45.67	45.67	31.30	7.13	7.13	7.13	7.13	3.57
REPAYMENT SHORT TERM DEBT	-	-	-	-	-	-	-	-	-	-	-
INTEREST ON LOANS	23.13	19.12	15.10	11.09	7.08	3.82	2.28	1.71	1.14	0.57	0.14
TOTAL DEBT SERVICE	68.80	64.79	60.77	56.76	52.75	35.12	9.41	8.84	8.27	7.70	3.71
CHANGE IN CASH BALANCE	186.44	207.78	229.89	254.92	280.66	322.02	373.51	401.78	431.22	462.27	499.15
CHANGE IN ACCOUNTS RECEIVABLE	3.95	4.22	4.51	4.93	5.21	5.64	6.05	6.48	6.90	7.33	7.89
TOTAL APPLICATIONS	256.56	274.00	292.15	313.43	335.20	359.11	385.04	412.92	441.86	472.50	505.58
DEBT SERVICE COVERAGE	3.73	4.23	4.81	5.52	6.36	10.22	40.92	46.71	53.43	61.36	136.28

PTT GAS PROJECT  
REVENUE ACCOUNT  
IN MILLIONS OF DOLLARS  
ESCALATED COSTS

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
UNION GAS COST TO 75	-	-	1.4541	1.7013	1.8203	1.9478	2.0842	2.2300	2.3861	2.5531
UNION GAS COST 76-150	-	-	1.2975	1.5180	1.6243	1.7380	1.8597	1.9899	2.1292	2.2782
UNION GAS COST 151 - 200	-	-	0.9732	1.1386	1.2183	1.3036	1.3949	1.4925	1.5970	1.7088
UNION GAS COST 201 UP	-	-	0.7494	0.8768	0.9382	1.0040	1.0741	1.1493	1.2298	1.3159
UNION PRODUCTION, MMCFD	-	-	-	-	200.00	250.00	250.00	250.00	250.00	250.00
TEXAS PRODUCTION, MMCFD	-	-	-	-	-	-	-	-	-	-
TOTAL PRODUCTION, MMCFD	-	-	-	-	200.00	250.00	250.00	250.00	250.00	250.00
SELLING PRICE	-	1.90	2.01	2.36	2.52	2.70	2.89	3.09	3.31	3.54
CALORIFIC VALUE, UNION GAS	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00
CALORIFIC VALUE, TEXAS GAS	830.00	830.00	830.00	830.00	830.00	830.00	830.00	830.00	830.00	830.00
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INCOME SALE OF GAS	-	-	-	-	192.79	258.20	276.37	295.50	316.54	338.53
COST OF GAS	-	-	-	-	122.12	149.87	160.36	171.60	183.59	196.46
OPERATING COSTS	-	-	-	-	2.50	2.60	4.40	4.60	4.90	5.24
DEPRECIATION CHARGE	-	-	-	-	26.10	28.25	30.25	32.37	34.63	37.06
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NET INCOME BEFORE INTEREST	-	-	-	-	42.07	77.48	81.36	86.93	93.42	99.77
INTEREST CHARGE	-	3.02	6.78	22.42	34.13	35.32	33.84	31.40	28.68	25.82
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NET INCOME AFTER INTEREST	-	(3.02)	(6.78)	(22.42)	7.94	42.16	47.52	55.53	64.74	73.95
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OPERATING RATIO	-	-	-	-	0.78	0.70	0.71	0.71	0.70	0.71

PTT GAS PROJECT  
REVENUE ACCOUNT  
IN MILLIONS OF DOLLARS  
ESCALATED COSTS

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
UNION GAS COST TO 75	2.7318	2.9230	3.1276	3.3465	3.5808	3.8315	4.0997	4.3867	4.6938	5.0224
UNION GAS COST 76-150	2.4377	2.6083	2.7909	2.9863	3.1953	3.4190	3.6583	3.9144	4.1884	4.4816
UNION GAS COST 151 - 200	1.8284	1.9564	2.0933	2.2398	2.3966	2.5644	2.7439	2.9360	3.1415	3.3614
UNION GAS COST 201 UP	1.4080	1.5066	1.6121	1.7249	1.8456	1.9748	2.1130	2.2609	2.4192	2.5885
UNION PRODUCTION, MMCFD	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00
TEXAS PRODUCTION, MMCFD	-	-	-	-	-	-	-	-	-	-
TOTAL PRODUCTION, MMCFD	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00
SELLING PRICE	3.79	4.06	4.34	4.64	4.96	5.31	5.68	6.08	6.51	6.97
CALORIFIC VALUE, UNION GAS	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00	1,048.00
CALORIFIC VALUE, TEXAS GAS	830.00	830.00	830.00	830.00	830.00	830.00	830.00	830.00	830.00	830.00
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INCOME SALE OF GAS	362.44	388.26	415.03	443.72	474.32	507.80	543.18	581.43	622.55	666.54
COST OF GAS	210.21	224.93	240.67	257.51	275.54	294.83	315.46	337.54	361.17	386.46
OPERATING COSTS	5.61	6.00	6.42	6.87	7.35	7.86	8.41	9.00	9.63	10.30
DEPRECIATION CHARGE	39.65	42.43	45.40	48.58	51.98	55.61	59.51	63.67	68.13	72.90
NET INCOME BEFORE INTEREST	106.97	114.90	122.54	130.76	139.45	149.50	159.80	171.22	183.62	196.88
INTEREST CHARGE	22.95	20.09	17.23	14.36	11.50	8.63	5.77	3.45	2.28	1.71
NET INCOME AFTER INTEREST	84.02	94.81	105.31	116.40	127.95	140.87	154.03	167.77	181.34	195.17
=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
OPERATING RATIO	0.70	0.70	0.70	0.71	0.71	0.71	0.71	0.71	0.71	0.70

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PTT GAS PROJECT  
REVENUE ACCOUNT  
IN MILLIONS OF DOLLARS  
ESCALATED COSTS

	1998	1999	2000
UNION GAS COST TO 75	5.3740	5.7502	6.1527
UNION GAS COST 76-150	4.7953	5.1310	5.4902
UNION GAS COST 151 - 200	3.5967	3.8485	4.1179
UNION GAS COST 201 UP	2.7697	2.9636	3.1711
UNION PRODUCTION, MMCFD	250.00	250.00	250.00
TEXAS PRODUCTION, MMCFD	-	-	-
TOTAL PRODUCTION, MMCFD	250.00	250.00	250.00
SELLING PRICE	7.46	7.98	8.54
CALORIFIC VALUE, UNION GAS	1,048.00	1,048.00	1,048.00
CALORIFIC VALUE, TEXAS GAS	830.00	830.00	830.00
	=====	=====	=====
INCOME SALE OF GAS	713.40	763.13	816.68
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COST OF GAS	413.50	442.46	473.43
OPERATING COSTS	11.02	11.79	12.62
DEPRECIATION CHARGE	78.00	83.46	89.30
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NET INCOME BEFORE INTEREST	210.88	225.42	241.33
INTEREST CHARGE	1.14	0.57	0.14
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NET INCOME AFTER INTEREST	209.74	224.85	241.19
	=====	=====	=====
OPERATING RATIO	0.70	0.70	0.70

PTT GAS PROJECT  
BALANCE SHEET  
IN MILLIONS OF DOLLARS  
ESCALATED COSTS  
AFTER REVALUATION OF ASSETS  
11/07/79

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
GROSS FIXED ASSETS, REVALUED	-	4.90	184.00	473.00	522.00	565.00	605.00	647.35	692.66	741.15	793.03	848.54
LESS ACCUMULATED DEPRECIATION	-	-	-	-	(26.10)	(56.18)	(90.36)	(129.06)	(172.72)	(221.87)	(277.05)	(338.87)
NET REVALUED FIXED ASSETS	-	4.90	184.00	473.00	495.90	508.82	514.64	518.29	519.94	519.28	515.98	509.67
CASH	-	-	-	-	5.78	61.07	111.96	170.24	236.35	314.10	404.41	508.24
ACCOUNTS RECEIVABLE	-	-	-	-	15.85	21.22	22.72	24.29	26.02	27.82	29.79	31.91
TOTAL ASSETS	-	4.90	184.00	473.00	517.53	591.11	649.32	712.82	782.31	861.20	950.18	1,049.82
EQUITY CAPITAL	-	1.10	40.00	77.00	77.00	77.00	77.00	77.00	77.00	77.00	77.00	77.00
REVALUATION RESERVE	-	-	-	13.00	46.00	81.17	117.24	153.26	189.54	225.94	262.29	298.41
ACCUMULATED RETAINED EARNINGS	-	(3.02)	(9.80)	(32.22)	(24.28)	17.88	65.40	120.93	185.67	259.62	343.64	438.45
TOTAL EQUITY	-	(1.92)	30.20	57.78	98.72	176.05	259.64	351.19	452.21	562.56	682.93	813.86
LONG TERM DEBT	-	-	-	-	-	-	-	-	-	-	-	-
WORLD BANK	-	4.90	38.00	97.00	101.00	107.00	107.00	103.43	96.30	89.17	82.03	74.90
EXXIM	-	-	69.00	172.00	180.00	180.00	165.00	150.00	135.00	120.00	105.00	90.00
COMMERCIAL SYNDICATION	-	1.12	17.36	100.85	124.95	114.53	104.12	93.71	83.30	72.88	62.47	52.06
LONG TERM DEBT	-	6.02	124.36	369.85	405.95	401.53	376.12	347.14	314.60	282.05	249.50	216.96
SHORT TERM DEBT	-	-	-	-	-	-	-	-	-	-	-	-
ACCOUNTS PAYABLE	-	0.81	29.44	45.37	12.87	13.52	13.54	14.48	15.49	16.58	17.74	18.98
TOTAL LIABILITIES	-	6.83	153.80	415.22	418.82	415.05	389.66	361.62	330.09	298.63	267.24	235.94
TOTAL LIABILITIES AND EQUITY	-	4.91	184.00	473.00	517.54	591.10	649.30	712.81	782.30	861.19	950.17	1,049.80
DEBT EQUITY RATIO	-	1.47	0.80	0.86	0.80	0.70	0.59	0.50	0.41	0.33	0.27	0.21
CURRENT RATIO	-	-	-	-	1.68	6.09	9.95	13.43	16.94	20.62	24.48	28.46
RETURN ON AVERAGE NET ASSETS %	-	-	-	-	8.68	15.42	15.90	16.83	18.00	19.20	20.67	22.41

PIT GAS PROJECT  
BALANCE SHEET  
IN MILLIONS OF DOLLARS  
ESCALATED COSTS

	1990	1991	1992	1993	1994	1995	1996	1997	1998
GROSS FIXED ASSETS, REVALUED	907.94	971.50	1,039.51	1,112.28	1,190.14	1,273.45	1,362.59	1,457.97	1,560.03
LESS ACCUMULATED DEPRECIATION	(407.99)	(485.13)	(571.07)	(666.65)	(772.83)	(890.60)	(1,021.07)	(1,165.44)	(1,325.02)
NET REVALUED FIXED ASSETS	499.95	486.37	468.44	445.63	417.31	382.85	341.52	292.53	235.01
CASH	625.53	757.02	903.42	1,066.23	1,246.07	1,454.09	1,695.05	1,954.51	2,233.54
ACCOUNTS RECEIVABLE	34.11	36.47	38.99	41.74	44.64	47.79	51.17	54.78	58.64
TOTAL ASSETS	1,159.59	1,279.86	1,410.85	1,553.60	1,708.02	1,884.73	2,087.74	2,301.82	2,527.19
EQUITY CAPITAL	77.00	77.00	77.00	77.00	77.00	77.00	77.00	77.00	77.00
REVALUATION RESERVE	334.09	369.09	403.14	435.94	467.13	496.34	523.14	547.05	567.53
ACCUMULATED RETAINED EARNINGS	543.76	660.16	788.11	928.98	1,083.01	1,250.78	1,432.12	1,627.29	1,837.03
TOTAL EQUITY	954.85	1,106.25	1,268.25	1,441.92	1,627.14	1,824.12	2,032.26	2,251.34	2,481.56
LONG TERM DEBT									
WORLD BANK	67.77	60.63	53.50	46.37	39.23	32.10	24.97	17.83	10.70
EXXIM	75.00	60.00	45.00	30.00	15.00	-	-	-	-
COMMERCIAL SYNDICATION	41.65	31.24	20.82	10.41	-	-	-	-	-
LONG TERM DEBT	184.42	151.87	119.32	86.78	54.23	32.10	24.97	17.83	10.70
SHORT TERM DEBT	-	-	-	-	-	-	-	-	-
ACCOUNTS PAYABLE	20.31	21.73	23.25	24.88	26.62	28.48	30.48	32.61	34.89
TOTAL LIABILITIES	204.73	173.60	142.57	111.66	80.85	60.58	55.45	50.44	45.59
TOTAL LIABILITIES AND EQUITY	1,159.58	1,279.85	1,410.82	1,553.58	1,707.99	1,884.70	2,087.71	2,301.78	2,527.15
DEBT EQUITY RATIO	0.16	0.12	0.09	0.06	0.03	0.02	0.01	0.01	-
CURRENT RATIO	32.48	36.52	40.53	44.53	48.49	52.73	57.29	61.62	65.70
RETURN ON AVERAGE NET ASSETS %	24.27	26.51	29.21	32.71	37.04	42.80	50.70	62.10	79.95

PTT GAS PROJECT  
BALANCE SHEET  
IN MILLIONS OF DOLLARS  
ESCALATED COSTS

	1999	2000
GROSS FIXED ASSETS, REVALUED	1,669.23	1,786.08
LESS ACCUMULATED DEPRECIATION	(1,501.23)	(1,695.62)
NET REVALUED FIXED ASSETS	168.00	90.46
CASH	2,533.07	2,858.21
ACCOUNTS RECEIVABLE	62.72	67.12
TOTAL ASSETS	2,763.79	3,015.79
	=====	=====
EQUITY CAPITAL	77.00	77.00
REVALUATION RESERVE	583.98	595.74
ACCUMULATED RETAINED EARNINGS	2,061.88	2,303.07
TOTAL EQUITY	2,722.86	2,975.81
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LONG TERM DEBT		
WORLD BANK	3.57	-
EXXIM	-	-
COMMERCIAL SYNDICATION	-	-
LONG TERM DEBT	3.57	-
	-----	-----
SHORT TERM DEBT	-	-
	-----	-----
ACCOUNTS PAYABLE	37.34	39.95
TOTAL LIABILITIES	40.91	39.95
	-----	-----
TOTAL LIABILITIES AND EQUITY	2,763.77	3,015.76
	=====	=====
DEBT EQUITY RATIO	-	-
CURRENT RATIO	69.52	73.22
RETURN ON AVERAGE NET ASSETS %	111.87	186.74

PTT GAS PROJECT  
SOURCE AND APPLICATION OF FUNDS  
IN MILLION OF DOLLARS  
ESCALATED COSTS

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
NET INCOME BEFORE INTEREST	-	-	-	-	42.07	77.48	81.36	86.93	93.42	99.77	106.97	114.90
DEPRECIATION	-	-	-	-	26.10	28.25	30.25	32.37	34.63	37.06	39.65	42.43
INTERNAL CASH GENERATION	-	-	-	-	68.17	105.73	111.61	119.30	128.05	136.83	146.62	157.33
CHANGE IN ACCOUNTS PAYABLE	-	0.81	28.63	15.93	(32.50)	0.65	0.02	0.94	1.01	1.09	1.16	1.24
WORLD BANK DRAW DOWN	-	4.90	33.10	59.00	4.00	6.00	-	-	-	-	-	-
EXXIM DRAW DOWN	-	-	69.00	103.00	8.00	-	-	-	-	-	-	-
COMMERCIAL SYNDICATION DRAW DOWN	-	1.12	16.24	83.49	24.09	-	-	-	-	-	-	-
SHORT TERM DRAWDOWN	-	-	-	-	-	-	-	-	-	-	-	-
INCREASE IN EQUITY	-	1.10	38.90	37.00	-	-	-	-	-	-	-	-
TOTAL SOURCES	-	7.12	157.24	282.49	104.26	111.73	111.61	119.30	128.05	136.83	146.62	157.33
CAPITAL EXPENDITURE	-	4.90	179.10	276.00	16.00	6.00	-	-	-	-	-	-
LOAN REPAYMENT	-	-	-	-	-	-	-	3.57	7.13	7.13	7.13	7.13
WORLD BANK	-	-	-	-	-	-	15.00	15.00	15.00	15.00	15.00	15.00
EXXIM	-	-	-	-	-	10.41	10.41	10.41	10.41	10.41	10.41	10.41
SYNDICATION	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL REPAYMENT LONG TERM DEBT	-	-	-	-	-	10.41	25.41	28.98	32.54	32.54	32.54	32.54
REPAYMENT SHORT TERM DEBT	-	-	-	-	-	-	-	-	-	-	-	-
INTEREST ON LOANS	-	3.02	6.78	22.42	34.13	35.32	33.84	31.40	28.68	25.82	22.95	20.09
TOTAL DEBT SERVICE	-	3.02	6.78	22.42	34.13	45.73	59.25	60.38	61.22	58.36	55.49	52.63
CHANGE IN CASH BALANCE	-	-	-	-	5.78	55.29	50.89	58.28	66.11	77.75	90.31	103.83
CHANGE IN ACCOUNTS RECEIVABLE	-	-	-	-	15.85	5.37	1.50	1.57	1.73	1.80	1.97	2.12
TOTAL APPLICATIONS	-	7.11	157.25	282.49	104.26	111.74	111.62	119.29	128.05	136.82	146.61	157.34
DEBT SERVICE COVERAGE	-	-	-	-	2.00	2.31	1.88	1.98	2.09	2.34	2.64	2.99

FTT GAS PROJECT  
SOURCE AND APPLICATION OF FUNDS  
IN MILLION OF DOLLARS  
ESCALATED COSTS

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
NET INCOME BEFORE INTEREST	122.54	130.76	139.45	149.50	159.80	171.22	183.62	196.88	210.88	225.42	241.33
DEPRECIATION	45.40	48.58	51.98	55.61	59.51	63.67	68.13	72.90	78.00	83.46	89.30
INTERNAL CASH GENERATION	167.94	179.34	191.43	205.11	219.31	234.89	251.75	269.78	288.88	308.88	330.63
CHANGE IN ACCOUNTS PAYABLE	1.33	1.42	1.52	1.63	1.74	1.86	2.00	2.13	2.28	2.45	2.61
WORLD BANK DRAW DOWN	-	-	-	-	-	-	-	-	-	-	-
EXXIM DRAW DOWN	-	-	-	-	-	-	-	-	-	-	-
COMMERCIAL SYNDICATION DRAW DOWN	-	-	-	-	-	-	-	-	-	-	-
SHORT TERM DRAWDOWN	-	-	-	-	-	-	-	-	-	-	-
INCREASE IN EQUITY	-	-	-	-	-	-	-	-	-	-	-
TOTAL SOURCES	167.94	179.34	191.43	205.11	219.31	234.89	251.75	269.78	288.88	308.88	330.63
CAPITAL EXPENDITURE	-	-	-	-	-	-	-	-	-	-	-
LOAN REPAYMENT	-	-	-	-	-	-	-	-	-	-	-
WORLD BANK	7.13	7.13	7.13	7.13	7.13	7.13	7.13	7.13	7.13	7.13	3.57
EXXIM	15.00	15.00	15.00	15.00	15.00	15.00	-	-	-	-	-
SYNDICATION	10.41	10.41	10.41	10.41	10.41	-	-	-	-	-	-
TOTAL REPAYMENT LONG TERM DEBT	32.54	32.54	32.54	32.54	32.54	22.13	7.13	7.13	7.13	7.13	3.57
REPAYMENT SHORT TERM DEBT	-	-	-	-	-	-	-	-	-	-	-
INTEREST ON LOANS	17.23	14.36	11.50	8.63	5.77	3.45	2.28	1.71	1.14	0.57	0.14
TOTAL DEBT SERVICE	49.77	46.90	44.04	41.17	38.31	25.58	9.41	8.84	8.27	7.70	3.71
CHANGE IN CASH BALANCE	117.29	131.49	146.40	162.81	179.84	208.02	240.96	259.46	279.03	299.53	325.14
CHANGE IN ACCOUNTS RECEIVABLE	2.20	2.36	2.52	2.75	2.90	3.15	3.38	3.61	3.86	4.08	4.40
TOTAL APPLICATIONS	167.93	179.33	191.44	205.10	219.31	234.89	251.75	269.78	288.88	308.86	330.64
DEBT SERVICE COVERAGE	3.37	3.82	4.35	4.98	5.72	9.18	26.75	30.52	34.93	40.11	89.12

SELECTED DOCUMENTS AND DATA AVAILABLE

IN THE PROJECT FILE

NEA Energy Statistics 1977

Thai Petroleum Legislation

Sofregaz  
Market Studies

DeGolyer and MacNaughton  
Reserve Estimates

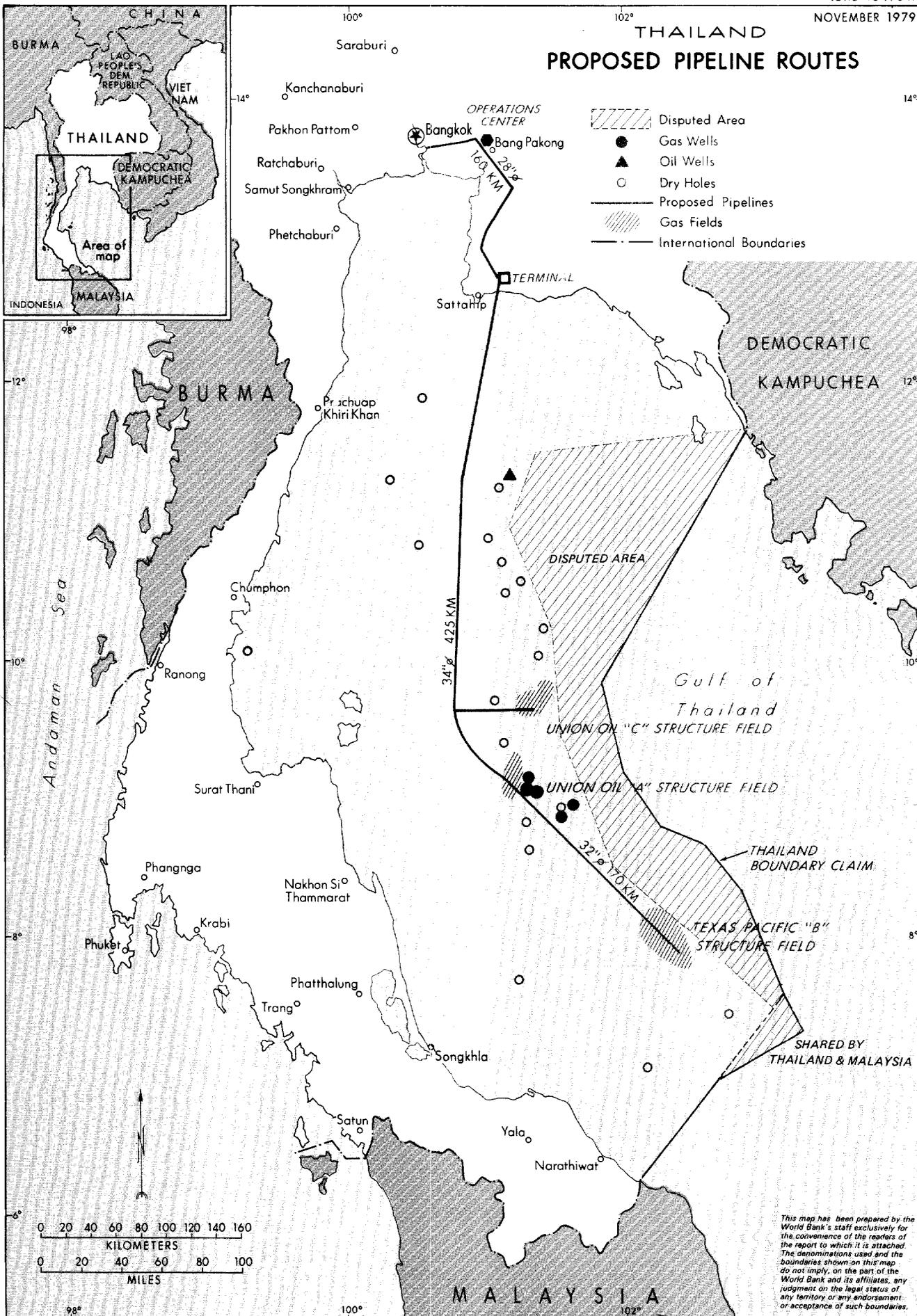
Fluor  
Pipeline Optimization Study

NGOT Accounts 1978, 1979  
OFO Accounts 1978

Chase Manhattan Financial Reports



# THAILAND PROPOSED PIPELINE ROUTES



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