Ⅷ. 資　　料

1. ガス開発に関する質問書とその回答

JICA Project Identification Mission
December 12 to 20, 1994

Mines and Energy Sector
Energy subsector
Including Urban Gas Development
Questionnaire

December 7, 1994

I. Objectives:

To examine and plan how to efficiently cooperate with PGN in developing the gas distribution to urban areas, the mission would like to:

(1) fully understand the historical background and the country-wide perspective of the ongoing projects in the gas sector, and

(2) obtain all the concrete data to assess the current project.

II. Questions

1. General Data:

(While many items in this section might be fulfilled in Japan or in Japanese institutions in Jakarta as well as some in other sections to follow, the mission would appreciate any conveniently packaged data from the Indonesian counterpart, if they are available)

・ Historical trend, and regional and major-municipal distribution of:

- Demography
- Economic fundamentals
- Financial
- International trade
- Energy

・ Brief status of urban development for each city considered

2. Energy/ Gas Industry

(1) Potential, possible and proven reserves of oil, gas, and coal, as well as other energy resources, with geographical distribution

(2) Gas Field:

- Identified gas fields dedicated to domestic supply
- Gas reserves for each gas well- with geographical location, P/R ratio
- Gas quality, pressure
- Development cost, depletion premium

(3) Production Facilities:-

- Gas processing plants- location, capacity and future plans
- Manufacturing facilities- ibid for coke ovens, oil cracking, etc.
- LPG handling facilities- ibid

(4) Pipelines: -

- Existing, under construction and planned status of:
  - Transmission network
  - Booster stations, if any
  - Distribution network
  - Pressure regulating systems
  - Storage -- types, capacity, materials and pressure
  - SCADA

- For pipes and pressure regulating systems above, please indicate:
  - location
  - size
  - length
  - pressure
  - material
  - purpose (residential or industrial, etc.)

- Gas send out fluctuations -- seasonal and hourly

- Seismic measures -- any dislocation areas?

(5) Competitive fuels and prices -- actual and economic prices; regulated or not, by sector:

- gas
- kerosene
- diesel
- LPG, by sector (is there some for cars?)
- fuel oil
- electricity

3. Energy Policies

(1) Current status, projection or national intention:

(2) Legal and regulatory framework:

- Energy supply
- Energy demand side management
- Structure of energy industry
- Public utility regulations
- Environment and safety legislation/ regulation
- Labor laws
- Foreign investment

(3) Industrial standards observed:

- Indonesian Standards, British Standards or any other ?

(4) Regulatory framework for gas and electricity-- present and future:

- Distinction of supply, transmission and distribution; wholesale and retail
  How vertically integrated?

- How official approvals are given for:

  - Line of business
  - Security
  - Facility regulation
  - territory

- Price regulation: who controls the price and how? for:

  - Large customers; by sector if applicable
  - Middle- commercial
  - Small customers - residential
  - Other customers

(5) Policy of energy export and domestic use:
  - Any criteria?

4. Institutional Structure Outlined:

- Of:
  - Related government agencies
  - Pertamina

- PGN
- PLN
- Coal industry
- Contractors
- Related associations
- Other

• and on:
  - Roles of each entity for gas development
  - Present organizational structures
  - Number of employees
  - High officials

• Future reform plans for industrial structure, if planned

5. PGN

(1) Corporate and financial:

• Organizational structure, numbers of staffs and roles of divisions
• Gas sales, income statement, balance sheet, other financial statements
  -history and projection, by city and type of customers
• Capital structure
• Finance - past, present and future-
• Privatization plans

(2) Operational:

• Facilities: natural gas, LPG, coal/coke, oil gas; gas storage
• Pipe network in each city considered for development
• Maintenance work - how performed, how contractors are organized?
• Customers by sector- large customers
  - commercial customers
  - air-conditioning customers?
  - residential customers
  - PLN or other generation customers
• Penetration of gas appliances-- type, market sector, region, etc
• Gas meters:
  - Types of meters used
  - maintenance
  - Leak control
• Metering and collection - how performed?
• Price regulation - the current rate system
• Competitive prices: price levels and how gas responds?

(3) Development:

- Investment - Past and future
  - By facility
  - Other adjustment
- Marketing promotion: status and plans
- CNG status
- Human resources development -- training

(4) Relations with Pertamina: -- present and future

(5) Involvement of British Gas, IGT, and the World Bank -- status and plan

(6) Specific city and district targeted by the current Terms of Reference

6. Cooperation of JICA and Japanese Entities with PGN

- Past assistance of JICA and other international institutions
- Organizational system to accept international cooperation
- Roles and expertise currently expected
- Accommodation for the experts despatched to PGN
- Request, complaint and any comment on JICA's assistance

QUESTIONNAIRE

JAPAN INTERNATIONAL COOPERATION AGENCY

PERUSAHAAN UMUM GAS NEGARA

DECEMBER 14, 1994

2.1 General Data

2.1.1 Historical trend regional and major municipal distribution of :

Demography

National population growth about 1,98% a year and for Jakarta around 5 % of urbanization which comes from out side of the city. It also happen to other new metro city such as Medan, Bogor, Surabaya , but not so high as Jakarta.

Economics Fundamental

To maintain agricultural progress to supply domestic demand beside to develop industrial which producing unfinished product, also to develop industrial which export's oriented beside step up to develop heavy industries .

Financial

Financial would be comes from tax, foreign exchange, oil and gas, non oil and gas, and loan foreign such as soft loan and commercial loan

International Trade

. Indonesia are involved on any International trade corporation such as GATT, APEC, ASEAN and WTO.
. Economic cooperation Southern-Southern.

Energy

. In five years development plan (PELITA V) 5.9 % a years (1989-1994).
. For the next PELITA VI would be held on 6 %.

2.1.2 Brief status urban development for each city considered

City	Household		Commercial		Industry		Total	
	Customer	Vol (m^3)	Customer	Vol (m^3)	Customer	Vol (m^3)	Customer	Vol (m^3)
Medan	5,669	1,623,891	149	995,786	63	47,772,805	5,881	50,092,482
Jakarta	8,549	2,091,737	277	4,421,140	134	350,621,660	8,960	365,036,948
Bogor	3,348	1,045,635	192	676,943	58	76,038,604	3,598	77,761,182
Cirebon	3,649	1,474,274	168	362,491	69	13,166,314	3,886	15,003,078

The distribution of Natural gas by PGN in 5 (five) city such as Medan, Jakarta, Bogor, Cirebon and Surabaya another city such Bandung, Semarang, and Ujung Pandang sale Liquid Petroleum Gas.

2.2 Energy/Gas Industry

2.2.1 Potential, possible and proven reserves of oil, gas, and coal, as well as other energy resources, with geographical distribution.

Resources	Unit	Potensial	Possible	Prosen	Total
Oil	na	na	na	na	na
Gas (1992)	TCF	62,11	na	29,34	91,45
Coal	Million Tons	na	na	na	31,975
Others	na	na	na	na	na

na = Not available

Oil Distribution is authority of Pertamina while coal distributed by Government company such as PTTBBA etc.

2.2.2 Authority of Pertamina

2.2.3 Authority of Pertamina

2.2.4 Pipeline

- Transmission
  Until now PGN only has transmission pipeline in Medan (East Sumatera). The transmission is from Wampu to Sicanang directly supplies gas to PLN (State Electricity Company) combined cycle. For the near future PGN will propose to construct transmission pipeline from Asamera - Duri - Batam and Prabumulih (South Sumatera) - Cilegon (West Java).

- Booster Station, until now PGN doesn't have it yet, but in the future maybe on PGN would installed for the transmission pipeline which has been constructed.

- Distribution
  Currently PGN has been operating pipeline network in five cities to supply natural gas to PGN's costumer. It is accounted that total length of pipeline (Medan, Jakarta, Bogor, Cirebon and Surabaya) around 1400 km; meanwhlie Bandung, Semarang, Ujung Pandang are distributed LPG.

  The material of the existing city gas pipeline network in Medan and Bogor is mostly polyethylene (PE) pipe, meanwhile in Jakarta installed 40% PE and in Cirebon about 15% PE.

- Pressure Regulating System

	Existing (Unit)	Under construction (Unit)	Remark
Medan	5	-	
Jakarta	4	1	Excluded MR/S customer and R/s for medium pressure
Bogor	1	-	
Cirebon	2	-	
Surabaya	1	4	

- Storage
  PGN has no storage, because PGN just only supplies natural gas to customer by pipeline.

- SCADA
  It has already installed in Medan, Jakarta, Bogor and planned to install in Surabaya.

For pipes and pressure regulating

	Existing	Planned	Remark
MEDAN	Wampu		Transmission Pipeline
	Pasar IX		Distribution Pipeline
	Paya Pasir		PLN Power
	Sp. Kantor		Distribution Pipeline
	Sicanang		PLN Power (all metering regulating system are 300 rating)
JAKARTA	Cimanggis		Rating 150
	Bitung		
	Serpong		
	Tegal Gede		
		Muara Karang	Rating 300
BOGOR	Cibinong/ Kedep		Rating 300 and 150
CIREBON	Bongas		Rating 150
	Veteran		
SURABAYA	Waru		Rating 600
		Gresik	Rating 600
		Tandes	Rating 600
		Gunung Sari	Rating 600
		Porong	Rating 600

Hardis/price (3)

2.3 Energy Policies

2.3.1 Current status, Projection or national intention

- Diversification of energy resources renewable and non renewable should consistency to conduct Energy Conservation. Implementation of that energy have to produce advantages/ profit economically, technical feasible and accepted in sicial and culture and environment friendly.

2.3.2 Legal and regulatory framework

- Energy supply
  In general, the energy supply is basically regulated by Article 33 paragraph 2 of Constitution 1945 which stipulate that :
  "Branches of production (economy) which are important to the State and which predominate in the living desire of the people shall be controlled by the State".

  Through this provision, the Government of Indonesia formulated several energy policies in the form of Act, Government Regulation, Presidential Decree and Ministrial Decision.

- Structure of energy industry
  Although the structure of energy industry in Indonesia still growing, the Government will establish a team to introduce legal aspect and regulatory framework in detail regarding this industry. At present, the structure is regularly built under the practices of energy undertakings.

- Public Utility regulations
  The Government stipulates the regulation on public utility concerning :

  a) The kind of public utility undertakings/bodies which differentiate among public utility (ies) who gain merely 100% profit, mostly agent of development and sufficient profit, and for social/public services.

  b) The supervision of the operational and procedures of public undertakings.

- Environment and safety legislation
  The Government has set out several rules on environment and safety legislation. The regulations regarding environmental aspect sound promising since the issue on environment being developed as one of the national programs.

- Labour laws
  The Ministry of Manpower is now formulating a new regulation concerning the labour, especially to :

  . protect labours from unjustice treatment;
  . increase the wage level of labours;
  . maintain the right and obligations of labours;
  . set up a standard of tribunal procedure to solve labour lawsuit, strike, commotion, termination, lock out, and pension fund.

- Foreign investment
  The Government of Indonesia has launching a set of policies to attract the foreign investors to invest. Through the new regulation (Government Regulation number 20 of Year 1994), it is widely open to the foreign investors to put the capital in the country including on the businesses which affect most of living desire of the people.

2.3.3 Industrial Standard Observed

The standards that have been adopting by PGN :

1.	ASME/ANSI B 31.8	Gas transmission and distribution piping system.
2.	ANSI 31.2	Fuels gas pipin.g
3.	ANSI B 16.5	Pipe flanges and flanged fittings.
4.	ANSI B 16.10	Face-to-face and end-to-end dimensions of valves.
5.	ANSI/AWWA C 20386 CW 4, PS/SWG,BGC/ PS/CWI	External coating.
6.	ANSI B 16.25	Butt welding ends.
7.	ANSI B 16.21	Gaskets.
8.	API 5 L	Specification for line pipe.
9.	API 6 D	Specification for pipeline valves (steel gate, plug, ball and check valves).
10.	API 598	Valve inspection and testing.
11.	API 601	Metallic gaskets for raised-face pipe flanges and flanged connections (double-jacketed corrugated and spiral-wound).
12.	API 1104	Welding of pipelines and related facilities.

13. API 2201	Hot tapping.
14. ASME	Boiler and pressure vessel code section VIII. Welding and branzing qualification code section XI. Non destructive examination code section V.
15. ASTM A 193	Standard specification for alloy steel and stainless steel bolting materials for high-temperature service.
16. ASTM A 578	Ultrasonic examination.
17. NACE RP 01-69	Control of external corrosion on under ground on metallic piping systems.
18. ASTM 68	Cathodic disbondment.
19. DIN 30672	Coatings of corrosion protection tapes and heat shrinkable materials for pipelines.
20. DIN 30673	Bituminous external and internal coating for corrosion protection of steel pipes.
21. DVGW G 469	Hydrostatic test.
22. GBE/section 5	Pipe system construction.
23. GBE/Dis 5.3	Polyethylene system.
24. GBE/Dis 5.5	Pressure testing.
25. GBE/Dis 5.9	Main insertion.

2.3.4 Regulatory Framework for Gas and Electricity

The Minister of Mines and Energy delegates the authority to give official approvals for the lines of business, security, facility regulation, territory to each of the Director General. Consequently, the Director General lowering their responsibility to the sub-ordinate body.
For example, line of business such as power generation will obtain an approval from the Directorate of Energy Development, etc.
In future, it is expected to arrange the procedure to obtain an approval in more simple and practical manner.

In Indonesia, the Government has a plan to establish a separate Government Agency (ies) to formulate gas pricing and other related aspects.

- Energy Policies

PGN is one of customer of Pertamina. Gas is supplied by PGN to industry, commercial and household, and also to PLN especially in Medan from Pertamina.

2.3.5 The policy of energy export and domestic use is as follows:

The Indonesian Goverment is developing domestic utilisation of natural gas in line with the growth of big industries. The utilisation of natural gas is gradually increasing and the Goverment plans to reduce domestic oil-fuel consumption with the alternate energy, whilst the exportation of energy is still possible since there are many alternative energy reserves available in the country.

2.4 Institutional Structure Outlined :

On Roles of Each Entity for gas development :

- PERTAMINA'S field of businesses is to conduct the oil and natural gas mining understakings covering Exploration, Exploitation, Refining and Processing, Transportation and Marketing. Therefore, PERTAMINA has a great and significant role to develop gas utilisation by the way of exploring and developing remote areas of natural gas reserves, and using natural gas in the form of CNG to alternate the consumption of oil-fuel, etc.

- PGN as Gas Transporter-distributor play its role in developing gas utilisation such as commercials and industries, and in the future will set up plans to build an Integrated Natural Gas Network wich will connected the Gas Transmission and Distribution System around the country.

- PLN as State-Owned Electricity Company may take part in power generating businesses to participate in the development of gas utilisation.

2.5 PGN

2.5.1 Corporate and Financial:

The organisational structure, numbers of staff and roles of divisions are shown in the Annual Report of the Year 1992. In detail, the role of each division is described by the Ministry Decision No. 785 K/MPE of Year 1992 as enclosed.

- Privatization plans
  PGN is going into privatization plans in order to conduct undertakings in line with the growth and development of gas utilization; and to accrue profits on the principles of sound management of the company. To achieve this plan, PGN is now under the process to convert its status into PERSERO (Limited liability Company - the Government holds most of the shares). PERSERO PGN shall undertake transmission and distribution of natural gas/ hydrocarbon gas and other related businesses, and to support these PERSERO shall made cooperation or joint operation with gas producers or other parties required.

2.5.2 Operational

- Facilities : Natural gas, LPG, coal/coke, oil gas, gas storage.

  These facilities belong to Pertamina and Bukit Asam Coal Mine (Tambang Batubara Bukit Asam).

- Pipeline network in each city that considered to be developed.

  Besides development of four cities (Medan, Jakarta, Bogor and Cirebon), since 1991 Surabaya branch has been developing. Financial for material (piping, valve, fitting, station) and part of construction is supported by loan 3209 Indonesia from World Bank.

  In effect to maintain PGN' customers in cities of Ujung Pandang, Semarang and Bandung, PGN has been temporarily suppling LPG in bottle to them on those cities. In addition to PGN's program, natural gas is anticipated to be supplied to Ujung Pandang (1998), Semarang (2002) and Bandung (2004).

- Maintenance work - How it performed, How contractors are organized.

  The facilities of PGN installed by contractor are supervised by PGN in all activities, maintained by PGN itself.

- Customers by sector

  Large customers :
  Transport fee to PLN power, PGN has been suppling to indutrial sector. This sector ranges small to medium customers.

  Commercial customers are just only being supplied to hotel and restaurant.

Air-conditioning customers : It has not developed yet.

Household customer :

PGN branch :	Volume (m^3)	Customer	Remark
Medan	1,623,893	5,669	- Data 1993
Jakarta	2,091,737	8,549	- Calorific value
Bogor	1,045,635	3,348	is 8,560 kcal/m^3
Cirebon	1,474,273	3,649	

Gas Meters

The types of meter used in PGN are related by meter gas standard.

Maintenance by PGN's staff
Leak control applied Leak Detector and used to the other gas company.

Metering and collecting - how performed

Untill now the performance is excellent, it doesn't have any trouble yet.
Metering manufacturer are Singer, Rombach, Tartarini and Bryan Donkin etc.

Price Regulations

The regulations of natural gas tariff of PGN are :

1. General tariff
   For household, commercial and industries.
   1.1. PGN Medan is Rp. 370/m^3
   1.2. PGN Jakarta and Bogor is Rp. 300/m^3
   1.3. PGN Cirebon is Rp. 225/m^3

   Provision:
   Minimum consumption is 10 m^3/month as customer load payment (abudoment).

2. Tariff contract
   The tariff for commercial and industry.
   2.1. PGN Medan is Rp. 320/m^3
   2.2. PGN Jakarta and Bogor is Rp. 265/m^3
   2.3. PGN Cirebon is Rp. 210/m^3

The regulations of the tariff contract are:
a. The minimum and maximum consumption depend on the customer demand.
b. Minimum consumption is 1,000 m^3/month.
c. Maximum consumption is 110% to 120% of minimum consumption per month.

Provision:
If the consumption are less than minimum limit should be charged as minimum contract.
If the consumption are more than maximum limit should be charged as valid tariff contract up to the maximum limit and the excess of consumption would be charged as general tariff.

Competitive prices :

Comparison of fuel prices

	Tariff (Govt.regulation)		General Tariff		Tariff Contract	
	Rp/unit	Rp/MMBTU	Rp/unit	Rp/MMBTU	Rp/unit	Rp/MMBTU
Natural Gas :						
per m^3						
Medan	-	-	370	8.476	320	7.331
Jakarta	-	-	300	8.690	265	7.676
Cirebon	-	-	225	8.100	210	7.560
Mixture			300	18.000	265	15.900
LPG						
per nm^3	1.928	16.845	1.960	17.131	-	-
per kg	750	16.845	763	17.131	-	-
OIL FUEL						
per litre						
Premix	700	21.426	-	-	-	-
Premium	550	16.835	-	-	-	-
Avtur	400	11.657	-	-	-	-
Kerosene	220	6.271	-	-	-	-
HSD/ADO	300	8.271	-	-	-	-
IDO	285	7.748	-	-	-	-
FO	220	5.677	-	-	-	-

2.5.3 Marketing promotion
In order to promote our market, currently we have some activities such as market suvey, advertising, making brochure, conducting seminar and exhibition.

Besides the activities above we have plan to make documentary film for same purpose.

CNG status
Natural gas is one of the alternative fuels for inclusion in the Goverment's development program.

The utilization of natural gas in transportation began in 1987 subtitute oil as a fuel for taxi. It is now planned that fuel of taxi should be converted to natural gas by 1994. There were seven unit of compressed natural gas refuelling station in Jakarta. They are in Jl. Sumenep, Jl. Pemuda, Jl. Raya Bekasi, Jl. Mampang Prapatan, Jl. Pluit, Jl. Daan Mogot and Jl. Raya Bogor. The pump station would be installed another 24 stations and on the next short and medium term will raise natural gas utilization and to supply 9600 cars a day. PGN is involved in that strategy by developing 2 (two) stations in Jl. Ahmad Yani Jakarta and Jl. Raya Bekasi including engine and road test.

The major problem to increase the utilization of gas on transportations are the minimum profit and the difficulty to find the space for refuelling stations.

Human Resources Development

a). Local
Training is conducted in joint cooperation with well established local oil and gas institutions such as Lemigas and PPTM Cepu.

b). Overseas
In order to increase and to improve PGN's staff capabilities in application of technology, still requires transfer of know-how such us transmission and distribution pipeline, SCADA and maintenance.

So far PGN has been doing training cooperation with Tokyo Gas (two generations), British Gas Company, Australia, Gas Unie-Holland, Gas de France, Italy and Belgium.

2.5.4 Relations with PERTAMINA:

PERTAMINA operates the undertakings based on Law No. 8 of 1971 and it covers exploration, exploitation, refining and processing, transportation and marketing of oil and natural gas. Meanwhile, PGN is assigned to transport natural gas as from the gas receiving station and distribute through PGN's network. It means that PGN undertake the business due to the availability and reliability of natural gas produced by PERTAMINA (PSC). PGN

merely sold the gas purchased to PGN's consumers and PERTAMINA retain the right to direct sale to any entity.PGN also take part in transporting the gas sold by PERTAMINA to PLN through PGN Distribution System in Medan.

It is hoped that in line with an efficient natural gas transmission and distribution system, a framework of competitive relationship between producers, transporters and consumers of natural gas should be built. It will be:

- Open access between producers, transporters, and consumers whereby gas producers and consumers such as PLN, Fertilizers, Petrochemicals and PGN itself can make direct transactions while PGN will assume a dual function i.e. as common carrier and consumer-distributor, or

- PERTAMINA is the sole gas producer while PGN will assume the right of transmission and distribution. In this position, PGN will act as transporter and distributor to supply gas to consumers.

2.5.5 Involvement of British Gas, IGT and the World Bank

The British Gas involvement in PGN is to provide technical assistance for natural gas utilisation, maintenance and development. It status can be explained as a counterpart of PGN in improving the capability and ability of PGN's personnel.

IGT has just to participate on the expertise to smooth the Plan of Trans Central Sumatra Natural Gas Transmission Project, which will connected the Asamera Duri Corridor Block - Jambi and Batam Island.

The World Bank is the first and longest international financial institution who provides PGN with the services to obtain loan(s) with low interest to develop the utilisation of gas in Indonesia.

2.5.6 Specific city and district targeted by currents Terms of Reference :

- Jakarta is a Capital City with the population 10 million, with the Central Business, Trade, Education, Industry and government to support that activity's part of the people is live in around Jakarta, Bekasi, Bogor, Depok, dan Tanggerang.

- Medan, is a Capital City of North Sumatra's Local Government, it functioned as business, industrial and trade on that area.

- Bogor and Cirebon is the Regency City of West Java Province Bogor famous with Puncak the place of some Villa and Real Estate Living for Rested in holiday season such as week end.

- Beicip-Fanlab in assosiation with PT. Ciprocon in 1994 subject gas Utilization Project Indonesia in Central Sumatra. Funded by ADB T.A No. 1906 IND.

- Goets GmbH, Metal-U Anlagenbau, Germany 1994 Subject study for anaerobic treatment plant for organic waste and garbage in Jakarta.

2.6 Cooperation of JICA and Japanese Entities with PGN:

Organizational system to accept international cooperation:

- PGN has running the twinning or counter-part organizational system to accept international cooperation. It assumes that the International Cooperation(s) will jointly work together in mutual benefit to assist PGN by their expertise. PGN has the right to accept, to refuse, to object and to complaint against the counterpart if their personnel does not conduct a good manner or submit bad results.

  Accomodation for the experts despatched to PGN
  All of accomodation for the experts despatched to PGN will be provided by PGN according to the Government prevailing regulations (Bappenas rate). PGN shall endeavour to provide suitable an accomodation for those experts.

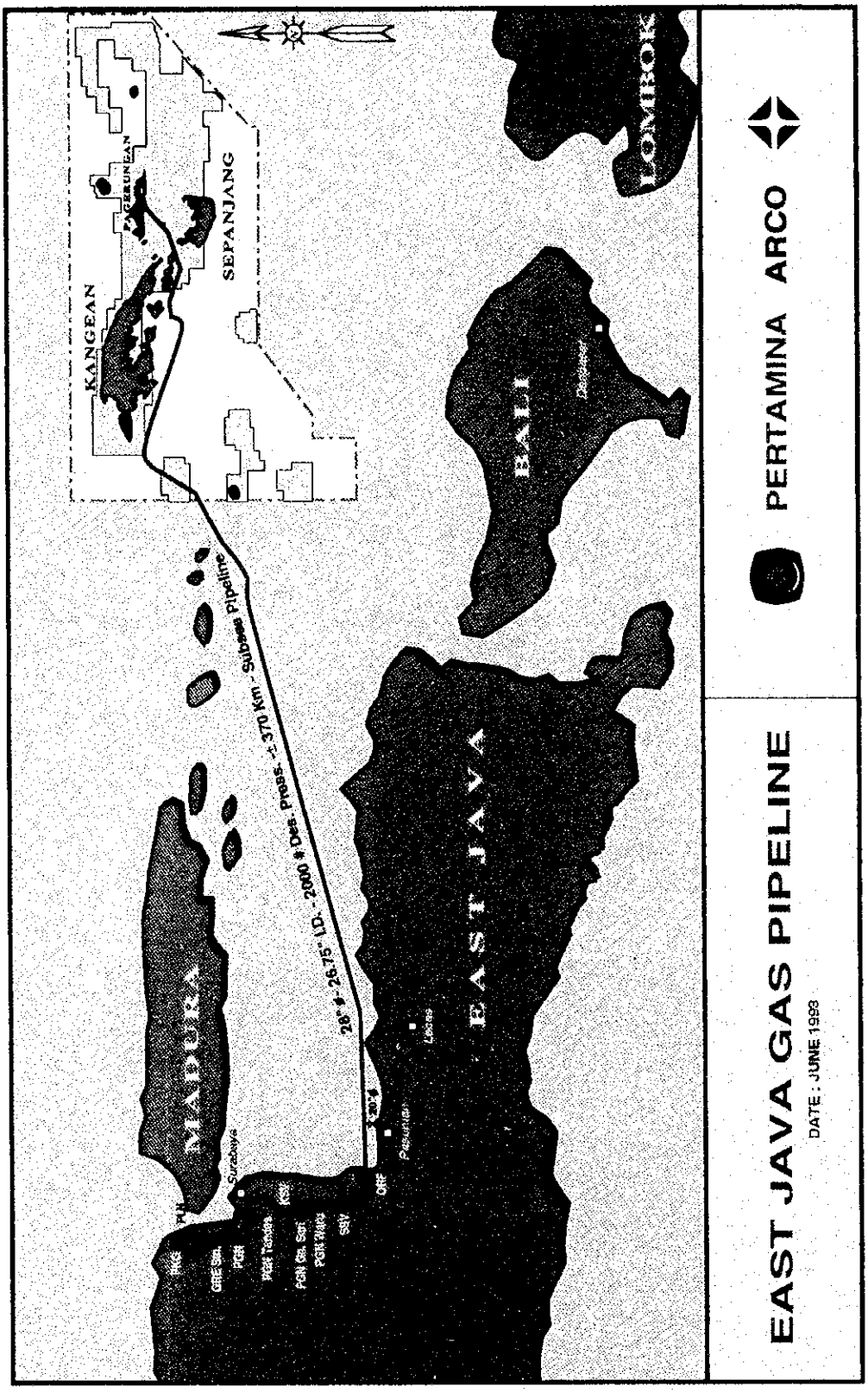
Request, complaint and any comment on JICA's assistance

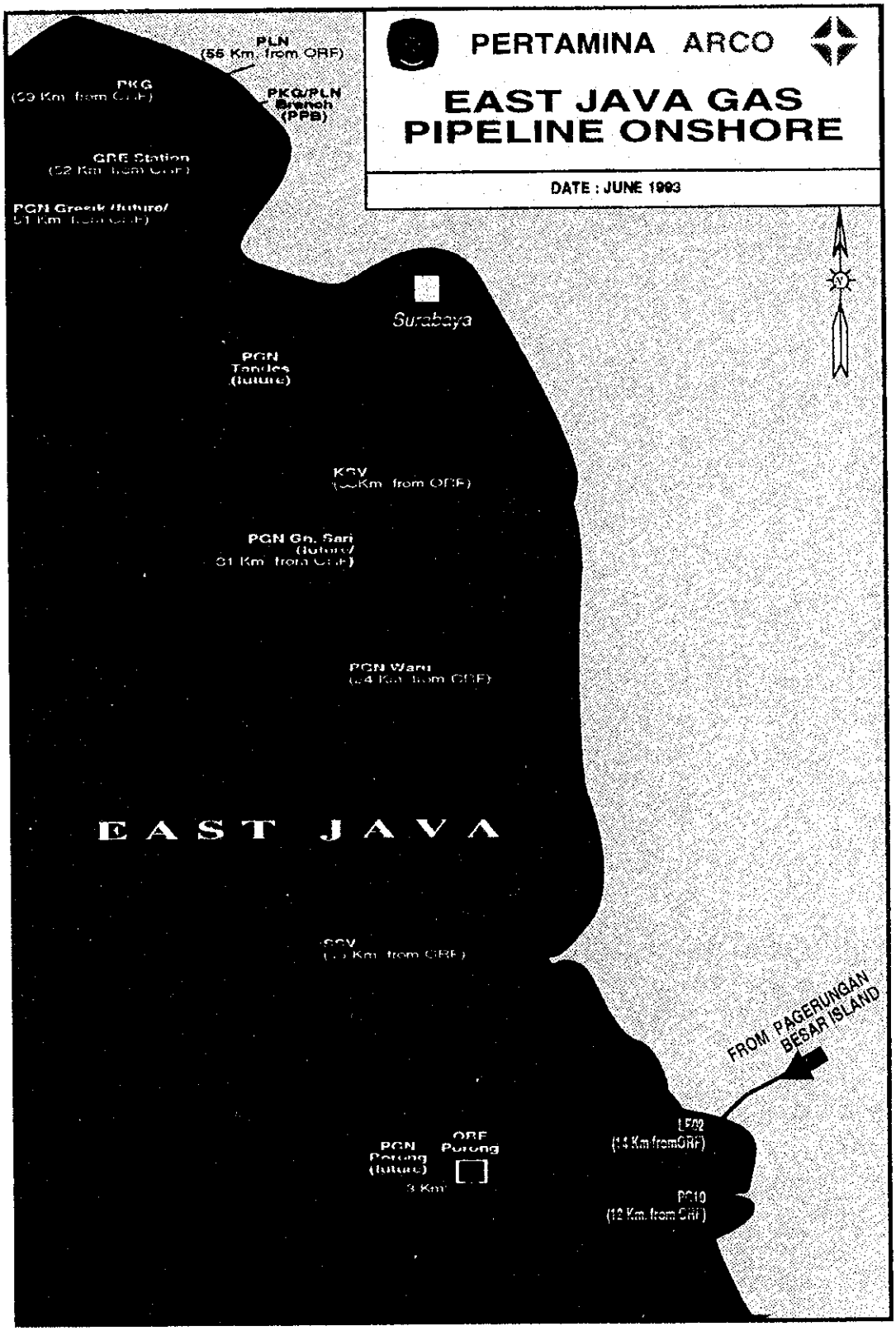
- PGN may request that the transfer of technology will be given by JICA based on transparency basis in shorter period of time, and the training provided should be more specific in gas utilisation.

- It is suggested that the JICA's assistance (Osaka Gas) is a continuity assistance and not cease in certain period.

- PGN's expectation is the coming assistance of JICA (if any) shall be a mutual benefit for PGN and JICA itself and also create a better understanding to both parties in developing the cooperation.

. 2. ガス開発に関する資料




PERTAMINA ARCO
EAST JAVA GAS PIPELINE ONSHORE
DATE : JUNE 1993
PLN (55 Km. from ORF)
PKG
PKG/PLN Branch (PPB)
GRE Station
PGN Gresik (future/
Surabaya
PGN Tandes (future)
KSV
PGN Gn. Sari (future/
PGN Wani
EAST JAVA
SSV
FROM PAGERUNGAN BESAR ISLAND
PGN Porong (future)
ORF Porong
3 Km
PG10
(12 Km. from ORF)

INDONESIA GAS RESERVES
STATUS 1.1.1993
(BSCF)

ACEH	9,472.4	1,378.5	10,850.9
NORTH SUMATRA	1,219.1	5,644.9	6,864.0
CENTRAL SUMATRA	472.7	402.0	874.7
SOUTH SUMATRA	3,171.4	3,645.0	6,816.4
WEST JAVA	4,749.5	2,910.5	7,660.0
EAST JAVA	2,183.8	1,105.8	3,289.6
EAST KALIMANTAN	18,998.7	10,583.0	29,581.7
NATUNA	26,434.8	20,292.9	46,727.7
SOUTH SULAWESI	623.7	196.4	820.1
IRIAN JAYA	206.1	550.0	756.1

EP-1:GAS-RSV

INDONESIA GAS RESERVES
STATUS 1.1.1993
(BSCF)

LOCATION	PROVEN	POTENTIAL	TOTAL
ACEH	9,472.4	1,378.5	10,850.9
NORTH SUMATRA	1,219.1	5,644.9	6,864.0
CENTRAL SUMATRA	472.7	402.0	874.7
SOUTH SUMATRA	3,171.4	3,645.0	6,816.4
WEST JAVA	4,749.5	2,910.5	7,660.0
EAST JAVA	2,163.8	1,105.8	3,269.6
EAST KALIMANTAN	18,998.7	10,583.0	29,581.7
NATUNA	26,434.8	20,292.9	46,727.7
SOUTH SULAWESI	623.7	196.4	820.1
IRIAN JAYA	206.1	550.0	756.1
TOTAL	**67,532.2**	**46,709.0**	**114,241.2**

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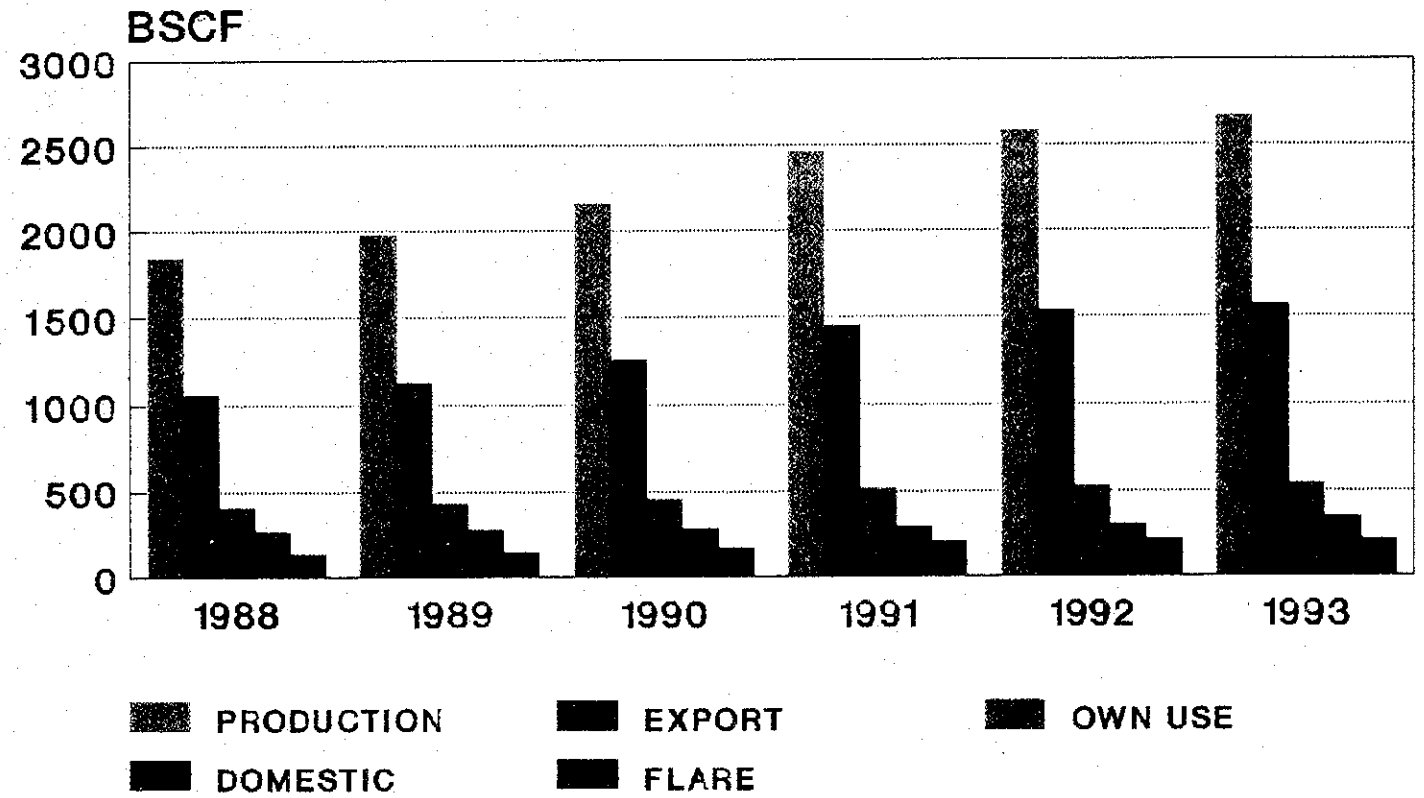
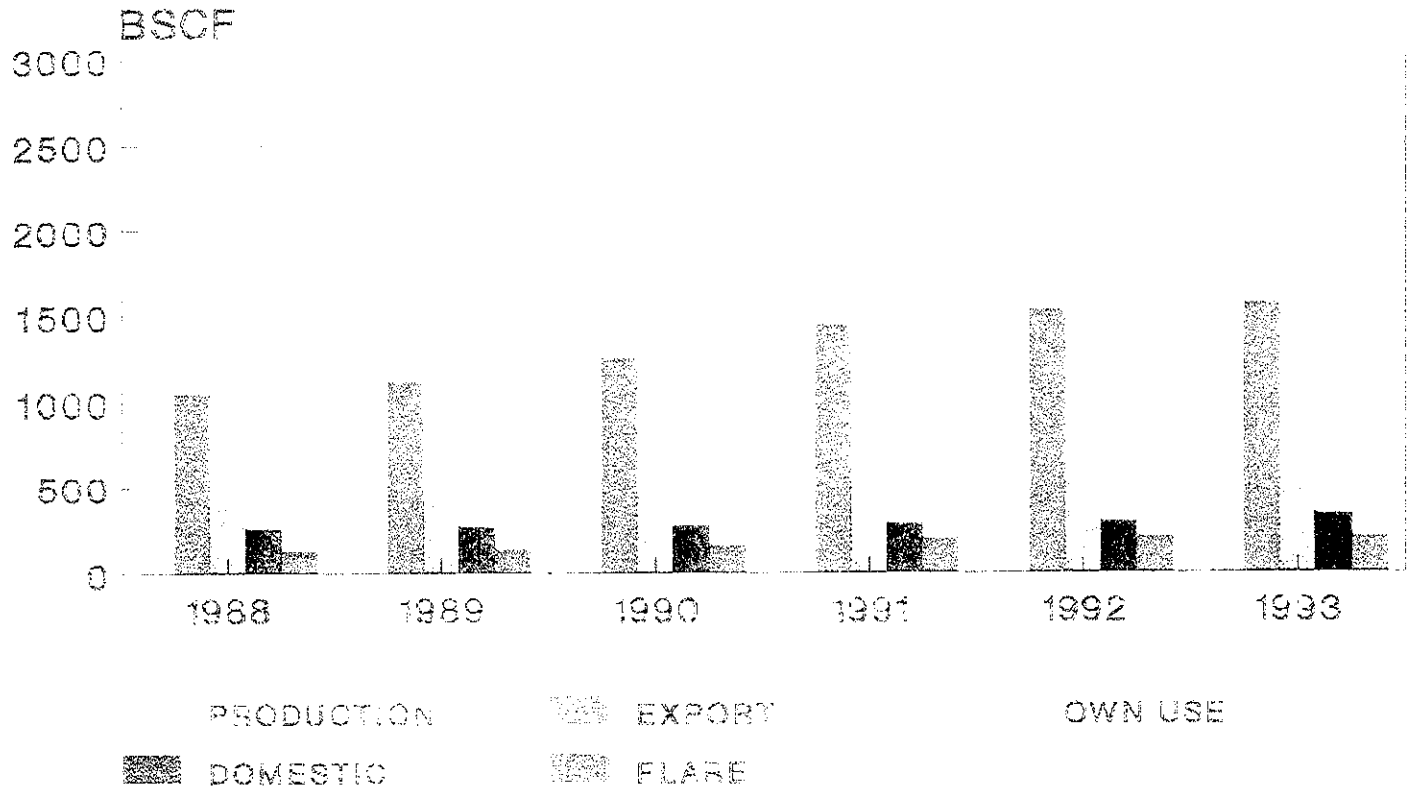
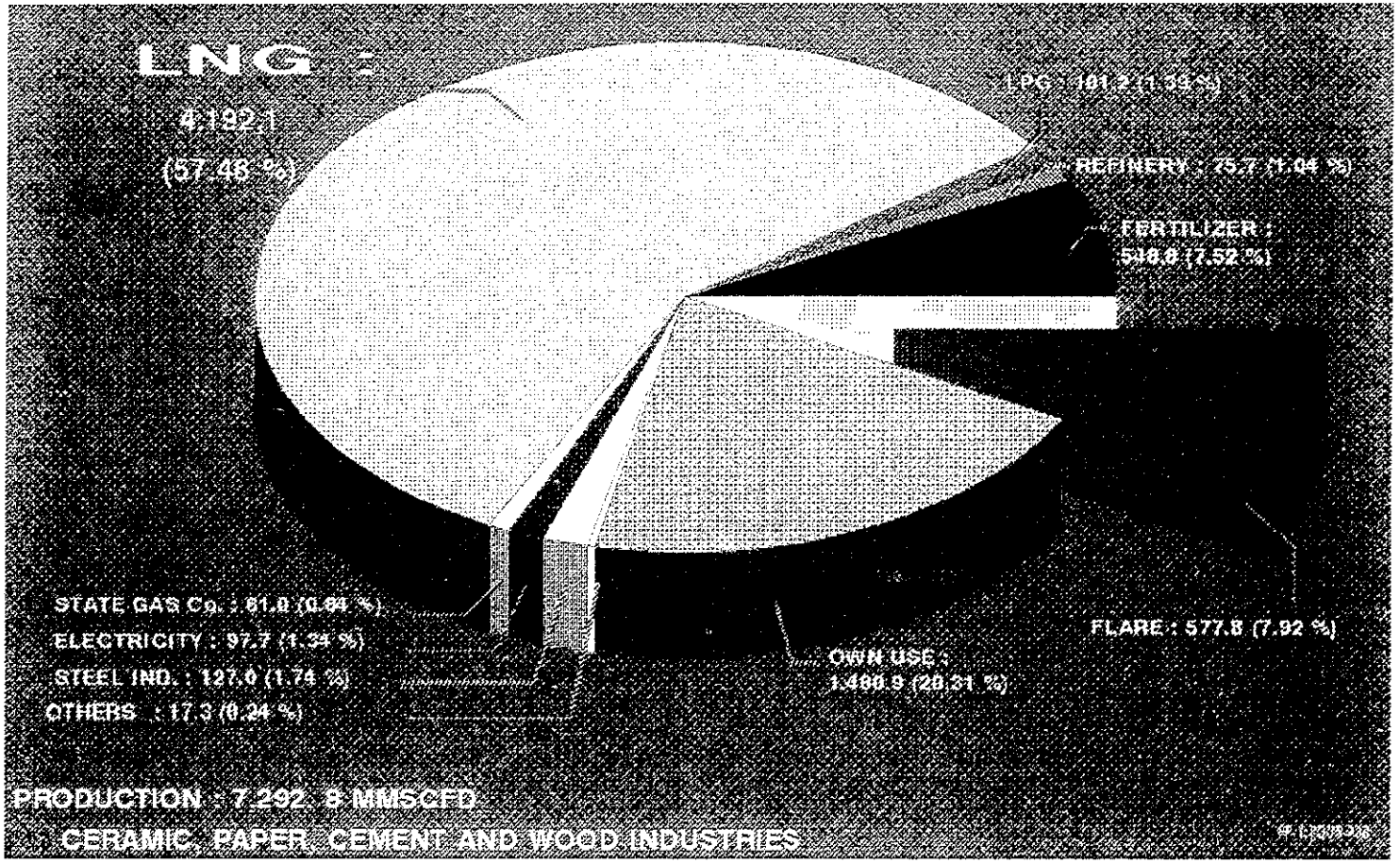
GAS PRODUCTION AND UTILIZATION
1988 - 1993



GAS PRODUCTION AND UTILIZATION
1988 - 1993

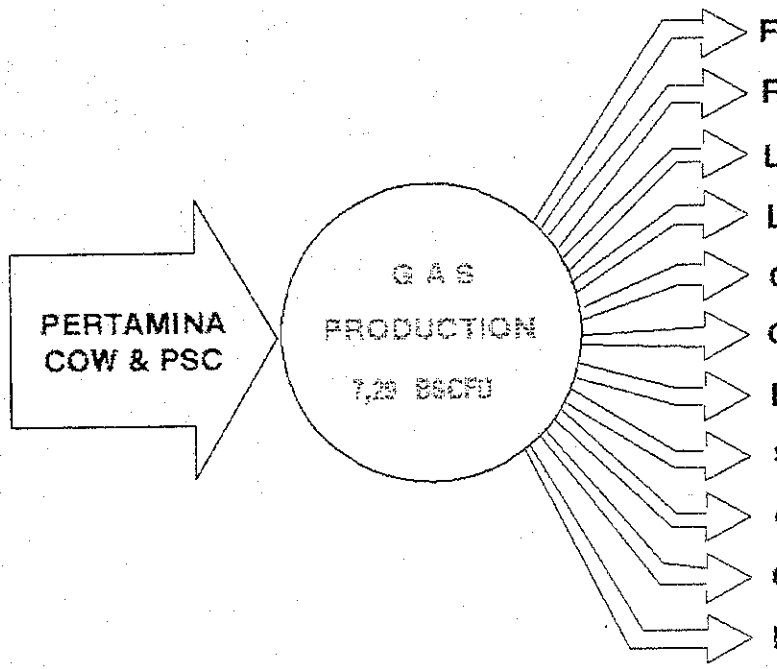


INDONESIA GAS PRODUCTION AND UTILIZATION
1 9 9 3
(MMSCFD)



INDONESIA GAS PRODUCTION AND UTILIZATION

1 9 9 3



	MMSCFD	(%)
FERTILIZER	548.8	7.52
REFINERY	75.7	1.04
L P G	101.2	1.39
L N G	4,192.1	57.48
CITY GAS	61.0	0.84
CEMENT	13.3	0.18
ELECTRICITY	97.7	1.34
STEEL INDUSTRY	127.0	1.74
OTHERS *)	17.3	0.24
OWN USE	1,480.9	20.31
FLARED	577.8	7.92
	7,292.8	100.00

*) CERAMIC, PAPER AND WOOD INDUSTRIES

P1:\PATTG93

KEMAMPUAN PLN SESUAI PENYELESAIAN UNIT - UNIT
PLTGU - PLTG MUARA KARANG & TANJUNG PRIOK

MMSCFD.

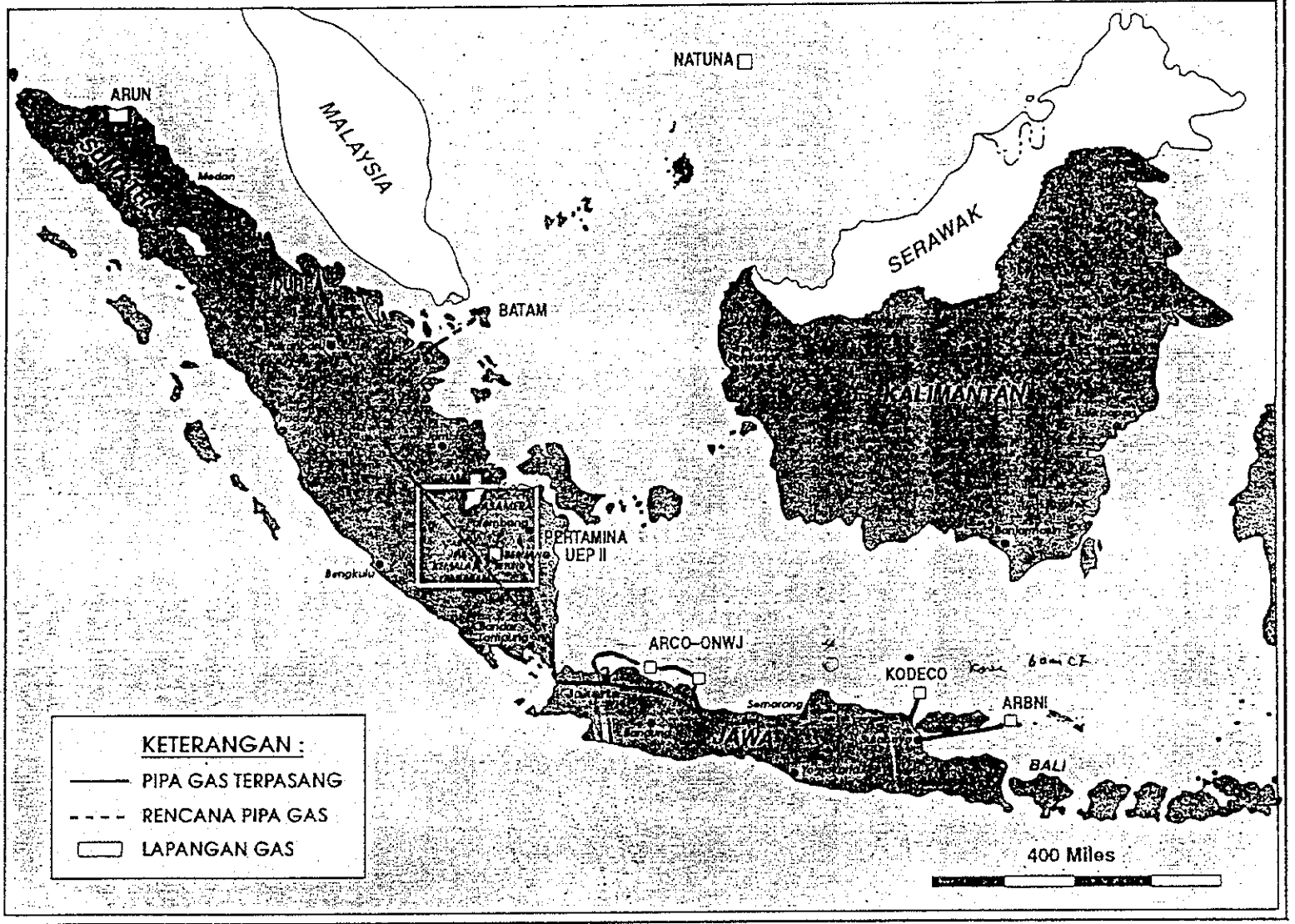
PLTGU / PLTG	1993							1994											1995			
	JUN	JUL	AGT	SEP	OKT	NOP	DES	JAN	PEB	MAR	APR	MEI	JUN	JUL	AGT	SEP	OKT	NOP	DES	JAN	PEB	MAR	APR
MUARA KARANG :																							
1. PLTGU (OC)																							
(3 x 108 MW)	-	-	-	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
2. PLTU (GASIFIKASI)																							
(2 x 200 MW) 1.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40	40	40	40	40	40
OIL→GSA 2.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40	40	40
SUB TOTAL :	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40	40	40	80	80	80
TANJUNG PRIOK :																							
1. PLTGU (OC)																							
(6 x 129 MW) 1.	-	-	-	-	-	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
2.	-	-	-	-	-	-	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
3.	-	-	-	-	-	-	-	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
4.	-	-	-	-	-	-	-	-	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
5.	-	-	-	-	-	-	-	-	-	20	20	20	20	20	20	20	20	20	20	20	20	20	20
6.	-	-	-	-	-	-	-	-	-	-	20	20	20	20	20	20	20	20	20	20	20	20	20
SUB TOTAL :	-	-	-	-	-	20	40	60	80	100	120	120	120	120	120	120	120	120	120	120	120	120	120
2. PLTG-GE (GASIFIKASI)																							
(4 x 50 MW) 1.	-	-	-	-	-	-	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2.	-	-	-	-	-	-	-	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
3.	-	-	-	-	-	-	-	-	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
4.	-	-	-	-	-	-	-	-	-	10	10	10	10	10	10	10	10	10	10	10	10	10	10
SUB TOTAL :	-	-	-	-	-	-	10	20	30	40	40	40	40	40	40	40	40	40	40	40	40	40	40
TOTAL :	-	-	-	60	60	80	110	140	170	200	220	220	220	220	220	220	220	260	260	260	300	300	300

PERTAMINA, DIA GAS EP.

GLESIK
1500MW

RENCANA PIPA GAS TERINTEGRASI

(TRANS JAWA - SUMATERA)



MP-M037

MIGAS/29 APR '93

DOMESTIC GAS PRICING

I. FUEL

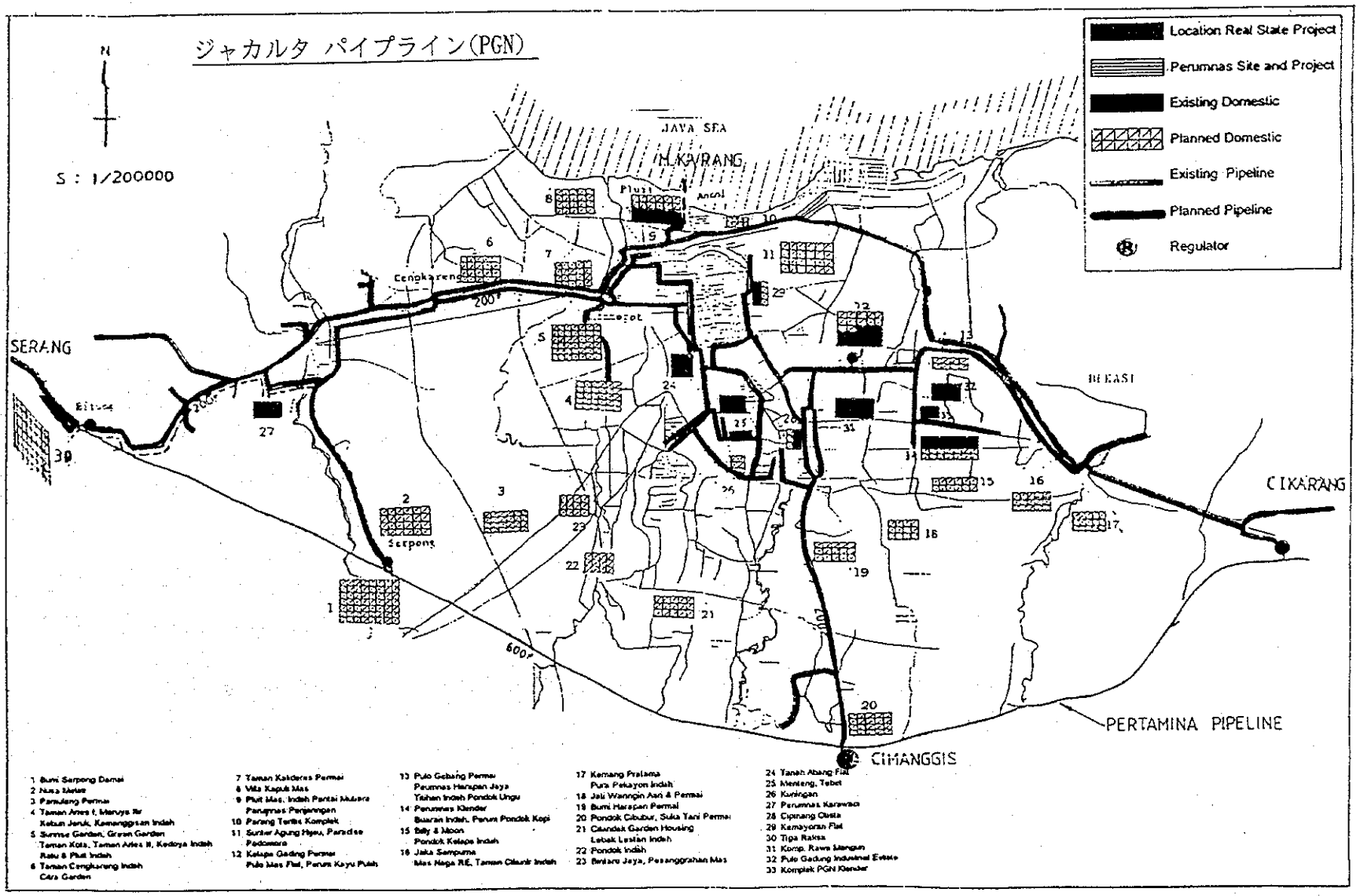
1. FERTILIZER	:	US$	1.00 – 1.50	/	MMBTU
2. STEEL INDUSTRIES	:	US$	2.00	/	MMBTU
3. ELECTRICITY	:	US$	2.45 – 3.00	/	MMBTU
4. CEMENT INDUSTRIES	:	US$	3.00	/	MMBTU
5. PAPER	:	US$	1.50	/	MMBTU
6. REFINERY	:	US$	1.49	/	MMBTU
7. WOOD INDUSTRIES (IRIAN)	:	US$	0.97	/	MMBTU
8. CITY GAS	:	Rp.	2,500 – 4,150	/	MMBTU

II. FEED STOCK

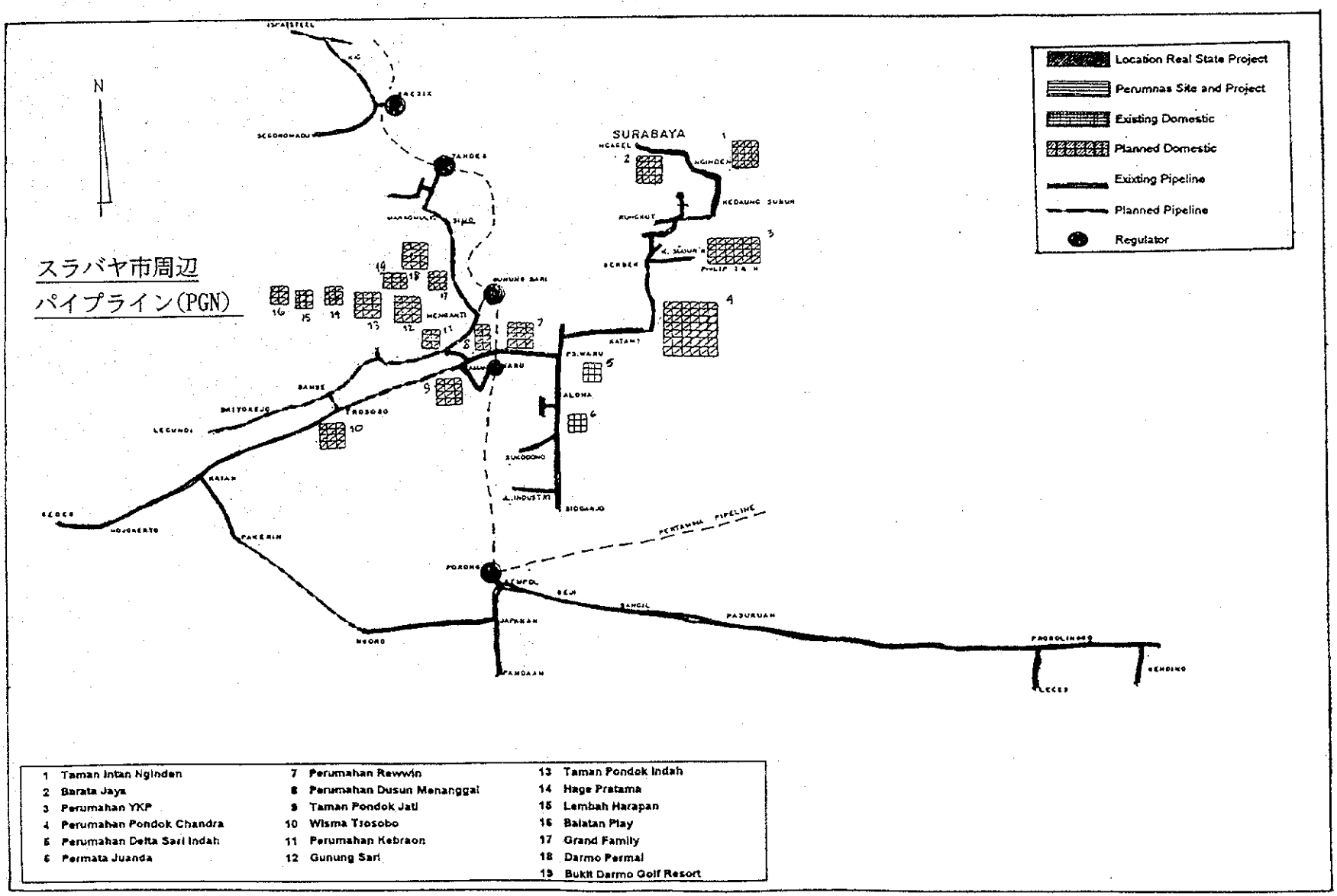
1. FERTILIZER	:	US$	1.00 – 1.50	/	MMBTU
2. STEEL INDUSTRIES	:	US$	0.65	/	MMBTU

III. NEW CONTARCT

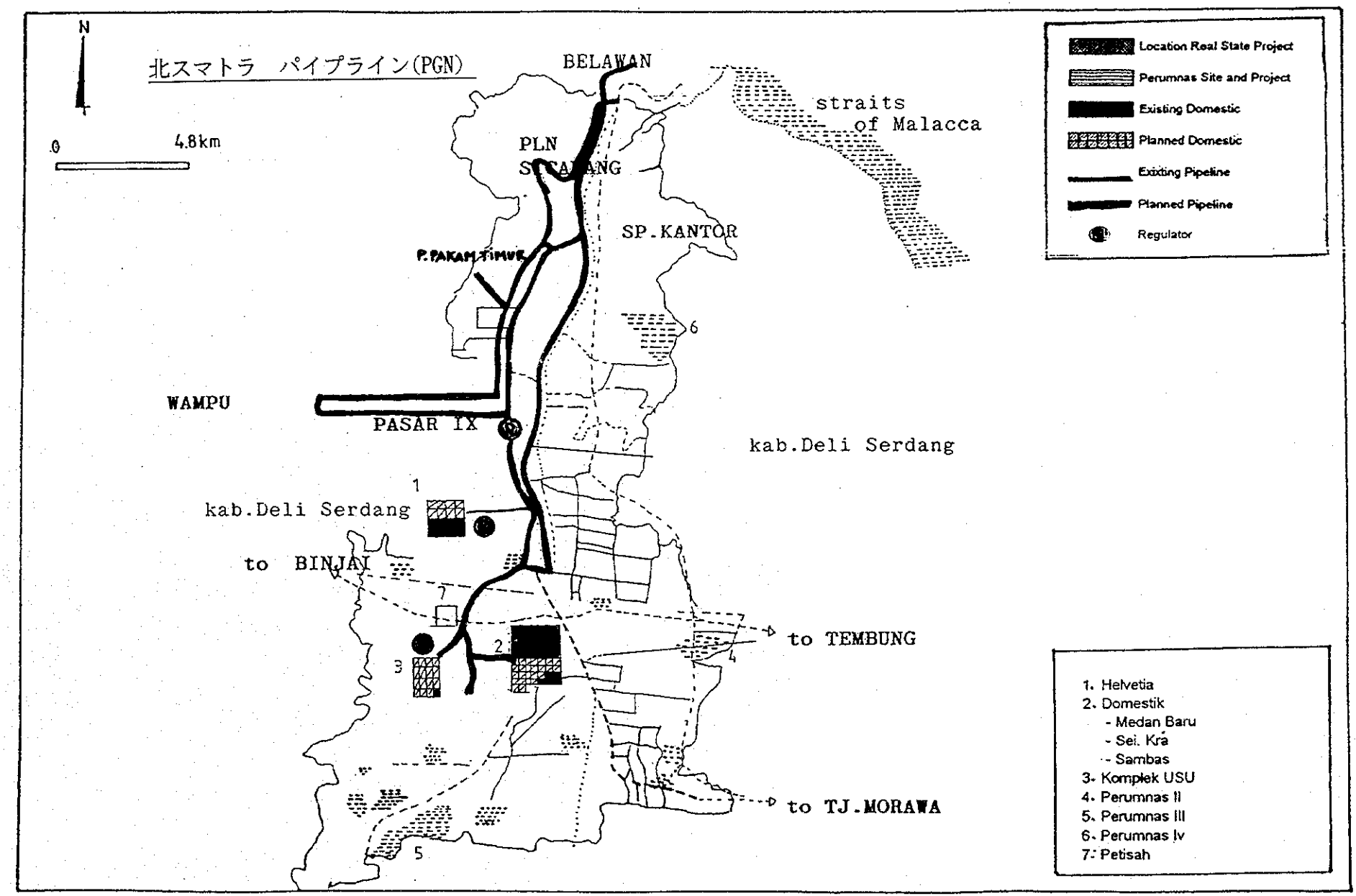
THE GAS DOMESTIC PRICING BASED ON ECONOMICS OF FIELD DEVELOPMENT AND TRANSMISSION FACILITIES.



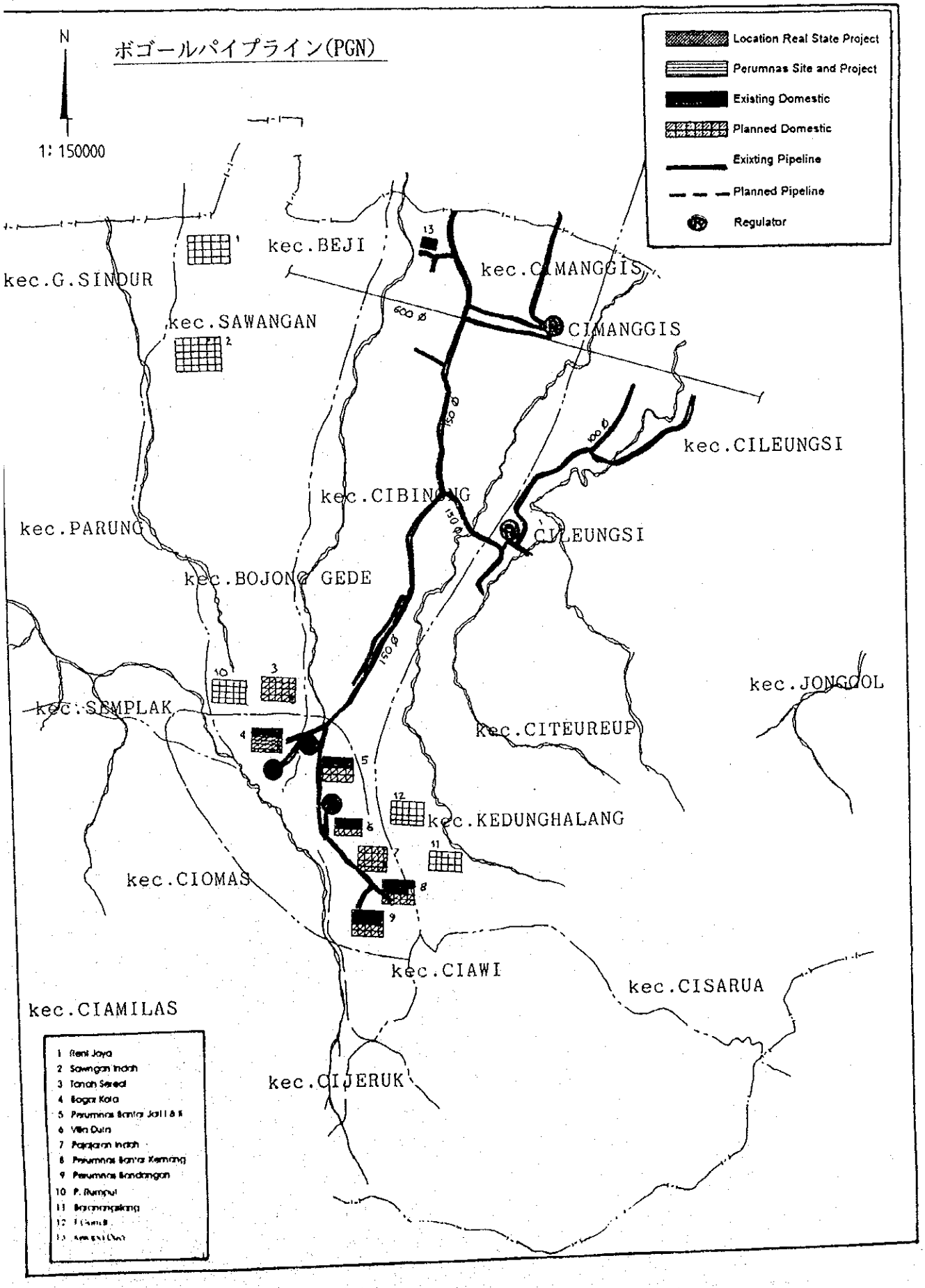
Medium and High Pressure Pipeline Routes in Jakarta



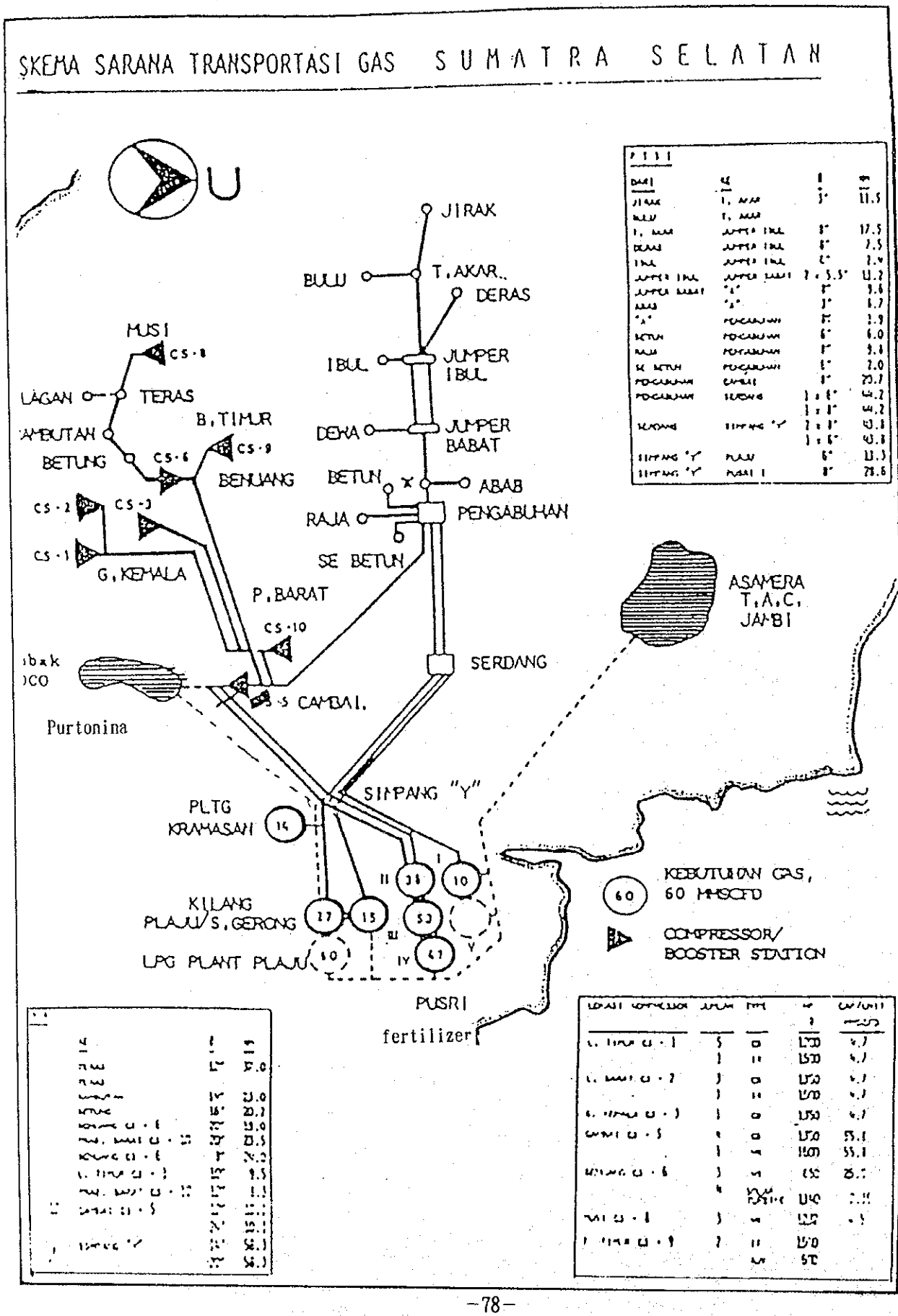
Medium and High Pressure Pipeline Routes in Surabaya



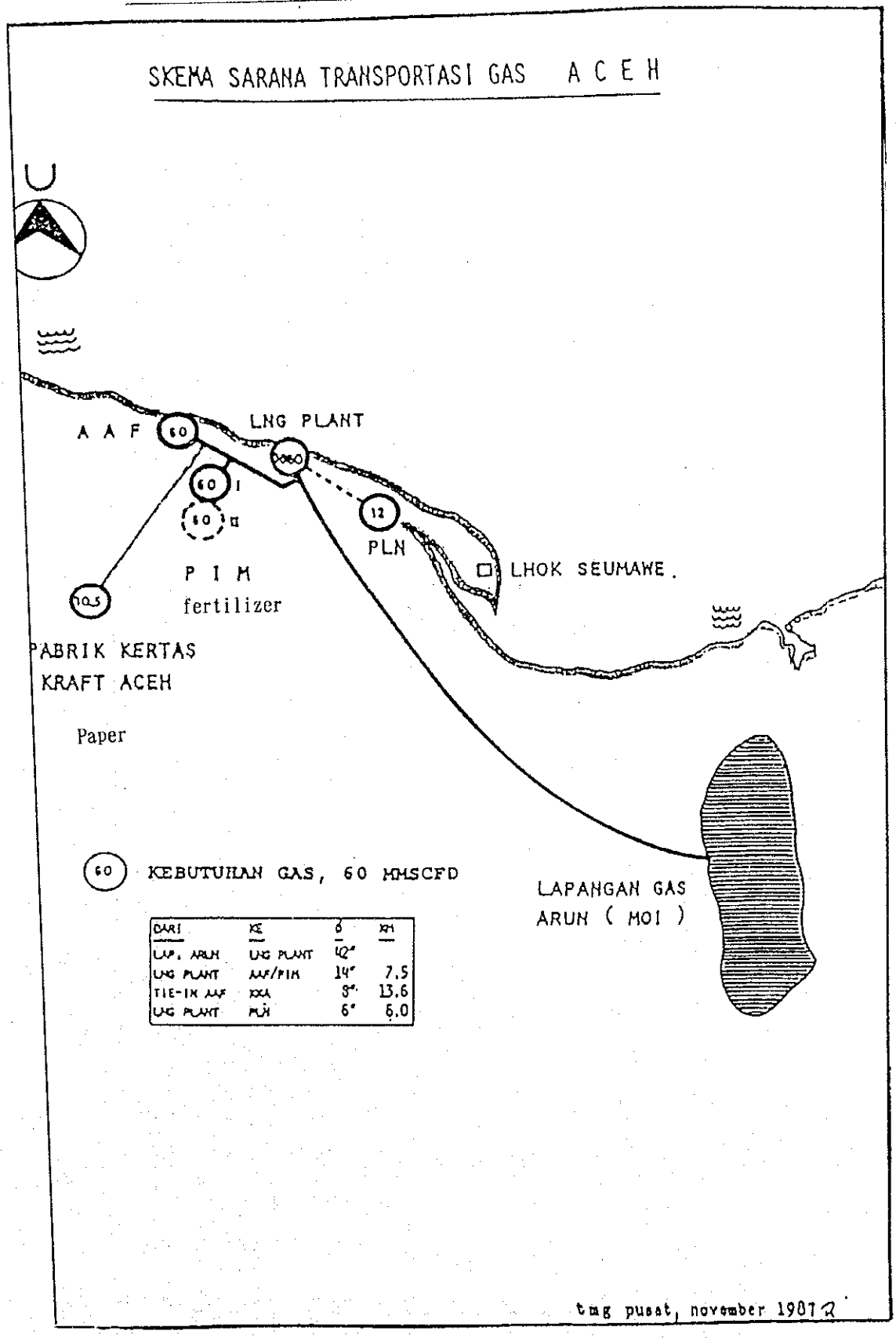
Medium and High Pressure Pipeline Routes in North Sumatera


ボゴールパイプライン(PGN)
N
1: 150000
Location Real State Project
Perumnas Site and Project
Existing Domestic
Planned Domestic
Exixting Pipeline
Planned Pipeline
Regulator
kec.G.SINDUR
kec.BEJI
kec.CIMANGGIS
kec.SAWANGAN
CIMANGGIS
600 ø
150 ø
100 ø
kec.CILEUNGSI
kec.CIBINONG
kec.PARUNG
CILEUNGSI
kec.BOJONG GEDE
kec.JONGGOL
kec.SEMPLAK
kec.CITEUREUP
kec.KEDUNGHALANG
kec.CIOMAS
kec.CIAWI
kec.CISARUA
kec.CIAMILAS
kec.CIJERUK
1 Reni Jaya
2 Sawangan Indah
3 Tanah Sereal
4 Bogor Kota
5 Perumnas Bantar Jati I & II
6 Villa Duta
7 Pajajaran Indah
8 Perumnas Bantar Kemang
9 Perumnas Bandongan
10 P. Rempul
11 Bracanangsiang

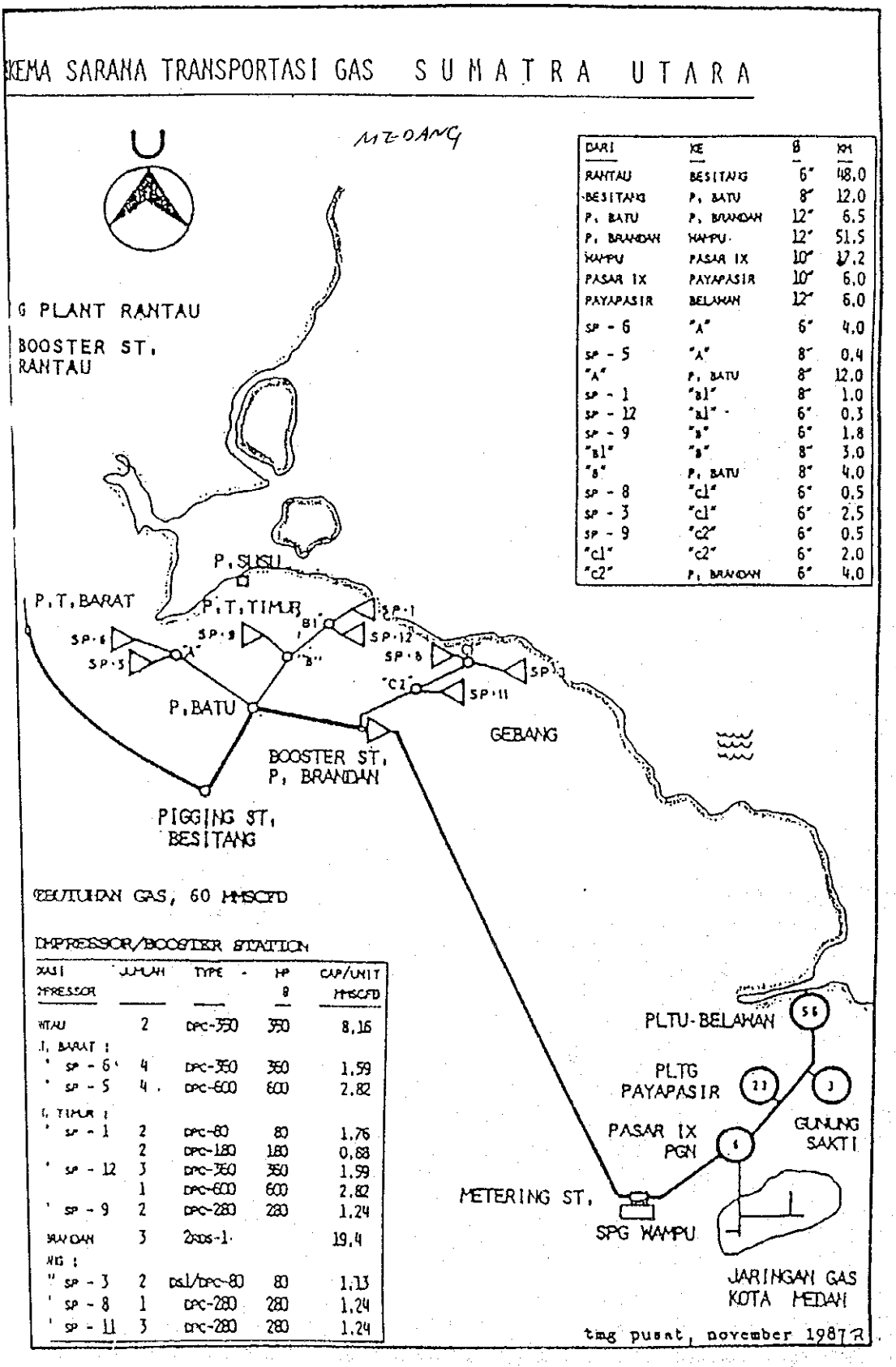
南スマトラ，アサメラ周辺パイプライン



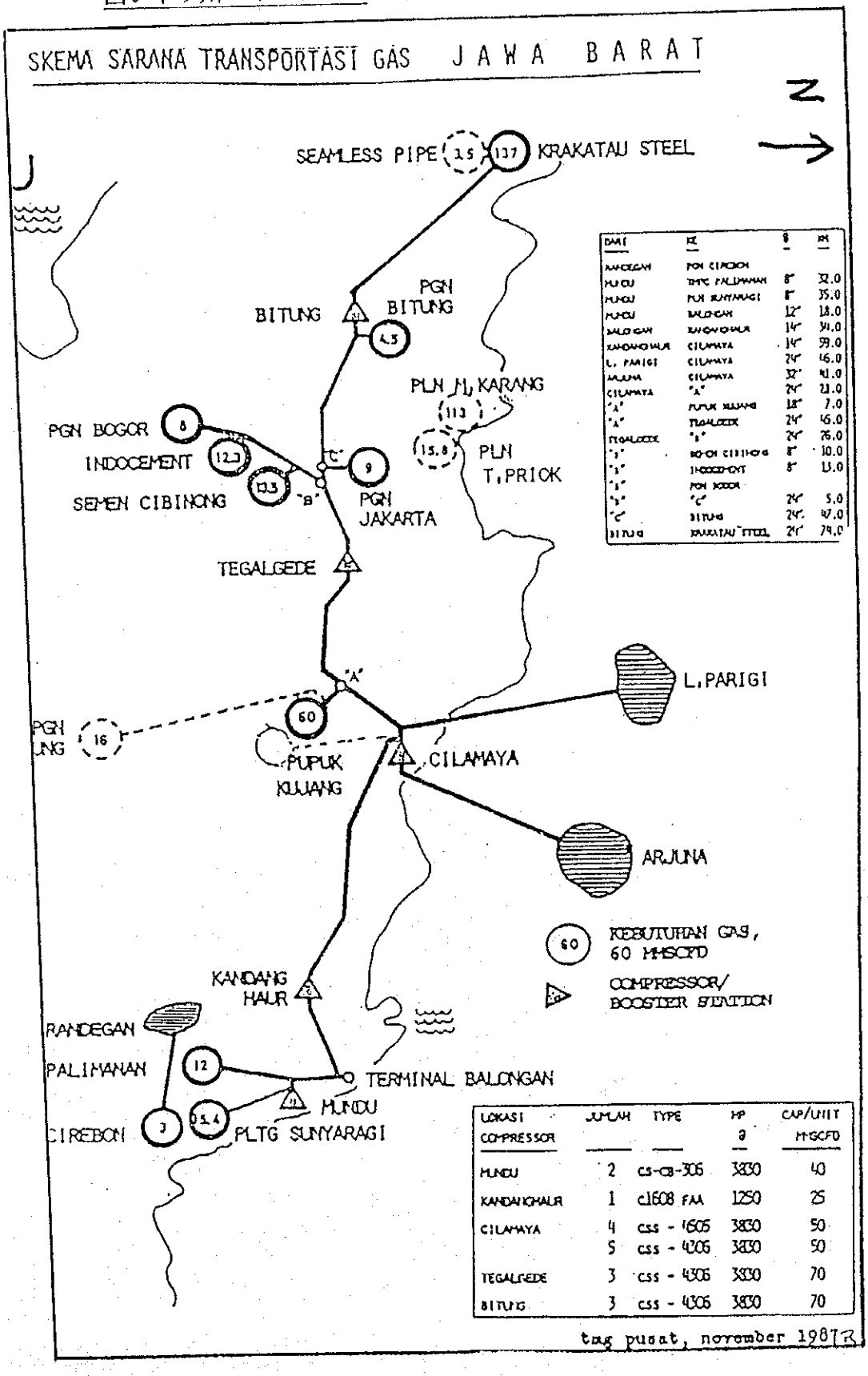
アルン周辺パイプライン



メダン周辺パイプライン

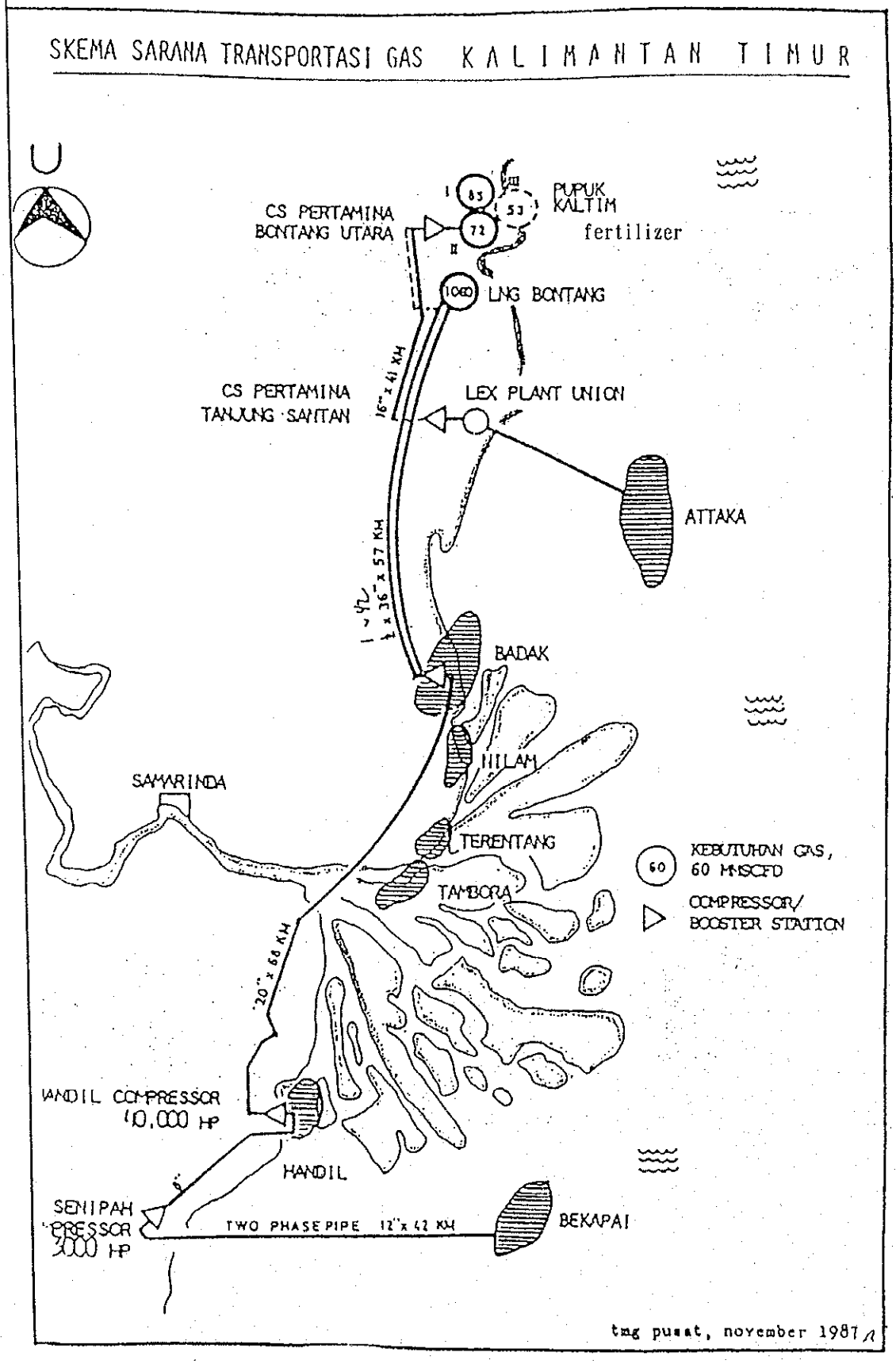


西ジャワ州パイプライン

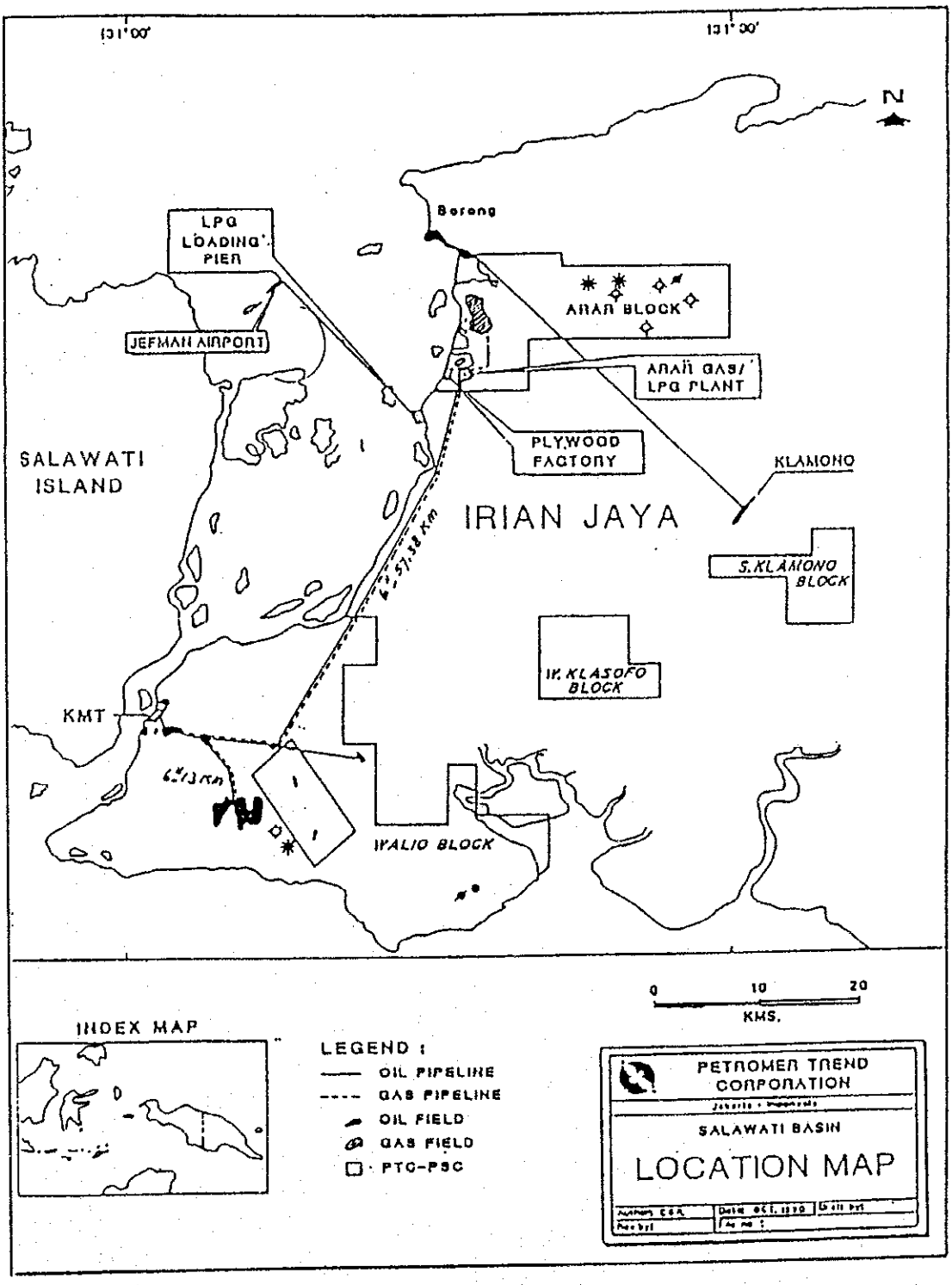


LOKASI COMPRESSOR	JUMLAH	TYPE	HP @	CAP/UNIT MMSCFD
MUNDU	2	GS-GB-306	3830	40
KANDANGHAUR	1	G1608 FAA	1250	25
CILAMAYA	4	GSS - 1605	3830	50
	5	GSS - 4306	3830	50
TEGALGEDE	3	GSS - 4306	3830	70
BITUNG	3	GSS - 4306	3830	70

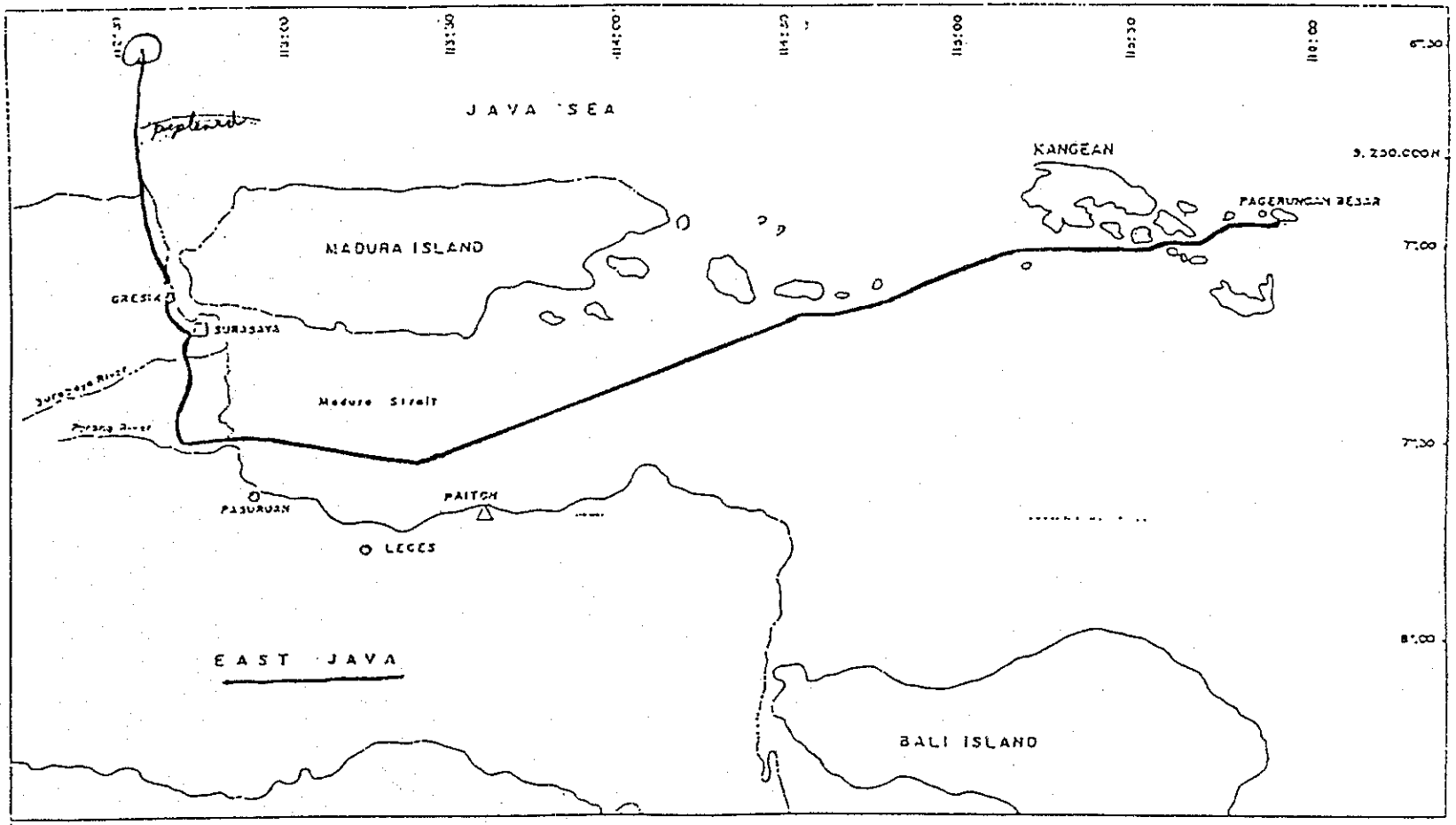
東カリマンタン周辺パイプライン



西イリアン　パイプライン（ガスは計画）



スラバヤ周辺輸送ライン



PGN GAS SALES

天然ガス自動車(Jakarta)

YEAR	NATURAL GAS (Million M3)	MANUFACTURED GAS (Million M3)	LPG (Kg)	CNG (M3)
1983	48.55	11.59	–	–
1984	58.17	11.57	–	–
1985	87.35	10.60	–	–
1986	126.85	9.16	–	–
1987	167.08	12.39	–	–
1988	210.75	10.99	55.462	433.447
1989	283.27	9.67	2.542.900	358.107
1990	396.76	1.91	3.388.570	1.434.653
1991	543.48	–	5.918.920	4.951.515
1992	604.18	–	6.945.240	5.824.153
1993	689.98	–	8.115.404	10.524.673
(1994)	(866.43)	–	(8.301.618)	(12.944.227)
(1995)	(1.148.87)	–	(8.176.440)	(17.129.000)

Jakarta

3. ＰＧＮの概要

PERUSAHAAN UMUM GAS NEGARA (STATE GAS CORPORATION)

I. BACKGROUND

1. PGN (Perum Gas Negara) was created in 1958 as a Government agency to take over the foreign interests in the manufacture and distribution of town gas in the cities of Jakarta, Bogor, Bandung, Cirebon, Semarang and Surabaya in Java; Medan in North Sumatera and Ujung Pandang in Sulawesi. With the availability of natural gas in West Java, several local distribution systems in Jakarta, Bogor and Cirebon were wholly or partially converted to natural gas during 1972 - 1982 (see slide 1).

   Under a Government regulation of 1984, PGN was turned into a Public Corporation, which gave it some operating autonomy within the Government regulations but restricted the capital ownership to the Government. However, in 1992 the Government of Indonesia gave greater life to this country's retailer of town gas, Perum Gas Negara (PGN) by issuing a Minister of Mines and Energy decree No. 785.K/M.P.E./1992. By the decree PGN was authorized not only as a gas distribution, but also as a gas transmission company.

   By 1985, PGN's total gas sales amounted to 95 million cubic meter (MMSCM) per year, equivalent to an average sale of 7.4 million cubic feet per day (MMSCFD), with a sales mix of 70% natural gas and 30% manufactured gas, which was about 20% of the then estimated potential demand from private industries and commercial entities. It had failed to expand the use of natural gas in the growing fuel market primarily due to lack of technical expertise. As a remedial measures, in 1986 GOI negotiated and signed a Bank loan (No. 2690 - IND) for PGN's first major expansion project (the gas distribution project) . Providing a ten-fold increase in natural gas distribution (from about 5 MMSCFD to 50 MMSCFD) by 1992 to about 350 medium size industry and 800 commercial entities in Jakarta, Bogor and Medan.

2. The implementation of the gas distribution project begun in December 1986; its progress has been satisfactory. The institution building of PGN is a key component, for which the bank designed a long-term collaboration (twinning) of PGN with a prominent and experienced gas utility (British Gas) . This relationship provided the means to integrate the know-how transfer and staff training on site in the course of project implementation and exposed PGN to an experienced operating organization acting as a role model. It has been very successful, and has enabled PGN to upgrade its management and technical skills. PGN's on-going skills development program covers 130 professionals (engineer, accountants, and sales executives) and 250 technicians of PGN, 200 technicians of gas pipeline construction contractors and internal gas piping installers, and technicians of industrial consumers.

3. Since 1986, PGN's sales have increased at an average rate of 36% per year and its gas losses have been reduced from 30% to 6%. Prior to 1986, PGN operated at a

loss, in FY88 it achieved brake-even and, in FY90 it made a 2.6% returned on net fixed assets in operation, which was short of the target of 10% but still reflects a turnaround in its operations. It is to PGN's credit that, despite the adverse domestic price movements in gas and liquid fuels. it was able to expand its gas sales in a competitive market through skillful marketing. The total gas sales is now about 90 MMSCFD compare to only 50 MMSCFD that had planned in 1992. In other words the PGN's sales have increased at the rate of 45% from 1992 to 1993.

4. Statutory Functions

The main functions of PGN under its charter are as follows :

(a) Production, supply and distribution of manufactured gas;
(b) Supply transmission of natural gas to customers;
(c) Planning and construction of natural gas transmission and distribution systems; and
(d) provision of services associated with the supply of gas and gas by-products.

5. Current Organization

PGN, being a state-owned utility, is held responsible to the Government through the Minister of Mines and Energy. It is managed by a Board of Directors appointed by the President Director and a maximum of four directors appointed by the President of the Republic of Indonesia on the recommendation of the Minister of Mines and Energy. The Board of Directors is entrusted, under the statutes of the Government and within the guidelines set by the Minister of Mines and Energy, to draw up annual work plan and budget, appoint and discharge employees, establish pay scales and determine the numbers and categories of staff required. The performance of PGN is periodically reviewed by a Board of Supervisors. This Board, also appointed by the President of the Republic of Indonesia, comprises senior staff of the Ministry of Mines and Energy. (See Organization Chart 1)

6. The President Director is the chief officer of the corporation. He is assisted by a Director of Technical Affairs, a Director of Development, Director of Finance, a Director of General Affairs. and an Internal Auditor. (See Organization Chart 2 and 3)

7. PGN's field activities are geographically organized through eight regional branches, located in Jakarta, Bogor, Bandung, Cirebon, Semarang and Surabaya in Java; Medan in North Sumatera and Ujung Pandang in South Sulawesi. The gas marketing and distribution system operations in the regions are managed by Branch Managers who report to the Director Technical Affairs and maintain functional links to other Directors. The construction activity is managed by Project Managers who are responsible to the Director of Development and maintain functional links to Branch Mangers and the other directors.

8. Each Director is supported by Division with responsibility for a major function or a group of smaller functions. Additionally some key function i.e evaluation and reporting center, training are headed by Senior Managers reporting directly to the Board of Directors.

II. GAS MARKET AND DEMAND.

The available gas is mainly used within the industrial and power generation sectors, with relatively small amounts being distributed to commercial and household customers.

Based on the study of the utilization of natural gas by the industrial customers as well as for power generation, the potential future gas market is highlighted in table :

Table 1.

Gas Market

LOCATIONS	DEMAND		
	Total (MMSCFD)	Power (%)	Industry (%)
Duri	400	25	75
Batam Island	290	52	48
West Java	580	40	60
Central Java	144	70	30
East Java	500	20	80
South Sulawesi	51	23	77

Duri

Currently Caltex consumes crude oil for their oil production (Duri Steam Flood Project), which is equivalent to 400 MMSCFD of natural gas.

Batam Island

Based on the survey which was carried out in May 1993, the existing demand for natural gas in Batam is approximately 14,2 MMSCFD, but the estimated future demand is as much as 290 MMSCFD. This figure will hopefully be realized by the year of 2003.

West Java

Current data shows that West Java has a total demand of natural gas as much 580 MMSCFD. This number comprises of the demand for existing industries (340 MMSCFD), the remainder being power generation. The areas of West Java having numerous potential customers of natural gas are Jakarta, Tangerang, Serang, Bogor and Cirebon.

Central Java

In central Java, the demand of 144 MMSCFD is mainly intended for power generation in Tambak Lorok (100 MMSCFD), while the rest are for industries which scatter in this province.

East Java

The total gas demand in East Java is mainly for existing industries (244 MMSCFD), industrial estates (156 MMSCFD) and power generation (100 MMSCFD). The potential customers exist throughput this province.

South Sulawesi

The potential customers in South Sulawesi consist of a cement factory (49 MMSCFD including its power generation) and other existing industries (2 MMSCFD), The customers are located between Sengkang and Ujung Pandang.

III. NEW IMPROVEMENT OF PGN

Contemporaneous to the issuance of the World Bank's study, the Government of the Indonesia gave greater life to the country's retailer of town of gas, Perum Gas Negara (PGN). In particular, in accordance with Minister of Mines and Energy decree No. 785.K/M.PE/1992, PGN was authorized not only as a gas distributor, but also as a gas transmission company. PGN will soon transform itself into a limited liability company ("perseroan") in order to recapitalize to undertake major gas projects. Reportedly, Pertamina is interested in purchasing up to 49 percent of

the new concern's shares. The Asian Development Bank and the World Bank have expressed interest in working with PGN as a gas distribution and transportation company to enhance domestic gas utilization. Under this new improvement PGN then set up a natural development program.

1. Natural gas development

Anticipating the policy of optimizing the use of natural gas in domestic market, and considering the potential gas sources in Indonesia, PGN are now planning to construct an integrated Indonesian Gas Transmission System, which anticipated to have a low operational cost. Many studies have been carried out and commissioned by PGN into further development of domestic natural gas markets. Principally these are as follows :

A. Short-term Planning (1993-1998).

There are 3 regions of development where a transmission system could be constructed i.e. South Sumatera, Java and South Sulawesi. The potential projects are :

1. To develop a gas transmission line from the Asamera Corridor Block to Duri Steam Flood with a branch to Batam Island. (as shown in figure 1) The Total cost of this project is estimated US$ 500 million and the total length is estimated 850 km, i.e. 550 km from Asamera Corridor Block to Duri and 300 km from Rengat to Batam Island. The required diameter of this transmission line is estimated to be 30 inches. The estimated gas reserves at Asamera are 2.47 TCF, with minimum flow-rate of 400 MMSCFD for approximately 15 years. This will flow to Duri and to Batam Island as much as 300 MMSCFD and 100 MMSCFD respectively.

2. To develop a gas transmission line from Palembang in South Sumatera to Cilegon in West Java. (as shown in figure 200). The length of this transmission line is estimated at 500 km with the estimated diameter of 30 inches, will cost around US$ 300 million. The estimated gas reserves in South Sumatera are 1.8 TCF, with the minimum flow-rate of 250 MMSCFD for approximately 15 years.

3. To develop a transmission feeder line in West Java supplying potential gas markets in that area (as shown in figure 3) amounting to 580 MMSCFD. The length of this transmission feeder line is estimated at 425 km with the estimated diameter of 30 inches, and will cost around 115 million.

4. To develop a gas transmission network in East Java (as shown in figure 4) to supply the potential gas market of 500 MMSCFD. The length of this transmission network is estimated at 277 km with an estimated diameter of 30 inches, and will cost around 110 million.

5. To develop a transmission line in South Sulawesi, from Sengkang to Ujung Pandang (A shown in figure 5) to supply the potential gas market of this

transmission li is estimated at 270 km with an estimated diameter 0f 24 inches, and cost around US$ 84 million.

B. Medium-term Planning (1993-2003).

The logical objective in the medium-term would be establish a trans Sumatera-Java transmission infrastructure by connecting the South Sumatera, West Java and East Java networks. The total length of such a network would be in the order of 2,195 km as shown in figure 6 and it will require additional investment of around US$ 450 million.

C. Long-term Planning (1993 - 2008).

Ultimately an Indonesia transmission grid could be contemplate linking the main sources (including Natuna) with the major demand centres, thereby enabling supply and demand matching to be optimized. The Total length of such network would be in the order of 3,800 km as shown in figure 7.

2. Implementation

1. To carry out these program particularly the Short Term Planning, negotiations for development funding were opened with the World Bank (WB) in late 1992 and the Asian Development Bank (ADB) in early 1993.

2. In principle, the World Bank is willing to support Palembang-Cilegon, the West Java and East Java grid, and the Sengkang field, whilst the ADB will support the Asamera - Duri - Batam Project.

3. To further develop the projects, a working team has been set-up which consists of representatives from the Ministry of Mine and Energy (Departemen Pertambangan dan Energi), The Ministry of Finance (Departemen Keuangan), Bureau of National Planning and Development (BAPPENAS), the State Oil Company (PERTAMINA), The State Electric Company (PLN) and other concerned parties.

Jakarta, May 19, 1994

PERUM GAS NEGARA

SLIDE 1

HISTORICAL BACKGROUND OF PERUM GAS NEGARA

1859 IN 1859 FIRMA LJN EINDHOVEN & CO. WAS ESTABLISHED IN BATAVIA AS THE FIRST GAS COMPANY IN INDONESIA

1863 IN 1863 LJN EINDHOVEN WAS TRANSFORMED TO NV. NIGM (NEEDERLANDSH INDISCHE GAS MAATSCHAPPY)

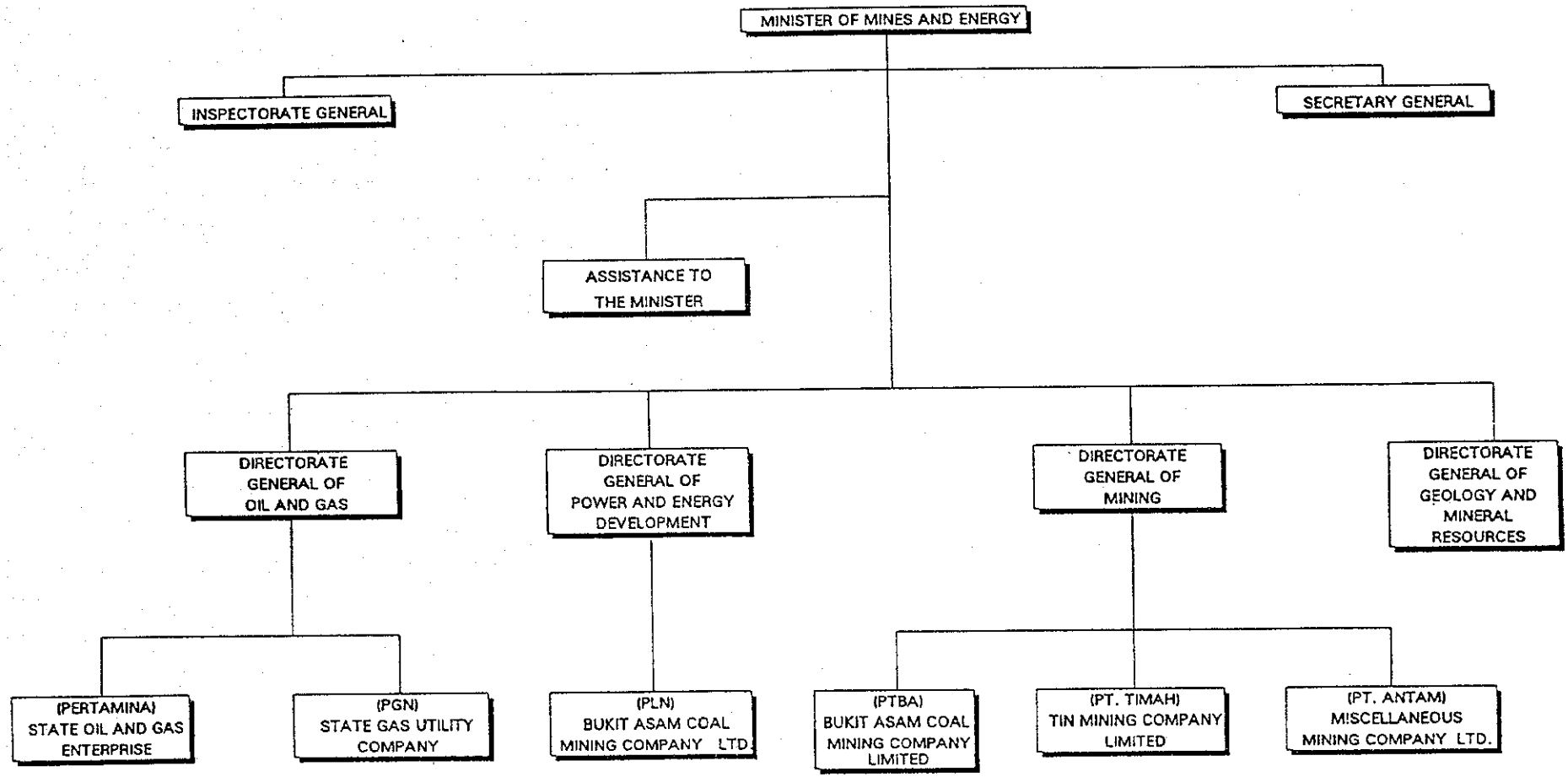
1879 IN 1879, 1898, 1901, 1919, 1921, 1925 AND 1937 NV. NIGM ESTABLISHED REGIONAL OFFICES IN SURABAYA, SEMARANG, BOGOR, MEDAN, BANDUNG, CIREBON AND MAKASAR RESPECTIVELY.

1945 IN 1945 NV NIGM WAS RESTRANSFORMED TO NV. OGEM.

1958 NV. OGEM WAS TAKEN OVER AND WAS CREATED TO A NEW NAME, PERUSAHAAN GAS NEGARA.

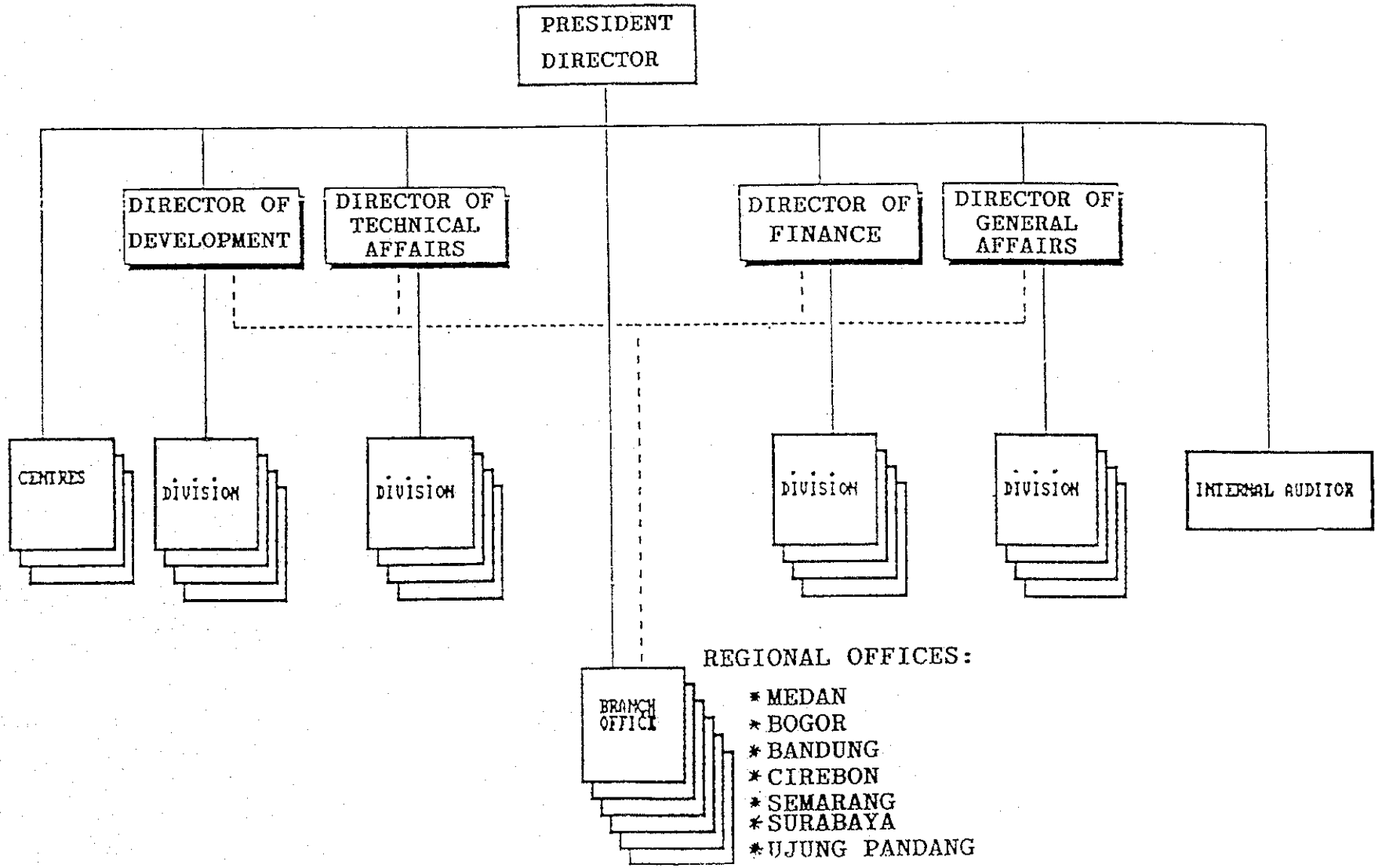
1984 IN 1984 UNDER A GOVERNMENT REGULATION NO 27/1984 PERUSAHAAN GAS NEGARA BECAME PERUSAHAAN UMUM GAS NEGARA, A STATE GAS COMPANY FOR GENERAL PUBLIC GAS UTILIZATION.

ORGANIZATION CHART FOR THE MINISTRY OF MINES AND ENERGY



ORGANISATION
CHART 2

ORGANIZATION STRUCTURE
STATE GAS PUBLIC CORPORATION



Statutory Functions

The main functions of PGN under its charter are as follows :

(a) Production, supply and distribution of manufactured gas;

(b) Supply transmission of natural gas to customers;

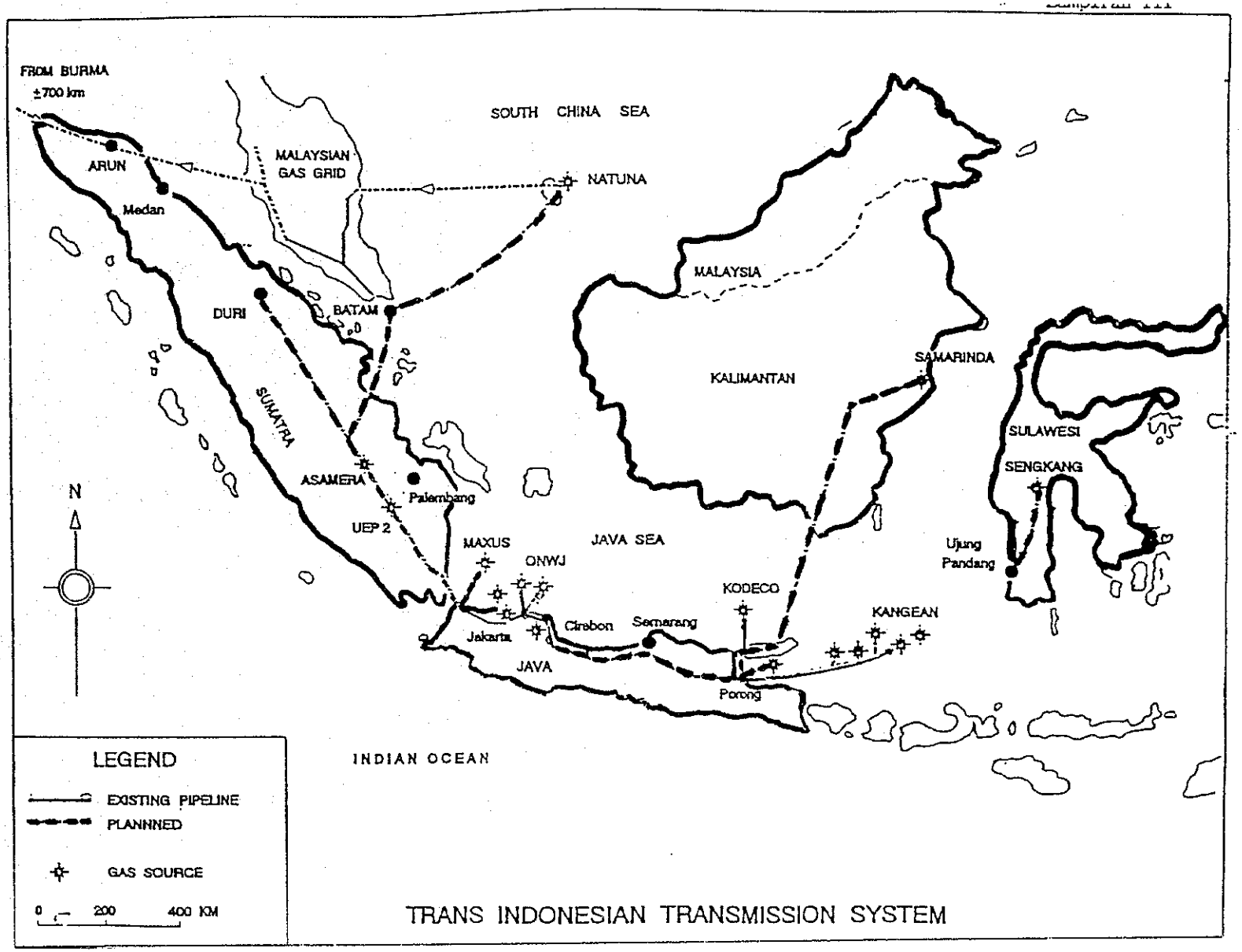
(c) Planning and construction of natural gas transmission and distribution systems; and

(d) provision of services associated with the supply of gas and gas by-products.

Table 1.

Gas Market

LOCATIONS	DEMAND		
	Total (MMSCFD)	Power (%)	Industry (%)
Duri	400	25	75
Batam Island	290	52	48
West Java	580	40	60
Central Java	144	70	30
East Java	500	20	80
South Sulawesi	51	23	77


FROM BURMA
±700 km
SOUTH CHINA SEA
MALAYSIAN
GAS GRID
NATUNA
ARUN
Medan
DURI
BATAM
MALAYSIA
KALIMANTAN
SAMARINDA
SUMATRA
SULAWESI
SENGKANG
ASAMERA
Palembang
UEP 2
MAXUS
ONWJ
JAVA SEA
Ujung
Pandang
KODECO
KANGEAN
Cirebon
Semarang
Jakarta
JAVA
Porong
N
INDIAN OCEAN
LEGEND
EXISTING PIPELINE
PLANNNED
GAS SOURCE
0 200 400 KM
TRANS INDONESIAN TRANSMISSION SYSTEM

4. ＰＧＮの民営化法令

インドネシア共和国大統領

国有ガス公社（ＰＥＲＵＭ）の民営化（ＰＥＲＳＥＲＯ）
に関する１９９４年度インドネシア共和国政府法令

インドネシア共和国大統領

法令制定に至った理由：

a．１９８４年度政府法令ＮＯ．２７に従って設立された国有ガス公社（ＰＥＲＵＭ）を、ガス供給事業の効率性および有効性を高めるために、１９６９年度法規ＮＯ．９の規定に従って民営化する必要性が生じた；

b．上記の件に関連して、国有ガス公社（ＰＥＲＵＭ）を民営会社（ＰＥＲＳＥＲＯ）に移行させるための政府法令の制定が必要となった；

法令制定に際しての参考法規：

1. １９４５年憲法第５条第(2)項
2. 民法典（１８４７年度法規ＮＯ．２３）。何度か改正が行なわれ、最終的な版は、１９７１年度民法典ＮＯ．４（１９７１年度政府官報ＮＯ．２０、政府官報追補ＮＯ．２９５９）；
3. 国有企業形態に関する１９６９年度法規ＮＯ．１の代わりとなる政府法令の制定について規定した１９６９年度法規ＮＯ．９（１９６９年度政府官報ＮＯ．１６、政府官報追補ＮＯ．２８９０）は、（１９６９年度政府官報ＮＯ．４０、政府官報追補ＮＯ．２９０４）となった；
4. 民営会社（ＰＥＲＳＥＲＯ）に関する１９６９年度政府法令ＮＯ．１２（１９６９年度政府官報ＮＯ．２１、政府官報追補２８９４）。これは改正が行なわれ、１９７２年度政府法令ＮＯ．２４（１９７２年度政府官報ＮＯ．３２、政府官報追補ＮＯ．２９８７）として発布された。
5. 国有会社（ＰＥＲＪＡＮ）、公社（ＰＥＲＵＭ）および民営会社（ＰＥＲＳＥＲＯ）の設立と管理手続に関する１９８３年度政府法令ＮＯ．３（１９８３年度政府官報ＮＯ．３、政府官報追補ＮＯ．３２４６）。これは改正されて１９８３年度政府法令ＮＯ．２８（１９８３年度政府官報ＮＯ．３７）として発布された。

上記の内容にもとづき以下の法令が制定されることになった：

法令の制定：国有ガス公社（ＰＥＲＵＭ）の民営化（ＰＥＲＳＥＲＯ）に関する１９９４年度インドネシア政府法令

第Ｉ部

事業形態の変更および解散

第一条

(1) １９８４年度政府法令ＮＯ．２７に従って設立された国有ガス公社（ＰＥＲＵＭ）は、１９６９年度法規ＮＯ．９の規定に従って民営化されることになった。

(2) 上記第(1)項に従い、国有ガス公社（ＰＥＲＵＭ）が民営会社（ＰＥＲＳＥＲＯ）に移行するにあたり、国有ガス公社（ＰＥＲＵＭ）は、民営化された時点で、規定にもとづき、解散を明らかにしなければならない。すなわち、解散の時点で国有ガス公社に属するすべての権利義務、資産および社員は、当該の民営会社（ＰＥＲＳＥＲＯ）にすべて移行するものとする。

第Ⅱ部

目的および方針

第二条

(1) 第一条に規定された民営会社（ＰＥＲＳＥＲＯ）の目的と方針は以下の通りである：

ａ．公の利益のためにガスを普及し、利用してもらうこと、さらに会社経営の原則に基づき利益を上げることを目的とする。

ｂ．国民の需要を充たすために、良質で、充分な量のガスを供給することを目的とする。

(2) 上記第(1)項ｂに規定された目的を達成するために、民営会社（ＰＥＲＳＥＲＯ）は、以下の事業を行なうものとする：

ａ．人工ガス（炭化水素ガス）の計画、建設、開発、生産、供給、流通事業を行なう；

ｂ．政府によって定められた方針に従い、天然ガスの計画、建設、配管整備および流通事業を行なう；

ｃ．現行の法規定に従い、上記のａおよびｂ項に規定された以外の事業を行なう。

(3) 上記第２項ｂに規定された事業を行なう場合、民営会社（ＰＥＲＳＥＲＯ）は、関係官庁によって定められた方針に従い、天然ガス開発利用の分野で天然ガス開発請負業者と協同で事業を遂行するものとする。

(4) 民営会社（ＰＥＲＳＥＲＯ）は、第(1)項の規定を考慮に入れ、政府によって定められた他の事業を行なうことができるものとする。

第Ⅲ部

民営会社（ＰＥＲＳＥＲＯ）の資本

第三条

(1) 設立時に設定され、払込が行なわれる民営会社（ＰＥＲＳＥＲＯ）の資本として、国有ガス公社（ＰＥＲＵＭ）に投下された国有資産が用いられるものとする。

(2) 第(1)項に記載した国有資産の価値は、大蔵大臣および鉱業エネルギー大臣とが協同で算定した結果にもとづき、大蔵大臣が決定するものとする。

(3) 民営会社（ＰＥＲＳＥＲＯ）の資本金に関するその他の規定は、定款の中で別途定めるものとする。その中には、株式として割り当てられる民営会社（ＰＥＲＳＥＲＯ）の授権資本に関する規定も含まれる。因みにこれらの規定は、１９６９年度政府法令ＮＯ．１２、後に改正された１９７２年度政府法令ＮＯ．２４の規定に従って定められるものとする。

(4) 民営会社（ＰＥＲＳＥＲＯ）の最初の貸借対照表は、大蔵大臣によって定められるものとする。

第Ⅳ部

民営会社（ＰＥＲＳＥＲＯ）の設立

第４条

第一条に規定された民営会社（ＰＥＲＳＥＲＯ）の設立は、民法典（１８４７年度法規ＮＯ．２３）すなわちこれが何度か改正され最終的に制定された１９７１年度法規ＮＯ．４の規定に従って行なわれるものとする。ただし、この場合、１９６９年度政府法令ＮＯ．１２、すなわち後に改正された１９７２年度政府法令ＮＯ．２４の規定を考慮して行なわれるものとする。

第５条

(1) 第４条に従って行なわれる民営会社（ＰＥＲＳＥＲＯ）の設立手続の完了に関する権限は、大蔵大臣にすべて委任されている。

(2) 大蔵大臣は、本条第(1)項に規定された権限およびそれに伴う代理権を、鉱業エネルギー大臣に譲渡することができるものとする。ただし、この場合、前もって大蔵大臣が民営会社（ＰＥＲＳＥＲＯ）定款草案に関する認可を与えていなければならない。

第Ⅴ部

終結規定

第６条

民営会社（ＰＥＲＳＥＲＯ）の設立および国有ガス公社（ＰＥＲＵＭ）の解散の日付をもって、１９８４年度政府法令ＮＯ．２７は無効となるものとする。

第７条

この政府法令の施行に際して必要とされる詳細な規定に関しては、大蔵大臣および鉱業エネルギー大臣が、各々の役割に応じて、協同でもしくは別個に定めるものとする。

第８条

この政府法令は、制定された日付をもって効力を発するものとする。

この法令をすべての国民に知らせるために、インドネシア共和国官報に掲載し、法令の制定を知らしめるものとする。

ジャカルタにて

１９９４年１２月６日

インドネシア共和国大統領スハルトにより

本法令の制定が決定される。

ジャカルタにて

１９９４年１２月６日

インドネシア共和国国務大臣ムルディオノにより

本法令が制定される。

１９９４年度インドネシア共和国政府官報ＮＯ．６６

原本および写し

インドネシア共和国内閣官房

法務立法局長

ランボック・Ｖ・ナハタンズ法学修士

5. GAS INFRASTRUCTURE DEVELOPMENT PLANS

By Directorate of Development
PERUSAHAAN UMUM GAS NEGARA

GAS INFRASTRUCTURE DEVELOPMENT PLANS

By Directorate of Development
PERUSAHAAN UMUM GAS NEGARA

ABSTRACT

The availability of gas in a relative abundance in Indonesia provides enormous opportunities to PGN, State Owned Gas Company, particularly, on gas development and gas utilization in the coming years.
This Paper outlines policies adopted as well as stages to be taken in development of natural gas transmission system in Indonesia.
Gas Transmission projects are capital investment, require technical and business expertise, and need gas base load, financing and capital sourcing capability and also the Government support, particularly in term of regulatory frame work.
The 800 km central Sumatera gas pipeline project from Asamera to Duri and from Jambi to Batam is part of the Indonesian gas integrated transmission system that will be linked to the further future Gas Transmission development.

GTDP94/paper-2/2111/#Z03

GAS INFRASTRUCTURE DEVELOPMENT PLANS

Introduction

The Indonesia economy is expected to grow at over six percent Per year over the next decade, and the demand for energy is expected to grow at an even higher rate. Rapid growth in domestic utilization of oil is reducing the exportable surpluses to the extent that Indonesia may become a net importer of oil by the turn of the century. One of the policy objectives of the Government is to satisfy energy demand while minimizing the diversion of petroleum products from export, by encouraging the use of alternative sources of energy. The relative abundance of gas resources and the increasing global concerns for cleaner environment, coupled with continued increases in demand in the domestic markets has led to increasing plan in development of gas infrastructure in Indonesia.

However, development of natural gas infrastructure involves high up front investment. In the case of pipeline projects, that we are discussing here, for domestic market, the investments likewise are just as capital intensive.

Transporting gas to the end consumers requires the synchronization of upstream gas field development and pipeline with downstream construction of gas processing plants, transmission lines, distribution lines, and other related facilities. Relative to other projects generally there is a long ges station period for recovery investment. With regard to Indonesian Gas pipeline, PGN (State owned Gas Company) plans to develop the gas infrastructure in stages, that will be linked later as Indonesia Gas Integrated Transmission System.

Gas Supply and Demand

Indonesia has Gas reserves of about 65 TCF of proven gas reserves and about 40 TCF of further potential reserves. In general these reserves do not coincide with areas of gas demand because these are located around the major conurbation's, and development requires high investment in gas facilities, both on-shore and off-shore. The gas reserves are distributed in Sumatra, Java, Kalimantan, Natuna and Sulawesi.

However, the gas demand for the near future pipeline system are mainly located in Java and Sumatra. The gas demand are accounted for 580 MMSCFD for west Java, 144 MMSCFD for Central Java, and 500 MMSCFD for East Java, while for Sumatra is about 400 MMSCFD. In addition, Batam island is expected to have 290 MMSCFD of gas demand and 51 MMSCFD for South Sulawesi.
All those are excluding the gas demand that being supplied in the existing gas network. Detailed market demand can be described as follows.

Gas currently developed for domestic marketing is used mainly in the fertilizer, steel and power generation sectors, with relatively small amounts being distributed to commercial and household customer.

As with all fuels, the demand for gas is price sensitive, but the price should be a true reflection of its market value in terms scarcity, availability of alternatives and cost of production.
table 2 below shows a current price comparison of fuels used for industrial purposes., of which natural gas is the cheapest except for fuel oil, which receives a Government subsidy of US$ 0.94 per MMBTU. Despite the adverse price difference there are factors in favour of choosing gas, particularly for a new factory which would not need to invest in oil transportation and storage tanks. Existing factories also may avail themselves of the 45 day 'grace period' offered by PGN in addition to considerable savings in maintenance of solid fuel or oil firing equipment.

INTER FUEL COMPARISON PRICES

FUELS	PRICE (US$/MMBTU)
Natural Gas (PGN)	3.58
IDO	4.66
ADO	5.03
LPG	8.02
Fuel Oil (subsidy)	2.95
Kerosene (subsidy)	3.80

PGN studies of potential demand in location where further gas supply may be feasible.

INDONESIA GENERAL INDUSTRY
POTENTIAL GAS MARKET

BY YEAR	TOTAL GAS MARKET DEMAND MMm³
1994	81
1995	173
1996	193
1997	240
1998	351

Duri

Caltex currently consume around 40,000 bpd of crude oil to fuel the enhanced oil recovery project (Duri Steam Flood Project), increasing to an estimated 60,000 bpd when production peaks in year 1998. This is replaceable by approx. 370 MMSCFD of natural gas.

Batam Island

According to the PGN marketing survey carried out in may 1993 present demand is 14.2 MMSCFD, but will increase to 83 MMSCFD by the year 1996 due to development of commercial premises, medium industry and combined cycle power generation.

West Java

Current demands in Jakarta and Bogor already supplied to the limit of gas available from the West Java Grid. Further demand growth is anticipated in Cikarang, Tangerang, Serang and Cilegon, these being areas served by the total roads, but as yet held back by lack of power

generation capacity. Total gas market demand for medium industry in West Java is 140 MMSCFD by year 1996, and it will be increased to 220 by year 1998.

Central Java

The demand estimate of 144 MMSCFD for year 1996 comprises of 100 MMSCFD for power generation in Tamak Lorok (PLN Semarang), and 44 MMSCFD for dispersed general industry. The existence of an established PGN branch office at Semarang will be a factor in the realization of this market.

East Java

Recent PGN data shows medium industry demand of 80 MMSCFD by year 1996, 98 MMSCFD by year 1998, and an ultimate demands of 240 MMSCFD by year 2003.

South Sulawesi

Total demand is estimated at 83 MMSCFD in year 1997 comprising 48 MMSCFD for industry and 35 MMSCFD for power generation in Ujung Pandang. All the customers are located between Sengkang Gas Field and Ujung Pandang.

Stages in development of this gas infrastructure

PGN are now planning to construct an integrated Indonesian Gas Transmission System to enable utilization of the main non-exportable reserves at low operational cost. The gas infrastructure is planned in stages and divided into steps as follows.

A. Short - Term Planning (1993-1998)

The three regions of development where a transmission facilities would most benefit Indonesia are South and Central Sumatra, Java and South Sulawesi. The projects in preparation are :

1. to construct 550 km 28" gas pipeline from the Asamera Corridor Block to Duri Steam flood with a 300 km 20" branch from Jambi to Batam Island (shown in Fig. 1) at an estimated total cost of US$ 530 Million. Estimated Corridor Block reserves are 2.47 TCF and the required deliverability over 15 years is 400 MMSCFD (300 MMSCFD for Duri and 100 MMSCFD for Batam).

2. To construct 500 km 28" gas pipeline from Palembang in South Sumatra to Cilegon in West Java (Fig.2) for an estimated total cost of US$ 300 Million. The reserves of South Sumatra total around 1.8 TC and the minimum required deliverability is 250 MMSCFD for 12 years.

3. To construct 150 km 16" to 20" feeder pipeline in west Java from the existing gas system to supply potential markets in that area (Fig.3) amounting to 220 MMSCFD at a total estimated cost of US$ 155 Million.

4. To develop a gas transmission network in East Java to supply the potential gas market 240 MMSCFD (Fig.4) of total length 277 km and diameters less than 20" at an estimated cost of US$ 110 Million.

5. To construct a 270 km gas pipeline of diameter less than 20" in south Sulawesi from Sengkang to Ujung Pandang (Fig.5) to supply the potential gas market of 51 MMSCFD, in principle, the World Bank is willing to support the South Sumatra to Java, and ADB will support the Asamera - Duri - Batam Project at an estimated cost of US$ 84 Mill.

B. Medium - Term Planning (1993 - 2003)

The medium term objective is to establish a Trans Sumatra - Java transmission infrastructure by connecting the South Sumatra, West Java and East Java networks into an integrated grid. The total length of such a system would of the order 2200 km (Fig. 6). and will require additional investment of around US$ 450 Million.

C. Long - Term Planning (1993-2008)

Ultimately an Indonesian Grid could be contemplated linking the main sources of supply (including Natuna) with the main demand centers, thereby enabling supply and demand matching to be optimized the total length of this future system would be 3,888 km, and is shown in Fig. 7.

Asamera - Duri - Batam Project.

In a very short time a step of the Gas infrastructure link will be implemented. This project is important to be discussed in a more detail here to give clearer understanding on the gas infrastructure in Indonesia.

Project Area

The project area extends from Gresik in South Sumatra Province to Duri and Batam Island in Riau Province. An onshore gas transmission pipeline will link the Asamera gas reserves with the consumers in Central Sumatera and a spur transmission pipeline, partially onshore and partially offshore, will extend to Batam. (see figure 1.)

Project Concept

The Asamera Corridor Block located in South Sumatera is estimated to contain about 2.2 trillion cubic feet (TCF) of natural gas reserve. it is proposed to utilize the gas reserves of the Asamera fields by transporting the gas to Central Sumatra and to Batam Island for use in oil field production, power generation, commercial establishments and industries. A petroleum development plan is being implemented by CPI at Duri in Central Sumatera for producing 300,000 barrels per day of crude oil by 1996. There will be a ready market for natural gas at Duri by substituting crude oil with gas, since about 20 per cent of the crude oil produced will be required for field production. There is also a sizable demand for natural gas in Central Sumatra comprising power generation, pulp paper mills and refinery. The economies of scale arising from such a scheme for utilization of natural gas has given PGN the opportunity of developing a larger scheme, intended to supply not only Duri and industrial consumers along the transmission pipeline but also to consumers in the emerging market in the island of Batam.

Batam has large potential demand for natural gas as it is being rapidly developed as an export processing zone and there is also the future possibility of exporting natural gas by pipeline to Singapore.

The Government strategy is to utilize natural gas as a replacement for exportable petroleum and to meet future energy requirements in the Project area by constructing the required gas infrastructure facilities. The capacity of the proposed gas transmission system would be about 450 million cubic feet per day (MMCFD) and as additional reserves are proven, system capacity can be further increased by adding compression facilities. Two separate entities will execute the upstream and downstream parts of the overall scheme comprising gas reserves development, and transmission and distribution of natural gas. Asamera, as operator of Corridor Block, is responsible for production of natural gas, construction of gathering mains and installation of gas processing facilities. PGN is entrusted with the responsibility for the construction and operation of gas transmission and distribution system.

Objectives

The primary objective of the proposed Project is to support Government's program of reducing the pressure on the exportable surplus of petroleum by substituting with natural gas in domestic use. This objective will be pursued through (i) acceleration of natural gas utilization as a substitute for petroleum products to help increase oil exports, to improve the efficiency of energy use, and to reduce pollution, (ii) the integration of gas utilization plans and operations to achieve economies of scale in the development and operation of gas transmission infrastructure, (iii) formulation of developmental policies conducive to private sector participation in the gas industry, (iv) the establishment of a supportive regulatory framework for the gas industry, and (v) institutional strengthening for efficient operation of the gas transmission and distribution networks.

Scope

The major components of the Project comprise the following :

(i) supply and construction of approximately 524 kilometers (km) long, 28 inches in diameter onshore transmission pipeline between Gresik and Duri and approximately 278 km long, 20 inches in diameter pipeline to Batam of which 207 km is offshore;

(ii) supply and construction of ancillary and offsite equipment and facilities consisting of distribution network, cathodic protection, gas terminal stations, metering stations, civil works, telecommunications, and supervisory control and data acquisition (SCADA) system;

(iii) consultancy and management services for design, engineering, procurement, construction supervision and Project management;

(iv) financial advisory services for restructuring of PGN; and

(v) institutional strengthening and human resource development.

Gas Demand

The market area for natural gas transmitted under the Project comprises most part of the provinces of Riau and Jambi in the Central Sumatra region and the islands of Batam and Bintan. While the market in Central Sumatra is large enough to utilize the projected quantities of gas that can be supplied in the future, the Batam market will develop overtime in line with its ongoing rapid industrialization program. The demand for other consumers are based on estimated penetration rate of natural gas in the energy market. The natural gas demand in Duri includes the fuel requirements for the steam flood operations (an enhanced oil recovery project) and for three power plants located at Duri and Minas. The demand at Duri field is expected to decline sharply after 2009. However, there will be additional energy requirements when the Rindu steam flood project also located at Duri is planned to come on stream. In total, the potential requirements for natural gas between 1997 and 2016 at Duri remains in the range of 370 to 450 MMSCFD. The demand for other consumers in Central Sumatera and Batam will grow through out the Project life. The gas demand is projected to increase from 25 MMCFD in 1997 to 200 MMCFD in 2016. Since the potential demand is much greater than the gas availability, the supply will need to be allocated among different consumers. It is expected that 200 MMCFD of pipeline gas will be delivered to Duri for oil field operations, 30 MMCFD for refinery and pulp and paper mills in Central Sumatra, and 80 MMCFD to PLN and other industrial consumers in Batam. However, until such time the markets develop in Batam, the surplus gas available can be supplied to Duri.

Gas Supply

The gas reserves located in the Corridor in the northern part of the South Sumatra province is operated by Asamera as a production sharing contractor (PSC). Asamera proposes to develop the gas reserves in two phases. Under the first phase, four gas field (Duyung, Gelam, Letang and Tengah) would be developed which are estimated to have recoverable reserves of 1.742 TCF of raw gas. All the development wells in Gelam, Letang and Tengah have been drilled, while 7 additional wells in Dayung remain to be drilled. The second phase of development is expected to provide additional recoverable reserves of 0.512 TCF, based on development of Sambar, Rawa gas cap and other fields in the area (Cetik Dalam, Suban, etc.). The average production during the life of the fields is estimated to be about 310 MMCFD of sales gas.

Cost Estimates

The total cost of the Project is estimated at about $588.0 million equivalent, comprising a foreign currency cost of $89.0 million (about 15.1 per cent). The foreign currency cost includes $51.4 million of interest and other charges during construction on the loans from the Bank and other co-financiers, and the local currency cost includes taxes and duties.

Human Resource Development

PGN will need to significantly strengthen its institutional capability to meet the challenges facing the organization. PGN's operational activity will increase many folds upon commissioning of the proposed project. In addition, other expansion schemes of the gas transmission and distribution system are planned. PGN recognizes that it must strengthen its organization to support its expanded operational activities. Improvements in organizational structure, management systems and staff levels are needed to ensure that the company is commercially driven. Consistent with its move towards a more commercial focus, PGN needs to strengthen its skill in setting up management information system, undertaking financial analysis and evaluation, developing corporate and strategic planning, carrying out safety risk and safety audits; and in operation and maintenance of supervisory control and data acquisition system, transmission pipelines and gas distribution system. Accordingly, the Project cost includes an institutional strengthening component. It is envisaged that such training will be

carried out overseas and will require about 200 person months. PGN will submit to the Bank a detailed training program, with the assistance of Project management consultant, for its personnel to be trained overseas prior to implementation. It will make suitable arrangements for all staff sent abroad for training to return to work for PGN for an appropriate period after the training is completed.

Implementation Arrangements.

The Project will be implemented by PGN. A Project Implementation Unit (PIU) responsible for the overall implementation of the Project has been establish in PGN. It is headed by a Project Manager who is assisted by qualified technical, accounting and administrative staff.

Conclusion

1. The integrated Indonesian gas Transmission System will be the main Gas Pipeline Infrastructure in Indonesia that will be constructed to enable utilization of the main non exportable reserves at low operational cost.

2. The Gas Infrastructure is planned to be developed in stages and divided into steps as the nature of gas infrastructure development involves high investment.

3. Transporting gas to the end consumers requires the synchronization of upstream gas field development and pipeline with downstream construction of gas processing plants, transmission lines, distribution lines, and other related facilities. Relative to other projects generally there is a long ges station period for recovery investment. With regard to Indonesian Gas pipeline, PGN (State owned Gas Company) plans to develop the gas infrastructure in stages, that will be linked later as Indonesia Gas Integrated Transmission System.

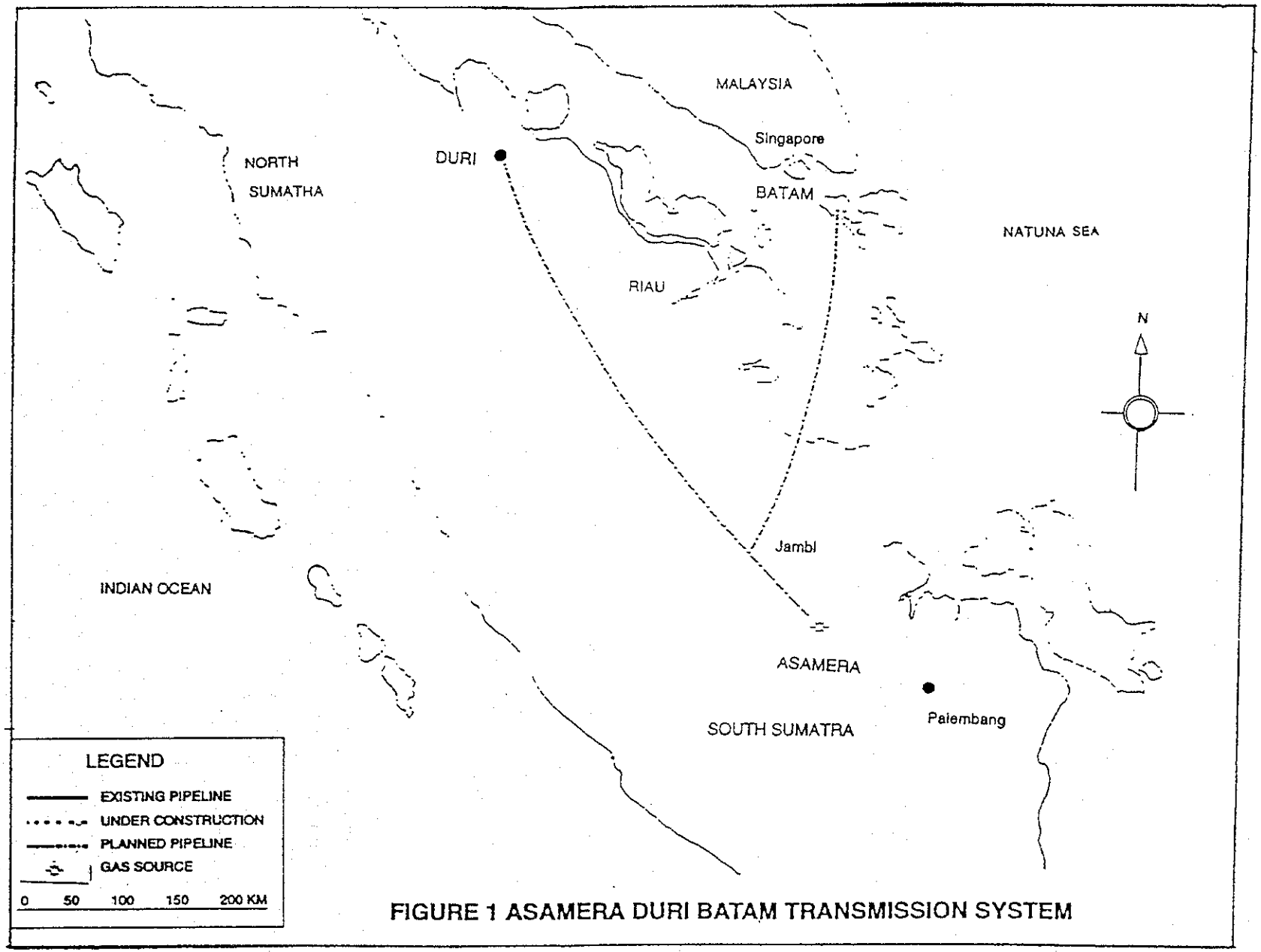


FIGURE 1 ASAMERA DURI BATAM TRANSMISSION SYSTEM

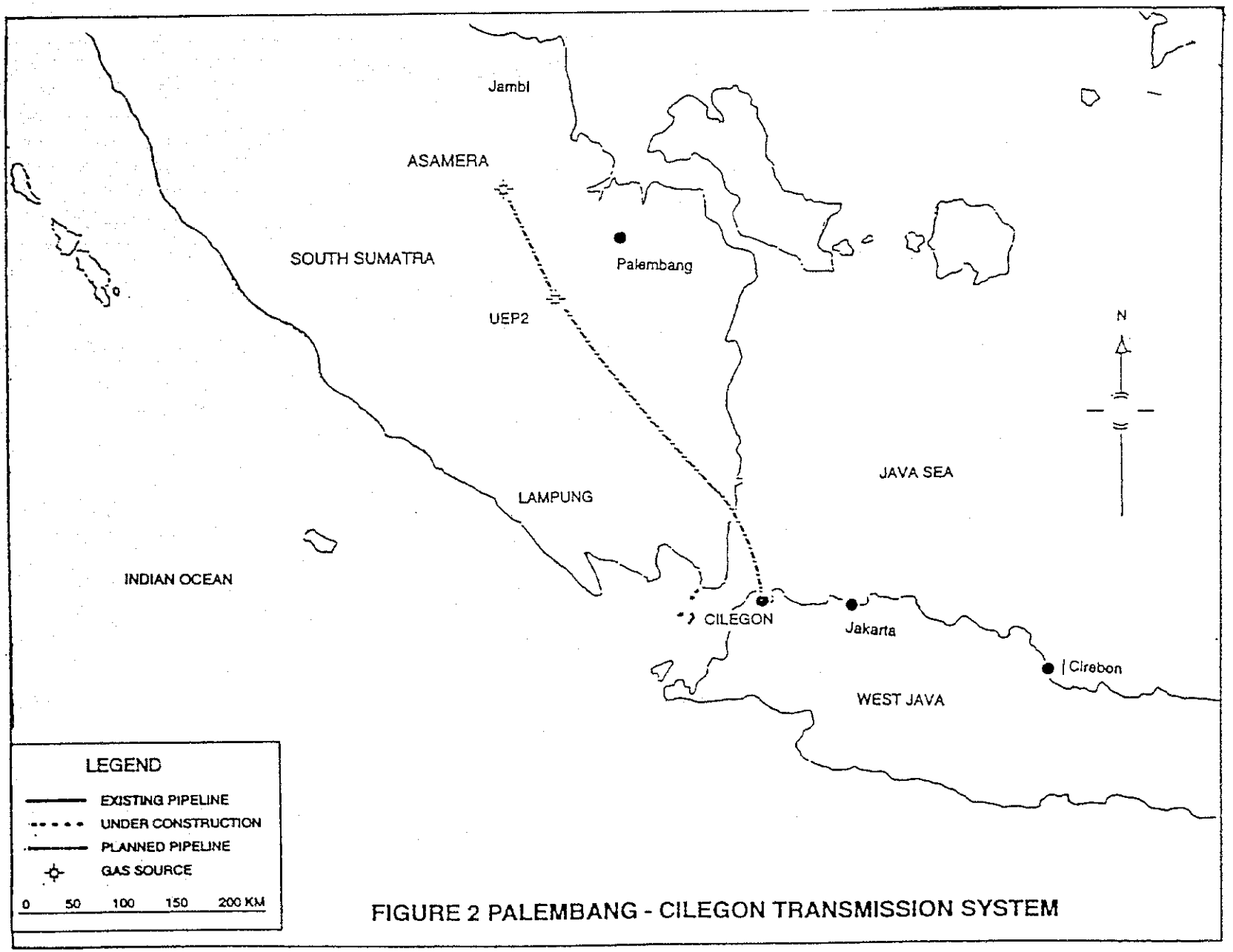


FIGURE 2 PALEMBANG - CILEGON TRANSMISSION SYSTEM

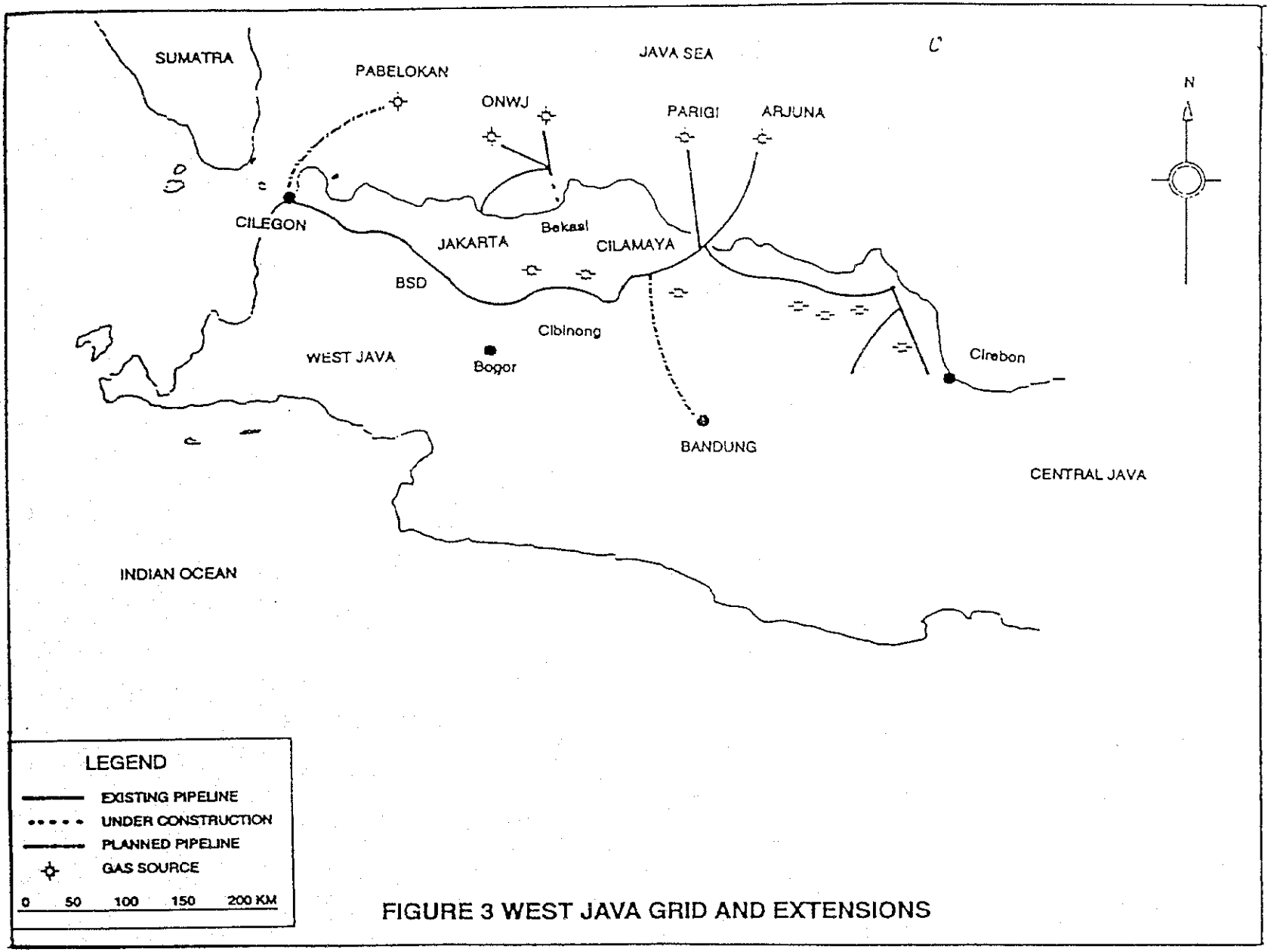


FIGURE 3 WEST JAVA GRID AND EXTENSIONS

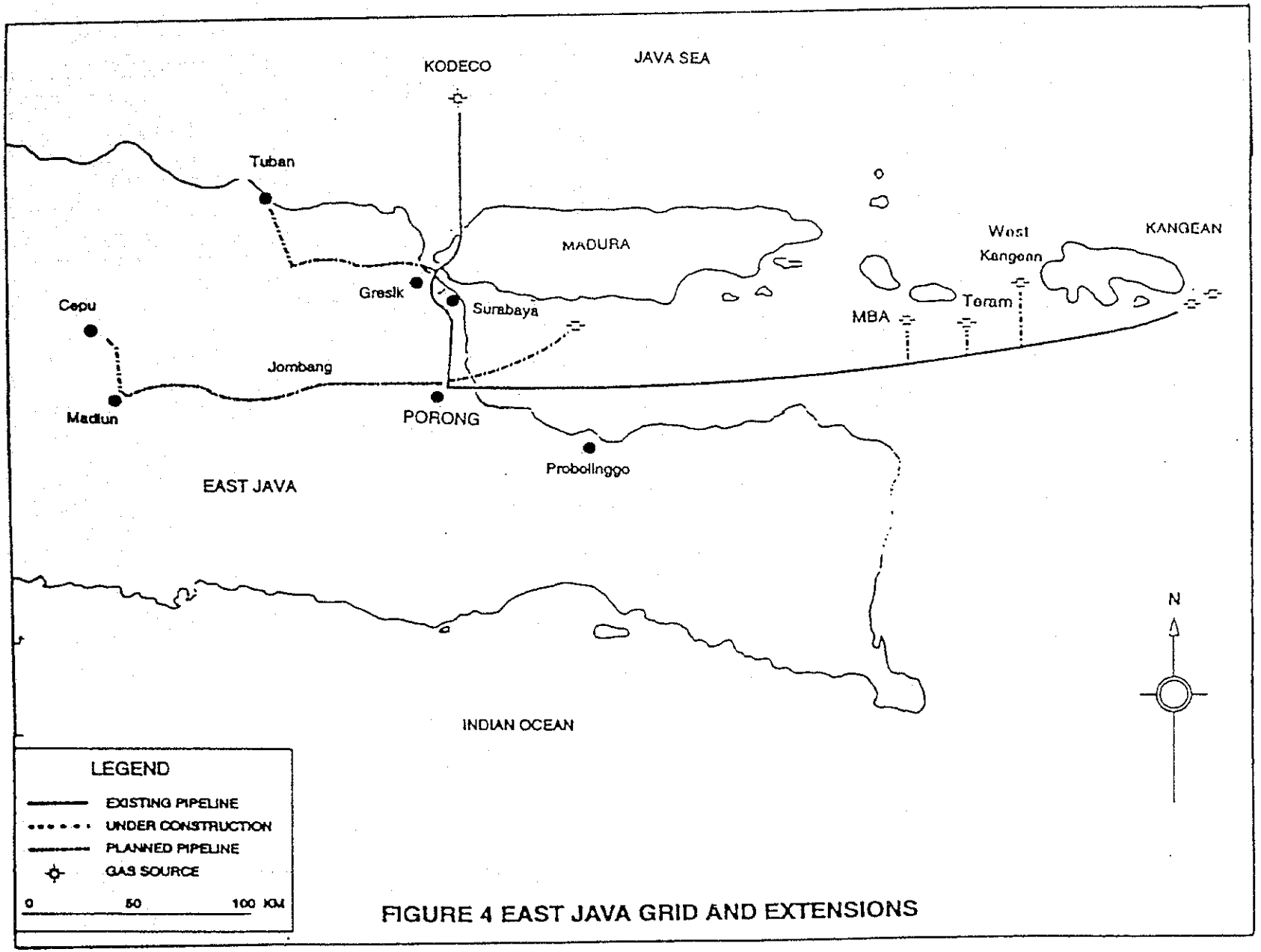


FIGURE 4 EAST JAVA GRID AND EXTENSIONS

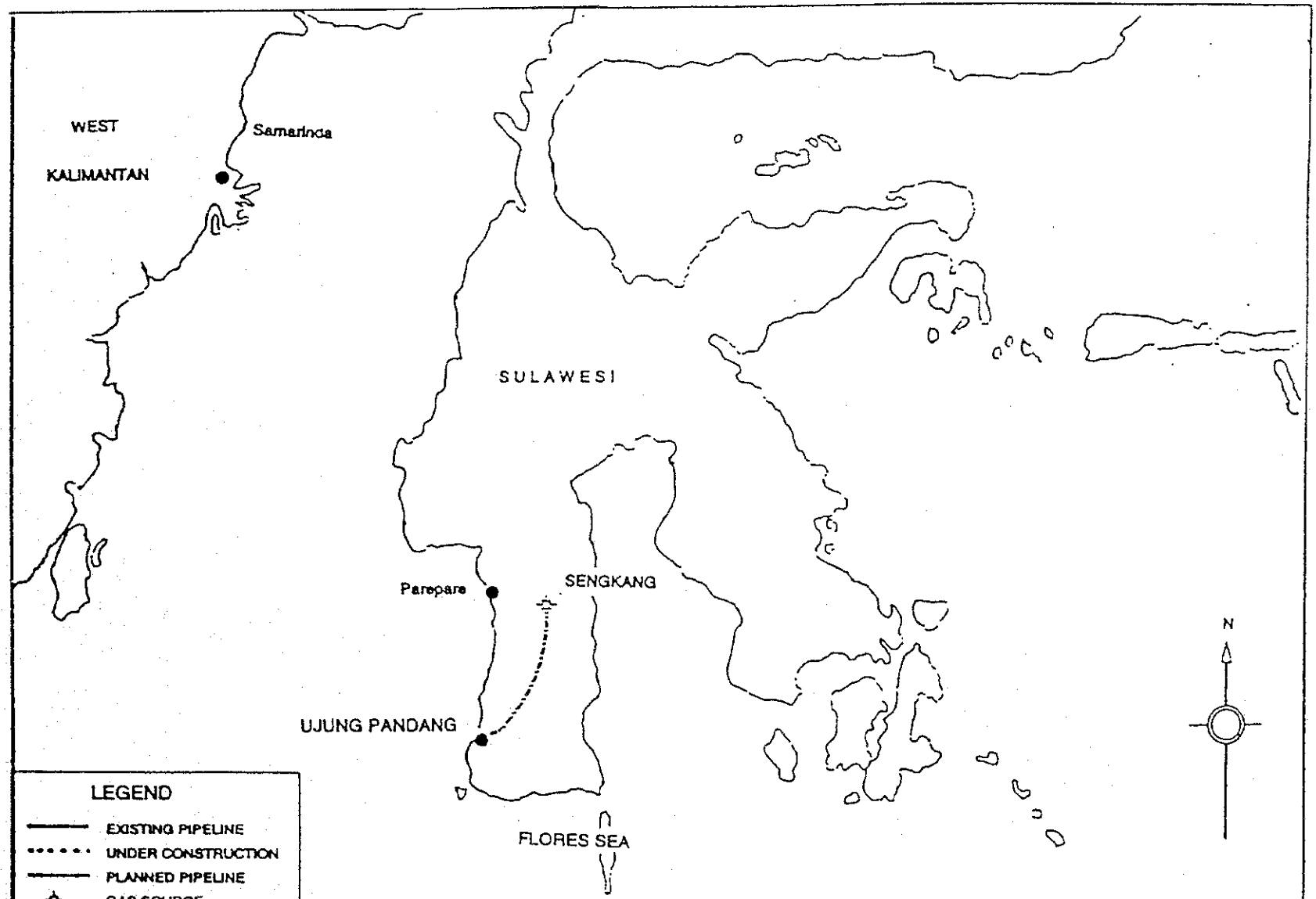


FIGURE 5 SENGKANG - UJUNG PANDANG TRANSMISSION SYSTEM

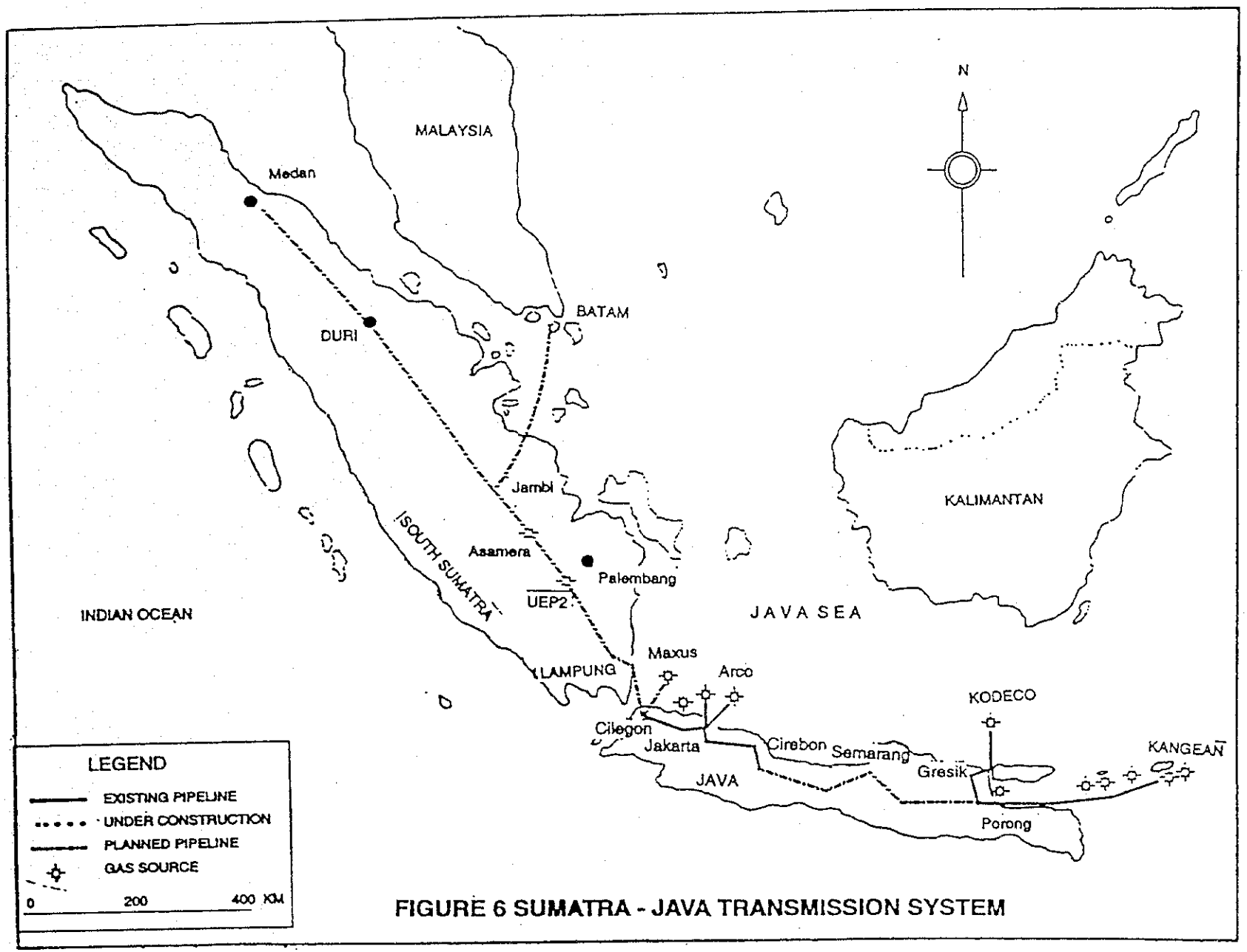


FIGURE 6 SUMATRA - JAVA TRANSMISSION SYSTEM

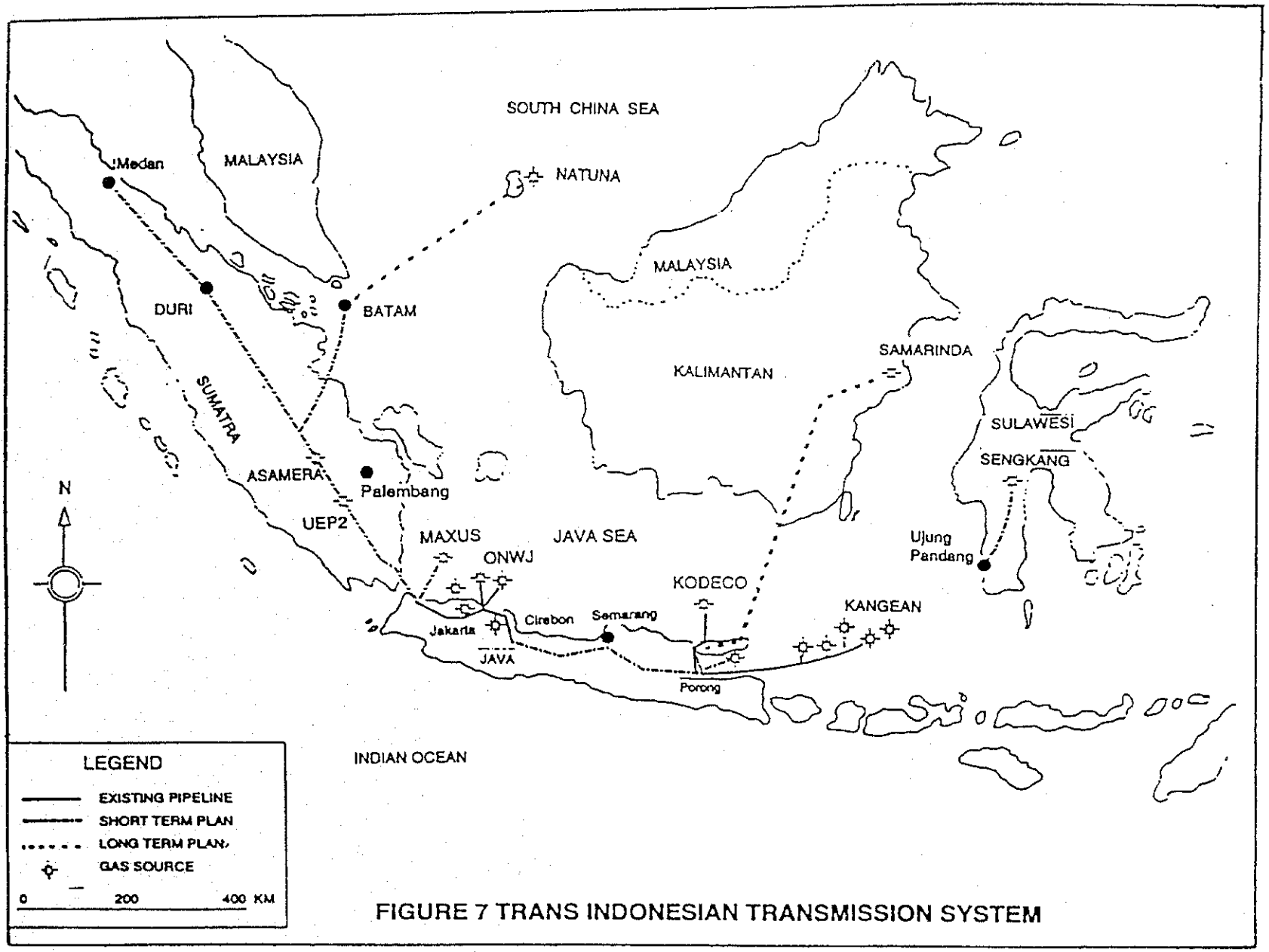


FIGURE 7 TRANS INDONESIAN TRANSMISSION SYSTEM

6. PROJECTION OF FUEL REQUIREMENT FOR POWER GENERATION IN INDONESIA

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PROJECTION OF FUEL REQUIREMENT FOR POWER GENERATION IN INDONESIA

Paper Presented at
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STATE ELECTRICITY CORPORATION

PROJECTN.SE.NOP93

Projection of Fuel Requirement For Power Generation in Indonesia

Contents

Projection of Fuel Requirement For Power Generation in Indonesia

1. INTRODUCTION

Natural gas was first consumed by PLN's generation plant in 1989, e.g. for the gas turbine peaking power plant in Cirebon, West Java. Gas is supplied from Pertamina field in Cirebon and delivered to the industrial zone by pipe transmission system. Most of the gas at this moment is utilized for industrial purposes such as fertilizer plants, cement plants and steel industry. In addition, small amount of gas are being used for another gas turbine power plants at Belawan, Medan and Palembang. Natural gas will play a mayor role in the development of generation plants especially to promote combined cycle power plants as alternative base plants.

This paper describes the future fuel requirement for generation plants and will start with the current electricity situation, electricity demand projection and primary energy resources available.
Then, it will be followed by a short analysis on the economic of developing gas for electricity generation in the long term electric power development.
Finally, fuel demand is projected based on the current generation plan.

2. CURRENT ELECTRICITY SITUATION

The Electricity Subsector

The electricity subsector is regulated by the Ministry of Mines and Energy (MME) through the Directorate General of Electric Power and Energy Development (DJLPE). The subsector comprises :

(a). Perusahaan Umum Listrik Negara (PLN), the state electricity corporation,
(b). Captive plants installed by parties for their own use and sale; and
(c). A small number of cooperatives which were set up to provide electricity in rural areas remote from PLN supply systems.

PLN is the state enterprise responsible for execution of government policies in the electricity energy subsector similar to PERTAMINA (National Oil Company for Oil and Gas) through the Directorate General of Oil and Gas.

An Electricity Act and Presidential Decree was passed in 1985 (Law No. 15) and 1992 (Decree No. 37). It consolidates earlier decrees, and permits private and cooperative participation in the electricity subsector.

The Evolution of Power Market and Development Program

The Market Share

Principle sources of electricity supply are PLN and, self generation mainly by industrial company.
Captive generation capacity has continued to increase in recent years. In 1992/93, the share of captive generation (inclusive of the capacities required for reserve) accounted for 154% of PLN's installed capacity in Outside Java and about 48% in Java. Electricity consumption has grown rapidly in the last decade from 9,101 GWh/annum in 1982/83 to 34,963 GWh/annum in 1992/93, or an average growth rate of 14.4% / annum.

Despite the rapid growth, the level of consumption of electricity supplied per capita by PLN remains low, at about 172 kWh (1992), compared to Malaysia (870 kWh per capita, 1988), Thailand (514 kWh per capita, 1988) and Japan (5500 kWh per capita, 1991). The low level of electricity consumption is primarily due to the lack of supply facilities and acces to the network for the residential and other sectors. In 1987/88, only 24% of all households in Indonesia were electrified. Through the expansion program of PLN, about 30% of all households had been electrified by 1992/93.

PLN's Facilities and Present Capacity-Mix

The evolution of PLN's facilities is demonstrated by the growth of generation capacity from 776 MW in 1973/74 to 10,875.7 MW in year 1992/93, the average growth of additional capacity being about 14.9% per year.
The present generating capacity shows a mix of energy resources for electricity generation as shown in Table-1, 15.9% from steam coal fired plants, 20.3% from oil and gas fired steam plants, 15.3% combined cycle plants, 8.1% gas turbine plants, 17.8% diesel plants, 21.3% hydro plants and 1.3% geothermal plants. 7,820 MW (70%) of the capacity is in Java whilst the remaining 30% is located outside Java.

Table-1. Present Generating Capacity Mix

(in MW)

Type	Java	Outside Java	Total	Share (%)	Energy Resources
Steam					
- Coal	1 600	130.0	1 730.0	15.9	Coal
- Oil/Gas	1 900	310.0	2 210.0	20.3	
Combined Cycle	1 404	260.0	1 664.0	15.3	
Gas Turbine	667	212.4	879.4	8.1	Oil/Gas
Diesel	86	1 849.9	1 935.9	17.8	
Hydro	2 023	290.9	2 313.9	21.3	Hydro
Geothermal	140	2.5	142.5	1.3	Geothermal
Total	7 820	3055.7	10 875.7	100.0	

3. ELECTRICITY DEMAND PROJECTION

Main variables of the demand forecast are shown in Table-2, broken down into Java Bali and Outside Java.

Table-2. Variables of Demand Forecast

Description		(1994/95 - 1998/99)		(1999/00 - 2003/04)	
		Java + Bali	Outside Java	Java + Bali	Outside Java
1. General					
a. Population growth	(% p.a)	1.54	2.16	1.42	1.18
b. GDRP growth	(% p.a)	7.18	5.13	7.08	5.96
2. Residential Sector					
a. Electrification Ratio	(%)	71.10	43.20	86.70	55.20
b. Av. add. Consumption/year	(kWH)	1,116	982	1,164	874
3. Commercial Sector					
a. Value added growth	(% p.a)	6.91	10.78	6.75	9.86
b. Customers elasticity		0.75	0.88	0.75	0.88
4. Public & Others Sector					
a. Value added growth	(% p.a)	6.91	10.78	6.75	9.86
b. Customers elasticity		0.97	0.85	0.97	0.85
5. Industrial Sector					
a. Value added growth	(% p.a)	11.30	11.40	9.85	10.03
b. Big Consummer	(MVA)	4,292.20	579.90	0	0
c. Captive Taking Over	(MVA)	0	922.00	704.0	0

The result of the demand forecast is as shown in Table-3 below, broken down into Java - Bali and composite of Outside Java.

Table-3. Summary of Demand Projection

Years	Prod. (GWh)	Peak (MW)	LF (%)
Java - Bali			
- 1993/94	40 307	6 512	70.7
- 1998/99	83 408	13 372	71.2
- 2003/04	125 722	20 356	70.5
Outside Java			
- 1993/94	9 813	1 900	59.0
- 1998/99	22 411	4 075	62.8
- 2003/04	39 056	6 928	64.4

In the next 10 years demand is expected to grow (in terms of peak demand) with 15.7%/year during the first five years (1994 - 1998) and with a 9.3%/year during the remaining five years (1999 - 2003) or with an average of 12.4%/year over the 10 year period. The growth is equivalent to an average incremental capacity of 1,014 MW per year in Java Bali and 647 MW per year Outside Java during the 10 years period.

4. ENERGY RESOURCES

Indonesia is fortunate to have abundant energy resources such as coal, hydro basins, geothermal, gas and oil. Unfortunately, the first two resources, which play an important role in the electricity subsector, are not matching with the electricity demand. These resources are mainly located Outside Java whereas future electricity demand is mostly located in Java (about 80% of total PLN's demand in year 1992/93). Only geothermal resources are matched with the electricity demand especially in Java.
A summary of the energy resources of Indonesia is shown in Attachment-1.

Coal

The major coal resources are located in Sumatra and Kalimantan, accounting for 99% of the total known resources of about 19 million metric tons. Lignite and brown coal account for 75% of the reserves found in South Sumatra and are considered suitable for use in mine mouth power plants after the years 2003. The present ratio between potential and utilization is about 630, so one can expect that coal will take a major role in the longer term. The level of coal requirement until year 2003 is still relatively low (35.3 million ton/year at the end of year 2003). Only coal transportation presents a critical problem in the near future.

Hydro Basins

A hydro power potential study made in year 1984 estimate a potential of about 75.0 GW. The largest potential was found in Irian Jaya, Kalimantan, Sumatra, Sulawesi and Java in descending order. The present utilization of hydro resources is relatively low (about 2.6%) mainly due to a mismatch between locations of hydro basins and electricity demand.

In Java Island the hydro resources are already utilized to about 52% and it seems that the future development of the remainder will be constrained by environmental problems especially that of land resettlement.

Geothermal

The ultimate geothermal energy resources of Indonesia are estimated to be 16,000 MW and about 50% are located in Java. Exploration and development are taking place at 18 areas in Sumatra, 29 areas in Java, 16 areas in Sulawesi and 14 areas in Bali, Nusatenggara, Maluku and Irian Jaya.

Proven reserves amounted to 1,155 MW but could possibly be between 2,625 MW and 10,740 MW.
Presently there are six geothermal electric plants with an installed capacity of 145 MW and this will increase to 310 MW when Salak and Drajat projects in Java Island are completed in 1994.

Oil and gas

Although oil reserves are still available, the utilization of oil in the electricity sub sector will be limited to emergency utilization on base load units (where the operation of such power plants is ahead of the supply of gas) and on isolated diesel systems before the interconnection of such systems to main grids.

After coal, gas is the next major resource which plays a major role in the electricity sub sector.
The latest reserve estimation amounted to about 90 TCF, consisting of traded and nontraded gas (less than 5 TCF is not economical for exports).

Presently the non traded gas can only be used in the electricity subsector, and the reserves are mainly located in Kalimantan. In future (beyond 2003) gas from these resources can be transported to Java by sea and converted to natural gas at the receiving point.

Natural gas resources of Sumatera are mainly in the following areas :
(i). Aceh Province (in particular Arun gas field near Lhok Seumawe)
(ii). North Sumatera Province near Pangkalan Brandan
(iii). South Sumatera Province near Prabumulih

While in Kalimantan, gas resources are located at :
(i). East Kalimantan
(ii). Natuna Island

In addition, some potential field also be found at northern part of Java sea.

5. ECONOMIC COST AND MERIT OF NATURAL GAS IN ELECTRIC POWER GENERATION

Economic Cost

Economic cost of non-traded and traded natural gas resources could be defined in terms of the production cost to explore one unit of gas, which is presented as the Average Incremental Cost (AIC).

Since, oil and gas exploration usually is a joint operation between private company and Government, the AIC of gas should consider taxation, Rate of Return (ROR) of investor, and Government's equity.

Based on the study of an intergrated gas transmission on Java, the average AIC for offshore traded gas before transmission (sending point) is about 0.5 - 0.7 US$/MCF, and the financial price is about 1.3 - 1.7 US$/MCF. In contrary, economic cost of non-traded gas is a specific price due to differences of investigation costs, risk premium and investment costs.
The non-traded natural gas price from East Java fields is about 2.27 US$/MCF including tax (Government share minus premium depletion), consisting of :

Cost Component	US$/MCF
- Production and transmission	0.86
- Premium depletion	0.47
- Premium risk	0.47
- Government equity	0.47
Total	2.27

While the economic cost of non-traded East Kalimantan gas resources is estimated at 3.23 US$/MCF (based on LNG's export price of FOB : 2.68 US$/MCF minus liquefaction cost of 0.67 US$/MCF plus transmission cost 1.22 of US$/MCF).
By this condition, the economic (supply side) would be in the range of 2.27 US$/MCF to 3.23 US$/MCF.

Merit Order of Primary Energy in Electricity Sub Sector

The merit order of primary energy resources (excluding fuel oil) based on energy production cost (levelized busbar generating cost) is as follows :

(i) natural gas for combined cycle plant
(ii) non-lignite coal for thermal plant
(iii) lignite coal for thermal mine mouth plant
(iv) geothermal for thermal plant
(v) uranium for nuclear plant

The comparison of energy generated cost per kWh is shown in Table-4. The result confirmed that combined cycle plant is an attractive plant among other alternative base load power plant.

Table-4

Cost Comparison of Based Load Generation Plant Alternatives

No.	Item Cost	Unit	Combined Cycle 600 MW	Coal Fired 600 MW	Geo-thermal 65 MW	Mine Mouth 2000 MW	Combined Cycle 600 MW	Nuclear Plant AP-600 600 MW
1.	Capital Cost [1]	$/kW	700	1204	1150	1878 [2]	700	2900
2.	Capacity Factor	%						
	1st year		50	55	80	55	50	55
	2nd year		55	60	80	60	55	60
	3rd year		60	65	80	65	60	65
	4nd year to 15th from 16th year to end of economic life time decreased by 2% per-year		65	70	80	70	65	70
3.	Fuel Cost	mills/kWh	20.6 [3]	14.9 [4]	24.6	11.6 [5]	28.44 [6]	10.00
4.	O & M Cost							
	O & M Fixed	$/kW-yr	21.0	24.1	28.8	20.0	21.0	87.0
	O & M Variable	mills/kWh	0.1	0.1	0.1	0.1	0.14	0.05
5.	Economic Life Time	Year	20	25	25	25	20	25
6.	Capital Cost	mills/kWh	18.6	26.5	20.9	41.3	18.62	63.9
7.	Fuel Cost	mills/kWh	20.6	14.9	24.6	11.6	28.44	10.0
8.	O & M Cost	mills/kWh	2.7	6.3	4.2	9.5 [7]	2.72	5.1
9.	Total Generation Cost	mills/kWh	41.9	47.7	49.7	62.4	49.78	79.0

Notes
1) Costs exclusive of VAT, but including interest during construction.
2) Costs of HVDC Transmission Line (674 $/kW) and additional cost for specific boiler for mine mouth power plant of 10% are included.
3) Based on natural gas price of 2.53 US$/MSCF for 252,000 kcal/MSCF.
4) Based on coal price of 34 US$/ton for 5300 kcal/kg.
5) Based on coal price of 10 US$/ton for 2000 kcal/kg.
6) Based on natural gas price of 3.5 US$/MCF (ex. Kalimantan, including of pipelines).
7) Including O&M Cost of HVDC line.

The Environmental Impact of Natural Gas Fired Power Plant

A thermal power station consumes enormous amount of fuel, and the main air pollutants generated from the plant are sulfur oxides (SO_x), nitrogen oxides (NO_x) and soot and dust which are contain in the boiler stack gas.
SO_x emission from boiler could be decreased by reducing sulfur content.
Among fuels available, natural gas whether as liquid natural gas (LNG) or liquid petroleum gas (LPG) has very high quality because sulfur content and other impurities are removed in the liquifaction process.

Natural gas (LNG or LPG) have no nitrogen content while coal has the highest, followed by heavy oil, crude oil and napthan. As same as NO_x, no soot and dust would be produced from gas fired power plants and therefore natural gas fueled combined cycle power plants or gas turbine power plants have the minimum air pollution compared to coal fired or oil fired thermal plant.

6. TEN YEARS PROGRAMME

Generation Planning

Generation development planning as part of an electric power system would ideally be within the context of the overall system planning approach. The primary objective of generation development planning is to design a generation system that will adequately meet future electric power demand at minimum discounted present value of capital and operating cost. Since, generation development is a capital intensive project with long lead time, and in conditions of considerable uncertainties, generation development planning has received the greatest attention.
Furthermore, the development have to take into account possible uses of coal, natural gas, geothermal, nuclear and hydropower in line with the national energy diversification campaign.

The ten years development program was planned anticipating a demand growth of 21.1% in Java - Bali and a weighted growth of 13.8% Outside Java.
Some projects on the first 5 years program were based on previous planning, such as steam coal fired and hydro electric power plants, since these projects required preparation of about 4 - 5 years, inclusive of studies, loan procurement and tendering.
A summary of the current 10 years development program (see Attachment-2) shows that 9,633 MW will be in service until the end of 1998/99 (inclusive additional capacity of on-going and committed projects) and 6,987 MW during the period of 1998/99 - 2003/04.
Following the plan, several combined cycle plants (PLTGU) are to be constructed at East Java (Grati, Gresik), West Java (Tanjung Priok), Batam, etc. To support gas supply to power plants and domestic uses, a trunk gas pipe line connecting gas fields will be required (Attachment-3).

Substations and Transmission Lines

In line with the generation capacity expansion program, substations and transmission lines will be developed. Substation expansions reach 57,057 MVA; of which 43,867 MVA are required for Java - Bali and the remaining 13,190 MVA are for Outside Java. The associated transmission lines will reach 26,048 km length, consisting of 500 kV, 275 kV and 150 kV levels. Due to the characteristics of PLN systems, the 500 kV and 150 kV systems are planned to be expanded in Java - Bali, the 150 kV and 70 kV systems will be expanded in the main grids Outside Java and the 275 kV will be introduced in Sumatra Island.

Distribution Facilities

The distribution program amounts to about 277,600 kms of medium voltage lines, 412,000 km of low voltage lines and 45,203 MVA transformers. These distribution facilities are programmed to provide electricity to 19,570,000 new customers including rural electrification of about 34,900 villages.

7. PROJECTION OF FUEL REQUIREMENT

Energy production to fulfill demand requirements based on the long term generation planning is shown in Attachment-4. Most electricity energy in 1993 is generated by oil fired thermal plant (22,771 GWh), while coal fired is about 11,680 GWh. Remaining energy generation will be from hydro and thermal.

In 1998, energy generated by oil will decrease sharply to 13,573 GWh. But on the contrary, energy generated by coal will be increased 3 folds (38,859 GWh), combined cycle plant 5 folds (38,298 GWh), geothermal plant 6 folds (6,002 GWh), and hydro 1.6 folds (10,815 GWh).
In the long term (2003), energy produced by oil will remain stable at a level of 13,331 GWh, while non oil production will keep on increasing.

Fuel requirement to support energy generation as mentioned above is presented in Attachment-5. Fuel requirement represent primary energy diversification in electric power subsector, with the objective of reducing oil consumption.
An extensive gas development, especially non-traded gas at remote demand centre is required. A trunk gas pipe line connecting Natuna and East Kalimantan reservoir to Sumatra - Java Island should be introduced, to enable the gas to be transmitted to the load centre in Sumatera and Java.

8. CONCLUSION

8.1. Incremental demand of 16,872 MW until year 2003/04 required additional generation facilities of 16,620 MW of which 10,147 MW is in Java Island and 6,473 MW Outside Java.

8.2. The role of gas for generating electricity could be affected by the quantity, location, timing of supply and price of gas; the policy and future development of the gas in Indonesia; development of new technology of electric power generation.

8.3. The generation cost of gas fueled combined cycle is the most competitive but as a matter of fact the role of combined cycle plant is limited due to uncertainty of the availability of gas.
Therefore, if more natural gas could be made available in the future, more gas turbine and combined cycle plants could be planned in the longer term.

8.4. Natural gas consumption for electric power generation is projected to be 307 BCF in 1998 and then slightly increase up to 349 BCF (2003). To meet gas demand, an extensive work for investigation gas reservoir, exploration of gas fields and the construction of gas pipe line is necessary.

Attachment – 1

ENERGY RESOURCES POTENTIAL IN INDONESIA

LOCATION	RESERVE									
	OIL		NATURAL GAS		COAL		HYDRO		GEOTHERMAL	
	Potential 10^9 bbl	Proven 10^9 bbl	Potential 10^12 CF	Proven 10^12 CF	Potential 10^9 ton	Proven 10^9 ton	Potential GW	Proven GW	Potential GW	Proven GW
SUMATERA ISLAND	–	–	24	18.3	–	1.7	15.6	–	4.8	–
JAVA ISLAND	–	–	8.8	3.3	–	–	4.2	–	8.2	–
KALIMANTAN ISLAND	–	–	32.1	17.1	–	2.7	21.6	–	–	–
OTHERS	–	–	44.2	41.5	–	–	33.6	–	3	–
INDONESIA	–	9.5 56 x 10^21 J	109.1 112 x 10^18 J	80.2 83 x 10^18 J	23.2 583 x 10^21 J	4.4 111 x 10^21 J	75.0 1.4 x 10^18 J/Yr	–	16.0 0.32 x 10^18 J/Yr	–
ENERGY CONSUMPTION (Incl. Export) in 1991/92 *)	–	0.5 2.9 x 10^21 J	–	1.9 2 x 10^18 J	–	0.007 0.157 x 10^21 J	112.9 TWh 0.118 x 10^18 J	–	12.5 TWh 0.013 x 10^18 J	–
RATIO OF PROVEN/CONSUMPTION		19		42		628		–		–

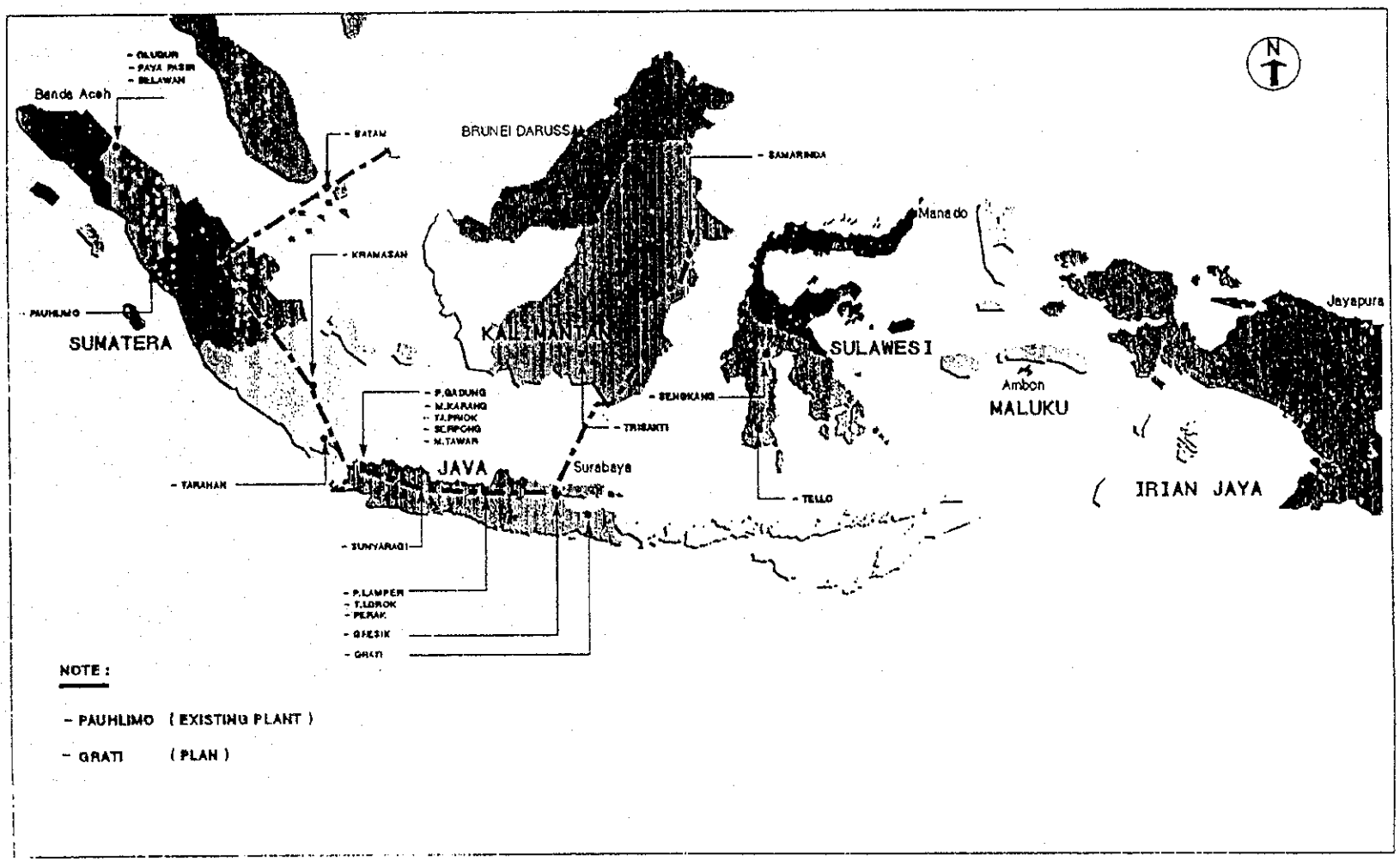
Attachment–2

ELECTRIC POWER DEVELOPMENT PLANNING AND
INVESTMENT PROGRAM, 1994/95 – 2003/04

No.	Incremental Demand, Project and Investment	Units	1994/95 – 1998/99						1999/00 – 2003/04						Total (1994–2003)
			94/95	95/96	96/97	97/98	98/99	Total	99/00	00/01	01/02	02/03	03/04	Total	
1.	Demand	(MW)	1775	2344	1498	1661	1757	9035	1803	1900	1913	2052	2168	9836	18872
2.	Projects														
	Generation :	(MW)													
	– PLN		1649	2022	2782	2434	746	9633	1166	1409	1963	600	1850	6987	16620
	– Private		–	–	–	1000	1895	2895	735	1335	1310	1200	0	4580	7475
	– Total		1649	2022	2782	3434	2641	12528	1901	2744	3273	1800	1850	11567	24095
	Substation	(MVA)													
	– (500/150 KV)		2000	500	4501	1500	1000	9501	500	1000	3500	2000	0	7000	16501
	– (275/150 KV)		–	–	–	–	–	–	0	1250	500	1750	250	3750	3750
	– (150/70 KV)		410	520	120	30	–	1080	0	0	0	0	0	0	1080
	– (150/20 KV)		5720	6570	2340	2590	2470	19690	1430	2650	3520	3700	3920	15220	34910
	– (70/20 KV)		440	150	86	30	–	706	40	0	20	50	0	110	816
	– Total		8570	7740	7047	4150	3470	30977	1970	4900	7540	7500	4170	26080	57057
	Transmission	(kmc)													
	– 500 KV		100	829	223	124	390	1666	10	168	1000	900	0	2078	3744
	– 275 KV		–	–	140	–	–	140	0	336	348	1502	800	2986	3126
	– 150 KV , OHL		1744	1456	1626	1645	2102	8574	1753	1487	2064	2502	2402	10208	18782
	– 150 KV , UGC		41	132	12	12	48	245	0	78	0	0	40	118	363
	– 70 KV		12	–	10	12	–	34	0	0	0	0	0	0	34
	– Total		1897	2417	2011	1793	2540	10658	1763	2069	3412	4904	3242	15390	26048
	Distribution :														
	– Medium Voltage	(kmc)	26338	32980	22298	25220	26483	133319	26358	27706	28123	30105	32003	144295	277614
	– Low Voltage	(kmc)	40687	49125	32340	36336	38253	196741	38772	41166	41917	45147	48288	215290	412031
	– Distribution Transf.	(MVA)	4598	5515	3543	3980	4181	21817	4234	4475	4552	4891	5234	23386	45203
	– Cons.Connection	(10 ^ 3 cons.)	2223	2215	2169	2107	2055	10769	1921	1858	1767	1667	1587	8800	19569
3.	Investment[const. disb. 1993]	(M US $)													
	– Generation *)		2695	2336	2311	2112	1631	11085	1826	2131	2744	3431	3793	13925	25010
	– S/S & T/L		999	637	445	445	356	2882	610	929	951	734	732	3956	6838
	– Distr.		1511	1543	1228	1327	1365	6974	1382	1431	1469	1557	1658	7496	14470
	T o t a l		5205	4516	3985	3883	3352	20941	3817	4492	5164	5721	6183	25377	46317

*) Excluding private investment

DISTRIBUTION MAP OF GASTURBINE AND COMBINED CYCLE PLANTS IN INDONESIA AND POSSIBLE GAS TRUNK LINE



Attachment - 4

ENERGY PRODUCTION - INDONESIA
(In GWh)

Fuel type	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Oil											
HSD	11678	7617	15510	16360	9382	9113	9233	9551	9555	10075	10590
MFO	11093	6968	4797	4647	4683	4460	4207	3860	3636	3641	2741
Total	22771	14585	20307	21007	14065	13573	13440	13411	13191	13716	13331
Non Oil											
Coal	11680	14913	17664	24797	30159	38859	46790	59314	65165	73171	78401
Natural gas	6838	21023	27470	27467	37191	36569	37298	32898	33772	35833	41818
Geothermal	1206	2166	2187	3102	4280	6002	7287	8062	8839	8837	8839
Hydro	6730	8601	8730	8974	9669	10815	11720	14107	18263	19980	22389
Grand Total	49225	61288	76358	85347	95364	105818	116535	127792	139230	151537	164778

Attachment - 5

Fuel Consumption
Indonesia

Fuel type	Units	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Oil												
HSD	10^3 kl	3763	2210	4671	4912	2665	2511	2619	2716	2788	2931	3074
MFO	10^3 kl	3073	1971	1357	1315	1325	1262	1190	1092	1029	1030	775
Non Oil												
Coal	10^3 ton	5213	6722	7962	11177	13407	17515	21090	26735	29372	32981	35338
Natural gas	bscf	82	180	242	238	312	307	312	276	284	300	349
Geothermal	GWh	1206	2166	2187	3102	4280	6002	7287	8062	8839	8837	8839