PRESENT SITUATION AND FUTURE OF UTILIZATION OF GEOTHERMAL ENERGY IN INDONESIA

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Abstract

To meet the rapidly increasing demand of electricity and in line with the National Energy Policy : Intensification, Diversification, Conservation, Indexation, Leads to accelerate, the development of geothermal energy resources in Indonesia.

Government of Indonesia invites private participation through BOT or BOO Concepts, up to now 11 Power Purchase Agreement have been signed totally nearly 1990 MW, 4 Contracts under Negotiation.

It,s projected that the installed capacity of geothermal energy by the year 2000 will be 1000 MW and of 5000 MW at the end of PJPII or 10% of it's potential.

Strategy to cope with the requirement be based on the understanding that geothermal is renewable, clean and not exportable.

The paper dealing with the resources potential, technology adapted as well as legal and environmental issues, private involvement and future programme facing the second long year development scheme.

Introduction

Indonesia archipelago compusing of morethan 13.700 islands that extend morethan 3000 miles along the equator. The total area is 735,000 square miles. Some of 6,000 of the islands are inhabited. The Indonesian Republic's 1945 Constitution and the National Philisophy "PANCASILA" guide all the policies of the present government and the organs of the state.

Based on current investigation the geothermal potential of Indonesia around 19.658 Mwe *(Figure* **1).** There is 309.75 MW of geothermal power plant currently operating in Indonesia some **1.5%** of total installed capacity. Under present Decree No. 37/1992 private generation, transmission and distribution is allowable and investment in geothermal sector is permitted under both, foreign and domestic capital investment law. It's projected that facing the year 2000 and 2020 the geothermal electricity production will reach 1000 MW and 5000 MW *(Figure 2).*

The paper dealing with govemment policy for geotliennal development present situation private partisipation and future programme facing the second long term development scheme and rural electricity generation utilizing geothermal resources.

Government Policy

To accelerate geothermal development in Indonesia Government Issued Geothermal Development Incentives :

1. To accelarate and intensity exploration and development
2. To set priorities for utiliting geothennal energy resources to meet the domestic requirements thereby conserving oil for export as follows :

First : the nonexportable energy resources geothermal and hydropower
Second : the less exportable and less valuable energy resources : coal
Third : the resource lesser flexibility for export natural gas
Finaly : Oil

Thereafter we hope further to diverse our energy supply by utilizing other sources such as peat, wind, solar, biomas, biogas.
To conserve energy and ensure its more efficient use. Being an oil producing and exporting country, we may well suffer a sort of inborn sin of tending to be wasteful of energy.

Indexation of energy use, meaning the application of the best and most efficient from of energy for each particular requirement.

Geothermal Situation In Indonesia

Electricity shortages are already being experienced in Indonesia. The electricity shortages are focusing the government's attention on an energy self-sufficiency. A prime component of this policy is diversification of the energy base for the generation of electricity.

One important electrical energy resource that is significantly underdeveloped in Indonesia is geothermal energy. To day I'II discuss how development of Indonesia's geothermal resources can contribute to Indonesia efforts towards energy self-sufficiency.

Talking about geothermal energy development in Indonesia one has to understand the geographical plexity an archipelagic country such as Indonesia, with consists of approximately 17,500 islands spread out over a distance of about 33,000 mile along the equator. Some 3,000 island inhabited by about 176 million people, but the population is unevenly distributed, with approximately 60% crowding the island of the island of Java.

Indonesia has the largest reserves of geothermal energy in the world, equivalent to minimum of 20,000 MW. This resources has been relatively little exploited. However this is changing rapidly. As recently, as last year Indonesia developed only 310 MW of power from geothermal resources, and put Indonesia in fifth place.

The 1994/99 five year plan foresees Indonesia producing 1000 MW of electricity from geothermal sources by 2000, second only to USA. By 2020, total capacity is projected to be 5000 MW, morethan *any* other country in the world. There are many reasons for Indonesia to develop geothermal energy. First, geothennal energy is proven, viable technology for electrical generation. Second, the development of geothennal energy provides greater flexibility for the Government to preserve or enhance it's foreign exchange earning.

Third, geothermal energy is cost competitive with other sources of electrical energy. Fourth, the private sector is willing to assume the risk of geothermal exploration and development for a reasonable rate of return on the invesment. Fifth, geothermal energy is valuable purely domestic recycle natural resources and environmentally attractive power sources. The government policy in developing geothermal energy is in the context of the energy policy, which has the following objectives : to assure the availability of energy for export, to reduce the dependence on oil, to assure a gradual shift from *an* oil based energy to multi energy economy, to protect the environment, and to improve national resilience and national endurance.

Facing the chal lenges ahead in the year 1995 through 2005, Indonesia has as opportunity to achieve these objectives through utilization of a variety of energy sources. One of the most attractive and available of these resources in geothermal energy. A recent survey of the geothermal in Indonesia has identified 217 prospects ***(Figure* 3)** throughout the country with the total potential of exceeding 20,000 MW. To put this potential in prospective, at the end of 1993/94 the State Electricity Company (PLN) installed capacity was 12.500 MW and captive generation capacity installed by private business nearly 7500 *MW*. Thus, full development of Indonesia's geothennal potential could provide a large proportion of Indonesia's electric energy needs for decades to come. Even with these advantages geothermal development in Indonesia has been slow. Less than 1% of the country's

geothermal potential has been developed. For geothennal energy to play significant role in Indonesia's future energy growth, geothermal development must be accelerated.

Even more advantageous to Indonesia is the location of the geothermal prospects. Approximately half of the geothennal energy could be easily fed into the electrical grid to supply Java's rapid Industrial growth Another 30% of Indonesia's geothermal potential is located on Sumatera, the site Indonesia's next major economic expansion. Tlie Sumatera potential could also be utilized to supply the growing Java demand by means of a submarine cable connecting the two islands like Java-Bali and Java-Madura.

Currently there are 310 MW of geotliennal power plant capacity installed in Indonesia thus is less than 1% of it's potential but in terms of electricity generation, provides 4% of the primary energy consumed. Further development is underway. At Gunung Salak in West Java, geothennal steam will suplly an additional of 220 MW power plant. This development will be followed by a 110 MW plant at Darajat in West Java, 95 MW at Dieng, in Central Java, 20 MW at Lahendong, in North Sulawesi and 22 MW in Sibayak North Sumatera. Several additional areas are under development such as : Patuha, Wayang Windu, Karaha in West Java, Candi Kuning in Bali, Ulubelu, Lumutbalai, Suoh Sekincau in Lampung and Gedong Hululais in Bengkulu.

To accelerate the development of geotehrmal energy, Indonesia invites private companies as contractors to cooperate with PERTAMINA in exploration and production ventures. Taking into account the lack of capital and technology, which is not fully available in Indonesia, the Government is also considering several incentives to enhance geothermal development.

An important question that must be addressed is whether it is more economical for government or private industry to develop geothermal resources. The government seemingly has a big advantage in that it can obtain funds through aid grants and soft loans with low interest rates. The availability of low cost financing obscures the concepts of risk. If the Government secures financing for a project, tlie Government money must be used to pay back the loan, putting and added burden on the population. Private industry, however, is willing to assume tliese risks for a reasonable rate of return. Such willingness provides the government with the opportunity to divert funds to low risk projects. Another advantage is that private industry has an incentive to develop the project quickly in order to generate a return on the invesment. Tlus incentive to quickly bring projects on line is a major consideration given the soaring demand for electricity in Indonesia today.

Tlus necessity to accelerate power projects in promoting the Government to change the role that private industry can play in geothermal development. In contracts written prior to 1990, private industry was solely a steam supllier to PLN. Private companies drilled wells and built tlie surface production facilities. PLN built the power plant and distributed the electricity. Private industry's earning were based upon PLN's electrical generation. To increase electrical energy capacity as quickly as possible, the Government recognized that additional outside investment had to be arrtracted. Consequently, tlie government elected to after it's geotliennal energy regulations so that private industry can undertake the total project Built Operate and Transfer (BOT) or Built Operate and Owned (BOO), including construction of the power plant and generation of the electricity without al-tering the prospective responsibilities of tlie hvo stated owned companies. An adjusment in relation to regulatory aspects are completed and approved by the implementation of President Degress No. 45/91 and 49/91.

A moderately ambitious schedule of geothermal development could provide an installed capacity of 1000 MW at the end of Repelita VI and of 5000 MW at the end of PJP 11 or 10% of it's potential, by the year 2020. This scenario based on 2450 MW could be developed in Sumatera, 2340 MW in Java-Bali and 210 MW in Eastern part of Indonesia (Sulawesi-Molucas, Nusatenggara). If this program could be implement, it may save more than 70 million barrels of oil equivalent annually. On Java, prospects now in the development state or under exploration could be producing more than 900 MW before tlie end of this decade. In North Sumatera, development of just four prospects could field an installed capacity of 1000 MW by the year 2003 (Sibayak & Sinabung, Sarulla, Sorik Merapi and Sibual-buali fields).

Amore ambitious schedule could add as much as an additional 1000 MW from potential resources in southern part of Sumatera Ulubelu, Rajabasa, Lubutbalai, Souh Sekincau and from prospects in West Java (Tampomas, Banten) Central Java, (Telomoyo, Wilis) and East Java (Ijen, Arjuna, Anjasmoro, Argopuro) to the Indonesian grid

by the year 2003.

These schedules are obviously dependent upon rig availability, exploration and prospect development success, transmission access, and **funding.** Nevertheless, tlus development program is attainable. While **this** schedule is ambitious, 3300 MW represents less than 25% of Indonesia's geothermal potential, leaving a lot of room for the expansion of the geothermal industry.

Opportunity For Private Sector Participation In Geothermal Development In Electricity Development.

Private Power Business

The development of electric power sector is of capital intensive nature, high technology and requiring long term period for constructi' , und operation. The source of capital investment which for the time being is provided from State Annual Budget (APBN), PLN Budget (APLN) and offshore borrowings in terms of soft loan, export credit etc., is considered insufficient thereby it is necessary to look for support from private investment sources.

Private participation in the power sector has been made public by Govemnent through Act No. 15 Year 1985 concerning Electrification By virtue of said Act that Cooperatives as well as Private Corporation may be given Electrification Operating Permit for own use or public utility as well.

Furhennore, the issuance of Presidential Decree No. 37 Year 1992 has extended a more and clear offer for the participation of private investor to run business in the electrical power sector :

in the PLN's services area where PLN is not yet able to provide electric power, the private corporation may be given permit to generate electric power to be sold to PLN who will there after deliver to the custumer.
in the PLN's services area, the private corporation may be given permit to generate electric power for own user or to sell directly to its customer as follow :

a. to obtain permit for direct sale to customers in its industrials area.
b. direct sale to other private corporation using PLN's.

The operation of private electric power generating can be catagorized as "Solicited Project" (increment of generation unit based on the Electrification Development Plant) and "Unsolicited Project" being outside the Electrification Development Plant. Based on current electrification development plants is offered to private investor.

As supplemental to existing regulations, the Ministry of Mines & Energy has issued Ministerial Decree No. 02.P/03/M.PE/1993 dated 23rd February 1993 concerning the Operation of Electric Power Provision by Private Corporation and Cooperation for Public Utility.

Indonesian foreign joint ventures signed contracts between PERTAMINA and PLN since late December **1994** to explorer and develop geothermal fields and power plant in Patuha, Karaha, Wayang Windu, Salak in West Java and Dieng Central Java to establish power plants with a total capacity of nearly 1000 MWs. Fiften under Built, Operate, Transfer (BOT) and Built, Operate, Own (BOO) scheme ***(Figure 4).***

Private Sector Participation In Geothermal Development

Hereafter, major electric power development projects, including those of geothennal, have been planned, implemented, and operated almost by PLN. This situation is now changing. While the integrated national electricity supply plan is still in the **hands** of the government, private investors are now welcomed to undertake utility-size power projects. ***As*** you probably know, article 7 of Law Number 15 of 1985 on Electric Energy sets forth the Government's policy on private sector participation in the provision of electricity in Indonesia. The **Law**

substantiates the structure of the power industry by legally enabling private entites and cooperatives to produce electricity for public uses or to be sold to PLN.

During the first phase of the "privatization" programme, the private sector is given opportunity to develop and implement 2,980 MW of generating capacity plants in total which are scheduled for completion during the time frame of 1994-1998 under the Build-Own-Operate scheme. This includes 353 MW geothermal plants wluch will be built in five locations in Java. Five Indonesian Americanjoint ventures signed contracts between PERTAMINA and PLN in late December 1994 to explorer and develop geothennal fields and power plant in Patuha, Karaha, Wayang Windu, Salak in West Java and Dieng Central Java to establish power plants with a total capacity of nearly 1000 MWs.

The developer bear exploration risk and recover operating costs after commercial production/operation begins. This developer provide the financial and technical capability to conduct geothermal operations.

The development of geothennal energy in Indonesia is not as smooth as what all of us have expected. One of the main reasons is the pricing scheme, geothermal steam is still considered to expensive by the potential steam user, and that it is not competitive with the closest alternative, i..e base-load coal-fired energy.

However, the government is services in the development of geothennal energy this is reflected by the desire of the Government to create positive economic climate for geothermal development in Indonesia. One of the government's effort to deal with this issue is by conducting a pricing study for geothennal steam under a grant from the Asian Developinent Bank, which has been completed in 1992 and another grant issued in the first quarter of 1995.

Rural Electrification Geothermal Utilizing Geothermal Energy

The development of mini geothermal project was initiated in 1981 when Vulcanological Survey Indonesia (VSI) and PLN under bilateral cooperation with Japan International Cooperation Agency (JICA) implemented a geoscientific survey and exploratory drilling at Kerinci, West Sumatera. The second exploratory drilling in which was part of feasibility study 1989, gives a steam production 375 kW of generating electricity and a production steam for proven potentia1 for 5 MW, so far implementation for this project are being planned.

Since 1989 PLN, under bilateral techrucal coopemtion with the Government of New Zealand was promoting Ulumbu Mini Geothermal Project in Flores. Drilling, works have been completed in 1994 and 1995 under PLN's budget, January 1996 confirmation on funding for the construction of 3 MW will confirmed by World Bank. Up to 10 MW under consideration with the Australian assisstance for further development.

Under the RE 11, 1995 PLN has received Loan from the World Bank for production drilling for mini geothermal (10 MW) at Tulehu, Ambon and at Sembalun, (10 MW) Lombok.

By the fiscal year of 1994/95 survey has been made for geoscientific study of 3 (three) locations of mini geothermal development in Eastern part of Indonesia funded by IBRD through Rural Environmental Development (RED) Project 1994 this is Jailolo (Mollucas), Bora (Central Sulawesi) Alor (Timor, NTT) and 3 locations by New Zealand government (Hu'u Sumbawa, Sukoria Flores and Saparua, Mollucas).

Most of the rural electrification in Indonesia is generated by diesel plant, tapping from the grid, mini hydro, hybrid and mini geothermal among other resources geotherinal is more prospective for the rural electrification.

Future Development

There will be a lot of geothermal plant construction in the near future specially for rural electrification program, as the electrified villages up to 1994 is 30,394 villages, while the total villages in Indonesia is 61,975 villages. As the diversification policy is concerned there will a National effort to substitute oil dependency by using geothermal energy.

Future Development Scenario

It is considered that Sumatera, Sulawesi and Jawa-Bali are more favourable for big scale geothennal power generation than for small scale which seems to be suitable in the more remote islands of East Indonesia.

Information shows development scenario up to year 2020. The generation target in this 5 year period is 380 MW giving a cumulative productive of 690 MW.

The incremental development target in the next 10 years is possible by maximizing the use of developed field potentials. This involves 220 *MW* in Salak, 275 MW in Damjat, 45 in Dieng, 160 MW in Sarulla, 60 MW in Lahendong and Tompaso and 60 *MW* in Kamojang giving a total capacity of 570 *MW* and cumulative production of about 1560 MW.

By assuming that most of the fields will be operated by private sector under total project JOC's with PERTAMINA, it is expected that up the year of 2020, Sumatera will have a geothermal plant of about 1000 *MW* capacity, Java-Bali has 1,300 *MW* and Sulawesi is about 200 MW giving a total of 2,500 *MW* installed capacity. The smaller scale (3-10 MW) developments are not included in tlus figure. Tlus is estimated about 74 *MW,* mostly in East Indonesia.

CONCLUSION

With regard to the governments's giving the private sector the opportunity to participate in the electricity Development Services was taken after the enactment of Act No. 15 of 1985 and President Degree No. 37 of 1992. Among the rural electrification resources, geothermal is more prospective for the future.

This geothermal privatization, which has been carried out in the electricity sector in Indonesia is, in fac more advanced than what has occured in Philippines, as we know that Philippines is the first leading geothennal countries in Asia with the installed capacities of more than 1000 MW today.

The participation of the private sector that we are currently implementing is intended to obtain sources of funds, technology and human resources trully capable of making geothermal electricity take off. In order to do tlus, Indonesia obviously require the participation of the private sector.

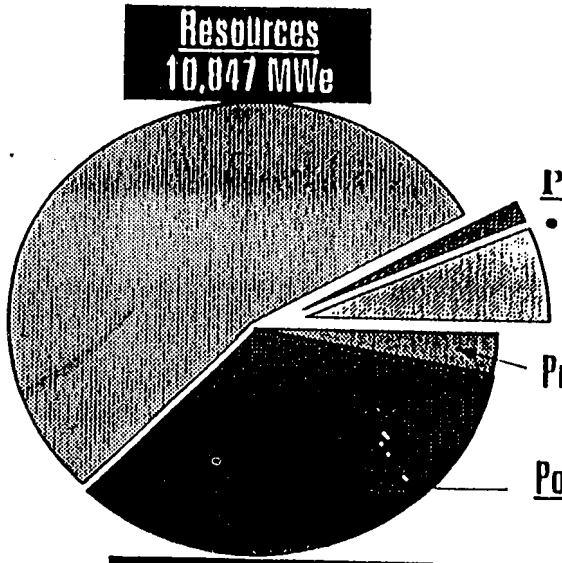
Private consortiums which also include the domestic and foreign private sector in the field of geothermal electricity development is a break through which has never occured in Indonesia before. The closed target which could be achieved by the govemment was to ensure that the geotliennal electricity contribution to the electricity sector will reach 1000 MW by the year 2000.

The .pattern of development of private geotliennal project is Total Project (Steam Field and Power Plant) through BOT (Built, Operate and Tmnsfer) for 30 years period. To day 12 geothennal project contracts has been signed by PLN and the private sector.

Strategy to cope with the requirement be based on the understanding that geothennal energy is to day energy resources.

GEOTHERMAL POTENTIAL IN INDONESIA

Status : January 1997



Resources
10,847 MWe

Proven Reserves 1,436 MWe
- Installed capacity = 309.5 MW (22%)

Probable Reserves 558 MWe

Possible Reserves
6,817 MWe

Reserves 8,811 MWe

Total : 19,658 MWe

Figure 2

G–7
GEOTHERMAL COUNTRIES THE BIG SEVEN

No	YEAR (1993)		YEAR (1994)		TODAY (1997)		NEXT YEAR (1998)		THE YEAR 2000		THE YEAR 2020	
	COUNTRY	INSTALLED CAPACITY (MW)	COUNTRY	INSTALLED CAPACITY (MW)	COUNTRY	INSTALLED CAPACITY (MW)	COUNTRY	INSTALLED CAPACITY (MW)	COUNTRY	INSTALLED CAPACITY (MW)	COUNTRY	INSTALLED CAPACITY (MW)
1.	U S A	2,964	U S A	2,964	U S A	3,000	U S A	3,000	U S A	3,000	*Indonesia*	*5,000*
2.	Philippines	894	Philippines	894	Philippines	1,100	Philippines	1,300	*Indonesia*	*1,950*	USA	3,500
3.	Mexico	600	Mexico	600	Mexico	600	*Indonesia*	*730*	Philippines	1500	Philippines	2,000
4.	Italy	570.3	Italy	570.3	Italy	570	Mexico	600	Mexico	800	Mexico	1,500
5.	New Zealand	273.2	*Indonesia*	*309.75*	*Indonesia*	*475*	Italy	570	Italy	650	Italy	1,000
6.	Japan	214	New Zeland	273.2	Japan	310	Japan	310	New Zealand	350	New Zealand	750
7.	*Indonesia*	*144.75*	Japan	214	New Zeland	273,2	New Zeland	273,2	Japan	310	Japan	500

Figure 3

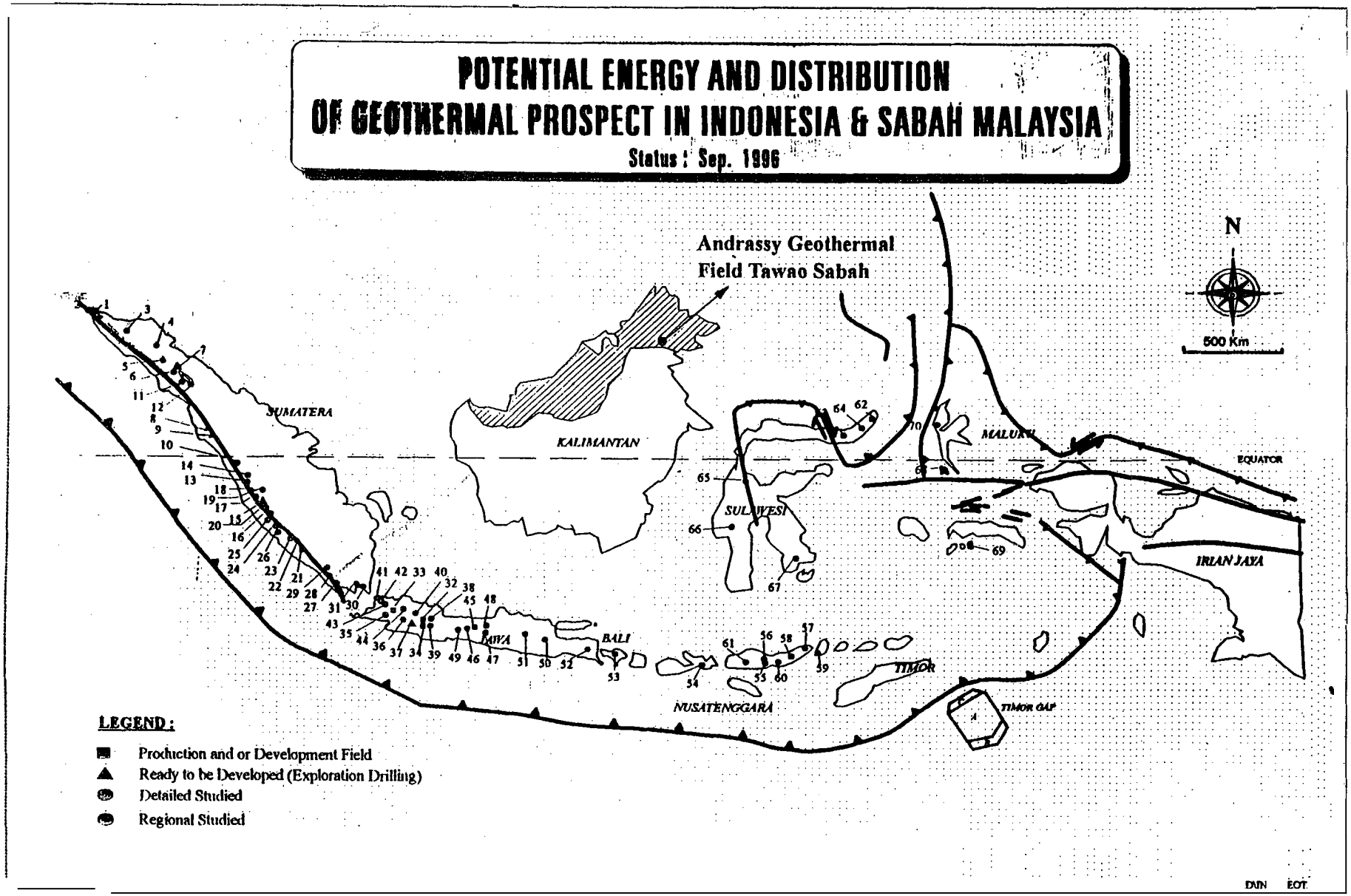

POTENTIAL ENERGY AND DISTRIBUTION
OF GEOTHERMAL PROSPECT IN INDONESIA & SABAH MALAYSIA
Status : Sep. 1996
Andrassy Geothermal
Field Tawao Sabah
N
500 Km
SUMATERA
KALIMANTAN
SULAWESI
MALUKU
EQUATOR
IRIAN JAYA
BALI
TIMOR
TIMOR GAP
NUSATENGGARA
LEGEND :
Production and or Development Field
Ready to be Developed (Exploration Drilling)
Detailed Studied
Regional Studied
DJN EOT

Figure 4

Schedul of Commercial Operation Date (COD) Indonesia Geothermal Project

DEVELOPER	PROJECT SITE	SIGNING CONTRACT	Unit	NOID	Commercial Operation	PERIOD YEARS	INFORMATION		
		. BOT . 27 Feb' 1993	6 x 55 MW (330 MW)	Agustus 1995	Unit 1: Kuartal II 1999	3 – 7 tahun	Dieng: Unit 1 : Q IV : 1996 Unit 2 : Q IV : 1997 Unit 3 : Q II : 1998 Unit 4 : Q II : 2000		
		. BOT . 16 Nov'1994	3 x 55 MW (165 MW)	31 Mei 1995	Unit 4: Kuartal II 1997 Second Q 1997	Proven Field			
		. BOO . 2 Dec'1994	2 x 20 MW 2 x 55 MW (150 MW)	Mei 1995	–	Proven Field	W. Windu Unit 1/2: Q III: 1998 3/4: Q IV: 1998		
		. BOO . 2 Dec'1994	4 x 55 MW (220 MW)	Maret 1996	–	Proven Field	Patuha: Unit 1 : Q IV: 1997 2 : Q IV: 1998 3 : Q IV: 1999 4 : Q IV: 2000		
		. BOO . 2 Dec'1994	4 x 55 MW (220 MW)	Jan' 1997	–	2 Years			
		. BOO . 2 Dec'1995	4 x 55 MW (220 MW)	Dec' 1996	–	2 Years			
		. BOO . 17 Nov' 1995	2 x 30 MW (60 MW)	Nov' 1996	Unit I: 36 Months (November 1998) Unit II: 42 Months (Mei 1999)	Proven Field	Karaha: Unit 1 : Q IV : 1998 –> 1999 2 : Q IV : 1999 –> 2000 3 : Q IV : 2000 –> 2001 4 : Q IV : 2001 –> 2002	Karaha data geoscientific Exist	Equity available tidak butuh supporting letter
		BOO 17 Nov'1995	4 x 55 MW (220 MW)	Unit I Jul' 97 Unit 2 Jan' 98 Unit 3 Jul' 99 Unit 4 Sept' 2000	Unit I: 36 Months: Nov' 98 Nov' 99 Nov' 2000 Nov' 2001	1 1/2 Years (?)	Bedugul No financial support	Bedugul data geoscientific Exist	NOID C. Oper. Unit 1. 20 bln 36 bln Unit 2. 26 bln 48 bln Unit 3. 44 bln 60 bln Unit 4. 58 bln 72 bln
		. BOO . 17 Nov'1995	1 x 10 MW (10 MW)	Nov' 1996	36 Months Nov' (1998)	Proven Field	Cibuni No financial support		
		. BOO . 15 Jan'1996	2 x 20 MW 2 x 40 MW (120 MW)	Jan' 1997	1: 36 Months: Jan'1999 2: 48 Months:Jan' 2000 3: 60 Months:Jan'2001 4: 72 Months:Jan'2002	Proven Field	No financial support		
		BOO 15 Jan'1996	3 x 70 MW 1 X 65 MW (275 MW)	Unit 2 Maret 1997 Unit 0 Oct' 1998 Unit VIP Maret 1999 Unit VIP Oct' 2000	36 Months : Jan' 1999 54 Months : Oct' 2000 72 Months : Maret 2001 90 Months : Oct' 2002	Proven Field	Darajat Unit 2,3,4 developed based on PLN approval		
		Total Capacity :	1950 MW		Co: 28 Months after NOID				
		Consted of REPELITA VI :	620 MW						
		REPELITA VII :	680 MW						
		REPELITA :	650 MW						

REPELITA VI : (1993 – 1998)		REPELITA VII : (1998 – 2003)		REPELITA VIII : (2003 – 2008)	
Salak 4,5,6	: 165 MW	Dieng 3,4	: 75 MW	Sarulla: 3,4,5,6	: 220 MW
Dieng 1,2	: 75 MW	WW: 3,4	: 110 MW	Bedugul: 3,4,	: 110 MW
WW (1, 2)	: 110 MW	KMJ 5	: 30 MW	Sibayak 2,3,4	: 100 MW
KMJ 4	: 30 MW	Sarulla 1,2	: 110 MW	Darajat 3,4,5	: 205 MW
	360 MW	Bedugul 1,2	: 110 MW		635 MW
		Cibuni	: 10 MW		
		Sibayak 1	: 20 MW	Pth, 3,4	: 110 MW
		Darajat 2	: 70 MW	Karaha 3,4	: 110 MW
			535 MW		855 MW
		Pth+ Krh –> (1,2) (1,2)	: 220 MW		
			755 MW		

STATUS :

Joint Commitee Meeting PLN – PERTAMINA/SWASTA

1. Sarulla : 3 x Meeting
2. Salak : 3 x Meeting
3. Dieng : 1 x Meeting
4. Patuha : Belum ada
5. Karaha : 2 x Meeting
6. W. Windu : 2 x Meeting
7. Kmj, Sibayak, Darajat, Bedugul–Cibuni : 2 x Meeting

CURRICULUM VITAE

Name	Vincent Radja
Brith date/Place	**July** 10, 1939
	Kupang, Timor, Nusatenggara Timur

Present **Position** and Responsibilities

- Advisor to the PLN Board of Director on Development of Indonesia Geothermal Project
- Leader of Indonesia Group on ASEAN Geothermal Development Project
- PLN Chairman of Joint Committee PLN-PERTAMINA-Private Geothermal Development Project
- Founder of Indonesia Geothermal Association (INAGA)

Educational Background

Undergraduate : Geology, at Bandung Institute of Technology, April 1964
Postgraduate : Geothermic, Institute the Le Richerche Geothermice, **Pisa, Italy** 1970

Working **Experience**

1. Actively Participate and Initiate geothermal activity in Indonesia since 1967 - Now (nearly 30 years)
2. Manager Kamojang Geothermal Project the **first** Indonesia geothermal project 1976 - 1983
3. **Head** of Geothermal Division PT. PLN (Persero) (State Electricity Board) 1993 - 1995
4. Chairman of PLN Geothermal Negotiation **Team** for Private Power 1995 - 1997
5. Chairman of RDE Geothermal Development Project PT. PLN (Persero) 1989 - 1995.
6. Chairman Indonesia Geothermal Association : 1991 - 1995
7. Director International Geothermal Association (IGA) 1992 - 1995)
8. Visit all Geothermal Countries all over the World (morethan 60 countries)

Publication

More than 50 Scientific articels in 50 International Conference on geology, energy, geothermy, Electricity.

Membership

1. Indonesia Geological Sociely (IAGI)
2. Indonesia Geothermal Association **(MAGA)**
3. Geothermal Resources Council (GRC-USA)
4. Institut Le Richerche Geothermic Pisa (Italy)
5. Auckland Geothermal Institute New Zealand
6. Kyushu Geothermal 'Institute, Japan
7. UN. Geothermal University Reykeyavik, Iceland

RDE = Reserch, Development, Engineering