NEW POLICY IN GEOTHERMAL DEVELOPMENT IN INDONESIA

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SUMMARY - Current installed capacity of Indonesia's geothermal power plants is **144.5** MW, which is less than 1 % of its estimated potential of **16,000 MW.** To accelerate geothermal development, national and foreign private companies are invited to participate in terms of Joint Operation Contracts with PERTAMINA. To **support** this scheme new policy have been issued, the most important of which is the corporate tax reduction from **46 %** to **34** %. Private industry can undertake the total project, including construction of power plant and generation of the electricity.

1. INTRODUCTION

There are many reasons for Indonesia to develop geothermal energy. First, geothermal energy is proven, viable technology for electrical generation. Second, the development of geothermal energy provides greater flexibility for the government to preserve or enhance it's foreign exchange earning. Third, geothermal energy is cost competitive with most 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 investment. Fifth, geothermal energy is **a** save and environmentally attractive power source.

Indonesia's 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 the domestic market at a reasonable price; to ensure 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.

The principal guidelines to implement energy policy are : intensification of exploration for various energy sources; conservation of energy by using it efficiently and wisely; diversification of sources of energy with the aim of reducing the share of oil in overall domestic energy consumption, developing and using non-oil energy resources, with the priority of utilizing non tradable, non exportable and/or renewable energy.

Facing the challenges ahead in the year 1995 through 2020, Indonesia has an opportunity to achieve these objectives through utilization of a variety of energy sources. One of the most attractive and available of these resources is geothermal energy. **A** recent survey of the geothermal in Indonesia has identified 217 prospects throughout the archipelago with the total potential of exceeding 16,000 MW.

To put this potential in perspective, in 1992 the state electricity company - PLN installed capacity was 10,772 MW and captive powers (electrical generation capacity installed by private business) amounted to 7,000 MW. For the year 2008 in Java and Bali about 37,000 MW and power plants installed capacity are required while outside Java and Bali the requirement is about 20,000 MW. Thus, full development of Indonesia's geothermal potential could provide a large proportion of Indonesia's electric energy needs for decades to come.

Since geothermal energy is non-exportable and to some extent is categorized as renewable energy, according to the Indonesia's energy policy is the first priority to be utilized.

Even with this advantages geothermal development in Indonesia has been slow. Less than 1 % of the country's geothermal potential has been developed. For geothermal energy to play significant role in Indonesia's future energy growth, geothermal development must be accelerated.

To accelerate the development of geothermal energy, very recently, the Government of Indonesia (GOI) had launched new policy in this area.

2. THE REGULATION OF UNDERTAKING

Through the Presidential decree No.22 of 1981, the government granted to PERTAMINA - the state oil and gas company, the authority to under: take exploration and exploitation of geothermal energy resources. PERTAMINA shall be obliged to sell the energy/electricity produced in the execution of the authority to undertake geothermal energy sources to PLN - the state electricity company.

To carry out operations which can not or can not yet be executed by PERTAMINA, the Minister of Mines and Energy (MME) may appoint other party as contractor by entering into a cooperation with PERTAMINA in the form of a Joint Operation Contract (JOC). The cooperation shall be conducted based on the guidelines, directives and requirements stipulated by the MME.

The Department of Mines and Energy, in this case the Directorate General of Oil and Gas shall conduct supervision and technical development on the operations relating to the execution of the authority to undertake geothermal energy sources by PERTAMINA.

Coinciding with this regulation, in utilizing geothermal energy in Indonesia, there are three parties involved, they are the geothermal field developer PERTAMINA and its contractors, the electricity power generator PLN, and the government.

The fiscal and financial aspects is regulated by the Presidential Decree No. 23 of 1981. According to this regulation PERTAMINA shall be obliged to deposit to the State Treasury 46 % of its net operating income originating from the executions of the authority to undertake geothermal energy resource, which shall exempt PERTAMINA from paying the corporation tax, the tax on interest dividend and royalty and other levies as referred to in article 15 "PERTAMINA Law" - Law No.8 of 1971. To the contractor of the JOC applied the corporation tax of 40 % of the taxable profit and tax on interest, dividend and royalty of 10 % of taxable profit, after deduction of the corporation tax.

3. THE DEVELOPMENT PRIOR TO 1991.

A recent inventory has identified 217 geothermal locations spread through out the country, along the volcanic belt from Sumatra (4,900 MW), Java (7,800 MW), Bali (300 MW), Nusa Tenggara (350 MW), Sulawesi (1,500 MW), Maluku, Irian Jaya, and others (1,200 MW), giving a total estimated potential of more than 16,000 MW of electricity.

In addition to the prospects mentioned above, various surveys have been done by the Directorate of Volcanology and PERTAMINA with difference degrees of intensity ranging from reconnaissance surveys to detail integrated surveys. Geological surveys have been done on 214 prospects, geochemical surveys on 200 prospects and geophysical surveys on 45 prospects.

Until 1991 - ten years after geothermal development had been regulated only ten of the 217 prospects have been drilled, namely Kamojang, Salak, Darajat, Cisolok, Banten, Ciharus, Wayang Windu in West Java, Dieng in Central Java, Lahendong in North Sulawesi, and Kerinci in West Sumatra. Of the ten, only two are producing, they are Kamojang (140 MW), and Dieng (2 MW) - both are operated by PERTAMINA.

Six prospects are now in the development stage i.e. Dieng, Lahendong, Salak, Darajat, Ciharus, and Wayang Windu. Three prospects are ready for exploration drilling i.e. Bali, Patuha and Karaha. Except Salak and Darajat which are operated by JOC contractors, UNOCAL Geothermal Indonesia and AMOSEAS Indonesia respectively, the others are operated by PERTAMINA.

Aside from the fields mentioned above, four prospects are planned to be developed in a small scale scheme (equal to or less than 10 MW), viz Ciwidey - West Java (10 MW -, a proposal to be

developed by the cooperative of TEKNOSA), Lahendong (2.5 MW Binary Cycle power plant for research purposes by BPPT and PLN), Kerinci (3.5 MW by PLN in cooperation with JICA), and Ulumbu (3MW by PLN in cooperation with the New Zealand Government).

The development of geothermal energy in Indonesia is very low compared with its potential, and very slow compared with the high growth demand on electricity, It is because in the past, in utilizing this energy, difficulties and problems have been found among others the lack of capital for power plant and geothermal steam pricing.

Indonesia has experienced a lack of capital (soft loans) for financing projects - especially for the construction of power plants. As can be seen in Table 1 the lead-time required from reconnaissance surveys to the (expected) commercial operation of power plants is more than 10 years. Except for the Kamojang where activity has been continuous, the activity in the other fields stopped after expioration had finished, waiting for a confirmation from the steam buyer (PLN) of the time schedule for power plant construction. PLN was not able to conform the time schedule promptly because PLN itself was looking for soft loans - which were not easy to obtain - in order to fund the project. If a lender (World Bank, Asian Development Bank, etc.) provided the loan for the project a certification of the availability of the resource usually had to be made by a third party. This means that the resource feasibility study, was actually done by the resource developer had to be reevaluated, involving extra time and cost.

The length of the lead-time will effect the economics of the steam field. The longer the time, the higher the cost of money, with a consequence increase in the steam price. The Kamojang field experience has shown that the time required from the starting of exploration to the commercial production was 10 years : 2 years for scientific exploration, 3 years for exploration drilling, and 5 years for development.

In the case of Salak development, where exploration by UNOCAL Geothermal Indonesia was initiated in 1982, the time required for scientific surveys was 2 years, for exploration drilling 3 years, and the field will be in commercial operation in early 1994 or 11 years since its exploration. If the development activities could proceed continuously, the lead-time could be reduced to only 6 years : 2 years for exploration, 2 years for field development, and three years for the construction of the power plant. Since the construction of the power plant could be started after 1 year of steam field development, the total time required could be reduced to just 6 years.

Geothermal energy utilization is capital intensive and high risk venture. The risk is inherent in the uncertainty of availability of the resource below the ground. As a compensation for bearing the risk, steam developer expect a certain level of Rate of Return (ROR) for their investment. GOI allows the contractors to have 20 % ROR. This of course causes an increase in the steam price.

Table 1.
Lead-Time of Geothermal Development
in Indonesia

Stage of Activities	Kamojang 30 MW		Salak 110 MW		Darajat 55 MW		Lahendong 15 MW		Dieng 55 MW	
	Period	Year	Period	Year	Period					Year
- Geoscientific Survey	'72 - '74	2	'82 - '84	2	'84 - '86	2	'82 - '84	2	'75 - '77	2
- Exploration Drilling (No. of Wells)	'74 - '77 (5)	3	'84 - '86 (8)	2	'86 - '89 (4)	3	'84 - '87 (7)	3	'77 - '88 (13)	11
- Discontinue		-	'86 - '89	3	'89 - '91	2	'87 - '90	3	'88 - '89	1
	'77 - '82		'89 - '93	4	'91 - '94	3	'90 - '94	4	'89 - '94	5
- Total Time	1			11		10		12		19

Even though GOI has allowed contractors to have such high ROR, only two foreign contractors entered into JOC with PERTAMINA since the regulation of geothermal exploration and exploitation was begun in 1982. When this is compared to the more than one hundred contractors who entered into contract for oil and gas exploration and exploitation, it is very small.

4. NEW POLICY

To overcome the problems faced in the past the GOI had adjusted the regulatory aspects of geothermal energy undertaking.

To accelerate the projects GOI changes the role that private industry can play in geothermal development. In contracts written prior to 1990, private industry was solely a steam supplier to PLN. Private companies drilled wells and built the surface production facilities. PLN built the power plant and distributed the electricity. Private industry's earning were based upon PLN's electrical generation.

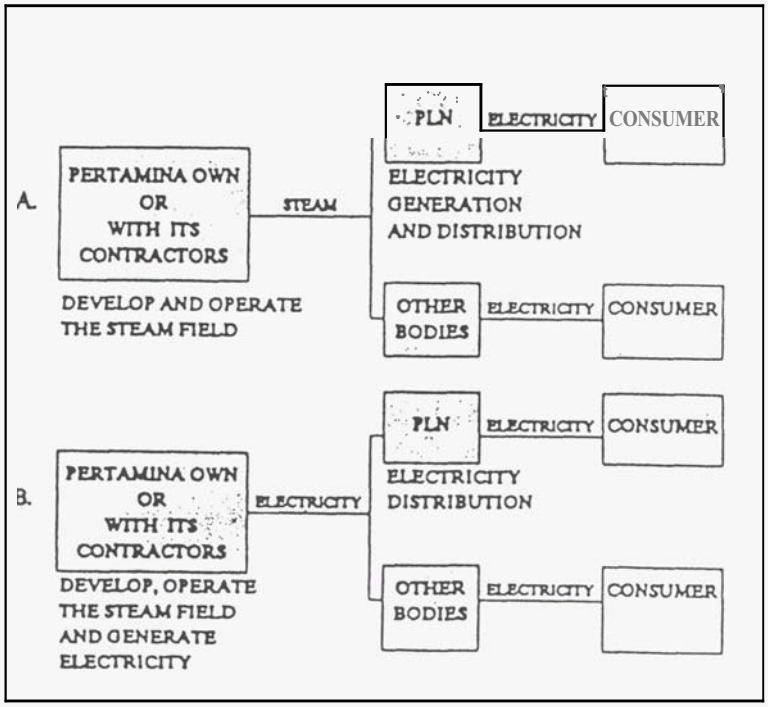
To overcome the lack of funding for power plant construction and to shorten the lead-time, the GOI recognize that additional outside investment had to be attracted. Consequently, the GOI elected to alter it's geothermal energy regulations so that private industry can undertake the total project, including construction of the power plant and generation of electricity. Without altering the respective responsibilities of the two state companies.

In November 1991 the Presidential Decree No. 45 of 1991 has been issued as an amendment to the Presidential Decree No.22 of 1981 on granting of mining rights for geothermal exploration and exploitation to PERTAMINA. Coinciding with this new regulation, Presidential Decree No. 49 of 1991 was also issued revoking the Presidential Decree No. 23 of 1981.

Under the new regulation, PERTAMINA may sell electricity to PLN, other agencies, other state companies, and national private business - including cooperative bodies. If necessary, the MME may grant licentious for the exploration and exploitation of geothermal resource on a small scale (equal to or less than 10 MW) to other agencies, other state companies, national private business - including cooperative bodies for electric power generation and/or other utilization.

Based on the new regulation some possible schemes could be applied in the geothermal energy development in Indonesia, as shown in Figure 1.

Figure 1 :
Possible Geothermal Development Schemes
(After PERTAMINA, 1992)



A. PERTAMINA - **own** or with its contractors develop **and** operate the steam field to produce geothermal steam. The steam could be sold to PLN or to other **bodies** which will generate electricity **and** sell it to **PLN** or other bodies for further distribution to the consumers.

B. PERTAMINA - own or with its contractors develop, operate the steam field and generate electricity. The produce electricity could be sold to either PLN or other bodies which will distribute into the consumers.

By the Presidential Decree No.49 of 1991, the tax rate is **34** % of net operating income, instead of **the** previous regulation's **46** %.

5. FUTURE OUTLOOK

The future demand of electricity is projected to grow at a relatively high rate. It is mainly due to the fact that only 33 % of the population have been supplied with electricity. In addition, the electricity demand for industry has grown very rapidly. For the period of 1994/95 - 1998/99 (The Sixth Five Year Plan, REPELITA VI), 12,000 MW power plants were needed **to** be built, in the period of 1999/2000 - 2003/04 (REPELITA VII), **15,000 MW ,** and in the period of 2004/05 - 2008/09 **(REPELITA VIII), 17,000 MW.**

From the supply side, coinciding with the diversification of energy policy, the future power plants will use non-oil energy. Uti'lization of alternative energies will play an important role.

Alternative energy resources such as hydro, gas, coal besides geothermal are abundant in Indonesia. The utilization of these energies in the future, however, will not only based on the availability of the resources, but also has to be environmentally acceptable oriented. Applying new technologies in the development of the energy to meet the environmental requirement will be the key factor.

To reach the balance between energy supply and demand, more opportunity will be given to private sector to participate in the energy development and operation. ***So,*** for the future the role of private sector will be another key factor.

As far as the geothermal energy development is concern, it has been proven in many parts of the world that geothermal energy **is** a relatively clean energy, so, it is **a** favorable energy for future development.

Potential markets for bigger scale geothermal development **seems** to be in Java, Bali, Sumatra and Sulawesi where various industrial centers are located or on projection. Market are also available in other islands in East Indonesia, however, this **seems** likely to be more favorable for smaller scale developments.

For future development, it is expected that most

Table 2
Geothermal Development Plan For
REPELITA VI & REPELITA VII
(Mega Watt Cumulative)

EXECUTOR	FIELD	REPELITA VI				REPELITA VII					
		1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
I. PERTAMINA	KAMOJANG	140	140	195	195	195	195	195	195	195	195
	DIENG	2	2	22	42	42	42	42	42	42	42
	LAHENDONG	2.5	2.5	22.5	22.5	22.5	42.5	42.5	42.5	42.5	42.5
	SIBAYAK	-	-		-	20	20	20	20	20	20
	ULUBELU	-	-	-	-	20	20	40	40	60	80
	LUYUTBALAI	-	-	-	-	20	20	20	20	40	60
SUB TOTAL I		144.5	144.5	239.5	259.5	319.5	339.5	359.5	359.5	399.5	439.5
I JOC - PERTAMINA	O. SALAK	110	310	310	310	310	310	310	310	310	310
	DARAJAT	55	55	55	110	110	110	110	110	110	110
	SARULLA	-	-	-	-	110	110	220	220	330	330
	PATUHA	-	-	-	20	40	60	60	80	100	120
	WAYANG-WINDU	-	-	-	20	40	80	120	120	140	160
	KARAHA	-	-	-	-	55	55	55	110	110	165
	BALI	-	-	-	20	40	40	40	60	60	60
SUB TOTAL II		165	365	365	480	705	765	915	1010	1160	1275
TOTAL I + II		309.5	509.5	604.5	739.5	1024.5	1104.5	1274.5	1369.5	1559.5	1714.5

of the fields will be operated by private sector under JOC's with PERTAMINA in a total project scheme. The development plan for REPELITA VI and REPELITA VII can be seen in the Table 2. Until the year 2020 the development of a total cumulative installed capacity of about 4,000 MW is projected.

6. ACKNOWLEDGEMENTS

The author would like to acknowledge the Director General of Oil and Gas for the permission to publish this paper.

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