

STRATEGY FOR GEOTHERMAL ENERGY DEVELOPMENT IN INDONESIA FACING THE YEAR 2020

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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. To accelerate the development of geothermal energy, Government of Indonesia invites private companies participation through BOT or BOO concepts, up to now 11 JOC and ESC have been signed totally morethan 1000 Mwe. Since geothermal private development is new animals to Indonesia, a lot of constrains facing during the implementation. Discussion be made on experienced dealing with private involvement as Independent Power Producers (IPP) on geotehrmal business in Indonesia past, present and future concern.

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

INTRODUCTION

Indonesia archipelago composing 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 Philosophy "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. 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.

The paper dealing with government policy for geothermal 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 accelerate and intensify exploration and development
2. To set priorities for utilizing geothermal 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 resource : Coal

Third : the resource with lesser flexibility for export natural gas

Finally : Oil

Thereafter we hope further to diversify our energy supply by utilizing other sources such as peat, wind, solar, biomass, biogas.

3. 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.
4. Indexation of energy use, meaning the application of the best and most efficient form of energy for each particular requirement.

GEOHERMAL 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'll 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 complexity 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 Java.

Indonesia has the largest reserves of geothermal energy in the world, equivalent to minimum of 20.000 MW. This resource 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, more than any other country in the world. 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 its 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 investment. Fifth, geothermal energy is a valuable purely domestic renewable natural resource and environmentally attractive power source. 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 challenges ahead in the year 1995 through 2005, 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 country with the total potential of exceeding 20,000 MW. To put this potential in perspective, 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 geothermal 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 geothermal 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 geothermal 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 of Indonesia's next major economic expansion. The 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 geothermal power plant capacity installed in Indonesia. This is less than 1 % of its potential but in terms of electricity generation, provides 4 % of the primary energy consumed. Further development is underway. At Gunung Salak in West Java, geothermal steam will supply an addition 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 Huluhais in Bengkulu.

To accelerate the development of geothermal 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 concept of risk. If the Government secures financing for a project, the Government money must be used to pay back the loan, putting an added burden on the population. Private industry, however, is willing to assume these 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 investment. This incentive to quickly bring projects on line is a major consideration given the soaring demand for electricity in Indonesia today.

This necessity to accelerate power projects is prompting 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 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 earnings 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 attracted. Consequently, the government elected to alter its geothermal 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 altering the prospective responsibilities of the two stated owned companies. An adjustment in relation to regulatory aspects are completed and approved by the implementation of President Decree 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 II or 10 % of its potential, by the year 2020. This scenario based on 2450 MW could be developed in Sumatera, 2340 MW in Jawa-Bali and 210 MW in Eastern part of Indonesia (Sulawesi-Molucas, Nusantara). If this program could be implemented, 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 the end of this decade. In North Sumatra, development of just four prospects could yield an installed capacity of 1000 MW by the year 2003 (Sibayak & Sinabung, Sarulla, Sorik Merapi and Sibual-buali fields).

A more ambitious schedule could add as much as an additional 1000 MW from potential resources in southern part of Sumatra Ulubelu, Rajabasa, Lumutalai, Suoh Sekincau and from prospects in West Java (Tampomas, Banten) Central Java, (Telomoyo, Willis) 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, this 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 construction and 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 Government 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.

Furthermore, 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 electric 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 customer.
- 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 Plan. 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 Cooperative for Public Utility.

Indonesian foreign joint ventures signed contracts between PERTAMINA and PLN since late December 1994 to explore 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. Fifteen under Built, Operate, Transfer (BOT) and Built, Operate, Own (BOO) scheme.

PRIVATE SECTOR PARTICIPATION IN GEOTHERMAL DEVELOPMENT

Hereafter, major electric power development projects, including those of geothermal, 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 entities 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 which will be built in five locations in Java. Five Indonesian American joint ventures signed contracts between PERTAMINA and PLN in late December 1994 to explore 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.

The developer bears exploration risk and recovers operating costs after commercial production/operation begins. The developer provides the financial and technical capability to conduct geothermal operations.

The development of geothermal 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 be 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's services in the development of geothermal energy are reflected by the desire of the Government to create a positive economic climate for geothermal development in Indonesia. One of the government's efforts to deal with this issue is by conducting a pricing study for geothermal steam under a grant from the Asian Development 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 potential for 5 MW, so far implementation for this project are being planned.

Since 1989 PLN, under bilateral technical cooperation 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, Jan 1996 confirmation on funding for the construction of 3 MW will confirmed by World Bank. Up to 10 MW under consideration with the Australian assistance for further development.

Under the RE II, 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, Moluccas).

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 geothermal 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 geothermal 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 production 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 Darajat, 45 MW 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 1,000 MW capacity, Jawa-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 this figure. This is estimated about 74 MW, mostly in East Indonesia.

CONCLUSION

With regard to the government'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 fact more advanced than what has occurred in Philippines, as we know that Philippines is the first leading geothermal 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 this, 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 occurred in Indonesia before. The closed target which could be achieved by the government was to ensure that the geothermal electricity contribution to the electricity sector will reach 1000 MW by the year 2000.

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

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