GEOTHERMAL PROSPECTS IN INDONESIA : PROSPECT STATUS AND DEVELOPMENT OPPORTUNITY

A. Rachman, L.I. Lubis, M. Boedihardi, Suroto and A. Mulyono

PERTAMINA Geothermal Division, Indonesia

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ABSTRACT

Geothermal exploration surveys in Indonesia have been intensively carried out since 1974. Regional surveys are mostly done by VSI (Vulcanological Survey of Indonesia) while the detailed surveys are by PERTAMINA, the State Oil and Gas Company of Indonesia. The surveys have identified 217 geothermal prospects. 70 of which are classified as high enthalpy with estimated reservoir temperature of greater than 200 °C. 32 of the high enthalpy prospects can be further differentiated into their prospect status, 8 are developed and drilled prospects and 24 prospects are categorized as ready for exploration drilling.

Indonesia's electric power sector experiences rapid increase in electrical demand. PLN, the State Electricity Company plans to develop approximately 2600 MW every year, generated from all sources of energy other than oil. Indonesia has a countrywide geothermal potential of about 19.000 MW. The development of this source of energy is pan of the National energy diversification policy.

INTRODUCTION

Indonesia's electric power sector has been growing at a fast rate during the past two decades. The growth in electrical consumption is fuelled by rapid increase in industrial, household consumption and economic sector. Up to the present. the generation of electricity is mostly dependent on oil fuel. To meet this rapid increase of electricity demand and to reduce the dependency on oil fuel for electrical generation, the government of Indonesia plans to make more diversified energy use which is part of the National Energy Policy. In agreement with this energy diversificationpolicy, geothermal is a priority to develop. Under government regulations, PERTAMINA is responsible for developing geothermal energy in Indonesia. PERTAMINA may produce steam or generate electricity and sell them to PLN or other bodies. The project may include transmission line construction. Geothermal exploration surveys throughout the Indonesia region have identified 70 high enthalpy geothermal prospects giving a total resource potential of about 19,000 MW and only less than 2% of this potential has been electrically installed.

GEOTHERMAL PROSPECTS IN INDONESIA

Regional Geology

The Indonesian region is mostly situated in the area of three major plate margins of the Indo-Australian, Eurasian and Pacific plate. The interaction among these plate margins has led to the generation of volcanism and major faulting along the Indonesian archipelago. The combination of the volcanic island arc with shallow crustal magmatic heat sources and faultrelated zones of enhanced permeability has created suitable conditions for the Occurrence of vast geothermal prospects along the volcanic island arcs. The geothermal prospects are mostly characterized by vigorous surface thermal features such as major fumarolic areas. solfataras, hotsprings. turbid hotpools and hydrothermally altered ground associated with late Pleistocene to Recent andesitic volcanics and dacitic volcanic centres

Prospect Status

Scientific survey works in Indonesia focused in 70 areas give a reserve potential of approximately 9,000 MW or about 45% of the total estimated resource potential of about 19,000 MW (Figure I). Of this capacity only 309.5 MW are currently installed, produced from four developed field in Jawa and one in North Sulawesi. These fields are developed by PERTAMINA and the steam are sold to PLN. Two fields in West Jawa developed by Unocal Geothermal of Indonesia (UGI) and Amoseas Indonesia (AI) under a Joint Operating Contract (JOC) with PERTAMINA. In early 1993, Unocal North Sumatera Geothermal (UNSG) under JOC with PERTAMINA committed to develop 330 MW installed capacity. Other JOC's for four prospects in Jawa, i.e. Patuha, Karaha, Wayang Windu and Dieng were signed in December 1994 (Figure 2).

DEVELOPMENT OPPORTUNITY

The biggest geothermal potential in Indonesia is located in Jawa, Sumatera and Sulawesi islands. Since the fact that the islands have high geothermal potential and experience rapid increase of electrical demand, PERTAMINA is focusing its exploration and exploitation in these islands.

PLN requires to develop approximately 35,000 MW to meet the projected electrical demand in year 2003 in addition to the current installed capacity of about 11,000 MW (Arismunandar, 1992, quote from Sudarman, 1992). Therefore the average additional annual increase of 2,600 MW is required to be installed, developed from all sources of energy including geothermal. This additional capacity will be distributed mostly in Sumatera, Jawa-Bali and Sulawesi which show high electricity demand growth. The development is prioritized to be located in areas close to industrial centres and transmission lines (Figure 3). Since geothermal energy in these islands is very abundant and parallel with energy diversification policy in Indonesia, the development opportunity of this source of energy is high. In addition the government has issued new regulation concerning with geothermal development to make this energy competitive to other energy resources.

GOVERNMENT REGULATION

The government has issued Presidential Decree (Kep.Pres) No. 4511991 as an improvement to the Presidential Decree No. 2211981. Eased on this decree PERTAMINA is allowed to sell steam or electricity not only to PLN but also to other bodies. ie. government or private companies including cooperated bodies.

On the fiscal aspect, the government has also issued another Presidential Decree No. 49/1991 which reduces the net operating income tax from 46 % down to 34 % for any company which develops geothermal energy in Indonesia (upstream or total project).

DEVELOPMENT SCHEME

To accelerate geothermal development in Indonesia, the government invites private companies as contractors to cooperate with PERTAMINA in the exploration and production venture. Possible schemes that can be applied in geothermal energy development in Indonesia are as follow :

A. PERTAMINA or with its contractors develop, operate the steam field to produce geothermal steam that can be sold to PLN or other bodies which will generate electricity and distribute it to consumers.

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

The diagram of this concepts is shown in a flow chart in Figure 4.

Any parties or companies interested in development of geothermal energy in Indonesia is encouraged to participate under a joint operation with PERTAMINA. The term and condition of joint operation will follow the existing JOC, but there is possibilities to modify it by applying the JOA/JOB concept of oil and gas. To accelerate the development, a total project scheme which means a field development to produce electricity will be applied.

SCENARIO OF DEVELOPMENT

Geothermal development scenario in Indonesia is presented in Figure 5. PERTAMINA plans to develop 1,200 MW which is expected to be ready in year 2000 and this will be gradually increased to 5,000 MW in year 2020.

SUMMARY

Geothermal development business in Indonesia is very attractive since the countrywide potential is quite high and the growth of electricity demand runs at a fast rate. In addition, the development of geothermal energy is part of energy diversification policy and the government has issued new regulation to make this energy competitive to other energy resources. Based on these conditions, there is a big chance and opportunity for private companies to participate in geothermal development in Indonesia.

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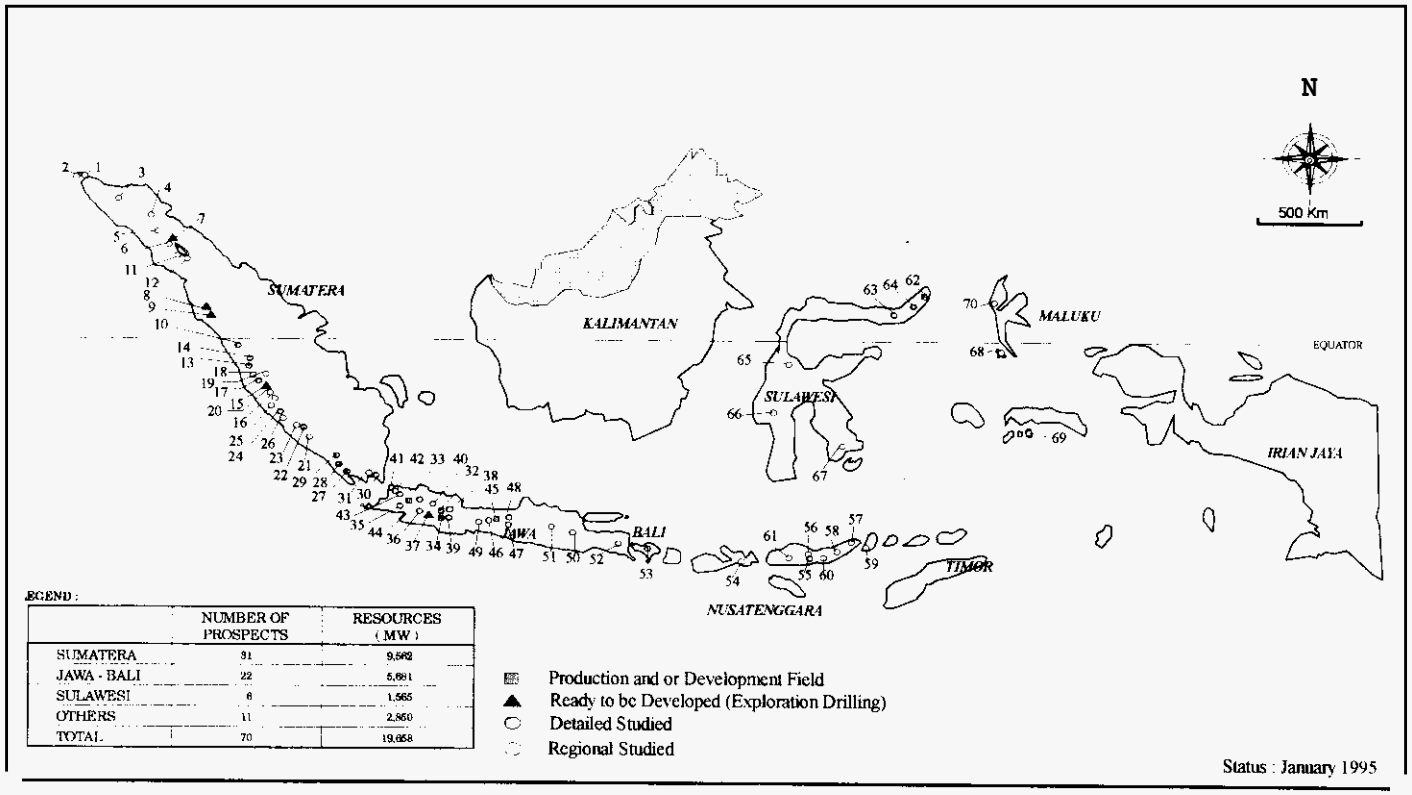


Figure 1 : INDONESIA GEOTHERMAL POTENTIAL RESOURCES AND PROSPECTS STATUS *MAP*

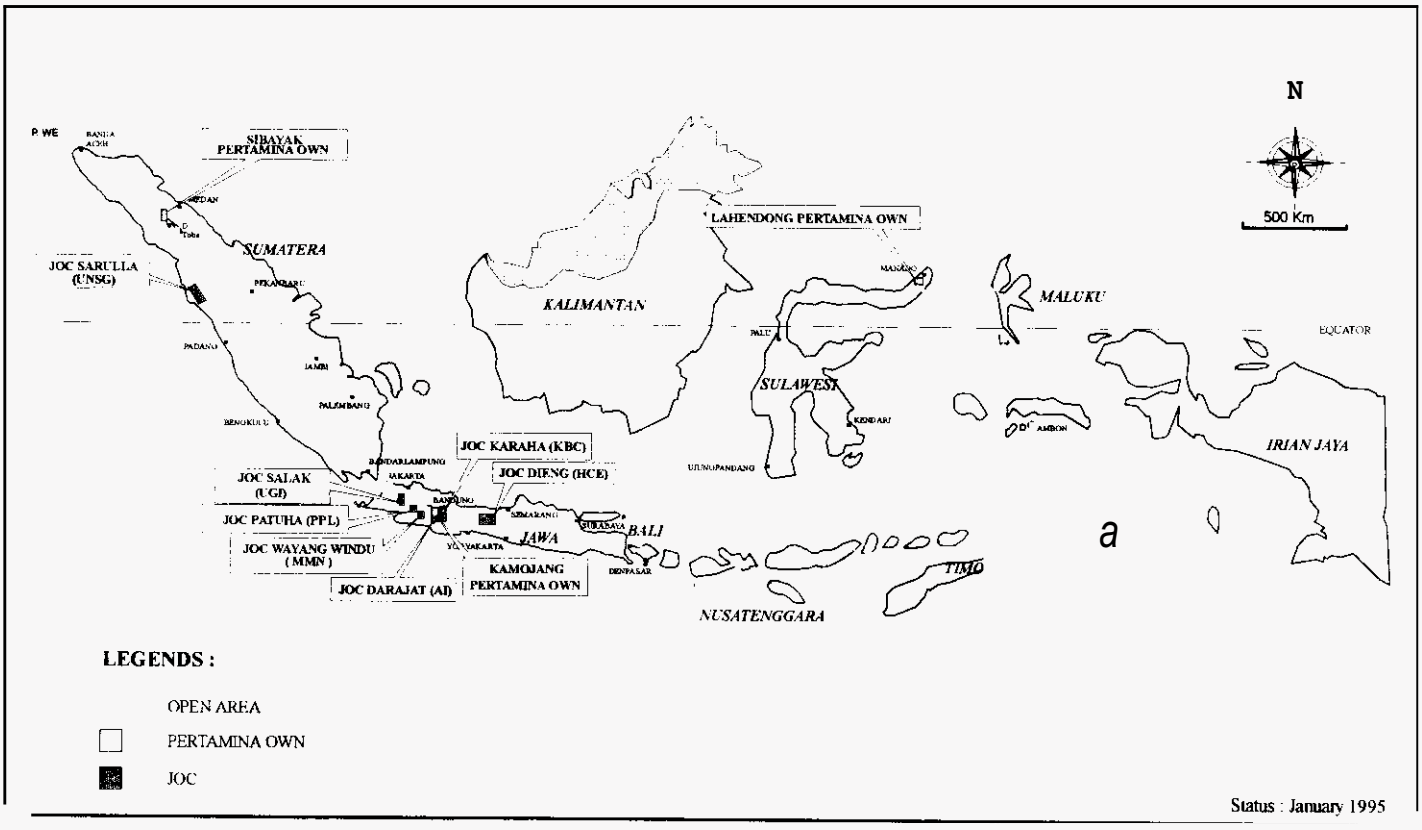
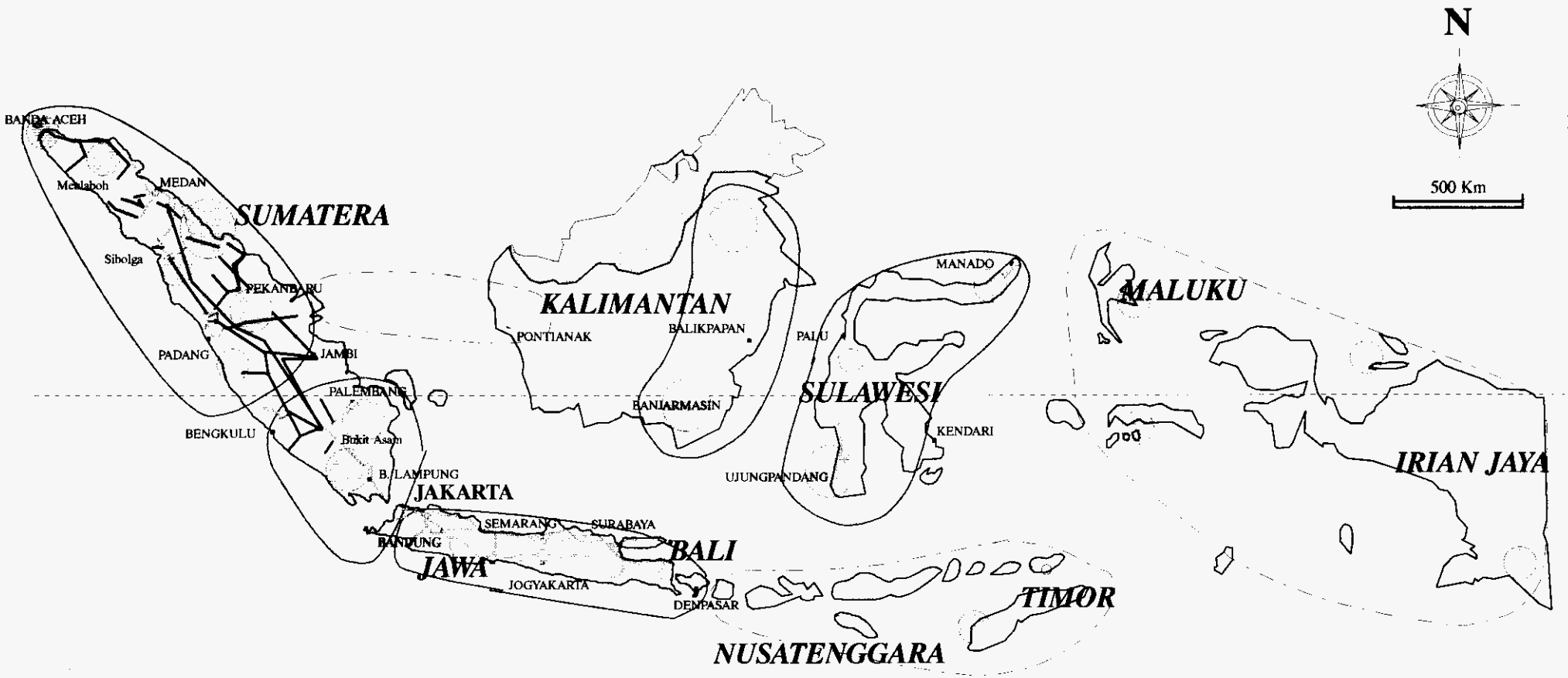


Figure 2 : INDONESIA GEOTHERMAL TO BE OFFERED PROSPECTS AND WORKING AREA *MAP*



LEGEND :

- Transmission line, 150/275/500 kV
- Transmission line, 150/275/500 kV (under construction)
- Transmission line, 2751500 kV (planning)
- Natural Resources Orientation
- Market Orientation
- Main Industrial Development **Area**
- Projected of the New Industrial Development **Area**

Source . Industrial Ministry of Indonesia 1992

Figure 3 : INDONESIA INDUSTRIAL CENTRE AND TRANSMISSION LINE MAP

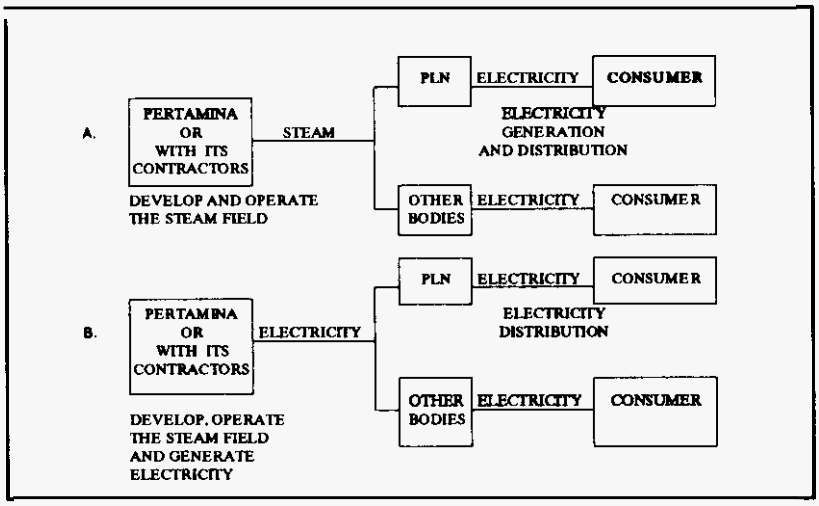


FIGURE 4 : POSSIBLE GEOTHERMAL DEVELOPMENT SCHEMES

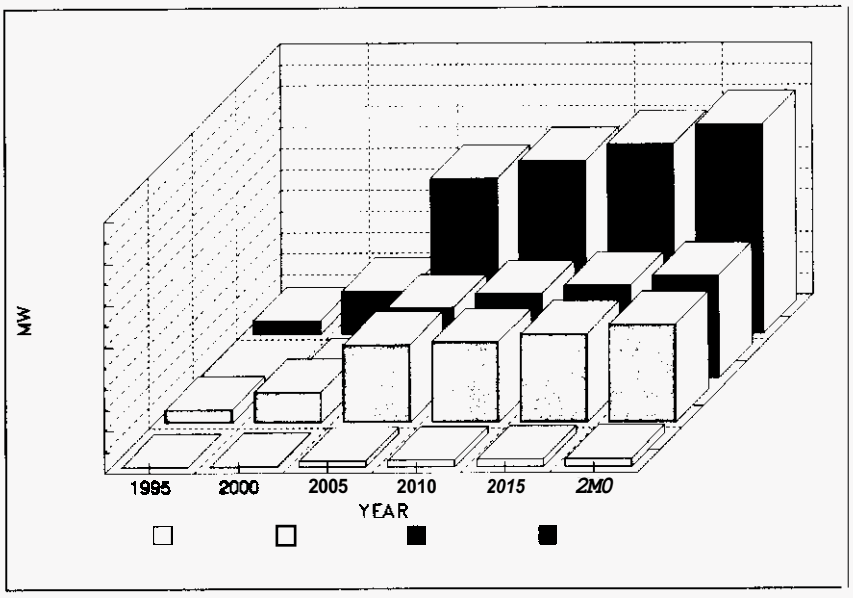


FIGURE - 5 : GEOTHERMAL DEVELOPMENT SCENARIO IN INDONESIA