The Progress of Geothermal Energy Resources Activities in Indonesia

Riki F. Ibrahim, Amir Fauzi, and Suryadarma

Indonesian Geothermal Association - INAGA

Gedung Indonesia Power, Jl. Jend. Gatot Subroto Kav. 18, Jakarta 12950, Indonesia

Keywords: Indonesia, Country Update

ABSTRACT

Indonesia comprises more than 200 volcanoes located along Sumatra, Java, Bali and the islands of eastern Indonesia, which is known as ‘The Ring of Fire’. This has given rise to large concentration of high temperature geothermal system. With the combined high and low enthalpy geothermal resources, the potential estimated by Directorate General of Geology and Mineral Resource is about 27,000 MW. In relations to the resource, the Government of Indonesia (GOI) is planning to utilize this big energy resource as a leading alternative energy to substitute fossils that may be fulfilling Indonesia’s growing demand for electric power during the 21st century.

PT Pertamina (Persero) reported that Indonesia is surrounded by 21 locations (2,795 MW) of prospective geothermal energy in which 10 locations (1,205 MW) planned to develop and operated by developers while 11 locations (1,590 MW) are still waiting for the new bidding. The current locations with total capacity of as a minimum 807 MW consists of Darajat (145 MW), Dieng (60 MW), Kamojang (140 MW), Gunung Salak (330 MW), Sibayak (2.0 MW), Lahendong (20 MW), and Wayang Windu (110 MW).

The severe economic crisis that started in late 1997 has adversely affected power sector demand and growth in Indonesia. This has resulted the failure of achieving targeted installed capacity of about 3000 MW by the year 2006. The degenerative situation is shaped by the inability of PLN to meet the decline of local currency by a factor of 5 relative to the US$ which influence even more to the electricity purchase contracts prepared by PT Pertamina and its joint operating partners. In addition, changes in the regulatory environment for the geothermal industry are the major issues affecting the future growth of the Indonesian geothermal industry.

For the purpose of energy recovery, GOI is setting a strategy to prepare Indonesia to become independent in meeting its energy requirement. In geothermal sector, GOI continues to encourage investors by offering confidence (GOI has gradually increased the national electricity tariff, and assessed a differential electricity tariff structure by region to support electricity infrastructure investment with regards to the needs of the region).

Following the establishment of the Policy on Geothermal, Indonesian Legislative Institution already issued the Law on Geothermal – UU No. 27/2003 - that focuses on the importance of geothermal energy utilization on top of the utilization of other renewable energy, and on the law protection towards the investor for the maximum use of Indonesian geothermal energy. In line with the new regulation, GOI is planning to have a total Geothermal Power Plant Installed Capacity of 6,000 MW by the year 2020.

In addition, National Electricity General Plan (Rencana Umum Ketenagalistrikan Nasional/ RUKN) assumed that up to 2006 geothermal power plant is expected to occupy the 3rd position on the Java-Bali power plant enhanced arrangement and, it is currently producing as a minimum 807 MW. Thus, the opportunity to develop geothermal power plant in Indonesia is still widely open.

Finally, in regard to investment substance GOI also expected to be able to maintain Indonesian country risk, to set up competitive basic electricity price, to determine market-demand currency rate, to arrange clear fiscal regulations, and to implement contract sanctity.

1. INTRODUCTION

Asosiasi Panas Bumi Indonesia (INAGA) in its English translation as Indonesian Geothermal Association or abbreviated to INAGA in an effort to anticipate this turbulent global competition has integrated work quality and management processes into its organization strategy. As a professional organization and government’s partner, INAGA continues focusing its long-term commitment and efforts to help making Indonesia’s energy policy with a strong foundation in the next millennium.

The mission becomes our focal point in the development of INAGA organizational strategies and programs. They are designed to support our national goals and realize important opportunities in three areas: enhancing energy security; strengthening economic competitiveness; and addressing concerns on environment.

Although Indonesia is one of a handful of countries to have developed geothermal energy, its development has proceeded very slowly and is currently facing difficult challenges. Over a span of 20 years, Indonesia has only developed at least 807 MW or about 4 percent of 20,000 MW of geothermal potential.

The early 1995s, the GOI did the awarding of eleven contracts for development of geothermal power plants, with a total committed REPELITA VI capacity (GOI’s five year plans) of 1,498 MW in original completion dates between 1998 and 2002 and a commitment contract capacity of 3,692MW. However, as a result of the 1997-1998 financial crisis, the Government suspended (postponed) twenty seven Independent Power Projects, including eleventh geothermal projects. As of May 2002, the government successfully resuscitated all geothermal contracts with one under legal dispute (Karaha Bodas, West Java).

Mid of 2004, Amoseas Indonesia Inc., a subsidiary of ChevronTexaco, signed a contract with state-owned oil company Pertamina and Indonesia’s national power company PT Perusahaan Listrik Negara (PLN), and local partner PT DGI to expand the geothermal power plant in Darajat, West Java. Expansion of the new power plant, called Darajat III, will bring a new investment of up to of around US$100 million to Indonesia. The plant will start up approximately
two years after construction is expected. The project will be completed by end of 2006. Once completed, the Darajat III will generate 100-110 MW of electricity, enough to supply electricity to approximately 1 million Indonesians.

This paper discusses the Indonesia geothermal status in the implementation of Power Sector Restructuring. In doing with the aim of processes, INAGA works together with government to disseminate its vision so that geothermal resources should become energy of choice in the expanding Indonesia energy market by virtue of its natural environmental benefits and its potential opportunities to add value in supports of Indonesia’s sustainable national development.

2. PRIMARY ENERGY AND RENEWABLE ENERGY CONSUMPTION

Geothermal energy has unique attributes which pose challenges to its development. The following factors are part of the reason for Indonesia’s lagging development of its geothermal resource:

- Exploration and resource commercialization is a costly process, and there is no market for the resource other than electricity. Therefore, the developer must have assurance of a future market and know the value of the electricity at the start of exploration. Contract provisions must be flexible enough to secure a market, yet not force the utility to take or have to pay for unneeded or unused power.
- Unlike other power projects, geothermal power projects must include the upstream cost of locating and verifying a resource. This upstream phase is similar to the discovery of an oil field or coal mine.
- Geothermal is site specific and must be converted into electricity in the vicinity where it is found. There is little use for geothermal energy in its original form.
- Development can be expedited with reduced business risk if growth takes place in relatively small increments, yet exploration and infrastructure costs can make the first increment of development prohibitively expensive. Therefore, contracts should be written for the production of the largest quantity of power possible for the given resource to spread exploration and infrastructure costs over a larger sales volume.

In this day and age, there is no genuine mechanism for considering geothermal long-term benefits such as low emissions or renewable nature. PT. PLN is the National Business Power Company, a government-owned private electricity sale and distribution to various consumers, considers geothermal as an option whose future development will depend on its competitiveness against other electricity generation.

The high risk cost of development, fossil subsidy, and the associated electricity tariff required remain core problems in Indonesia’s geothermal development. PLN as other private corporate, they have to survive and compete with other private sectors.

In the long run, Indonesia still presents as one of the world’s most attractive geothermal prospects but there is a need to look for new development approaches to maximize its potential. To date, U.S. companies that are operating in geothermal development projects in Indonesia are Unocal, Amoseas (a wholly owned subsidiary of ChevronTexaco). There have been other US companies involved for short-time including California Energy, Magma Power Co., Caithness and Florida Power & Light.

INAGA identifies the barriers to the growth of Indonesia geothermal industry:

- Competitiveness of Geothermal Energy Price;
- Continuing Subsidy of Fossil Fuel Price;
- Lack of Political Will to Intensify Geothermal Energy Utilization;
- Shortage of Competence Human Resources;
- Absence of Technology and Research & Development Supports;
- Lack of renewable incentives;
- Lack of Risk Appreciation and Mitigation Efforts;
- Absence of Integrated Energy Planning;
- Lack of Information and Publicity on Indonesia’ Geothermal Potency and Benefits; and
- Low Environmental Awareness.

Indonesia possesses a variety of energy resources. While a substantial portion of the country’s energy mix continues to rely on oil, PLN and businessmen are pushing for greater utilization of other primary sources of energy, particularly coal and “non-transportable” fuels, such as geothermal and natural gas. Geothermal and hydropower have also been considered the right answer to energy diversification needs and rising concern over environmental issues and declining non-renewable energy resources. The National Committee on Climate Change has recommended conversion from coal and petroleum-based fuels to the use of renewable energy sources to reduce emissions. The government has tried to promote development of renewable resources but with little success.

The government’s general policy for energy (KUBE) has clearly advocated diversification of energy sources, but no commitment to implement this policy has been forthcoming (due to the fact the KUBE is not a law enforcement). Statistics from the Ministry of Energy and Mineral resources (MEMR) indicate that renewable energy utilization (hydropower and geothermal) accounts for only about 3% of total reserves. The growth of electricity demand has not been enough to drive renewable energy development. Recently, the Government increased petroleum fuel prices, which have long diminished the viability of more environmentally friendly energy sources such as geothermal, to reduce its subsidy burden. This step may stimulate further utilization of alternative, including renewable, energy resources.

The Indonesian fossil energy reserve is very small when compared with world energy potential (in terms of natural oil, for example. Indonesia has only got ± 1% of the world energy potential, and in natural gas ± 3% from the world energy potential, and in coal, ± 3.6% of the world energy potential), see Table I.
Table I: Indonesian Energy Reserve

<table>
<thead>
<tr>
<th>Energy</th>
<th>Total Reserve</th>
<th>Proven Reserve</th>
<th>Production</th>
<th>Ratio of Reserve/Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Oil</td>
<td>10 billion barrels</td>
<td>5.0 billion barrels</td>
<td>0.5 billion barrels</td>
<td>10 years</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>165 TSCF</td>
<td>87 TSCF</td>
<td>2.9 TSCF</td>
<td>30 years</td>
</tr>
<tr>
<td>Coal</td>
<td>38 billion tons</td>
<td>6.5 billion tons</td>
<td>73 million tons</td>
<td>88 years</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy</th>
<th>Potential Reserve</th>
<th>Equivalent MW/GW</th>
<th>Utilization</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro</td>
<td>845 million boe</td>
<td>75.76 GW</td>
<td>6851 GWh</td>
<td>3854MW</td>
</tr>
<tr>
<td>Geothermal</td>
<td>219 million boe</td>
<td>19.66 GW</td>
<td>3558 GWh</td>
<td>807MW</td>
</tr>
<tr>
<td>Mini/</td>
<td>-</td>
<td>458.75MW</td>
<td>-</td>
<td>54MW</td>
</tr>
<tr>
<td>Macrhoydro</td>
<td>-</td>
<td>49.81 GW</td>
<td>-</td>
<td>302.4MW</td>
</tr>
<tr>
<td>Biomass</td>
<td>4.8kWh/Day</td>
<td>-</td>
<td>-</td>
<td>5MW</td>
</tr>
<tr>
<td>Diesel Oil</td>
<td>M2/Day</td>
<td>-</td>
<td>-</td>
<td>0.5MW</td>
</tr>
<tr>
<td>Wind</td>
<td>3-6M/Second</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: METI, January 2003, Renewable Energy Data

3. GEOTHERMAL OPERATORS

Indonesia currently utilizes at least 807 MW [Darajat (145 MW), Kamojang (140 MW), Gunung Salak (330 MW), Sibayak (2.0 MW), Lahendong (20 MW), and Wayang Windu (110 MW)] of geothermal energy from 797 MW of installed geothermal capacity. This number accounts for 2.2 percent of approximately 36,000 MW of total installed electric capacity, of which PLN generates about 21,000 MW, IPPs 1,600 MW, and captive power 13,519 MW. The average peaks of production can be about 837 MW required by Java-Bali system as shown in Table II.

Table II: Geothermal Power Plants (MW)

<table>
<thead>
<tr>
<th>Fields</th>
<th>Installed-PLN, MW</th>
<th>Installed-ESC, MW</th>
<th>Max-Generation, MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kamojang, West Java</td>
<td>140 (3 units)</td>
<td>-</td>
<td>140 (3 units)</td>
</tr>
<tr>
<td>Darajat, West Java</td>
<td>55 (1unit)</td>
<td>80 (1 unit)</td>
<td>145 (2 units)</td>
</tr>
<tr>
<td>Gunung Salak, West Java</td>
<td>165 (3 units)</td>
<td>165 (3 units)</td>
<td>360 (6 units)</td>
</tr>
<tr>
<td>Wayang Windsu, West Java</td>
<td>-</td>
<td>110 (1 unit)</td>
<td>110 (1 unit)</td>
</tr>
<tr>
<td>Dieng, Central Java</td>
<td>-</td>
<td>60 (1 unit)</td>
<td>60 (1 unit)</td>
</tr>
<tr>
<td>Sibayak, North Sumatra</td>
<td>2 (1 unit)</td>
<td>-</td>
<td>2 (1 unit)</td>
</tr>
<tr>
<td>Lahendong</td>
<td>20 (1 unit)</td>
<td>-</td>
<td>20 (1 unit)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>382</td>
<td>415</td>
<td>837</td>
</tr>
</tbody>
</table>

The 797 MW figure of installed geothermal power generation comprised 382 MW built by state utility company PLN and 415 MW by ESCs. With the operation of these plants, the country saves the equivalent of some 37,000 barrels/day of oil for 30 years. In 2000, Indonesia produced about 47.00 million tons of geothermal steam, which translates into about 5,800 GWh of electricity.

3.1. Direct Utilization

Indonesia began developing geothermal direct utilization (non-electricity) more than ten years ago. The most common and traditional use is for balneology, heated swimming pool and hot springs. Five years ago, a group of researchers in the government sponsored research and technology agency (BPPT) began to investigate methods to apply geothermal energy in the agricultural sector, particularly the use of geothermal energy to sterilize the growing medium used in mushroom cultivation. The concept is under research (no proved commercial yet) at the Kamojang geothermal field.

3.2. Field Development and Contractor Status

The early 1990s, PN-PLN signed 11 geothermal power sales contract with total capacity of 3,692 MW, but under PD No. 39/1997, only three have moved forward. The planned projects were previously expected to come on stream between 1998 and 2002. Eight of the contracts development was suspended after 1998’s economic crisis. They are being planned for future program in accordance with Presidential Decree No. 133 of 2000 through a process of negotiation. The projects are still difficult to move forward due to investment uncertainty as the country is facing economic turmoil.

3.2.1. Pertamina

Kamojang (140 MW): Pertamina started exploration activities in Kamojang in 1974 and installed a 250 KWh mini block geothermal power plant in 1978. PLN built on this initial success with the construction of Indonesia’s first commercial
geothermal electric power plant in late 1982 with a capacity of 30 MW. Units II and III (2x55 MW), the US$61 million World Bank financed project, commenced operation in 1987. The facility is at present supplied by 24 production wells. The size of the productive area is about 9.9 square km with an estimated electrical potential equal to 240 MW. In December 1994, Asia Power and PT. Latoka Trimas Bina Energy signed an IPP agreement with PLN to develop 2x30 MW in Kamojang field, West Java, with an investment of US$72 million. The project was postponed by PD No. 39/1997 and PD No.S.5/1998. Exploration activities identified resources sufficient to increase the existing plant by an additional 110 MW. PT Pertamina (Persero) plans to build a fourth geothermal plant with an output capacity of 60 MW which is enough to supply electricity to approximately 0.6 millions Indonesian.

Sibayak: Pertamina and PT. Dizamatra are developing Sibayak geothermal field in North Sumatra. Pertamina has invested US $3.0 million in drilling activity. The area is expected to supply steam for a 110 MW power plant. The field produces 2 MW plant of electricity since October 2000.

Lahendong: In May 1999, Pertamina signed a contract with PLN to supply steam to unit I (20 MW) geothermal power plant constructed by PLN. The two parties also agreed on a steam price of US$0.0695/kWh. The project commenced operational in August 2002, after waiting over one year for commercial operation. Pertamina expects to derive an annual income of Rp 22 billion from this project. Recently, PLN offered to cooperate with Pertamina in the development of unit II (2x20 MW) in anticipation of continuing electricity demand growth in North Sulawesi.

BPPT (research of technology agency) conducted Indonesia’s first disappointment binary cycle power plant in the area, with the assistance of a $5 million soft loan from France. The 2.5-MW plant is a pilot scheme to gather experience in the development of other small-scale geothermal power stations and is not succeed to continue operations due to poor plan.

3.2.3. Amoseas Indonesia Inc. (a wholly owned subsidiary of ChevronTexaco)

Darajat (Phase I): In December 1984 Amoseas signed a Joint Operation Contract (JOC) with Pertamina and an Energy Sales Contract (ESC) with PLN to develop geothermal energy within a 56,650 hectare area in Daradjat, West Java. Amoseas, which acts as the operator for the project, confirmed a resource sufficient to generate a 55-MW power plant and with potential for 145 MW. After investing US $55.2 million for the construction of 55-MW power plant, PLN started commercial operation in November 1994, with steam supplied by Amoseas. In 1995 Amoseas re-negotiated and amended the ESC that enabled the company to drill 17 more development wells.

Darajat (Phase II): In 1996, Amoseas signed a PPA with PLN for the construction of a 275 MW geothermal power plant with total investment of US $330 million. Amoseas completed unit I (80 MW Plant) in 1999, but the plant was suspended by the government in 1998. As a result of contract renegotiation, PLN and Amoseas reached a final long-term solution in April 2000, with price of electricity dropped to US $0.042/kWh from US$0.0695 in the original PPA. The two parties signed an amended agreement in July 2000 for commercial operation.

May 2004 — Amoseas Indonesia Inc., a subsidiary of ChevronTexaco, signed a contract with state-owned oil company Pertamina and Indonesia’s national power company PT Perusahaan Listrik Negara (PLN), and local partner PT DGI to expand the geothermal power plant in Daradjat, West Java.

Darajat III will supplement the two existing units, Darajat I and Darajat II, which at present have successfully generated up to 145 MW of clean electricity. Power generated from Darajat III will be sold to PLN which also buys power from Darajat I and Darajat II.

The Darajat Unit III plant will generate up to 100-110 MW of electricity.
3.2.4. Caithness and Florida Power & Light

Karaha Bodas: In December 1994, Karaha Bodas Company LLC signed a PPA with PLN for the construction of a 220-MW geothermal power plant in West Java, with 55 MW to be completed by 1998. Karaha Bodas Company LLC was a joint venture between Caithness (40.5%) and Florida Power & Light (40.5%), both of the US, and Tomen of Japan (9%) and a local company Sumarah Daya Sakti (10%).

KBC drilled about 22 wells and had an international arbitration claim against PT Pertamina on behalf of the Indonesian government for the postponement of its contract. Based on Presidential Decree No. 39/1997 and No. 5/1998, the project is one of the 27 projects that were postponed by the government because of the impact of the economic crisis. The Government unilaterally defaulted on its obligations under those contracts. Finally, by virtue of Presidential Decree No. 15/2002 (March 2002), after five years, the government agreed to resume the electric power plant projects. The impact is that the developer in the year 1998 sued PT Pertamina through the process of the International Arbitratory Body in Switzerland. As per mid-2004, the dispute with regard to their detriment has not been settled.

3.2.5. California Energy

Dieng (60MW-IPP): In December 1994, Himpurna California Energy Limited (HCE), a joint venture between PT Himpurna Enerindra Abadi (10 percent) and California Energy International of the US (90 percent), signed a contract to undertake Dieng geothermal project in Central Java. The contract was for a total power capacity of 150 MW, with total investment of US $192 million to be completed by 2001. The plant was planned as 4 units. Unit I, with a capacity of 55 MW, was certified for commercial operations in July 1998. All construction, exploration activities and operations for Unit II were suspended in 1998. From the 48 exploration and development wells, HCE identified the field’s potential as 350 MW. Currently, the project is operated by PT GeoDipa and produces about 60 MW.

Patuha: HCE also signed a total project contract for the development of Patuha geothermal field in West Java, with a total capacity of 220 MW. California Energy teamed with PT Enerindra Supra Abadi. Total investment was planned to reach $264 million. Unit 1 (55 MW) is under review status and units 2-3 and 4 were postponed in 1998. Original scheduled for completion was in 1999. The project is also operated by GeoDipa after HCE won on an international arbitration claim against the Indonesian government for the postponement of its contract. Within this regard, the Government does not refuse the claim made by OPIC (Overseas Independent Investment Corporation. The Indonesia’s government assigned both Dieng and Patuha to the PT GeoDipa for project continuance.

Bedugul: In November 1994, Bali Energy, a joint venture between California Energy and local company PT Pandan Wangi Sekartaji, signed a JOC with Pertamina and ESC with PLN for a 4x55 MW power plant. At present, the government has invited investors to continue the Bedugul geothermal energy project to meet the increasing electricity demand in Bali. The agreement under renegotiation with PLN finally reached the selling price settlement of 70% from the average electricity price in Bali.

3.2.6. Asia Power Ltd

Wayang Windu: In December 1994, Mandala Magma Nusantara BV signed a total project contract for the development of the Wayang Windhu geothermal field in West Java, with a total capacity of 440 MW. Mandala Magma Nusantara BV was a joint venture between the Indonesian companies Figears, Oko Satrya Mandala, and Magma Power Co. of the US. However, after the merger between California Energy and Magma Power Company, the contract principal party was changed to Asia Power Ltd of New Zealand. At the initial stage, the contractor was supposed to build a 220 MW plant at a cost of $264 million, later to be increased to 400 MW, with an estimated total investment of $800 million. The field at present has only 110 MW plant.

3.3. CDM Prospect

Indonesia, due to its attractive geothermal potential and geothermal expansion plans, has started to prepare for Clean Development Mechanism (CDM) implementation as promoted by Kyoto Protocol. The CDM has the potential to become a powerful incentive for geothermal projects compared to other renewable energy types. Indonesia has the potential to reduce greenhouse gas (GHG) emission about 17.1 million tons of carbon dioxide (tC) along the period 1995-2025 at a cost of about US $0.80-0.78/tC using hydropower power plants. On the other hand, geothermal power plant can potentially reduce GHG emissions by 100.9 million tC at a cost of US $0.439/tC. Geothermal energy has so far not been promoted actively as means to reduce greenhouse gas emissions. This is due to the absence of groups stressing the geothermal potential at international climate negotiations. Indonesia also hopes to participate in a strategy to sell Greenhouse Gas (GHG) emissions reduction via the Clean Development Mechanism (CDM) to reduce investment costs.

4. PRICING AND AUTONOMY

Investment in geothermal development faces substantial uncertainties and continuing challenges. The industry has identified high prices, high capital costs, mining risk, long payback periods for investment, financing mechanisms, a lack of market opportunities, insufficient law and regulation, and regional autonomy as major issues impeding geothermal development.

The pricing of steam is the main obstacle to the development of geothermal energy in Indonesia. The price needs to be competitive with other energy alternatives, and at the same time offer the contractor or producer an attractive rate of return. According to PLN, the cost of electricity produced by geothermal power plants varied between Rp $ 0.60 to Rp $ 1.50/kWh for PLN owned power plants, US$ 0.042/kWh for negotiated ESCs, and as high as US $0.085/kWh for original IPP terms.

IPP and ESC electricity prices have risen in ruiah terms as the ruiah depreciated. Contractual obligations are set in dollars, while the PLN’s ruiah selling price in early 2004 is already about Rp 750 (US $0.068)/KWh. The geothermal industry argues that the price could be more competitive if both up and downstream activities could be integrated, with VAT applied also to the electricity sales. A significant factor affecting geothermal price is the 34 percent tax rate applied to electricity sales. (A percent rate applied to the electricity produced by geothermal power plants. On the other hand, geothermal power plant can potentially reduce GHG emissions by 100.9 million tC at a cost of US $0.439/tC. Geothermal energy has so far not been promoted actively as means to reduce greenhouse gas emissions. This is due to the absence of groups stressing the geothermal potential at international climate negotiations. Indonesia also hopes to participate in a strategy to sell Greenhouse Gas (GHG) emissions reduction via the Clean Development Mechanism (CDM) to reduce investment costs.

PLN is currently negotiating to bring down tariff rates on various geothermal IPPs, with the intent of lowering prices from US 6-8 cents/kWh agreed under PPAs and ESCs to around US$ 5 cents/kWh.

Regional Autonomy

Ibrahim et al.
The concept of regional autonomy is still undefined and ambiguous. Investors, however, expect Regulation No. 22/1999 on Regional Autonomy to enhance prospects for development geothermal projects, since they can contribute to regional development. This is other high risk factors, unresolved decentralization issues and the potential implemented regulatory changes that are brought by a new Tax policy are able to be feasible major disincentives to the investor in geothermal projects. Once regional autonomy is fully implemented, geothermal is expected to offer a viable alternative supplying the energy needs of many of Indonesia’s remote areas and does not become disincentive. The autonomy law allows the regional government to exercise control over the development of electricity infrastructure.

5. DEVELOPMENT PROSPECTS
Indonesia will be facing shortage of power in the near future due to the fact the sector has not been able to make adequate developments/investments in the power supply capacity to meet its growing electricity demand of beyond 9 percent per year. The Indonesian Government also permits other agencies and private developers to undertake geothermal development on a small-scale basis (less than 30 MW) for power generation or other utilization, without a partnership with Pertamina. The Director General of Geology and Mineral Resources in the Ministry of Energy and Mineral Resources supervises this program.

In addition, Table III indicates that the Government has initial plans to develop geothermal power plants with 2,000 MW of capacity in 2008 and 3,442 MW in 2012. PLN is expected to invite investors for tender, with electricity prices fixed by PLN. By 2020, Indonesia is expected to install 6,000 MW of power plant.

Table III: Indonesia Geothermal Energy Potential *)

<table>
<thead>
<tr>
<th>Reserves</th>
<th>Sumatra</th>
<th>Java-Bali</th>
<th>Sulawesi</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proven Reserves</td>
<td>159</td>
<td>1,722</td>
<td>65</td>
<td>-</td>
<td>1,946</td>
</tr>
<tr>
<td>Probable Reserve</td>
<td>15</td>
<td>573</td>
<td>11</td>
<td>-</td>
<td>698</td>
</tr>
<tr>
<td>Possible Reserves</td>
<td>3,911</td>
<td>2,041</td>
<td>315</td>
<td>200</td>
<td>6,467</td>
</tr>
<tr>
<td>Hypothetical Resources</td>
<td>2,077</td>
<td>1,445</td>
<td>325</td>
<td>150</td>
<td>3,997</td>
</tr>
<tr>
<td>Speculative Resources</td>
<td>3,300</td>
<td>-</td>
<td>750</td>
<td>2,500</td>
<td>6,550</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>9,462</td>
<td>5,781</td>
<td>1,565</td>
<td>3,550</td>
<td>19,658</td>
</tr>
</tbody>
</table>

*) PT PERTAMINA (PERSERO)

Indonesia’s Geothermal Resource Potential
According to the Ministry of Energy and Mineral Resources (MEMR), the indicated resource base for geothermal energy total 20,000 MW (9 billion barrels of oil equivalent), of which about half (8000 MW) is located in Java and Bali, the most populous islands with the highest demand for electricity.

MEMR estimates that there are more than 255 geothermal locations in the country, including 84 in Sumatra, 76 in Java, 51 in Sulawesi, 21 in Nusa Tenggara, 3 in Irian Jaya, 15 in Maluku, and 5 in Kalimantan. Indonesia Geological Survey has been carried out on 255 locations, geophysical survey on 200 locations and geophysical survey on 45 locations.

Of the 255 prospects, Pertamina (the state oil and gas company) has drilled 100 wells in ten geothermal prospects -- PT PERTAMINA has identified 70 high-temperature geothermal prospects. Sixteen (16) exploration wells and fifty six (56) development wells drilled during 1989 to 2000 have confirmed a total proven reserve of 1,946 MW and a total probable and possible reserve of 7,165 MW.

6. CONCLUSION
As a result of the financial crisis (1997), the Government postponed and reassessed sixteen Independent Power Projects, including eleven ESC of geothermal projects. PLN continued to operate at a loss and the Government unilaterally stopped the project continuance through electricity price re-negotiation that was to find an alternative structure. The aim was to warrant continuation of the project. However, today is a difficult time to be a private power developer; investors have seen large losses in this industry; lenders are in workout mode, and Indonesia needs to:

- Offer a tempting opportunity (decent returns and low risk);
- Develop a clear process for private power;
- Educate (and sell) developers and lenders on this process;
- Provide a convincing story about investments in Indonesia.

No serious progress was happened within last 10 years except, the expansion of the new power plant, called Darajat III that brings in new investment of around US$100 million to Indonesia. Another project is Kamojang’s expansion of 60 megawatt plant but, as per mid of 2004 it is still being undertaken. Once completed, Darajat III and Kamojang IV will generate 110 MW and 60 MW of electricity, respectively, enough to supply electricity to approximately 1.6 million Indonesians.

Indonesia with high geothermal potential has a significant challenge to attract private power. INAGA as government’s partner for implementing the 6,000MW Road Map, proactively positions geothermal energy at competitive edge because of its renewable, environmentally sound, and economically attractive benefits to meet increasing demand of Indonesia’s energy market through the technology, business, and regulatory strategies.

7. REFERENCES

