1. Country and Sector Background

Indonesia has made a strong economic recovery from the 1997 financial crisis. Its gross domestic product (GDP) grew at an average of 4.8 percent per year from 2000 to 2006, and registered 5.6 and 5.5 percent growth rates in 2005 and 2006, respectively. The economy is projected to grow at 6 to 7 percent per year in the next few years. Primary energy consumption increased by 5.2 percent per year from 2000 to 2006, and electricity consumption grew by about 6 percent per year during the same period. The demand for electricity is expected to grow at 7 to 9 percent per year between 2007 and 2020.¹

Faced with rapidly growing electricity demand and the high cost of oil the Government of Indonesia (GoI) is pursuing a power generation expansion strategy that will boost the use of coal and natural gas while also scale up the utilization of the country’s large geothermal power potential. In fact, PLN, the state-owned national electricity utility, is carrying out a crash program of building 10,000 MW of coal-fired power plants by 2009. The increasing reliance on coal-fired power, currently seen as a low-cost alternative to quickly expand capacity, presents a challenge of dealing with the associated local and global environmental impacts. Geothermal power, on the other hand, can serve as a suitable base-load substitute for coal-fired capacity in many areas with significantly lower emissions of air pollutants and greenhouse gases. The GoI plans to achieve 6,000 MW of installed geothermal power capacity by 2020, up from about 970 MW in 2007. This ambitious plan will require strong government support to materialize. Any shortfall in the expansion of geothermal power generation capacity is most likely to be met by additional coal-fired power plants, resulting in additional local air pollution and greenhouse gas emissions.

¹ Economic and energy data in this section were drawn mainly from: World Bank country brief (www.worldbank.org/id), APEC Energy Overview 2006 (http://www.ieej.or.jp/aperc/energy_overview.html), and Indonesia and Climate Change: Current Status and Policies, PEACE, 2007 (www.worldbank.org/id).
Indonesia has the world’s largest geothermal power development potential, estimated to be about 27,000 MW. So far, around 253 geothermal fields have been identified, and 53 of which are ready for detailed exploration or exploitation. The 970 MW of installed capacity accounts for less than 4 percent of the identified potential. Most of the currently installed geothermal power capacity was the result of a GoI initiative in 1991 to develop about 4,500 MW of geothermal power under a Presidential Decree (PD45/1991). But development stalled in the aftermath of the Asian Financial Crisis. Geothermal contracts along with other power purchase agreements with private producers were suspended during the economic turmoil. They were subsequently either renegotiated or cancelled. Many of the existing investors who were already producing power eventually renegotiated their power purchase agreements at substantially lower tariff levels. Many others who had rights but were yet to develop their respective fields opted to transfer these assets back to public control, either as a result of arbitration proceedings or the cancellation of their contracts. Presently, there is nearly 1,000 MW of unexploited geothermal power potential under private control and over 3,000 MW with state-owned enterprises. About half of these resources are in geothermal fields which are currently producing electricity (brownfields) or with confirmed reserves (quasi-brownfields) and are well placed for further expansion.

The GoI has intensified its efforts to revive and scale up geothermal power development in the past few years. In 2003, the Geothermal Law (Law 27/2003) was promulgated, making geothermal the only renewable energy governed by its own law. The Law, among other things, mandated that future geothermal fields (fields which were not included under the PD45/1991, with a total potential of about 22,000 MW) must be transparently and competitively tendered for development. It also permitted operators of the fields previously allocated under the PD45/1991 to retain control. In 2004, the Ministry of Energy and Mineral Resources (MEMR) issued the “Blueprint for Geothermal Development in Indonesia,” which was intended as a roadmap to develop a total of 6,000 MW of geothermal power capacity by 2020. In 2005, the Directorate of Geothermal Enterprise Supervision and Groundwater Management were established by MEMR to strengthen sector management and support. In 2006, MEMR initiated the Master Plan Study for Geothermal Power Development in Indonesia funded by Japan International Cooperation Agency (JICA), further solidifying the knowledge and understanding about developing Indonesia’s geothermal resources. Despite these recent efforts, Indonesia still faces significant hurdles in attracting commercial financing and private investors to develop geothermal power. A number of issues have also constrained the state-owned enterprises to expand geothermal power capacity in fields under their control. The main barriers that deter investments in geothermal power expansion include the following:

*Lack of an adequate policy framework that incorporates the environmental benefits of geothermal energy and provides sufficient economic incentives for investing in the sector.*

Despite a flurry of government initiatives in the last four years two critical issues remain unaddressed: (i) the environmental benefit and the initially higher cost of developing geothermal power, compared with building coal-fired power plants, meaning that economic incentives for harnessing the benefit and bridging the cost gap are needed to promote investments in geothermal power; and (ii) the exploration risks associated with developing upstream geothermal resources, which, without proper mitigation mechanisms or compensation, often deter investments in the sector. The introduction of appropriate economic incentives is particularly important in the next five years or so for developing the brownfields that are already explored...
and geothermal resources confirmed, and remain under the control of either private operators or state-owned enterprises. In the longer term, the introduction of an effective risk mitigation mechanism will be important to address the uncertainty and the resulting costs associated with exploration of greenfields. These policy issues need to be addressed to effect future geothermal power project transactions.

*Lack of government planning and management capabilities to efficiently conduct transactions of geothermal power projects.* Presently, the government has relatively weak administrative and technical capabilities to conduct geothermal power transactions. The MEMR has limited capability to plan and identify suitable geothermal opportunities for development. This is partly evident in the inconsistency between the GoI geothermal blueprint and the power expansion plan by the state-owned power utility, PLN. Furthermore, there is very little experience within the MEMR in preparing and designing (structuring) investment transactions so that they can be made attractive (bankable) to potential investors. Therefore in order to move forward, MEMR will need to develop a credible process for transacting future greenfield geothermal sites in compliance with the Geothermal Law.

*Lack of domestic technical capabilities to support long-term growth in the sector.* The domestic capability is weak in almost all the major areas of geothermal development from resource identification to operation of geothermal power generation facilities. The level of domestic participation in all parts of the value chain of geothermal resource development is low, and project costs remain high as a result. There is no coordinated effort to develop the skills of domestic professionals in the sector, or efforts to reduce costs through technology transfer. Given Indonesia’s large share of world geothermal resources, the GoI is keen to support increased involvement of concerned domestic industries in the sector.

If Indonesia is to accelerate the development of geothermal resources and to achieve the goals set forth by the Blueprint, it will be necessary for the GoI to address these key interrelated barriers. It is estimated that some 10,000 MW of geothermal power capacity is economically viable when local and global environmental benefits are considered (see Annex 4). The economically viable geothermal resources are likely to grow as the resource assessment and exploration deepens. Yet a business-as-usual scenario suggests that Indonesia’s installed geothermal power capacity would only reach about 2,800 MW by 2020, compared with the GoI target of 6,000 MW. To improve the investment climate for greater development of geothermal resources in a sustainable manner, these barriers would need to be tackled through an integrated set of actions.

A two-pronged strategy to move forward will be necessary, with an immediate aim to mobilize expansion in fields that are already partially developed, while simultaneously undertaking appropriate reforms to sustain long-term development of the sector. Most existing developers will be looking for the GoI to address financial shortfalls involving commitments under the PD45/1991 and to help ensure cost recovery from new expansions. The development of the large number of unallocated fields would need sufficient economic incentives offered through a credible transaction process. Investors will also seek opportunities to reduce their upstream technical risks associated with developing unexplored geothermal fields. By undertaking such a reform strategy, the GoI hopes to exploit its large geothermal resource endowment and provide a viable alternative for replacing base-load power generation from fossil fuels.
2. Objectives
The development objective of the proposed project is to promote the expansion of economic and environmentally friendly geothermal power generation in Indonesia, and to reduce CO₂ emissions from the power system. The project will assist the GoI to prepare and implement its geothermal sector reform program designed to remove the key policy and institutional barriers which presently prevent greater development of geothermal resources, and will assist in the transaction of geothermal power investments. The principal outcomes will be an improved investment environment for geothermal power projects and enhanced government capacity to support sector growth, leading to increased market uptake of geothermal electricity. The key development indicator is the geothermal power generation capacity with secured financing resulting from the reforms and the transactions implemented through the project.

The global environment objective of the project is to promote on-grid electricity from geothermal sources, reducing the need for coal-based generation capacity, and avoiding associated greenhouse gas emissions. The outcome will be increased geothermal energy in electricity grids. The key global environment indicator is the amount of carbon dioxide emissions that will be avoided due to the utilization of geothermal power from investments that result from the reforms and transactions of the proposed project.

3. Rationale for Bank Involvement

The Bank is supporting the GoI with its infrastructure and energy sector reform efforts, and has been requested by the Ministry of Energy and Mineral Resources to assist with the proposed project. The proposed project would be an expansion of work already underway in the geothermal sector where the Bank has been advising the MEMR on its reform agenda. A recently commissioned study by the World Bank on identifying barriers that prevent greater levels of investments in geothermal is serving as input into designing the concept of the reform program. A subsequent study is also assisting MEMR enhance their understanding of pricing and transaction issues. Furthermore, the Bank is facilitating a carbon finance transaction of the Lahendong geothermal project in North Sulawesi, which will provide greater insights into addressing the challenges facing geothermal developers.

The Bank has a significant engagement in assisting the government to expand investments in the infrastructure sector through public-private partnerships, which would benefit geothermal power development. As a result, present work through the Private Participation in Infrastructure Technical Assistance Project, the Guarantee Framework, and the Infrastructure Facility, could be well placed to support the expansion of geothermal power. In fact, the transaction that is expected to be tendered through the proposed project would be consistent with the national agenda for developing model projects to serve as examples to be replicated in subsequent competitive tenders.

The Bank can also bring considerable international experience that would correspond with all aspects of the proposed project. In the Philippines, the world’s second largest geothermal producer, the Bank has financed geothermal investment projects which will provide insights into the development challenges and technical risks specifically associated with the sector. Several
investment funds being supported by the Bank and the GEF in Africa and Eastern Europe could provide lessons and experiences in investment risk management. Experiences in applying pricing and incentive policies to spur the development of renewable energy supplies in other countries could be useful for Indonesia to consider as they attempt to resolve their own pricing issues related to the development of geothermal power.

By undertaking a two-pronged strategy to catalyze immediate investments, while at the same time, reforming the sector for long-term development, Indonesia will be able to exploit its large geothermal resource endowment as a readily available alternative for replacing base-load power generation from fossil fuels. Greater utilization of geothermal resources for power generation will benefit Indonesia in a number of ways that include: (i) improved local and global environment; (ii) enhanced energy security by utilizing a non-tradable indigenous resource; and (iii) improved power generation mix as geothermal energy can serve as a hedge against the volatility of fossil-based commodity prices. Since Indonesia’s future base-load power expansion is primarily coal-based, any incremental development of geothermal power will displace an equivalent amount of coal-fired power.

4. Description

The proposed project is designed to address some of these key barriers in an integrated manner so that investments in geothermal can be mobilized quickly for fields that are ready to be developed while also including measures that will strengthen the long-term development prospects. The components that make up this integrated geothermal policy reform project are:


The project will aim to assist the GoI improve the present set of policies in order to enhance the investment climate for high quality geothermal development.

- **Policy to Address Incremental Costs:** This sub-component is designed to develop a pricing mechanism to provide adequate economic incentives for developing geothermal resources. It will also address any incremental costs that may be associated with some geothermal developments as a result of the market failure to incorporate the environmental externalities into investment decisions, which remains a key barrier to geothermal development.

- **Instrument for Upstream Risk Mitigation:** This sub-component is designed to create a mechanism for mitigating upstream resource development risks faced by geothermal developers in Indonesia. It is intended to limit investor’s exposure to uncertainty stemming from the potential power capacity in geothermal fields and the relatively higher upfront investment costs – both of which can be prohibitive for commercial financing of geothermal projects.

- **Support the implementation of the Geothermal Law:** This sub-component will review the Geothermal Law and the draft Implementation Rules and Regulations of the Geothermal Law as well as other related policies, identify gaps within the documents and potential hindrances to future geothermal power project investments, and recommend necessary changes and supplementary policies and regulations, in view of the coherence of the overall policy framework for geothermal power development in Indonesia.


**Component 2: Transactions to Mobilize Investments in the Geothermal Sector.** This component will assist the GoI, especially the MEMR, to develop the capacity for planning and transacting geothermal power developments in an efficient and transparent manner. The present lack of a credible mechanism for offering geothermal development opportunities is a key shortcoming to attracting investors.

- **Expanding development in fields that are already allocated to investors:** This sub-component is designed to catalyze investments by existing developers to expand geothermal power generation in fields under their control. It will help structure offers that would lead to the development of about 300 MW of new generation capacity in these geothermal fields (for estimated leveraged investment of about US$700 million).

- **Tendering unexplored and unallocated fields for development.** This sub-component will develop the procedures through which MEMR will offer new geothermal development opportunities to potential investors. This sub-component will financially engineer a selected project (50 MW installed capacity or greater in scale) to ensure that it is “bankable” and offer it through the transaction process in order to mobilize financing towards developing the investment (for a leveraged investment of about US$100 million).

**Component 3: Technical Capacity Building.** This component will address the limited domestic technical capacity for handling most geothermal related activities, and support the long-term development prospects of the sector.

- **Training to facilitate geothermal transactions.** This sub-component will train relevant staff in the central and local governments in preparing transactions, engaging investors, evaluating bids, and negotiating financial closings.

- **Awareness program for geothermal development.** This sub-component is designed to enhance the familiarity of various stakeholders with the implementation aspects of the Geothermal Law as well as the GoI geothermal power development targets and sector reform program.

- **Long-Term cost reduction options.** As a preparation for implementing a cost reduction program in geothermal related industries in Indonesia for enhanced domestic participation and competitiveness, the project will support an industrial analysis that will be conducted to identify key areas where local industries maintain a comparative advantage, and develop a sector strategy to strengthen their roles and participation in the geothermal power development industry.

5. **Financing**

<table>
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<td>Global Environment Facility (GEF)</td>
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<td><strong>Total</strong></td>
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6. **Implementation**
The proposed project will be implemented by the Ministry of Energy and Mineral Resources through its Directorate General of Mineral, Coal and Geothermal (DGMCG). The MEMR is uniquely positioned to implement the proposed project for it is the sole national agency responsible for policy formulation and regulation of both the power sector and the geothermal sector. The Directorate of Geothermal Enterprise Supervision and Ground Water Management (DGESGWM) under the DGMCG will be the executive implementation unit.

A Stakeholder Advisory Group will be established by DGESGWM to review and comment on key project outputs, including intermediate results, and help enhance the focus and effectiveness of the policy recommendations. The advisory group will meet twice a year or depending on work progress.

7. Sustainability

The GoI has intensified its support to geothermal power development in recent years by (i) shoring up the legal basis through the Geothermal Law; (ii) increasing institutional capacity through the establishment of a dedicated government branch; and (iii) consolidating knowledge and information on sector potential through an extensive and in-depth assessment of geothermal resources. The GoI is moving toward the next and critical step of mobilizing investments and has requested the Bank’s assistance to enhance the policy framework with specific issues to address, including development and introduction of economic incentive and risk mitigation instruments with associated financing mechanisms and regulatory assurances, as well as implementation of investment transactions for immediate expansion of generation in partially developed fields and for competitive tendering of unexplored fields. These results-driven activities are expected to significantly increase geothermal power generation in the near term while also establishing the essential building blocks for sustained growth in the sector.

8. Lessons Learned from Past Operations in the Country/Sector

A universal lesson for developing renewable energy resources is that they need strong government policy support to gain a foothold in the fossil fuel dominated energy markets, and that aspiring government goals for renewable energy development need concrete and clear regulatory provisions and/or economic incentives to materialize. Broadly speaking the key lessons for developing on-grid renewable energy are:²

- Mandatory market uptake requirements are effective policies to support scaling up of on-grid renewable energy supplies. These regulations may be in the forms of mandatory purchase of renewable-energy-based power at a fixed price, such as the electricity feed-in law in Germany, or renewable energy portfolio standards (RPS) introduced in the US.

- Two-key forms of support go hand-in-hand in helping develop a market for on-grid renewable energy supplies: creating a favorable investment climate for private power projects, and establishing a transparent and stable regulatory framework for independent power production. In many countries, utility regulatory frameworks that allow fair competition for electricity

generation by independent power producers, including power purchase agreement and a transparent and stable tariff setting regime, are an essential first step towards creating private markets for renewable energy. In addition, rules and institutions for bidding and transacting power purchases are also essential elements of a power market.

- In view of encouraging economically viable development of renewable energy sources (capturing their environment benefits), policy frameworks must address the question of how the additional cost of renewable-energy-based power (relative to conventional sources) can be covered — and especially the questions of who will pay this additional cost and what policy/institutional mechanism allow the additional cost to be collected.

- Market development takes time and that a large and growing domestic industry is required to work out regulatory, contractual, technical, and operational challenges of on-grid renewable energy. This means that GEF assistance must focus explicitly on the medium and short-term outcomes which ensure that sustainable regulatory mechanisms, policies, financing, and adequate skills and manpower are developed. One of the key focuses of GEF assistance would be the development of frameworks for independent power producers, formulation of model power-purchase agreements, feed-in tariff schemes, and simplified procedures for access to the grid.

Geothermal power development involves substantial risks and upfront investments to confirm the reliability of the energy source and the capacity for power generation. Mitigation of the financial risk associated with the upstream steam field development is a major hurdle for geothermal investors. Various mitigation measures have been used internationally to share the risk of upstream geothermal exploration, and the main methods have included: (i) *Exploratory drilling cost-sharing*. During 1979 and 1980 the United States Department of Energy (DOE) used federal funds to share the risk of exploratory drilling (with industry) in 15 prospect areas of Utah and Nevada. A similar approach is now used by the US DOE through the Geothermal Resource Exploration and Definition Program. (ii) *Government-sponsored exploration*. The Philippines National Oil Company (PNOC) undertook upstream exploration through a service contract with the national government. Similar government-sponsored exploration programs also exist in Iceland and New Zealand. (iii) *Partial risk guarantee fund*. In countries in the African Rift Valley, a guarantee is provided to cover the exploratory risk and appraisal drilling at the early stages of resource exploration as well as during the advanced stage of production drilling. A combination of subsidies and insurance is provided to cover exploration risks while the prospect of a fully unsuccessful well is covered through insurance. These and other international experience will be drawn upon towards developing a policy that is applicable in Indonesia.

9. Safeguard Policies (including public consultation)

<table>
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<tr>
<td>Involuntary Resettlement (OP/BP 4.12)</td>
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</table>
Indonesia’s future expansion of base-load power is predominantly expected to be coal-based, and any incremental development of geothermal power resulting from the project will displace an equivalent amount of power produced from coal. It is initially estimated that a business-as-usual approach is only likely to result in about 2,800 MW of the GoI target of 6,000 MW by 2020 set in the Geothermal Blueprint. With the implementation of the proposed reforms, GoI can quickly mobilize some of the fields that are already partially developed and are not hindered by other obstacles. This could enable financial closure within the duration of the project of as much as 500 MW of incremental capacity and develop them in a relatively short period of time. Over the longer-term the reforms supported through the project will enable further expansion in these fields while also promoting the development of greenfield areas that are unexplored. With the help of the proposed project, the GoI will be able to get their geothermal development program back on track towards achieving their target. Over the long-term, this would result in an incremental capacity of 3,200 MW by 2020, which would result in the reduction of about 7.0 million tons of CO$_2$ per year. The project will also facilitate compliance by geothermal power investors with Indonesian environmental assessment regulations, and for investors who are interested in securing international financing, suggest measures that would be consistent with international good practice.

The proposed project will not have a direct environmental impact as it will not finance geothermal investments. Therefore, the project is classified as environmental assessment Category C, where an environmental assessment is not required. Instead, the project seeks to assist geothermal developers, who will bid on transactions that are competitively tendered under Component 2, in complying with safeguards requirements in Indonesia.

GOI’s AMDAL (environmental and social assessment) requirements are generally adequate for the energy sector, but it is their implementation that can often fall short of the standard desired by the Ministry of Environment. As a part of the transaction component, the project will seek to improve the application of the existing environmental and social regulations in Indonesia. A Guidance Document on environmental and social aspects of geothermal development will be developed and included in the bid package.

The Guidance Document will include:

(a) Guidelines, timelines and models for compliance with GOI environmental and social requirements; and

(b) Suggestions based on international good practice to enhance the “bankability” of potential projects for investors intending to make proposed projects suitable for international financiers.

*By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas*
Disclosure of the ISDS and PID will be adequate to inform interested stakeholders of the safeguards arrangements for the project. Consultation will become important when the guidance document is drafted. MEMR will arrange for consultations on the drafts with stakeholders that will include MOE, environmental NGOs, industry representatives, a sample of sub-national environmental and development planning agencies (drawing from areas where geothermal power development is most likely), and interested bilateral and multilateral development agencies. The completed guidance document will be made available to the public in Indonesia and in the Bank’s InfoShop.

10. List of Factual Technical Documents
None

11. Contact point

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