

**PROJECT INFORMATION DOCUMENT (PID)
APPRAISAL STAGE**

Report No.: AB5963

Project Name	Geothermal Clean Energy Investment Project
Region	EAST ASIA AND PACIFIC
Country	Indonesia
Sector	Renewable energy (50%); Power (50%)
Lending Instrument	Specific Investment Loan
Project ID	P113078
Borrower(s)	Republic of Indonesia
Implementing Agency	PT. Pertamina Geothermal Energy (PGE) Menara Cakrawala Lantai, 15th Floor Jl. MH Thamrin No.9, Indonesia. 10340 Tel: (62-21) 3983-3222 Fax: (62-21) 3983-3230 info@pgeindonesia.com
Environmental Screening Category	<input checked="" type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> FI
Date PID Prepared	March 29, 2011
Estimated Date of Appraisal Completion	March 31, 2011
Estimated Date of Board Approval	May 26, 2011

I. Country Context

1. The Indonesian economy continues to experience robust growth over a decade following the Asian Financial Crises. Since 2003, the real gross domestic product (GDP) has expanded at a rate of 5 to 6 percent annually, reaching 6.1 percent in 2008. Even during the global economic downturn in 2009, the Indonesian economy grew at 4.2 percent - one of the highest growth rates in the region. A series of macroeconomic reforms have also strengthened Indonesia's fiscal situation, which has enabled the Government to invest in priority sectors including infrastructure.

II. Sectoral and Institutional Context

2. Indonesia's power sector has struggled to keep up with the high electricity demand that has accompanied economic growth. An initial surplus of power generation capacity immediately following the Asian Financial Crisis eventually gave way to shortages as PT. Perusahaan Listrik Negara (PLN), the national power company, struggled to mobilize investments. PLN's financial position, which had already weakened due to the crisis, further deteriorated as a result of the dramatic increase in oil prices on the international market from 2002 to 2008. The national power company not only struggled to invest, but required growing government subsidies to keep operating a system highly dependent on petroleum products in order to meet its public service obligation. Private sector investment came to a halt under the

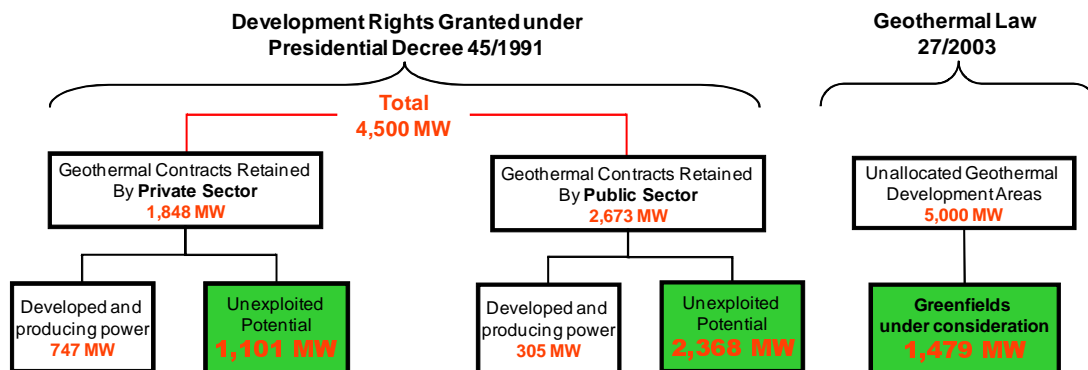
combined effect of capital flight from emerging markets, and the institutional turmoil that followed the repeal of the 2002 Electricity Law by the Constitutional Court in Indonesia. Supply barely managed to keep up with increasing demand; brownouts and load shedding impacted economic growth and affected even ordinary consumers.

3. The Government of Indonesia (GoI) is responding to the capacity shortfall by assisting PLN in scaling-up its investments in power generation. In 2006, PLN, backed by government sovereign guarantees and bilateral cooperation, began to implement a *Fast-Track Program* designed to rapidly develop 10,000 MW of power generation capacity. These new power plants, located throughout the country, would utilize Indonesia's abundant, readily available, and relatively inexpensive, coal resources. It would displace high cost oil-fired generation units, increase supply at an affordable price to the economy and households, and reduce the impact of PLN's Public Service Obligation (PSO subsidy) on the state budget. This first *Fast-Track Program* is well under implementation.
4. The 10,000 MW coal-based *Fast-Track Program* also poses significant challenges. It will exacerbate local and global environmental impacts and increase Indonesia's dependence on fossil fuels for power generation. Over eighty percent of the electricity generation in Indonesia is presently based on fossil fuels, with estimated annual emissions of over 108 million tonnes of CO₂, 1.9 million tonnes of SO₂, 1.1 million tonnes of NO_x, and 0.1 million tonnes of total suspended particulates (TSP). Environmental conditions will further deteriorate when the additional 10,000 MW of coal-based capacity is fully commissioned.
5. To ensure a more environmentally sustainable development of the sector, the GoI launched a second 10,000 MW *Fast-Track Program* in late 2008 that is predominantly made up of renewable energy, with geothermal making up forty percent of the target. The expected outcome is a substantial increase in renewable energy displacing alternate investments in coal-based power production. This investment in renewable energy will reduce the carbon footprint of the power sector and substantially reduce local environmental impacts. However, these benefits would come at sizable incremental costs; and could undermine the affordability objective and/or add to the already high PSO subsidy.
6. Geothermal power is one of the best options to diversify Indonesia's energy mix. It is a base load generation technology not subject to the intermittency and variability associated with most renewable electricity sources. Geothermal resources in Indonesia are also ideally located on islands with major population centers where electricity demand is high and continues to grow. Furthermore, as an indigenous and non-tradable energy source, it will also enhance the country's energy security and serve as a natural hedge against the volatility of fossil-fuel prices.
7. Indonesia's geothermal power potential is estimated at 27,000 MW, roughly 40 percent of the world's resources. Despite this potential, less than 4 percent of the total geothermal resources in Indonesia are currently developed to produce power. GoI has set a target of developing 9,500 MW by 2020, with nearly 4,000 MW of this target included in the second *Fast-Track Program* to come on-line by 2015. However, estimates suggest that only about a

third of this total is likely to be developed under a business-as-usual scenario¹ despite the fact that a large number of projects have been estimated to be economically justified when local and global environmental externalities are considered².

8. The GoI has long recognized the potential for geothermal to serve as a significant power generation source. A major effort began in the 1990's to target the development of 4,500 MW of power generation capacity. As a part of this effort, GoI issued a Presidential Decree in 1991³ allocating development rights in 18 geothermal working areas to public and private developers. However, beginning in 1997, the Asian Financial Crisis effectively stalled expansion of the program with the country having only reached 807 MW of installed capacity. Very little new geothermal capacity has been added since. At present, installed capacity is approximately 1,050 MW. Of this amount, approximately 750 MW of geothermal capacity is privately operated with another 1,000 MW of unexploited potential under the control of existing private developers. Several state-owned enterprises operate another 300 MW of generation capacity, although the fields they control could support substantially more – about 2,350 MW of generation capacity. In consideration of these conditions, the public sector is expected to play a key role in catalyzing the second *Fast-Track Program*; and immediately scale-up the majority of the considerable geothermal resources under its control. The remaining geothermal fields are to be competitively tendered for development. Figure 1 below illustrates the geothermal concessions currently under private and public control, as well as the potential development rights that are to be tendered.

Figure 1: Allocation of Geothermal Resources Prospects in Indonesia



9. In 2003, the GoI resumed efforts to revive the sector, and issued a geothermal law (Law 27/2003), making geothermal the only renewable energy governed by its own law. The Law, among other things, shifted regulatory authority of the sector from what was previously delegated to the national oil company back to the GoI (Ministry of Energy and Mineral Resources - MEMR); mandated that geothermal fields that are not allocated under Presidential Decree No. 45/1991 be transparently and competitively tendered for development; and, to be consistent with the decentralization law, enhanced the role of local

¹ World Bank, May 2008, Indonesia Geothermal Power Generation Development Project – Project Appraisal Document.

² It is important to distinguish that although avoidance of local pollution directly benefits Indonesians, the benefits of avoided GHG emissions extend beyond a single country and positively impact the entire world.

³ Presidential Decree No. 45/1991.

governments in developing the geothermal resources within their respective jurisdictions. In order to better handle its increased oversight responsibilities for sector development, MEMR established a dedicated directorate for geothermal⁴. The directorate has led the way in revising the sector *Master Plan*, establishing the geothermal development targets and selecting the projects to be included in the second *Fast-Track Program*. If the 4,000 MW target in the second *Fast-Track Program* is achieved, then the avoided annual emission from displaced coal-fired power plants would amount to an estimated 29 million tonnes of CO₂, 144,000 tonnes of SO₂, 80,000 tonnes of NO_x, and 68,000 tonnes of TSP.

10. Despite the GoI's ambitious geothermal development program and recent reform initiatives, the present capacity of 1,052 MW is significantly below the 2,700 MW target established for 2010 in the *Geothermal Road Map* issued by MEMR. In general, Indonesia has had difficulty in mobilizing financing even for conventional power generation options such as coal, given the challenging investment climate both globally and within the country. Despite being regarded as a commercially viable renewable energy technology, geothermal power development in Indonesia faces a number of significant sector specific issues that are deterring investments. These barriers include: (a) momentous investment needs that are estimated to be as much as \$10-\$12 billion for the second *Fast-Track Program* alone, (b) insufficient policy and regulatory support for implementation of the Geothermal Law, (c) inadequate incentives and pricing mechanisms that fail to both reflect the environmental benefits of the technology and enable investors to secure a return commensurate with the higher risks they face especially when developing unexplored (green) geothermal fields, (d) limited institutional capability to properly plan geothermal development and sufficiently engage suitable developers, and (e) weak domestic capacity in the areas of resource assessment, equipment manufacturing, construction, and operation and maintenance of geothermal energy facilities. Consequently, only a handful of existing geothermal operations (brownfields) in Indonesia have expanded production over the past decade while no new greenfield projects that carry greater risks have been developed.
11. Despite these challenges, geothermal development remains a key development priority for the GoI, and is a vital part its *Low Carbon Growth Strategy* for Indonesia. In order to move forward with sector reforms and mobilize investments, the GoI has requested assistance from international and bilateral organizations, including the World Bank Group (WBG). The WBG has responded by developing a strategy, as summarized in Table 1, under which both the International Bank for Reconstruction and Development (IBRD) and the International Finance Corporation (IFC) would coordinate efforts to bring their respective comparative advantages to support geothermal development in Indonesia. The WBG strategy calls for a two-pronged approach. First and foremost, the WBG is assisting the GoI with the major reforms that are being undertaken to progressively enhance the investment climate in the sector. At the same time, the WBG is also helping to immediately stimulate investments that are at an advanced stage of preparation by directly supporting both public and private developers.

Table 1 – WBG joint strategy for geothermal development in Indonesia

⁴ As of 2010, the Geothermal Directorate is under a dedicated Director General for Renewable Energy.

Policy Reforms to enhance investment climate for geothermal development
<ul style="list-style-type: none"> • Supporting the GoI effort to create sufficient policies and incentives to mobilize investments in geothermal development
<ul style="list-style-type: none"> • Helping GoI better prepare and manage the process of offering (tendering) geothermal concessions to developers, in line with the Geothermal Law
<ul style="list-style-type: none"> • Improving domestic capabilities to manage sector development and to undertake investments
<ul style="list-style-type: none"> • Extending long-term carbon funds towards geothermal development in order to enhance the financial viability of investments
Direct support to immediately stimulate investment and scale-up development
<ul style="list-style-type: none"> • Assisting public and private developers with existing concessions to expand development
<ul style="list-style-type: none"> • Helping reduce the cost of geothermal development and filling financing gaps by extending attractive financing terms as well as mobilizing grant support
<ul style="list-style-type: none"> • Cost sharing of exploration risks associated with geothermal power development especially with undeveloped fields (greenfields)
<ul style="list-style-type: none"> • Improving the capabilities of developers to immediately undertake the development of their geothermal fields

12. The GoI is in the process of developing a set of policy and institutional reforms to address critical barriers and mobilize investments in the geothermal sector. The World Bank's *Geothermal Power Generation Development Project*⁵ is intended to support MEMR design, develop consensus among GoI stakeholders, and implement several key reform measures. More specifically, the project is assisting MEMR develop a pricing and compensation policy, mitigate geothermal resource risks, and strengthen domestic capabilities in the sector, in particular to competitively tender new transactions. Key among these activities is the pricing and compensation policy that is necessary to address geothermal electricity's higher financial cost than coal-based power when environmental and other benefits are not internalized; so that developers can secure a return commensurate with the costs and associated risks. International experience suggests that such a policy should include provisions to mandate electricity off-take from geothermal generators, a simple and efficient price setting approach, and a mechanism to compensate either the off-taker or the developer for the associated incremental costs.

13. Attempts thus far to develop a comprehensive pricing and compensation mechanism have been done through a piecemeal approach by the GoI, and have had little success. Some progress has been made, including recognition by the Government that the environmental benefits of geothermal are not reflected in the financial prices; and that generators should be paid a (premium) price internalizing these benefits. However, the latest pricing decree⁶ does not provide a clear directive to pay a premium to compensate developers, and instead establishes a ceiling price of 9.7 US cents/kWh. As a result, developers must rely on long, drawn out negotiations to reach agreement on a power purchase price with PLN, which undermines efforts to scale-up geothermal development. PLN, which is already under pressure to reduce its costs, is reluctant to off-take more expensive electricity without clear direction from GoI as to the mechanism through which they will be compensated for the associated incremental cost. Through the support of the *Geothermal Power Generation*

⁵ Sector reform project funded by a \$4 million Global Environment Facility (GEF) grant that is currently under implementation.

⁶ Ministerial Decree No. 32 of 2009.

Development Project, the GoI has now mobilized international consultants to help them refine the existing policy framework and develop an adequate and comprehensive pricing and compensation mechanism. These efforts are also supported through the series of *Climate Change Development Policy Loans*, collectively provided by the World Bank, Japanese International Cooperation Agency (JICA), and Agence Française de Développement (AfD). However, it will take some time to develop consensus, design the mechanism, identify the resources, and implement the recommended policies.

14. The World Bank is also assisting GoI with additional geothermal related reforms and activities. For example, international experts were mobilized to help identify geothermal resource risks and mitigation options⁷, to assist GoI efforts. The World Bank also helped the GoI host geothermal developers and investors from around the world at the 2010 *World Geothermal Congress*. After facilitating the sale of carbon emission credits in support of the *Lahendong II Geothermal project*, the World Bank is now helping the GoI prepare a *Carbon Finance Framework for Geothermal* that could be an important complement to the design of the pricing and compensation policy currently underway. To transparently allocate new geothermal fields, both the World Bank and IFC are advising the GoI on developing a tender process that investors would find credible. The WBG is also making a specific effort to directly finance geothermal projects that are at an advanced stage of development. To this end, IFC is in discussions to reach an agreement with a private developer to support its geothermal investment. The World Bank is working with Pertamina Geothermal Energy (PGE), the leading public sector geothermal developer, to help immediately stimulate the development of the significant resources under its control. This effort is also in support of Indonesia's voluntary pledge to reduce its GHG emissions by up to forty one percent conditional upon receiving international assistance⁸. However, the GoI has also made it clear that such efforts to mitigate climate change cannot be at the expense of the poor; and that any climate change assistance should be in addition to development commitments previously made. Such support will enable the immediate expansion of geothermal development while also providing valuable time necessary to successfully design and implement the sector reforms. To this end, the WBG together with the ADB, helped the GoI secure US\$400 million in concessional financing from the Clean Technology Fund (CTF); of which, US\$300 million is allocated on a priority basis specifically to support geothermal development. The concessional financing is vital to expanding geothermal development without burdening electricity consumers and with minimal impact to the fiscal budget.
15. The proposed engagement to support the GoI geothermal development program is one of the first fully green finance projects in the IBRD and CTF portfolio which will have a truly transformational impact since it will revive development of geothermal energy after a decade of relative standstill. It would help demonstrate an immediate scale-up in geothermal projects in the country, and therefore help revive the confidence of other developers in the sector. Moreover, IBRD and CTF financing can fill a critical gap where the private sector is reluctant to invest, and help push the boundaries by enabling the development of higher risk greenfield projects. The proposed fields are also located in islands where investments are

⁷ "An Assessment of Geothermal Resource Risks in Indonesia", 2010, funded by PPIAF.

⁸ President Yudhoyono pledged at the 2009 G20 Summit to unilaterally reduce Indonesia's emissions by 26 percent and further decrease it by an additional 15 percent with international assistance.

more limited despite considerable power supply shortages. In addition to providing financing, the World Bank can draw on its experience from geothermal projects financed in other parts of the world, and extract lessons to help overcome technical and institutional challenges faced by developers in Indonesia. By helping to strengthen the capacities of public developers in Indonesia, the World Bank would also contribute to establishing credible institutions that are independently capable of meeting international and industry standards in their operations. These public institutions can become reliable partners for private sector investors through strategic public-private partnerships or partial/full privatization in the future. They would be well placed to continue to advance geothermal development in Indonesia over the long-term.

III. Project Development Objectives

16. The development objective of the proposed project is to increase power generation from renewable geothermal resources, and reduce local and global environmental impacts. This will be achieved by assisting PT. Pertamina Geothermal Energy⁹ (PGE), a leading public sector geothermal developer, expand power generation capacity in the Ulubelu and Lahendong (Tompaso) geothermal fields located in South Sumatra and North Sulawesi, respectively.

IV. Project Description

17. The proposed project includes a single component with an investment cost estimated at US\$574.7 million. Of this total, the World Bank will provide financing of US\$175 million through an IBRD loan which complements a US\$125 million concessional loan from the Clean Technology Fund (CTF). PGE will contribute US\$274.7 million from funds secured from its parent company.

- *Investment in Geothermal Power Generation Capacity (US\$574.7 million) – confirmation of geothermal resources, steam field development, construction of the Steamfield Above-Ground System (SAGS), and power plants of 110 MW and 40 MW at the Ulubelu and Lahendong (Tompaso) geothermal fields, respectively.*

V. Financing

	(\$m.)
Source:	
Borrower/Recipient	274.70
IBRD	175.00
IDA	
Others – Climate Investment Funds	125.00
Total	574.70

⁹ A subsidiary of Pertamina, Indonesia's state-owned oil and gas company.

VI. Implementation

A. Institutional and Implementation Arrangements

18. PGE will have the overall responsibility for the implementation of the proposed project. PGE was formally established in 2006 as a subsidiary of Pertamina to focus on developing and operating its geothermal resources. At present, PGE operates 272 MW of geothermal capacity, and has developed a strategy in line with the GoI's second Fast-Track Program to expand its geothermal production capacity by four fold with an addition of 1,050 MW by 2015. PGE has prior experience with planning and implementing large infrastructure projects.
19. Pertamina, as the shareholder of PGE, provides structured and regular oversight to the company, including the review and approval of its investment plans, provision of funds to carry out investment activities, support for the human resources function as necessary; and now the facilitation of the proposed loan. This process is also formalized through PGE shareholder meetings. The overall coordination of the GoI geothermal development program rests with the Ministry of Energy and Mineral Resources by law, while Bappenas is taking an active role in monitoring results since it is facilitating considerable public financing towards the sector¹⁰.
20. PGE has well established institutional functions designed (with the assistance of a leading international management consulting firm) to specifically develop geothermal resources; and key positions are staffed with qualified personnel. New projects in PGE are normally developed within the Directorate of Planning and Development and then executed by the Coordination Unit for Monitoring and Implementation. Within the latter, dedicated Project Managers are appointed for each geothermal field with responsibility for overseeing all aspects of development. The Project Managers are supported by various specialists from other specialized departments (i.e. Finance, Supply Chain Management) to oversee activities such as financial planning & management and procurement of goods and services. PGE's Heads of Directorates and its President Director form its Board of Directors (BoD), which formally oversees the company's operations. By in large, the proposed project will follow the same established PGE project implementation process, with the addition of a dedicated Project Implementation Unit (PIU) to help coordinate the work under the proposed loan.
21. The PIU, which was already established through a President Director decree¹¹ during project preparation, will continue to operate during its implementation. The PIU brings together the various existing functions within PGE, and helps coordinate their efforts including the channeling of loan funds towards implementing the proposed project. As such, it will be responsible for overseeing and coordinating all aspects of project implementation – including procurement, monitoring and evaluation, quality assurance, safeguards, and implementation of the Governance and Accountability Framework (GAF). In order to effectively coordinate these activities, the PIU includes key representatives from PGE's central departments that are

¹⁰ The World Bank is providing Bappenas with an Institutional Development Fund (IDF) grant to help strengthen its capacity in this regard.

¹¹ PGE President Director Decree No. 055/PGE000/2010-S0 dated January 28, 2010.

responsible for specific functions and activities. This includes representation from the Departments of Finance, Procurement, Safeguards, and Technical Managers in addition to the dedicated Project Managers for the Ulubelu and Lahendong (Tompasso) geothermal fields. The PIU is led by a senior manager from the Planning and Development Directorate, who will report directly to the President Director so that any issues related to the proposed project can be elevated quickly for senior management attention and resolution.

22. Procurement in PGE is centralized under the Supply Chain Management Department (SCMD). However, for the proposed loan, it will be handled by the PIU, which has established a procurement committee that includes specialists designated by various relevant departments; in line with the President Director decree that established the PIU. The PIU's financial management and analysis team will represent PGE's Directorate of Finance. It will ensure that the financial management conforms to the legal agreements reached with the World Bank for the proposed project.
23. Furthermore, PGE will hire consultant services as necessary to assist with additional engineering and design work as well as to help them oversee the construction of project facilities. Retroactive financing, of up to twenty percent of the loan amount for payments made up to one year prior to loan signing, will be made available to cover these and other expenses as necessary.

B. Results Monitoring and Evaluation

24. PGE maintains a statistical system with sufficient data to monitor most of the outcomes of the project as defined in results framework and indicators as follows:
 - **Indicator 1:** New geothermal power generation capacity installed – 150 MW
 - **Indicator 2:** Avoided local air pollution - 3,000 tonnes of nitrogen oxides (NO_x) annually, 5,400 tonnes of sulfur dioxide (SO₂) annually, and 2,500 tonnes of total suspended particulate (TSP) annually
 - **Indicator 3:** Avoided global greenhouse gas pollution – 1,100,000 tonnes of carbon dioxide (CO₂) annually
25. Results indicators related to the construction work (output indicators) and other intermediate outcome indicators will be regularly monitored by the PIU and reported in periodic progress reports to be submitted to the Bank.

C. Sustainability

26. PGE has taken several actions to ensure the sustainability of the project. This includes proper assessments of the capacities of geothermal fields. The steam gathering systems and the power plants were sized to ensure an optimal utilization of the geothermal energy and the best returns on the investment. This has been captured by the detailed feasibility studies. Moreover, PGE has signed long term power purchase agreements with PLN, the electricity off-taker.

27. Appropriate measures to mitigate the social and environmental impacts associated with the project have been developed by PGE and agreed with the World Bank. These will ensure the social and environmental sustainability of the project as summarized in the safeguards framework and related environmental and social impact management plans. The measures also address the safety of workers and the population during the construction and operation period.

VII. Safeguard Policies (including public consultation)

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP 4.01)	x	
Natural Habitats (OP/BP 4.04)		x
Pest Management (OP 4.09)		x
Physical Cultural Resources (OP/BP 4.11)		x
Involuntary Resettlement (OP/BP 4.12)	x	
Indigenous Peoples (OP/BP 4.10)		x
Forests (OP/BP 4.36)		x
Safety of Dams (OP/BP 4.37)		x
Projects in Disputed Areas (OP/BP 7.60)*		x
Projects on International Waterways (OP/BP 7.50)		x

VIII. Contact point at World Bank and Borrower

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* By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas

IX. For more information contact:

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