CTF PRIVATE SECTOR PROPOSAL

Name of Project or Program	Indonesia Geothermal Electricity Finance (IGEF) Program
CTF amount requested	1. Investment – up to US$49.3 million 2. Implementation and supervision budget – US$0.7 million
Country targeted	Indonesia
Indicate if proposal is a Project or Program	Program

1. DETAILED DESCRIPTION OF PROGRAM

1.1 Proposal Context:

The proposal is for a programmatic initiative that aims to promote transformation of Indonesia's renewable energy (RE) sector, particularly its private geothermal power subsector. It is consistent with the original Indonesia's Country Investment Plan (CIP) that was endorsed by the CTF Trust Fund Committee (TFC) in March 15, 2010 and updated in May 2013.

The Indonesia CIP focuses on two areas: (a) the scale up of geothermal power and (b) financial sector transformation for energy efficiency (EE) and small-scale RE projects. The original CIP envisioned US$75 million allocation to IFC programs, with US$25 million for private sector geothermal power development and US$50 million for RE/EE financing through commercial banks. The updated CIP kept the total allocation to IFC's programs at the $75 million level, but adjusted the distribution between geothermal and RE/EE programs to better reflect the relative needs in the respective sectors: US$50 million for geothermal development and US$25 million for financing RE/EE projects either through direct investment or through financial intermediaries. Since the CIP update, IFC has developed a strong pipeline of geothermal sub-projects that, when realized, will help generate much needed experience in financing of private sector geothermal projects and play a catalytic role in scaling up private sector geothermal investments in Indonesia. To move ahead with this pipeline, IFC is seeking approval for $50 million of CTF funds for the IGEF program.

The Indonesia Geothermal Electricity Finance (IGEF) Program is designed and will be implemented in coordination with respective ADB and IBRD programs that focus on the development of geothermal projects proposed and are supported by the Government of Indonesia (GOI). To ensure that all programs are complementary, IFC, IBRD, and ADB management agreed that the project teams will coordinate closely and maintain open communications. In addition, the Program is well aligned with and reinforces other initiatives undertaken by Indonesian government and will exploit synergies with some ongoing efforts, such as Second Fast Track Program. If successful, it would help the GOI to move forward with various financial programs and instruments aiming to support geothermal sector that have been discussed, but have not materialized yet.

1.2 Country Context:

Lack of sufficient investment in power generation in Indonesia since the 1997-98 Asian financial crisis has resulted in a considerable shortage of electricity. As of today, more than US$31 billion of capital investment is required by 2019 to meet its growing electricity demand. To address the shortage of electricity, mitigate the local environmental impacts, diversify the fuel mix, and hedge against fossil fuel price volatility, the GOI launched the Second Fast Track Program, which aims to develop 10,000 megawatts (MW) of generation capacity by 2014, predominantly targeting RE, with a special focus on geothermal (4,000 MW).

Indonesia is one of the world's largest emitters of greenhouse gases (GHGs), with an estimated 2.3 gigaton of CO_2 emitted in 2005. While over 80% of these emissions are due to the release of GHGs from peat land, land-use change and forestry practices, particularly deforestation, the GHG emissions from non-forestry

sectors, including power sector, grow at a much higher rate. The situation is complicated by the Indonesia's heavy reliance on fossil fuels for the energy supply. As Indonesia works on improving access to electricity (currently around 70%, the lowest in South East Asia), growth of GHG emissions will further accelerate and may nearly triple by 2025[1].

The GOI is committed to mitigating GHG emissions. At the G20 meeting in 2009, President Susilo Bambang Yudhoyono announced that Indonesia would reduce GHG emissions by 26 percent by 2020, or by 41 percent if international support is provided. The GOI also pledged to phase out subsidies for fossil fuels, joining the G20 effort. Indonesia is developing a strategic, multi-year policy and investment program for low-carbon growth, supported by the National Action Plan for Climate Change (NAP 2007) and the Development Planning Response to Climate Change (2008).

The GOI has identified GHG reduction priorities in the energy sector, including (i) EE, particularly in the industrial sector; (ii) RE for power generation, primarily geothermal, but also including biomass; and (iii) low-carbon transport, especially public transport, vehicle efficiency improvements, and clean fuels.

1.3 Geothermal Sector Context:

Indonesia has the largest geothermal potential in the world – nearly 30,000 MW in electricity generation. Yet the current installed capacity is mere 1,226 MW (third globally, after 3,093 MW of the US and 1,904 MW of the Philippines) and more than 200 promising sites remain undeveloped.

To seize the untapped opportunity and make geothermal energy a greater contributor to the country's energy mix, Indonesia has recently announced an initiative of a globally unprecedented scale-up of geothermal generation capacity – "Vision 25/25 Plan". The Plan includes a target to install 12,000 MW of new geothermal electricity generation capacity by 2025. The government also expects to have 25% of the country's electricity come from renewable energy sources by 2025. Longer term targets aim for a 15,000 MW of geothermal by 2030 and 25,000 MW by 2050. The Second Fast Track Program attempts to accelerate the development of geothermal projects and envisions a total of 70% of new geothermal projects to be implemented by the private sector.

However, in over the four years since the inception of the Second Fast Track Program, no new geothermal power plants from the program have come on-line and exploration drilling programs have not progressed. In spite of recent attempts to revive the development in the sector, the progress has been quite slow, leaving the country's electricity generation mix heavily dependent on fossil fuel (95% of generation capacity), particularly coal (50% of generation capacity), with geothermal of only 4% of total generation capacity. Over the last two decades, private sector participation in geothermal sector in Indonesia remained very limited, resulting only in around 750 MW of private sector geothermal installed capacity.

1.4 Barriers to Private Sector Investment in Geothermal projects:

Geothermal projects face a number of interrelated barriers and uncertainties, many of which are related to the exploration phase of project development. Among the key barriers are:

- *The need for significant upfront exploration capital.* Relative to other renewable energy projects, geothermal projects have an additional pre-construction capital expense associated with the exploration phase. Exploration phase precedes the construction phase and undertakes test drilling to assess and validate the availability of commercially viable geothermal resources. The high upfront expenditure, which is difficult to quantify in advance due to geological risks, is a deterrent to developers and investors and securing adequate financing for this phase is the key to developing geothermal power plants;
- *High uncertainty of exploration phase*. Not only does the exploration phase require significant capital

[1] Indonesia GHG Abatement Cost Curve 2009, National Council on Climate Change

expenditures, for which equity is usually the only source of funds, but also the certainty of the outcome of the exploration phase is much lower than that of other similar industries. Sometimes, the exploration phase may produce a negative result (concluding that resources are insufficient or unusable);

- *Lack of information and experience in assessing and pricing exploration risk.* Unlike in other similar industries, there is little understanding of the risk evolution during the exploration phase of developing a geothermal project. Although, resource uncertainty is high at the beginning of the exploration phase, it gradually decreases as more information on quality and quantity of the geothermal resource becomes available. However, most financiers, especially senior lenders, have limited understanding of how the resource risk evolves over the exploration phase and often perceive it to remain high until the very end of the exploration. This lack of knowledge prevents lenders from providing financing till the very end of the exploration phase and, as a result, there is no meaningful track record and information that investors can rely on in evaluating the exploration results and other risks.
- *Long project development cycle*. The development of a geothermal project can take a significant time because of delays and long lead-times required for ordering key power plant equipment components (often a year or more). As senior lenders typically do not provide financing until the resource exploration phase is fully completed, the construction completion and commercial operation dates are pushed further, therefore, diluting a project's equity return substantially.

In addition, other risks, such as permitting and land issues, and lack of a tested and established regulatory regime for geothermal projects, further disadvantage geothermal projects. High risks along with capped utility-like returns provide little incentives for investors and lenders to mobilize financing for geothermal projects, despite the existence of attractive geothermal resources in Indonesia. A few successful geothermal projects in Indonesia can have the effect of catalyzing investments in the sector after such projects establish a track record of generating base load power at a fixed cost.

1.5 Summary of the Program and use of CTF funds:

The design of the IGEF Program is informed by discussions with private sector in Indonesia and consistent with the lessons from past experiences by the IBRD, the Global Environment Facility (GEF), and others. For example a recent report by Energy Sector Management Assistance Program (ESMAP)[2] on this topic states that, "The concessional financing should be directed at phases in the geothermal development cycle when such financing has the most impact in reducing the risk for investors and thus increasing the bankability of a geothermal project. In the development phases of a typical geothermal power generation project, the early phases of project preparation, including test drilling phase, will usually be the most suitable phases for a targeted application of concessional funds."

This IGEF Program will comprise a series of sub-projects, which will catalyze financing from IFC and other commercial investors and lenders in the geothermal sector with the aim to unlock the pipeline of potential geothermal projects. Subject to further discussions with the project sponsors, IFC and CTF will provide capital to fund the late stage of the exploration. Therefore, initial exploration (typically about three *successful* wells) and verification of a sufficient steam resource (which is determined on a project by project basis) will be funded and carried out by the sub-project sponsors. Based on the results, a third-party independent review of a resource feasibility study will then be conducted by a qualified geothermal engineering consultancy. In case of an acceptable outcome, the IFC and CTF funds will be provided to complete the exploration stage. Final approval of IFC and CTF funding to any sub-project would be subject to a full due diligence and approval by an internal IFC Approval body as well as IFC Board.

[2] ESMAP: Geothermal Handbook: Planning and Financing Power Generation, Technical Report 0002/12, June 2012

1.6 Program's strategy to achieve market transformation:

The Program will utilize significant global IFC experience in geothermal sector accumulated over the last decade: IFC has played a leading role in facilitating a number of private-sector geothermal investments with a total investment of about US$285 million in various projects and total installed capacity of about 1,300 MW over the past 10 years. This Program will, therefore, seek to leverage IFC's own experience in geothermal investments. CTF support will enable IFC and other investors to address resource development risk, which has been the key impediment to the uptake of geothermal investments by the private sector.

The IGEF Program will play a catalytic role towards transformation of the geothermal sector in Indonesia by supporting early private sector entrants in a series of geothermal investment sub-projects. CTF funding will be used to allow these sub-projects to complete the exploration phase and reach financial closure, therefore creating a precedent of the successfully completed geothermal investments. The Program will allow the broader financial community to better understand and be able to gauge exploration and other risks, and will incentivize senior lenders and other capital providers to participate in the development cycles of geothermal projects.

The knowledge generated by the experience of the investment projects will become available to benefit future market entrants (e.g., legal advice on negotiation of initial model contracts, etc). And the demonstration effect of the proposed sub-projects should lead the way for developers, investors and lenders to follow with scaled up investment. It is anticipated that the momentum created by the Program will indirectly assist in a broader range of geothermal energy projects with the cumulative installed capacity of 5x the installed capacity of the Program (up to the size of the current pipeline of 3,200 MW under various stages of exploration).

2. FIT WITH INVESTMENT CRITERIA

2.1 Potential GHG Emissions Savings:

Implementation of the proposed sub-projects would reduce greenhouse gas (GHG) emissions in the Indonesian power sector by a significant amount. The estimates below are based on currently envisioned pipeline of geothermal sub-projects. Assuming:

a) a grid emission factor for Indonesia of 0.709 tCO_2e/MWh;

b) geothermal sub-project(s) of 660 MW capacity (see *Implementation Potential* and *Demonstration Potential at Scale* sections below) operating at 90% capacity;

c) an asset life of 30 years.

These sub-projects are expected to directly generate GHG emission reductions of 110.7 million tCO_2e (0.709 tCO_2e/MWh x 660 MW x 90% x 30 years x 8760). Indonesia has abundant geothermal resources presenting a significant opportunity for RE development in the country. Once this Program is implemented and demonstrates a successful track record, the sector will likely gain a sufficient momentum for continued expansion and may achieve at least 5x multiple effect in promoting the development of new installed capacity (with the effect of up to the size of the current pipeline of 3,200 MW).

Assuming a 5x multiple in terms of indirect, demonstration impact, the Program will enable around 3,000 MW of new geothermal capacity resulting in reductions of around 500 million tCO_2e or more over the estimated 30-year lifetime.

2.2 Cost-Effectiveness:

Based on the above calculations and an expected Program cost of US$50 million the implied direct GHG reductions per CTF US dollar spent will be 2.2 tCO_2e/$ over the life of the sub-projects.

2.3 Demonstration Potential at Scale:

Indonesia has a geothermal capacity of nearly 30,000 MW – the largest of any country in the world. This resource presents an opportunity for Indonesia to green its energy mix effectively, as geothermal power generation is already among the most cost-competitive renewable energy sources and is capable of generating firm base-load power supply. However, the current installed capacity is mere 1,226 MW and the progress in developing new geothermal power plants is very slow.

The Program will enable funds from IFC and other financiers to flow to these projects. Financial close of the sub-projects can help address some of the early entrant barriers for the private sector and expand successful track record, encouraging future investors and opening opportunities in the sector. Once a track record is established by the Program, development and implementation process should be made much more clear and feasible, and the investors and financial community should become much better equipped to properly understand and be able to gauge the risks pertaining to geothermal development, specifically at the exploration phase. This should unlock Indonesia's geothermal sector (and broader renewable energy area), making it commercially attractive.

2.4 Development Impact / Co-benefits:

The expected co-benefits to be achieved by the Program include:

- Playing significant and catalytic role in scaling up private-sector geothermal investments in Indonesia;
- Encouraging other emerging economies with undeveloped geothermal resource to follow this model;
- Showcasing the ongoing efforts in Indonesian geothermal sector by other donors and MDBs, including the IBRD, JICA, KfW, USAID and MCC among others;
- Substantial contribution to reducing global GHG emissions;
- Helping Indonesia increase its energy generation capacity, leading to increased access to modern energy (currently the lowest in the region);
- Maintaining high affordability of electricity prices to consumers through generating cost competitive electricity. The cost of generating the geothermal electricity is expected to below other sources, such as diesel;
- Reduced need for electricity subsidy from Indonesia government;
- Diversification of country energy mix (currently 95% fossil-fuel based) and increasing energy security;
- Benefiting population living in the local area through increased employment, demand for goods and services, and increasing access to energy;
- Developing frontier region. Some of the sub-projects under review could be located in the frontier regions;
- Tapping into domestic, non-tradable indigenous resources that are not open for global competition and not affected by global commodities price swings (like coal);
- Reducing local pollution. In the Indonesian context, the geothermal power will likely displace coal-based generation – not only known for significant contribution to GHG emissions, but also for local

pollution (SOx, NOx, PM);

- Generating around 1,300 jobs during construction and 1,100 jobs during operation. The estimates are based on the currently envisioned pipeline of sub-projects and on the data on job creation provided by the US Geothermal Energy Association study.[3] The study concludes that for a standalone geothermal power plant expected job creation is 4.0 persons/MW during construction and 1.7 persons/MW during operation. As the sub-projects will be staggered in time, with possibility of participation of some of the same workforce in the construction phases of different sub-projects, the total jobs generated during the construction phase is expected to be about half of estimated by the study – 1,320 [= 660 MW x 4 jobs/MW x 50%] and jobs generated during operation – 1,122 [= 660 MW x 1.7 jobs/MW].

2.5 Implementation Potential:

The economics of geothermal projects is site and project specific and remain uncertain until the end of the exploration phase, but the sub-projects selected for this Program will be in a relatively advance stage of development, which would partially mitigate potential uncertainties. In addition, the sub-projects will be selected on the basis of the financial and technical strengths of the sub-project sponsors. Moreover, the sub-projects included in the 10,000 MW pipeline of GOI supported Second Fast Track Program as well as in the long-term electricity plan of the State utility company, PT Perusahaan Listrik Negara ("PLN") will be considered more closely.

2.6 Additional Costs & Risk Premium:

The Program aims to unlock the pipeline of geothermal projects in Indonesia and tackle the perceived excessive risk associated with resource uncertainty. Specifically, by enabling several geothermal projects to reach financial closure, the Program will generate better/more reliable information that can be used to price exploration risk. Concessional financing from CTF will be a key component, as it will tilt the risk-return ratio to help the sub-project sponsors overcome one of the key barriers to accelerating the scale up of geothermal investment, namely the high exploration risk and the very uncertain return prospects associated with this phase of a project's evolution. For that, CTF and IFC will provide financing currently not available in the market.

The Program, among other goals, aims to expedite and accelerate the availability of limited recourse financing. The senior lenders typically would not take resource risk and would require completion of the exploration well drilling phase prior to financial closure of a loan. Given the long lead-times required for ordering key power plant equipment components (often a year or more), the need for the senior lenders to wait for the full resource development before lending to the project, noticeably dilutes project's equity returns.

Thus, there remains an opportunity to improve the economics of the projects by generating more information that could help senior lenders to accurately assess the risk during the various stages of the exploration phase. The Program aims to address this issue by providing exploration capital to the project sponsors so that they would be able to project finance the geothermal project prior to the completion of the exploration phase.

2.7 Financial Sustainability:

Existing support have so far not been able to create any meaningful deal flow of private sector geothermal projects, even since the announcement of the Second Fast Track Program in Indonesia in 2009. The proposed Program looks to promote sustainability by helping to establish a track record for the technical and financial viability of private sector geothermal projects. Future project developers are expected to benefit from the development efforts, persistence and high costs encountered by the early movers in the sector, including the sub-projects within the Program, which should ease the development and implementation process and

[3] Jennejohn, D., *Green Jobs Through Geothermal Energy*, Geothermal Energy Association, 2010

lower the entry costs for future project developers. The lowering of risks, which is assisted by the establishment of such a track record, will make future Indonesia's renewable energy projects attractive on their own merits.

2.8 Effective Utilization of Concessional Finance:

Concessional funding will:

- Enable sub-projects to obtain the early stage financing not currently available on the market;
- Allow IFC and other investors to provide financing at an earlier stage of project development;
- Generate data and improve financiers' knowledge of exploration phase, allowing them to engage sooner in the process;
- For the future projects, will lead to speeding up project implementation, lowering the perceived risk, and improving the returns;
- Encourage private sector participation in geothermal projects.

2.9 Mitigation of Market Distortions:

The Program is designed specifically to have a supporting rather than distorting impact on the nascent private geothermal sector. The proposed Program will provide CTF funds to individual sub-projects and will enhance an already supportive domestic regulation that encourages RE development, until the sector accumulates sufficient experience and reaches needed scale to grow sustainably. It is unlikely that these pioneer sub-projects would move forward without the CTF concessional financing.

2.10 Risks:

Risks associated with the Program include:

- Exploration Risks: while the drilling success rate is said to be about 60-70% on average worldwide, the risk is location specific and difficult to be quantified ex-ante;
- Risk-Return perception: given the current fluidity in a risk-return market perception of geothermal exploration, the Program's return expectation would need to be flexible to make the sub-projects viable and blended financing would be critical in this regard;
- Independent Geothermal Consultants: the quality of the independent geothermal consultant would be key to success; but, the availability of such consultants could be limited as the industry is very small world-wide (a highly reputable geothermal consultant has been approached for this and shown a willingness to work with IFC);
- Off-taker risk: The ability of the sub-projects to generate revenues by selling electricity relies on the financial strength and stability of the off-taker. All electricity generated by the sub-projects will be sold to PLN – the state owned utility that operates the majority of country's power generating capacity and transmission and distribution services. However, PLN continues to depend on government subsidies in fully covering the costs of power generation/purchases, creating potential financial risk for a project sponsor developing a power plant. This offtake risk is in part mitigated by a Business Viability Guarantee Letter from the Ministry of Finance.
- Environmental risks: With a large proportion of Indonesia's geothermal resources located in the vicinity of forests, project development and implementation will bear some environmental and social risk. To mitigate these risks, IFC will require full compliance with the IFC Performance Standards, including conducting comprehensive Environmental and Social Impact Assessment (ESIA). An ESIA typically

includes: (i) initial screening of the project and scoping of the assessment process; (ii) examination of alternatives; (iii) stakeholder identification (focusing on those directly affected) and gathering of environmental and social baseline data; (iv) impact identification, prediction, and analysis; (v) generation of mitigation or management measures and actions; (vi) significance of impacts and evaluation of residual impacts; and (vii) documentation of the assessment process (ESIA Report). In addition, consultations with all affected persons and stakeholders will be carried out and concerns addressed in a participatory fashion and with due respect to gender impacts.

3. PERFORMANCE INDICATORS

The performance indicators outlined below are derived from the CTF Results Measurement Framework. These indicators will be tracked at least annually. Suggested performance indicators for the project include:

Indicator	**Current Baseline**	**Anticipated Impact**
DIRECT IMPACTS:		
MW of private geothermal power directly supported and installed by the IGEF Program	1,226 MW	660 MW for 3 sub-projects; up to 1,000 MW for the entire Program
GHG emissions avoided	0 MtCO2e per annum for the energy sector	3.7 MtCO2e per annum; 110.7 MtCO2e over the life-time of the program
Incremental financing leveraged (of all, non-CTF parties)	US$0	US$2,270 million for the entire program amount
Jobs created	N/A	1,300 jobs during construction and 1,100 jobs during operation