

**SREP Ethiopia  
Project Approval Request  
Public Document  
International Finance Corporation (IFC)**

<b>1. Country/Region:</b>	<i>Ethiopia</i>		<b>2. CIF Project ID#:</b>	(Trustee will assign ID)
<b>3. Source of Funding:</b>	<input type="checkbox"/> FIP	<input type="checkbox"/> PPCR	<input checked="" type="checkbox"/> SREP	
<b>4. Project/Program Title:</b>	<i>Geothermal Sector Strategy and Regulations</i>			
<b>5. Type of CIF Investment:</b>	<input type="checkbox"/> Public	<input checked="" type="checkbox"/> Private	<input type="checkbox"/> Mixed	
<b>6. Funding Request in million USD equivalent:</b>	<i>Grant: USD 1.5 million for advisory services only</i>		<i>Non-Grant: n/a</i>	
<b>7. Implementing MDB(s):</b>	<i>IFC</i>			
<b>8. National Implementing Agency:</b>	<i>Private Sector</i>			
<b>9. MDB Focal Point and Project/Program Task Team Leader (TTL):</b>	<i>Headquarters- Focal Point: SREP Focal Point: Joyita Mukherjee</i>		<i>TTL: Alejandro Moreno, Senior Operations Officer – Geothermal Strategy and Regulation</i>	

**10. Program Description (including objectives and expected outcomes)**

**I. Introduction:**

This Project Proposal responds to the advisory services/technical assistance components of the IFC-managed SREP Project “Design of a Long-Term Strategy for Geothermal Sector” as listed in Ethiopia’s Investment Plan, endorsed by the SREP Sub-Committee in March 2012.

IFC’s *Geothermal Sector Strategy and Regulations Project* will support the Government of Ethiopia (GoE) to develop and implement a long-term strategy for the development of geothermal assets in the country, with a particular focus on recommending options for private investment and participation in order to leverage the private sector strategically as a source of expertise, project manager, equipment supplier, investor and financier. In addition, the Project aims to ensure that future geothermal projects are bankable and that required business skills are built in relevant public institutions.

The Project will be executed in two phases. Phase 1 will comprise the development of a Long-Term Geothermal Power Sector Strategy to support the efficient production of electricity from Ethiopia’s vast geothermal resources, including both recommendations for one or more models of private sector participation and the identification of specific regulatory, institutional, and capacity needs required to

implement the strategy.

Phase 2 will consist of provision of technical and commercial capacity building to the GoE to implement the Strategy designed in Phase 1. Activities under the second phase will include support to the Government on drafting and/or revising geothermal laws and regulations aiming at providing a strong and transparent regulatory framework to govern private power generation as well as support for the development of required operational and institutional structure.

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## **II. Project Description**

### **1. Context:**

Current energy generation capacity in Ethiopia is 1,937 MW, of which 1,858 MW come from hydropower plants, leaving the power supply vulnerable both to natural changes in water flows as well as the effects of climate change. The Government of Ethiopia has a goal to develop more than 23,000 MW of additional electricity generation capacity by 2030, and that includes substantial diversification into wind and geothermal power. Geothermal in particular can provide significant advantages, including high capacity factors and low variability, and therefore, the development of Ethiopia's geothermal resources is a key priority for the Government. The current GoE's 5-year Growth and Transformation Plan (GTP) is explicitly focused on increasing energy supply and access, and the 2011 Climate Resilient Green Economy Strategy (CRGE) sets a target of increasing generation five-fold within five years through investments in hydropower, geothermal, solar and wind. The Ministry of Water and Energy (MoWE) includes explicit geothermal development targets of 75 MW capacity by 2015 and 1,000 MW by 2030.

The East Africa Rift Valley is a major potential source of geothermal power, and Ethiopia's resource is estimated at 5,000 MW spread across 16 fields. However, so far, this vast and important asset remains untapped. Deep drilling has been undertaken in three areas, Aluto Lungano and Tendaho, sponsored by GoE, and in a third, Corbetti by a private sector concessionaire. The remaining fields are in the first stages of surface exploration. The only existing geothermal generation however comes from a 7.3 MW pilot project at Aluto Lungano, installed in the late 1990s. A recent feasibility study conducted in 2010 concluded for the possibility to expand the Aluto Lungano field to 75 MW, and four production wells with a total capacity of 35 MW were drilled there in 2011. At the Tendaho field, three deep and three shallower exploratory wells were drilled in the 1990s that indicated a total resource of 100 MW that could be developed from the deep geothermal resource.

To date, all centralized power generation in Ethiopia has been undertaken by the public sector, with the Ethiopian Electric Power Company (EEPCo) the only company operating power plants and selling electricity to the national grid. All private companies that have been involved in electricity generation in Ethiopia until now have worked exclusively as Engineering, Procurement, and Construction (EPC) contractors or consultants. Ethiopia's legal framework, however, allows for private sector investment in power generation without any capacity limits, contingent on a negotiated Power Purchase Agreements (PPA) with EEPCo. As in many other

countries, the GoE has traditionally been reluctant to allow for private ownership in power generation, although this view is now shifting as the GoE has indicated a willingness to consider innovative approaches, and specifically private sector investment in the production of electricity based on geothermal steam.

In spite of the recent improvements in the geothermal sector in Ethiopia (e.g. new drillings and move towards openness for greater private sector engagement), private participation in the sector has been held back by the lack of a systematic, long-term strategy for developing geothermal assets and, in particular, for engaging the private sector in one or more stages of the project development process. Private sector participation in geothermal development has taken different forms in various countries, from a contracting model where the private sector retains all ownership to a pure private model where a private company takes all risks and is responsible for each phase of development (from exploration through power sales). Experiences have shown that the role of the private sector in the initial exploration phases – and the associated risk it accepts – are likely to affect the way resources are developed, total government expenditures, and the ultimate price of power developed. In order to attract stable investment that balances costs and risks to Ethiopia, GoE has requested support to systematically assess the various options for private involvement in geothermal development and determine one or more models most appropriate to Ethiopia's resource characteristics and policy priorities. The determination of such models would provide the backbone of a long-term sector strategy, allowing Ethiopia to clearly signal opportunities to potential investors, and to spur the development of the laws and regulations, institutional structures, and technical capacity necessary to attract investment and successfully develop the sector.

Since the initial phase of the SREP program in Ethiopia, a number of international donors have begun activities to support the development of geothermal power in the country. These activities include commercial negotiation capacity-building provided by the U.S. Agency for International Development (USAID), geothermal surface exploration and field prioritization conducted by l'Agence Française de Développement (AFD), the Icelandic International Development Agency (ICEIDA) and the Japanese International Cooperation Agency (JICA), a Geothermal Risk Mitigation Fund supported by KfW as well as substantial financing for drilling and exploration from the World Bank.

The development of a long-term sector strategy proposed under this Project is directly complementary to each of the above activities, and IFC has begun discussions with each of the donors mentioned above to ensure close coordination with their work. In particular, the geothermal field data collected by JICA will provide a valuable input into the optimal role of the private sector in field development, and the commercial negotiation training provided by USAID may provide valuable technical capacity necessary to implement any strategy that involves private sector ownership and sale of power generated.

## **2. Market barriers:**

Ethiopia's geothermal resource is estimated at 5,000 MW, second in Africa only to Kenya. While Ethiopia has been quite successful in developing hydro and wind projects via the state-owned electricity company (EPCO), it has been less successful in developing geothermal projects either on a public or private basis. Only a single

7.3 MW pilot geothermal plant has been developed in the country to date. The number of wells drilled has also been limited given the lack of public financial resources and a reluctance to involve the private sector except in one field. The failure to successfully harness Ethiopia's geothermal resources largely has been due to:

- The lack of a clear strategy for development and prioritization of geothermal production;
- The lack of a policy and enabling environment to attract private sector interest in exploration; and development, particularly with regards to upstream licensing and power plant development;
- Insufficient technical capacity and information within the Government, in particular in relation to upstream exploration risks and key aspects of private power plant development (including a lack of knowledge of key clauses of necessary agreements);
- Insufficient domestic financial resources and technical capacity combined with high country risk for foreign investors;
- Underlying high risk of failure in drilling in general (50-70% of wells can turn out dry), accentuated by lack of latest information technology;
- Difficulty to access financing for both upstream drilling and power plant development.

### **3. Project Objectives**

The overall objective of the Project is to support the Government of Ethiopia to define options and implementation arrangements for how geothermal assets in the country can be developed, including leveraging the private sector strategically as a source of expertise, project manager, equipment supplier, investor and financier. Moreover, the Project aims to ensure that future geothermal projects are bankable and that required business skills are built in relevant public institutions. The specific objectives of the Project are:

1. *Development of a Long-term Geothermal Sector Strategy* to support the efficient production of electricity from Ethiopia's vast geothermal resources, including thorough private sector participation in exploration and production;
2. *Development of a strong and transparent regulatory framework* to govern private power generation from geothermal resources, both addressing existing barriers to investment and reducing developer risk to facilitate private sector participation in the sector.
3. *Development of institutional structure and technical capacity* to ensure implementation of the geothermal Strategy.

### **4. Project Description:**

IFC, as an impartial stakeholder, will advise the Government of Ethiopia on options to bring private sector participation in geothermal development both at the upstream stage (drilling) and downstream (power plant development and production). The Project will be implemented in two phases according to the following scope of work, agreed upon with MoWE, and discussed with other donors active in the sector.

#### **Phase 1. Geothermal Sector Strategy**

Under this phase, the Project will conduct the following activities to develop and propose a Long-Term

Geothermal Sector Strategy:

***Component 1: Geothermal and Power Sector Data Collection and Analysis.***

Under this component the project will collect information and generate technical and economic assessment of the opportunities and costs for geothermal power development in Ethiopia. Information to be collected and assessed will include: field characteristics and resources, field development (exploration, drilling, construction), commercial developments, existing institutions, key actors in the sector and their roles and capacities, policy/regulatory frameworks, financial/economic assessments as well as financing arrangements.

***Component 2: Vision for Ethiopia Geothermal Generation.*** Building upon existing power sector strategies as set forth in existing national strategy documents (e.g. CRGE), the Project will develop a vision of the role and value of geothermal power within the context of Ethiopia's broader electricity sector and GoE's goals for generation and security of supply. This will be based on the technical data and analysis of Component 1 and GoE's input regarding the role of geothermal in existing energy sector plans, rationale and value of geothermal power for Ethiopia as well as target for installed capacity and timing.

***Component 3: Assessment of International Experience in Geothermal Development and Options Analysis.***

Under this component, the Project will perform a detailed assessment of alternative international approaches to development of the geothermal value chain with a specific focus on effective management of upstream risks as well as on roles and alternative models for private sector involvement. In addition, the Project will provide GoE with an options assessment of possible models of development for Ethiopia.

***Component 4: Recommendations of Appropriate Models for Ethiopia.*** After presentation of an options analysis, IFC will work closely with MoWE and GoE stakeholders to define one or more appropriate geothermal development models for Ethiopia, with a particular emphasis on advantages and disadvantages of private sector engagement at various stages in the development process, including investment requirements and economic benefits from alternatives.

***Component 5: Suggested Institutional Approach and Requirements.*** Based on the model(s) recommended in the previous component, the Project provide the GoE with: (i) a description of institutional requirements and options to successfully implement the recommended models, (ii) recommendations for a specific institutional structure, including organizational functions, responsibilities, and relationships, and (iii) identification of the legal/institutional processes required for implementation. Project recommendations will be based on international experience in successful geothermal development, feasibility of implementation as well as GoE institutional preferences and priorities.

***Component 6: Opportunities for Technical Capacity Building.*** The Project will identify technical capacity needs within GoE institutions in order to successfully implement the strategy and ultimately successfully develop GoE's geothermal power goals.

***Component 7: Policy and Regulatory Requirements and Options.*** Under this component, the Project will

identify specific legislation, regulations, or provisions that would be required or beneficial to implementing the chosen development models. Regulations should address issues including project development processes, private sector rights and responsibilities, price calculation, fiscal/non-fiscal incentives. Types of regulations may include: (i) sector policies, (ii) licensing regime: process, eligibility, requirements, retention, and transfer, (iii) models contracts/agreements/MOU, (iv) renewable energy incentives, and (v) geothermal law.

**Component 8: Detailed Action Plan.** The Project will develop a step by step roadmap for the implementation of the above recommendations.

### **Phase 2. Strategy Implementation and Regulations**

In Phase 2, IFC will support GoE to undertake steps articulated in the Action Plan, including the institutional organization, capacity-building, and regulatory reforms necessary to implement the strategy designed in Phase 1. The implementation of the strategy will include institutional, capacity-building and regulatory components, however the specific steps required will be determined by the results of Phase 1. Project activities may include, among others:

**Component 1: Drafting of Key Legal and Regulatory Documents.** The Project will provide detailed technical input and drafting assistance for a suite of proposed regulations, rules, and associated documents agreed upon by IFC, the Ministry of Mines, and MoWE necessary to implement the strategy developed in Phase 1. The specific regulations/documents required will be determined by the results of Phase 1, but may include geothermal sector policy or law, concession agreements, licensing procedures, fiscal or tax incentives, or model power purchase agreements.

**Component 2: Organizational and Operational Set-Up.** Under this component, IFC will provide support to the GoE for the establishment of the institutional structure and teams recommended in Phase 1 and required to execute the Long-Term Geothermal Sector Strategy.

**Component 3: Capacity Building.** IFC will support the hiring and training of relevant personnel in order to help ensure the necessary capacity within new and existing GoE institutions responsible for executing the Geothermal Sector Strategy.

Overall, under phases 1 and 2, the Project is expected to create a strong enabling environment for successful private sector participation to develop of Ethiopia's geothermal sector. This can have the indirect positive impact of increasing geothermal generation and increasing private investments in the sector.

The direct impact of the Project will be achieved through the preparation and endorsement by the GoE of a sector strategy that specifies one or more approaches to private sector participation in geothermal energy development. This approach or approaches include the regulatory, institutional, and capacity reforms required to implement the strategy.

The Project also expects to enable substantial indirect impacts that reflect the actual development of geothermal power in Ethiopia. Once GoE officially endorses the geothermal sector strategy developed by the Project and undertakes the regulatory, institutional and capacity reforms required for its implementation, private sector geothermal power developers are likely to show interest in Ethiopia and devote resources to exploration, steam production, and/or power plant construction/operation<sup>1</sup>.

## **12. Consistency with Investment Criteria:**

### ***a) Increased installed capacity from renewable energy sources:***

The Project is expected to promote investments in additional/new geothermal capacity by providing investors with an attractive regulatory framework and supportive GoE institutions that will facilitate early stages of project development. Indirect project impacts are projected to include 100 MW of installed geothermal capacity during the project monitoring period (estimated by 2019) and potentially 1,000MW cumulative installed capacity by 2035 (see footnote 1 above).

### ***b) Increased access to energy through renewable energy sources:***

The Project will indirectly result in increased electricity generation which will be necessary to meet the growing access rates as well as rising energy demand in Ethiopia. 100 MW of new capacity (at 80% capacity factor) would lead to 700,800 MWh of renewable energy generated, and 1,000 MW would lead to 7,008,000 MWh.

### ***c) Low Emission Development:***

Given its vast renewable energy resources, the country has an opportunity to improve the living standards of Ethiopians based on carbon neutral growth. Project will contribute to eliminate the potential need to use high-emitting diesel or gas fired power plants as backup power when Ethiopia's hydropower generation is not operating at full capacity. Moreover, the Project fits into and contributes to GoE's Climate Resilient Green Economy (CRGE) Strategy, which aims at transforming Ethiopia into a low carbon emitting and renewable energy nation by 2025.

### ***d) Affordability and competitiveness of renewable sources:***

The Project will explicitly address the high initial costs and risk of geothermal development and exploration by helping GoE leverage private sector expertise and funding throughout the geothermal energy development process.

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<sup>1</sup> It should be noted that indirect impacts will materialize over a long time horizon (presumably over the next 20 years) and are subject to a variety of factors outside the scope of this project. Most of the impacts will become evident after the SREP project. Given the considerably long timeframe for geothermal project development – typically about 7 years from initial exploration to power generation – it is possible that only one or two smaller first-stage projects will have reached financial closure and begun construction (IFC's condition for counting project impact) within the timeframe of the Project and the planned three-year post-project monitoring period. The estimates for indirect impacts reported by this project are based on IFC's estimate of 100 MW of installed geothermal capacity during the project monitoring period (by 2019).

**e) Productive use of energy:**

The Project will focus entirely on the promotion of power generation. The additional generation will help the Ethiopian power system to keep pace with rapidly growing demand without blackouts and load shedding that are severely detrimental to the productive use of electricity.

**f) Economic, social and environmental development impact:**

IRENA (International Renewable Energy Agency) estimates that the per capita consumption of electricity in Ethiopia is about 40-50kWh—among the lowest in the world. Energy experts note that a residential electricity supply of 500 kWh per person per year is needed for more comfortable life in homes and communities, and about 1000 kWh per person is needed to support modern industries and services and improve economic productivity.

The government has made major strides in recent years in improving energy access to its population, but currently only 14% of the population is connected to the grid. As access to the grid increases over time, there will be an increasing demand for electricity. Moreover, electricity demand will also increase due to population growth (growing at an estimated 2.6% a year) and economic growth—all of which will inevitably lead in the need for further expansion of the energy sector. For energy security reasons, the GoE has a plan to diversify the mix of new energy sources in its national strategy (CRGE), with at least 10% non-hydro renewable energy mix in the grid. Geothermal development is a key element of this strategy and this project will therefore contribute to the diversification of power generation in Ethiopia and also help the country achieve energy security and access.

**g) Economic and financial viability:**

A key objective of the Project is to implement an institutional and regulatory framework that allows private sector geothermal projects to be financially viable.

**h) Co-benefits of renewable energy scale-up:**

Please see above “f) economic, social and environmental development impact”.

### 13. Stakeholder Engagement

The Project will engage with stakeholders at various levels:

**At a Governmental Level:** The Government has requested IFC to help develop a long-term strategy for the geothermal sector and the necessary regulations to implement it. The development of the strategy will require very close and frequent engagement with a number of GoE entities, in particular the Ministry of Water and Energy, the Ethiopian Electric Power Corporation, the Ministry of Mines, and the Geological Service of Ethiopia. Moreover, the GoE has agreed to assemble a technical team with representatives from each agency to coordinate GoE’s input into the strategy and serve as a direct element of the project team. As the strategy must reflect GoE’s policy priorities and ultimately be endorsed at high levels in order to be implemented, this level of coordination and government input will be critical to project success.



**At a Private Sector Level:** Geothermal field exploration and the subsequent plant construction and power generation are both highly risky and highly complex, and much of the global expertise and experience is concentrated in a relatively small number of companies. The Project will engage with international geothermal exploration and development companies to identify appropriate development models for Ethiopia’s fields and to provide input into technical capacity requirements, support needed by private sector firms, and regulatory gaps or modifications needed to attract private investment.

**At a donor level:** Ongoing donor activities in the Ethiopia geothermal sector provide valuable input to the long-term sector strategy design and facilitate its implementation. Based on initial discussions with each donor, all parties have agreed to work closely together and share information when relevant. The Project team will build on initial discussions with USAID, JICA, and the World Bank and will continue to coordinate closely with them. In addition, as donor activity in the sector is increasing, IFC will formally join the Ethiopia Energy Sector Support Group, monthly working group for all donors active in the Ethiopia power sector to share their activities and identify synergies between their work.

#### 14. Gender Considerations

This project will undertake a strategy development and as such does not foresee specific gender-related considerations. Women and girls will benefit from increased electricity generation and security, which are indirect results of the Project.

#### 15. Indicators and Targets<sup>2</sup>:

Indicator	Target
<b><u>Direct impacts:</u></b>	
a) Number of recommended laws/regulations enacted	3
b) Number of recommended policies/practices improved	3
c) Number of entities that implemented recommended changes	4
d) Number of workshops, training events, seminars, conferences, etc.	10
<b><u>Indirect impacts</u> (based on an estimate of 100MW installed geothermal capacity during project lifetime (including 3-year post-implementation monitoring period))</b>	
a) Increase in availability of private financing for geothermal development (volume) <sup>3</sup>	Up to \$150 million

<sup>2</sup> The project level impact indicators listed in this proposal follow IFC’s internal policies. SREP is currently undertaking initiatives to establish results indicators that measure enabling environment for scaling-up deployment of clean energy investments. IFC will seek to harmonize its results reporting under this Project with SREP new directives on measuring policy and enabling environment once they are established.

b) Increase in renewable energy produced (in MWh) per year <sup>4</sup>	700,800
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## 16. Budget

<b>Total project costs:</b>	<b>2,000,000</b>
<b>Source of Financing</b>	<b>Amount (USD)</b>
SREP financing	1,500,000
Co-financing from the Government of Ethiopia	500,000

## 17. Project/Program Timeframe

Expected MDB Management Approval Date: February 2013  
 Expected Project closure Date: June, 2016 (estimated)

## 18. Other

**I. Implementation Arrangements** (including procurement of goods and services):  
 Projects activities will be implemented by IFC in coordination with the Ministry of Water and Energy. IFC will work closely with relevant departments within government ministries, with private sector partners, local government agencies and community organizations to implement the project. In terms of procurement of goods and services, World Bank Group procurement guidelines will be followed. For more information, please see:  
[http://siteresources.worldbank.org/INTPROCUREMENT/Resources/278019-1308067833011/Procurement\\_GLs\\_English\\_Final\\_Jan2011.pdf](http://siteresources.worldbank.org/INTPROCUREMENT/Resources/278019-1308067833011/Procurement_GLs_English_Final_Jan2011.pdf)

**II. Monitoring and Evaluation**  
 The Monitoring and Evaluation (M&E) process comprises of establishing baselines, target setting, data collection, tracking results, reporting and evaluation. The Project will collect information and results that will be used to monitor progress. New geothermal energy capacity and generation will be tracked, but it is expected that any generation resulting from the Project will materialize after the Project has closed, due to the long project development timeline of geothermal projects.

At project completion, a final evaluation will be conducted to establish overall impact of the Project. Given the long development timeframe of geothermal projects, an evaluation will also be conducted three years after project close.

<sup>3</sup> Based on an estimate of 100MW installed geothermal capacity during project lifetime (which includes a 3-year post-implementation monitoring period), assuming an 80% capacity factor and \$3 million/MW installed cost split evenly between the public and private sector.

<sup>4</sup> Ibidem