REQUEST FOR CEO ENDORSEMENT/APPROVAL

PROJECT TYPE: Full-sized Project
THE GEF TRUST FUND

GEF

Submission Date: March 23, 2010

PART I: PROJECT INFORMATION

GEFSEC PROJECT ID:
GEF AGENCY PROJECT ID: 557205
COUNTRY(IES): Turkey
PROJECT TITLE: Turkey Geofund
GEF AGENCY(IES): World Bank (IFC)
OTHER EXECUTING PARTNER(S):
GEF FOCAL AREA(s): Climate Change
GEF-3 STRATEGIC PROGRAM(S): OP#6 – Renewable Energy Use & Energy Conservation
NAME OF PARENT PROGRAM/UMBRELLA PROJECT: GEOFUND

Expected Calendar (mm/dd/yy)	
Milestones	**Dates**
Work Program (for FSPs only)	May 2003
Agency Approval date	Mar 2010
Implementation Start	Apr 2010
Mid-term Evaluation (if planned)	Sep 2012
Project Closing Date	Mar 2015

A. PROJECT FRAMEWORK (Expand table as necessary)

Project Objective: To address barriers to geothermal markets in Turkey through technical assistance and Geological Risk Mitigation. The increase of geothermal energy use by developing and implementing four financially viable projects in Turkey will help to accelerate the use of geothermal energy, build private-sector confidence in investing in this resourceand offering geological risk insurance, and demonstrate to the regulatory bodies at national and local government levels approaches to address geothermal resource risks cost effectively. Through this project direct GHG emission reductions of 18.4 million tons over a 20-year investment lifetime will be achieved

Project Components		**Expected Outcomes**	**Expected Outputs**	**GEF Financing***		**Co-financing***		**Total ($)**
				($)	%	($)	%	
1. Technical assistance	TA	Outcome 1: Capacity and awareness barriers reduced	Output 1.1: capacity enhanced and awareness raised Output 1.2: legal support ensures sound instrument structure Output 1.3: technical support ensures sound project appraisal, monitoring and surveillance Output 1.4: lessons learned widely disseminated	1,700,000	81%	400,000	19%	2,100,000
2. Geological Risk Mitigation	Investment	Outcome 2: Private sector investments facilitated through geological risk mitigation	Output 2.1: drilling operations take place to exploit geothermal resources	8,000,000	46%	9,500,000	54%	17,500,000
3. Contingency*	Investment & TA	-	-	300,000	100%	-	0%	300,000
4. Project management				-	0%	750,000	100%	750,000
Total project costs				10,000,000		10,650,000		20,650,000

*Contingency will be allocated to either component 1 or component 2 as required
[2] TA = Technical Assistance; STA = Scientific & Technical Analysis.

B. SOURCES OF CONFIRMED CO-FINANCING FOR THE PROJECT (expand the table line items as necessary)

Name of co-financer (source)	Classification	Type	Amount	%
International Finance Corporation (IFC)	Exec. Agency	In kind	1,150,000	100%
Total co-financing			1,150,000	100%

* Percentage of each co-financier's contribution at CEO endorsement to total co-financing.

C. FINANCING PLAN SUMMARY FOR THE PROJECT ($)

	Project Preparation*	Project	Total at CEO endorsement	Agency Fee	For the record: Total at PIF
GEF	-	10,000,000	10,000,000	-	-
Co-financing	-	1,150,000	1,150,000		-
Levered co-financing	-	9,500,000	9,500,000		-
Total	-	**20,650,000**	**20,650,000**	-	-

* The project is financed with GEF-3 resources and the agency fee was provided at the time of Council approval.

D. GEF RESOURCES REQUESTED BY AGENCY(IES), FOCAL AREA(S) AND COUNTRY(IES)[1] N/A

[1] No need to provide information for this table if it is a single focal area, single country and single GEF Agency project.

[2] Relates to the project and any previous project preparation funding that have been provided and for which no Agency fee has been requested from Trustee.

E. CONSULTANTS* WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	*Estimated person weeks*	*GEF amount($)*	*Co-financing ($)*	*Project total ($)*
Local consultants **	140	260,000	-	260,000
International consultants**	150	1,044,000	400,000	1,444,000
Total		1,304,000	400,000	1,704,000

Note: In addition to the consultant inputs above, USD 126,000 has been allocated to workshops, and USD 270,000 to travel under the technical assistance component.

* Where expertise is available in-house, IFC will utilize these resources as appropriate in lieu of external consultants. See notes in Annex C for full rationale. ** Details provided in Annex C.

F. PROJECT MANAGEMENT BUDGET/COST

Cost Items	Total Estimated Person Weeks (PW) (GEF only)	GEF ($)	Co-financing ($)	Total ($)
Local consultants *	-	-	400,000	400,000
International consultants*	-	-	315,000	315,000
Office facilities, equipment, vehicles and communications*				-
Travel*		-	35,000	35,000
Others		-	-	-
Total PM Budget		-	750,000	750,000

* Details provided in Annex C.

G. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? Yes
(If non-grant instruments are used, provide in Annex E an indicative calendar of expected reflows to your agency and to the GEF Trust Fund).

H. DESCRIBE THE BUDGETED M&E PLAN: The M&E framework will assess the Project's impact on the development of a sustainable market for renewable power. In developing the M&E plan IFC has drawn on the logframe (see Annex A) to create a results management framework that includes both indicators and targets.

The key performance indicators include:

- Project developers and financiers use the Geological Risk Mitigation instruments to implement geothermal projects in Turkey (target 4 projects implemented);
- Demonstration of the Geological Risk Mitigation instruments to government and private insurance providers interested in creating ongoing mitigation-type instruments to address exploration risks;
- GHG emission reductions (CO_{2eq}) (target: 18.4 million tons over a 20-year investment lifetime);
- Installed electrical / thermal capacity from geothermal sources (target: 73 MW_{el} and 117 MW_{th});

The project results will be captured on three levels: outputs, outcomes and impact:

> *Outputs* are the direct results of project activities and can normally be measured immediately or in a short-term period during the project timeframe. An output, for example, is the number of companies attending a specific training.
>
> *Outcomes* can usually be observed during the project life and certainly within 1-3 years after the completion of activities. Outcomes measure the achievement of objectives. An outcome, for example, is the specific change that a company attending a training event will finally implement in their operations.
>
> *Impact* is the desired final change, which measures the achievement of the original project goal and typically can be witnessed within 2-3 years after completion. In some cases, impacts can be measured already during the project timeframe. An example of an impact is the incremental revenue or saving generated in the company thanks to the measures introduced after the training received.

Key performance indicators defined in the logframe will be monitored semiannually during the program implementation. The detailed M&E plan describing the timeframe, responsibilities and method for data collection for each indicator will be developed prior to project implementation start.

Monitoring and evaluation will combine three complementary processes: (i) internal process of capturing short-term operational results; (ii) data collection on market characteristics from official sources and self reporting from sponsors' as a part of financing facility monitoring; (iii) external midpoint and final evaluation.

Midpoint and final evaluations
The objective of the external evaluations is to provide stakeholders with an independent assessment of the program's progress, results and recommendations on any changes in the project implementation, and in addition capture lessons learned for other initiatives.

The midpoint evaluation's main objectives will be to (i) measure program status with respect to its results based management logframe for outputs, outcomes and impacts (across the indicators, where relevant, measurement will be provided with respect to baseline); (ii) identify opportunities to improve Project execution effectiveness; (iii) refine the initial framework for evaluation being used by the Implementation Team, and (iv) as necessary, recommend adjustments in the Project execution strategy and implementation processes to the Implementation Team. The mid-term evaluation will allow the project team to reevaluate and reassess the overall strategy and make adjustments as necessary to enhance project impact. Some of the key areas of review during the mid-term evaluation would include:

1. Output, outcome and impact achievement; potential for impact given market and regulatory conditions; recommendations for achieving broader development impact; and an assessment of the existing measurement framework and indicators
2. Results from the customer surveys and interviews capturing feedback on level of satisfaction with the Project activities and outcome of advice, training and other assistance provided by the Project. Surveys should include feedback on relevance, value-added, quality of prepared materials and provided services etc.
3. Perception of the Project by other external stakeholders such as relevant business associations, training partners etc.
4. Analysis of program management procedures and administration.
5. Cost efficiency analysis, benchmarking against initiatives of GEF, IFC and/or other technical assistance projects.
6. Lessons learned and recommendations for improvement in Project organization, activities and targets.

The final project evaluation will be performed by the independent evaluator at the conclusion of the Project execution, and will review the similar areas to the mid-term evaluation and measure the Project's direct impacts.

The total M&E costs are currently estimated at $150,000 and will be paid for using supervision fees. A budget of $85 000 has been set aside for contracting external monitoring and evaluation contractors, and $15,000 for travel. Other costs associated with data collection are likely to account for about $50,000 during the course of the project.

PART II: PROJECT JUSTIFICATION:

A. STATE THE ISSUE, HOW THE PROJECT SEEKS TO ADDRESS IT, AND THE EXPECTED GLOBAL ENVIRONMENTAL BENEFITS TO BE DELIVERED:

Turkey's Energy Sector – Legal Framework, Policies and Issues
Turkey's 67 million people are significantly increasing their levels of energy consumption, which are currently far below the OECD average. At present, the country imports 90 percent of its oil and is very dependent on Russia for its natural gas.

Liberalization has been leading to a gradual opening of the Turkish energy market. Turkey has made early use of financing models such as build-own-operate (BOO) and build-own-transfer (BOT).
In 2001 the Government of Turkey approved the Electricity Market Law and established the Energy Market Regulatory Authority (EMRA). In the scope of the "Turkish Electricity Market Law", electricity production from renewable energy resources is encouraged. It contains two regulations pertaining to the promotion of the use of renewable energy: The legal entities applying for licenses for construction of renewable energy facilities are required to pay only 1 percent of the total license fee. Also renewables based generation facilities are exempt from paying the annual license fees for the first eight years following the facility completion date as specified in the license.

The Turkish Electricity Transmission Company (TEIAS) and/or distribution companies are required to give priority status for systems connection of generating facilities based on renewables. In 2004, the High Planning Council approved the Electricity Sector Reform Strategy to renew the reform process. According to the "8th Five Year Development Programme," the 2005 target for electricity production from renewable energy resources was as follows: 643 MW installed capacity from wind energy; 40 MW installed capacity from geothermal energy; and 10 MW installed capacity from biogas-waste. It is a main target of the government that wind power should account for 2 per cent of total installed capacity. In May 2005 Turkey adopted a new feed-in law for renewables and a new Development Program is currently under preparation.

Renewable Energy Resources. Non-fossil energy sources have a high share of energy supply in Turkey. Hydroelectric power already accounts for about 18 percent of electricity demand. Turkey's rapid growth in hydroelectric production in the water-starved Middle East has provoked disputes with neighboring countries. In addition to hydroelectric power, Turkey is encouraging the construction of wind power plants. The first facility was commissioned in December 1998, and the country has a goal of deriving 2 percent of its electricity from wind power.

Turkey has extended its involvement in geothermal energy projects, supported by loans from the Ministry of Environment, and geothermal energy is expected to increase substantially in coming years. Overall, Turkey has an estimated 2,000 MW of geothermal power production potential and 31,000 MW_{th}. Solar energy also could provide significant amount of power for Turkey, given the country's suitability in terms of solar radiation. Currently, solar power is used mainly for domestic hot water production. Additionally, Turkey needs to create a level playing field for renewables by allowing prices of conventional fuels to rise to market levels. This would help diversify and increase the use of alternative energies as sources for transport, such as natural gas-operated municipal buses and electricity-operated railway systems.

Geothermal Energy. Turkey is located on the Alpine-Himalayan orogenic belt, which has high geothermal potential. 188 geothermal fields have been discovered by MTA (General Directorate of Mineral Research and Exploration, a Governmental Establishment of Turkey), where 95 percent of them are low-medium enthalpy fields, which are suitable mostly for direct use applications (heating of cities, residences, thermal facilities and greenhouses, balneological use). Around 1200 hot and mineralized natural springs and 500 geothermal wells exist in Turkey.

The possible geothermal heat potential of Turkey is estimated by some as 31.500 MW_{th} (equal to 5 million residences equivalence[1] heating). Based on current consumer requirements about 1.25 million residences equivalence could possibly be heated geothermally in Turkey. However, currently only 71,500 residences are heated in this way. There is also limited use of geothermal energy for electricity despite potential of around 2000 MW_{el} – current installed capacity is 20.4 MW_{el} in Kızıldere, although production is much lower (7 MW_{el} in 2000) as a result of various technical difficulties.

Most of the development is achieved in geothermal direct-use applications by 1350 MW_{th}. 950 MW_{th} (which equals the heat requirement of 71,500 residences equivalence) of this potential is being used for geothermal heating including district heating, thermal tourism facilities heating and 1,600,000 m^2 geothermal greenhouses heating. The remaining 400 MW_{th} of this potential is being used for balneological purposes (there are 215 thermal facilities / spas in Turkey).

By summing up all these geothermal uses, the geothermal installed capacity in Turkey is 1,350 MW_{th} for direct thermal use and 75.2 MW_{el} for electricity production.

Geothermal District Heating (DH) Sector. Geothermal DH systems are the main geothermal utilization in Turkey. The DH systems applications were started with large-scale, city-based geothermal DH systems in Turkey. An annually average of 23 percent growth of residence connection to geothermal DH systems has been achieved since 1983 in Turkey.

The main units of geothermal DH systems are geothermal water production, reinjection, heat exchangers, piping system and pumps. By using the new approaches in determining the heat load instead of classical methods, the initial investment cost has generally been reduced. Fifteen years of experience showed that real heat loads were approximately three times lower than the heat loads evaluated by theoretical methods.

Geothermal policy. A Renewable Energy Law (No. 5346) was passed in 2005 that endorsed the increased and preferential use of renewable sources of energy, and required a certification of the resource under a Guarantee of Origin. This was taken to include geothermal energy; but because of a court ruling, it was necessary to enact a separate Geothermal Law (No. 5686) in 2007, specifically naming geothermal energy as one of the renewable sources, setting forth the rules and principles for exploring, producing and protecting geothermal and mineral water resources. This Law clearly authorized private development of the geothermal resource. In December 2007, the Turkish government adopted regulations governing procedures under the Geothermal Law. These include procedures for issuing and transferring licenses, auditing actions of the licensee, revoking licenses, and protection of the environment. As of July 2009, a draft amendment to the Renewable Law was being prepared in order to provide further incentives to the renewable energy sector. According to the draft, the proposed cap for geothermal resource is 9.0 Euro cents per kWh.

The sector issues noted above, in particular the financing barriers to RE, along with the Governments' commitment to address them, provide a compelling case for a GEF-supported contingent finance operation in Turkey for building a sustained market-based capacity to develop and finance geothermal projects on commercial terms under the proposed GeoFund.

Market Barriers to Geothermal Energy Development in Turkey

Significant barriers impede the increased use of renewable energy and geothermal energy in many ECA region countries. Three major barriers hinder the development of renewable energy resources (RER) in

[1] One Residence Equivalent (R.E.) corresponds to 100 m^2 of residential housing.

general, and two more are specific to the development of geothermal energy. The three general barriers that delay the increased utilization of RER in ECA countries, including Turkey, are:

- The lack of expertise and know-how about RER among energy sector decision makers at government-, industry- and local consulting services' levels;
- Energy market issues, including distorted energy policies (e.g., high subsidies for fossil fuels, energy tariffs not covering costs, lack of synchronization between various environmental support programs and the very frequent crowding out of potential support by excessive national subsidies), and inadequate and non-transparent legal, regulatory and institutional frameworks, leading to uncertainties in the heat and power industry and to a bias in favor of fossil fuels; and
- High transaction costs due to the typically small size of RER projects compared to the large fossil fuel-based projects.

In addition to the barriers impeding the development of RER, there are technology barriers particular to developing projects based on geothermal energy:

- High up-front costs relative to conventional heat/power generation technologies (due to the need to identify the geothermal deposits and drill high cost production/re-injection wells), and
- The associated geological risks of not finding sufficient resources during exploration or premature resource depletion during operation.

The barriers associated with the management of geological risks appear to be among the most difficult ones to tackle. Geological risks can be summarized as follows:

- Exploration risks: Dry well or insufficiently productive reservoir; lower than expected yield of the aquifer; lower than predicted temperature of geothermal fluid; lower than expected geo-physical/geochemical parameters of geothermal fluid (i.e. high Total Dissolved Substances (TDS), too much captive CO_2).

- Operating risks: Re-injection risks due to insufficient or quickly deteriorating long-term ability of the reservoir rocks to absorb the returned geothermal fluid due to gradual non-reversible clogging; thermal draw down caused by thermal breakthrough; critical corrosion or scaling of the walls steel casing endangering their strength or dramatically increasing the pressure losses.

While investors and financiers are willing to take conventional economic/financial and technological risks, the special knowledge that pertains to the assessment and handling of geological risks is often beyond the experience and capacity of both potential energy investors and lenders which reduces their willingness to undertake or participate in geothermal projects.

There is some positive experience with insurance instruments to cover exploration risks particularly in Germany and France, provided by private insurers, mostly in co-operation with government programs or match funding. However, at present, the risk of geothermal exploratory drilling in developing countries is considered very high which is why the private sector is not providing this sort of insurance to date. Turkey as a European Union neighbor may be a good testing ground for private insurers to move to other markets with significant potential.

Legislative support to the development of renewables in the ECA region has been growing and has reached different levels in different countries. The strongest support is found in Turkey.

Program summary

The Turkey Geofund project will address barriers removal in the geothermal sector in Turkey through two key instruments:

- **Technical assistance** for barrier removal, capacity building, and project preparation/ implementation (GEF contribution of US$ 1.7 million);
- **Geological risk mitigation** to help mitigate geological/ geothermal resource risks (GEF contribution of US$ 8 million).

Project Development Objective and Key Indicators

The Program objective of the GeoFund is to systematically promote the use of geothermal energy in the ECA region by removing barriers to the development of renewable energy.

The Turkey Geofund subproject will specifically aim to address barriers to geothermal markets in Turkey through technical assistance and Geological Risk Mitigation instrument (such as Geological Risk Insurance). The increase of geothermal energy use by developing and implementing a number of financially viable projects in Turkey will help to accelerate the use of geothermal energy, build private-sector confidence in investing in this resource, and demonstrate to the regulatory bodies at national and local government levels approaches to address geothermal resource risks cost effectively.

The key performance indicators include:

- Successful operation of appropriate Geological Risk Mitigation instruments in Turkey;
- Demonstration of the Geological Risk Mitigation instruments to government and private insurance providers interested in creating ongoing mitigation-type instruments to address exploration risks.
- GHG emission reductions (CO_{2eq}) (target: 18.4 million tons over a 20-year investment lifetime),
- Installed electrical / thermal capacity from geothermal sources (target: 73 MW_{el} and 117 MW_{th});

Project Components

The Turkey GeoFund Project will involve the provision of Technical Assistance, and Geological Risk Mitigation including:

Component 1: Technical Assistance (GEF funding US$ 1.7 million)

The technical assistance component of the Turkey GeoFund will address information and capacity barriers that slow the growth of geothermal energy in Turkey. Assistance will be provided for:

- **Capacity building and awareness raising** to improve understanding of geothermal energy in Turkey and project development;
- **Legal support in preparation of insurance and other documentation:** outside counsel will be retained to prepare model risk mitigation documentation for finance from the Geological Risk Mitigation fund. Counsel will also be used to review all other relevant agreements and comment or advise on conditions or necessary amendments as required;
- **Due-diligence, appraisal, monitoring and surveillance of projects** through the provision of international and local expertise with significant knowledge and experience of geothermal energy to assess, structure and monitor the GRI instruments;

- **Marketing / replication:** to ensure that the approaches to stimulating geothermal markets piloted in this project are replicated locally and internationally IFC will allocate a portion of the operational budget for Knowledge Management, education activities and information dissemination of targeted stakeholders within Turkey, as well as anticipating emergent opportunities in the other markets where similar instruments might be effective. Project developers will commit to sharing their project experience and information as a condition to receiving program support in order to facilitate demonstration and replication. During implementation the approaches will be developed in such a way as to facilitate replication, through development of, in particular general information, templates, model contracts, case studies, etc., that will be widely disseminated to key stakeholders and other interested parties.

Component 2: Geological Risk Mitigation (GEF funding US$ 8 million)
Depending on market dynamics, we will utilize one of the following 3 approaches to risk mitigation for our Stage 1 projects[2]:

- Providing a geological risk insurance product through the private sector and offer a first-loss guarantee to the private insurer, a premium cost buy-down to the project sponsors, or a combination of these approaches utilizing GEF funds. In this approach, a geological risk insurance product will be structured by a private insurer to cover temperature and/or flow rate. Based on the project due-diligence the insurance company will determine their comfort on the possibility of success and define the insurance premium. The Geofund intervention will focus on a combination of a first-loss provision and/or insurance premium cost buy-down to ensure the viability of the instrument and the optimization of the GEF funds. If the drilling proves successful the GEF funds will be able to continue supporting other wells as needed (with a declining level of cover) under the same project until the project is completed.

- Spearheading the creation of a fund for geothermal drilling which will provide soft loans to project developers for exploratory drilling similar to what Munich Re and KfW have done in Germany. GEF funds would reallocate risk by absorbing a larger portion of the downside risk and sharing a larger portion of the upside. In the German model, Munich Re has contributed €20 million to a €60 million fund which is being offered in conjunction with the German Federal Ministry for the Environment and state-owned KfW Bankengruppe in Frankfurt to help finance deep geothermal wells and minimize the productivity risk of the projects. Munich Re will also use its expertise to evaluate the productivity risk of geothermal well projects before a subsidized loan is granted. The subsidy in this approach comes in the form of a soft loan to project developers as the principal amount of the loan only needs to be repaid if the drilling is a success.

- Directly provide a contingent grant to project sponsors for exploratory drilling similar to the World Bank approach. This is the approach utilized in the Geofund Hungary project and more recently in the Argeo project. Under this approach, the IFC directly administers the geological insurance product to the project sponsors in the form of contingent grants which cover temperature and/or flow rate. If the drilling is a failure we pay out a certain pre-determined portion of the drilling costs to the project sponsor, whereas if it is a success than there is no payout. In this case, it is expected that the projects would catalyze further market development through a replication/demonstration effect. In addition, more market data will become available

[2] Please note that the structure we end up using will be heavily influenced by market dynamics. Hence, while the above structures are useful in communicating our approach, the optimal solution will be based on final negotiations with market participants. However, we will apply similar guiding principles to whatever approach we take and will, in every case, conduct thorough due-diligence as described below to ensure that we are using GEF funds in the most optimal and efficient fashion.

for the particular fields which could potentially facilitate the involvement of insurance companies at a later stage.

IFC will conduct its due-diligence analysis of the projects, through external as well as in-house technical and insurance experts on geothermal projects. This due-diligence analysis will assess the projects in detail, determine associated risks, and structure the projects in order to apply the best possible risk mitigation structure for each project, leveraging GEF funds in an optimal way to achieve the greatest leverage. We plan to hire external technical, insurance and risk experts with experience in developing, structuring and implementing risk management solutions who, together with our in-house insurance experts, will stress-test the economics of any transaction or structure that we undertake. Our insurance experts will present relevant price and market data to us which we will use in our negotiations with private sector stakeholders. For example, if we utilize option 1, our experts will conduct their own assessment to determine whether prices/premiums quoted by the insurance companies and project developers are commensurate with associated risks.

This approach will be complementary to our effort in creating competition among insurance providers. The longer term thinking is that the private sector's engagement with Turkey can serve as a pilot case for how an insurance company can cover this risk elsewhere leading to a more sustainable market for this type of insurance.

As an example a typical GRI, if we decide to go with option 3 and provide contingent grants as a means to address geological exploration risk, could work as follows:

a) Geological parameters such as wellhead temperature and flow rate will be selected as the key indicators to measure success and failure of geothermal exploration.
b) The threshold value for each parameter to define the full success, partial success/failure, total failure will be set. (e.g. full success above 150 degree Celsius, total failure below 80 degree Celsius, and partial success in between the two thresholds).
c) GRI will not be paid in the case of full success.
d) GRI will be paid for up to 85 percent of the eligible testing, drilling and exploration cost in the case of total failure defined by the lower threshold value.
e) GRI will be paid on a prorated basis in the case of partial success/failure based on the defined parameter value.
f) The beneficiaries of the GRI will pay an upfront premium assessed by the GeoFund through the project appraisal process.

The Geofund intervention could be at company/sponsor level or at Geofund project portfolio level. Risk diversification through project aggregation at the portfolio level will play an important role in the structuring of cost-effective Risk Mitigation instruments both directly or via an insurance company.

It is aimed to re-invest any unpaid amounts under the GeoFund risk mitigation activities for additional geothermal project activities, thus leveraging the funds for further market development and creating incentives for market players to minimize the risk of project failure. IFC will use these funds as efficiently as possible and in that regard, will operate the program as a revolving facility. This will allow us to lever up the existing GEF grant and have maximum impact. For instance, if our projects are able to drill successfully for the geothermal resource we will use funds originally committed to their project towards another exploratory drilling project as required and appropriate. This methodology will increase the replication potential and also incentivize the project sponsors to use the facility in the most effective way.

Early in 2009, the World Bank/IFC issued a Request for Proposals for applications to be supported by the GeoFund in Turkey. IFC received a total of 7 applications from 5 companies which were assessed by a team of external technical consultants hired to conduct thorough technical due-diligence on the proposals

received. The technical selection process resulted in a clustering of project proposals that we received for Turkey into three categories:

Category 1: Projects that will be considered in the first stage of the Geofund program

Category 2: Projects that will be considered after they reach a certain stage of development without Geofund intervention

Category 3: Projects that will not be considered

Two projects were in Category 1 which means they are at a relatively mature stage in their project planning and implementation. These are projects IFC can engage with as soon as the GEF project starts. GRI is an innovative product that has not yet been implemented in Turkey, therefore we will need to work together with the developers and the potential insurance companies to structure and customize the risk mitigation instruments based on the specific project needs (component 1). The following projects are in category 1:

Project A: This project is clustered as Category 1 project, once the well location has been confirmed and drilling success criteria defined.

Project B: This project is clustered as Category 1 project. The project sponsor is committed and has done significant progress in defining the drilling wells since the time they submitted their proposal to IFC. On the whole the application is well prepared and can be considered for Geofund support as soon as the exploration phase is completed and the drilling positions are identified.

In addition, 2 projects are in category 2 and are thus in the pipeline. Feedback will be provided to the developers on their proposal and they will be eligible to re-submit it when their project is at a more mature stage. The following fall under Category 2:

Project C: This project is clustered as Category 2 project, once drilling success criteria have been defined.

Project D: This project is clustered as Category 2 project. As the project is still at an early exploration phase, sufficient data for situating a well is not available and it is not considered, by the technical experts, timely to drill for the first well until further exploration activities have been conducted. Therefore, the project does not warrant a GRI at this stage but could be re-evaluated later after the exploration survey has been completed. However, the project presents interesting potential if the geothermal resource is confirmed.

Since we are in the process of negotiating with various stakeholders as to the exact nature of our intervention and support the numbers accompanying each project are indicative. Through our negotiations we will ensure that GEF funds are used in the most efficient manner possible and to try and have the largest possible impact on the market. Additionally, given market dynamics that see new market players enter the market and uncertainty about the viability of each and every current project (to be confirmed during due diligence), as well as the revolving nature of the allocated funds, it is anticipated that additional projects may be added to this list, should the opportunity arise.

B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL AND/OR REGIONAL PRIORITIES/PLANS:

As stated in Section A, the Turkish Government has created clear renewable energy policy to support geothermal energy including the Geothermal Law (No. 5686) created in 2007 which sets forth the rules and principles for exploring, producing and protecting geothermal and mineral water resources. This Law

clearly authorizes private development of the geothermal resource. Bylaws under this law include procedures for issuing and transferring licenses, auditing actions of the licensee, revoking licenses, and the protection of the environment. As of July 2009, a draft amendment to the Renewable Law was being prepared in order to provide further incentives to the renewable energy sector. According to the draft, the proposed cap for geothermal resource is 9.0 Euro cents per kWh. The project is clearly fully consistent with these plans and the priorities as expressed in these laws and bylaws.

C. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH GEF STRATEGIES AND STRATEGIC PROGRAMS:

The Turkey Geofund program falls under GEF-3 strategic program on Renewable Energy Use, and is submitted under GEF focal area Climate Change covering OP3: Promoting Market Approaches for Renewable Energy. The use of GEF funding is in line with overall GEF strategy to facilitate, lever, and complement other sources of financing, in this case mainly commercial financing. The proposed program is in accordance with the Climate Change focal area's overarching goal to support market transformation outcomes that contribute to GHG emissions reduction and avoidance.

D. JUSTIFY THE TYPE OF FINANCING SUPPORT PROVIDED WITH THE GEF RESOURCES.

The IFC has conducted numerous meetings with stakeholders in the Turkish geothermal energy market, including policy-makers, project developers, and companies that provide products and services related to geothermal energy. On the basis of these discussions and an analysis of existing market barriers (see Section A), the IFC has ascertained that the most effective approach to developing the market is through a combination of technical assistance and geological risk mitigation instruments.

E. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES:

The concept and objectives of the Turkey Geofund Program support IFC's strategy to assist Turkey in the sustainable use of its energy resources and related climate change impacts. The program is fully consistent with the World Bank and IFC Country Partnership Strategy (CPS), approved by the Board of Executive Directors. IFC is already supporting energy efficiency financing in the region through a wide range of Advisory Services to financial institutions, their clients, and other market players to support investments in renewable energy and energy effieincy.

In order to ensure the additionality of IFC's role, IFC has initiated and maintained dialogue with numerous development partners, including the IBRD, EBRD, and a number of bilateral donors. These discussions were used initially to identify the role of IFC in augmenting ongoing work. This dialogue has since been used to ensure that stakeholders are aware of the project goals and activities. The World Bank Group in general and IFC in particular have made mitigating climate change a key strategic pillar.

F. DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH INCREMENTAL REASONING :

As detailed in Annex F, the reasoning behind GEF participation in the proposed project is based on the removal of barriers and enabling the mobilization of domestic financing from commercial and public sources. GEF funding ($10 million) is directed to the removal of barriers to support the creation of sustainable markets for geothermal energy in Turkey. Without GEF participation and the demonstration of Geological Risk Mitigation instruments that this facilitates, private developers may not be able to develop and finance projects that benefit project partners and the country at large. It is the IFC intention that GEF support will lead to the creation of sustainable risk mitigation mechanisms for the support of geothermal energy resulting in long-term reductions of greenhouse gas emissions.

The direct reductions that can be attributed to this project are expected to be approximately 18.4 million tones of CO_{2eq} (savings from investments made during the 5-year project period, over a 20-year

investment lifetime) as a result of increased uptake of geothermal energy. A detailed break-down of direct and indirect emission estimates for the project are provided in Annex F.

G. INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS, THAT MIGHT PREVENT THE PROJECT OBJECTIVE(S) FROM BEING ACHIEVED AND OUTLINE RISK MANAGEMENT MEASURES:

The development and operation of geological risk mitigation in Turkey poses certain risks. These risks relate primarily to the successful introduction and market acceptance of the instrument, which is expected to be mitigated by sound market research and careful design. The main risks of the Program with mitigation measures are summarized in the table below:

Table 1. Critical Risks and Possible Controversial Aspects

Risks	Risk Mitigation Measures	Risk Rating with Mitigation
The current financial crisis is protracted and private sector funding remains severely constrained	The risk mitigation mechanism itself will alleviate this risk to some extent. The project will concentrate on economically viable projects. Technical Assistance in identifying potential investors. Mobilization of IFIs who can provide equity finance (e.g. EBRD, IFC)	Modest
Access to favorable commercial lending remains insufficient	Promotion of projects with local lenders through appropriate technical assistance activities. Demonstration of financial viability	Modest
Inadequate project sponsor capacities	Provision of technical assistance for project preparation, feasibility studies and business plans, as well as capacity building for project management	Modest
Unusually high occurrence of dry wells or inadequate wells, forcing abandonment of the projects and rapid depletion of the GRI	Insistence on thorough geological investigations. Possibly, provision of technical assistance to help investigate the geology and analyze the geological parameters.	Modest
Negative environmental or social impacts	The risks of negative environmental or social impacts will be mitigated through the application of IFC's environmental and social due diligence processes which strive to ensure that these issues are addressed according to best international practice.	Low
Overall risk rating:		Modest

Risk ratings:

High Risk (H)	Greater than 75% probability that the outcome/result will not be achieved
Substantial Risk (S)	Probability of 50 – 75% that the outcome/result will not be achieved
Modest Risk (M)	Probability of 25 - 50 % that the outcome/result will not be achieved
Low or Negligible Risk (N)	Probability of less than 25% that the outcome/result will not be achieved

H. EXPLAIN HOW COST-EFFECTIVENESS IS REFLECTED IN THE PROJECT DESIGN:

Obtaining adequate financing, especially for high-risk exploratory drilling, is difficult but essential. Financing has been the limiting factor in many geothermal projects, both in developed countries, such as the United States, and in the developing world (for example, the Philippines and Indonesia). The cost of surface exploration is relatively small and can add value to a 'green field' prospect. Financing for surface exploration usually can be raised from local markets, or via partnerships or private placements, or even from company cash reserves. However, the most difficult and time-consuming aspect of any geothermal project has been – and continues to be – obtaining financing to cover the cost of drilling exploratory

wells. This is the riskiest part of the project: either a discovery will be made, increasing project value significantly, or the project becomes a failure with only salvage value.

Alternatives to address the challenge of obtaining financing to cover the cost of drilling exploratory wells include venture capital and Direct Investment Funding (DIF) through providing low-cost loans, straight grants, or contingent grants.

Because of the risk, relatively few venture capital groups will undertake exploratory drilling. This usually causes delays – which in turn add to cost – and raises the cost of finance (and thus the IRR 'hurdle rate').

Analysis of worldwide exploration and development data indicates that discovery and confirmation drilling reduces project risk significantly, perhaps by as much as 70 or 80%. Another way of looking at this is that the resale value of the successfully drilled prospect will more than cover all expenditure. After discovery and confirmation (typically 2-3 wells) and a determination of feasibility, obtaining development financing is relatively straightforward, even if costly and requiring patience. Therefore, it is strongly recommended that any geothermal project undertaken in Turkey initially have sufficient financing in place to cover both the surface exploration and the drilling of exploratory wells.

For support of up-front investment costs and risks during the exploration and drilling phase, GRI would be a preferred instrument from a donor resource efficiency point of view. However, in countries where geothermal energy reservoirs have not been much exploited and reliable geological data are not available, it would be more appropriate to use a grant facility to support experimental geothermal projects. In addition, in capital scarce lower-income countries, capacity of the project sponsors to mobilize their own resources and local public and private capital for up-front investment tends to be more constrained than in middle income countries. Since in Turkey there project sponsors have good capacity to mobilize resources, a Geological Risk Mitigation instrument such as GRI as proposed here are is preferred.

As indicated in the incremental cost analysis, under the most likely case scenario using the Geological Risk Mitigation instrument proposed in this project, at a cost per tonne of USD 0.6/tCO_{2eq} (10 million USD from GEF, resulting in 18.4 million tons direct reduction over the project lifetimes) equivalent GHG abated, the Program provides a cost effective intervention to reduce GHG emissions in Turkey. In line with the GEF strategy to lever its funding from other resources, the GEF funds of USD 10 million will be matched with private sector funding.

PART III: INSTITUTIONAL COORDINATION AND SUPPORT

A. INSTITUTIONAL ARRANGEMENT:

The Turkey Geofund project will be implemented by IFC in collaboration with Ministry of Environment and Forestry of Turkey through a project implementation team based in IFC offices in Istanbul and Washington. Partnership with the CTF is not currently envisioned.

B. PROJECT IMPLEMENTATION ARRANGEMENT:

The Implementation Team will be responsible for overseeing all the activities of the Program, and be the key point of contact with the Turkish Government stakeholders and others ensuring efficient execution of all aspects of the project. Product structuring and pricing, as well as oversight of the financial portfolio (direct investment, as well as other financial instruments offered to eligible FIs, etc.) will be supported by IFC investment staff with appropriate credit and deal structuring expertise, while IFC advisory staff will oversee the technical assistance activities.

The project Implementation Team will be balanced with appropriate resources to reflect the two project Components. This will include, in addition to program management resources, expertise in the areas of insurance, law, geothermal energy and investment expertise.

In addition, a team of consultants (managed by the Implementation Team) will be drawn upon to support the technical assistance component work.

Monitoring and Evaluation (M&E) will be supported by an externally-hired independent evaluator. Program monitoring, will be the primary responsibility of the Project Implementation Team, with M&E consultant providing validation of the baseline, as well as completing the mid-term and final program evaluations.

Advisory committee

A proven technique IFC has employed in multiple private sector-focused market development programs in the past, to secure stakeholder dialogue, is to organize an Advisory Committee consisting of Ministry of Environment and Forestry of Turkey representatives from relevant ministries, local government agencies, NGOs, private companies, utilities, and end-user associations with interest in SE project development and finance. The main role of the Advisory Committee is to provide advice and feedback on the Program design and support implementation during program operations with policy support and by facilitating key partnerships across the market. The Advisory Committee also provides a forum for the advancement of sustainable energy finance. The Advisory Committee members typically play important roles in promoting and sustaining a favorable policy environment for investments.

The Advisory Committee will be convened by the IFC project implementation team semiannually to advise the Program on operational issues and promote its coordination with other national initiatives and policies. The first Advisory Committee meeting will be organized after launching the Program. The purpose of the first meeting will be to announce that the Program has started its operation, present Program strategies for the first year and discuss the implementation plan. Potential interested, government, FIs and other partners would be invited to the meeting as observers.

The purpose and the agenda of the following meetings will be to present Program activities of previous year and strategy for the upcoming year. The Committee members may provide comments and advise the Program implementation team on specific questions, and might provide information on policy, legal and government strategies related to the geothermal sector. The Advisory Committee can also serve as a lobbying body to support Program implementation by addressing critical business related policy and strategy issues at the government level. Beyond the semi-annual Advisory Committee meetings, Program

management and implementation team may contact the Committee members to seek advice on issues raised during day-to-day Program operation.

The Advisory Committee is also a potential forum to handle possible objections and questions coming on environmental and social issues related to sub-projects under the Program. These possible questions may come from the government or NGOs. In specific cases, the Committee may issue official declarations on these issues to the public.

Stakeholder Involvement

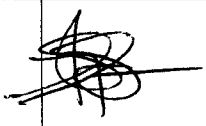
IFC is engaging in extensive consultations with local stakeholders. Local stakeholder participation in the Program (in particular related to Component 1 where technical assistance will be the focus), will be encouraged where possible including with representatives from government, developers, financial institutions, transmission infrastructure management, utilities, civil society and project teams for complementary projects in Turkey or in the region. This list is by no means exhaustive and simply serves to illustrate the profile of select interested parties. Relevant partners will be added as and when they are identified.

PART IV: EXPLAIN THE ALIGNMENT OF PROJECT DESIGN WITH THE ORIGINAL PIF:

The proposed project is part of the GeoFund that was approved by Council under GEF-3 and prior to the introduction of the PIF. The project is aligned with the GeoFund's objectives and processing requirements.

PART V: AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for CEO Endorsement. (A completed and signed copy of this certification is attached separately)

Agency Coordinator, Agency name	Signature	Date *(Month, day, year)*	Project Contact Person	Telephone	Email Address
Steve Gorman WB/GEF Coordinator			Alexios Pantelias	90-212-385-2527	APantelias@ifc.org
Stacy Swann IFC/GEF Coordinator		23 March 2010			

ANNEX A: PROJECT RESULTS FRAMEWORK

Project Strategy	Objectively Verifiable Indicators	Sources of Verification	Assumptions
Impact			
GEF Strategic Priorities: Strategic Program 3: Promoting Market Approaches for Renewable Energy	Project developers and financiers use the Geological Risk Mitigation instruments to implement geothermal projects in Turkey (target 4 projects implemented by end of project); Demonstration of the Geological Risk Mitigation instruments to government and private insurance providers interested in creating ongoing mitigation-type instruments to address exploration risks; GHG emission reductions (CO2eq) (target: 18.4 million tons over a 20-year investment lifetime); Installed electrical / thermal capacity from geothermal sources (target: 73 MWel and 117 MWth).	Reporting from project sites, data from feasibility studies, verification of savings and electricity generated	Geothermal resources meet expectations and IPPs find the line of business profitable Implementation of project activities will foster geothermal energy and lower CO_{2eq} emissions
Outcomes			
Barriers to geothermal energy in Turkey are reduced	Technical assistance facilitates cost effective use of Geological Risk Mitigation instruments Investment facilitated into geothermal energy through provision of geological risk mitigation of 8 million USD, enabling 4 wells to be drilled.	Existence of legal documents, evidence of framework being used within investments. Sponsor's regular reporting to the project as part of financing facility monitoring. Compilations of project data reported by sponsors	Regulation currently under discussion is, with the support of the programme, indeed enacted and enforced. The Program overcomes existing renewable energy market barriers and builds a sustainable renewables market capacity The barriers we identified are indeed the principal constraints to growth in this area. There is no major deterioration in the macro economic and political climate, and Turkey emerges from the current financial crisis within the next two years.

Outputs			
Component 1: Technical assistance	Capacity built and awareness raised to improve understanding of geothermal energy in Turkey. Average capacity score doubled by project end-term compared to start of project baseline	Survey of capacity shows change in availability of information[3]	
	Risk mitigation structure and documentation of high quality enable cost effective operation of risk instruments	Expert assessment of the geological risk mitigation instrument structure[4]	
	Due diligence, appraisal and monitoring of project implementation ensures cost effective operation of risk instruments	Mid- and End-term evaluation of the project will be used to rate cost effectiveness of the instruments and the contribution of due diligence, appraisal and monitoring to effectiveness	
	The best practise from the program is widely disseminating thereby maximizing local and international replication	Records of marketing impact, impact logs. Responses to marketing efforts in terms of enquiries and requests for information will be tracked throughout the project. Impact logs will be used to record responses in government and media.	
Component 2: Geological risk mitigation	Applications for the risk mitigation instruments received and supported: Target 2 by year 2 and 4 by end of project.	Reports from operations of the mitigation instruments.	With effective provision of geological risk mitigation instruments, barriers to investment can be sufficiently reduced to make investment profitable and attractive.

[3] The system for scoring capacity, including weighting of factors, will be determined at project inception. Scores will be assigned based on results of the start of project survey, and compared to that in the end-term survey. Indicators for enhanced capacity may include: knowledge of geothermal energy and international best practice, knowledge of local potential and benefits, presence of processes and procedures to facilitate growth of geothermal energy.

[4] Independent peer reviews of the structure and quality of documentation will be carried out by leading experts. Quality criteria, including fitness for purpose, cost effectiveness, and fit with local conditions will be rated low, medium, high or excellent and an overall score calculated, with an overall target of 'high' by the end of the project. Baseline: structure and documentation do not exist.

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF)

Comments received on the overall GeoFund approval were addressed at the time of Council approval and CEO endorsement of the GeoFund (October 2006)

ANNEX C: CONSULTANTS TO BE HIRED FOR THE PROJECT USING GEF RESOURCES

Position Titles	$/Person Week	Estimated PWs	Tasks to be performed
For Technical Assistance			
Local			
Technical Experts (Geoscientists, Financial Analysts, Geothermal Engineers)	2,000	80	Technical and strategic advice, due-diligence, appraisal, monitoring and surveillance of projects
Knowledge management experts	2,000	40	Preparation of marketing and communications materials for different stakeholders, publications in external magazines
Legal advisors	1,000	20	Legal expertise supporting contractual arrangements locally
International			
Legal Advisors	6,000	24	Legal expertise supporting contractual arrangements at an international level with external stakeholders (eg. with private sector insurance company)
Financial specialist	6,000	50	Geological Risk Mitigation instrument structuring
Technical Experts (Geoscientists, Financial Analysts, Geothermal Engineers)	7,500	80	Strategic advice, due-diligence, appraisal, monitoring and surveillance of projects
Justification for Travel, if any: Travel will be required to different locations in Turkey for e.g., appraisals, due-diligence, meetings with the decision-makers and with project beneficiaries, and ongoing project monitoring. The sum of budgets for above consultants ($1,304,000) plus travel at $270,000 plus workshops at $126,000 = $1,700,000 which is GEF contribution to TA component of the program. This is an indicative budget and represents estimated costs based on current industry knowledge. These numbers may be revised during actual implementation to better reflect market dynamics.			

Where expertise is available in-house, IFC may utilize these resources as appropriate in lieu of external consultants. For example, for the financial expertise listed above external experts would cost at estimated 8000 USD per week and need to be hired for 60 PW. *This would mean greater costs of 10% of the TA budget for no added benefit to GEF.*

ANNEX D: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS

Note: These activities took place prior to IFC involvement

ANNEX E: CALENDAR OF EXPECTED REFLOWS

USD 8 million will be allocated to funding a Geological Risk Mitigation instrument, which is described in Component 2. For the 5-year duration of this program, any unpaid amounts under these GeoFund risk mitigation instruments will be reinvested for additional geothermal project activities, thus leveraging the funds for further market development and creating incentives for market players to minimize the risk of project failure. IFC will use these funds as efficiently as possible and in that regard, will operate the program as a form of revolving facility. This will allow us to lever up the existing GEF grant and have a maximum impact. For instance, if our projects are able to drill successfully for the geothermal resource we will use funds originally committed to their project towards another exploratory drilling projects as required and appropriate. This methodology will increase the replication potential and also incentivize the project sponsors to use the facility in the most effective way.

After the 5-year program period, any money remaining in the fund will be returned to the GEF.

ANNEX F: INCREMENTAL REASONING

Introduction

Turkish installed power capacity is about 40 GW with a need for about 2 – 3 GW of additional generating capacity to be installed annually. The potential for geothermal energy is estimated at about 2,000 MW of power and 31,000 MW_{th} heat, with current installed capacity only 75.2 MW_{el} and 1,350 MW_{th} (including all thermal spas, greenhouses, and district heating).

As discussed in the body of this proposal, the main reasons for slow development of geothermal energy projects relate to the specific characteristics of geothermal energy, namely:

- High up-front costs relative to conventional heat/power generation technologies (due to the need to identify the geothermal deposits and drill high cost production/re-injection wells), and
- The associated geological risks of not finding sufficient resources during exploration or premature resource depletion during operation.

Rationale for GEF involvement

The justification of this project for GEF participation is based on the removal of barriers to geothermal energy and enabling the mobilization of international and domestic financing from commercial and public sources. GEF funding ($10 million) is directed to the removal of barriers to address geological risks associated with drilling of wells. The risk associated with the drilling of wells is a major hurdle to overcome in the exploitation of potential resources. Without GEF participation, private and municipal developers may not be able to develop and finance projects that benefit project partners and the country at large. GEF support could help to lead to the creation of sustainable private geological risk insurance mechanisms (possibly with support of the public sector) for the support of geothermal energy resulting in long-term reductions of greenhouse gas emissions.

As a result of GEF participation, total funding of US$ 260 million could be mobilized in the form of investments. Total funding has been estimated as follows:

Project pipeline	GRI (USD)	Total cost of wells (USD)	Capacity (MW_{el})	Capacity (MW_{th})	Estimated total project investment (USD)
Project A	2,867,000	3,372,941	60.0		196,000,000
Project B	1,370,880	1,958,400	10.0	40.0	45,000,000
Project C	980,669	1,153,728		69.0	1,153,729
Project D	4,356,415	5,125,194	2.9	8.0	17,000,000
	9,574,964	**11,610,264**	**72.9**	**117.0**	**259,153,729**

Note: These projects and their respective data represent the current best estimate by the project team. Given the significant dynamics in the market and differing risks and commercial dynamics, it is anticipated that some of the above mentioned projects may ultimately not be pursued while other projects may be added to the list.

System boundary

The geographical boundary of the proposed project is the national territory of Turkey.

The baseline scenario

The baseline scenario describes the project without GEF support. According to the "8th Five Year Development Programme" the 2005 target for electricity production from renewable energy resources was as follows: 643 MW installed capacity from wind energy; 40 MW installed capacity from geothermal energy; and 10 MW installed capacity from biogas-waste.

While there are significant geothermal resources available, and a growing interest in exploiting these resources given government policy to develop them, the rate of growth may be limited and slower without GEF support to address geological risks.

GEF Alternative Scenario

Under *the alternative scenario,* GEF support (along with co-financing) is expected to remove barrier to the development of geothermal energy, thereby addressing the high up-front costs relative to conventional heat/power generation technologies (due to the need to identify the geothermal deposits and drill high cost production/re-injection wells), and the associated geological risks of not finding sufficient resources during exploration.

The Project will include the following components:

- **Component 1: Technical Assistance:** The technical assistance component of the Turkey GeoFund will address information and capacity barriers that slow the growth of geothermal energy in Turkey. Assistance will be provided for a range of technical assistance needs including: capacity building and awareness raising to improve understanding of geothermal energy in Turkey; legal support in preparation of insurance documentation.

- **Component 2: Geological Risk Mitigation:** The Geological Risk Mitigation component will help to mitigate the geological risks associated with geothermal energy exploration and operation. The GRI or other mitigation instrument is designed to cover part of the drilling and exploration cost or operational cost in the event that less than the expected level of geothermal energy is found in the wells or a higher than expected deterioration rate of geothermal energy coming out of the well over time. The GRI would insure project developers/investors/lenders against such geological risks that are generally considered one of the key barriers for geothermal energy investment.

To determine the emissions reductions resulting from the Turkey Geofund we have used the project-level calculation formulae provided by the GEF for direct, direct post-project, and indirect CO_2 reductions. The following figures were used as inputs into the emission reduction estimations:

Summary of key figures	
GRI facility (with 3 million USD cap)	$ 8,000,000
Electrical capacity to be installed	73 MW_{el}
Thermal capacity to be installed	117 MW_{th}
Equipment lifetime	20 years
Estimated size of total enabled investments	$ 260,000,000
Emission factor[5]	0.537 tCO2/MWh

Estimated geothermal power installed as a result of project		Power	Heat	CO2 savings in 2015 (tonnes)
Geothermal power	TWh	0.66	1.05	917,787
	MW	72.90	117.00	

[5] Source: RETScreen v4. Figure covers entire power sector and assumes no net GHG emissions from geothermal energy. We have assumed that the displaced heating which will be provided by geothermal energy was provided by electricity.

Using the above figures, and assuming a linear investment profile over the 5-year project starting from year 2, projections of emission reductions in the GEF alternative can be estimated.

Direct reductions

The direct reductions that can be attributed to this project are expected to be approximately 18.4 million tonnes of CO_{2eq} (savings from investments made during the 5 year project period, with a lifetime estimate of 20 years) as a result of increased uptake of geothermal through the financing facility to be established during this project. The annual and cumulative emission reductions are shown in the table below.

CO_2 savings	Annual reductions	Cumulative reductions
Year 1	-	-
Year 2	229,447	229,447
Year 3	458,893	688,340
Year 4	688,340	1,376,680
Year 5 (end of project period)	**917,787**	**2,294,467**
Year 6 (direct post-project)	917,787	3,212,253
Year 7	917,787	4,130,040
Year 8	917,787	5,047,827
Year 9	917,787	5,965,614
Year 10	917,787	6,883,400
Year 11	917,787	7,801,187
Year 12	917,787	8,718,974
Year 13	917,787	9,636,760
Year 14	917,787	10,554,547
Year 15	917,787	11,472,334
Year 16	917,787	12,390,120
Year 17	917,787	13,307,907
Year 18	917,787	14,225,694
Year 19	917,787	15,143,481
Year 20	917,787	16,061,267
Year 21	917,787	16,979,054
Year 22	688,340	17,667,394
Year 23	458,893	18,126,287
Year 24	229,447	18,355,734
Year 25	-	**18,355,734**

Direct post-project emission reductions

Since it is currently not known whether the financing facility to be established by IFC under this program will be renewed, no Direct Post Project emission reductions have been counted in this analysis.

Indirect emission reductions – top down

Starting from resources, and based on assessments carried out by local experts, the market potential for renewable energy over the next 10 years is estimated to be 22 GW. The GHG emission reduction per year would be 26 million tons CO2eq. With a linear growth, and a 20-year investment lifetime, this would amount to approximately 520 million tons. Using a GEF causality factor of 40% since the project impact is considered to be "modest", the attributable indirect emission reduction impact is 208 million tons CO2.

Indirect emission reductions – bottom up

Based on a replication factor of 4 and the direct impact of 5 million tons we expect an additional indirect reduction of 20 million tons.

Calculations
The outcome of calculations is shown in the following table:

Sources of reduction	Emission reductions (tons CO_2)	GEF Contribution factor	Total (tons CO_2)
Direct (5 years)	5,000,000	1	**5,000,000**
Indirect – top down (10 yrs)	520,000,000	0.4	**208,000,000**
Indirect – bottom up (10 yrs)	20,000,000	1	**20,000,000**
TOTAL			**5 million to 208 million**

Note: in the above table the top-down indirect emission calculations include the project period, whereas the bottom-up figures do not.

Local Benefits: include: (i) reduction in local pollution; (ii) building of the institutional capacity and know-how in planning, assessing, and financing renewable projects, (iii) increased employment in the renewable energy sector and (iv) contribution to the governmental policy to diversify energy sources, in particular, in remote regions.

In addition, the project will have a positive impact on Turkey's consulting and manufacturing industry. Finally, new financial instruments will become available, such as contingent grants and soft loans.