Document of
The World Bank

Report No: 37317-ECA

PROJECT DOCUMENT

ON A

PROPOSED GLOBAL ENVIRONMENT FACILITY GRANT

IN THE AMOUNT OF US$810,000

TO THE INTERNATIONAL GEOTHERMAL ASSOCIATION

AND US$3.72 MILLION

TO THE HUNGARIAN OIL AND GAS COMPANY, PLc

AS PART OF THE US$25.0 MILLION

GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

IN

EUROPE AND CENTRAL ASIA

October 18, 2006

Sustainable Development Department (ECSSD)
Central Europe and the Baltic States Country Unit (ECCU7)
Europe and Central Asia Region

CURRENCY EQUIVALENTS
(Exchange Rate Effective September 5, 2006)

Currency Units = Hungarian Forint (HUF)
217.06 HUF = US$1

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AA	Administrative Agent
APL	Adaptable Program Loan
CAS	Country Assistance Strategy
CIS	Commonwealth of Independent States
CO2	Carbon Dioxide
DH	District Heating
DIF	Direct Investment Funding
DO	Development Objective
EA	Environmental Assessment
EBRD	European Bank for Reconstruction and Development
ECA	Europe and Central Asia Region
EE	Energy Efficiency
EIB	European Investment Bank
EMP	Environmental Management Plan
EU	European Union
EXGRI	Exploratory Geological Risk Insurance
FM	Financial Management
FSU	Former Soviet Union
GA	Grant Agreement
GAF	GeoFund Advisory Forum
GCT	GeoFund Coordination Team
GeoE	Geothermal Energy
GEBS	Global Environmental Benefits
GED	Geothermal Energy Development
GEF	Global Environmental Facility
GEFSEC	Secretariat of the GEF
GeoFund	ECA Geothermal Energy Development Program
GHG	Greenhouse Gas
GoHU	Government of Hungary
GRI	Geological Risk Insurance
EIB	European Investment Bank
IBRD	International Bank for Reconstruction
IFC	International Finance Corporation
IFIs	International Finance Institutions
IFR	Interim Financial Report
IGA	International Geothermal Association
IRR	Internal Rate of Return
ISDS	Integrated Safeguards Data Sheet
LEBS	Local environmental benefits
MoA	Memorandum of Agreement
MOL	MOL Hungarian Oil and Gas Company
MW	Megawatt per hour
NGO	Nongovernmental Organization
NOx	Nitrogen Oxides
NPV	Net Present Value
OECD	Organization for Economic Cooperation and Development
OM	Operational Manual
OPGRI	Operational Geological Risk Insurance
PAD	Project Document
PCN	Project Concept Note
PM10	Particulate Matter less than 10 microns in diameter
PMU	Project Management Unit
PPA	Power Purchase Agreement
RE	Renewable Energy
RER	Renewable Energy Resource
SA	Screening Application
SO_2	Sulfur Dioxide
SOE	Statement of Expenses
STE	GeoFund Group of Scientific and Technical Experts
TA	Technical Assistance
TDS	Total Dissolved Substance
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization

Vice President:	Shigeo Katsu
Country Director:	Suman Mehra (acting)
Sector Manager:	Charles Feinstein
Task Team Leader:	Helmut Schreiber

EUROPE AND CENTRAL ASIA
GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

CONTENTS

GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

PROJECT DOCUMENT

Europe and Central Asia Region
ECSSD

Date: October 18, 2006 **Country Director:** Suman Mehra (acting) **Sector Manager:** Charles Feinstein **Project ID:** P075046 **Lending instrument:** Horizontal APL	**Team Leader:** Helmut Schreiber **Sector(s):** Renewable energy (75 %); District heating and energy efficiency services (25%) **Themes:** Climate change; Environment; Energy **Environmental screening category:** FI

Project Financing Data

[ ] Loan [ ] Credit [x] Grant [ ] Guarantee [ ] Other

Total GEF financing: US$4.53 million
Proposed terms: as per Grant Agreement

International Geothermal Association (IGA) Subproject Financing Plan (US$ million)

Source	Local	Foreign	Total
Recipient: International Geothermal Association			
Global Environment Facility		0.810	0.810
Total			0.810

Hungary Subproject Financing Plan (US$ million)

Source	Local	Foreign	Total
Recipient: Hungarian Oil and Gas Company, PLc (MOL)	18.6		18.6
Global Environmental Facility (GRI as contingent payment)		[3.72]	[3.72]
Total			18.60

Recipients: International Geothermal Association (IGA), Hungarian Oil and Gas Company, PLc. (MOL)

Responsible Agencies

IGA	The IGA Secretariat c/o Samorka Sudurlandsbraut 48, 108 Reykjavik, Iceland
MOL Hungary	Mr. Attila Kujbus, Project Manager Ministry of Environment and Water Fö utca 44-50, 1011 Budapest, Hungary, Phone: +36 1 457 3300,

Estimated disbursements of the Program (Bank FY/US$m)

FY	2007	2008			2009 - 2015							
	IGA	IGA	MOL	Other	AM	RU	TR	TJ	UA	IGA	Other	Total
Disbursement	0.5	0.31	[3.72]*	[6.97]	[4.7]	[2.1]	[3.9]	0.2	0.2	0.2	[2.2]	[25.0]

*These numbers in bracket include the amount under GRI operation. Disbursement under GRI will only occur when the geological risk materializes.

Program implementation period: July 1, 2006 to December 31, 2014 (8 years)
Expected effectiveness date: December 15, 2006
Expected closing date: Program: June 30 , 2015
IGA Grant: December 30, 2008
MOL Grant: September 30, 2007

Does the project depart from the CAS in content or other significant respects? ○ Yes ○ No

Does the project require any exceptions from Bank policies? Have these been approved by Bank management? Is approval for any policy exception sought from the Board?	○ Yes ○ No ○ Yes ○ No ○ Yes ○ No
Does the project include any critical risks rated "substantial" or "high"?	○ Yes ○ No
Does the project meet the Regional criteria for readiness for implementation?	○ Yes ○ No

Project development objective: ***Ref. PAD B.2, Technical Annex 3***

The objective of the Program is to systematically promote the use of geothermal energy in the Europe and Central Asia region by removing barriers to the development of renewable energy.

Global environment objective: ***Ref. PAD B.2, Technical Annex 3***

The Program's global objective is to reduce greenhouse gas (carbon dioxide) emissions.

Project description:

The Program will be an umbrella for geothermal subprojects in participating countries of the Europe and Central Asia Region and will involve the provision of technical assistance for (i) capacity building to remove knowledge barriers; (ii) policy reviews and amendments; (iii) project preparation as well as financial assistance to facilitate the access to additional commercial financing on reasonable terms; (iv) direct investment funding; and (v) geological risk insurance.

The Global Environment Facility provided grant financing to set up the World Bank implemented Geothermal Energy Development Program (GeoFund). Funding of the tasks above will be through the three principal instruments of the GeoFund:

- A ***technical assistance window***, to address barriers that retard the use of renewable energy resources and geothermal energy. It will also help set up or systematize geothermal databases, will contribute to dissemination of geothermal knowledge and know-how, and will help to identify and prepare/implement geothermal projects.
- A ***direct investment funding window*** that would provide low cost loans, contingent grants and outright grants, covering part of the project cost through monetization of external benefits.
- A ***geological risk insurance window*** to partially insure project developers/investors against the short-term and medium-term geological risks.

Which safeguard policies are triggered, if any?

As the environmental category of the Program will be FI, no safeguard policies are triggered by the GeoFund Program itself. Subprojects will be individually assigned environmental screening categories.

Significant, non-standard conditions, if any, for:

Board presentation: none

Grant effectiveness conditions:

For IGA:

- the Recipient shall have established the financial management system satisfactory to the Bank; and
- the Recipient shall have opened the Special Account.

For MOL:

- The execution and delivery of the Grant Agreement on behalf of the Recipient have been duly authorized or ratified by all necessary governmental and corporate action.
- The condition of the Recipient, as represented or warranted to the Bank at the date of the Grant Agreement, has undergone no material adverse change after such date.
- The Recipient shall have paid to the Bank the non-refundable processing fee in United States Dollars in an amount equal to ten thousand United States Dollars ($10,000) and a premium in United States dollars in an amount equal to three percent (3%) of the Insurable Expenses.

Covenants applicable to Project implementation for MOL:

The Recipient to:

a) use all reasonable, due and usual care and skill in conducting the Exploration Activities;
b) comply with all laws and regulations applicable in undertaking and conducting the Exploration Activities;
c) take all measures necessary to carry out the Environmental Management Plan in a timely manner, ensuring adequate information on the implementation of said measures is suitably included in the Project Reports;
d) maintain the financial, technical and engineering records of the Exploration Activities; and
e) promptly notify the World Bank of any material changes in the Exploration Activities (including material physical damages) or the organizational and ownership arrangement of the Consortium.

A. STRATEGIC CONTEXT AND RATIONALE

1. Country and sector issues

Many countries of the Europe and Central Asia Region (ECA) lag behind current European Union (EU) member states in regards to the use and the development of renewable energy resources (RER). Significant barriers impede the increased utilization of renewable energy and, more specifically, geothermal energy (GeoE) in these countries. There are three major barriers hindering the development of RER, and two more that are specific to the development of GeoE. The major barriers that retard the increased utilization of RER in ECA countries include:

- 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 the 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/geo-chemical 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.

The above issues relating to the technological investment hurdles are common to all ECA countries (see Annex 1). Financial barriers show a less even picture across the region as these are related to the availability of public and private equity finance, the performance of the banking system, the general investment climate, and economic development in a given country. Financial barriers tend to be less significant in the western parts of the ECA region, i.e., in the countries that have recently joined the EU or are designated EU accession countries, but can be prohibitive in Former Soviet Union (FSU) countries.

Legislative support to the development of RER in the ECA region has been growing and has reached different levels in different countries. The strongest support is found in Turkey. Some of the countries that recently joined the EU exhibit various degrees of support for RER, following the recommendations of the EU. Non-EU countries for the most part do not have any favorable rules and regulations towards RER in place:

In ***Turkey*** electricity production from RER is encouraged. The "Turkish Electricity Market Law" contains two regulations pertaining to the promotion of the use of RE. The Turkish Electricity Transmission Company and/or distribution companies are required to give priority to generating facilities based on renewables.

A number of indirect incentives exist in ***Hungary*** and other Central European Countries to promote the use of RER, including lower import duties on equipment and lower taxes or tax holidays; there is also substantial legislative support for RE in these countries.

Armenia adopted a legal framework supportive to the development of RER. Armenian law guarantees purchase of RE and provides payment assurance. The regulatory commission has set attractive tariffs (USc 4.5/kWh for small run-off river hydropower and USc 7.0/kWh for wind and biomass plants) for 15 years. As a result, over 30 project developers have been granted construction licenses for RE projects recently. A number of barriers and constraints, however, still impede large scale private investments in RE projects (lack of long-term financing, unfamiliar risk profile of RE developers, lack of reliable information, etc.).

The main provisions of the ***Russian*** Energy Strategy place relatively little emphasis on environmental issues. Only a short section focuses on the development of technologies and the technical means for the long-term development of energy resources. A Federal Law on RER has not been adopted yet.

Ukraine has introduced some incentives for wind energy development in its legislation but there is no special support for geothermal energy.

Most of the potential client countries of the GeoFund Program do not have a policy framework in place that transparently supports renewable/geothermal energies. The role of the GeoFund Program is to assist participating countries' legislative and regulatory bodies to increase the use of GeoE by developing and implementing appropriate legislative frameworks as well as to provide financial support to geothermal project implementation.

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 the ECA region for building a sustained market-based capacity to develop and finance geothermal projects on commercial terms under the proposed GeoFund.

In principle, all ECA countries are eligible for participation in the Program, provided that the country

- is eligible to receive GEF co-financing,[1] and
- has submitted an endorsement of the GeoFund concept with a written indication of its wish to participate in it.

Countries that wish to participate will submit an endorsement of the concept of the Program and a request for support to the Bank/GEF. So far, Armenia, Bulgaria, Hungary, Poland, Romania, Russia, Ukraine, Tajikistan, and Turkey have provided written endorsements, while Georgia has indicated that they would like to participate in the Program.

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[1] Eligibility to receive GEF co-financing is tied to ratification of the United Nations Framework Convention on Climate Change (UNFCCC).

All recipient countries of the projects proposed for the Start-up Phase (see Table 1) have submitted National Communications to the UNFCCC in all of which the importance of increased renewable/geothermal energy utilization as a key measure within the energy sector to mitigate global climate change is highlighted. This is also reflected in respective sector development plans of most of the concerned countries.

2. Rationale for Bank involvement

The rationale for Bank involvement is as follows:

a) The Bank in its capacity as one of the three Implementing Agencies of the GEF has experience, knowledge, and responsibility in implementing projects of GEF operational programs (see Annex 2). The proposed GeoFund complements and builds on the efforts to promote the adoption of RE by removing barriers and reducing implementation costs.

b) The Bank has a comparative advantage in managing complex, multi-country and regional programs, especially in

- Analytical and operational work that draws on the Bank's cross-country experience;
- Ensuring that policy reforms are consistent; and
- Using the specific expertise of the International Finance Corporation (IFC) to promote private sector investments.

c) The Bank has played a major role in developing and fostering global partnerships among other development and multilateral financial institutions.

d) Furthermore, the concept and objectives of the Program support the Bank's strategy to assist its client countries in the sustainable development of their energy resources. More specifically, this initiative builds upon the World Bank strategy for increasing the use of geothermal energy in ECA as described in the Bank Strategy Paper "Fire without Smoke" endorsed by the ECA regional management in October 2002.

3. Higher level objectives to which the project contributes

The importance of the global climate change, its potential implications, and the need to address it is understood across the countries of the ECA region. Nevertheless, national climate change strategies show certain variations that are implied by respective Kyoto commitments; country-specific GHG emissions reduction potentials and the economic situation of countries play a role in setting energy generation import and use priorities. While middle-income countries have, in most cases, already implemented, or are considering implementing measures that lead to decreases in the emissions of GHGs, those with struggling economies lack the necessary financial resources. National climate change strategies of recipient countries are detailed in their National Communications to the UNFCCC.

For all recipient countries, the Program is consistent with CAS development objectives pertaining to sustainable use of natural resources, the promotion of undistorted energy markets and support to private sector investments.

GEF eligibility. One of the Program's principal objectives is to facilitate the creation of an enabling business/regulatory environment in participating countries of the ECA region so that the development of geothermal energy becomes attractive to investors.

In this way, the Program directly supports the **GEF Operational Program #6: *Promoting the adoption of renewable energy by removing barriers and reducing implementation costs***. In so far as the construction of geothermal plants requires the upgrading/modernization of existing district heating networks or combined heat and power plants, the Program also supports the removal of barriers to energy efficiency and energy conservation, although this is not formally claimed here.

B. PROJECT DESCRIPTION

1. Financing instrument

A GEF grant amounting up to US$25 million will finance about 20 subprojects over a period of eight years. As in the case of the Hungary subproject, the GeoFund will provide only a small part of the overall project investment. It is expected that the GeoFund will cover approximately 10 percent of the overall Project investment costs and thus mobilize around US$200 million in additional financing[2].

The grant is to be provided through three windows of instrument:

- **Technical assistance window** for barrier removal, capacity building, and project preparation/ implementation in the amount of US$7 million;[3]
- **Direct investment funding window** which could provide low cost loans, contingent grants as well as outright grants in the amount of US$8 million;
- **Geological risk insurance window** to help mitigate geological/ geothermal resource risks in the amount of US$10 million.

The proposed GeoFund Program, envisioned as a region-wide and multi-country facility, will establish a GEF facility for up to US$25 million using an approach similar to that of horizontal Adaptable Program Loans[4] (APL). As the PAD describes in more detail later, the GeoFund will be implemented through a series of individual subprojects. The first subprojects will be implemented in Hungary through the Geological Risk Insurance (GRI) and through the International Geothermal Association (IGA) with TA on a region-wide basis. All relevant information about the IGA and Hungary subprojects is presented in Annexes 19 and 20. These two subprojects will be presented to the Board for approval along with the GeoFund Program facility. In accordance with the procedures for horizontal APLs, for each of the following subprojects, the Project Appraisal Document will be circulated to the Board for information after approval in principle of the corresponding GEF grant by the management. Approval of the individual negotiated Grant Agreements (GAs) will be delegated to the regional level (i.e. Regional Vice President or Country Director). In the absence of requests from three or more Executive Directors for Board consideration of the GEF grant, management approval will become effective ten working days after the circulation of the documents to the Board. For the approval of those subprojects which will be executed by IFC as GeoFund's executing agency, the IFC management will have an authority in accordance with its own rules and procedures as granted under the 1996 Arrangement (see Annex 6 for detail).

Program phases: The GeoFund will be implemented in a series of individual subprojects over a period of eight years. To assure high quality and achievement of the defined project goals as well to provide support in a flexible manner, the Program will be implemented on a project by project basis. A first set of subprojects will be implemented in a start-up phase that is expected to last 24 – 30 months. The GeoFund is a new and innovative approach to barrier removal for the utilization of geothermal energy combining several

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[2] There are already offers from France, Iceland, the Russian power company RAO UES and other potential partners which, when secured, are expected to augment the confirmed budget through donor funding or co-financing.

[3] The GeoFund Coordination Team (GCT) has identified about 25 projects in different countries. With a few exceptions, all are in need of TA for project preparation. This led to a higher demand of TA during the Start-Up Phase of the GeoFund Program than was anticipated at the time of the Project Brief preparation. It was, therefore, suggested by the GCT to increase the allocation of the TA from US$5 million to 7 million.

[4] A similar approach was taken under the Social and Institutional Development and Economic Management Technical Assistance Program (SIDEM) for Eligible Members of the European Union (APL).

instruments. Its systematic approach allows adjusting and refining the specifications of its instruments based on experience gained during the Program implementation and changing market conditions. This will not only enhance each subproject's results but also maximize the impact of the utilized funds.

As requested by GEF, it was originally planned to establish a region-wide fund with further multilateral and bilateral contributions. In case a region-wide geothermal organization cannot take over the GeoFund, subprojects will continue to be implemented on a country-by-country basis. Lessons learned during the implementation of the start-up phase will be integrated into project design and management.

One of the key lessons in international efforts to promote renewable energy has been the importance of uninterrupted project implementation through right timing that also allows for necessary adjustments and changes in project design.

APL triggers: Two sets of triggers apply under the horizontal APL: project triggers which determine when an individual investment is eligible to receive Bank funds, and policy triggers determine the eligibility of an individual country to receive Bank assistance under the APL program.

Policy triggers are:

- proven country commitment by GEF focal point endorsement of the GeoFund Program
- established country program on RE development (or program is in the process of being established)

Project triggers are:

- proven commitment of the project sponsor by co-financing in a ratio of approximately of 1:5
- proven project readiness by a sound screening package as described in "Subproject processing overview" on page 49
- project eligibility criteria are met as described in Annex 4.G.
- individual project triggers as established at the respective Quality enhancement review meeting (i.a. regulatory framework and procedures in the country)

2. 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 most important barriers include (i) knowledge and information barriers; (ii) institutional, policy, legal and regulatory barriers, and (iii) financial barriers. In pursuing the above objective, the Program will:

- Provide technical assistance for capacity building, methodological, informational, and institutional support that will lead to changes in the current unfavorable investment and incentive conditions and create an enabling environment in participating ECA countries that fosters the development of geothermal energy utilization for heating and power generation applications; (barriers (i)-(ii));
- Increase financing availability through extending geological risk insurance to mitigate the geological risks (barrier (i)) which would help facilitate commercial lending to geothermal projects through leveraging private finance, and through providing grants through the DIF window (barrier(iii)).

The increase of geothermal energy use by developing and implementing a number of financially viable projects throughout the ECA region will help to accelerate the use of RE, build private confidence in investing into this resource, and demonstrate to the regulatory bodies at national and local government levels the feasibility and sustainability of geothermal energy use.

The Program's global objective is to reduce emissions of greenhouse gases (GHGs) in the interest of climate change mitigation by systematic and streamlined implementation of geothermal projects. Thus, the Program would help participating countries in the ECA region to initiate or expand their efforts to reduce the emissions of GHGs in view of the fact that these countries are large emitters of GHGs on a GDP per capita

basis. The principal outcome of the Program for the global environment will be the reduction of CO_2 emissions.

2.1 Key performance indicators of the GeoFund Program

Performance indicators with respect to the GeoFund Program objective include:

- Number of successful projects implemented;
- Amount of private capital raised for every dollar of GEF financing through the GeoFund Program (Leverage Ratio);
- Measurable reduction of CO_2 emissions per year (tons/year);
- Adoption of policies.

2.2 Key performance indicators for subprojects

Progress toward achieving the project outcome at the project level will be measured by such project parameters as:

- Quantity of Energy generated (MW/h);
- Amount of thermal/electric capacity installed (MW);
- Cost per ton CO_2 reduced (US$/t CO_2);
- Installed yearly geothermal production;
- Reduced CO_2 emissions per year (tons/year);
- Associated investment volume of the project with the investor or potential investor;
- Number of GeoE projects and associated investment volume with other financial institutions and investors.

The institution/company that is implementing a subproject, will prepare a set of monitoring indicators (physical/technical, operational, financial and environmental) including the key indicators which will be monitored and reported upon on a quarterly basis in the context of the Project Management Reports. A list of monitoring indicators acceptable to the Bank will be agreed at negotiations. The final commitment to the monitoring indicators selected (including numerical targets, as appropriate) will be made at the signing of the legal agreements by attaching an appropriate supplemental letter.

Additional indicators describing further impacts and benefits will be developed during appraisal of each subproject to evaluate other development contributions (industrial, local manufacture, employment, and other social benefits). For more information on this topic see Annex 3.

3. Project components

The GeoFund Program will be an umbrella facility for geothermal subprojects in participating ECA countries and will involve the provision of Technical Assistance, Direct Investment Funding, and Geological Risk Insurance. (For further information see Annex 4.)

Initial allocations for each window will be indicative. Based on the experience during implementation and cooling market conditions, the allocations of funds among the three windows could be adjusted. A combination of three windows to co-finance one project could also be possible.

Component 1: Technical Assistance Window (US$7 million)

The Technical Assistance (TA) component of the GeoFund will address information and capacity barriers that retard the use of RER and geothermal energy. Assistance will be provided for:

a) Region-wide and country specific capacity building to improve understanding of the nature of barriers and to find ways to remove them;

b) Region-wide and country specific policy reviews concerning energy demand and use and amendments to legislation favorable to geothermal energy; and

c) Project preparation and implementation.

The GeoFund Coordination Team (GCT) will work with participating governments, NGOs, international organizations, and project developers to identify key constraints, determine their priorities and measures to implement improved policies, legal, regulatory and institutional frameworks. The TA window will also help to improve geothermal databases and help disseminate knowledge and know-how regarding geothermal energy. Not least, it will assist in identifying, preparing and implementing geothermal projects. This may include co-financing of (pre-) feasibility work, financial due diligence and business planning. The amount of the TA window is proposed to be US$7 million, to be potentially supplemented by TA funding from multilateral and bilateral donors, as well as local counterpart funding. Further information is contained in Annex 18.

Component 2: Direct Investment Funding Window (US$8 million)

Direct Investment Funding (DIF) will support project developers through providing low-cost loans, straight grants, or contingent grants where refund of grant may be required under certain circumstances or the disbursement will be tied up to fulfillment of pre-determined milestones.

Grant funds may be used solely to defray a portion of the direct investment costs associated with geothermal drilling of production and reinjection wells and post drilling project implementation. The GeoFund will give priority to providing grant funding for exploration drilling and well testing expense in order to maximize the risk coverage offered to project developers at that critical juncture of project development. After a positive drilling result, further project direct investment costs may be considered for grant funding to the extent that the project developer is able to demonstrate that further support is critical to enhance project economics sufficiently to allow the project to proceed to implementation.

For support of up-front investment costs and risks during the exploration and drilling phase, GRI would be a preferred instrument from the GEF 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 through the DIF window. 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. Broadly, DIF would be deployed under resource-constrained situation while GRI would be deployed under risk-constrained situation. The conditions to be met for DIF deployment are stipulated in the GeoFund Operational Manual.

The total amount for the DIF window will be US$8 million. Further information is contained in Annex 4.

Component 3: Geological Risk Insurance Window (US$10 million)

The Geological Risk Insurance (GRI) component will help to mitigate the geological risks associated with geothermal energy exploration and operation. The GRI 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 will insure project developers/investors/lenders against such geological risks which are generally considered one of the key barriers for geothermal energy investment. GeoFund could issue both short-term exploration geological risk insurance (EXGRI) or long-term operational geological risk insurance (OPGRI). It is envisaged, however, that EXGRI will dominate during the Start-up phase. OPGRI will be developed during the implementation period by learning through the experience of EXGRI and the new product development in the market, and, if warranted, may be used in future subprojects. The GRI window

is proposed to total US$10 million. Any amount committed but not paid under the GRI will be reutilized for subsequent GeoFund activities.

1. A typical GRI (e.g. EXGRI) operation would work as follows (detailed description of the instruments is in Annex 4): Geological parameters such as well head temperature and flow rate will be selected as the key indicators to measure success and failure of geothermal exploration.
2. 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).
3. GRI will not be paid in the case of full success.
4. 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.
5. GRI will be paid on a prorated basis in the case of partial success/failure based on the defined parameter value.
6. The beneficiaries of the GRI will pay upfront premium assessed by the GeoFund through the project appraisal process.

GRI as compensation scheme: GRI, while it is called insurance, is essentially a compensation scheme. Because of the uncertainty about the geological risk in individual geothermal wells, it would be very difficult to quantify and measure the risk for individual transactions. As of today, GRI type of insurance is not being provided by private insurance companies on a fully commercial basis. All existing geological risk insurance schemes (e.g. those in France, Iceland, the U.S., etc.) are publicly subsidized schemes. It is expected that as GRI operations establish a track record, risk measurement methodology will improve over time with the development of the private insurance market. GRI operations are expected to work as an incubator or prototype model for the development of a fully market-based instrument. Given this nature of GRI as "market development" instrument, the GRI fee premium is designed as risk-based fee, but set at the level which may not fully compensate the underlying risk but would encourage potential applicants to utilize the GRI window.

GRI fund flow. In each subproject, GEF Grant funds for the GRI component will remain in the GEF Trust Fund Account until claims become payable. As shown in chart 1, GRI fees (risk premium and processing fee) received from beneficiaries will be credited back to the GEF Trust Fund Account for further allocation to the GeoFund sub-account. Detailed procedures are described in Annex 4.

Chart 1. GRI Fund Flow

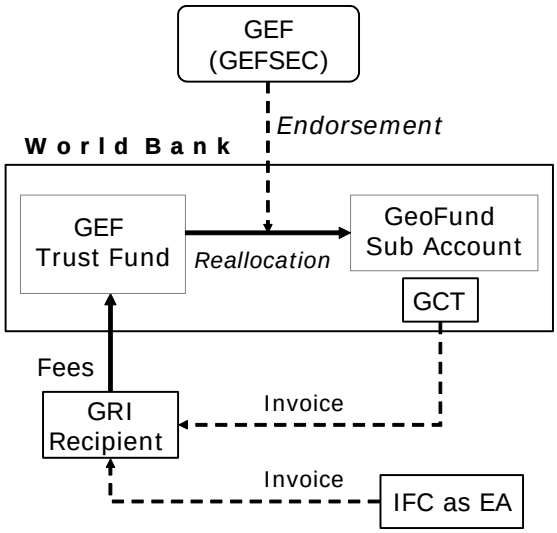


Table 1 below shows the indicative disbursement under the GeoFund Program. Disbursement from the TA window will be straight grant. Disbursement from the DIF windows would include straight or contingent grant which may be redeemed and reutilized for subsequent GeoFund activities. Disbursement from the GRI window will be conditional upon the geological risk event. Any amount committed but not paid under GRI will be reutilized for subsequent GeoFund activities.

Table 1. Indicative Disbursements of Funds of the GeoFund According to Component, Phase and Country

Component	Projects identified (Start-Up Phase) (US$m)	Projects most likely (US$m)	Total GEF-Financing (US$m)
Technical Assistance	4.8	2.2	7.0
Russia	0.8	0.2	1.0
Armenia	0.4	0.6	1.0
Turkey	2.3	0.4	2.7
Ukraine	0.4	0.2	0.6
Tajikistan	0.1	0.2	0.3
IGA/CIS EPC	0.8	0.2	1.0
Other countries (unallocated)	-	0.4	0.4
Direct Investment Fund	3.2	4.8	8.0
Armenia	2.0	1.9	3.9
Russia	1.2	-	1.2
Turkey	-	2.5	2.5
Other countries (unallocated)	-	0.4	0.4
Geological Risk Insurance	3.5	6.5	10.0
Hungary	[3.72] *	-	[3.72]
Russia	[1.0]	[1.9]	[2.9]
Turkey	[0.5]	[1.0]	[1.5]
Armenia	-	[2.2]	[2.2]
Other countries	-	[1.4]	[1.4]

Component	Projects identified (Start-Up Phase) (US$m)	Projects most likely (US$m)	Total GEF-Financing (US$m)
(unallocated)			
Sum	**11.5**	**13.5**	**25.0**

* These numbers in bracket under the Geological Risk Insurance are the estimated maximum payable amount under each GRI operation. Actual amount of GRI payout (disbursement) will depend on the severity of risk event occurring for each GRI operation and is expected to be substantially less than the maximum amount. GRI will be fully backed by the allocated GEF resource through the implementation period.

The GeoFund will support investments in geothermal energy use for:

a) Electricity generating projects;

b) Fuel substitution projects in existing or possibly new district heating facilities;

c) Geothermal energy projects for the purpose of heating of other facilities, and

d) Any combination of (a) to (c), i.e. cascading applications.

The projects of this component are based on their readiness, economic viability, available co-financing resources, and willingness of the governments to participate in the GeoFund. Several regional-wide capacity building and policy development activities were identified during the preparatory stage. They aimed to involve experts from all ECA countries, not only from targeted clients. These activities will be implemented under the TA window through the International Geothermal Association. (See Annex 19)

The following table gives a summary of activities to be financed under the Start-Up Phase of the Program.

Table 2. Indicative Costs and Financing Plan of the Projects identified (Start-Up Phase)

Country	Subproject	Category	GeoFund (US$k)		
			GeoFund (US$k)	IFC	World Bank
Hungary	MOL power project	GRI	[3,720]*	-	[3,720]
Armenia	Preparation of Drilling	TA	400	400	-
Armenia	Drilling	DIF	2,000	-	2,000
Russia	NPAF	TA	150	-	150
Russia	Labinsk (I phase)	TA	250	250	-
Russia	Dem. project Rozovy	TA	200	200	-
Russia	Pre-FSs for 5 Geothermal DH	TA	75	75	-
Russia	FS of Kazminsky GH plant	TA	50	50	-
Russia	Pauzhetskaya PP	TA	150	150	-
Russia	Labinsk DH project	GRI	[1,000]	-	[1,000]
Russia	Verthny Mutnovsky	DIF	1,200	-	1,200
Turkey	Demonstration GeoE Drying P.	TA	170	-	170
Turkey	FS for Yozgat GeoE DH project	TA	800	-	800
Turkey	FS for Izmir GeoE DH project	TA	600	-	600
Turkey	FS for Dikili GeoE DH project	TA	400	-	400
Turkey	FS for GeoE Cooling P.	TA	150	-	150
Turkey	Drilling wells for Salihli DH	GRI	[500]	[500]	-
Turkey	Support to Organiz. of GEE	TA	200	-	200
Tajikista	Demonstration project	TA	100	-	100

Country	Subproject	Category	GeoFund (US$k)		
			GeoFund (US$k)	IFC	World Bank
n					
Ukraine	DP in Crimea region	TA	150	-	150
Ukraine	Demonstration project in Lvov	TA	200	-	200
Ukraine	Study on GeoE development	TA	50	-	50
IGA	Regional TA	TA	785	-	785
		Sum	**11, 500**	**3,425**	**8,075**

*These numbers in bracket under the Geological Risk Insurance are the estimated maximum payable amount under each GRI operation. Actual amount of GRI payout (disbursement) will depend on the severity of risk event occurring for each GRI operation and is expected to be substantially less than the maximum amount. GRI will be fully backed by the allocated GEF resource through the implementation period.

4. Lessons learned and reflected in the project design

4.1 General lessons for renewable energy projects. All countries in the ECA region have made considerable progress in unbundling the energy market, setting up regulatory bodies, and cutting back subsidies, but most lag behind the old EU member states in regard to the development and use of renewable energy.

In recent years, several renewable energy (RE) and energy efficiency (EE) projects have been financed by the World Bank and other international agencies. These include the *Romania EE Project,* the *Bulgaria EE Project,* the *Podhale Geothermal District Heating and Environmental Project,* the *Klaipeda Geothermal Demonstration Project*, the *Turkey Renewable Energy Project,* and the *Caribbean Renewable Energy Development Programme*. Experience shows that relatively high transaction costs associated with RE project development and financing, the unfamiliar risk profiles of energy users, and the lack of collateral value of RE project equipment result in very cautious bank lending practices toward smaller clients. In addition, domestic financial institutions often lack relevant experience, expertise, and capacity with regard to project finance and lack an understanding of RE business potential and how to assess RE project risk. These financial barriers will be addressed through the creation of a revolving risk insurance scheme based on the experiences of the Romania and Bulgaria EE projects. The GeoFund will provide a strategic mix of risk insurance, investment and TA instruments to move beyond individual projects to a more systematic approach towards geothermal energy within the ECA Region.

4.2 Lessons/experiences from geothermal projects. As mentioned above, the Bank and GEF have been involved in the preparation and implementation of a number geothermal district heating (DH) operations such as Lithuania (Klaipeda); Poland (Podhale, Mszczonow, Skiernewiece, Stargard, Kolo). In some countries, these projects have been integrated well with the mainstream of the Bank's policy dialogue with its clients, and may have contributed to the removal of some barriers in the use of RER. Commonly these small and scattered projects, however, were not able to contribute to the removal of major barriers to RER development. In fact, project managers had to fight for support from the governments rather than being able to influence policy.

The Bank and GEF have recognized that a systematic approach to developing strategies for RER in general and for GeoE in particular, is essential. Mechanisms need to be developed to systematically support the identification, preparation, and implementation of GeoE projects. This is even more important when considering the typically high up-front costs and risks of geothermal energy projects, since drilling costs can be excessive and the nature of the deposit and the reservoir might differ from expectations of exploration results. Also no broad generalization of production costs is possible because of the great variability of technical and economic parameters involved in the implementation of geothermal projects.

The proposed region wide facility will provide risk insurance and investment to project developers that otherwise would refrain from investing in this energy source. Streamlined procedures for the risk insurance scheme and successful project implementation are expected to convince the private insurance market, developers, the public, and decision makers of the viability of geothermal energy.

Since an accelerated and wider use of geothermal resources is mainly linked to policy, legal and regulatory conditions and to inherent constraints of the geothermal energy utilization, a region wide fund would provide a mechanism to adequately address these issues.

4.3 Lessons from district heating projects. The Bank is and has been involved in many district heating (DH) projects throughout the ECA region, supporting them with loans and/or GEF grants. Important lessons have been learned from these projects, as well as from dedicated DH sector studies. The results of these studies and lessons learned are summarized in ESMAP Report 234/00 of August 2000 entitled "Increasing Efficiency of Heating Systems in Central and Eastern Europe and the former Soviet Union," as well as by World Bank Technical Paper No.493 of March 2001 on "District Energy Trends, Issues and Opportunities."

The key messages of these reports are:

- Modernized DH systems, managed in a business-like fashion, and located in densely populated areas (high concentration of heat loads), are well placed to provide efficient DH at highly competitive prices.
- In EU accession countries in Central Europe, DH systems exist in most cities, commercialization of DH utilities has largely taken place, and many systems have been modernized. Successful commercialization of DH utilities will be a prerequisite for GeoFund support in these countries. Here geothermal heat utilization is an excellent energy substitute for coal or oil-fired or even gas-fired heat generation.
- DH systems are natural monopolies but have to compete against decentralized boiler systems or even gas-based individual household heating. Required assessments will take into account possible scenarios in which geothermal heat could reduce the competitiveness of DH. The GeoFund would not get involved under such circumstances because resulting switches to individual household heating could lead to increases in GHG emissions.
- In CIS countries, DH systems are still mostly old, decrepit and technically obsolete, and the tariff systems often do not cover costs. Rehabilitation would require large outlays of funds, which might not be available. Here, policy change and improved corporate governance will be instrumental to improve the situation and to help attract private investors. Also, cities need to move from price-based subsidies to socially based subsidies in order to help make systems financially viable.

5. Alternatives considered and reasons for rejection

During the preparation of the GeoFund, three alternatives were considered: a commercial administrative agent, a new trust fund, and a GEF sub-account.

- Commercial Administrative Agent as Grant Recipient. Originally, the GeoFund Coordination Team (GCT) explored the possibility of using a major commercial Bank as an Administrative Agent (AA), headquartered in Europe with operational networks in the participating ECA countries. In this way, economies of scale of account management would be assured and returns on unused funds, managed professionally would be maximized. Flexibility would be provided as to the use of funds in different countries. In case substantial projects in one country were delayed, and in another country would be proceeding faster than expected, the AA could easily reallocate funds, as it would manage unused funds in-house. This would, indeed, satisfy the critical requirements (regional and revolving) of the administration of the funds, and assure the most efficient use of GeoFund resources. The AA would establish and operate the accounts for the three windows including a revolving fund for the DIF and

GRI windows. AA would disburse the fund out of three different windows upon instruction by the GCT, and would collect fees, debt service payments and refund of contingent grants from the project clients. As the AA would gain experience, more responsibilities could be delegated to it by the GCT, including project processing activities such as evaluation, screening, partial due diligence, and project supervision and monitoring.

However, such AA scheme could lead to major legal complications, as the AA as a commercial bank- is typically subject to the national regulatory jurisdiction while World Bank operations are conducted within the framework of international laws.

- New Trust Fund. Creating a dedicated new trust fund for GeoFund at the World Bank for eligible recipients as governments and geothermal organizations, which would be funded by the GEF grant, was also considered to avoid the legal complications with an external agency. The new trust fund, which would be created by submitting an IBTF (Initiating Brief for a Trust Fund), could issue GRI insurances and disburse DIF loans and grants and T/A grants against the dedicated resource in the GeoFund. However, administration of individual small-size transactions of GeoFund instruments would not necessarily meet the capacity of the World Bank's loan and accounting department.
- GEF Sub-Account. A similar operational arrangement could be made, without creating a new trust fund, by making use of a GEF sub-account, which would be established for any GEF-supported geothermal projects to eligible recipients as governments and geothermal organizations. However, under the current GEF policy, GEF sub-accounts can only be used for disbursement of grants. A new policy is under consideration to allow sub-accounts to be used in other modalities of financing including loan and insurance. Moreover, even after a new policy would allow the GeoFund sub-account to directly issue GRI insurance and DIF loans, the issue related to the administrative capacity of the Bank's loan and accounting department would still remain.

C. IMPLEMENTATION

1. Partnership arrangements

Parallel co-financing and donor funding at the subproject level is expected from multilateral and bilateral donors, as well as from local sources (e.g. local government contributions, local environmental funds). The financing of individual subprojects will vary, the details of which are not available at this point, but potential international agencies contributing to the financing of subprojects may include the International Finance Corporation (IFC), the European Bank for Reconstruction and Development (EBRD), the European Investment Bank (EIB), and other IFIs and international organizations. Some of the projects are financed together with other national and regional institutions, for example in Russia with United Energy Systems of Russia (RAO UES) and with the regional administration of Krasnodar. Additional bilateral and multilateral support at the Program level could come from some countries that have already confirmed their interest in being a partner to the GeoFund. They include Austria, Denmark, France, Germany, and Iceland as well as the European Union.

2. Institutional and implementation arrangements

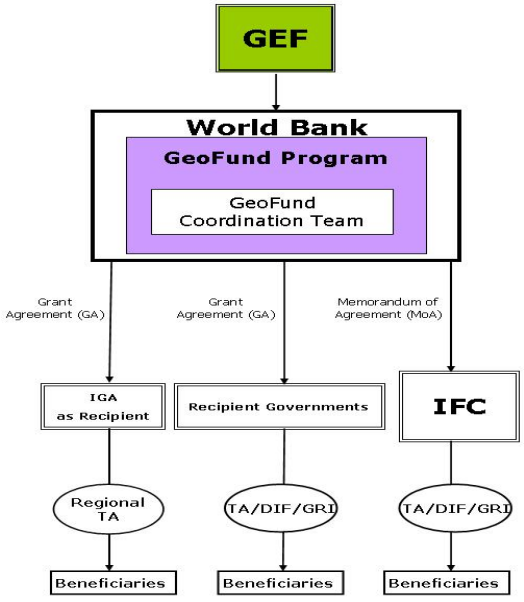
The GeoFund will be established as a program conduit at the World Bank to be fully funded by the GEF's initial contribution of US$25 million and with participation of other donors and contributors as co-financiers at the subproject level. The co-financiers would include project developers and investors, commercial lenders, public sector, sponsors and donors. The GeoFund is conceived as a region-wide program across the ECA countries, and would seek to become a true regional scheme as it will be implemented over time. The GeoFund Program will be implemented in two phases. (Further information in Annex 6).

The GeoFund will be launched for operation in the later part of 2006 starting with subprojects in the countries listed in Table 2. , The GeoFund is expected to operate through several host government recipients, recipient organizations (e.g. IGA) and through IFC and possibly other organizations as executing agency as

shown in the institutional arrangement (Chart 2). The World Bank will enter into a Grant Agreement (GA) with each recipient and a Memorandum of Agreement (MoA) with IFC as executing agency, and possibly other organizations in the future as the United Nations Development Programme.

Depending on the specific needs of subprojects, the GeoFund will provide a combination of products available under the GeoFund's three windows to the recipients. IGA as recipient will implement a first set of regional TA activities. IFC as executing agency of the World Bank will implement TA, DIF, and GRI for certain subprojects which involve private clients or sub-sovereign clients. Other executing agencies and partner institutions could participate in the GeoFund as the program develops and might attract further partners.

Chart 2. GeoFund Institutional Arrangement



The GeoFund institutional arrangements could evolve during implementation in response to market demand if a feasible legal structure becomes available to support a new arrangement. It is envisaged that if it becomes feasible for the GeoFund to operate as a region-wide fund without a country-by-country setup, the GeoFund could adopt such new framework with due care to policy, legal and regulatory compliance.

PMUs in line ministries and agencies and also PMUs with clients directly will be the principal implementers of all country-based operations, financed by the World Bank. They will be hosted at government ministries or agencies. The GeoFund will allocate the specific amount of TA, DIF and GRI facilities to the relevant PMU.

a) The International Finance Corporation (IFC) as Executing Agency of the GeoFund Program

IFC's participation will strengthen the GCT's capacity in terms of the identification of private/sub-sovereign sector clients and the commercial due diligence of the project applications.

IFC could identify and develop subprojects, and propose them for GCT consideration in accordance with the Memorandum of Agreement (MoA). GCT may recommend IFC for execution of those subprojects which GCT considers more appropriate to be handled by IFC than through the host government recipients.

In addition to the MoA, the working arrangement between the Bank and IFC for the GeoFund operations will be also governed by the "Arrangement for the Administration and Management of Funds from the Global Environment Facility (GEF) to be Made Available by the International Bank for Reconstruction and Development Acting as and Implementing Agency of the GEF to the International Finance Corporation" dated May 31, 1996 (the Arrangement). Pursuant to the Arrangement, those subprojects which will be assigned to IFC will be administered in accordance with its guidelines and procedures for financial management, contract implementation, safeguards, etc. IFC has executed many GEF-supported projects under the Arrangement, and its capacity as Executing Agency for the GeoFund operations is considered satisfactory in all respects.

b) The International Geothermal Association (IGA)

IGA as a recipient will be primarily responsible for the execution of region-wide TA activities under the capacity building component. The reasons for the cooperation with IGA are its profound knowledge about the specific characteristics of geothermal energy and its worldwide operations. It has more than 2000 members in 65 countries, a special consultative status with the Economic and Social Council of the United Nations, and is a Partner of the European Union for the Campaign for Take Off (CTO) Renewable Energy. Even though it does not have extensive experience in project implementation, it was found to be the only available organization capable of working on a regional basis. Further information on IGA is provided in Annex 19.

IGA will contract to national geothermal associations and other institutions for the organization of training courses, seminars and other events. The work program of IGA's region-wide TA activities will be prepared jointly by IGA and GCT and periodically reviewed in accordance with the Grant Agreement (GA) between IGA and the Bank.

During implementation, the GeoFund may expand its partnership with other organizations.

3. Monitoring and evaluation of outcomes/results

Monitoring of project activities and evaluation of their results in the GeoFund Program will serve a dual function. First, it will track progress toward the Project objectives. Second, it will facilitate learning and generation of knowledge necessary for the preparation of follow-on projects and the further implementation of the Program.

Each subproject will have its own monitoring indicators, benchmarks, and monitoring plans to confirm actual amounts of carbon reduction achieved, as measured against a project-specific baseline. This is very important globally in that cost-effectiveness indicators (US$/$CO_2$ removed) will be established through the GeoFund for different project types and situations, which will be used in possible future applications by GEF and by the international community as non-recipient countries enhance their actions to reduce carbon emissions. Detailed key indicators for subprojects, including performance indicators, as well as monitoring plans and institutional arrangements for the collection and evaluation of outcome indicators will be addressed in specific project documents.

Institutional and data collection arrangements at the subproject level will be determined for each individual project, with reporting responsibility resting on the project sponsor. Monitoring and evaluation of the outcome indicators of the GeoFund will be the responsibility of the GCT. Sources of data collection will be reports by subproject sponsors, government offices, national geo-information offices as well as surveys and interviews conducted with representatives of utilities, the financial sector, etc. These reports will be expected to be received from project management annually and will cover progress of project implementation, updated cost and financing plans, financial statements of the project developer and financial management reports,

updated procurement plans, environmental compliance reports, as well as operational performance reports of the project once started up: physical inputs and outputs, costs of inputs and outputs, reductions of emissions of local and global pollutants, measured against the baseline.

The beneficiary is responsible for monitoring and controlling the drilling execution, the testing and the operations of the geothermal wells and plant facilities. All parameters, which are covered under the GRI, will also be monitored by independent consultants. Monitoring equipment needs to be part of the scope of investments. The monitoring results will be provided in regular reports, readily accessible to the GCT.

Monitoring indicators are described in section B.2 and Annex 3.

4. Sustainability and Replicability

The GeoFund is designed to demonstrate how financing modalities, such as contingent financing, incremental risk financing, and the development of public-private partnerships can help develop geothermal resources for replication throughout the ECA Region.

Replication of geothermal projects is expected because:

a) The capitalization on selective project types;

b) Removal of barriers towards use of RER/geothermal energy should expand in participating client countries;

c) Knowledge should improve as the data base on the potential of geothermal energy expands in a participating country; and

d) The understanding of geothermal technology, project preparation and implementation advances.

Exit Strategy. The exit strategy for any remaining funds will be defined during the midterm review of the GeoFund Program based on the following options:

- The remaining balance will be granted to an established regional or global organization, which is acceptable to GEF and the Bank, and which would use the funds for geothermal project preparation and implementation;
- The remaining balance will be granted to a country with promising geothermal investments; or
- Would be returned to GEF.

5. Critical risks and possible controversial aspects

The development and operation of the GRI window is the core of the GeoFund. The establishment and operation of a geothermal risk insurance scheme poses certain risks. These risks relate primarily to the successful introduction and market acceptance of the instrument, which is expected to be mitigated by market research and careful design. Additional risks may arise from unwillingness to enact legislative amendments in recipient countries. The main risks of the Program with mitigation measures are summarized in the table below:

Table 3. Critical Risks and Possible Controversial Aspects

Risks	Risk Mitigation Measures	Risk Rating with Mitigation
Legislative risks		
Cooperation with government officials for barrier review and prioritization becomes difficult	Up-front endorsement of the objectives and the concept of the Program by participating governments.	S
Legislative amendments concerning identified legal barriers are not enacted	GCT may propose to withdraw from the country.	S
Subproject development risks		
Slower than expected project portfolio build-up	Country studies on potential geothermal supply, potential geothermal projects, and on identification and eventual removal of barriers.	N
Insufficient local equity financing of subprojects	Solicitation of donor support by GCT and TA in identifying potential investors. Mobilization of IFIs who can provide equity finance (e.g. EBRD, IFC)	S
Inadequate availability of co-financing	Concentration on economically viable projects.	M
Access to favorable commercial lending remains insufficient	Promotion of projects with local lenders through appropriate TA activities. Demonstration of financial viability	S
Inadequate project sponsor capacities	Provision of TA for project preparation, feasibility studies and business plans, as well as for project management and implementation	M
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 TA to help investigate the geology and analyze the geological parameters.	M
GeoFund risks		
Excessive GRI/DIF default rates	Conservative projection	M
Subproject operating cost overruns	Careful scheme design	M
Overall risk rating:		M

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

6. Grant conditions and covenants

(a) Effectiveness condition: standard conditions.

D. APPRAISAL SUMMARY

1. Economic and financial analyses

Economic Analysis. "Traditional financial analysis undervalues future fuel price risks and completely ignores the environmental and health costs of fossil-fueled power plant emissions. As a result, the current utilization of modern renewable energy (excluding traditional biomass use) in most countries is quite small. Yet, on a life-cycle cost basis, some renewable energy technologies are already cost competitive with conventional energy sources. However, the potential of these financially viable renewable energy technologies is not fully realized because of a variety of "market barriers."

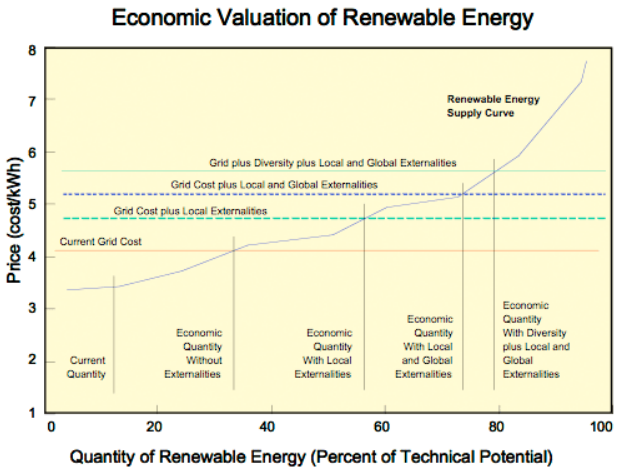


Figure 1: Illustrative Example of the Economic Valuation of Renewable Energy

As shown in Figure 1, if the cost of local environmental externalities and global externalities (e.g. through "carbon credits") are included in the economic valuation as is done in a typical WBG economic calculation, the economically viable quantity of renewable energy increases. If the diversification value is also added to the economic cost, the economically viable optimum quantity of renewable energy becomes even larger.

Given the market distortion that environmental externalities and diversification values are not recognized in the market place as well as a series of market barriers, financial incentives are required to attract investors to achieve the economically viable optimum quantity of renewable energy."[5]

Economic analysis of each subproject will provide the primary basis for selection of projects. Primary geothermal project outputs will typically include heat supply for DH systems and/or electricity supplied to the grid. Economic benefits will include the avoided cost of baseline supplies of the same outputs as well as quantified values for reductions of CO_2, SO_2, NO_x, and PM_{10} emissions compared to baseline supplies. Baselines will be identified through determination of least-cost supplies with appropriate consideration of both operating margins and build margins. Projects selected for GeoFund support will be limited to those that demonstrate positive net economic benefits on this basis.

Proper quantification of environmental benefits can be difficult and subject to controversy. To provide a consistent basis for project selection and to expedite project evaluations, the GeoFund will establish standard estimates and methods for evaluation of these benefits that reasonably reflect established values that are currently being used. Countries will be free to establish their own methodologies and estimates or to use the default approach provided by the GeoFund. If independent estimates are used, the supporting data and methodology will be subject to review and approval by the GeoFund as part of the evaluation of the project application. A common set of values and methods must be used for all projects within a given country.

The GeoFund Program will not have a detailed economic analysis ex ante. However, a pro-forma economic model of a geothermal project will be developed to illustrate the interplay of local and global environmental benefits with traditional economic benefits. This model will also provide the justification for GEF support in terms of barrier removal and global benefits from reduced CO_2 emissions at a specified incremental cost. The anticipated leveraging ratio of 1:8 suggests that incremental costs on the order of US$4.00 per metric ton of CO_2 are likely for the GeoFund project portfolio. As the loan and insurance facilities will revolve and are expected to insure/finance many more projects until depleted, the cost effectiveness will multiply over time.

[5] WB REToolKit, World Bank Webpage.

All subprojects will be screened according to the criteria set out in WB BP 10.04 - Economic Evaluation of Investment Operations and the corresponding WB Handbook on Economic Analysis of Investment Operations. Details of the economic justification for individual subprojects according to GEF criteria are contained in Annex 9 and in the GeoFund Operational Manual.

Financial Analysis. In order to gauge the market potential for geothermal projects that can be supported by the GeoFund in the early years, a preliminary market assessment was carried out and an indicative project portfolio was developed based on technical and financial feasibility evaluation.

The viability of the above projects and other geothermal investment opportunities that will be identified on a rolling basis during implementation hinges on the success of drilling geothermal wells. Once the required quality of the resource is proven, geothermal investments in most cases offer internal rates of return that are sufficient for commercial project financing, in particular when external but inherent economic benefits can be monetized through provision of an equivalent amount of grant or low cost loan funding. Based on the assumption of successful drilling outcomes the pipeline shows favorable economic characteristics.

The key factor determining profitability prospects are the parameters of the underlying power purchase agreements. The actual purchase price for geothermal energy will normally be linked to the market index for the fossil fuels that are being replaced, i.e., the higher the cost for the conventional energy sources that serve as a market reference, the more profitable the geothermal investment will become. Also other tariff schemes where preferential purchase is obligatory and has a premium attached to it influence the financial viability of the project.

All projects will be financed with private equity, GEF funds, commercial loans and contributions from international, bilateral and/or local sources. Financial due diligence for the demonstration projects will include, among other requirements, creditworthiness of the developer (including track record); business plan (technical and financial *pro forma*); permitting and licensing, including status of privileged producer; heat- and/or power sales contract, rules of operation in the market.

Fiscal Impact. The Program has no fiscal impact for recipient governments as there is no or only minimal borrowing by the governments and the investment projects are financed mainly on a commercial basis. Taxation may be applied as royalties on the resource, calculated on the basis of the heat content of the exploited geothermal water. The tax system in each country is different and may be applied to one or more of the above factors. It is therefore impossible to assess the generic effect of the taxation system on the prices. Nevertheless it is advisable to calculate the tax effect under some typical conditions, and analyze what effects a taxation system has on the final price of energy and competitiveness of the geothermal source.

More important than the tax issues in the proposed projects will be the tariff rates for heat and electricity. In many existing DH systems in the ECA region the tariffs paid by customers barely cover operating costs and leave little room for even needed investments of renewal and modernization. In projects, which are not financially viable even after monetization of external benefits because of inadequate levels of tariffs, the GeoFund will not be able to participate.

2. Technical

The GCT has prepared an Operational Manual (OM) for the TA, DIF and GRI Program components, which spells out the technical, procurement, Financial Management (FM), M&E, and Safeguard requirements of the Program as well as the institutional arrangements. (See Annexes 7, 8, 10)

Subprojects will be assessed as to their technical soundness and use of appropriate geothermal technology as part of the due diligence procedure. This assessment will in particular review geological information provided and analyses carried out to establish with reasonable certainty the existence of a suitable geothermal resource and its accessibility, and re-injectivity into the geothermal reservoir; it will also review and assess the technical know-how and expertise of the project developer and might call for training and technical assistance.

3. Fiduciary

The financial management assessment for IGA and the MOL has been undertaken, as part of due diligence procedure, in accordance with the requirements of OP 10.02. For other grant recipients and implementing agencies (excluding IFC as executing agency) or promoting company, the financial assessment will include the financial performance and likely sustainability, the financial management systems and capabilities and potentially needed upgrading and technical capability, track record in project development and project operation. The assessment will also review auditing arrangements.

For each subproject, the Bank will require the recipient to maintain financial management arrangements that are acceptable to the Bank and that, as part of the overall arrangements that the recipient has in place for implementing the operation, provide reasonable assurance that the proceeds of the grants are used for the purposes for which the grant was granted. Acceptable internal controls should be available prior to flow of funds. On this basis, appropriate financial management arrangements will be designed and in place for each according to agreed procedures.

4. Social

Changes in heat price may cause social impacts in the individual subprojects. One important goal of the Program is to increase the competitiveness of geothermal energy. The terms of the DIF component of the support scheme for individual DH subprojects will be established on the basis of the financing needs of the project, which, in turn, is largely determined by the ability of customers to pay for the service. This ability to pay will be established based on a reasonable percentage of income.

Secondary social impacts in the form of improved local environment are also expected. Appropriate stakeholder participation in project preparation, implementation, monitoring and evaluation is ensured through the application of World Bank guidelines for consultation and disclosure.

5. Environment

A key feature of the Program is the promotion of amendments to policy, regulatory and institutional frameworks that improve the competitiveness of geothermal energy. This is expected to contribute to environmentally sustainable growth and resource management. Through endorsing project activities, client countries subscribe to integrate such amendments into their relevant sector reforms to enhance the Program's environmental benefits.

The Program will facilitate improved and transparent management of natural resources through increased use of clean and renewable geothermal energy (and the decreased use of the polluting and depleting fossil fuels). It will directly reduce vulnerability of the poor to global environmental change through the reduction of CO_2. Furthermore, the Program will protect people's health from pollution by reducing the emissions of such local pollutants as NO_x, SO_2 and PM_{10}.

Monitoring of the above environmental benefits will be achieved through the monitoring of the associated parameters: reductions in the emissions of CO_2, NO_x, SO_2 and PM_{10}.

In case of low enthalpy geothermal projects (up to 100 degrees C), providing for heat and other direct use, potential environmental issues could be the handling and disposal of drilling mud, of geothermal brines, as well as noise generation during project implementation and very little during operations. These environmental impacts are typically limited and can be handled by appropriate management actions. Thus the projects are typically classified as Category B projects under World Bank guidelines.

An estimated 20 percent of the expected projects might be medium to high enthalpy projects with temperatures well above 100 degrees C. In those cases there may be environmental issues relating to the emission of gases, impact from sudden steam bursts during drilling, etc. Moreover, these projects are

typically larger, and have a more significant impact on the environment. Such projects might be designated Category A with due diligence on all the safeguard policy matters applicable to them.

6. Safeguard Policies

Safeguard Policies Triggered by the Program	Yes	No
Environmental Assessment (OP/BP/GP 4.01)	[x]	[]
Natural Habitats (OP/BP 4.04)	[ ]	[x]
Pest Management (OP 4.09)	[ ]	[x]
Cultural Property (OPN 11.03, being revised as OP 4.11)	[ ]	[x]
Involuntary Resettlement (OP/BP 4.12)	[ ]	[x]
Indigenous Peoples (OD 4.20, being revised as OP 4.10)	[ ]	[x]
Forests (OP/BP 4.36)	[ ]	[x]
Safety of Dams (OP/BP 4.37)	[ ]	[x]
Projects in Disputed Areas (OP/BP/GP 7.60)*	[ ]	[x]
Projects on International Waterways (OP/BP/GP 7.50)	[ ]	[x]

The environmental screening category will be FI. Subprojects will have to follow the environmental safeguards and will require each subproject to comply with the World Bank's or IFC's safeguard policies. Each subproject will be individually assigned environmental screening categories. All subprojects will be screened for environmental purposes in accordance with the Bank's safeguard policy on Environmental Assessment (OP/BP/GP 4.01).

Safeguard policy compliance assessment of subprojects will involve an environmental assessment of the proposed project with all its implications. This assessment will review the project sponsor's capacity to implement the safeguard policies recommendations and, if the capacity is insufficient, propose measures to bring this capacity to the required level. Thus, for every subproject an Integrated Safeguards Data Sheet (ISDS) will be prepared by the project sponsor and will be reviewed in the Bank.

Responsibility for the supervision of the proper execution of subprojects will be with the Bank. The Bank requires that each proposed subproject is screened and ensures that recipients carry out an appropriate Environmental Impact Assessment (EIA) for each subproject. Before approving a subproject, the Bank will verify that the subproject meets the environmental requirements of appropriate national and local authorities and is consistent with the safeguard policies of the Bank.

7. Policy Exceptions and Readiness

The GeoFund Program requires no Bank policy exceptions.

Table 4. Readiness Criteria

ISSUES	STATUS
Fiduciary	Beneficiaries indicate high level of compliance with FM requirements.
Disclosure Requirements	All Environmental Assessments will be done during appraisal of individual projects.
Monitoring & Evaluation	M&E indicators have been prepared and incorporated into the project design and implementation arrangements.
Technical	Generic OM is established.

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

Annex 1: Country and Sector Program Background

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

A. HUNGARY

Energy Sector – Legal Framework, Policies and Issues. Hungary has targeted an increase in the share of primary energy utilization of renewables to 5-6 percent from the present level of 3.4 percent by 2010. The Hungarian energy policy also includes provisions for the promotion of European Union priorities such as security of supply, energy efficiency, economic efficiency, serving national interests, environmental protection, etc. The CX/2001 Electricity Act requires mandatory purchase of renewable electricity, provided that the facility's installed capacity is greater than 0.1 MW, the technical conditions of uptake are met and the price does not exceed the respective price as set by the relevant decree. The law also calls for a system of green certificates, but delays are expected in the launch of this market for several years until the EU or international markets for green certificates become operational. The 56/2002 Decree of the Ministry of Economy on the purchase obligation of renewable electricity (regularly revised) further elaborates on the regulations of purchasing renewable electricity and sets preferential prices (currently about 11 US$ cents/kWh[6]).

A separate RE law is currently being prepared. This law envisages decentralized support and promotion of local use, as well as state guarantee for loans to set up RE enterprises. The "Szechenyi Plan," a general-purpose investment promotion fund, includes a limited size window for providing grant funding for renewable energy projects[7].

Renewable Energy Resources (RER). In addition to biomass, hydro, wind and geothermal energy have potential in Hungary, with increases forecasted in the use of wind and geothermal energy in the medium term. The use of geothermal energy is already on a more developed level. In the long term the direct use of solar energy also has significant potential, but rapid expansion to the mass market is not anticipated due to technical and economic limitations. The most significant source of renewable energy is biomass, including not only traditional forests, but also energy plantations specially developed for this purpose.

District Heating (DH) Sector. In 2005, there were 240 DH plants operating in 97 cities and towns in the country, providing heat for nearly 650,000 homes. This constitutes 16 percent of the 4 million homes in total. Total DH peak demand equals 6500 MW, while total installed boiler capacity is 12,200 MW.

The tariff for district heat is set by the DH plant, but the respective DH plant observes the relevant act that sets a tariff ceiling. The XVIII/1998 District Heating Act stipulates that the tariff shall a) promote safe and lowest cost heat and efficient use of capacities and b) include reserves for the costs of reserve capacities and for the expenses of eventual decommissioning and environmental remediation (for geothermal resources, in particular).

Geothermal Energy. Hungary is unique in that is possesses both high-enthalpy and low-enthalpy resources with temperatures ranging from 10°C to 254°C. The Pannonian Basin is one of the hot spots due to a thin crust with the geothermal gradient reaching as high as 58.8 °C/km in some areas. Use of geothermal energy in Hungary is predominantly for balneological purposes, including a large portion of space heating and hothouse agriculture. No reinjection is practiced anywhere at this time. Hungary uses geothermal water for 61 medicinal baths, 350 public baths, and 1,200 swimming pools. Agriculture has an installed capacity of 120.43 MWt; district heating, sanitary hot water, and industrial applications 58.7 MWt; and bathing and balneology 187.3 MWt for a total of 366.5 MWt.

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6 November 2005.

7 Currently suspended.

B. ARMENIA

Energy Sector – Legal Framework, Policies and Issues. The State Energy Policy of Armenia considers priority development of own renewable sources of energy as one of the main conditions to ensure energy security and sustainable development of Armenia's energy sector.

The legal framework guarantees purchase of electricity produced for all small renewable power plants and provides payment assurance. The regulatory commission has set attractive tariffs for newly constructed run-of the river small hydropower (USc 4.5/kwh), and wind and biomass plants (USc 7.0/kwh) for 15 years.

Renewable Energy Resources (RER). Armenia has significant renewable energy resources, but they play a limited role in the country's energy supply. Approximately 740 MW of small hydropower, wind and geothermal resources have been identified, which, if implemented, would represent approximately 25 percent of the present installed capacity. Hydropower and some of the wind resources are estimated to be most attractive. There is also interest with respect to biogas generation from farm-based anaerobic digesters as well as from landfills.

Due to the favorable legal and regulatory framework around 35 project developers have recently obtained construction licenses for the hydropower plans. However, a number of financial, legal/regulatory, institutional and informational barriers impede large scale private investments in the development of renewable resources.

Geothermal Energy. Though Armenia is located in a zone of high tectonic activity and recent volcanism, its geothermal resources are largely unexplored. At present they only provide low-to-medium temperature thermal water. Further exploration may reveal high enthalpy resources suitable for electricity generation.

The Jermakphur area has been identified as suitable for electricity generation with geothermal power plant envisaged to have a capacity of 25 MW with a maximum annual output of approximately 200 GWh of sales power. Development technology comprises underground development in doublet configuration and the establishment of a surface geothermal power plant comprising steam field and power generation.

The Government of Armenia is committed to the development of renewable resources, particularly the geothermal energy as evidenced by the establishment of supportive legal/regulatory framework. Further the Ministry of Energy through its own resources has carried out geophysical and geochemical investigations in the Jermakphur area.

To advance development of geothermal resources in Armenia it is necessary to carry out careful analysis of available geological and geothermal data including the results of hydrodynamic investigations and testing of geothermal reservoirs in existing wells to reveal prospective areas.

Identification of Areas/Projects with High Potential for Geothermal Energy

The only definite opportunity for geothermal development in Armenia lies in the creation of state-of-the art heat supply systems with heat pumps. Any electricity production projects need high cost investigations with additional exploration drilling.

Barriers/Incentives for Geothermal Energy

Specific incentives for the implementation of geothermal projects in Armenia include:

The shortage of fuel-power resources in Armenia results in the necessity to import large volumes of expensive natural gas. Development of geothermal resources would preserve capital in the country.

Specific barriers to the implementation of geothermal projects in Armenia include:

- Need for high cost investigations to discover high temperature reservoirs
- Tariffs for geothermal power are set based cost-plus approach complicating cash flow projections for investors.

C. RUSSIA

Energy Sector – Legal Framework, Policies and Issues. Despite restructuring efforts underway to privatize the industry, the energy sector faces many of the same challenges as other eastern European countries, including uneconomic tariff structures, non-payment, and aging electric systems.

In 2001, a phased restructuring program was enacted to facilitate the liberalization of the electricity sector through 2009. Under this plan, generating companies will be divested into separate, independent entities. The greatest threat of energy sector privatization is the concentration of assets in the hands of 3-4 financial industrial groups, which would provide opportunities for price fixing. Furthermore Russia hasn't reduced the state's influence in the energy sector.

Russia is the fourth largest generator of electricity, behind the US, China, and Japan. Throughout the 1990's the consumption and generation of electricity fell dramatically. In fact, the total generation is not expected to reach 1990 levels until 2010. The decrease in production can bee attributed to a number of factors, including decreased demand through economic downturns, plants being retired, and customers being disconnected from the system for non-payment.

Russia currently still lacks a coherent energy policy, as the energy sector remains monopolized and heavily regulated at the same time. The present state of regulation and the lack of concrete steps toward restructuring have resulted in under investment in this sector. A competitive market structure is a prerequisite to ensure that the cost of energy stays low enough (at 3 cents per kilowatt) to allow the creation of new industrial enterprises. The Russian government approved the country's energy strategy to 2020 in September 2003.

The *Main Provisions of the Russian Energy Strategy* places relatively little emphasis on environmental issues. Only a short section focuses on the development of technologies and the technical means for the stable long-term development of energy resources, ensuring ecological and technological safety of energy production and use. A Federal Law on Renewable Energy Sources has not been adopted yet.

The Main Provisions of the **Russian** Energy Strategy places relatively little emphasis on environmental issues. Only a short section focuses on the development of technologies and the technical means for the stable long-term development of energy resources, ensuring ecological and technological safety of energy production and use. A Federal Law on Renewable Energy Sources has not been adopted yet.

Renewable Energy Resources (RER). With the exception of hydropower, Russia's utilization of renewable energy sources remains low relative to its consumption of fossil fuels. Almost 75 percent of Russia's hydroelectric capacity is located at 11 power stations. The Kamchatka Peninsula in the Far East has rich geothermal resources.

District Heating (DH) sector. Combined electricity and heat generation (cogeneration) is among the most technologically clear, industrially mastered and commercially efficient ways of cutting down the consumption of fossil fuels and of reducing the environmental impact involved. In Russia is plenty of experience available in this field. In the USSR, cogeneration-based centralized heat supply for municipal consumers dates back to 1925 in St. Petersburg and to 1928 in Moscow for the delivery of steam to industrial facilities and for residential heating. The cogeneration-based centralized heat supply systems had found in the USSR a wide commercial application already before World War II.

The current challenge is to revitalize the DH and co-generation local energy systems through modernization, good tariff structure and use of renewable energies.

Geothermal Energy. In Russia there is a good level of information available on geothermal resources. Geothermal energy development targets are envisaged by the National Program on Renewable Energy Sources Development. It estimates a geothermal potential for electricity generation with more than 3000 MW, a gross (theoretical) potential of 400 MW, and a technical potential (with proven resources) of 300 MW by 2005.

At present the geothermal energy is used in Russian Federation both for heat supply and electricity production. High enthalpy geothermal locations are Kamchatka Peninsula (steam- water fields), Kuril Islands (steam- water fields), and Northern Caucasus (hot geothermal brines). Electricity production is carried out at two operating geothermal power plants located at Kamchatka Peninsula.

Specific incentives for the implementation of geothermal projects in Russia include:

- High prices for imported mazute (fuel oil) used at thermal power plants of Kamchatka and Kuril Islands and correspondingly high tariffs for electricity.
- Shortage of basic power in Eastern part of Northern Caucasia, where the large thermal power plants are absent.
- Considerable proven resources of geothermal energy including with already drilled wells.

Specific barriers to the implementation of geothermal projects in Russia include:

- Absence of legal support at the level of Federal laws.
- High investment risks.
- Low tariffs for electricity in European part of the country.

D. TURKEY

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 is 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 *Turkey* electricity production from renewable energy resources is encouraged. The "Turkish Electricity Market Law" contains two regulations pertaining to the promotion of the use of RE: The legal entities applying for licenses for construction of RE 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.

Renewable Energy Resources (RER). Non-fossil energy sources have a high share of energy supply in Turkey. Hydroelectric power already accounts for about 40 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 4,500 MW of geothermal power production potential. Current Turkish geothermal generating capacity is 820 MW. 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 District Heating (DH) Sector. Turkey is the seventh richest country in the world in geothermal potential. Engineering design for nearly 300,000 residences equivalence of geothermal DH has been completed. 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; whereas, the GDH center and distribution networks have been designed according to the geothermal DH systems parameters. This constitutes an important advantage of geothermal DH systems investments in Turkey in terms of the technical and economical aspects. An annually average of 23 percent growth of residence connection to GDHS 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 Energy. Turkey is located on the Alpine-Himalayan orogenic belt, which has high geothermal potential. 170 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 utilization). Around 1200 hot and mineralized natural springs and 500 geothermal wells exist in Turkey.

The theoretical probable geothermal heat potential of Turkey is estimated as 31.500 MWt (equal to 5 million residences[8] heating). According to today's technical and economical convenience, 1.25 million residences equivalence could possibly be heated geothermally in Turkey. However, now only 65000 residences equivalence are heated geothermally.

Most of the development is achieved in geothermal direct-use applications by 1077 MWt. 750 MWt (which equals to the heat requirement of 65000 residences equivalence) of this potential is being utilized for geothermal heating including district heating, thermal tourism facilities heating and 565000 m^2 geothermal greenhouses heating. The remaining potential of 327 MWt of this potential is being utilized for balneological purposes (There exists 195 thermal facilities (Balneology) in Turkey).

By summing up all these geothermal utilizations, the geothermal installed capacity is 1077 MWt for direct-use and 20.4 MWe for electricity production in Turkey. Moreover, a liquid carbon dioxide and dry ice production factory (120.000 tons/year) is integrated to this electricity production power plant.

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[8] One residence equivalence is assumed to be 100 m^2 floor area.

Annex 2: Major Related Projects Financed by the Bank and/or other Agencies

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

Sector Issue	Project	Latest Supervision (PSR) Ratings (Bank-financed projects only)	
Bank-financed		Implementation Progress	Development Objective (DO)
Low demand, awareness and capacity for energy efficiency services in the buildings sector; Risk barriers in the financial markets inhibiting commercial bank participation in energy efficiency project financing.	Poland: Krakow Energy Efficiency Project	S	S
Lack of capacity to implement energy efficiency projects. A core project developer is established for this purpose.	Croatia: Energy Efficiency Project	S	S
Financial barriers	Poland: Podhale Geothermal DH and Environment Project	U	S
Lack of experience and examples of successful small-hydro plant rehabilitation;	Hungary: Small Hydro Project	HS	HS
Lack of the necessary institutional procedures and capacity, supporting regulations, and a financing mechanism to provide commercial long-term financing for renewable energy projects	Turkey: Renewable Energy Project	S	S
Difficult access to finance, Perception of high risk for EE projects, weak capacity to develop bankable EE projects, lack of innovative EE financing	Romania: Energy Efficiency Project	MS	S
Excessive Energy Intensity, Difficult access to finance, Perception of high risk for EE projects, weak capacity to develop bankable EE projects, lack of innovative EE financing, information barriers, weak financial incentives for end-users	Bulgaria: Energy Efficiency Project	active	
Institutional and financial as well as competitiveness barriers	Russian Federation: Renewable Energy Project	Pipeline	
Lack of an economically and environmentally sustainable market for renewable energy resources; Barriers include policy, financial and technical barriers.	Croatia: Renewable Energy Resources Project	Pipeline	
Other development agencies			
Financial barriers	Poland: Pyrzyce Geothermal Project		HU
Financial barriers	Poland: Mszczonow Geothermal Project		S
Financial barriers	Russian Federation: Mutnovsky Geothermal Project		S

Annex 3: Results Framework and Monitoring

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

Results framework. Each subproject that will lead to actual investments will have its own monitoring indicators, benchmarks, and monitoring plans to confirm actual carbon reduction achieved, as measured against a project-specific baseline. This is very important globally in that cost-effectiveness indicators (US$/$CO_2$ removed) will be established through the GeoFund for different project types and situations, which will be used in possible future applications by GEF and by the international community as non-recipient countries enhance their actions to reduce carbon emissions.

The institution/company that is implementing a subproject, will prepare a set of monitoring indicators (physical/technical, operational, financial and environmental), including the key indicators which will be monitored and reported upon on a quarterly basis in the context of the Project Management Reports. A list of monitoring indicators, acceptable to the Bank, will be submitted to the Bank by the Recipient at negotiations. The final commitment to the monitoring indicators selected (including numerical targets as appropriate) will be made at the signing of the legal agreements by attaching an appropriate supplemental letter.

Additional indicators describing further impacts and benefits will be developed during appraisal to evaluate other development contributions (industrial, local manufacture, employment, and other social benefits). Their specific values will be further defined during project preparation. The following section deals with the monitoring of outcome indicators of the GeoFund.

PDO/PGO	Program Outcome Indicators	Use of Program Outcome Information
PDO: The objective of the Program is to systematically promote the use of geothermal energy in the Europe and Central Asia region by removing barriers to the development of renewable energy. PGO: The Program's global objective is to reduce greenhouse gas (carbon dioxide) emissions by streamlined implementation of geothermal projects.	Preparation and implementation of about 8 to 10 geothermal energy projects in participating ECA countries over the lifetime of the Program. CO_2 reductions in an overall amount of app. 6 million tons of CO_2eq over the lifetime of the Program.	Evaluation of initial Program concept; if necessary, re-alignment of operational principles, terms of support, etc. – enabling framework for RER investments. These projects may be demonstration projects, which will be replicated throughout the region. – increased level of financing for GeoE projects. Demonstrate that CO_2 reduction can be achieved in a cost effective manner while also producing local benefits.
Intermediate Outcomes	**Intermediate Outcome Indicators**	**Use of Intermediate Outcome Monitoring**
Component One: Geothermal technology inherent barriers (IB – technology and scientific barriers) removed.	Component One: Better understanding of the technical and economic potential of geothermal energy in ECA member countries. Geothermal data bases, dissemination of knowledge and Know-How.	Component One: Inputs to project development

Component Two: External barriers (EB – institutional, policy, legal and regulatory barriers) removed.	Component Two: Increased capacity and cooperation within governments. Priority list of barriers and program of barrier removal. Improved energy strategies, policies and funding mechanisms; incentives for RE and geothermal energy use. Increased capacity in the private sector. Increased capacity in the public sector (particularly public utilities).	Component Two: Determine whether Project activities of this component help to establish a favorable regulatory framework and enabling environment for GeoE investments. Favorable conditions for project development.
Component Three: Investment risk and financial barriers (IB and EB) removed.	Component Three: Amount of private capital raised for every dollar of GEF financing through the GeoFund Program (Leverage Ratio). Number of GeoE projects and associated investment volume with other financial institutions and investors.	Component Three: Determine whether the projects components meet the financial needs of GeoE projects investments. Favorable conditions for GeoE project implementation.

Arrangements for results monitoring. Institutional and data collection arrangements at the subproject level will be determined for each individual project, with reporting responsibility resting on the project sponsor. The beneficiary is responsible for monitoring and controlling the drilling execution, the testing and the operations of the geothermal wells and plant facilities. All parameters, which are covered under the GRI, will be monitored also by independent consultants. Monitoring equipment needs to be part of the scope of investments. The monitoring results will be provided in regular reports, readily accessible to the GCT.

Monitoring and evaluation of the outcome indicators of the GeoFund will be the responsibility of the GCT. Sources of data collection will be reports by subproject sponsors, government offices, national geo-information offices as well as surveys and interviews conducted with representatives of utilities, the financial sector, etc. These reports will be expected to be received from project developers annually and will cover progress of project implementation, updated cost and financing plans, financial statements of the project sponsors and financial management reports, updated procurement plans, environmental compliance reports, as well as operational performance reports of the project once started up: physical inputs and outputs, costs of inputs and outputs, reductions of emissions of local and global pollutants, measured against the baseline. (For more details see also Annex 15.)

Examples for Envisaged CO_2 Reductions for Projects started in the Start-Up Phase. There are three projects that are envisaged to receive support: the Verkhne Mutnovsky power plant (Russia), the Jermakhpur power plant (Armenia), and the project in Hungary. CO2eq reductions from these three projects are envisaged as follows:

- Hungary project: the annual reductions are 20,000 ton of CO_2 reduction or 0.6 million tons over the life of the project;
- Verhne-Mutnovsky project: the annual reductions are 40,000 tons of CO_2 or 1.2 million tons over the life of the project;
- Jermakhpur project: the annual reductions are 120,000 ton of CO_2 reduction or 3.6 million tons over the life of the project.

The three projects could generate some 5.4 million tons of reductions.

Table 1. Arrangements for results monitoring

		Target Values		Data Collection and Reporting		
Program Outcome Indicators	**Baseline**	**2006-08 identified**	**2009-13 envisaged**	**Frequency and Reports**	**Data Collection Instruments**	**Responsibility for Data Collection**
Increase in investments in geothermal energy in participating countries	TBD	TBD	TBD	Twice during GeoFund implementation	Mid-term Review and ICR (Implementation Completion Report)	GCT
Number of projects implemented	0	2	7	Yearly	ICR	GCT
CO_2 reductions in an overall amount of app. 6 million tons of CO_{2eq} over the lifetime of the subprojects	0	Achieved 4million tons of securableCO_{2eq} reduction	Achieved 5.4 million tons of securableCO_{2eq} reduction	Twice during GeoFund implementation	Aggregated from subproject M&E consultant reports	GCT
Intermediate Outcome Indicators						
Better understanding of the technical and economic potential of geothermal energy in x number of participating ECA countries through case studies and training	0		6	Twice during GeoFund implementation	Reports from geo-information offices	IGA
Geothermal data bases and International summer school in x numbers of countries	0	2	5	yearly beginning in 2006	Report from IGA to the World Bank	IGA
Roster of International Geothermal Experts	0	by mid 2006	Yearly update	Yearly	Report from IGA to the World Bank	IGA
Creation and maintenance GeoFund web side	0	By end of 2006	Continuous	Half yearly	Report from IGA to the World Bank	IGA
Priority list of barriers and program of barrier removal by country or by country group	0	1	Completed and approved	Twice during GeoFund implementation	Report from IGA to the World Bank	IGA

TA for Feed-in Tariff Design favorable to GeoE	0		Completed and approved	Twice during GeoFund implementation	Report from IGA to the World Bank	IGA
TA for sub-laws on grid code, licensing, and permitting procedures	0		completed and approved	Twice during GeoFund implementation	Report from IGA to the World Bank	IGA
Amount of private capital raised for every Dollar of GEF financing through the GeoFund Program (Leverage Ratio)	0	3	4	Twice during GeoFund implementation	Report from WB to GEF	GCT
Develop and introduce an innovate financial product tailored for financial needs of geological projects (GRI)	0	1	3	Yearly	Legal contracts	GCT

Annex 4: Detailed Project Description

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

A. Overview

The Program follows a strategic approach in providing assistance to barrier removal, provides geological risk insurances, financial support and technical assistance in project preparation and implementation to project developers in client countries to ultimately facilitate the implementation of individual geothermal projects. The Program will be an umbrella for many geothermal subprojects in participating ECA countries and will involve the provision of:

1. Technical assistance for the following purposes:

- *Capacity building to improve understanding of barriers and their means of mitigation.* The availability of geothermal resources, modes of occurrence, and methods of utilization will be assessed and comprehensive geothermal data bases will be established. Thus, the existence of geothermal resources in the participating ECA countries will be confirmed or demonstrated. This task will be completed primarily by local geological institutions or associations, with technical assistance support by the Project. Development of use of RER, including GeoE, will be monitored. Local capacities to develop and implement geothermal energy projects will be strengthened.
- *Policy reviews concerning energy demand and use and amendments to legislation preferential to geothermal energy*. Energy sector policies and legal, regulatory and institutional frameworks in participating ECA countries will be systematically reviewed to identify key barriers towards the use of RER. Policy reforms and framework improvements, which would reduce the bias in favor of fossil fuels, will be developed.
- *TA support for project preparation and implementation*. Feasible geothermal projects will be supported with technical assistance and capacity building, assisting project developers to prepare, implement and operate their investments.

2. Financial assistance supporting project developers through providing:

- Low cost loans;
- Contingent and non-contingent grants, and
- Facilitation of access to additional commercial financing on reasonable terms through the provision of geological risk insurances for the geological risks of the investment.

The World Bank will set up the ***Geothermal Energy Development Program (GeoFund)***. The GeoFund is designed to respond to medium-/ long-term market conditions existing in the participating countries. The paramount objective of the GeoFund is to build sustained market capacity to develop and finance geothermal projects on commercial terms using private capital. Funding of the tasks above will be through the three principal instruments of the GeoFund, as discussed below.

B. Technical Assistance Window

The Technical Assistance (TA) Window of the GeoFund will address in the first place barriers that retard the use of RER and geothermal energy. It will work with participating government agencies to identify the barriers, determine their resolution queue and devise means to implement improved policies, legal, regulatory and institutional frameworks. Participating countries would carry out the identification of barriers, and delineate ways of addressing them. The TA Window will also help set up geothermal databases, and will identify and prepare/implement geothermal projects. The amount of the TA Window is proposed to be US$7 million. As countries recently joined the EU are already fairly advanced in the lowering or removal of

barriers, TA would focus more on the "countries further east". For a discussion of four categories of countries, with increasing need of TA funding, see the discussion of the Investment Funding Window below.

Three major types of TA will be distinguished:

- Region-wide TA: technical assistance for region wide activities, such as review and assessment of geothermal resources, modes of occurrence, and methods of utilization, training of local experts in preparation and implementation of geothermal energy projects; transfer of know-how through establishing a roster of international geothermal experts and implementation of targeted international studies; support to organization of conferences and workshops; dissemination of information through support to the creation of knowledge resource centers and publications (approximately, 40 percent of funding resources);
- Country-specific TA: energy sector policies, technical assistance for legal/regulatory/institutional barrier removal and technical assistance for setting up geothermal data bases and information systems (approximately, 25 percent of funding resources); and
- Project-specific TA: technical assistance for project preparation and implementation (approximately, 35 percent of funding resources).

The TA fund is likely to be supplemented by TA funds from multilateral and bilateral sources, as well as by support from client countries. The GeoFund Coordination Team (GCT) has identified about 40 projects in different countries. With a few exceptions all are in need of TA for project preparation. This led to a higher demand of TA during the Start-Up Phase of the GeoFund Program than was anticipated at the time of the Project Brief preparation. It was, therefore, suggested by the GCT to increase the allocation of the TA from US$5 million to 7 million.

C. Direct Investment Funding Window

The Direct Investment Funding (DIF) Window will provide contingent grants, low-cost loans or, in limited cases, grant financing, thereby covering part of the project cost through monetization of external benefits. The total amount for the DIF Window will be US$8 million. Grant funds may be used solely to defray a portion of the direct investment costs associated with geothermal drilling of production and reinjection wells and post drilling project implementation. The GeoFund will give priority to providing grant funding for exploration drilling and well testing expense in order to maximize the risk coverage offered to project developers at that critical juncture of project development. After a positive drilling result, further project direct investment costs may be considered for grant funding to the extent that the project developer is able to argue persuasively that further support is critical to enhance project economics sufficiently to allow the project to proceed to implementation.

The grants and contingent grants would be particularly important where, due to distortions in the energy and financial markets, only demonstration projects could be implemented to help highlight the substantial benefits of geothermal energy development. The funds of the DIF Window are considered to compensate project developers for the substantial externalities of geothermal projects by monetizing the associated benefits. However, it would be expected that the predominant form of DIF instruments would be a straight grant, at least during the first Start –up Phase of the GeoFund, mainly from the point of view of administrative efficiency. Appropriate size of straight grant and applicable conditions for contingent grants for individual subproject will be determined at the subproject level based on the assessment of desirable economic and financial impact to the project.

Regional coverage. While the terms of investment project specific TA support and those of the GRI are adjusted to the requirements of individual projects as well as to the results of risk assessment, the availability and terms of DIF support varies across the region. In this respect the following two types of countries will be distinguished:

- Group 1: The set of countries which joined the EU in May 2004, consisting of Poland, Czech Republic, Slovakia, Hungary, Estonia, Latvia, and Lithuania. EU countries are not eligible for outright grants. In certain project specific circumstances they may be eligible for contingent grants.
- Group 2: All remaining countries of the World Bank grouping of Europe and Central Asia (ECA), i.e. Bulgaria, Romania, Serbia and Montenegro, Macedonia, Bosnia and Herzegovina, Albania, Moldova, Turkey, the Russian Federation and Ukraine, Belarus, Georgia, Azerbaijan, Armenia, Kazakhstan, Kyrgyz Republic, Turkmenistan, Tajikistan and Uzbekistan. Project specific criteria will be used to determine eligibility for outright grant or conditional grants.

Indicative Terms of DIF Support. In addition to the above principles that recognize the differences in such factors influencing renewable investments as legislative and institutional support, the performance of the banking sector and the availability of investment capital across the region, the required DIF support would be determined for each subproject in consideration of the required revenue stream necessary for servicing its debt. In the case of DH projects, where heat sales constitute this revenue, in most countries of the region the ability to pay for the service is a critical constraint to all district heat projects. Determination of the required type of support scheme will therefore be based on an assessment of affordability, i.e. an assumed percent of household income. Contingent grants could also then be reduced if incomes rose enough so that heat prices could be raised. Similarly, the level of the DIF support justified for a power project at the beginning may need a revision should electricity prices be later adjusted.

Region and country specific tasks (removal of knowledge barriers, transfer of know-how, assessment of geothermal potential, preparation of geothermal data bases, monitoring of the development of RER/GoeE use, implementation of policy reviews and amendments) will be funded through the TA window of the GeoFund. Subproject specific support extended to project developers will be made available through different instruments of the GeoFund during different preparatory stages of the project, as illustrated in the following figure:

Table 1. Illustrative scheme of Instruments

Project phase	Activity	TA	GRI	DIF
Preparation/Development	Resource Assessment; Pre-feasibility Study Etc.			
	Feasibility Study; Business Plan Etc.			
Exploration and well construction/testing	Drilling		EXGRI	
	Test Operation		EXGRI	
	Construction			
Operation	Operation		OPGRI	

D. Geological Risk Insurance Window

The Geological Risk Insurance (GRI) Window of the GeoFund will, in part, insure project developers/investors against the short-term, up-front geological risk of exploration, and, in limited circumstances, against the long-term geological risk associated with the unexpected deterioration of the performance of the geothermal reservoir over time. In the case of long-term geological risks, the geological risk insurance will provide for a stream of pre-defined payments over the tenure of the insurance, to make up for lower than estimated revenues, and/or higher than estimated operating costs. The risk coverage and

insurance coverage under the GRI Window will be partial, to motivate project sponsors to carry out a sound and thorough geological investigation and avoid moral hazard. The main purpose of the GRI Window is to provide help to project developers to obtain adequate financial resource for their project. The GRI Window is proposed to be endowed with US$10 million. Any amount committed but not paid under the GRI will be reutilized for subsequent GeoFund activities.

The risk mitigation of the GRI Window should stimulate private and public investors to proceed with their projects and enable them to attract additional financial resources at an affordable pricing. This, in turn, should allow resulting project cash flows to service annual loan repayment obligations comfortably. The GRI Window will be designed to compensate investors or their commercial banks in case of specified risks materializing.

GRI Instruments. Broadly there will be two types of GRI coverage available:

- Exploration Risk Insurance (EXGRI): a short-term cover for up-front geological exploration drilling risks (the production wells not encountering a geothermal reservoir or not encountering yield and temperature parameters as estimated prior to drilling), and
- Operation Risk Insurance (OPGRI)[9] a 3 – 5 year long cover for operational risk of geothermal wells (declining yield and/or temperature, as well as chemistry, mineralization, resulting scaling and/or difficulties to re-inject the geothermal brine).

GRI parameters. For each type of GRI, the insurance coverage will be defined against the key parameters of the geothermal energy production, such as reservoir temperature, wellhead pressure, wellhead flow rate, geothermal fluid chemistry, etc. In developing the GRI coverage, which is linked with geothermal performance of the insured production and/or injection well, a scoring model will be established based on the estimated (i.e., predicted) and actual geothermal data such as wellhead temperature, wellhead flow rate, estimate of permeability, geochemical analyses of geothermal fluid and non-condensable gasses. Such scoring model and framework will be critical for quantifying the insurance coverage in a transparent manner as well as managing and monitoring the geological risk covered under the GRI window.

A well that under-performs due to no injection or thermal breakthrough from a poorly sited injection well should not be eligible for remedy.

Since there is no established actuarial methodology to reliably quantify the geological risk, the GRI should not be considered as a pure insurance instrument. It is more like a compensation scheme to cover part of the drilling cost or operational revenue which is lost as a result of less-than estimated quantity or quality of geothermal energy resource. Thus, if the temperature of the geothermal reservoir was estimated at about 100 degrees Celsius, but the tests showed only 75 degrees Celsius, the EXGRI would cover the part of the drilling cost and expenses if such test result is considered total failure and the drilled well becomes a “dry” hole. GRI could pay prorated amount if the result is less than full success but more than total failure.

The OPGRI would cover the period of the learning curve for smooth operations (e.g. three to four years), thereby giving enough time to appreciate potential trouble spots of the operations. This would then require the monitoring of key parameters on a regular basis until the end of the OPGRI, to allow calculations of claims, if and when parameters change significantly. It may take time to develop the OPGRI scheme as a standard tool because of the complexity of risk definition and length of insurance period. It is therefore envisaged that EXGRI will be predominantly used at an early stage of project development.

Coverage. EXGRI would cover up to 85 percent of the eligible cost. Eligible cost will be defined as the actual loss incurred by the project developer due to drilling results other than expected.

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[9] OPGRI is an untested instrument and has not been fully developed. It will not be actively marketed during the Start-Up Phase. It will be offered as the GeoFund develops a track record with EXGRI and establishes a workable product framework.

Tenure. Each EXGRI would have tenure of up to nine months from the start of the drilling of well covered under the EXGRI.

The OPGRI will have to be limited to three to five years of operation. It should also consider using a formula with a cap set, for example, at the costs of the wells, reduced by some depreciation rate, and multiplied by an appropriate GRI Ratio. This maximum would only apply in case of necessary complete abandonment of the installations.

Pre-Conditions and Underwriting Criteria. While GRI will cover in principle the geological and geology related risk, other technical and commercial aspects including the safeguard issues of the project need to be carefully reviewed. With respect to GRI applications, technical and geological evaluation of the geothermal exploratory well under GRI coverage will be conducted and presented in the form and substance in accordance with the GeoFund operational guidelines. The technical and geological evaluation will be critical to control the probability of GRI payout and to maximize the financial sustainability of the GRI portfolio in the GeoFund.

Pre-Conditions for EXGRI Application. A key risk mitigation strategy for geothermal energy projects is to adopt a phased approach associated with the geothermal exploration and development activities with a clear decision point at the end of each phase, before proceeding to the next phase. However, such initial geothermal exploration phases as office-type geothermal resource study, field reconnaissance surveys and investigations and detailed geothermal exploration surveys must be completed and are required elements for the project to be eligible for the GRI Windows of the GeoFund. The data and information from these initial exploration phases are the critical elements that will need to be evaluated by the GCT and the GeoFund Group of Scientific and Technical Experts (STE) to determine whether the geothermal energy project will be considered for support under the GRI Window associated with the exploration-drilling phase of the specific geothermal project. Although there can be no absolute pre-drilling determination of whether a particular geothermal exploratory well will be successful, the technical evaluation data and testing methodologies described above are necessary for the GCT to assess the probability of successful well drilling with reasonable confidence. With a positive recommendation from the STE based on their analysis of the accumulated data and interpretations of the three initial exploration phases and the designation of a probable exploration-drilling target by the geothermal energy project developers/investors, the World Bank may make a GRI commitment in form of a grant agreement.

Pre-Conditions for OPGRI Application. Once it has been determined by the Project Task Manager that the exploration associated with the development of the investment subproject has been successfully completed, the World Bank may make a GRI commitment to the operational phase of the geothermal project in form of a grant agreement. The primary long-term geological risks associated with the operational phase of a geothermal project include producing a geothermal reservoir with lower-than-estimated temperature, higher than estimated mineralization, or difficulty with re-injection of geothermal fluids back into the subsurface formations.

The determination of a sub-optimal operational performance and the triggering of the GRI commitment will be derived from requested well testing, the continuous monitoring and measurements of physical and chemical parameters, including as a minimum the determination of the wellhead temperature, wellhead pressure, wellhead flow rate, and geochemical analysis of the produced geothermal fluids and gasses as a function of time. These geothermal parameters will be continually monitored and analyzed to document the sub-optimal performance of the geothermal project.

GRI Premium and Fee. The GRI premium could be determined in theory by the probability of risk occurrence over the life of GRI scheme for EXGRI and OPGRI, respectively. However, because of the peculiarity of the geological nature of each geothermal well and the lack of reliable data and technical and actuarial methodologies, it would be very difficult to assess the probability of risk occurrence with a high degree of confidence level. Conversely, if the probability of risk occurrence is measured with high confidence, a project developer would be willing to proceed with the geothermal project by taking such

calculated risk into account in developing financial feasibility, and the need for geological risk mitigation instruments will be diminished.

Given the experimental nature of GeoFund as a development vehicle for geothermal energy projects, GRI premiums will need to be determined with relatively greater emphasis on practical consideration of the GRI instrument's marketability as a compensation scheme than the theoretical consideration on the financial sustainability of the GRI scheme as a pure insurance scheme. GRI premiums will be reviewed and adjusted during the implementation period based on the actual occurrence of geological risk events. Underwriting criteria may also need to be adjusted. As a medium and long-term prospect, private insurance market may develop a fully market-based instrument which can mitigate the geological risk with affordable pricing. Alternatively, technological advancement may enable the project sponsor to assess the geological risk with a much greater degree of confidence and virtually make any insurance scheme obsolete or needless. In this respect, the role of GRI as a "market development" instrument is to bridge the gap between the mostly publicly subsidized schemes to fully market-based instrument.

GRI premiums will be proposed as follows:

For EXGRI: between 3 to 5 percent on the eligible cost of drilling and payable upfront upon signing.

Applicable fee will be determined based on the risk-assessment of individual projects. Lower fee for better risk and higher fee for relatively riskier proposal would apply.

For OPGRI up to [X] percent p.a. on the total amount of OPGRI payable during the OPGRI tenure. Premium can be prorated in proportion to the maximum payout amount.

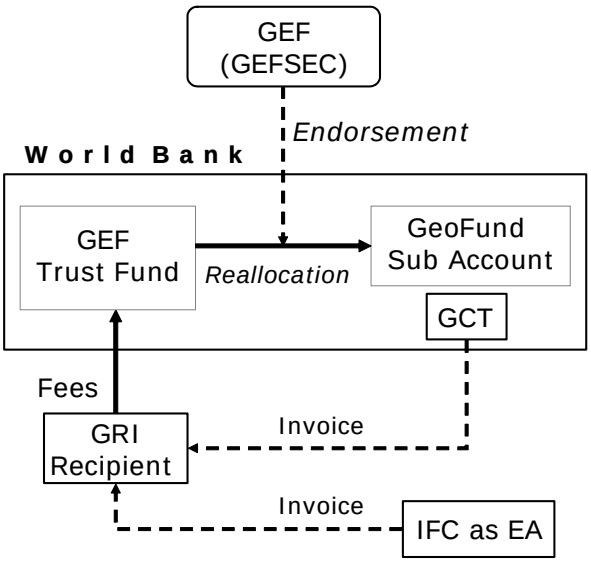
Application and Processing Fee: To be determined by the GCT on individual project basis depending on the complexity of the project proposal. Application and processing fee is to cover part of the preparation and processing expenses including hiring expert consultants for technical, financial, and legal advisory.

Fee payment and reallocation procedures. Upon receipt, GRI premium and processing fee will be first credited to the GEF Trust Fund, and then reallocated to the GeoFund sub-account in the same amount. The reallocated amount to the GeoFund sub-account will be further utilized as part of the overall GeoFund resource.

The processing of the fee payment and reallocation in the Bank will take the following steps.

1. The GCT (or IFC for its operations) will issue an invoice to the recipient for the amount of fees payable, specifying that the payment will be credited to Trust Fund No. TF029840 (the GEF Trust Fund). Trustee and ACTTF will be copied or informed of the invoicing (date of the invoice, expected payment date and amount of the invoice etc.).
2. The Trustee shall notify IBRD Treasury of the incoming payment.
3. The recipient pays the amount to be credited to TF029840.
4. Receipt of the fee will be confirmed by the Trustee to the GCT (or IFC) which will constitute a condition of effectiveness of the GRI commitment.
5. The Trustee shall inform the GEFSEC of the fee income received and request GEF CEO approval/endorsement for the increase of allocation to this Project by the fee income.
6. Upon notification by the GEFSEC of the approval/endorsement of the increase, the Trustee shall commit and transfer the approved amount to IBRD as Implementing Agency, who shall allocate the same to GeoFund sub account as reallocation of the GEF resource for further utilization for the GeoFund operations.

GRI Fund Flow



E. Lifetime of GRI and DIF Windows

While funds in the TA window deplete according to a pre-determinable disbursement schedule, those in the GRI and DIF windows are both of a partially revolving nature. GRI funds become depleted over time according to an assumed average failure rate of maximum 35 percent. Multiple guarantees will be possible too, as the probability of the risk materializing is limited. Most of DIF support will be on no contingent basis, even though it would facilitate a revolving operation. Due to the small transactions and to legal constrains a contingent operation is envisaged for the second phase of the Program. The overall ratio of depletion for the DIF window (incl. non-contingent grants and assumed failure rate of contingent grants) is assumed to be 60 percent.

F. Project Types

The GeoFund will support investments in geothermal energy use for the following purposes:

a) Electricity generating projects in places where the geothermal reservoir promises sufficiently high temperatures to achieve that goal. Likely candidate areas for such projects would be in several parts of Russia (Kamchatka), in Hungary, Turkey and possibly in Romania and the Slovak Republic;

b) Fuel substitution projects in existing district heating facilities will be the most likely projects; in these cases geothermal energy would be to a large extent substituted for an existing fossil fuel source; these have a good potential throughout most of the ECA countries;

c) Geothermal energy projects for the purpose of heating of individual housing blocks (not involving DH networks, or only small new networks), of greenhouses, of wood drying chambers, as well as spas and other balneological facilities; and

d) Any combination of (a) to (c), i.e. cascading applications where geothermal resources would be cooled down in successive stages (industrial heating, heating of housing, heating of greenhouses, heating of balneological facilities, etc.), before being re-injected.

It is expected that the majority of geothermal projects (well over 60 percent) would involve district-heating facilities. Only up to 20 percent of projects are expected to deal with electricity generation and the remaining up to 20 percent would involve other uses. Most projects would involve a combination of district heat provision and other applications (combination of (b) and (c)). Typically, most projects involving electricity generation would be in combination with district heating.

G. Project Eligibility

Project proposals will need to fulfill a set of basic eligibility criteria for receiving support from the GeoFund. Eligible subprojects:

a) are located in an eligible country[10];

b) conform to the laws, regulations, objectives, and respective development priorities of the country;

c) will comply with applicable social, environmental and safeguard policies of the World Bank;

d) must meet the requirements set out in the Bank's Articles of Agreement and the relevant provisions of World Bank Operation Manual;

e) are based on one of the three eligible project types or a combination thereof, as described above; and

f) submit an endorsement from the proposing country's GEF Focal Point.

GeoFund support will be available for any type of capital expenditures and investments through equity, debt, mezzanine, etc. by private sector entities, which might support the financing of geothermal energy projects as classified above.

[10] For country eligibility refer to Section A.1.

Annex 5: Project Costs

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

Project Financing (US$ million)	**Start-up Phase (projects identified)**	**Projects most likely after 2008**
GEF Project Financing	11.5	13.5
Technical assistance	*4.8*	*2.2*
Investment financing	*3.2*	*4.8*
Geological risk insurance	*3.5*	*6.5*
Co-financing (Donors, IFIs, banks, governments, private sector)	65.8	104.2
Total Project Costs/Financing	**77.3**	**117.7**

About 8 - 10 projects with an estimated total cost of about US$200 million will be financed under the Program. GEF financing of US$25 million will be made available through three forms as discussed in the previous annex. Disbursement of GEF funds will be done on a project by project basis. The GeoFund would expect additional funding from co-financing partners by leveraging GEF funds at an aggregated overall Project ratio of 1 to 7 (GEF: US$25 million, other sources: US$170 million). It is expected that low-cost funding could become available on a ratio of 1 to 2 (GEF and other sources, including bilateral sources and domestic sources) and that bilateral donors or local funds would provide further grant funding for geothermal development. The minimum debt/equity ratio required for individual projects is 1:5. The modalities of co-financing arrangements will be established on a project-by-project basis.

Distinction needs to be made between:

- GEF sources in the form of a geological risk insurance which do not directly contribute to a project's financing plan and therefore should have a very high leveraging ratio depending on actual payout for unsuccessful projects, and
- Other GEF sources (TA, contingent grant funding, or low cost funding), which directly contribute to a project's financing plan.

Taking only the latter funding (about US$15 million), leveraging would exceed 1 to 10 for those funds.

Annex 6: Implementation Arrangements

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

A. Institutions and Role of Participants

The objectives of the Geothermal Energy Development Program are to provide:

a) Support to Governments in policy improvements and the removal of barriers against the use of RER and notably geothermal energy in participating countries;

b) Capacity building regarding geothermal energy development in ECA countries;

c) Development of a balanced portfolio of geothermal energy projects across ECA countries and applying different geothermal technologies; and

d) Utilization of Geothermal Energy through implementation of geothermal energy projects supported by effective use of the GeoFund resources.

To meet these objectives, a number of actors need to interact as follows:

GEF is providing ***core funding*** of the GeoFund in the amount of US$25 million through the instruments of the GeoFund.

Co-financiers of the geothermal investment projects will be ***investors*** (equity), ***lenders*** (debt financing), and ***donors*** (grants, contingent grants and low cost loans). ***Donors*** will provide co-financing and technical assistance to support policy improvements and project preparation, implementation. Beneficiaries of the Project will be ***Host Governments*** (TA), who will implement policy improvements to eliminate barriers to geothermal energy development, ***NGO and international organizations,*** which will support capacity development in all ECA countries, ***Project Developers*** (equity and debt financing) who will implement geothermal projects, and ***Clients*** of these project companies who will enjoy stable tariffs for heat and electricity.

Project developers, typically utilities, financiers or investors, will be the direct beneficiaries of project-specific technical assistance, Geological Risk Insurances (GRIs) and Direct Investment Funding (DIF) and the indirect beneficiaries of regional and country-specific TA.

Country authorities involved in the implementation of TA activities and subprojects may include the national GEF focal point, ministries responsible for energy and environment protection matters, for science, technology development and innovations, energy regulatory offices, government or private institutions responsible for geological exploration and regional and municipal authorities. Country dialogue will be initiated, in most cases, by the GCT in close cooperation with ECA Infrastructure Department with the appropriate representatives of the client country's respective ministry. Principles of the TA activity, its scope as well as the terms of the support will be agreed with these authorities. The country should agree on a counterpart entity with whom the GeoFund enters into a TA project agreement. The regional and municipal authorities will be involved in the further elaboration of the activity and the preparation of the Terms of Reference. Institutions responsible for geological exploration will be typically involved during the implementation phase of the assignment and will be, together with the energy regulatory office, key counterpart to the consulting firm executing the task. The GEF focal point submits a request for the participation of the country in the GeoFund and provides endorsement of investment subprojects.

Nongovernmental organizations (NGOs), defined as any non-profit organization, group or institution that operates independently from a Government and has humanitarian or cooperative, rather than commercial, objectives, can be used as implementing agents and as contractors. An implementing agent is an entity engaged by and accountable to the executing agency to procure and deliver project inputs and their conversion to project outputs. NGOs may serve as implementing agents when they possess specialized expertise in a technical subject or geographic area, thus being well placed to carry out certain project

activities, without assuming overall management (execution) of the project. Henceforth, the executing agency is not obliged to select NGOs as implementing agents through the competitive bidding process; they may be designated through a letter of agreement between the two parties, provided certain selection criteria are met. A contractor/subcontractor is defined as an entity providing services or goods in exchange for payment or other consideration. The responsibilities of a contractor, therefore, differ from those of an implementing agent. Selection of a contractor/service provider is considered as procurement, and the World Bank procurement and contracting regime applies to the selection of an NGO in that respect.

The GeoFund Coordination Team (GCT) will be responsible for the implementation of the GeoFund Program, providing overall strategy, direction, processing.

The GCT as implementing unit of the GeoFund at the Bank will be formed by the representatives of the World Bank, IFC and other partners and executing agencies. The GCT will have the following responsibilities;

- Overall management (setting the GeoFund operational strategy, managing balanced portfolio, etc.) and coordination with donors and partners of the GeoFund;
- Promotion and marketing of the GeoFund program and products to the targeted countries and clients;
- Identification, preparation and development of new subproject applications;
- Internal processing and appraisal of subprojects;
- Instructions of administrative actions for project implementation; and
- Supervisions of subprojects.

It is important to note that the GCT will not be involved directly in the implementation of subprojects. Similar to the Coordination Unit in the Danube/Black Sea program, it tasks will be restricted to coordinating and supervision of the activities of the GeoFund. The project implementation will be done by recipients in the participating countries, supervised by a Project Task Manager in the Bank.

The GeoFund Coordination Team (GCT) will work with participating governments, NGOs, international organizations, and project developers to identify most relevant constraints, determine their resolution queue and devise means to implement improved policies, legal, regulatory and institutional frameworks.

The GeoFund Advisory Forum (GAF) will provide policy advice towards the strategic direction of the GeoFund activities. Therefore, it will provide guidance to the GCT for project development and regional, as well as country-specific and project-specific technical assistance. It will help the GCT to develop its annual and multi-annual GeoFund activity programs and will comment on the GeoFund's annual reports. An important objective of the GAF is to promote barrier removal and to discuss related efforts in the participating countries. The GAF will meet about once a year and will be loosely organized. It will consist of representatives of participating countries' Governments, nominated by national GEF focal points, and will be open to staff from the expert community of countries of the ECA Region and the rest of the world, as well as to representatives of interested donors, project sponsors, private sector participants, and professional NGOs. GCT will nominate the membership of the GAF

The GeoFund Group of Scientific and Technical Experts (STE) will be an expert community, based on a roster of geology, technical, environmental, financial, economic and legal experts. The STE experts will be responsible for carrying out technical, environmental and financial due diligence related activities, will in particular, provide geological risk assessment of projects, and will assist in economic evaluations, as well as legal support for contractual arrangements. The STE will not have permanent staff for the whole period of the Project. Rather, the experts will be selected by the GCT on an ad-hoc basis from the roster, as required for individual projects and tasks. The STE is similar in structure to the Scientific and Technical Advisory

Panel (STAP) of GEF, but has a wider focus in that it also supports the resolution of economic, financial and legal issues in the context of execution of the GeoFund operations.

The World Bank will be implementing the TA Window through each government as recipient. Distinction is made between Regional TA, Country-Specific TA and project-specific TA. For Regional TA, the ***International Geothermal Association (IGA)*** will be executing individual operations as recipient under the work program agreement with the World Bank. IGA will be primarily responsible for the execution of region-wide TA activities under the capacity building component. Reasons for the cooperation with IGA are its profound knowledge about the specific characteristics of geothermal energy and its worldwide operations. It has more than 2000 members in 65 countries, a special consultative status with the Economic and Social Council of the United Nations, and is a Partner of the European Union for the Campaign for Take Off (CTO) Renewable Energy. Even so it has no extensive experience in project implementation it was found to be the only available organization capable of working on a regional basis. IGA will contract to national geothermal associations and other institutions for the organization of training courses, seminars and other events. The work program of IGA's region-wide TA activities will be prepared jointly by IGA and GCT and periodically reviewed in accordance with the Grant Agreement (GA) between IGA and the Bank. Further information on the IGA is provided in annex 19.

The International Finance Corporation (IFC) has been selected as Executing Agency for the World Bank to execute part of GeoFund activities through the Geological Risk Insurance (GRI) window, the Direct Investment Funding (DIF) window as well as the TA window. IFC will mainly focus on the GeoFund operations for private sector beneficiaries. IFC's participation will strengthen the GCT's capacity in terms of the identification of private/municipal sector clients and the commercial due diligence of the project applications.

IFC could identify and develop subprojects, and propose them for GCT endorsement in accordance with the Memorandum of Agreement (MoA). When the GCT identifies or receives project applications, GCT may recommend IFC for processing of those subprojects which GCT considers more appropriate to be handled by IFC than through the host government recipients.

In addition to the MoA, the working arrangement between the Bank and IFC for the GeoFund operations will be also governed by the "Arrangement for the Administration and Management of Funds from the Global Environment Facility (GEF) to be Made Available by the International Bank for Reconstruction and Development Acting as an Implementing Agency of the GEF to the International Finance Corporation" dated May 31, 1996 (the Arrangement). In accordance with the Arrangement, those subprojects which will be assigned to IFC will be administered in accordance with its rules and procedures in terms of the financial management, contract implementation, safeguards, etc. IFC has executed many GEF-supported projects under the Arrangement, and its capacity as Executing Agency for the GeoFund operations is considered satisfactory in all respects.

B. Legal Agreements and Project Documents

Legal relations, distribution of labor, sharing of responsibilities etc. among beneficiaries, intermediaries and the GeoFund will be governed by a series of agreements, as follows:

- **Memorandum of Agreement (MoA) with IFC:** the GeoFund (World Bank) signs a MoA with IFC as executing agency for the GeoFund activities. This agreement spells out the responsibilities of IFC, the distribution of roles between the GCT and IFC for identification, processing, approval, implementation and supervision, and the modality of the transfer of the GEF grant from the World Bank to IFC. In principle, IFC will use its own rules and procedures to execute each GeoFund activity.
- **Grant Agreement (GA) with recipient:** With each recipient (governments and IGA, etc.), the World Bank will enter into a GA under which the principles and objectives of the GEF grant for the GeoFund activities will be spelled out. In the case of IGA, a work program agreement will be

attached to the GA to ensure the quality of underlying activities and to measure progress of implementation against the program.

- **GRI/DIF Agreements:** The World Bank and IFC may use additional documents (e.g. detailed term sheet) to define specific terms for the GRI and DIF instruments for each subproject.

C. Project Processing

The Project processing will follow an approach of a Horizontal APL, similar to the multi-country African Stockpile Programme Project 1. The Start-Up considers six countries. The first subprojects will be implemented in Hungary with a GRI and by IGA with region wide TA. All relevant information about the IGA -, and Hungary -, subprojects is presented in annexes 19, and 20, respectively.

The internal approval process of the GeoFund Program will take the following steps:

1. The GEF Secretariat (GEFSEC)will endorse each subproject based on the council approval of the whole Program;
2. Bank Board approval will be sought for each of the two initial grants for Hungary and IGA and the overall GeoFund Program. The approval of the following grants will be delegated to the RVP and circulated to the Board for 10 working days for information;

The following sequence of activities for project preparation of all subprojects of the GeoFund Program will be followed:

1. The GeoFund Program will follow a programmatic approach similar to a horizontal APL;
2. Each tranche will be given a separate project number. It can consist of a single operation in one country or of several small operations in one or more countries as presented in the PAD for Board approval. The decision whether to bundle several operations or not depends on the size and nature of the operation;
3. Subprojects that are less than US$1 million would follow the GEF MSP documentation and approval instead of a full sized GEF PAD;
4. In lieu of a PCN for subprojects, we will draft a memo to Files (for the Country Director and Sector Manager to sign) that confirms that there are no significant deviations from the Program Objectives. Upon filing, this Memo will be circulated to the standard distribution list;
5. The next phase would be obtaining authorization to proceed to the next phase. To this the Task Manager sends a simple memo (one page maximum) to the Country Director requesting authorization to proceed with the next phase attached with a draft ISDS approved by the RSC and a draft PAD. This memo will be circulated to a standard distribution list of a PCN review. The date of approval of this memo by the CD will be considered the starting date for project preparation and will be recorded as such in SAP;
6. A QER will be held for each subproject of the GeoFund prior to the decision meeting authorizing appraisal and negotiations. All subsequent steps will be the same as for other SIL projects except that subproject final approval will be sought from the RVP. Management approval becomes effective 10 working days after the circulation of the documents to the Board.

<u>Technical Assistance</u>

Submission of request

Regional TA: IGA as recipient of this component will closely cooperate with participating Governments and the GCT to identify and develop a work program for eligible Regional TA activities. IGA will also execute requests for such Regional TA coming directly from governments or NGOs or international organizations or project sponsors. The work program will be reviewed and amended as needed to reflect the updated project pipeline for the regional TA activities.

Country Specific TA: Requests for support of TA for barrier removal activities will be submitted to the GCT by participating host governments or institutions. The request will contain a concise summary of the country's energy sector priorities including future strategy for RER/geothermal energy utilization and the country's geothermal potential with ongoing/planned exploration activities (if any). This overview must demonstrate that the country has geothermal potential with meaningful utilization opportunities and that this potential can be turned into economically exploitable projects, provided that existing barriers are sufficiently addressed.

Project Specific TA: Requests for TA for project preparation/ implementation/ operation activities for a Geological Risk Insurance and/or for financial assistance (DIF) for project implementation/ operation will be submitted to the GCT by the project sponsor (see section (2) below).

Evaluation

Regional TA: IGA will evaluate the proposals based on the principles set out in the Grant Agreement. The work program will be developed by the IGA jointly with the GCT.

Country Specific TA: The GCT will evaluate the proposals. For a request for support of country-specific TA to be evaluated positively, it has to demonstrate that the removal of existing barriers to geothermal energy development in the country will have a fair chance to lead to the successful implementation of geothermal energy development projects.

Project Specific TA: The GCT and the STE experts will evaluate the justification of the proposals based on the economic and financial feasibility of the project.

Implementation

Regional TA: The IGA will prepare the TOR for each TA activity to be cleared with the GCT on a no-objection basis and execute the selection of the consultants in accordance with World Bank procurement procedures.

Country Specific TA and project specific TA: Upon positive evaluation of the TA requests, the assigned Project Task Manager will prepare the TOR for the proposed TA activities and execute the selection of consultants in accordance with the applicable procurement rules. The Project Task Manager will supervise the contracts' execution jointly with the GCT.

DIF and GRI

Submission

Requests for support of a Geological Risk Insurance (GRI) and/or a financial assistance (DIF) for project implementation/ operation will be submitted to the GCT by the project sponsor. Details of the requested support for the different types of activities will be described in the Project Concept Note (PCN) to be submitted with the request. A GEF National Focal Point endorsement will be requested at the screening stage of project processing.

Evaluation

Evaluation of requests for support of GRI and DIF begins with the assessment of the overall soundness of the subproject including:

- Adequate geological data of the reservoir with good prospects for availability of a geothermal resource;
- Reliable technologies adopted for exploration;
- Project Economics (market demand, investment cost/produced energy, sustainability of tariff, etc.);
- Availability of financial resources;

- Environmental and social aspects (in line with the WB's safeguard policies).

The project sponsor/developer's experience and capacity to implement the project will be assessed at an early stage of GeoFund involvement. Projects of very small-size or very large-size may not be considered as appropriate. However, the GeoFund may be interested to support projects with high potential of demonstration effect as a replicable model regardless of the small project size. The GeoFund may not be able to support very large-size projects because of the lack of resources. It will be the responsibility of the project developer to furnish the GeoFund with sufficient information in the PCN. If the project proposal is considered to have merits for further work, the project specific TA could be provided through the TA window.

D. Monitoring and Supervision

For the purpose of monitoring and supervision, the GCT would ensure continued compliance of the executed subprojects, in particular with environmental and social safeguards. In addition, compliance with the contract requirements will be subject to regular audits and verification by the GCT, as applicable. The table below illustrates the processing steps of investment subprojects:

Subproject Processing Overview

Processing phase	Responsible party	Activity	Documentation
Project Identification	GCT	Inform prospective client about GeoFund Assist in the preparation of Project Application	Project Application Package (Project Concept Note, Project Support Sheet, Request for Project Support, Information material)
	Project developer	Submits Application Package to GCT	Project Application Package (Project Concept Note, Project Support Sheet, Request for Project Support, Information material)
	GCT	Assesses eligibility and, if warranted, registers the subproject and sends out Screening package	Project Pipeline
Screening	Project developer	Submits Screening Package to GCT	Screening Package (Updated Project Concept Note, Environmental Questionnaire, Endorsement letter))
	GCT	Reviews Screening Package, decides prima facie eligibility	Screening Package (Updated Project Concept Note, Environmental Questionnaire, Endorsement letter)
		Issues Endorsement or Denial Response Letter	Endorsement / Denial Response Letter

	Host country authority	Provides endorsement	GEF focal point endorsement letter
Subprojects implemented by IFC will be administered by IFC according their own rules & regulations			
Appraisal	World Bank Management	Economic & financial assessment	GeoFund subproject Appraisal Document
		Technical assessment	GeoFund subproject Appraisal Document
		Fiduciary assessment	GeoFund subproject Appraisal Document
		Environmental Assessment	GeoFund subproject Appraisal Document
Approval	RVP/ Country Director	Sign relevant legal agreements	Grant Agreement
Supervision	Project Task Manager	Supervise and monitor subprojects	Project Completion Report

Annex 7: Financial Management and Disbursement Arrangements

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

Financial Management Arrangements

Financial management. Each activity or subproject will have a separate grant account with the Bank, and each recipient will be responsible for assuring that the recipient establishes and maintains: (i) financial management arrangements that are acceptable to the Bank, (ii) adequate accounting systems and procedures; (iii) funds flow mechanisms including timely disbursements to its suppliers; and (iv) appropriate arrangements for regular financial audits. These responsibilities will be specified in grant documents. Participating recipient will be evaluated as to their compliance with Bank financial management standards at the preparation and launching stages, as well as on supervision missions during grant implementation.

Staffing arrangements. Staffing arrangements will be discussed during Appraisal of the countries and will be further detailed prior to and during negotiations.

Financial reporting. Maximum use will be made of recipient existing practices and reporting formats providing that they meet Bank standards. For project monitoring purposes, financial monitoring reports will be required at least semi-annually.

Financial audits. Audits of project financial statements are required, which are to be carried by the auditor general of the recipient country acceptable to the Bank, or by acceptable independent auditing firm. The selection and appointment of the external auditor and TOR will be in accordance with the Bank's guidelines. An audit report prepared in accordance with Bank guidelines will be required to be submitted to the Bank six months following the end of the recipient's fiscal year-end. In addition to the audit report, the auditors will be expected to prepare management letters giving observations and comments, and providing recommendations for improvements in accounting records, systems, controls and compliance with financial covenants in the Grant Agreement.

Internal controls. Minimum internal controls should be available prior to flow of funds. Controls over grant funds will be especially important for these projects. The Bank will assess the control environment of the recipient and implementing agencies during project preparation, and by the auditors in their annual audit. Significant weaknesses identified will require prompt resolution.

I*nternal audit.* Internal audit arrangements are normally required for each project. Where the scope of financial transactions does not justify the existence of a dedicated internal audit, internal control will be required through management supervision and a clear separation of duties.

Risk Assessment. From financial management perspective, this project is considered low to modest risk because of the following reasons: (a) the Geological Risk Insurance (GRI) Window (US$10.0 million out of US$25 million) will be managed by the GEF Trust Fund Unit in the Bank and no fund will flow to the grant recipient unless the event crystallize, (b) The International Finance Corporation (IFC) has been selected as Executing Agency for the World Bank to execute part of GeoFund activities through the Geological Risk Insurance (GRI) window, the Direct Investment Funding (DIF) window as well as the TA window, and (c) each subproject or activity would have to have acceptable FM arrangements prior to Board approval.

Activity or subproject specific project documentation (PADs, Technical Annexes). These documents will provide more detailed information as to the particular financial management arrangements for IGA and Hungary and other initial proposals acceptable to the Bank before the Board presentation, and for the subsequent subprojects in consistent with ECA specific requirements, to be put in place in each recipient.

Flow of Funds and Disbursement Procedures

The total budget for the GeoFund Program is US$25 million funded by the GEF. The funds will be managed and administered by the Bank according to existing policies and procedures, including disbursement methods and arrangements described below. Each recipient country, IFC and IGA will access the funds after signing

appropriate legal agreements as grant agreements and Memorandum of Agreement in line with the Bank-Donor signed bilateral administration agreement.

The proceeds of the GEF Grant will be disbursed in accordance with the Bank's standard disbursement procedures currently in use, i.e., largely through transaction based disbursement using withdrawal applications supported by Statements of Expenditures. Direct payment may be used in some instances.

The pertinent disbursement procedures will be described in the Disbursement Letters which each recipient will receive after signing the Grant Agreement with the Bank. The letter will describe the applicable disbursement procedures and the authorized method for withdrawing funds.

As all the countries covered by the GeoFund have some experience with Bank financed operations and disbursement procedures, no major difficulties are expected in the flow of funds.

As the needs for each country and each subproject will be reviewed so as to come up with an appropriate funds flow mechanism to finance project activities through GEF funds. Local project accounts will be opened in some cases to channel counterpart funds to the Project. This will be not required were the contributions are in kind. All accounts will be opened on terms and conditions acceptable to the Bank. Withdrawal applications, submitted to the Bank, will include such supporting documentation as specified in the Disbursement letter.

Financial Management Assessments for IGA and first recipients

For the MOL Geothermal Power Pilot Project for Hungary, this is geological risk insurance with general terms as per those of the partial risk guarantee facility under the GeoFund program. Disbursement is contingent on project parameters not reaching expected values, as spelled out in the grant agreement. In case of a loss incurred by the project developer due to lower than expected reservoir parameters, the GEF pays a certain percentage of this loss through the geological risk insurance window of the umbrella GeoFund Program. The insurance facility will be managed by the GEF Trust Fund Unit in the Bank and no fund will flow to the grant recipient unless the event crystallize, then only the amount as agreed in advance are paid to developer directly. Accordingly no fiduciary assessment is necessary for this project. From financial management perspective, this activity is considered low risk.

A financial management assessment was undertaken in 2006 to determine whether the financial management systems to be utilized by IGA to manage the grant funds are acceptable to the Bank. It has been concluded that the current financial management arrangements of IGA are not acceptable to the Bank. Accordingly it has been agreed that the disbursement of the grant fund to IGA is subject to the establishment of acceptable financial management arrangements. From financial management, this activity is considered modest risk. An improvement action plan has been agreed with IGA to ensure that it can fully meet the Bank's requirements prior to the disbursement of grant fund. The action plan includes the following critical activities:

1. Recruitment of a part-time accountant/procurement specialist to manage the grant facility;
2. Establishment of satisfactory FM policies and procedures manual, including appropriate internal controls for grant funds, for the grant facility;
3. Establishment of accounting system that is capable of recording and reporting flow of funds and tracking of expenditures of the grant facility;
4. Finalize interim financial reports (IFRs) acceptable to the Bank; and
5. Provide appropriate training to new accountant/procurement specialist on Bank's procedures on FM and procurement.

Annex 8: Procurement Arrangements

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

A. General

Procurement for the proposed Project would be carried out in accordance with the World Bank's "Guidelines: Procurement Under IBRD Loans and IDA Credits" dated May 2004; and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004, and the provisions stipulated in the Legal Agreements. The general description of various items under different expenditure category is described below.

This Annex describes general, "umbrella-type" approach to procurement, while specific requirements will be added for each subsequent project financed by GeoFund and as may be further detailed in Operations Manual for subsequent project, as applicable.

For each contract to be financed by the Grant, the application of different procurement methods or consultant selection methods, the need for pre-qualification, estimated costs, prior review requirements, and timeframe are agreed between the Recipient and the Bank in the Procurement Plan. The Procurement Plan will be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity. The Bank's Standard Bidding Documents for goods and works and Standard Request for Proposals for Consultants, as well as all standard evaluation forms, are recommended to be used throughout project implementation. Other bidding documents may also be acceptable, provided they are reviewed by the Bank, prior to their first use.

Geological Risk Insurance (GRI) Window. Underlying works under this component will comprise the geothermal drilling and drilling related services. In the context of the GRI, these works will not be financed by the GEF grant and the disbursement will not take place unless there is a claim arising from materializing a geological risk. Therefore, Bank's procurement procedures shall not be applicable as there are no goods, works or services financed by GEF grant proceeds. However, the national legislation on competitive bidding procedures normally used for public procurement in the territory of each of the Recipients acceptable to the Bank should be used to procure underlying works and related technical services under this component.

Direct Investment Funding (DIF) Window. This component would provide funding in the form of grants, contingent grants or low cost loans to Recipients under separate projects. Procurement procedures would be as follows:

Well-established small private companies in countries for which the World Bank has conducted a procurement review, that has been found satisfactory, could use prudent commercial practices provided that these procedures will ensure a transparent competitive process of seeking bids and evaluation of bids based on pre-disclosed clear bid evaluation criteria for award of contract to the lowest evaluated responsive bidder. The contractors and suppliers selected for award should have adequate financial and technical resources to perform the contract satisfactorily. Government –owned enterprises or institutions in the Recipient's country may participate only if they can establish that they (i) are legally and financially autonomous, (ii) operate under commercial law, and (iii) are not dependent agencies of the recipient or sub-recipient. The Bank will review the procurement documents for compliance with these principles based on the assessment of procurement capacity of a specific Recipient. Normally, bidding documents for the first package would be reviewed by the Project Task Manager to determine whether subsequent packages could be reviewed as a post review. In addition, for contracts exceeding commercial practices thresholds established during appraisal of each specific project, procurement will be conducted by NCB or ICB as the case may be.

Selection of Consultants

Technical Assistance (TA)-Window. The TA – window provides funds for region wide, country wide and project specific Technical Assistance.

Consulting services under the region wide TA window of the Project will be primarily implemented by IGA, following also the Bank Guidelines on Selection and Employment of Consultants. Further information on procurement arrangement for the IGA subproject is outlined in Annex 19.

Sub-component managed by the Recipient: Consulting services will be procured in accordance with the Bank's Consultants' Guidelines. Short lists of consultants for services estimated to cost less than the threshold ceiling per contract established for each Recipient country may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Guidelines.

Others. The procurement procedures and Standard Bidding Documents to be used for each procurement method, as well as model contracts for works and goods to be procured, shall be presented in the Operations Manual if applicable.

B. Assessment of the agency's capacity to implement procurement

An assessment of the capacity of **each Recipient** to implement procurement actions for the project will be carried out during appraisal of each specific project financed by GeoFund.

C. Procurement Plan

Recipient of a specific project, at appraisal, will develop a Procurement Plan for project implementation which provides the basis for the procurement methods. Procurement plan shall be approved by the Bank covering the initial 18 month (or longer) period of implementation of the project and shall be updated from time to time but not later than 12 months after the date of the preceding Procurement Plan.

D. Frequency of Procurement Supervision

In addition to the prior review supervision to be carried out by the Bank, the capacity assessment of the Implementing Agency of each of the Recipient will recommend frequency of the supervision missions to visit the field to carry out post review of procurement actions.

The PAD includes a detailed procurement plan for each Recipient in the respective annexes of the PAD. It shall follow the following model Procurement Plan:

E. Details of the Procurement Arrangements Involving International Competition

1. Goods, Works, and Non Consulting Services

(a) List of contract packages to be procured following ICB and direct contracting:

1	2	3	4	5	6	7	8	9
Ref. No.	**Contract (Description)**	**Estimated Cost**	**Procurement Method**	**P-Q**	**Domestic Preference (yes/no)**	**Review by Bank (Prior / Post)**	**Expected Bid-Opening Date**	**Comments**

(b) ICB contracts estimated to cost above [*fill in threshold amount for each Recipient*] per contract and all direct contracting will be subject to prior review by the Bank.

2. Consulting Services

(a) List of consulting assignments with short-list of international firms.

1	2	3	4	5	6	7
Ref. No.	**Description of Assignment**	**Estimated Cost**	**Selection Method**	**Review by Bank (Prior / Post)**	**Expected Proposals Submission Date**	**Comments**

(b) Consultancy services estimated to cost above [*fill in threshold amount for each Recipient*] per contract and single source selection of consultants (firms) for assignments estimated to cost above [*fill in threshold amount for each Recipient*] will be subject to prior review by the Bank.

(c) Short lists composed entirely of national consultants: Short lists of consultants for services estimated to cost less than [*fill in threshold amount for each Recipient*] equivalent per contract, may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

Procurement Procedures of the IFC

Subprojects implemented by the IFC will be governed by the "Arrangement for the Administration and Management of Funds from the Global Environment Facility (GEF) to be Made Available by the International Bank for Reconstruction and Development Acting as and Implementing Agency of the GEF to the International Finance Corporation" dated May 31, 1996. In consistent with the Arrangement, those subprojects which will be assigned to IFC will be administered in accordance with its rules and procedures in terms of the financial management, contract implementation, safeguards, etc. IFC has executed many GEF-supported projects under the Arrangement, and its capacity as Executing Agency for the GeoFund operations is considered satisfactory in all respects.

Annex 9: Economic and Financial Analysis

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

Economic Analysis

Economic analyses are relevant at two levels for the GeoFund. First, the economics of the entire GeoFund concept will be evaluated to justify the commitment of US$25 million in GEF funding to support geothermal development. This can most readily be developed as an incremental cost analysis per ton of CO_2 reduction based on multiples of a prototypical project of the type that is anticipated to result from the GeoFund.[11]

In the lexicon of World Bank projects, the high level economic analysis of the GeoFund is referred to as a framework project analysis. For framework projects, the economic analysis should identify the process that will be used to screen and select subprojects that are economically justified and should specify the criteria that will be used to evaluate projects. Only projects that can demonstrate positive net economic benefits will be accepted for GeoFund support. In any given funding cycle, project applications will be ranked in terms of net economic benefits although discretion will be used to assure desirable geographic, size, and technology distributions of the projects that are selected. This is necessary to maximize the influence of the GeoFund to as many countries as possible and to minimize risk through diversification.

The second level of economic analysis applies to each subproject. Economic justification of geothermal projects often relies in part on recognition of both avoided costs of production from fossil-fueled alternatives and of the environmental benefits that attend clean geothermal production of heat and/or electricity. To avoid exaggerated and inconsistent methods of estimating environmental benefits, the GeoFund will provide default parameters and methods that can be used to estimate the benefits associated with reduced emissions of CO_2, SO_2, NO_x and PM_{10}. This default approach will be provided to project applicants. As an alternative, each country will be free to establish their own methodology and values for reduced emissions of these pollutants subject to approval by the GeoFund. Approved countrywide methods will be applied to all projects submitted from that country.[12]

The economic analysis framework for subproject analysis can best be described as cost effectiveness analysis since no attempt will be made to quantify the benefits from the heat and/or electricity that are produced by the project. Rather, the life cycle economic costs of producing project outputs will be compared with the costs of producing those same outputs with the least cost alternative source. Typically, that will be from existing coal-fired boilers although gas or oil fired boilers would certainly be considered if prevailing practice in that country shows that these are the more like alternatives to geothermal heat production. Geothermal projects that produce electricity or a mixture of electricity and heat will also require a more complex baseline alternative definition. The avoided cost of conventional heat and/or electric production will be referred to as traditional economic benefits.

Geothermal project lives can often extend to thirty years or beyond but the analysis will be limited to the lesser figure of twenty years or the expected economic life of the project. A baseline analysis will establish

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[11] An indicative analysis based on a project in Stargard Poland can be developed as follows. The target leverage of GEF funding is 1:8 which suggests that US$25 million will support total project investment of about US$200 million. The baseload geothermal district-heating project in Stargard will produce about 37,500 GJ of heat per year per million dollars of investment. Production of that heat in coal boilers with 80 percent efficiency would require about 10,400 MWh of coal input, which would result in 3,750 MT of CO_2 emissions per year per million dollars of investment. Then US$200 million investment would reduce CO_2 emissions by 750,000 MT per year. This would translate to 15 million tons over nominal twenty-year project lives with a very attractive incremental cost of US$1.67 per ton of CO_2. Although not all projects will be as attractive as this, these results provide broad grounds for optimism that the GeoFund investment is a cost effective means of reducing CO_2 emissions.

[12] It is anticipated that the GeoFund will sponsor a web-based literature review and survey study to establish the various values of costs per ton associated with key pollutant emissions that are now in use. Regulatory agencies, ministries of the environment, and select research institutes will be surveyed to establish the values and methods to apply.

the least-cost method of producing project outputs. Both operating margins and build margins will be considered to the extent necessary. The least-cost method production scenario then provides the comparative basis for estimating avoided costs and reduced emissions of the specified pollutants. The least-cost analysis will be conducted in economic rather than financial terms.

In addition to traditional economic benefits, project benefits attributable to reduced emissions of the specified pollutants will be estimated using either the GeoFund default methods or approved country specific methods. Conceptually,, the per unit benefits represent the lesser figure of control costs or damages related to the emissions. Reduced emissions of SO_2, NO_x and PM_{10} are referred to as local environmental benefits (LEBS) [13]. Reduced emissions of CO_2 are global environmental benefits (GEBS). The total of traditional economic benefits plus LEBS plus GEBS will be compared with the economic costs of the project to derive the net present value of the net benefit stream and the economic internal rate of return. All costs will be estimated in real terms and discounting will be at 10 percent per year unless a different rate is justified for an individual country. All projects within the same country will be evaluated using the same discount rate for projects evaluated during the same year.

It is anticipated that the economic analysis will provide a clear and rational basis for synchronizing various renewable energy support programs within countries. Typically, domestic funding should be provided to monetize LEBS while GEF or other carbon funds should be used to monetize GEBS. An incremental cost per ton of CO_2 reduction will be calculated for each project but the ongoing test of economic viability will only be applied to the total GeoFund portfolio.

In addition to the base case net benefit analysis, a full set of sensitivity analyses will be provided to indicate project dependence on key input assumptions.

Financial Analysis

The Financial Intermediary character of the GeoFund will call for (a) an assessment of the selected financial intermediary (IFC as Executing Agency), and (b) the methodology to be used for providing a financial analysis of the individual subprojects.

a) Financial Intermediary. International Finance Cooperation (IFC)

b) Financial Analysis of IGA

c) Financial Analysis of individual subprojects. Financial Due Diligence requires in the context of the individual subprojects that two distinct objectives are fulfilled:

- to assure that the project owner is a financially sound and sustainable entity which will not go broke during the implementation of the project thereby putting the project at risk; and
- to assure that the project itself is financially sound and feasible, given its financing plan and operational projections. This will mitigate against the risk that the project may fail and/or add a major financial burden to the project owner entity.

Project Owner Analysis for World Bank Implemented Projects

The project owner analysis will normally be based on the last three to five years' financial results and evolving financial position to date, as well as three to five years of financial projections for the project owner. Thus, the owner will provide financial statements, including income statements, balance sheets and fund flow statements for the past three to five years. He further will provide a commentary about the

[13] Quantification of LEBs is difficult although the development of the EXTERNE LE model by the EU has greatlysimplified this task for the countries that it covers. For other countries, the GeoFund will provide a default set of unit costs that can be used to assure consistency across projects being evaluated for any given country.

financial performance and explanations as to unusual events in the financial performance. An audit report for each of the years under review will also be provided if available.

Projections will again be based on projected income statements, balance sheets and fund flow statements for the next three to five years. Both historic and projected statements will highlight in appropriate ratios the financial performance. Typical ratios will be the operating costs over total income, profitability, and return on investments and on equity, current ratios and debt service coverage ratios.

The information provided by the project owner will be reviewed by, and discussed with the responsible Task Manager who will subsequently make its own analysis to assure that the project owner is likely to have a sound and sustained financial performance. The analysis will be reflected in summary form in the Project Appraisal Document.

Subproject Analysis for World Bank Implemented Projects

The financial analysis of subprojects will be based on estimated project investment costs, the envisaged financing plan as well as projections for project implementation, learning curve of project operations, costs of inputs and revenues from sale of the outputs, debt schedules and depreciation plans.

The time horizon for financial projections of the subproject will cover the life cycle of the envisaged project, including needed re-investments and possible scrap values at the end of the projection period.

The projections should be in real terms. The analysis will provide for calculations of net present values (NPVs), internal rates of return (IRRs) on the overall investment and on equity, before and after tax. The risk profile of the subproject will be discussed and documented by providing appropriate sensitivity and risk analyses. The impact of provision of grants on the projected ratios will also be documented by using appropriate sensitivity analyses.

Annex 10: Safeguard Policy Issues

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

The GeoFund Program includes multiple subprojects. The depth and breadth of EA and choice of EA instrument(s) for each component or each subproject is decided on the basis of its respective potential impacts and risks. The GeoFund Environmental Framework that was disclosed at the Infoshop on June 15, 2006 spells out the requirements with regard to social/environmental safeguards and will require each subproject to comply with the World Bank's safeguard policies. Each subproject will be individually assigned safeguard and environmental screening categories. All subprojects are expected to trigger the Environmental Assessment (OP/BP/GP 4.01) safeguard policy.

Safeguard policy compliance assessment of subprojects will involve a social and environmental assessment of the proposed project with all its implications. This assessment will review the project sponsor's capacity to implement the safeguard policies recommendations and, if the capacity is insufficient, propose measures to bring this capacity to the required level. Thus, for every subproject an ISDS as well as EMPs will be prepared by the project sponsor and will be reviewed in the Bank.

Responsibility for the screening and execution of subprojects will be either with the Bank or delegated to the Intermediary of the grant. The Bank requires that each intermediary screens proposed subprojects and ensure that recipients carry out appropriate EIA for each subproject. Before approving a subproject, the intermediary verifies that the subproject meets the environmental requirements of appropriate national and local authorities and is consistent with the environmental policies of the Bank. Responsibilities of intermediary concerning safeguards requirements will be detailed in the Memorandum of Agreement and/or GeoFund Environmental Framework.

The performance of the energy sector potentially affects the environment. A key feature of the Project is the promotion of amendments to policy, regulatory and institutional frameworks that improve the competitiveness of geothermal energy. This is expected to contribute to environmentally sustainable growth and resource management. Through endorsing project activities, client countries subscribe to integrate such amendments into their relevant sector reforms to enhance the Project's environmental benefits.

The project facilitates improved and transparent management of natural resources through increased use of the clean and renewable geothermal energy (and the decreased use of the polluting and depletable fossil fuels). It directly reduces vulnerability of the poor to environmental change through the reduction of CO_2, which mitigates climate change. Furthermore, the Project protects people's health from pollution through reducing the emissions of such local pollutants as NO_x, SO_2 and PM_{10}.

Monitoring of the above environmental benefits is made easy through the monitoring of the associated parameters: reductions in the emissions of CO_2, NO_x, SO_2 and PM_{10}.

Potential environmental issues could be the handling and disposal of drilling mud, of geothermal brines, contamination of ground and surface water, subsidence, increased seismicity, impact on surface as well as noise generation during project implementation and operations. These environmental impacts are typically limited and can be handled by appropriate management actions. Thus the projects are typically classified as Category B projects under World Bank guidelines, unless major environmental impacts are to be expected.

As an example for attention to social/environmental aspects of a specific project, the Stargard Geothermal DH Project is highlighted here. It was designated a Category B project for environmental/social safeguard purposes. That project, almost complete, will establish a geothermal base-load heating plant with an installed capacity of about 14 MWt opposite the site of the coal fired heat plant of the District Heating Company PEC Stargard. The Project includes two new wells (production and re-injection well) drilled near the existing district heat plant to a depth of about 2,700 meters and the above ground connections to the existing district heating system. Aboveground plant components include a new building, which will house heat exchangers, electrical equipment and installations, process equipment and controls and the piping connection to the

existing district heating network of Stargard. Total project investment costs are estimated to be US$8.6 million. Geothermal heat will be used to displace some of the heat previously provided by Stargard's existing coal-fired boilers.

The main risks ex ante for environmental damage and impacts were as follows:

- Risk of damaging soil and road surfaces during construction works;
- Risk of intrusion of geothermal water into the surface or deeper layers of the ground during well drilling;
- Risk of contamination of ground water during well drilling;
- Risk of damaging impact on the surface of the liquid waste generated by the process of washing out the cuttings during drilling;
- Risk of de-stabilization of geological formations caused by well drilling;
- Risk of causing damage to environmentally sensitive areas on the ground;

These risks were minimized through appropriate mitigation measures as per the EMP of 2002, prepared in close cooperation between the Geotermia Stargard staff and a visiting World Bank team.

Construction is now almost complete and the system is about to start operations. There are several identified environmental impacts during the imminent operation phase:

- Impact on the nearby Ina river of geothermal water discharged from a retention reservoir, constructed to safely retain geothermal brine during the drilling process and the cleaning of the geothermal plant filters during operations;
- Potential impact on the ground water of geothermal water stored in the reservoir as a result of unexpected leakage;
- Noise generated in the surface plant around the DH pumps.

These impacts are minimized through agreed measures as follows:

- Discharged brines will be diluted with cleaned municipal sewage waters;
- Ground water contamination to be monitored to allow timely counter measures;
- Noise abatement below 70 dB will be sufficient in the industrial area location.

The EMP of 2002 has been updated to reflect additional requirements for operations of the plant (discharge of limited amounts of geothermal brine). These measures illustrate how environmental risks can be mitigated successfully.

As can be seen from the example above, and based on experience gained in other earlier geothermal projects the main risks for environmental damage and impacts during construction and drilling are as follows:

- Risk of damaging soil and road surfaces during construction works;
- Risk of intrusion of geothermal water into the surface or deeper layers of the ground during well drilling;
- Risk of contamination of ground water during well drilling;
- Risk of damaging impact on the surface of the liquid waste generated by the process of washing out the cuttings during drilling;
- Risk of de-stabilization of geological formations caused by well drilling;
- Risk of causing damage to environmentally sensitive areas on the ground;

Social safeguards concerns are to be addressed through public consultation, invitation of representatives of appropriate groups of people to participate in both administration procedures: for the “construction permit” and the “water permits”. Especially those local residents potentially affected by the project in any significant way should be invited. In category A projects, at least two public consultations will be carried out: ex ante, and after completion of the environmental impact assessment and prior to implementing the project.

Annex 11: Project Preparation and Supervision

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

	Planned	Actual
PCN review	03/07/2003	03/07/2003
Initial PID to PIC	Does not apply	
Initial ISDS to PIC	Does not apply	
Appraisal start	08/15/2006	08/16/2006
Negotiations start	08/22/2006	08/30/2006
GEF CEO Approval	09/05/2006	09/18/2006
Board/RVP approval	10/03/2006	10/14/2006
Planned date of effectiveness	12/01/2006	12/31/2006
Planned date of mid-term review	01/31/2009	03/31/2009

Project preparation has been carried out by a team of World Bank staff, with the cooperation of staff from the GEF, consultants, as well as government officials and private sector actors in recipient countries. Ministries of Environment have been the prime counterpart for GEF/World Bank in requesting GEF support and endorsing participation in the project. The ministries in charge of energy matters and the energy regulatory agencies have been key partners in preliminary discussions concerning the future implementation of policy reviews and amendments.

A PDF B grant in the amount of US$700,000 has been received from the GEF for the preparation of the Project. (One of the prospective client countries of the project, Bulgaria, has obtained a PHRD grant of US$770,000 to assess the country's geothermal resources and to help prepare two geothermal projects. This financing is, however, not part of the financing plan of the project.)

Bank staff and consultants who worked on the project included:

Name	Title	Unit
Charles Feinstein	Sector Manager	ECSSD
Helmut Schreiber	Task Team Leader	ECSSD
Emilia Battaglini	GEF Regional Coordinator	ECSSD
Kyoichi Shimazaki	Lead Financial Officer	IEF
Claudia Pardinas-Ocana	Sr. Counsel	LEGEC
Ron Hoffer	Lead Environmental Specialist	ECSSD
Heike Lingertat	Consultant	ECSSD
Gyorgy Lazi	Consultant	ECSSD
Larisa Marquez	Program Assistant	ECSSD
Karina Mostipan	Sr. Procurement Specialist	ECSPS
Siew Chai Ting	Lead Financial Management Specialist	ECSPS

Christine Castillo	Operations Analyst	ECCU7
Andrina Ambrose-Gardiner	Finance Officer	LOAG1
Nicholay Chistyakov	Sr. Finance Officer	LOAG1

Bank resources: US$490,364 (GEF)

Estimated Implementation cost:

Estimated annual supervision cost: US$200,000 (GEF)

Annex 12: Documents in the Project File

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

1. Request for PDF Block B grant
2. Project Brief
3. Country endorsements (Armenia, Bulgaria, Hungary, Poland, Ukraine, Tajikistan, Romania, and Turkey)
4. ISDS
5. Operational Manual
6. Legal documents

Annex 13: Statement of Loans and Credits

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

			Original Amount in US$ Millions						Difference between expected and actual disbursements	
Project ID	FY	Purpose	IBRD	IDA	SF	GEF	Cancel.	Undisb.	Orig.	Frm. Rev'd
P074971	2006	NUTRIENT REDUCTION	0.00	0.00	0.00	12.50	0.00	12.50	0.00	0.00
P008497	2000	MUNI WASTEWATER	31.60	0.00	0.00	0.00	0.00	8.74	8.73	8.73
		Total:	31.60	0.00	0.00	12.50	0.00	21.24	8.73	8.73

HUNGARY
STATEMENT OF IFC's
Held and Disbursed Portfolio
In Millions of US Dollars

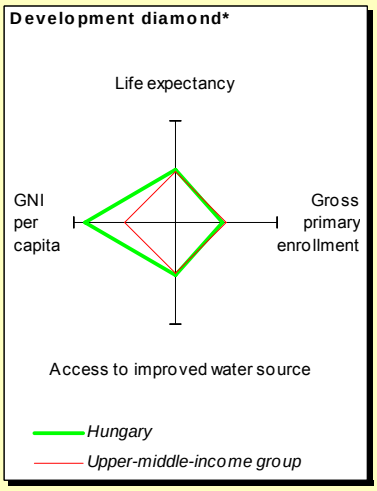
		Committed				Disbursed			
		IFC				IFC			
FY Approval	Company	Loan	Equity	Quasi	Partic.	Loan	Equity	Quasi	Partic.
2001	HEECP2	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total portfolio:	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

		Approvals Pending Commitment			
FY Approval	Company	Loan	Equity	Quasi	Partic.
	Total pending commitment:	0.00	0.00	0.00	0.00

Annex 14: Country at a Glance

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

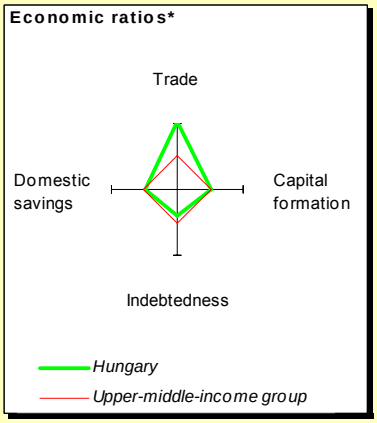
POVERTY and SOCIAL	Hungary	Europe & Central Asia	Upper-middle-income
2005			
Population, mid-year *(millions)*	10.1	473	599
GNI per capita *(Atlas method, US$)*	10,030	4,113	5,625
GNI *(Atlas method, US$ billions)*	101.2	1,945	3,368
Average annual growth, 1999-05			
Population *(%)*	-0.2	0.0	0.6
Labor force *(%)*	0.3	0.6	1.2
Most recent estimate (latest year available, 1999-05)			
Poverty *(% of population below national poverty line)*	..	..	..
Urban population *(% of total population)*	66	64	72
Life expectancy at birth *(years)*	73	69	69
Infant mortality *(per 1,000 live births)*	7	28	23
Child malnutrition *(% of children under 5)*	..	5	7
Access to an improved water source *(% of population)*	99	92	94
Literacy *(% of population age 15+)*	..	97	94
Gross primary enrollment *(% of school-age population)*	98	104	107
Male	99	105	108
Female	97	102	106



KEY ECONOMIC RATIOS and LONG-TERM TRENDS

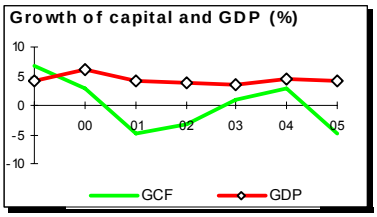
	1985	1995	2004	2005
GDP *(US$ billions)*	20.6	44.7	100.7	109.2
Gross capital formation/GDP	25.0	22.6	24.7	22.6
Exports of goods and services/GDP	42.2	44.6	65.7	67.7
Gross domestic savings/GDP	27.1	22.6	21.6	21.3
Gross national savings/GDP	23.2	19.2	15.9	15.2
Current account balance/GDP	-2.2	-3.4	-8.8	-7.3
Interest payments/GDP	4.0	4.2	1.5	..
Total debt/GDP	67.7	70.9	62.7	..
Total debt service/exports	36.8	33.6	25.2	..
Present value of debt/GDP	..	..	59.3	..
Present value of debt/exports	..	..	87.8	..

	1985-95	1995-05	2004	2005	2005-09
(average annual growth)					
GDP	-1.9	4.3	4.6	4.1	..
GDP per capita	-1.6	4.6	4.9	4.3	..
Exports of goods and services	-0.9	12.7	15.7	10.6	..

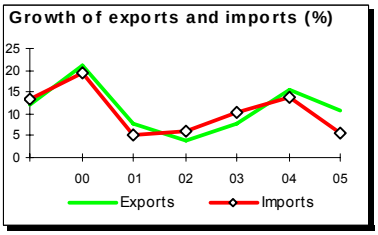


STRUCTURE of the ECONOMY

	1985	1995	2004	2005
(% of GDP)				
Agriculture	17.9	7.1	3.8	..
Industry	47.0	32.3	31.1	..
Manufacturing	..	23.6	22.8	..
Services	35.2	60.6	65.0	..
Household final consumption expenditure	62.8	66.4	67.6	68.4
General gov't final consumption expenditure	10.1	11.0	10.8	10.3
Imports of goods and services	40.1	44.7	68.8	69.0



	1985-95	1995-05	2004	2005
(average annual growth)				
Agriculture	-4.3	1.8	37.9	-10.8
Industry	-3.8	5.2	4.7	6.9
Manufacturing	..	6.5	5.4	5.8
Services	-0.4	3.5	2.9	4.2
Household final consumption expenditure	-1.5	5.2	4.7	2.2
General gov't final consumption expenditure	2.0	3.3	0.9	-1.4
Gross capital formation	-1.4	3.9	2.8	-4.7
Imports of goods and services	1.9	13.1	14.0	5.8



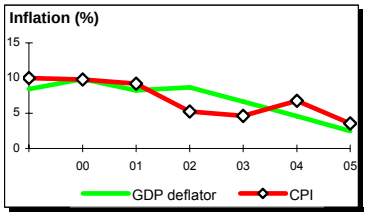
Note: 2005 data are preliminary estimates.

This table was produced from the Development Economics LDB database.

* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will

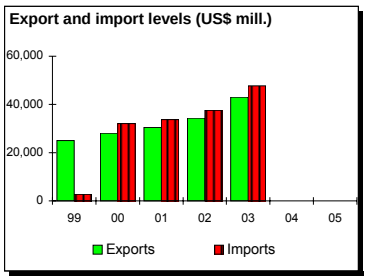
PRICES and GOVERNMENT FINANCE

	1985	1995	2004	2005
Domestic prices				
(% change)				
Consumer prices	7.0	28.3	6.8	3.6
Implicit GDP deflator	5.9	26.7	4.6	2.5
Government finance				
(% of GDP, includes current grants)				
Current revenue	59.8	44.6	..	..
Current budget balance	6.5	-2.3	..	..
Overall surplus/deficit	-1.1	..	..	..



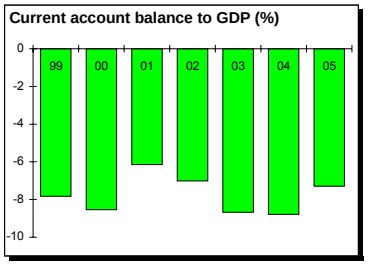
TRADE

	1985	1995	2004	2005
(US$ millions)				
Total exports (fob)	8,267	12,905	..	..
Commodity 1	..	..	..	..
Commodity 2	..	..	..	..
Manufactures	..	..	..	..
Total imports (cif)	7,846	15,406	..	..
Food	..	..	..	..
Fuel and energy	..	..	..	..
Capital goods	..	..	..	..
Export price index *(2000=100)*	16	57	..	..
Import price index *(2000=100)*	15	55	..	..
Terms of trade *(2000=100)*	107	104	..	..



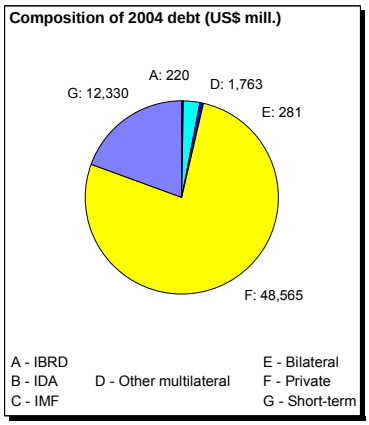
BALANCE of PAYMENTS

	1985	1995	2004	2005
(US$ millions)				
Exports of goods and services	9,807	19,928	66,181	74,268
Imports of goods and services	9,460	19,949	69,264	75,592
Resource balance	347	-21	-3,083	-1,325
Net income	-867	-1,690	-6,069	-6,918
Net current transfers	65	200	..	..
Current account balance	-455	-1,511	-8,836	-7,954
Financing items (net)	971	6,525	..	..
Changes in net reserves	-516	-5,014	..	..
Memo:				
Reserves including gold *(US$ millions)*	..	12,254	..	..
Conversion rate *(DEC, local/US$)*	50.1	125.7	202.7	199.6



EXTERNAL DEBT and RESOURCE FLOWS

	1985	1995	2004	2005
(US$ millions)				
Total debt outstanding and disbursed	13,957	31,651	63,159	..
IBRD	372	2,218	220	171
IDA	0	0	0	0
Total debt service	3,689	7,019	17,156	..
IBRD	25	411	55	52
IDA	0	0	0	0
Composition of net resource flows				
Official grants	0	33	254	..
Official creditors	225	-131	402	..
Private creditors	1,707	2,901	10,853	..
Foreign direct investment (net inflows)	0	4,804	4,608	..
Portfolio equity (net inflows)	0	-62	1,491	..
World Bank program				
Commitments	279	38	0	..
Disbursements	162	188	4	3
Principal repayments	0	251	43	42
Net flows	162	-63	-40	-40
Interest payments	25	160	12	10
Net transfers	137	-223	-51	-50



Note: This table was produced from the Development Economics LDB database. 8/13/06

Annex 15: Incremental Cost Analysis

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

A. Purpose of Incremental Cost Analysis

Since its inception, GEF has relied heavily on incremental cost analysis to guide its allocation of funds to projects and to programs based on unit abatement costs expressed as the cost in USD per MT of CO2 equivalent reduction over the economic life of the proposed project or program. Incremental costs are defined in economic rather than financial terms. This core GEF concept was established to counter early fears that GEF interventions in project supports would distort domestic investment priorities through support of specific reductions in emissions of air pollutants that may have been lower priorities than investments in improved water quality, for example. To neutralize the impact of interventions in projects that are designed to reduce greenhouse gas emissioins, GEF direct supports were limited to coverage of the incremental economic costs. Thus, an investor considering such a project would be held harmless from investing in a more expensive, but cleaner alternative. GEF policies were then broadened to focus on barrier removal for groups of similar projects that were similarly disadvantaged by existing markets and/or energy policies. Recognition was also given to innovative projects that were seen as influential beyond measurable single project impacts.

Incremental economic costs expressed as unit abatement costs (USD/MT of CO2 reduction) also provide a basis for judging the relative efficacy of investments in alternative projects using the same or similar technologies. For a given level of GEF support, the biggest "bang for the buck" would be achieved by choosing those projects with the lowest unit abatement costs.

The GeoFund has been designed to provide specialized GEF-funded support for geothermal projects that addresses both the general barriers faced by renewable energy projects and challenges that are unique to geothermal technology. GEF incremental cost analysis is thus a logical guide to project selection and barrier analysis is a logical guide to determination of the type and level of support to be provided to individual projects. While incremental cost analysis provides the economic rationale for projects selected for GeoFund support, geothermal projects have unique risk characteristics that may make needed private investment impossible to secure. In such cases, a compelling barrier analysis may justify GeoFund support for a particular project that differs from the calculated incremental costs.

As noted in Annex 9, incremental cost and barrier analyses will provide both the basis for overall economic justification of the GeoFund and the primary methodology for selection of projects to be supported and for design of the support packages offered to those projects. The following sections build the conceptual foundation for the framework incremental cost analysis. Annex 15 provides the generic incremental cost model for project analysis. This model is then applied to a specific Hungarian project in Annex 20. The Annex 20 case study clearly illustrates the kinds of modifications that will often be needed in applying the generic model to specific case studies.

B. Broad Energy Sector Development Objectives in the ECA Region

Primary energy use will double over the coming decade in the ECA region if economic growth projections are met. To achieve increases in energy supply without additional pollution-related impacts from coal burning and threats of global climate change, the countries of the region will need to continue to improve energy efficiency and diversify away from fossil fuels.

Over the longer term, the only option for significantly reducing greenhouse gas emissions is an expansion of non-carbon energy sources. To tap the full potential of renewable energy sources, the countries must adopt new market-oriented energy sector development strategies and increase investment in research, development, demonstration and dissemination of the most promising technologies, including geothermal solutions.

Within the ECA region, the World Bank is addressing the challenges to the energy sector along the following four broad areas of intervention and support:

- Delivery Efficiency: Improving the quality and technical efficiency of energy services.
- Financial Efficiency: Creating fiscal space by eliminating or restructuring subsidies and improving economic efficiency in the energy sector.
- Sub regional Integration: Creating regional energy markets and achieving economic efficiency through cooperation and power trading.
- Mitigation of adverse environmental impacts: Fuel switching, plant upgrades, and the promotion of renewable energy sources and demand side energy efficiency.

The World Bank is promoting sustainable energy in ECA within a framework of market-based incentives. Based on this strategic approach, two primary areas of focus have emerged to promote sustainable energy development in ECA:

- **To establish a supportive policy framework and to create investment opportunities:** Establishing a supportive policy framework by addressing the institutional and financial barriers and constraints includes providing advice on policies and laws related to renewable energy and energy efficiency, as well as supporting and establishing national institutions that help with policy implementation and project preparation.
- **Creating investment opportunities for private sector investment:** and participation in renewable and energy efficiency projects includes developing projects that demonstrate innovative financing, risk-sharing structures, and technical approaches, as well as creating regional or national funding or insurance mechanisms.

C. Current Barriers to Strategic Integration of Geothermal Energy Sources into Energy Sector Development in the ECA Region

Geothermal energy represents a vast, rarely tapped energy source in most countries of the region. It is renewable and thus environmentally friendly. It is insensitive to external shocks – such as weather influences and oil price fluctuations. Finally, it is increasingly cost effective and is becoming commercially viable under ideal circumstances.

Despite a large resource potential and government commitment to clean energy, the contribution of geothermal sources to the regions current energy supply is very small due to a number of market and non-market barriers.

The major barrier to the exploitation of geothermal energy is the high financial risk in comparison not only with the use of natural gas and also compared to most other forms of renewable energy. A geothermal resource must also be close to an area of high demand. Only countries (e.g. France, Iceland or Indonesia), which have underwritten the risks at both the reservoir assessment and drilling stage, have been able to induce systematic development of geothermal resources.

A second major barrier is represented by uneven regulatory playing fields that favor und often subsidize fossil fuels, and do not pay attention to the specific risk, resource and operating characteristics of geothermal fields. There is a lack of published technical, financial and legislative information for developers, particularly comparing the investment climate for geothermal investments in different countries of the ECA region.

Development risks are high and prediction of the quality of a resource requires capital investment in drilling and well tests. Unproven resource availability implies a high degree of uncertainty as to the success of geothermal development. This is linked to technology constraints, which imply a limited ability to establish certainty on resource availability.

Geothermal development requires considerable up-front investment, which is related to exploration, appraisal and production drilling. In this regard investors face funding constraints, which are due to political, resource, technical and commercial risks. If funds are available, be it equity or loan funding, theses risks translate into a significant risk mark-up.

Commercial risk is highly linked to tariffs and to their recovery rate. Tariffs have to be sufficiently high to allow for cost recovery and an appropriate return on equity. But conditions must also provide for an appropriate recovery rate, which means that PPAs have to be executed in a reliable manner. This in turn will depend on an appropriate recovery rate on the retail level. In this regard the paying attitude of public clients, usually representing the majority of sales, is crucial.

The combination of relatively small world wide geothermal project portfolios coupled with high front-end investment requirements and substantial front-loaded risk profiles contribute to the sparsity of lending institutions that are willing to provide debt financing for geothermal projects.

The above-mentioned investment barriers translate into risk and thus into high return on equity expectations of investors and punitive terms on debt financing. Risks thus dampens investor enthusiasm for geothermal projects. As a result, competition is limited when geothermal projects are tendered. The barrier circle is completed as limited competition and lending capacity leads to high tariffs that restrict potential consumer interest in purchasing geothermal project outputs.

Major generic barriers that retard the increased utilization of renewable energy resources in the region are:

- The lack of expertise and know-how about RER among energy sector decision makers at government-, industry- and local consulting firm levels;
- Issues of ECA countries' energy markets, including poor energy policies (e.g. high subsidies for fossil-fuels, energy tariffs not covering costs, failures to recognize the external costs of fossil fuel use), inadequate and non-transparent legal, regulatory and institutional frameworks, leading to uncertainties in the 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.

Technology-inherent barriers to geothermal energy include:

- High up-front costs relative to conventional technologies (due to the need of identifying the geothermal deposits and drilling the high cost production/re-injection wells), and
- The associated geological risks both during well construction/testing and operation.
- The barriers associated with the management of geological risk 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 (or decreasing during operation) yield of the aquifer
- Lower than predicted temperature of geothermal fluid
- Lower than expected geo-physical/geo-chemical parameters of geothermal fluid (i.e. high TDS, high non-condensable gas content)

Re-injection risks:

- Insufficient ability of the reservoir rocks to absorb the returned geothermal fluid
- Thermal draw down

While investors and financiers are prepared for and willing to take economic/financial risks and conventional technology 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 geothermal projects. While oil and gas industries face similar risks, the end products are typically valued in international markets at much higher levels than the heat and/or electricity output of geothermal projects which are often priced below cost as social necessities.

The above issues that relate to the technology inherent investment hurdles are common to all ECA countries. Financial barriers show a less even picture across the Region as these have a lot to do with the availability of public and private equity finance, the performance of the banking system, the general investment climate, and economic development in a given country. Financial barriers tend to be less significant in the western parts of the ECA Region, i.e. in the countries that have recently joined the European Union (EU) or are designated EU accession countries, but can be prohibitive in the countries further east, i.e. FSU countries. Even in well-developed capital markets, risk aversion accentuated by a lack of familiarity with certain technologies often leads to punitive lending terms and high hurdle rates or return on equity investments.

In light of this array of barriers to geothermal progress, a central focus of the GeoFund will be to assist a portfolio of geothermal projects in ways that demonstrate how barrier mitigation can enhance the legitimate role of geothermal projects in the energy sector of the region.

C. The Role of Incremental Cost Analysis in GeoFund Portfolio Selection

Incremental cost analysis has a long and well-established history as a central criterion in the selection of projects and programs for support by GEF. For that reason, the GeoFund will also rely heavily, sought not exclusively, on incremental cost analysis as a component of the justification for both the overall program and for individual projects to be included in that program. At the same time, the focal point of the GeoFund facility is on barrier reduction under GEF program OP-6. This section defines the anticipated interplay of incremental cost analysis and barrier reduction analysis in screening projects and in defining the level and type of support for specific projects.

Incremental costs for a project are defined as the difference between the economic costs of the proposed GEF project and a baseline development that provides the same level of outputs. Annex 9 has defined three categories of economic costs and benefits that will be analyzed for all projects that are considered for GeoFund support. Benefits in this context are simply the avoided costs from baseline delivery of the proposed project outputs. Traditional economic costs for the proposed project equal the sum of all operating and investment costs valued at economic prices and expressed in constant terms (excluding normal inflation). These are essentially the out of pocket costs for the project with fuel prices recalibrated to international levels and all general inflation removed. Local environmental costs constitute the second category. These costs relate to the effects on health, buildings and crops from emissions that are generated due to project related combustion of fossil fuels. This includes direct combustion by the project or indirect combustion caused by the project by consumption of electricity. The third cost category relates to the global environment. Emissions of greenhouse gasses expressed in tons of CO_2 equivalents are converted to economic costs/benefits based on the current willingness to pay for CO_2 reductions.

The following hypothetical example clarifies these concepts. The proposed project has traditional costs that exceed the traditional costs of the baseline project by US$40 million expressed as a present value over a twenty year life cycle of the project. This disadvantage is partially offset by the reduced damages to the local environment associated with the proposed project. The upshot is total incremental costs of US$40 - US$20 = US$20 million. Since CO_2 emissions over the life cycle of the proposed project are reduced by 20 million tons, the incremental cost per ton of CO_2 is a very attractive US$1.00. Willingness to pay for CO_2 reductions in JI projects currently is near US$6.00 per ton while prices in the EU ETS system have ranged to levels well above US$20 per ton. Since the incremental cost is well below the economic value, provision of GEF support to this project can easily be economically justified. GEF could provide up to US$20 million without exceeding the incremental cost of the project. However, it is further assumed that a barrier analysis has

shown that only US$12 million would be necessary to make this project viable. (This could happen, for example, if domestic supports for the project would provide coverage for US$8 million of the local environmental benefits.) The GeoFund would then provide GEF support of US$12 million to the project which would remove the barriers that were preventing project implementation.[14]

The final condition for GEF support is that the project must be economically and financially viable under established World Bank due diligence testing. With 20 million tons of CO_2 valued at US$6.00 per ton, the total economic benefits of the project exceed the economic costs by US$100 million with all discounting at 12 percent and economic viability is easily demonstrable. It is further assumed, although not illustrated in the table, that the financial rate of return and debt service coverage will be sufficient to justify the project.

Incremental Cost Analysis

Case 1	Classic GEF		Life Cycle Present Values @ 12.0%		
Category	Items	Units	Proposed Project	Baseline	Difference
Traditional	Investment Costs Operating Costs Total	MUSD	$ 100	$ 60	$ 40
Local Environment	Health Buildings Crops Total	MUSD	$ 20	$ 40	$ (20)
Global Environmen	CO2 Tons	Million Ton	5	25	20
Incremental Cost		MUSD USD/Ton			$ 20 $ 1.00
Barriers		MUSD			$ 12
GEF Assistance		MUSD			$ 12
Bank Net Benefits		MUSD			$ 100

Two essential features of the proposed GeoFund vetting system emerge from this illustrative analysis. First, the primary ranking criterion for project selection will be the incremental cost per ton of CO_2 with the lowest cost projects being given priority. It should be noted, however, that political, geographical, and technological diversity will also be considered in project ranking to manage the risk of the portfolio and to maximize the impact of the GeoFund. Second, the primary determinant of the amount and type of support provided will be based on the type of barrier that is considered most critical. With any less support, the project will not be implemented. Any more support would be redundant. This approach honors the historic GEF commitment to incremental cost analysis as a guide to utilization of their funds and the intended focus of the GeoFund on barrier removal.

To summarize, incremental costs will be used to guide project selection for GeoFund support in the following ways:

- Incremental economic costs per expected ton of CO_2 reduction will be calculated as part of each project application.
- Economic analyses of each project that offers incremental costs lower than the then current willingness to pay for CO_2 equivalent reductions will be prepared in conformance with World Bank standards.
- Economically viable projects with incremental costs per ton below the willingness to pay will be deemed eligible for GeoFund support.
- Priorities among project applications in any given GeoFund funding cycle will generally be based on incremental costs per ton of CO_2 although the GeoFund will also seek balance across project sizes,

[14] Note that the figures are purely illustrative. The GeoFund will certainly not fund any single project at this level.

technologies, and geographic distribution to enhance the total impact of the GeoFund in geothermal barrier reduction.

- The general target for the value of support provided to any given project will be for the GeoFund to remove the estimable barriers that would otherwise prohibit project implementation.
- Given a clear project-based illustration of the barriers to attractive geothermal projects in a specific country, technical assistance funding for policy reforms that will materially reduce the operative barriers can be considered for GeoFund support. Applications for such support should include performance targets in terms of the number of geothermal projects that will be realized within a defined time horizon as a result of the recommended policy reforms.

This use of incremental cost analysis and barrier targeting at the project level will assure GEF that the total GeoFund program will comprise economically justified reductions in greenhouse gas emissions and will be focused on maximal reductions in the barriers that currently restrain geothermal development below its legitimate economic potential in the eligible regions.

D. Barrier Analysis

Section B above characterized the most critical barriers to completion of economically viable geothermal projects as inherent technological risk, inadequate recognition of the total cost of fossil fuel combustion, consequent lack of attractive debt financing for these capital intensive projects and project portfolios that are too small in size and number to realize the lowest possible per unit costs. Section C indicates that quantification of these barriers for the specific projects chosen for GeoFund support will provide the primary determinant of the type and amount of assistance to be provided. This section discusses the kinds of barrier analysis that are envisioned for these purposes.

Incremental cost analysis for GEF purposes is economic in nature and is designed to insure that projects and programs selected for support will contribute positively to economic development objectives of the host country. Barrier analysis can also be economic if the envisaged project investments are likely to be funded by public agencies in accordance with public investment criteria. However, throughout the ECA region the demands for public investment in infrastructure are substantial and the access to resources for such investments is extremely limited. Thus, it is expected that many, if not most, of the projects seeking GeoFund support will involve substantial private investment. For such cases, the appropriate focus for barrier analysis will shift to financial rather than economic analysis. The intent must be to elevate the selected projects to financially viable status from a private investment perspective. Anything short of that will be unlikely to materially accelerate geothermal development in this region.

Because of the key role of risk in restraining geothermal development, the primary support window for the GeoFund has been established as a risk insurance program. Projects to be supported through this window will need to provide a financial analysis of their project that clearly defines the financing structure and the financial internal rate of return (FIRR) with and without GeoFund risk insurance. The ideal project for this type of support relies on leveraged equity investment to achieve the necessary hurdle rate of return on equity in light of the risk profile of the project. The operative barrier is then in finding debt finance on terms that will achieve both adequate debt service coverage, total project FIRR and return on equity. The GeoFund support for such projects from this window will be defined as the cost of providing the necessary risk guarantee to allow access to the needed debt financing to achieve all hurdle rates of return.

The GRI Scheme of the GeoFund will partially insure project developers/investors against the short-term, up-front geological risk of exploration, and the medium-term geological risk associated with the unexpected deterioration of the performance of the geothermal doublet over time. In the case of medium-term geological risks, the geological risk insurance will provide for a stream of pre-defined payments over some time (typically until long-term loans have matured), to make up for lower than estimated revenues, and/or higher than estimated operating costs. Thus, the Scheme will be a Geological Risk Scheme with covenanted risk coverage. The Scheme will be partial, to motivate project sponsors to carry out a sound and thorough

geological investigation and avoid moral hazard. The main purpose of the Geological Risk Insurance Scheme is to provide help to project developers to obtain adequate commercial lending for their project.

In addressing the second critical barrier of inadequate recognition of the full cost of fossil fuel use, GeoFund support will be limited by two sets of parameters. First, support will not exceed the reasonably estimated external costs of the specific fossil fuel combustion that is avoided. Support beyond that level would lead to market distortion rather than market correction. As discussed in Annex 9, the EXTERNE LE model developed for the EU can be used for estimation of these costs for all current EU member countries. For countries outside the EU, standard costs per unit will be adopted for GeoFund evaluation purposes. Second, all support provided from the client country except for supports directly related to CO_2 emissions will be deducted from the external costs to arrive at the eligible amount for GeoFund support. Examples of the kinds of support that are now available include the following:

- Current legislative support of renewable energy in ***Hungary*** is limited to the preferential buy-back of renewable electricity. A separate renewable energy law is currently being prepared. This law envisages decentralized support and promotion of local use, as well as state insurance for loans to set up renewable energy enterprises. The "Szechenyi Plan" [15], a general-purpose investment promotion fund, includes a limited size window for providing grant funding for renewable energy projects.
- Energy companies in ***Poland*** are obliged to purchase electricity and heat from non-conventional energy sources or from renewables. Funding of geothermal/renewable energy projects is facilitated by such general environmental protection purpose funds as the National Fund for Environmental Protection and Water Management (loan funding, subsidy funding, equity funding) and the EcoFund (to channel part of the foreign debt of Poland into a fund intended to support environmental protection projects).
- In the ***Slovak Republic*** legislation obliges distribution companies to purchase electricity produced from renewable sources and heat suppliers to purchase heat from renewable or waste heat sources or from combined heat and power plants. There is also an income tax holiday for operators of renewable energy sources and combined heat and power production facilities in the first five years of operation.

Most of the potential client countries of the GeoFund Program that are not yet EU members, and in particular the Commonwealth of Independent States (CIS) countries, however, do not have an adequate policy framework in place that transparently supports renewable energy broadly and geothermal energy in particular. The envisaged role of participating countries' decision making entities in the collaborative effort to increase the use of geothermal energy is to implement a legislative framework that is transparently supportive of renewable/geothermal energy.

The type and size of the support provided to any specific project will directly reflect the demonstrable barriers that currently prohibit the development of that project. Thus, a project may apply for support from both the guarantee window and the direct investment window when both types of barriers are shown to apply. Technical assistance could also be sought for establishment of the appropriate barrier removal supports.

Within these broad guidelines, project sponsors must recognize that the choice of the type of GeoFund supports sought and the demonstration of eligibility for those supports will be their responsibility.

E. The Benefits and Costs of the GeoFund Program

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[15] Currently suspended.

The ECA Geothermal Energy Development Program (GeoFund) is responding to a number of ECA countries that requested support to develop geothermal energy. The Project follows a strategic approach in providing assistance in barrier removal, financial support, and technical assistance in project preparation and implementation to project developers in client countries to ultimately facilitate the implementation of individual geothermal projects. The Project will be an umbrella for many geothermal subprojects in participating ECA countries. The Project will support the development of geothermal energy for electricity generation, district heat, and other heating applications in the following ways:

- Provision of technical assistance and capacity building to transfer know-how and to establish a geothermal database and capacities to develop and implement geothermal energy projects.
- Support of capital investments in geothermal energy development projects.
- Development of reforms in policy and in the legal regulatory and institutional framework of the energy market.

One of the Project's principal objectives is to facilitate the creation of an enabling business/regulatory environment in participating countries of the ECA Region in which the development of geothermal energy becomes attractive to investors. In this way, the Project directly supports the GEF Operational Program #6: Promoting the adoption of renewable energy by removing barriers and reducing implementation costs. In so much as the construction of geothermal plants requires the upgrading/modernization of existing district heating networks, or combined heat and power plants, the Project also supports the removal of barriers to energy efficiency and energy conservation, although this is not formally claimed here.

In addition to meeting eligibility criteria related to GEF Operational Program #6, the Project responds to such strategic priorities of GEF as:

- *Increased Access to Local Sources of Financing for Renewable Energy and Energy Efficiency (CC-2):* One key objective of the Project is to facilitate the access of geothermal investments to financing through the GeoFund (see later) to be established under the Project;
- *Power Sector Policy Frameworks Supportive of Renewable Energy and Energy Efficiency (CC-3):* One key component of the Project is technical assistance to support improvements to policy frameworks supportive of renewable energy;
- *Productive Uses of Renewable Energy (CC-4):* While implementation of the Project will already result in increased geothermal energy use for such productive purposes as heating (DH, individual and other) and industrial and agricultural applications (wood drying, fish farming, greenhouses, etc.), its long-term outcome will be an improved policy and market environment, leading to further geothermal applications.

Global Environmental Benefits

The Project's global objective is to reduce emissions of greenhouse gases in the interest of climate change mitigation through a systematic and streamlined implementation of geothermal projects. Thus, the Project would help participating countries in the Region in their efforts to reduce the emissions of greenhouse gases in compliance with their commitments to the Kyoto Protocol and further, in view of the fact that countries of the Europe and Central Asia Region (ECA Countries) are large emitters of these gases on a GDP per capita basis.

The principal outcome of the Project for the global environment will be the reduction of CO_2 emissions. By using geothermal energy, fossil fuel burning will be reduced. Geothermal power and heating plants emit only excess steam and very few trace gases resulting in dramatic reductions in total emissions of CO_2 compared to coal fired plants.

The Project is estimated to displace about 4 million tons of coal equivalent and to achieve CO_2 reductions in an overall amount of approximately 6 million tons of CO_{2eq} over the lifetime of the GeoFund.

Additional Domestic Benefits

In addition to global environmental benefits, the GeoFund Program would result in significant local environmental benefits. Renewable energy projects result in substantial reductions in the emissions of particulates, sulfur, and nitrous oxides. Detailed estimates of the amount of particulates and sulfur that can be reduced over the life of the Program and the related economic costs from damages to health, buildings and crops will be quantified during the preparation of specific subprojects.

Incremental Costs

Exploitation of geothermal resources in the countries targeted by the GeoFund is constrained by the above-described barriers. Development of new sites and the associated environmental benefits will be unlikely in absence of the Project. To achieve maximum impact, the GeoFund follows a strategic approach in providing assistance in barrier removal, geological risk insurances, financial support and technical assistance in project preparation and implementation to project developers in client countries to ultimately facilitate the implementation of individual geothermal projects. The Project will be an umbrella for many geothermal subprojects in participating ECA countries and will involve the provision of:

1. Technical assistance (US$7 million) for the following purposes:

a) Capacity building to remove knowledge barriers: transfer of know-how. The availability of geothermal resources, modes of occurrence, and methods of utilization will be assessed and comprehensive geothermal data bases will be established. Thus, the existence of geothermal resources in the participating ECA Countries will be confirmed or demonstrated.

b) Policy reviews and amendments: Energy sector policies and legal, regulatory and institutional frameworks in participating ECA countries will be systematically reviewed to identify key barriers towards the use of RER. Policy reforms and framework improvements, which would reduce the bias in favor of fossil fuels, will be developed.

c) TA support for project preparation and implementation: Feasible geothermal projects will be supported with technical assistance and capacity building, assisting project developers to prepare, implement and operate their investments.

2. Financial assistance* (*US$18 million) supporting project developers through:

a) Geological Risk Insurance (GRI) Scheme (US$10 million)

The GRI Scheme of the GeoFund will partially insure project developers/investors against the short-term, up-front geological risk of exploration, and the medium-term geological risk associated with the unexpected deterioration of the performance of the geothermal doublet over time. In the case of medium-term geological risks, the geological risk insurance will provide for a stream of pre-defined payments over some time (typically until long-term loans have matured), to make up for lower than estimated revenues, and/or higher than estimated operating costs. Thus, the Scheme will be a Geological Risk Scheme with covenanted risk coverage. The Scheme will be partial, to motivate project sponsors to carry out a sound and thorough geological investigation and avoid moral hazard. The main purpose of the Geological Risk Insurance Scheme is to provide help to project developers to obtain adequate commercial lending for their project.

b) Direct Investment Funding (DIF) Window (US$8 million)

The DIF Window will provide contingent grants, low cost loans or, in limited cases, grant financing, thereby covering part of the project cost through monetization of external benefits. The amount and mode of allocation of these funds will depend, on the level of financial barriers in the client countries. The grants and contingent grants would be particularly important where, due to distortions in the energy and financial markets, only demonstration projects could be implemented to help highlight the substantial benefits of geothermal energy development. Only in very specific cases, i.e.

in a country with significant barriers but with a government willing to substantially modify its legal, regulatory and institutional framework to reduce these barriers, some straight grant funding could be considered to enable such demonstrations.

Incremental Cost Matrix

Incremental cost analyses will guide the GeoFund program at two levels. At the program or framework level, the incremental cost analysis can best be visualized in the following matrix. It is anticipated that the GeoFund will support approximately 10 geothermal projects that will have collective incremental costs of about US$25 million. It is further anticipated that the barriers for the projects selected for GeoFund support can be removed through three support windows as shown below. Finally, generic calculations suggest that the resulting CO2 reductions from these projects will be approximately six million tons of CO2eq over the lives of the projects. Thus, the program unit abatement cost is expected to be about US$4.17 per ton of CO2 reduction. Since the various carbon funds administered by the World Bank are now willing to pay in the range of US$6.00 per ton of CO2eq, economic justification of the program is evident if these general parameters can be achieved.

Incremental Cost Matrix

Item	Baseline	GEF Alternative	Increment
Project Investments	I(B)	I(G)	I(G)-I(B)>0
Project Operation Costs	O(B)	O(G)	O(G)-O(B)<0
Domestic Environmental Costs	E(B)	E(G)	E(B)-E(G)>0
Total Costs	T(B)	T(G)	T(G)-T(B) = 25 MUSD
Estimated Barrier Removal			
Technical Assistance			7 MUSD
Partial Drilling Risk Guarantee			10 MUSD
Investment Support			8 MUSD
GEF Program Total			25 MUSD

The incremental cost matrices for individual projects will have the same format and will provide the detailed analyses necessary to construct the program ICA table above as the primary program monitoring report. Annex 16 presents a detailed description of a generic economic model for a geothermal district heating project. That model is then extended to provide the incremental cost and EIRR analysis for the Hungarian geothermal CHP project in Annex 20.

GeoFund Illustrative Economic Model

Annexes 9 and 15 have discussed economic and financial due diligence to meet World Bank due diligence prerequisites and the role of incremental cost analysis in GEF screening of projects for support through the GeoFund. Abstract discussions of the interplay between the economic, financial and incremental costs analyses can easily be misinterpreted. Typically, the clearest way to confirm how the intended methods are to be applied is through a specific case study that quantifies each of the critical results from the required analyses. Although no case study will provide completely general results that will cover all possibilities, the economic analysis of a specific geothermal district heating project in Stargard, Poland should offer one representative and clear example of the calculations and the use of the results to support the application for GeoFund support. The following table shows illustrative economic calculations for nine of the twenty years

included in the analysis. The spreadsheet that produces these results is available upon request from the GeoFund.

The most important results are highlighted in green and can be summarized as follows:

- The economic internal rate of return is 10.9 percent which is generally sufficient to demonstrate that the Project would meet World Bank due diligence testing that shows that the Project will contribute positively to the economic development of the host country. While evidence would need to be provided to identify the economic opportunity costs of capital on a risk-adjusted basis, results in excess of 10.0 percent for the EIRR would normally be satisfactory if Project risks were not excessive.
- The incremental economic costs of the Project compared to the baseline are about US$2.3 million while the decremental emissions of CO_2eq are about 1.5 million tons over the 20 year period of analysis. This yields a per unit incremental cost of US$1.56 per tonne of CO_2eq. That relatively low figure demonstrates that this Project is a cost-effective use of GEF funds to reduce emissions of greenhouse gasses. There is no absolute standard that assures GeoFund support since applications in each given funding cycle will be compared to determine the most cost effective use of GEF funds during that cycle. However, historic experience suggests that results in this range should have very good prospects for obtaining GeoFund assistance.
- The GeoFund has been established based on the belief that many projects that are economically attractive and that offer low cost reductions in GHG emissions can still not be implemented because of numerous possible barriers. The identification and quantification of barriers is an important determinant of the kind and amount of assistance to be provided by the GeoFund. Obviously, this will be specific to a particular project and to the energy policies that apply in the host country. For the case study, a simple situation is cited in which the local environmental benefits attributable to reduced emissions of SO2, NOx and PM10 are only partially compensated. A financial analysis would normally be used to demonstrate the level of support needed to make the investment feasible. For the illustrative case, it is simply assumed that full compensation for local environmental benefits would be sufficient to realize the Project investment. In this case, GeoFund support may be set at US$3.1 million rather than US$2.3 million. The actual form of support to be provided would also be based on financial analysis that shows the perspective of the investors in the Project.

It should be noted that GEF would normally desire to see some changes in domestic energy policy that would render similar supports for future projects unnecessary. In other words, barrier removal should apply to future similar projects as well as to the project now applying for GeoFund support. In this case, that could be through more complete monetization of domestic environmental benefits and/or higher financial penalties for relevant emissions that contribute to domestic damages.

GeoFund Illustrative Economic Model

Line																
2	**Pro-Forma Geothermal District Heat Project**															
3	**Economic Analysis**			Key Outpurs												
4																
5	**Economic Comparisons**				1	2	3	4	5	6	7	8	9			
6		Units	BY PV		2005	2006	2007	2008	2009	2010	2011	2012	2013			
7	Present Value Factors - 2005 BY				1.0000	0.9091	0.8264	0.7513	0.6830	0.6209	0.5645	0.5132	0.4665			
8																
9	**Proposed Project**															
10	Investment	TUSD	$ 18,909	$ 8,000	$ 12,000											
11	Annual Cost															
12	Production	GJ					617,143	617,143	617,143	617,143	617,143	617,143	617,143			
13	Electric Use	MWh					4,443	4,443	4,443	4,443	4,443	4,443	4,443			
14	Economic Value	$/MWh				$	26.40	$ 26.40	$ 26.40	$ 51.59	$ 51.59	$ 51.59	$ 51.59			
15	Economic Cost Electricity	TUSD	$ 1,521			$	117	$ 117.31	$ 117.31	$ 229.22	$ 229.22	$ 229.22	$ 229.22			
16	Other Annual Cost	TUSD	$ 1,923			$	248	$ 248	$ 248	$ 248	$ 248	$ 248	$ 248			
17	Total Annual Costs	TUSD	$ 3,444			$	366	$ 366	$ 366	$ 478	$ 478	$ 478	$ 478			
18	Total Costs	TUSD	$ 22,353	$ 8,000	$ 12,000	$	366	$ 366	$ 366	$ 478	$ 478	$ 478	$ 478			
19																
20	**Baseline Alternative**															
21	Equivalent Production	GJ					617,143	617,143	617,143	617,143	617,143	617,143	617,143			
22	Existing Coal Boilers															
23	Coal Use	GJ					822,857	822,857	822,857	822,857	822,857	822,857	822,857			
24	Coal Cost	TUSD	$ 8,780			$	1,810	$ 1,810	$ 1,810	$ 1,810	$ 1,810	$ 1,810	$ 1,810			
25	Non-Fuel O&M	TUSD	$ 988			$	204	$ 204	$ 204	$ 204	$ 204	$ 204	$ 204			
26	New Coal Boilers	MW		0	0		0	0	0	0	0	0	0			
27	New Boiler Investment	TUSD	$ 1,212	$0	$0		$0	$0	$0	$0	$0	$0	$0			
28	New Boiler Coal Use	GJ					-	-	-	-	-	-	-			
29	New Boiler Coal Cost	TUSD	$ 4,616				-	-	-	-	-	-	-			
30	Non-Fuel, Non-Electric O&M	TUSD	$ 589			$	-	$ -	$ -	$ -	$ -	$ -	$ -			
31	Electric Use	MWh					1,142	1,142	1,142	1,142	1,142	1,142	1,142			
32	Electric Cost	TUSD	$ 391			$	30	$ 30	$ 30	$ 59	$ 59	$ 59	$ 59			
33	Total Baseline Cost	TUSD	$ 16,574	$ -	$ -	$	2,044	$ 2,044	$ 2,044	$ 2,073	$ 2,073	$ 2,073	$ 2,073			
34																
35	TEBS = Avoided Costs	TUSD	$ 16,574	$ -	$ -	$	2,044	$ 2,044	$ 2,044	$ 2,073	$ 2,073	$ 2,073	$ 2,073			
36																
37	**Reduced Damage/Control**															
38	SO2	TUSD	$ 20,099			$	2,714	$ 2,714	$ 2,714	$ 2,725	$ 2,725	$ 2,725	$ 2,725			
39	NOx	TUSD	$ 2,738			$	370	$ 370	$ 370	$ 371	$ 371	$ 371	$ 371			
40	Particulates	TUSD	$ 982			$	133	$ 133	$ 133	$ 133	$ 133	$ 133	$ 133			
41	CO2	TUSD	$ 3,482			$	470	$ 470	$ 470	$ 472	$ 472	$ 472	$ 472			
42	Total	TUSD	$ 27,301			$	3,687	$ 3,687	$ 3,687	$ 3,702	$ 3,702	$ 3,702	$ 3,702			
43	Adjusted to Polish GNI/Per Cap	TUSD	$ 6,988			$	944	$ 944	$ 944	$ 948	$ 948	$ 948	$ 948			
44																
45	**Total Economic Benefits**	TUSD	$ 23,563	$ -	$ -	$	2,988	$ 2,988	$ 2,988	$ 3,020	$ 3,020	$ 3,020	$ 3,020			
46	**Total Economic Costs**	TUSD	$ 22,353	$ 8,000	$ 12,000	$	366	$ 366	$ 366	$ 478	$ 478	$ 478	$ 478			
47	**Net Benefits**	1.05	$ 1,210	$ (8,000)	$ (12,000)	$	2,622	$ 2,622	$ 2,622	$ 2,543	$ 2,543	$ 2,543	$ 2,543			
48	**EIRR**		10.9%													
49	**Benfit Summary**															
50	Avoided Costs	TEBS TUSD	$ 16,574			$	2,044	$ 2,044	$ 2,044	$ 2,073	$ 2,073	$ 2,073	$ 2,073			
51	Avoided Costs	LEBS TUSD	$ 3,506			$	473	$ 473	$ 473	$ 475	$ 475	$ 475	$ 475			
52	Avoided Costs	GEBS TUSD	$ 3,482			$	470	$ 470	$ 470	$ 472	$ 472	$ 472	$ 472			
53	Avoided Costs	Total	$ 23,563			$	2,988	$ 2,988	$ 2,988	$ 3,020	$ 3,020	$ 3,020	$ 3,020			
54																
55	**Incremental Costs**	TUSD	$ 2,272													
56	**Per MT of CO2**	USD	$ 1.56													
57	Project	TUSD	$ 22,353													
58	Avoided	TEBS TUSD	$ 16,574													
59	Avoided	LEBS TUSD	$ 3,506													
60	Avoided	Total	$ 20,080													
61																
62	Barrier															
63	Host Country Pays Only 75% of LEBS															
64																
65	Project	TUSD	$ 22,353													
66	Avoided	TEBS TUSD	$ 16,574													
67	Effective Avoided	LEBS TUSD	$ 2,630													
68	Effective Incremental	TUSD	$ 3,149	15.7% % of Investment												

The following sections provide additional discussion of the GeoFund economic model concepts, structure and limitations. Then line by line descriptions of the inputs needed for the model are provided as a guide to project applicants in preparing their economic analyses. The input sheet shown below has input data color coded in yellow and calculations coded in blue. The spreadsheet model will be provided upon request to project applicants.

Line																
2	**Pro-Forma Geothermal District Heat Project**			Inputs												
3	**Economic Analysis**			Calculated												
4																
5	**Data Inputs**		Base Year													
6	Investment Period	Units	Year 1	Year 2	Comment											
7			2005	2006	Assume Two Year Development Period											
8	Operating Life	Years	20		Conservative Estimate of Operating Life But Excessive Estimate of Private Investment Horizon											
9	Investment Schedule	TUSD	8000	12000	Arbitrary But Reasonable Assumption Based on 1:8 Leverage And $25 million GeoFund With 10 Projects											
10	Capacity	MW	28.6		Based on Very Optimistic Stargard Cost Per kW											
11	Annual Operating Period	Hours Full Load Eq	6,000		Stargard Is Near Maximum Condition with 6,150 FLE Hours											
12	Annual Net Production	MWh	171,429		Capacity Times Hours											
13		GJ	617,143		3.6 GJ/MWh											
14	Operating Cost Geo	$/GJ														
15	Electric Use	MWh	4,443		Based on Stargard	7.2	kwh/GJ Out						0.25	0.75		
16	Incremental Electric Costs	TPLN	411	47.2%	Based on the current incremental cost calculated below in line 44							Stargard	Vari	Fixed'		
17	Maintenance	TPLN	313	36.0%	Stargard Maint is 250 TPLN for 308 TJ. Assume 75% fixed and 25% va							250	62.5	187.5	313	
18	Labor	TPLN	438	50.4%	Stargard Maint is 250 TPLN for 308 TJ. Assume 75% fixed and 25% va							350	87.5	262.5	438	
19	G&A	TPLN	94	10.8%	Stargard Maint is 250 TPLN for 308 TJ. Assume 75% fixed and 25% va							75	18.75	56.25	94	
20	Other	TPLN	25	2.9%	Stargard Maint is 250 TPLN for 308 TJ. Assume 75% fixed and 25% va							20	5	15	25	
21	Total Ex Electricity	TPLN	869	100.0%												
22	Total Ex Electricity	TUSD	248	3.5	PLN/USD	$/GJ	Unit Cost									
23	GJ Sold	GJ	617,143		Stargard	$ 0.59	Operating Incl Elect									
24	Cost Per GJ Excluding Electric	$/GJ Out	$ 0.40			$ 3.81	Investment									
25	Total Cost Per GJ Sold	USD/GJ				$ 4.40	Total									
26	**Least Cost Alternative**	Existing Coal Boilers														
27	Average Efficiency		75%		Arbitrary Assumption											
28	Retirement Year		2015		Arbitrary Assumption											
29	Replacement	New Coal Boilers														
30	Average Efficiency		85%		Generic											
31	Delivered Coal Price	$/MT	$55.00		Generic											
32	Coal Heat Content	GJ/MT	25		Generic											
33	Coal Cost	$/GJ	$2.20		Calculated											
34	Coal Cost	$/MWh	$7.92													
35	Non-Fuel O&M	$/GJ	$0.33		Estimate at 15% of Coal Cost	0.15										
36	New Coal Boiler	$/kW	$100		Generic Estimate Based on Czech Data For Compliant Coal Boilers											
37																
38	**Electric Use Geothermal**	kWh/GJ Out	7.20		Based On Stargard											
39	Annual Geothermal	MWh	4,443													
40	Existing Grid Marginal Plant Net Efficiency		33.0%		Grid Specific Estimate of the Net Efficiency of the Marginal Grid Power Plants.											
41	Year Of New Grid Capacity Need		2010		Grid Specific Estimate of the Next Addition of New Generation Capacity to the Grid											
42	New Grid Plant Marginal Net Efficiency		36.0%		Generic Estimate											
43	Grid Plant Non-Fuel O&M	% of Coal Cost	10.0%		Generic Estimate											
44	Economic Cost Without Capacity	$/MWh	$26.40		Marginal Cost of Generation			Inv/kW	CRF 1020	Ann Cap	FIXOM %	O&M/MWh				
45	Economic Cost With Capacity	$/MWh	$51.59		Marginal Cost Including Generation and Capacity			$ 1,300	$0.1175	$21.81	3.0%	$ 5.57				
46	Electric Use For Coal Boilers	kWh/GJ Out	1.85		Stargard Figure											
47																
48	**Environmental Unit Costs - US**		Pace 1990													
49	SO2	$/MT	$ 4,466		Should be Adjusted Based On GDP/Capita vis a vis US											
50	NOx	$/MT	$ 1,804		Should be Adjusted Based On GDP/Capita vis a vis US											
51	Particulates	$/MT	$ 2,618		Should be Adjusted Based On GDP/Capita vis a vis US											
52	CO2	$/MT	$ 6.00		Based on CFB Willingness to Pay											
53	GNI Per Capita US	2004	$ 41,440		WB Development Indicators											
54	GNI Per Capita US	2004	$ 6,100		WB Development Indicators											
55	Ratio		14.7%		Ratio											
56																
57	**Emission Factors**															
58	COAL							Pace 1990								
59	SO2 Coal Existing Boiler 1.2% s	lbs/GJ In	1.7060	GJ/MWH	3.6	lbs/MMBTU	1.8									
60	NOx	lbs/GJ In	0.5753	MMBTU/MW	3.412	lbs/MMBTU	0.607									
61	Particulates	lbs/GJ In	0.1422	GJ/MMBTU	1.055	lbs/MMBTU	0.15									
62	CO2	MT/MWh In	0.36		This depends on the coal used and can range from .32 for hard coal to 0.4 for lignite.											
63	Economic Discount Rate		10%		Represents the opportunity cost of capital for the country hosting the Project.											

Economic vs. Financial Model Concepts

Typically, Project proponents who seek support from the GeoFund are likely to have a reasonably developed financial model that provides the basis for their interest in pursuing the Project. Unfortunately, financial and economic justification are quite distinct despite frequent misuse of the terms on an interchangeable basis. The economic model can draw heavily on the financial model but will also require many elements that will not be found in the financial analysis. Some of the critical distinctions include:

- All monetary flows in financial models will typically be in nominal terms in the domestic currency. This is appropriate actual interest rates used for loans to the project will inherently include market expectations for domestic inflation. Economic models, however, will be developed in real terms (excluding general price escalation) and economic rates of return will reflect the opportunity costs of investing capital in the proposed Project.

- Financial models necessarily include consideration of all taxes and subsidies that apply to the project. Financial flows basically represent out-of-pocket costs and into pocket revenue streams as they will appear in the accounts of the project owner/operator. Heat, electric, and some fuel costs often appear in the financial analysis based on tariffs that do not reflect the full economic values for these key items. Even full cost tariffs are designed to recover historic investments plus current operating costs while economic costs look forward to incremental or decremental costs attributable

to the Project. Project use of labor that would otherwise be unemployed would enter the financial analysis at prevailing wage rates while the economic analysis would assign zero cost to these resources.

- Output streams from the proposed Project (heat and/or electricity) will be valued at market prices or tariffs for financial analysis. For economic analysis, these products will be valued based on the avoided cost of producing the same outputs in a different way.
- Emissions of pollutants will only have a cost in the financial analysis if there is an enforced system of fines or costs of permits. The economic evaluation will assign costs to these externalities based either on the cost of damages done or on the cost of required control, whichever is less.
- Financial analyses typically include analyses of the mix of debt and equity used to pay the investment costs. Annual analyses include repayment schedules for each loan, depreciation, and debt service coverage. The capital investment is represented on an annual basis as the sum of interest plus depreciation charges to allow calculation of taxable income on an accrual basis. Economic analysis is not encumbered by any consideration of debt financing or accrual accounting.
- Discount rates used to convert future monetary flows to present values are chosen differently for financial and economic analysis. Financial analysts will typically choose the weighted average cost of capital for the Project investor as the relevant concept. Economic analysts will use some estimate of the risk-adjusted opportunity cost of capital or the available return on the marginal projects being approved in the host country. Since this can be difficult to estimate accurately, World Bank conventions suggest use of a rate of 10 to 12 percent for typical situations.
- The period of analysis chosen for financial and economic analyses will often be distinct. Financial analyses are most concerned with showing viability over the period when loans to the Project are outstanding. Economic analysis is often over a longer period of time determined by the period over which benefits are expected to be realized. A nominal period of economic analysis for geothermal projects or 20 years should be conservative and can be reasonably adopted as a standard.

Model Structure. The pro forma model consists of three worksheets. The first contains all of the critical inputs to the economic model.

The second sheet presents the economic analysis and derives all needed indicators including the economic internal rate of return (EIRR), incremental costs, barriers, and effective incremental costs. The EIRR will be used as the primary determinant of whether the Project is deemed to be in the national interest in accordance with World Bank screening procedures. The EIRR derivation includes separate identification of traditional economic benefits (TEBS), local environmental benefits (LEBS) and global environmental benefits (GEBS). Incremental costs per ton of CO2 reduction are calculated to indicate whether the Project is a cost effective investment in carbon reduction. Barriers to realization of the Project are then illustrated and quantified to show what level of support is needed to implement the Project. For this illustration, it is assumed that the barrier is inadequate compensation for the local environmental benefits of the geothermal Project. Completion of these analyses will provide key inputs to GeoFund decisions on the amount and type of support that could be provided to the Project.

The third sheet provides a convenient summary of the reductions of emissions of each key pollutant that will be realized due to the proposed Project. Both baseline and Project emissions are presented to show the derivation of claimed reductions.

Model Limitations. While this model fully illustrates the essential elements of the desired economic analysis and is generally based on an actual geothermal district heating project that has been completed in Poland, it does not provide a universal spreadsheet that will apply without modification to all projects. Project applicants can use the conceptual approach that is illustrated here but will need to modify the model as necessary to properly represent the specifics of their situation.

There is also no claim that the generic estimates used in this model will apply to other situations. Project applicants should take care to independently estimate the input parameters to reflect their specific situation. This is particularly true for the environmental damage parameters. This model uses some vintage estimates for the US and adjusts those estimates by the ratio of per capita income figures to obtain estimates for the project location. The EXTERNE model that is now available is a preferred tool for development of the environmental damage estimates on a per unit basis. The EXTERNE estimates can be used as inputs to the pro forma model.

The illustrative case study has been developed primarily in USD although many estimates were converted from Polish Zloty (PLN). It is often more convenient to develop the analysis in the local currency and then to simply convert key results to EURO or USD for reporting purposes. Of course, this will require careful consideration of the exchange rates to be used and sensitivity to exchange rate forecasts should be presented.

Illustrative Project .The case study that is used to illustrate the economic calculations is a 14 MW geothermal district heating project in Poland. The new geothermal wells were drilled at the district heating plant site so the interconnection to the network is at the same location as the interconnection to the coal-fired boiler plant that currently provides all of the heat supply. The investment cost for this Project was approximately US$700 per kW of installed capacity. The geothermal output of about 310 TJ per year will be used to cover baseload requirements of the district heating company. The total economic cost of the geothermal heat is approximately US$4.40 per GJ assuming a 20 year life and 10 percent discount rate.

Model Input Documentation. This section provides line by line descriptions for the model inputs on worksheet 1 including what is needed and some discussion of alternative sources that may be used. The illustrative inputs are also explained. In the spreadsheet, inputs are color coded yellow while calculations are shown in blue.

Line 7: Enter the years of the construction/investment period. Two years beginning in 2005 are illustrated but longer periods may be appropriate for some projects. All discounting will be tied to the first year of the construction period which is referred to as the base year.

Line 8 Enter the operating life of the Project. Most geothermal projects may last longer but the maximum figure that should be used here is 20 years. The economic analysis will extend for the number of years indicated here beyond the last year of the construction period. Please note that the model currently does not automatically adjust to the proper period of analysis based on the input. Use of a period different than 20 years will require appropriate modifications of the model.

Line 9 Enter the investment outlays for each year of the investment period excluding all taxes and denominated at base year price levels. In the example, all costs are expressed at 2005 price levels.

Line 10 Enter the installed capacity of the Project in net MW. Net MW are the total or gross MW installed less the average MW used to supply station demands. Net MW multiplied by the full load hours of operation in a year will equal the heat or electricity supplied to the purchaser at the sale point.

Line 11 Enter the annual full load equivalent hours of operation of the Project. For district heating projects this will depend on the placement of the Project under the annual heat load duration curve. For the case study, the Project will be used for baseload supply yielding full load hours of operation of 6,000.

Line 14 For the case study, the Project will use an estimated 7.20 kWh per GJ of output sold as shown in Line 37. This is primarily for operation of the production and reinjection wells since there is a very small distance between the well head and the entry point to the district heating network. This simple model assumes constant electric use for each operating year of the Project. Annual usage should be input if changes are anticipated over the operating lift of the Project.

Lines 16-19 Enter the specific annual costs at full load operation for maintenance, labor, general and administrative and all other non-electric costs for the Proposed Project. If the project uses labor that would otherwise be unemployed, the labor costs should be below what is actually paid in financial terms. The case

study estimates have been calculated from Stargard estimates assuming that 75 percent of these costs are fixed and 25 percent vary in proportion to Project heat production.

Line 21 Enter the exchange rate between local currency and USD. If substantial changes are expected in the future, the model should be modified to use the year by year estimates of the real exchange rates that are expected.

Lines 25-36 This section provides the inputs needed for estimating the non-electric avoided costs attributable to the Project. The baseline project used for comparison must be carefully identified using well documented CDM and/or JI procedures for baseline evaluations. In concept the baseline alternative is the most probable future scenario without consideration of carbon sales. For the illustrative case study, the baseline study showed that the baseline alternative was continued supply of all heat from the existing coal-fired boilers through 2014 and from new coal-fired boilers from 2015 on. Thus, the avoided costs for 2007 – 2014 are just the marginal economic operating costs for the existing coal boiler portfolio while the avoided costs beginning in 2015 reflect new coal boilers. Following the language of CDM ACM002 for the electric sector, the period through 2014 bases avoided costs on the baseline operating margin while the later period has avoided costs based on the build margin.

Line 26 Enter the average annual efficiency for the existing coal-fired boilers that are operating on the margin during the hours that the geothermal Project is expected to operate.

Line 27 Enter the year when existing boilers will be retired and replaced with new boilers that will operate on the margin. For the illustrative case, the most likely replacement will come in year 2015 and will again be coal-fired. However, the baseline study by the Project applicant should carefully assess the build margin using established CDM or JI methodologies to show what type of capacity is likely to be added and when.

Line 29 Enter the average efficiency for the replacement boilers that will be added in the future. For the case study, those boilers are added in 2015 and are assumed to operate at 85 percent average annual efficiency.

Line 30 Enter the delivered fuel price for the existing and replacement boilers. In the case study, both will use coal. To avoid any distortions from domestic fuel pricing policies, the fuel prices reflect border prices plus marginal delivery costs to the site of the baseline heat supply.

Line 31 Enter the calorific value of the fuel used in the baseline heat supply source.

Line 34 The illustrative model uses a simplified estimate of the variable non-fuel O&M costs based on a percent of fuel costs. The illustrative percentage is 15 percent. More detailed costing may be available and should be used if available. The percentage can be replaced by a direct estimate of the US$/GJ for all non-fuel variable cost.

Line 35 Enter the cost/kW for the new boilers that will be added in the future. Be sure to include all costs necessary to assure that the new boilers are fully compliant with all environmental and efficiency regulations. The Czech Republic, for example, has established efficiency standards that must be met for new and replacement district heat boilers for different sizes and fuels.

Line 37 This cell provides a simple way to represent all electric use associated with the proposed Project operation. Note that in this case electric costs comprise almost half of the total operating costs for the geothermal project. Since most electric use is typically associated with pumping, this is represented on a kWh/GJ out basis.

Line 39 Enter the net efficiency of the marginal grid electric plants that are supplying electricity to both the Project and the baseline source of heat supply. Net efficiency is calculated as the MWh delivered to the Project divided by the fuel input in MWh to the marginal grid electric plants. CDM methodology

ACM0002 provides guidance on ways to identify the relevant margins. For Poland, the existing plants that operate on the margin are fired with hard coal and operate at a net efficiency of 33 percent.

Line 40 Enter the year of the next anticipated significant capacity addition to the electric generation portfolio of the grid. This year will provide the dividing point between the operating margin and the build margin in the analysis of electric usage impacts.

Line 41 Enter the net efficiency of the new grid electric plant that defines the build margin.

Line 42 Enter an estimate of the grid electric plant non-fuel O&M costs as a percent of coal costs. This will then apply to both existing and new plants with different efficiencies.

Line 44 This line contains four inputs that determine the fixed costs associated with the expected new grid electric plants. The first input is the investment cost per kW. Figures for this can be obtained from the USDOE Annual Energy Outlook or from IEA Studies on the Projected Cost of Electricity. Costs should be adjusted to the extent necessary to reflect local conditions and should be tied to base year dollars and should exclude all taxes. The investment cost is annualized using a capital recovery factor (PMT function in Excel). For the case study, the CRF was set assuming a 20 year plant life and 10.0 percent discount rate. The third input is an estimate of the fixed O&M costs for new plants expressed as a percentage of the investment cost. The fourth input is an estimate of the hours per year that the new plant will operate. In the case study, the new plants are baseload plants that will operate about 7,000 hours per year.

Line 45 Enter the kWh usage of the baseline heat supplies on a kWh/GJ out basis. For the case study, the coal boilers used 1.85 kWh/GJ supplied which is about 25 percent of the geothermal requirement.

Lines 49-51 These critical parameters are estimates of the costs per MT of SO2, NOx and particulates whether they are emitted from coal fired heat-only boilers or from grid electric power plants. A more refined model would distinguish these two sources. The inputs shown are for the U.S. Adjustment from U.S. damage estimates to the host countries of GeoFund projects should be made based on gross national income per capita basis with the GNI figures taken from the most recent World Bank Development Indicators that is available on the web. As noted in the GeoFund PAD, applicants can use and defend their own estimates of the damages per ton of each pollutant or they can rely on figures provided by the GeoFund. Use of the EXTERNE model is encouraged as a way to get figures for these important but difficult to estimate parameters.

Line 52 This figure can be provided by the GeoFund. It represents the current willingness to pay for CO2 reductions expressed in USD/MT as established by the Carbon Finance Business (CFB) of the World Bank.

Lines 53 -54 These are the current GNI per capita figures that are used to adjust U.S. figure to host countries. The case study figures are from 2004.

Lines 59-61 The inputs here are emission factors from a 1990 study by Pace. Pace figures are reported in pounds per MMBTU of fuel input. These are converted to lbs per GJ of fuel in. Applicants can provide and defend alternative factors if appropriate for their situation. Of course, those factors must be converted to correct units for the model to work correctly.

Line 62 This is the emission factor for coal combustion expressed as MT/MWh of fuel input. The International Panel on Climate Change (IPCC) provides the methodology for calculating these factors. The same factors must be used for all Projects submitted from any given country. The same factor is used in the simplified model for both the baseline heating plant and for the grid electric plants. If very different coals are used, two factors should be input and applied appropriately.

Line 63 Enter the real economic discount rate for the host country of the Project. Default options of 10.0 to 12.0 percent are typically used by the World Bank.

Key Model Outputs

The second sheet of the model develops the economic analysis in lines 1 through 44 and summarizes the key results in lines 45 through 68. Key results shown in green are interpreted as follows:

Line 18 The 2005 present value of Project economic costs using a 10 percent discount rate is US$22.4 million which is comprised of US$18.9 million in investment and US$3.5 million in annual operating costs.

Line 53 The 2005 present value of Project economic benefits equals US$23.6 million which is comprised of US$16.6 million in TEBS, US$3.5 million in LEBS, and US$3.5 million in GEBS.

Line 47 - 48 Net benefits are then US$23.6 million less US$22.4 million or US$1.2 million. The benefit cost ratio is 1.05 and the EIRR is 10.9 percent. If the hurdle rate for is below 10.9 percent, this Project would clearly satisfy World Bank economic due diligence requirements. The results are satisfactory but not as strong as might be desired but they would probably be deemed adequate if risks are not extreme.

Lines 55-56 Incremental costs can be calculated simply by ignoring the GEBS benefits. Then the benefits of the Project fall to US$20.1 million. Those benefits equal the costs of the baseline project. The Proposed Project costs remain at US$22.4 million. Incremental costs of the Project are then US$22.4 million less US$20.1 million which equals US$2.3 million. These incremental costs are divided by the 20 year sum of CO_2 reductions which is 1,456,791 MT to obtain the cost per MT of the reductions. The cost per MT is US$1.56 which is generally regarded as attractive. It certainly compares well with the current willingness to pay or US$6.00 per ton from CFB. A result in this range would likely be attractive for GeoFund support if all other conditions prove acceptable.

Line 63 Barrier analysis is expected to be a central component of many GeoFund applications. Barrier analysis may include evaluation of many impediments to Project realization. However, those barriers that can be easily translated to monetary terms will provide the clearest basis for GeoFund support of a particular kind and amount. The case study provides a very simple example. Here it is assumed that existing policies in the host country will only monetize 75 percent of the LEBS that have been estimated.

Line 67 This line introduces the concept of "effective avoided costs" which are the monetized portions of the LEBS. In the case study these equal .75*US$3.5 million =US$2.6 million. That is actually the incentive that the Project sponsor has to pursue the project under current policies.

Line 68 Effective incremental costs now equal the Project costs less TEBS less effective LEBS which equals US$22.4 million less US$16.6 million less US$1.7 million equals the effective incremental cost of US$4.1 million. The GeoFund could consider supports up to this level based on a compelling barrier analysis.

Annex 16: STAP Roster Review

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

UNIVERSITY OF CALIFORNIA, BERKELEY

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April 3, 2003

To: Helmut Schreiber, ECSSD
Email: Hschreiber@Worldbank.org
Tel: +1/202/473-6910
From: Daniel M. Kammen
Re: Review of: World Bank - GEF Geothermal Energy Development Project in the Europe and Central Asia Region and The Geothermal Energy (GeoE) Development Fund (GEDF)

Summary:
This project is a departure in structure and vision from many previous GEF efforts in that here a portfolio for regional lending for geothermal energy generally will be supported. There are clear benefits of this approach in terms of: (1) regional coordination; (2) developing expertise in project design and implementation; and (3) developing experience and investor/lender trust in high up-front and capital-intensive energy development efforts.

The project is recommended for approval.

Major Comments:

Pages 4 & 5, Section 4 (pages 6 & 7) and thereafter throughout the text: RER and GeoE technologies are discussed too interchangeably in this initial overview. Many of the issues facing geothermal energy are somewhat more akin to the issues in oil well exploration than they are with the classic decentralized renewable energy systems (solar, wind, biomass) where the energy densities are very different, and the degree on dispatchable/non-dispatchability are often dramatically dissimilar. This discussion should

highlight these similarities/differences as to many planners GeoE is seen as a very different sort of resource than the rest of the 'new' renewables. A particularly important and problematic example of this is on page 11, The TA Window, where it states, "of the GeoFund will address in the first place barriers that retard the use of RER." The text, however, is focused on GeoE, and it is unclear how this program will – or why it should -- support other RERs at all. The Polish project (page 52) also blurs the line between the two technologies and what sort of resources each needs.

Page 7: 'provision of technical assistance'. Training of a generation of geothermal RER personnel – engineers, financial and policy planners – would be greatly facilitated with extended internships at successful geothermal facilities outside the region, for example in New Zealand, the U. S., and Scandinavia. These internships would also build collaborations and status of this emerging energy market segment. They could be arranged as industrial internships through the OECD, EU, and U. S. Department of Energy.

Page 7 and 60, 'Regional Initiative', item (d); again , RER and GeoE are being mixed here. Surely the Regional Initiative is not the ideal body to take on the monitoring of fast moving developments in the RER field generally. Wind and PV use are both growing by over 25 percent/year. The International Energy Agency, for example, is far more capably staffed and sized to take on this role. Further, the issue raised (page 43ff) about the need to use the funds to catalyze new efforts, not just to fund those already of interest to commercial enterprises, raises the issue of the role of the GEDF. How will the project analysis take place? Reviewing the GeoE resource is one thing, but examining the market and grid resources to make these profitable ventures is another. It is unclear – so far – how the GEDF will either obtain this capacity, or how and with whom it will partner to bring it into the discussion. This infrastructure/analysis capacity mismatch should be listed on page 60 (Table in Annex 4) and addressed as part of the project plan for the GEDF.

Page 8: The parallel national local objectives list is exceptionally important to the overall project success. A component of this program would logically include the training/internship opportunities I discussed from page 7 (above).

Page 10, ff: The GeoFund. The TA Window fund is set at US$5 million. Given the cost of GeoE projects, this amount – and the fact that it is the first, and thus often the most difficult phase – this amount appears to be insufficient to make a significant impact. Item (d) on page 12 also suggests that the funding level for the TA Window is going, in practice, to be too small.

Page 12, item (d): This frank assessment of the capacity of many CIS nations to undertake GeoE projects is a major concern in for the overall structure of this project. On the one hand, the GEDF (GeoE Development Fund) structure provides significant project flexibility, which is good. However, if many of the nations will need to undertake pilot projects first that must be financed by other means (due to the larger funding levels, reaching 40 percent), then what will the GEFD do that direct project evaluation and funding and promotion will not do? The reason for this worry is not that the GEFD is not a good institution to develop, it arguably is, but that for the more significant project funding that will generally be needed for the fund not to devolve into a support mechanism for a small subset – Russia and the Ukraine, perhaps – of nations?

Page 15: Section 5.4. The GEDF would be far stronger if the participating donor nations had to make their contributions up front and under a standard arrangement so that these funds are not, directly or indirectly, used to leverage a greater role for the GeoE industries in each of these nations in the project development phases in the recipient nations.

Page 43ff: Throughout the document, a mismatch seems to exist between well developed projects, and those that are fully exploratory. The GEDF structure could be a good one to overcome this problem. An example would be the degree to which the Sapareva Bania project is clearly exploratory, while some of the Russian projects, or that of Stargard Szczeciński, are essentially ready to go. There are no clear safeguards in the project to keep the most significant support to flow to those less well defined projects, as they are likely to be the ones that do the most to spur the development of the GeoE industry in Eastern Europe.

Minor Comments:

Page 3: balneology: may be an unfamiliar term to many reviewers/readers. Balneology: water/spa cures.

Page 27/28: Example projects.

To provide a measure of the ability of the GEDF to catalyze the GeoE industry, the total project funding for the set of example projects (Slovak Republic, Russia, Hungary, Czech Republic, and Poland) should be totaled, along with the amount that they could logically request from the GEDF. Would each of these projects be better served by the GEDF, or direct, individual project funding? An evaluation should be made for each.

Page 32: I agree with the project authors, if this is to move ahead and be seen as a significant catalyst to geothermal expansion, there should be no delay in approving the first tranche of project funding.

Page 35: **Other partners of the Regional Initiative**

The way this would operate, who would partner, the benefits, and how this would be administered are completely vague.

Annex 17: Identified Projects

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

Project Pipeline

#	Country	Location	Type	Status		Number	GeoFund support in US$k				Total
				Project	GEF Focal Point	of wells	TA	DIF	GRI		Proj. Cost
					End.	to be drilled			EXGRI	OPGRI	(in US$m)
1	2	3	4	5	7	8	9	10	11	12	13
Start-Up Phase projects identified											
1	Hungary	MOL	EG	advanced preparation	yes	2	0	0	3500	0	30
2	Turkey	Izmir	DH	preparation	yes		600	0	2000	0	85
3	Turkey	Dokuzeyul	DC	preparation	yes	8	150	0	0	0	
4	Turkey	Salihli	DH	identification	yes		0	0	500	0	35
5	Turkey	Salihli	IH	identification	yes		170	0	0	0	0.2
5	Turkey	Yozgat	DH	identification	yes		800	0	0	0	80
6	Turkey	Dikili	DH	identification	yes	8	400	0	0	0	
7	Armenia	Yerivan	EG	preparation (GEF pr.)	yes	2	400	2000	0	0	38
8	Ukraine	Demonstrat. P	DH	identification	yes		150				
9	Ukraine	DP Crimea R	DH	identification	yes	3	150				6.5
10	Ukraine	DP in Lvov	DH	identification	yes		200				
11	Russia	V. Mutnovsky	EG	operation	likely	4	0	1200		0	11
12	Russia	Pauzhetskaya	EG	operation	likely		150	0	1000	1000	10
13	Russia	Labinsk	DH	advanced preparation	likely	13	250	0	1000		36
Projects most likely											
14	Russia	Stavropol	DH	identification	likely						
15	Russia	Mutnovsky 2	EG		likely		200	0	0	1000	250
16	Romania	Oradea	DH	preparation	yes		0	0	0	1000	4
17	Turkey	Aydin	EG	advanced preparation	yes	10	300	0	2000	0	70
18	Turkey	Edremit	DH	identification	yes	8	0	1000	0	1000	
Project reserve											
19	Georgia	Tbilisi	DH	identification	likely						
20	Kirgistan			identification	tbd						
21	Poland	Lodz	DH	identification	yes						
22	Romania	Beius	DH	identification	yes	4		1000			20

23	Russia	Elizovo	DH	identification	likely		350	0	0	0	55
24	Serbia		DH	identification	tbd						
25	Bulgaria	SeparovaBania	DH	identification	yes		0	500	500	0	
26	Tajikistan	Demonstratr. P	DH	identification	yes		100	0	0	0	
27	Ukraine	Beriegovo	DH	preparation	yes	17	400	1000	500	500	8.6
28	Ukraine	Mostiska	DH	preparation	yes	2	200	1000	500	500	5.2

Abbreviations and Acronyms

DH	District Heating
EG	Electricity Generation
BA	Balneology
DC	District Cooling
IH	Individual Heating
TA	Technical Assistance

TA	Technical assistance
DIF	Direct Investment Funding
GRI	Geological Risk Insurance
EXGRI	Exploraty GRI
OPGRI	Operational GRI
tbd	to be decided

Annex 18: Detailed Description of Technical Assistance

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

The scope and structure of the GeoFund TA Window will be as follows:

1. Capacity Building Component:

a) Review and assessment of geothermal resources, modes of occurrence, and methods of utilization;

b) Training of local experts in the preparation and implementation of geothermal energy projects;

c) Transfer of know-how through the establishment of a roster of international geothermal experts and implementation of targeted international studies;

d) Support to the organization and execution of conferences and workshops;

e) Dissemination of information through support to knowledge resource centers creation and publications.

2. Policy Development Component:

The Policy Development Component consisted of two subcomponents:

Country Policy Support Activities:

Review of energy sector policies and legal, regulatory and institutional frameworks as well as energy tariff systems in ECA countries to identify key barriers towards the use of renewable energy resources;

a) Support of Governments' policy reforms and framework improvements, including taxation in favor of geothermal energy development;

b) Development of national geothermal programs and action plans;

c) Creation of domestic financial mechanisms for support of geothermal energy projects;

d) Creation of, and secretariat support to the GeoFund Advisory Forum (GAF), consisting of experts from the ECA countries;

e) Creation of, and secretariat support to the GeoFund Group Scientific and Technical Experts (STE)

Demonstration Projects:

a) Development of innovative approaches to technical, organizational and financial aspects of geothermal energy projects;

b) Implementation of projects and dissemination of their results.

3. Project Preparation Component:

a) Preparation of business plans, feasibility and pre-feasibility studies;

b) Technical assistance to geothermal project promoters aimed to their capacity development to prepare, implement and operate their investments.

During the Start-Up Phase the World Bank jointly with recipient countries and project beneficiaries identified a set of priority activities for 2006-2008 for the support from the TA Window.

Indicative Costs and Financing Plan for TA

	GEF	Governments and other Institutions	Total
Objective 1: Building of individual and institutional capacities of stakeholders in the ECA region to develop geothermal energy (GeoE) projects	**375,000**	**450,000**	**620,000**
Output 1.1: Training courses and other awareness raising activities for geothermal experts and local and national stakeholders	245,000	175,000	420,000
Output 1.2: Targeted international studies and publications on geothermal energy technology applications.	100,000	100,000	200,000
Output 1.3: Mechanism of prompt access to geothermal international experts	30,000	0	30,000
Objective 2: Supporting the implementation of policies, legislation and regulations that create an enabling environment for geothermal energy development (GED)	**560,000**	**720,000**	**1280,000**
Output 2.1: Creation of domestic investment mechanism to support of GED in Turkey	200,000	200,000	400,000
Output 2.2: Reviews of legal, regulatory and institutional frameworks in ECA countries to identify and address to key barriers towards the use of GeoeoE	100,000	200,000	300,000
Output 2.3: Reviews and assessment of GERs, modes of occurrence, and methods of utilization	260,000	320,000	580,000
Objective 3: Demonstrating innovative approaches to technical, organizational and financial aspects of GE projects	**820,000**	**1,720,000**	**2,540,000**
Output 3.1 Demonstration of technologies of GeoE use in agriculture	270,000	220,000	490,000
Output 3.2: Demonstration of practical applications of technologies on complex and cascade use of GeoE	550,000	1,500,000	2,050,000
Objective 4: Assisting to geothermal project promoters to prepare, implement and operate their investments	**3,425,000**	**7,700,000**	**11,125,000**
TOTAL project specific TA	**4,495,000**	**9,670,000**	**14,165,000**
Total regional TA	**735,000**	**765,000**	**1,500,000**
Other Costs	**225,000**	**2,143,000**	**2,368,000**
TOTAL	**5,455,000**	**12,578,000**	**18,033,000**

Technical Assistance Window: PRIORITY ACTIVITIES FOR 2006-2008

	Component/Activities	Modality/Form of agreement	Outputs	Implementing Agency/ Executive agent	Total Activity Cost (US$000)	GeoFund support (US$000)	Contractors
	1. Capacity Building Component				**620**	**375**	
1.1.	Dissemination material for Course on Geothermal Feasibility Studies and Project Implementation Turkey	NGO-Execution/ Cooperation Agreement	Dissemination material (Study, CD-Rom)	IGA/ WGC-2006 Organizing Committee	150	75	Individual experts (lecturers), Fellows
1.2.	Targeted international studies and workshops on mineral co-production in geothermal development	NGO-Execution/ Cooperation Agreement	- 1 workshop proceedings published, - up to 50 experts from ECA countries involved	IGA/ Russian Geothermal Society, Oregon Institute of Technology	200	100	Individual experts (organizing team), Fellows, Subcontractors, if needed
1.3.	Roster of International Geothermal Experts/Support to the GeoFund Advisory Panel	NGO-Execution/ Cooperation Agreement	- Mechanism of prompt international experts selection,	International Geothermal Association	0	30	Individual experts
1.4.	Support to International Summer School	NGO-Execution/ Cooperation Agreement	- 2 ISS (2006 - 2008), including thematic workshops held -proceedings published, - up to 200 experts from ECA countries trained	International Geothermal Association/ Institutes in host countries	200	100	Individual experts (organizing team), Fellows, Subcontractors, if needed
1.5.	Publications on GeoE, including maintenance of the GeoFund web side	NGO-Execution/ Cooperation Agreement	- Updated GeoFund web side, -10 monographs	International Geothermal Association/ Institutes in host	40	40	Individual experts (organizing team),

				countries			Fellows, Subcontractors, if needed
1.6.	Series of 3 case studies	NGO-Execution/ Cooperation Agreement	-	International Geothermal Association/ Institutes in host countries	30	30	Individual experts (organizing team), Fellows
	2. Country Policy and Knowledge Development Component				**1,380**	**610**	
2.1	Support to Organization of Geothermal Energy Development Financing Facility in Turkey	National Execution/ Project Document on TA activities in Turkey countersigned	- Feasibility study for creation of an investment mechanism to support GED in Turkey	Government of Turkey (Designated Ministry)/ Turkish Geothermal Association	400	200	Individual experts and subcontractors if needed
2.2	Review and economic assessment of geothermal resources in CIS countries	NGO-Execution/ Cooperation Agreement	- Report on an assessment of geothermal potential of 12 CIS countries - Conference for decision-makers and experts	IGA /Executive Committee of CIS Electric Power Council	300	100	Individual experts, Consultant company to be selected competitively
2.3	TA on legislative, normative and institutional support to geothermal energy development in Ukraine	National Execution/ Project Document on TA activities in Ukraine countersigned	Recommendations on policy in support of geothermal energy development in 5-6 CIS countries, - Improve legislation base favoring RE and geothermal energy use	Government of Ukraine (Designated Ministry)/	100	50	Individual experts, Consultant company to be selected competitively
2.4	Advisory services to ministries of energy in CIS countries on policy improvement	NGO-Execution/ Cooperation Agreement	- Recommendations on policy in support of geothermal energy development in 5-6 CIS countries,	IGA/Executive Committee of CIS Electric Power Council	260	100	Individual experts, Consultant company to be selected

			- Improve legislation base favoring RE and geothermal energy use				competitively
2.5	Country assessment of barriers to GeoeoE use for power production in Hungary	NGO-Execution/ Cooperation Agreement	- Report on assessment of barriers	International Geothermal Association	220	110	Individual experts, Consultant company to be selected competitively
2.6	Assistance in evaluation of project proposals for second phase of GeoFund	NGO-Execution/ Cooperation Agreement		International Geothermal Association	0	30	Consultant company to be selected competitively
2.7	Stand alone economic program for GE DH and GeoE power projects to reduce costs of feasibility studies	NGO-Execution/ Cooperation Agreement	Computer program Training on use of this program	International Geothermal Association	100	20	Consultant company to be selected competitively
3.	**3. Demonstration Projects**				**2,540**	**820**	
3.1	Demonstration Geothermal Drying Project in Salihli (Turkey)	National Execution/ Project Document on TA activities in Turkey countersigned	Pilot facility and project documentation for replication in the region and overseas	Government of Turkey (Designated Ministry)/ Municipality of Salihli	340	170	Consultant company to be selected competitively
3.2	Demonstration project on complex utilization of geothermal resources in Lvov region (Ukraine)	National Execution/ Project Document on TA activities in Ukraine countersigned			600	200	
3.3	Demonstration project on complex utilization of geothermal resources in Crimea region (Ukraine)	National Execution/ Project Document on TA activities in Ukraine countersigned			450	150	
3.4	Demonstration project on geothermal heating of greenhouses in Tajikistan	National Execution/ Project Document on TA activities in Tajikistan			150	100	

		countersigned					
3.5	Demonstration project on cascade utilization of GeoE in Rozovy (Russia)	National Execution/ Project Document on TA activities in the Russian Federation countersigned			1000	200	
	4. Project Preparation Component				**11,125**	**3,425**	
4.1	Feasibility study for Geothermal Cooling Project in Dokuz Elul University (Turkey)	National Execution/ Project Document on TA activities in Turkey countersigned	Feasibility study for investments of US$5 M, Project documentation for replication in the region and overseas	Dokuz Elul University	300	150	Consultant company to be selected competitively
4.2	Feasibility study for Izmir Geothermal DH project (Turkey)	National Execution/ Project Document on TA activities in Turkey countersigned	Feasibility Study expected investments of US$100 M	Izmir Geothermal Company	1500	600	Consultant company to be selected competitively
4.3	Feasibility study for Yozgat Geothermal DH project (Turkey)	National Execution/ Project Document on TA activities in Turkey countersigned	Feasibility Study	Yozgat Municipality	2000	800	Consultant company to be selected competitively
4.4	Feasibility study for Dikili Geothermal DH project (Turkey)	National Execution/ Project Document on TA activities in Turkey countersigned	Feasibility Study	Dikili Municipality	800	400	Consultant company to be selected competitively
4.5	Feasibility study for Geothermal power production project in Armenia	National Execution/ Project Document on TA activities in Armenia countersigned	Feasibility Study	Government of Armenia	1000	400	Consultant company to be selected competitively

4.6	Feasibility study and technology testing for Labinsk Geothermal DH project (Russia)	National Execution/ Project Document on TA activities in the Russian Federation countersigned	Feasibility study and other documentation for investments of US$33 M	JSC Yuzhgeothermalheat	2200	250	Consultant company to be selected competitively
4.7	Pre-Feasibility study for Geothermal DH project in Pasohlawky (Czech Republic)	National Execution/ Project Document on TA activities in the Czech Republic countersigned	Pre-Feasibility study	Administration of Pasohlawky Municipality	400	200	Consultant company to be selected competitively
4.8	Pre-Feasibility study for Geothermal DH project in Litomerice (Czech Republic)	National Execution/ Project Document on TA activities in the Czech Republic countersigned	Pre-Feasibility study	Administration of Litomerice Municipality	2125	400	Consultant company to be selected competitively
4.9	Pre-Feasibility studies for 5 Geothermal DH projects in Krasnodar krai (Russia)	National Execution/ Project Document on TA activities in the RU countersigned	5 Pre-Feasibility studies	Administration of Krasnodar krai	200	25	Geotherm-M
4.10	Feasibility study for Kazminsky DH project (Russia)	National Execution/ Project Document on TA activities in the RU countersigned	Feasibility study	Government of Stavropol kraj	200	50	Consultant company to be selected competitively
4.11	Feasibility study for Pauzhetsky Geothermal Binary Power Plant (Russia)	National Execution/ Project Document on TA activities in the Russian Federation countersigned	Feasibility study and other documentation for investments o US$10 M	JSC “Pauzhetsky Geothermal Power Plant’	400	150	Consultant company to be selected competitively
	5. Management and Administration component				**2,368**	**225**	
	TOTAL from GEF for 2006-2008				**18,033**	**5,455**	

Annex 19: GeoFund Subproject: Regional Technical Assistance Implemented by IGA

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

A. STRATEGIC CONTEXT AND RATIONALE

1. Country and sector issues

All countries of the Eastern Europe and Central Asia region lag behind current European Union (EU) member states in regards to the use and the development of renewable energy resources (RER).

Most of the potential client countries of the GeoFund Program do not have a policy framework in place that transparently supports renewable/geothermal energies. The role of the GeoFund subproject is to assist participating countries' legislative and regulatory bodies to increase the use of GeoE by developing and implementing appropriate legislative frameworks as well as to provide financial support to capacity building and knowledge sharing.

2. Rationale for Bank involvement

The rationale for Bank involvement is described in detail at page 5 in this document.
Since the IGA has no extensive project implementation experience, it is especially important that the Bank provides its knowledge sharing and best practices in implementing GEF financed projects

3. Higher level objectives to which the project contributes

The importance of global climate change, its potential implications, and the need to address it is understood across the countries of the ECA Region. Nevertheless, national climate change strategies show certain variations that are implied by respective Kyoto commitments; country-specific GHG emissions reduction potentials and the economic situation of countries play a role in setting energy generation import and use priorities

B. PROJECT DESCRIPTION

1. Financing instrument

The financing instrument is an APL as described in the PAD.

2. Project development objective and key indicators

The project development objective for this subproject is derived from the Program's overall goal: to promote the use of geothermal energy in the ECA region through assistance in the removal of its barriers.

This will be achieved through the implementation of a capacity building component and a policy development component.

3. Project components

The International Geothermal Association (IGA), will be responsible for the execution of region-wide TA activities under the capacity building component and partly under the country policy and knowledge development component.

The IGA, founded in 1988, is a scientific, educational and cultural organization established to operate worldwide. It has more than 2000 members in 65 countries. The IGA is a non-political, non-profit, non-governmental organization in special consultative status with the Economic and Social Council of the United Nations, and Partner of the European Union for the Campaign for Take Off (CTO) the Renewable Energy. The objective of IGA is to encourage research, development and utilization of geothermal resources worldwide through the compilation, publication and dissemination of scientific and technical data and information, both within the community of geothermal specialists and between geothermal specialists and the general public.

Affiliated Organizations are: Canadian Geothermal Energy Association (CGEA), Chinese Geothermal Association, Ethiopia Geothermal Association, Georgian Geothermal Association (GCA), Geothermal Resources Council [of USA](GRC), Geothermal Association [of Germany](GAG), Hungarian Geothermal Association (HGA), Iceland Geothermal Association, Indonesian Geothermal Association (INAGA), Ireland Geothermal Association, Italy Geothermal Association , Japanese Geothermal Association (JPA), Lithuanian Geothermal Association (LGA), Macedonia Geothermal Association, Mexican Geothermal Association (AGM), New Zealand Geothermal Association (NZGA), Philippines Geothermal Association , Polish Geothermal Association (PGA), Romanian Geothermal Association (RGA), Russian Geothermal Association (RUGA), Slovak Geothermal Association (SGA), Swiss Geothermal Association (SWGA), Turkey Geothermal Association (TGA).Affiliated agreements are currently prepared with the El Salvador Geothermal Association and the Iranian Geothermal Association. In addition talks are held with the International Renewable Energy Association to become a member.

IGA will contact national geothermal associations and other institutions for the organization of training courses, seminars and other events. The work program of IGA's region-wide TA activities will be prepared jointly by IGA and GCT and periodically reviewed in accordance with the Grant Agreement (GA) between IGA and the Bank.

COMPONENT A:

The **Capacity Building Component** includes**:**

a) Review and assessment of geothermal resources, modes of occurrence, and methods of utilization;

b) Training of local experts in the preparation and implementation of geothermal energy projects;

c) Transfer of know-how through the establishment of a roster of international geothermal experts and implementation of targeted international studies;

d) Support to the organization and execution of conferences and workshops;

e) Dissemination of information through support to knowledge resource centers creation and publications.

Expenditures under this component may be eligible for retroactive financing.

COMPONENT B:

The **Policy Development Component** consisted of two subcomponents:

(a) Country policy support activities and (b) Demonstration projects of which only component (a) will be implemented by the IGA.

Country policy support activities include:

Review of energy sector policies and legal, regulatory and institutional frameworks as well as energy tariff systems in ECA countries to identify key barriers towards the use of renewable energy resources;

a) Support of Governments' policy reforms and framework improvements, including taxation in favor of geothermal energy development;

b) Development of national geothermal programs and action plans;

c) Creation of domestic financial mechanisms for support of geothermal energy projects;

d) Creation of, and secretariat support to the GeoFund Advisory Forum (GAF), consisting of experts from the ECA countries;

e) Creation of, and secretariat support to the GeoFund Group Scientific and Technical Experts (STE).

Expenditures under this component may be eligible for retroactive financing.

COMPONENT C:

Under the Management and Administration Component IGA will recruit an implementation specialist to manage the funds of the project. He/she will receive adequate training in FM, procurement and disbursement rules and regulations of the World Bank. Appropriate segregation of duties will be achieved in hiring this consultant to strengthen project implementation. The Bank will review the TORs for this position.

The daily activities of the project will be carried out by the Executive Secretary of the IGA secretariat.

Regional Technical Assistance Window: PRIORITY ACTIVITIES FOR 2006-2008

	Component/Activities	Modality/Form of agreement	Outputs	Implementing Agency/ Executive agent	Third Party Financing (US$000)	GeoFund support (US$000)	Contractors
1.	**Capacity Building Component**				620	**375**	
1.1.	Dissemination material for Course on Geothermal Feasibility Studies and Project Implementation Turkey	NGO-Execution/ Cooperation Agreement	Dissemination material (Study, CD-Rom)	IGA/ WGC Organizing Committee	150	75	Individual experts (lecturers), Fellows
1.2.	Targeted international studies and workshops on mineral co-production in geothermal development	NGO-Execution/ Cooperation Agreement	workshop proceedings published, up to 50 experts from ECA countries involved	IGA/ Russian Geoth. Society, Oregon Institute of Technology	100	50	Indiv. experts (organizing team), Fellows, Subcontractors
1.3.	Targeted international studies and workshops on mineral co-production in geothermal development (09/5 – 09/10 06)	NGO-Execution/ Cooperation Agreement	workshop proceedings published, up to 50 experts from ECA countries involved	IGA/ Oregon Institute of Technology	100	50	Individual experts (organizing team), Fellows, Subcontractors
1.4.	Roster of International Geothermal Experts/Support to the GeoFund Advisory Panel	NGO-Execution/ Cooperation Agreement	- Mechanism of prompt international experts selection	International Geothermal Association		30	Individual experts
1.5.	Support to International Summer School (2007 - 2008),	NGO-Execution/ Cooperation Agreement	- 2 ISS, inc. thematic workshops, proceedings published, up to 200 experts from ECA countries trained	IGA/ Institutes in host countries	200	100	Individ. experts (organizing team), Fellows, Subcontractors, if needed
1.6.	Publications on GeoE, including maintenance of the GeoFund web side	NGO-Execution/ Cooperation Agreement	-Updated GeoFund web side, -10 monographs	International Geothermal Association/ Institutes in host countries	40	40	Individual experts (organizing team), Fellows, Subcontractors, if needed
1.7.	Series of 3 case studies of projects that have been developed (selected in 2006 and completed in 2007)	NGO-Execution/ Cooperation Agreement	-3 case studies	IGA/ Institutes in host countries	30	30	Individual experts (organizing team), Fellows

2.	**Country Policy and Knowledge Development Component**				800	**360**	
2.1	Review and economic assessment of geothermal resources in CIS countries (2007 & 2008)	NGO-Execution/ Cooperation Agreement	- Report on assessment of geothermal potential of 12 CIS countries - Conference for decision-makers and experts	IGA /Executive Committee of CIS Electric Power Council	300	100	Individual experts, Consultant company to be selected competitively
2.2	Advisory services to ministries of energy in CIS countries on policy improvement	NGO-Execution/ Cooperation Agreement	- Recommendations on policy in support of geothermal energy development in 5-6 CIS countries, - Improve legislation base favoring RE and geothermal energy use	IGA/Executive Committee of CIS Electric Power Council	260	100	Individual experts, Consultant company to be selected competitively
2.3	Country assessment of barriers to GeoE use for power production in Hungary	NGO-Execution/ Cooperation Agreement	- Report on assessment of barriers	International Geothermal Association	220	110	Individual experts, selected competitively
2.4	Assistance in evaluation of project proposals for second phase of GeoFund	NGO-Execution/ Cooperation Agreement		International Geothermal Association		30	Consultant company to be selected competitively
2.5	Stand alone economic program for GeoE DH and GeoE power projects to reduce costs of feasibility studies	NGO-Execution/ Cooperation Agreement	Computer program Training on use of this program	International Geothermal Association	100	20	Consultant company to be selected competitively
4.	**Management and Administration component**					**75**	
	TOTAL from GEF for 2006-2008				1500	**810**	

4. Lessons learned and reflected in the project design

Lessons learned have been detailed in the PAD.

5. Alternatives considered and reasons for rejection

Alternatives considered and reasons for rejection have been detailed in the PAD.

C. IMPLEMENTATION

Project implementation period: October 17, 2006 to April 30, 2008
Expected effectiveness date: December 31, 2006
Expected closing date: December 31, 2008

1. Partnership arrangements

For all project activities is parallel donor funding expected from the International Geothermal Association or other local organizations.

2. Institutional and implementation arrangements

Institutional arrangements of the GeoFund are described in detail in chapter C 2.

The World Bank will enter into a Letter of Agreement (LA) with the International Geothermal Association.

IGA will implement a first set of region-wide TA activities based on an agreed work program.

The work program will be prepared jointly by IGA and GCT and periodically reviewed in accordance with the Letter of Agreement (LA) between IGA and the Bank.

3. Monitoring and evaluation of outcomes/results

IGA will be responsible for M&E of the regional TA activities of this subproject.

A common set of indicators has been included in the work program. IGA will report against these indicators allowing the GeoFund Coordination Team to report progress against the global objectives of increasing the use of geothermal energy in the ECA region by removing its barriers.

The performance indicators used to justify *Implementation Progress* ratings during supervision include:

- Number of training events completed;
- Number of case studies completed; and
- Completion of TA assignments relating to enabling framework and information dissemination.

Arrangements for Result Monitoring

		Target Values		Data Collection and Reporting		
Project Outcome Indicators	**Baseline**	**2006-08**	**2009-13**	**Frequency and Reports**	**Data Collection Instruments**	**Responsibility for Data Collection**
Competitiveness of geothermal energy in client countries increases on a country by country basis	0	yes	yes	Twice during GeoFund implementation	Mid-term Review and Implementation Completion Report	IGA
Intermediate Outcome Indicators						
Better understanding of the technical and economic potential of geothermal energy in x number of participating ECA countries through case studies and Training	0		6	Twice during GeoFund implementation	Reports from geo-information offices	IGA
Geothermal data bases and International summer school in x numbers of countries	0	2	5	yearly beginning in 2006	Report from IGA to the World Bank	IGA
Roster of International Geothermal Experts	0	by end 2006	Yearly update	Yearly	Report from IGA to the World Bank	IGA

4. Sustainability

The project will contribute to the sustainability of the overall geothermal Program by:

a) providing knowledge and building capacity among decision-makers and market participants for a better understanding and acceptance of geothermal energy

b) supporting the creation and implementation of the enabling legislation; and

c) supporting the creation of an attractive climate for private investment that will entice multiple market participants to seek business opportunities in geothermal energy;

Project sustainability will depend greatly on having an effective and enforceable policy and legal framework in place. Therefore it is crucial for IGA to cooperate with local geothermal organizations to provide regulation and policy recommendations to regulatory authorities and other local institutions. The combination of adequate institutional and regulatory capabilities, increased public awareness and understanding, and active and informed NGOs play an important role for the sustainability of the project.

5. Critical risks and possible controversial aspects

The critical risks and possible controversial aspects of the project are summarized in Section 5 of the PAD, outlining risks, risk mitigation measures and risk rating.

6. Grant conditions and covenants

FM covenants: Establishment of acceptable financial management arrangements and opening of a Special Account are conditions of effectiveness for this grant fund.

IGA will maintain a financial management system both for itself and the project acceptable to the Bank. The IGA financial statements, SOEs and special account will be audited by independent auditors acceptable to the Bank and on terms of reference acceptable to the Bank. The annual audited statements

and audit reports together with the Management Letter will be provided to the Bank within six months of the end of each fiscal year.

IGA shall not draw down reserves to cover operating costs in connection with this project at any time during project implementation without the prior written approval of the Bank.

D. APPRAISAL SUMMARY

1. Economic and financial analyses

The IGA subproject will essentially provide TA and therefore does not lend itself well to typical economic or financial analysis. For further details are described in Section D1 of the PAD.

2. Technical

The GeoFund Coordination Team and IGA have prepared a detailed work program that covers regional assistance for capacity building and policy development. No technical issues are of concern for this subproject.

3. Fiduciary

Financial Management Arrangements

Conclusion

A financial management assessment was undertaken in 2006 to determine whether the financial management systems to be utilized by IGA to manage the grant funds are acceptable to the Bank. It has been concluded that the current financial management arrangements of IGA are not acceptable to the Bank. Accordingly it has been agreed that the establishment of acceptable financial management arrangements is a condition of effectiveness. From financial management, this activity is considered modest risk. An improvement action plan has been agreed with IGA to ensure that it can fully meet the Bank's requirements prior to effectiveness of the grant fund. The action plan includes the following critical activities:

1. Recruitment of a part-time accountant/procurement specialist to manage the grant facility;
2. Establishment of satisfactory FM policies and procedures manual, including appropriate internal controls for grant funds, for the grant facility;
3. Establishment of accounting system that is capable of recording and reporting flow of funds and tracking of expenditures of the grant facility;
4. Finalize interim financial reports (IFRs) acceptable to the Bank; and
5. Provide appropriate training to new accountant/procurement specialist on Bank's procedures on FM and procurement.

IGA – Organization structure

International Geothermal Association (IGA) was incorporated under the New Zealand Incorporated Societies Act 1908 on the 6th July 1988. It is currently located in Iceland where the bank account is kept. It is relatively small association, with total revenue (membership and contribution) of around US$40,000 and total expenditures of around US$55,000 in the year ended 31 December 2004.

The accounting person is the Executive Secretary at the Secretariat in Iceland. He works closely with its treasurer who is currently based in New Zealand and the finance committee chair who is currently based in Seattle (USA). The Audit committee reviews the books on an annual basis. The audit of the IGA is carried out by Franchi & Sbrana in Italy, according to Italian Law. Formal responsibility for preparation of budget is that of the chairman of the finance committee, with inputs for budget proposal from sub-committees and board members.

Financial Management Arrangements

The IGA subproject will have a separate grant account with the Bank, and will be responsible for assuring that it establishes and maintains financial management arrangements that are acceptable to the Bank, including (i) adequate accounting systems and control procedures; (ii) funds flow mechanisms including timely disbursements to its suppliers; and (iii) appropriate arrangements for regular financial audits. These responsibilities will be specified in grant documents. IGA as recipient will be evaluated as to its compliance with Bank financial management standards at the preparation and launching stages, as well as on supervision missions during grant implementation.

Staffing Arrangements

The day to day activities of the project will be carried out by the Executive Secretary of the IGA secretariat. In addition, an implementation specialist segregating functions of accountant/procurement specialist will be recruited to manage procurement and disbursement of the project funds. He/she will receive adequate training in procurement, FM, and disbursement rules and regulations of the World Bank.

Financial Reporting and Monitoring

IGA prepares reports on three levels relative to finances. These include the Treasure's Report, the Secretariat Report and the Audit Committee Report. It is the responsibility of the Finance Committee Chair and the Treasure to come up with the budget for the coming year. The Secretariat tracks all income and expenditures and prepares an Operating Statement covering all expenses and revenue, an IGA Revenue and Expense Summary and a Balance Sheet. The Treasurer prepares a report comparing budget vs. income and expenditures. The Audit committee is responsible for the Audit Report which is prepared by an outside firm and verified by the Audit Committee.

Reports are prepared for IGA Board meetings on a semiannual basis with the Audit done on a yearly basis.

For project monitoring purposes, financial monitoring reports will be prepared quarterly detailing all revenue and expenses related to the Grant for the WB and a semi annual report for the IGA board of directors. The special GeoFund account will be audited yearly in conjunction with the audit of other IGA financials.

IGA will maintain accounts of the project and ensure appropriate accounting of the funds provided. IGA will be responsible for preparing interim un-audited financial reports (IFRs) (previously known as Financial Monitoring Report (FMRs)) on a quarterly basis. The IFRs to be finalized prior to negotiation will include:

- Brief progress report of the grant
- Project sources and uses of funds
- Uses of funds by project activity
- Special account statement
- Procurement reporting
- Statement of grant balance

The first IFR will be furnished to the Bank not later than 45 days after the end of the first quarter after the Effective Date, and will cover the period from the Effective Date to the end of the quarter.

Information Systems

IGA uses software package called TOK a product of the Icelandic company Ax hugbunadarhus (http://www.ax.is).

For the project purposes the IGA will use TOK to gather the data on the use of GEF funds (coming through the special account, direct payments etc) and counterpart funds which will not be recorded in the books of IGA. In addition IGA will use Excel spread sheet to keep track of grants issued. Establishment of accounting system that is capable recording and reporting flow of funds and tracking of expenditures of the grant facility is a FM improvement action plan.

Financial Audits

Audits are required annually by auditors acceptable to the Bank. The selection and appointment of the external auditor and audit TOR agreed upon during negotiation will be in accordance with the Bank's guidelines. Auditing of project activities financed by the World Bank will be financed by IGA and handled during the annual external audit of the IGA. The auditor will have direct access to the files and records of the projects and is based in Iceland. An audit report prepared in accordance with Bank guidelines will be required to be submitted to the Bank six months following the end of the recipient's fiscal year-end. In addition to the audit report, the auditors will be expected to prepare management letters giving observations and comments, and providing recommendations for improvements in accounting records, systems, controls and compliance with financial covenants in the Grant Agreement.

Internal Controls and Procedure

Minimum internal controls should be available prior to flow of funds. Controls over grant funds will be especially important, as the grant would represent a significant increase in the scope of activities of the IGA. In addition, there is currently no proper control procedures on the management of Bank's grant fund. Accordingly, internal control will be required through management supervision, clear separation of duties, and proper documentation. A financial management manual outlines key controls, policies and procedures for the management of Bank grant funds should be finalized, acceptable to the Bank, prior to effectiveness of the grant fund.

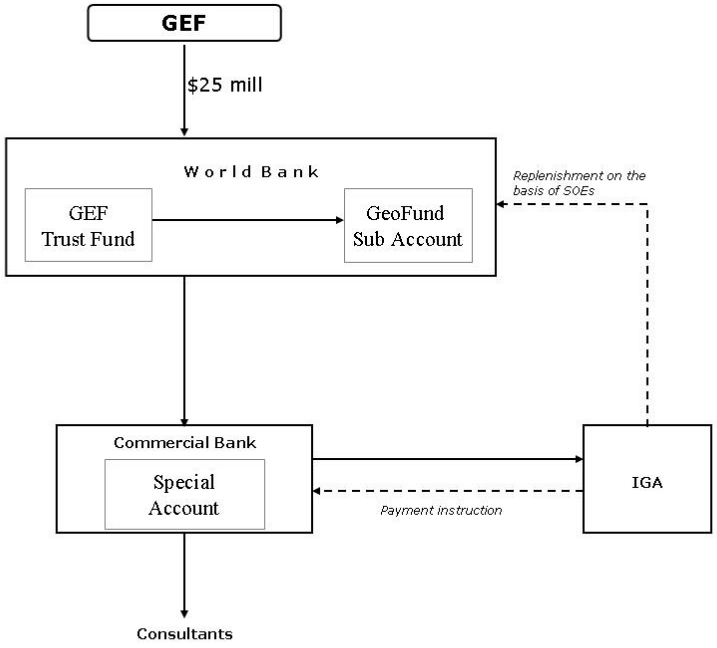
The Board of Directors of IGA will sign the work program between IGA and the World Bank. Approval for contracts between IGA and the recipients will be given by the Executive Committee of IGA. A technical lead for every activity monitors and supervises the product as well approves payments. Payments up to the amount of US$5,000 will be authorized by the Executive Secretary of IGA and issued by the Accountant officer. Contracts above US$5,000 need further authorization from the IGA Board of Director. Regular and accurate bank reconciliations will be done by the Secretary for the overall IGA accounts and by the Account officer for the project component.

The Executive Secretary works closely with our treasurer in New Zealand and the finance committee chair in USA. The roles of the treasurer include "...shall have the custody of the Association's funds and shall be responsible for managing these funds in a judicious manner. With the assistance of the Executive Director he shall keep full and accurate accounts of receipts and disbursements, and shall deposit all monies and other valuable effects in the name and to the credit of the Association in such depositories as may be approved by the Board of Directors."

The Audit committee reviews the books on an annual basis. The role of the Audit Committee include "...shall be responsible for reviewing and controlling all financial and administration matters and inspecting the relative documents and the account books of the Association. The Audit Committee shall consist of at least five members, at least one of whom shall not be a member of the Board."

Flow of funds

The IBRD would make funds available to IGA under the Letter of Agreement, governing the terms and conditions of the GEF Grant and specifying the project. Project funds will flow from the Bank, via a single special account at Sparisjodur Reykiavikun Og Nagrennis (SPRON) Bank in Reykiavik, Iceland. They will be replenished on the basis of Statement of Expenses (SOEs) or direct payments.



Disbursement Arrangements

The project is expected to be implemented over a period of 2.5 years, plus six months for the completion of accounts and the submission of withdrawal applications.

Due to the prolong project preparation and already scheduled TA activities as conferences the Bank agrees to apply retroactive financing up to 10 percent of the grant amount, thus, up to an amount of US$81,000 for expenditures for consultants' services, training and operational costs. Procurement should be conducted according to the Bank guidelines. Retroactive financing may be used for payments made for expenditures incurred after July 1, 2006 prior to the date of signing of the Letter of Agreement.

Bank funds will be disbursed under the Bank's traditional procedures of SOEs. Supporting documentation for SOEs, including completion reports and certificates, will be retained by IGA and made available to the Bank during project supervision. Disbursements for expenditures above the SOE thresholds will be made against presentation of full documentation relating to those expenditures.

To facilitate timely project implementation, IGA will establish, maintain and operate a single Special Account in US$ under terms and conditions acceptable to the Bank. Withdrawal applications for the replenishments of the SA will be sent to the Bank quarterly regardless the activity during the period or size of the special account. Replenishment applications must include reconciled, detailed bank statements as well as other appropriate documents (e.g. SOE or source documentation). The bank statement must indicate both the opening and closing balance of the special account for the period covered by the expenditures claimed, and likewise, indicate all transactions and activity on the account during the period.

The reconciliation statement must also explain any discrepancies (surplus or shortage of funds) and the status of any previously deducted expenditures.

The project implementation progress reports will be monitored in detail. IFRs/FMRs will be reviewed on a regular basis by FM and any issues arising will be followed up promptly. Audited financial reports of the project will be reviewed and identified issues followed up.

Conditions of Effectiveness:

1. Opening of a special account

2. Establishment of satisfactory financial management arrangements acceptable to the Bank

An initial deposit of US$81,000 of the grant amount into the Special Account will be expected since up-front investments are needed set up a functional financial management within IGA that complies with World Bank rules and regulations and a number of activities will start immediately after project effectiveness.

Table 1. Allocation of Grant proceeds

Ref. No.	Category	Amount of the Grant Allocated (Expressed in U.S. Dollars)	% of Expenditures to be Financed
1.	Consultants' services and training	735,000	100 percent
2.	Operating costs	75,000	100 percent
	Total	**810,000**	

Procurement Arrangements

Procurement Assessment of IGA

IGA will be the primary recipient of the GEF grants and will coordinate the implementation of the overall project. The primary reasons for selecting IGA as implementing agency were the following: (i) it understands issues related to geothermal energy development (ii) it works globally on geothermal issues and can therefore draw on its cooperation with local organizations, experts, and agencies in the field of geothermal energy.

IGA will be responsible for providing regional-, country based-, and cross-cutting support to the Program. The procurement of Consultants services to be conducted by IGA shall follow the Bank's Consultants guidelines. This will include hiring of Individual Consultants in accordance with section V, including paragraph 5.2 and 5.34. All TORs will be prior reviewed by the Bank. In this regard, many of the individual consultants would be individuals who are employed at universities and other research centers. In accordance with Consultants guidelines paragraph 1.11 (c) "services of Government – owned universities or research centers in the Borrower's country are of unique and exceptional nature, and their participation is critical to project implementation, the Bank may agree on hiring those institutions on a case-by-case basis. On the same basis, university professors or scientists from research institutes can be contracted individually under Bank financing." In the context of this operation there is no any particular

impediment to the engagement of such individuals, but such engagement should further be compliant with the provisions of the memorandum of August 19, 1999 that had been issued before "new" 2004 Consultant Guidelines" were formulated. This memorandum expands on the rationale for this procedure.

The Bank undertook a procurement assessment of IGA during IGA's representatives' mission to the World Bank in February 2006 and evaluated their procurement capacities, types of proposed procurement packages to be handled by IGA and whether there is a need to hire an individual consultant that will be paid from project funds to support the project implementation. An individual will be recruited to manage procurement and disbursement of the project funds. The procurement procedures followed by IGA are in general compliant with international practice but World Bank procedures will be used in project activities. The assessment findings, recommendation and specific agreements on the handling of procurement have been discussed.

IGA in general has followed procurement procedures that are compliant with the World Bank's rules and procedures.

The Secretariat will be charged by the Board of Directors of the IGA to carry out all procurements for the tasks as identified. Members of the IGA Board will serve as evaluators of proposals and in the selection of consultants. For specific proposals the Board may invite outside experts to assist the Board in such evaluations. Consultants so selected will enter into contracts with the IGA through the Secretariat. The IGA Board will appoint a technical supervisor to each project whose duties will be to verify the adequacy of the work being performed and to be in regular contact with the consultant(s) and the Secretariat. All financial transactions will be carried out by the Secretariat and payments will only be made upon the approval of the technical supervisor.

Members of the IGA Board and Secretariat will make such arrangements as are required in order to carry out the assignments of the projects within the participating countries. Where applicable the IGA will use the services of one of its affiliates to the extent possible.

General

Consulting services under the region wide TA window of the Project will include:

a) Review and assessment of geothermal resources, modes of occurrence, and methods of utilization;

b) Training of local experts in the preparation and implementation of geothermal energy projects;

c) Transfer of know-how through the establishment of a roster of international geothermal experts and implementation of targeted international studies;

d) Support to the organization and execution of conferences and workshops; Dissemination of information through support to knowledge resource centers creation and publications.

e) Support of Governments' policy reforms and framework improvements, including taxation in favor of geothermal energy development;

f) Development of national geothermal programs and action plans;

g) Creation of domestic financial mechanisms for support of geothermal energy projects;

h) Creation of, and secretariat support to the GeoFund Advisory Forum (GAF), consisting of experts from the ECA countries;

i) Creation of, and secretariat support to the GeoFund Group Scientific and Technical Experts (STE)

Consulting services under the country TA will include:

a) Development of innovative approaches to technical, organizational and financial aspects of geothermal energy projects;

IGA as beneficiary of the GEF grant will serve in two functions:

1. Implement TA activities and in this function assign task to individual consultants or consultant firms.

2. Facilitate, and supervise country wide geothermal activities, as well as analyze these results and make recommendations

All Consulting services of function (1) will be procured in accordance with the Bank's Consultants' Guidelines. Short lists of consultants for services estimated to cost less than the threshold ceiling per contract established for each Recipient country may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Guidelines.

Consulting services of function (2) will be procured in accordance with the Bank's Consultants' Guidelines if further World Bank funding is involved at the country level.

Others:

The procurement procedures and Standard Bidding Documents to be used for each procurement method shall be presented in the Operations Manual prepared for all projects which will include procurement section describing procurement arrangements where applicable.

Procurement Plan for consulting services

IGA has established a detailed procurement plan for all activities implemented by IGA itself (1). This procurement plan is derived from the table of activities. IGA will update this Procurement Plan annually or as needed throughout the duration of the project. It will be submitted to the Bank for approval.

a) List of consulting assignments has been established as follows:

Table 2: Procurement Plan for IGA

1	2	3	4	5	6	7
Ref. No.	**Description of Assignment**	**Estimated Cost US$k**	**Selection Method**	**Review by Bank (Prior / Post)**	**Expected Proposals Submission Date**	**Comments**
1.1.	Dissemination material for Course on Geothermal Feasibility Studies and Project Implementation TU	75	IC	prior	10/19/2006	Prior review for IC of or above US$50,000
1.2.	Targeted international studies and workshops on mineral co-production in geothermal development	50	IC	prior	10/19/2006	Prior review for IC of or above US$50,000
1.3.	Targeted international studies and workshops on mineral co-production in geothermal development (September 5 – 10, 2006)	50	IC	prior	10/19/2006	Prior review for IC of or above US$50,000
1.4.	Roster of International Geothermal Experts/Support to the GeoFund Advisory Panel	30	IC	post	10/31/2006	

1.5.	Support to International Summer School (2007 - 08)	100	CQS	prior	06/30/2007 06/30/2008	ToR will be reviewed by the Bank
1.6.	Publications on GeoE, including maintenance of the GeoFund web side	40	IC	post	12/31/2006	ToR will be reviewed by the Bank
1.7.	Series of 3 case studies of projects that have been developed (selected in 06 and completed in 07)	30	IC	post	12/31/2006	ToR will be reviewed by the Bank
2.1	Review and economic assessment of geothermal resources in CIS countries (2007 & 2008)	100	CQS	prior	07/31/2007 07/31/2008	ToR will be reviewed by the Bank
2.2	Advisory services to ministries of energy in CIS countries on policy improvement	100	CQS	prior	08/31/2007	ToR will be reviewed by the Bank
2.3	Country assessment of barriers to GeoE use for power production in Hungary	110	CQS	prior	12/31/2006	ToR will be reviewed by the Bank
2.4	Assistance in evaluation of project proposals for second phase of GeoFund	30	IC	post	09/30/2008	ToR will be reviewed by the Bank
2.5	Stand alone economic program for GeoE DH and GeoE power projects to reduce costs of feasibility studies	20	IC	post	10/19/2006	ToR will be reviewed by the Bank

b) Consultants' services provided by a firm estimated to cost the equivalent of $100,000 or more and consultants' services provided by an individual estimated to cost the equivalent of $50,000 or more shall be subject to Prior Review by the Bank.

c) Short lists composed entirely of national consultants: Short lists of consultants for services estimated to cost less than *US$100,000* equivalent per contract may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

A procurement plan for supervision and analytical activities as of IGA's role described in function (2) will be provided in more detail as the countries become ready.

Frequency of Procurement Supervision

In addition to the prior review carried out by the Bank, the capacity assessment of the IGA has been completed and recommends annually supervision missions to visit the field to carry out post review of procurement actions. Desk reviews may also be possible.

4. Social

This project includes regional TA activities that are not related to any investment operations. Therefore no social issues are foreseen.

5. Environment

This project includes regional TA activities that are not related to any investment operations. The Project category is "C' as no environmental issues are involved.

6. Safeguard policies

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP/GP 4.01)	[**x**]	[ ]
Natural Habitats (OP/BP 4.04)	[ ]	[ ]
Pest Management (OP 4.09)	[ ]	[ ]
Cultural Property (OPN 11.03, being revised as OP 4.11)	[ ]	[ ]
Involuntary Resettlement (OP 4.12)	[ ]	[ ]
Indigenous Peoples (OD 4.20, being revised as OP 4.10)	[ ]	[ ]
Forests (OP/BP 4.36)	[ ]	[ ]
Safety of Dams (OP/BP 4.37)	[ ]	[ ]
Projects in Disputed Areas (OP/BP/GP 7.60)*	[ ]	[ ]
Projects on International Waterways (OP/BP/GP 7.50)	[ ]	[ ]

The Environmental Assessment (OP/BP 4.01) safeguards apply. Beyond screening, no further environmental assessment action is required for a Category C subproject.

7. Policy Exceptions and Readiness

The project requires no Bank policy exceptions.

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

Annex 20: GeoFund Subproject for Hungary: MOL Geothermal Power Pilot Project

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

A. STRATEGIC CONTEXT AND RATIONALE

1. Country and sector issues

Hungary is well known as a country of favorable conditions in terms of geothermal resources since most measured geothermal gradients are higher than the worldwide average. According to the results of numerous published geothermal assessments, Hungary has the largest underground thermal water reserves and geothermal energy potential of low and medium enthalpy in Europe. The measured geothermal resource temperatures in Hungary range from 10°C to 254°C. While the utilization of geothermal energy in Hungary is significant, on a worldwide average it remains relatively low compared to the resource base. This is largely due to the typical barriers as learned from numerous lessons through Bank involvement in geothermal projects: high upfront investment requirement and geological risks associated with drilling.

The CX/2001 Electricity Act orders mandatory purchase of renewable electricity, at prices set by subsequent decrees of the Ministry of Economy. This price, following the latest revision in October 8, 2005, is currently 22.46 HUF/kWh (10.8 US cents/kWh).

A comprehensive renewable energy law is currently under preparation. It is expected that the new law will introduce, among others, differentiated preferential pricing for different renewable energy types.

2. Rationale for Bank involvement

The value added of the Bank's assistance for this project is the covering of the geological risk associated with drilling. Without this guarantee, which is unique on the market, the profitability of the project is not attractive enough for the project developer to undertake the project. Neither conventional type lending, nor straight grants suit the needs of this kind of operation. While loans are available from various commercial sources and will be part of the financing package, they do not improve the risk adjusted IRR. Straight grants on a scale that would push the project above the hurdle rate are not justifiable for private investors.

3. Higher level objectives to which the project contributes

Hungary targets to increase the share of primary energy utilization of renewables to 5-6 percent from the present level of 3.4 percent by 2010, in addition to the pursuance of such European Union priorities as security of supply, energy efficiency, economic efficiency, serving national interests, and environmental protection. The project directly contributes to these objectives as it increases the share of renewable electricity in the country's grid mix.

The proposed Project is consistent with the *Framework for World Bank Support to the European Union (EU) New Member Countries of Central and Eastern Europe (SecM2004-0283 dated May 28, 2004)*. In supporting the development of renewable energy, the project is in line with the role envisaged for the World Bank including support for global issues such as environmental protection.

B. PROJECT DESCRIPTION

1. Financing instrument

The financing instrument is a grant which would disburse if the risks insured under the Geological Risk Insurance (GRI) window of the GeoFund program occur. Disbursement of the grant, in essence, is contingent on geological parameters not reaching the expected values as stipulated in the grant agreement.

2. Project development objective and key indicators

The project's development objective is to increase the share of renewable electricity in the country's grid mix.

The output of the project will be a geothermal power plant that will generate from 1.6 to 3 megawatts of electricity. In accordance with the CX/2001 Electricity Act, the generated electricity will be purchased as a mandatory requirement and fed into the national grid. If the testing results do not reach the expected geothermal yields enabling power generation, the project will be converted into a direct heat supplying facility, or in the worst case scenario, will be abandoned completely.

3. Project components

The project consists of the provision of a Geological Risk Insurance (GRI) to cover the short-term geological risk associated with the drilling and testing activities to support the development of a geothermal power pilot project to be undertaken by the consortium led by MOL.

Project background

MOL, Hungarian Oil and Gas Company, Plc. (MOL) – the project developer –has embarked recently to assess the technical and economic viability of developing medium enthalpy geothermal power plants (i.e., geothermal fluids in the temperature range of 140°C to 180°C) using existing shut-in, non-productive, hydrocarbon wells. Within Hungary there are more than 8,000 hydrocarbon wells, the majority of which owned by MOL, and geothermal production and injection wells can be constructed from these non-productive hydrocarbon wells.

The planned project site is north of the village of Iklódbördöce, in the county of Zala, in South-west Hungary with three existing hydrocarbon exploration wells. A fourth production well will be drilled here. The planned power plant will be connected to the regional system of North Transdanubian Electric Service Company. Total estimated project costs are HUF 3,900 million (USD 18.6 million).

The underlying geothermal power pilot project which will be supported by GRI will include well completion or reconstruction into geothermal production and injection wells, new well drilling, pipelines between wells and the power plant, injection pumps, the power plant, and connection to the grid. All of the geothermal fluids will be injected into the reservoir to guarantee the renewable nature of the energy source.

Provision of GRI

The proposed GeoFund subproject will provide geological risk insurance (GRI) to a test operation for about nine months on a doublet converted from two existing hydrocarbon wells. This test operation consists of production and re-injection to establish long-term hydrological conditions. The project developer will proceed to the implementation phase on the basis of the evaluation of the results of the test operation phase.

Parameters for GRI

Due to the existence of reliable information about the reservoir, all key parameters (yield, temperature, quality) can be estimated with relatively high probability. Based on the MOL's projection, the project will achieve an economic break-even if it produces an adequate volume of geothermal energy. The volume of hot water produced (flow rate) will determine the success or failure of the project. The proposed GRI will have to determine the exact volumetric parameters, the loss and residual revenue in case of a total as well as partial failure.

(1) Under preliminary assumptions, if the flow rate coming out of the doublet yields higher than 2,100 cubic meters per day, the MOL consortium will proceed with building an electricity generation plant by completing another doublet to make the entire flow rate volume about 4,200 plus which will produce more than 1.6 MW of power. This will represent full success for the purpose of GRI.

(2) If the measured flow rate is lower than 2,100 cubic meters per day, the MOL consortium may abandon the construction of the power generation facility, and instead directly sell thermal heat to local users such as green house heating, tile factory heating, etc. There will be no assurance that the heat will be purchased by the local users because of the price competition with the natural gas price. It was indicated by potential local heat users that they will be only interested to buy geothermal heat when the heat price is less than 60 percent of the gas price. This will represent a partial success/failure for the purpose of GRI. The direct heat sale is considered as a fall back option to recover the investment.

(3) If the measured flow rate is below 1,200 cubic meters per day, the MOL consortium will completely abandon the geothermal project in any form in the region. This will represent a total failure for the purpose of GRI.

Payout under GRI

(1) No amount of GRI will be paid in the event of full success, i.e. the measured flow rate data is higher than 2,100 cubic meters per day.

(2) In between these two thresholds, i.e. lower than 2,100 cubic meters per day but higher than 1,200 cubic meters per day, GRI payment will be prorated based on the measured flow rate between the maximum and minimum parameters.

(3) The maximum amount of GRI will be paid in the event of total failure, i.e. the measured flow rate data is lower than the minimum threshold (below 1,200 cubic meters per day). .

Other GRI terms

Maximum payout amount: Up to 85 percent of the eligible testing and drilling expenses incurred (Insured Amount). The estimated total cost of testing and drilling is US$4.3 million. The Insured Amount will be determined by deducting ineligible cost items (e.g. VAT, contingent cost, etc.) from the total cost. It is estimated that the maximum payout amount will be no more than US$3.72 million.

Risk fee: 3 percent on the Insured Amount.

Processing fee:US$10,000.

Other detailed terms are defined in the Grant Agreement.

4. Lessons learned and reflected in the project design

Project

The Pannonian Basin is one of the hot spots due to a thin crust with the geothermal gradient reaching as high as 58.8 °C/km in some areas. Use of geothermal energy in Hungary is predominantly for balneological purposes, including a large portion of space heating and hothouse agriculture. Hungary uses geothermal water for 61 medicinal baths, 350 public baths, and 1,200 swimming pools. Agriculture has an installed capacity of 120.43 MWt; district heating, sanitary hot water, and industrial applications 58.7 MWt; and bathing and balneology 187.3 MWt for a total of 366.4 MWt.

While there is a wealth of experience with geothermal resource applications in Hungary for the project developer to build on, there remain such technical issues to be resolved as problems with scaling and re-injection, the latter mostly for technical reasons of reservoir permeability. In addition, geothermal energy has been utilized for balneologic and heating purposes only so far in Hungary, not for electricity production. Re-injection problems associated with reservoir permeability are typical to reservoirs in sandstone layers. This project exploits a karst reservoir. International experience is tapped for the implementation of the technology that uses geothermal energy for electricity generation. One of the partners in the consortium is the Iceland-based Enex, a company recognized worldwide for its expertise in geothermal applications. Enex is a world leader in comprehensive and integrated utilization of geothermal energy.

GRI

There are only a few existing cases of an insurance/compensation scheme applied for geological risk in geothermal energy development projects. All the existing schemes such as those in France, Iceland, the U.S., etc. were funded by public resources as loss compensation schemes. Among those, the French Geothermal Guarantee Fund has been most actively used since the 1980s, and has had a relatively good performance in terms of the failure rate. GRI is broadly designed in line with the French model under which two geothermal parameters, temperature and flow rate were used to measure the success/failure thresholds. There is no meaningful scheme applied in private risk insurance market.

The proposed GRI is the first application under the GeoFund program. There is a risk of quickly depleting the GRI resources in the event of a the high failure rate. However, such risk would not arise in the short-run because only a few GRI (Hungary and Russia) will be expected to be issued during the Start-Up Phase and each GRI carries a short expiration period (6-9 months), thereby making performance monitoring relatively easy. If the failure rate is considered excessive, selection criteria could be tightened during the implementation period.

5. Alternatives considered and reasons for rejection

Project

Given the resource base (medium enthalpy geothermal reservoir) and the targeted output to reach the project's development objective (a geothermal power plant that will generate from 1.6 to 3 megawatts of electricity) project alternatives are basically reduced to alternatives in siting. Within Hungary there are more than 8,000 hydrocarbon wells, the majority of which are owned by MOL. From shut-in hydrocarbon wells, well drilling and cost information, as well as potential reservoir data, are available in addition to information from flow test operations, including temperatures, pressures, and flow rates. MOL personnel have conducted geological, hydro-geological, geochemical, and geophysical surveys and studies to identify and quantify geothermal resources in Hungary. Geological and hydro-geological surveys and studies have involved mapping hot springs or other surface thermal manifestations and the identification of favorable geological structures. These data are used to recommend where production wells can be drilled with the highest probability of encountering a favorable geological structure. MOL personnel have also conducted geophysical surveys to assist in the determination of the shape, size, depth and other important characteristics of the deep geological structures that may contain the potential economic geothermal reservoir. The eventual selection of the wells for this project has been a result of multi-phase short listing, on the basis of the above surveys and studies.

GRI

There is no alternative support considered for the subproject. Hungary (and MOL) is not eligible for support under the GeoFund DIF window. MOL, the project sponsor has specifically requested GRI support.

C. IMPLEMENTATION

Project implementation period: October 23, 2006 to July 31, 2007
Expected effectiveness date: October 20, 2006
Expected closing date: September 30, 2007

1. Partnership arrangements

The feasibility study for the project was funded by the United States Trade and Development Agency (USTDA) in an amount of US$167,000. Consultants were competitively selected to conduct the study.

2. Institutional and implementation arrangements

The project will be implemented by the MOL Hungarian Oil and Gas Company, Plc. (MOL), operating together with Enex Iceland (Enex) and Vulcan Kft. These three companies have set up a consortium led

by MOL, which is the leading integrated oil and gas group in Central and Eastern Europe and the largest company in Hungary by sales revenues. The consortium is operated under an operating agreement with MOL as a commercial lead. Enex mainly provides the technical service for geothermal power generation operation based on its long experience in geothermal power business in Iceland. Vulcan Kft, the local subsidiary vehicle of an Australian energy investment company of Hecules Energy Pty Ltd. plays a relatively passive role as an investment company for energy projects.

The core activities of MOL include:

- exploration and production of crude oil, natural gas and gas products
- refining, transportation, storage and distribution of crude oil products in both retail and wholesale markets
- import, transportation, storage and wholesale trading of natural gas and other gas products
- the production and sale of olefins and polyolefins.

MOL is the market leader in each of its core activities in Hungary and Slovakia.

3. Monitoring and evaluation of outcomes/results

Bank involvement is limited to the exploratory phase of the project. The outcome of the test operation will determine the payment by GEF: (full payout – up to 85 percent of eligible losses; partial payout – less than 85 percent of eligible losses, or no payout). The major direct parameter to calculate the payout ratio will be flow rate of the doublet that will be subject to test operation. Measurement of the flow rate is of paramount importance for both the project developer and for the Bank, as the results will serve as inputs to the execution of the grant agreement between the parties. In this regard the grant agreement contains provisions. Even without contracting such risk insurance, however, this is part of the project developer's routine monitoring exercises and poses no special challenge in terms of capacity. The costs are obviously integrated into project costs.

4. Sustainability

The sustainability of the project's objectives basically depends on two factors: one technical and one policy. Long-term operation of the power plant relies on the ability to exploit geothermal water from a reservoir and on the ability to re-inject the geothermal fluid to the same reservoir for 25 years. In order to obtain all possible information on the aquifer, the project developer will carry out a test operation for 3 months on a doublet converted from two existing hydrocarbon wells to establish long-term hydrological conditions.

Objectives of the test operation:

- To prove the existence of the thermal water flow required for establishing the power plant
- To identify the thermal water parameters which can be calculated on the long term, such as: flow, wellhead temperature, wellhead pressure, and the chemical parameters of the fluid
- To prove the good technical condition of the wells
- To prove that 100 percent of the produced thermal water can be re-injected over the long run

Long-term economic viability of the project builds on the assumption that the Government continues its supportive approach to renewable energy development. The Hungarian Electricity Act (2001/CX.), which entered into force on the 1st of January, 2002 obliges the purchase of power from renewable energy generators at prices that are established by periodic decrees until 2010. The latest – and current – decree sets the prices of 26.12 HUF/kWh (peak), 23.00 HUF/kWh (valley) and 9.38 HUF/kWh (deep valley) for all renewable energies that corresponds to a weighted average of 22.46 HUF/kWh. This is a continuous increase over the past years with further increases expected, in line with the requirements of the EU.

Furthermore, the renewable energy law currently under preparation is expected to provide additional preferential support to geothermal energy as it is recognized that this type of renewable energy is considerably underutilized in Hungary.

5. Critical risks and possible controversial aspects

It is the geological risk through which the GEF is involved in the project. In case of a loss incurred by the project developer due to lower than expected reservoir parameters, the GEF pays a certain percentage of this loss through the partial guarantee window of the umbrella GeoFund project. As a measure to reduce exposure of GEF to risks associated with moral hazard, the GeoFund guarantee instrument has been designed to provide partial coverage. The calculation of the payout ratio is based on, among other things, analysis performed during the preparatory phase of the project.

Risks	Risk Mitigation Measures	Risk Rating with Mitigation
To project development objective		
Policy risk (renewable electricity price volatility)	Government's commitment to support renewable energy in line with the requirements of the EU	N
To component results		
Traditional (non-geological) investment risk[16]	Project is implemented by a consortium of three internationally recognized companies. The leading sponsor (MOL) has a robust track record with large scale exploratory investments, has a highly qualified human resource base and impressive financial power. It owns the wells and the project sites, and has thorough understanding of the market and policy environment. The other two partners are both large firms with also good track records and expertise in energy (Hercules Energy) and geothermal energy (Enex).	N
Geological risk[17]	Careful pre-investment activities such as geological, hydro-geological, geochemical, and geophysical surveys and studies and 3-5 months of test operation. A thorough feasibility study, sponsored by the US government, has been completed.	M
Overall risk rating		**N**

6. Loan/credit conditions and covenants

a) The execution and delivery of the Grant Agreement on behalf of MOL have been duly authorized or ratified by all necessary governmental and corporate action.

b) The condition of MOL, as represented or warranted to the Bank at the date of the Grant Agreement, has undergone no material adverse change after such date.

c) MOL shall have paid to the Bank the non-refundable processing fee in United States Dollars in an amount equal to ten thousand United States Dollars ($10,000) and a premium in United States dollars in an amount equal to three percent (3%) of the Insurable Expenses.

[16] Weak project design, weak implementation capacity, insufficient expertise, fragile financing plan, etc.
[17] The production wells not encountering a geothermal reservoir or not encountering yield and temperature parameters as estimated prior to drilling and unsuccessful wells good for re-injection.

Other Conditions:

The Recipient shall:

a) use all reasonable, due and usual care and skill in conducting the Exploration Activities;

b) comply with all laws and regulations applicable in undertaking and conducting the Exploration Activities;

c) take all measures necessary to carry out the Environmental Management Plan in a timely manner, ensuring adequate information on the implementation of said measures is suitably included in the Project Reports;

d) maintain the financial, technical and engineering records of testing and drilling activities which are covered and related to this Agreement; and

e) promptly notify the Bank of any material changes in the Exploration Activities (including material physical damages) or the organizational and ownership arrangement of the Consortium.

D. APPRAISAL SUMMARY

1. Economic and financial analyses

Economic analysis. The generic economic model presented in Annex 16 illustrated the calculation of incremental costs and the EIRR for a project in which geothermal heat was used to supply a district heating system. The MOL project is more complex and provides both electricity and heat to be supplied to a few large users. The annual MOL project outputs are approximately 75 percent in the form of heat and 25 percent in the form of electricity. For purposes of the incremental cost analysis provided here, it is assumed that absent this project, the electricity produced would come from a new grid power plant that would come on line in 2009 and that the heat produced would come from new gas-fired heat-only boilers. The new grid power plant is represented as a gas-fired combined cycle unit. A detailed analysis of the grid expansion plans may yield somewhat different assumptions but this approach should yield reasonable incremental cost results for the purposes of this PAD.

Table 1 summarizes the model inputs including comments that explain the basis or source for each parameter. The inputs shown here pertain to the highest expected yield of the geothermal well and thus represent the most optimistic outlook from a production perspective. They also assume that MOL will be successful in connecting the large heat loads that are being pursued even though those arrangements have not as yet been secured by contract. Again, this provides an optimistic assessment.

Since both the baseline electric and heat supplies will come from gas-fired technologies, it is obvious that the economic value of natural gas will have a significant impact on the economics of the proposed geothermal project. The relevant economic value for natural gas is the incremental cost from the marginal source. Hungary has some domestic gas resources but the dominant supply is from Russia with the border price historically indexed to world oil prices. The volatility of world oil prices in recent years adds a significant risk element to projects that displace gas utilization. The World Bank recently worked very closely with a major regional power supplier (Pannon Power) on a gas and biomass power project that included detailed economic analyses that were also heavily influenced by gas price projections. Natural gas tariffs remain distorted with large consumers heavily subsidizing residential users on a cost of service basis. However, the Pannon Power project included a forecast of free market prices with capacity and energy components separately identified. The energy component of that price forecast should be a reasonable proxy for the border price of gas assuming that existing delivery and storage capacity remains sufficient. The Pannon Power forecast was tied to a certain expectation regarding oil prices. Subsequently, oil prices have increased dramatically and are substantially above the Pannon outlook from 2003. To arrive at a reasonable forecast of economic values for 2009, the Pannon forecast has been adjusted to reflect the 2006 USDOE forecast of world oil prices. The result of these calculations suggests

an economic value in the range of US$250/TCM of gas for 2009. To remain conservative, no real increases are assumed after 2009. Of course, the 2009 forecast is subject to substantial uncertainty. The economic value could plausibly vary within a range of 20 percent which would suggest 2009 values ranging from US$200 to US$300 per TCM. The cases that have been considered in the incremental cost calculations include US$200, US$225 and US$250 per TCM. The specific scenario illustrated below assumes an economic value of US$225/TCM. The gas value is by far the most critical input parameter in the economic analysis of the project. The fact that this input is subject to substantial, and irreducible uncertainty emphasizes the risk of the project both from a social and a private investment perspective.

The remaining inputs are largely self explanatory and conventional except for the environmental damage parameters. As previously indicated, the GeoFund intends to provide default environmental damage coefficients that can be applied by country for projects applying for funding. Project proponents will be allowed to provide their own analyses if they choose not to use the GeoFund default options. For more detailed project applications, the EXTERNE model will most likely be the source of the GeoFund coefficients. For the illustrative analysis of the MOL project, the damage coefficients and emission rates per unit of fuel input have been taken from Environmental Costs of Electricity by Pace University Center for Environmental Legal Studies (Table 1, Page 362). The coefficients from this 1990 study have been updated to 2006 price levels in USD and then adjusted by the relative Gross National Income (GNI) per capita for Hungary vs the US in 2004. This provides the relevant damage coefficients for NOx and for particulates. SO2 is not a factor since the avoided fuels are all natural gas. CO2 has been valued at US$6.00 per MT based on the current willingness to pay of some carbon funds that are administered by the carbon finance business of the World Bank.

An economic discount rate in the range of 10 percent to 12 percent normally applied for World Bank projects. In this case, 10 percent has been applied for the MOL project illustration.

Table 1. MOL Project Economic Inputs

Line								
2	**MOL Geothermal CHP Project**			Inputs				
3	**Economic Analysis**			Calculated				
4								
5	**Data Inputs**		Base Year					
6	**Proposed Project**	Units	Year 1	Year 2	Year 3			Comment
7	Investment Period		2006	2007	2008			
8	Operating Life of Geothermal	Years	20					Low End Estimate To Be Conservative
9	Investment Schedule	THUF	930,000	2,600,000	370,000			Costs Including Price Escalation
10	Capacity	Net Mwe	3.000					Varies from 1.575 MW to 3.0 MW as Flow Rate Varies from 4,200 to 8,000 CUM/d
11	Capacity	Net MWt	15.6					Calculated as production/FLH
12	Annual Operating Period Elec	Hours Full Load Equiv	8,000					Allows for down time and reduced load operation
13	Annual Operating Period Heat	Hours Full Load Equiv	4,600					Allows for down time and reduced load operation
14	Annual Net Production Elec	MWh	24,000					Capacity times hours
15	Annual Net Production Heat	GJ	257,600					Varies from 135,240 GJ to 257,600 as Flow Rate Varies from 4,200 to 8,000 CUM/d
16	Operating Cost Geo	THUF	78,000					Generic estimate based on 2.0% of CAPEX
17	Exchange Rate 2006		205					HUF/USD - Conservative Forecast Leaves Constant
18	**Least Cost Alternative**							
19	Average Efficiency	Existing Gas Boilers	75%					Generic Assumption
20	Retirement Year Gas Boilers		2009					Assumes New Boilers Will Be Needed in This Year Absent the Project
21	Replacement	New Gas Boilers						
22	Average Efficiency	New Gas Boilers	85%					Generic Assumption
23	Incremental Natural Gas Cost	2006 $/TCM	$225.00					Pannon Power Free Market Price Forecast Adjusted by AEO06 Oil Price Forecast
24	Natural Gas Heat Content	GJ/TCM	34					Generic Assumption - Low Heat Value
25	Natural Gas Economic Cost	2006 $/GJ	$6.62					Calculated
26	Natural Gas Economic Cost	2006 HUF/GJ	1,356.62					Calculated
27	Non-Fuel O&M	Percent of Investment	3.0%					Generic Assumption
28	New Gas Boiler	HUF/kW	5,125					Generic Assumption - $25/kW
29	2006 Exchange Rate	HUF/USD	205					2006 Exchange Rate
30	Electric Grid Capacity Addition	Year	2009					Assumed Year of Baseload Addition
31	Type of Grid Addition Assumed	Gas-Fired CC						Assumed
32	Average Efficiency	Gas-Fired CC	47.4%					AEO 2006 Data
33	Variable O&M	2006 HUF/MWh	404.9					AEO 2006 Data Escalated to 2006 & Converted to HUF at 2006 Exchange Rate
34	Fixed O&M	2006 HUF/kW-year	2,449					AEO 2006 Data Escalated to 2006 & Converted to HUF at 2006 Exchange Rate
35	Investment Cost Per kW	2006 $/kW	$ 613.57					AEO 2006 Data Escalated to 2006
36	Investment Cost Per kW	HUF/kW	125,781					Calculated
37	Investment Schedule	Year 1	20%					Generic Schedule
38	Investment Schedule	Year 2	50%					Generic Schedule
39	Investment Schedule	Year 3	30%					Generic Schedule
40	**Environmental Unit Costs - US**		Pace 1990 Esc to 2006	1990 CPI	2006 CPI			Comment
41	SO2	$/MT	$ 6,907	130.7	202.1			Should be Adjusted Based On GDP/Capita vis a vis US
42	NOx	$/MT	$ 2,790	130.7	202.1			Should be Adjusted Based On GDP/Capita vis a vis US
43	Particulates	$/MT	$ 4,049	130.7	202.1			Should be Adjusted Based On GDP/Capita vis a vis US
44	CO2	$/MT	$ 6.00					Based on CFB Willingness to Pay
45	GNI Per Capita US	2004	$ 41,440					WB Development Indicators
46	GNI Per Capita US	2004	$ 8,370					WB Development Indicators
47	Ratio		20.2%					Ratio
48								
49	**Emission Factors**							
50	COAL						Pace 1990	
51	SO2 Coal Existing Boiler 1.2% s	lbs/GJ In	-	GJ/MWH	3.6	lbs/MMBTU	0	
52	NOx	lbs/GJ In	0.3981	MMBTU/MWH	3.412	lbs/MMBTU	0.42	
53	Particulates	lbs/GJ In	0.0028	GJ/MMBTU	1.055	lbs/MMBTU	0.003	
54	CO2	MT/MWh In	0.2					Generic Factor
55	Economic Discount Rate		10%					Represents the opportunity cost of capital for the country hosting the Project.

The economic analysis of the MOL project is summarized for select years in Table 2. The period of analysis is from 2006 through 2028 which provides for a three year project development period followed by twenty years of operation. The operation period is believed to be a conservative estimate of likely capability. All costs have been expressed in Hungarian Forint (HUF) using 2006 price levels. Conversions of HUF to USD have been made at the current exchange rate of 205 HUF/USD. Annual production of heat and net electricity have been based on the maximum flow rate of 8,000 cubic meters per day. Annual O&M costs for the proposed project have been estimated by MOL based on 2.0 percent of the capital cost. The 2006 present value of the proposed project costs is 4.064 billion HUF.

Table 2: MOL Economic Analysis – Select Years

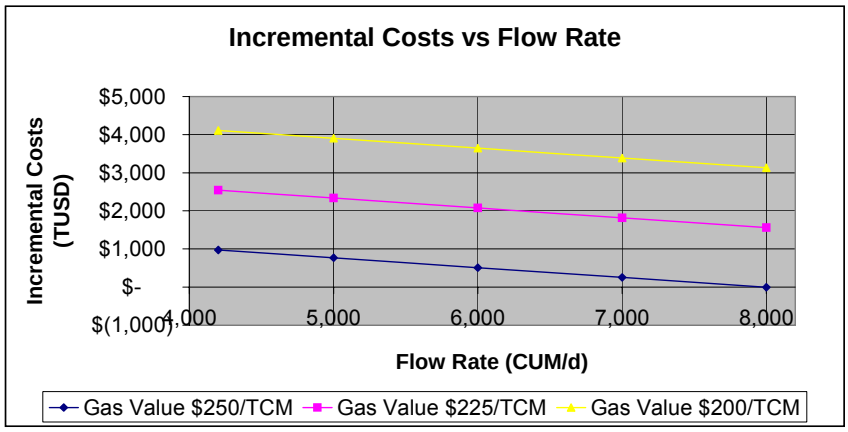
Line											
2	**MOL Geothermal CHP Project**	HUF/USD		205							
3	**Economic Analysis**		Mid 06 Pres Valu	Key Outpurs			1	2	19	20
4	**Hungarian PPI**			1.0000	1.0250	1.0506	1.0769	1.1038	1.6796	1.7216
5	**Economic Comparisons**	Period		1	2	3	4	5	22	23
6		Year		2006	2007	2008	2009	2010	2027	2028
7	Present Value Factors - 2006 Mid \	Units		1.0000	0.9091	0.8264	0.7513	0.6830	0.1351	0.1228
8	**Proposed Project**									
9	Investment	Nominal THUF	3,599,421	930,000	2,600,000	370,000				
10	Investment	Real 06 THUF	3,527,037	930,000	2,536,585	352,171				
11	Annual Cost									
12	Production	GJ					257,600	257,600	257,600	257,600
13	Net Electric Production	MWh					24,000	24,000	24,000	24,000
14	Annual O&M Cost	THUF	537,376				76,375	76,375	76,375	76,375
15	Total Economic Costs	THUF	4,064,413	930,000	2,536,585	352,171	76,375	76,375	76,375	76,375
16	**Baseline Alternative**									
17	Equivalent Production Heat	GJ					257,600	257,600	257,600	257,600
18	Existing Gas Boilers									
19	Gas Use	GJ				-	-	-	-	-
20	Gas Cost	THUF	-			-	-	-	-	-
21	Non-Fuel O&M	THUF	-			-	-	-	-	-
22	New Gas Boilers	Net MWt		0	0	15.6	0	0	0	0
23	New Boiler Investment	THUF	65,886	$0	$0	79,722	$0	$0	$0	$0
24	New Boiler Gasl Use	GJ				-	303,059	303,059	303,059	303,059
25	New Boiler Gas Cost	THUF	2,892,747			-	411,135	411,135	411,135	411,135
26	Non-Fuel, O&M	THUF	16,828				2,392	2,392	2,392	2,392
27	Equivalent Production Electric	MWh					24,000	24,000	24,000	24,000
28	Electric Gas Use	MWh					50,617	50,617	50,617	50,617
29	Electric Gas Cost	THUF	1,739,319				247,203	247,203	247,203	247,203
30	Electric Variable O&M	THUF	68,375				9,718	9,718	9,718	9,718
31	Electric Fixed O&M	THUF	51,690				7,347	7,347	7,347	7,347
32	Electric Investment	MWe Addition			0	3.00	-			
33	Electric Investment	THUF	340,544	75,468	188,671	113,203				
34	Total Baseline Cost	THUF	3,672,143	75,468	188,671	192,925	464,143.26	464,143.26	464,143.26	464,143.26
35		EIRR	8.6%	(854,532)	(2,347,914)	(159,246)	387,768	387,768	387,768	387,768
36	TEBS = Avoided Costs	THUF	3,672,143	75,468	188,671	192,925	464,143	464,143	464,143	464,143
37	**Reduced Damage/Control**									
38	SO2	THUF	-			-	-	-	-	
39	NOx	THUF	353,352			-	50,221	50,221	50,221	50,221
40	Particulates	THUF	3,663			-	521	521	521	521
41	CO2	THUF	233,319			-	33,161	33,161	33,161	33,161
42	Total	THUF	590,334			-	83,902	83,902	83,902	83,902
43	Adjusted to Hungarian GNI/Per Ca	THUF	305,428			-	43,409	43,409	43,409	43,409
44										
45	**Total Economic Benefits**	THUF	3,977,572	$ 75,468	$ 188,671	$ 192,925	$ 507,553	$ 507,553	$ 507,553	$ 507,553
46	**Total Economic Costs**	THUF	$ 4,064,413	$ 930,000	$ 2,536,585	$ 352,171	$ 76,375	$ 76,375	$ 76,375	$ 76,375
47	**Net Benefits**	0.98	(38,688)	$ (854,532)	$ (2,347,914)	$ (159,246)	$ 431,177	$ 431,177	$ 431,177	$ 431,177
48	**EIRR**		9.8%							
49	**Benfit Summary**									
50	Avoided Costs	TEBS THUF	3,672,143	75,468	188,671	192,925	464,143	464,143	464,143	464,143
51	Avoided Costs	LEBS THUF	72,109			$ -	$ 10,249	$ 10,249	$ 10,249	$ 10,249
52	Avoided Costs	GEBS THUF	233,319			$ -	$ 33,161	$ 33,161	$ 33,161	$ 33,161
53	Avoided Costs	Total THUF	3,977,572	$ 75,468	$ 188,671	$ 192,925	$ 507,553	$ 507,553	$ 507,553	$ 507,553
54										
55	**Incremental Costs**	TUSD	$ 1,562							
56	**Per MT of CO2**	USD	$ 2.76							
57	Project	THUF	$ 4,064,413							
58	Avoided	TEBS THUF	$ 3,672,143							
59	Avoided	LEBS THUF	$ 72,109							
60	Avoided	Total THUF	$ 3,744,253							

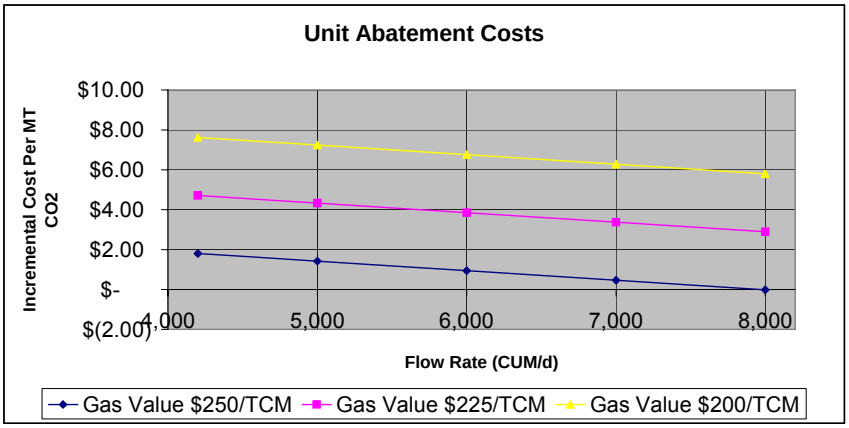
Baseline supply of proposed project outputs has been costed based on heat supply from new gas-fired heat-only boilers (HOBS) and electric supply from new gas-fired combined cycle (CC) power plants. The costing parameters for the gas HOBS are generic estimates. The CC plant parameters are from the 2006 Annual Energy Outlook by USDOE. The present value of baseline costs is 3.672 billion HUF without local environmental costs or 3.744 billion HUF including the costs from NOx and particulate emissions. Incremental costs are then 4.064 – 3.744 = .641 BHUF or US$1.562 MUSD. The unit abatement cost is an attractive US$2.78 per MT of CO2 compared to a willingness to pay value of US$6.00 per MT.

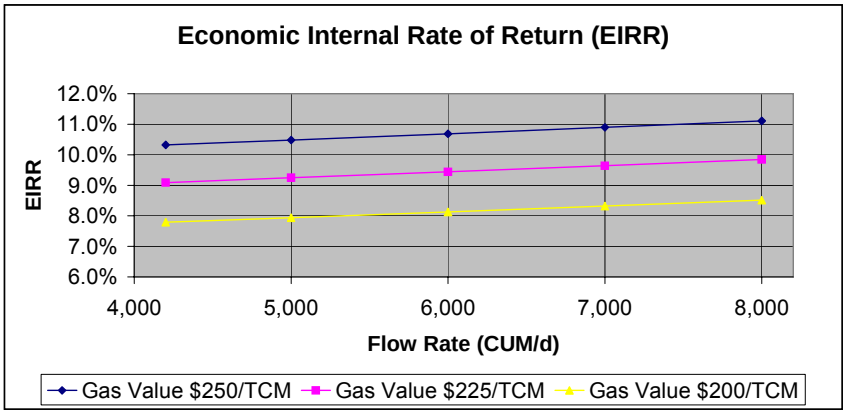
The sensitivity of the key outputs to the dominant inputs (gas value and flow rates) is illustrated in Figure 1. Incremental costs can range from US$4.0 million to zero over the range of anticipated flow rates and gas values. For a gas value of US$225/TCM, incremental costs vary from US$2.5 to US$1.6 million. For the mid range of flows (6,000 CUM/d) the incremental costs vary from 0.5 to 3.6 million USD. Unit abatement costs are always below the criterion figure of US$6.00 for all cases with gas prices above US$200/TCM and for the maximum flow case when the gas value equals US$200/TCM. EIRRs are all

above 10 percent when the gas value equals US$250/TCM and are between 9.0 and 10.0 percent for all cases with gas valued at US$225/TCM.

Figure1. Sensitivity to Gas Value and Flow Rates







The overall project economics based on EIRR are marginal with the mid range gas value but acceptable with the high gas value. The EIRRs are quite stable across the range of possible flow values. On these grounds, the project would normally be considered marginally acceptable by World Bank standards. As a carbon reduction project, the results are much stronger. The vast majority of the gas value – flow rate pairs that are anticipated would result in unit abatement costs that are well below the US$6.00/MT hurdle price. Complete determination of the support that should be provided to the Project by the GeoFund would require a systematic financial quantification of the barriers to this investment. However, the

middle gas value provides a useful range of values to consider. The middle gas value coupled with the middle flow figure suggests that a figure of US$2.1 million would not be unreasonable for this project. Values within 20 percent of that figure would seem plausible if supported by a clear analysis of financial barriers.

For GEF purposes, the preparation of the project has included the incremental cost analysis shown above. This analysis provides a baseline and the incremental cost of achieving global benefits by using geothermal energy as a renewable energy source.

To assure the proposed geothermal exploration venture is technically sound and commercially viable, a technical and financial due diligence review was conducted by an expert consultant during the appraisal process.

Financial analysis[18]. Total estimated project costs are HUF 3,900 million (US$18.6 million), of which subsurface components are: HUF 1,700 million (US$8.1 million); above surface components: HUF 2,200 million (US$10.5 million).

Key input parameters:

Commission date:	2008, 3rd quarter
Useful plant life:	20 years
Discount rate:	2 percent (for revenues and operating costs)
Electricity price:	22.46 HUF/kWh
Capacity:	3.0 MW
Yearly hours of operation:	8,000
Electricity sales:	24.0 GWh

Table3. Capital cost estimates (HUF million)

CAPITAL COST ESTIMATES IN HUF MILLION				
Expenditure item	**Y1 (2006)**	**Y2 (2007)**	**Y3 (2008)**	**Total**
Project preparation, studies, direct test costs	160	40	0	200
Well completions (3 old wells)	600	300	0	900
1 new well	0	800	0	800
Pipelines, injection pumps	80	120	0	200
Power plant	0	1,000	0	1,000
Installations of the power plant	0	100	100	200
Connection to the electric grid	0	100	300	400
General & Administrative costs	40	140	20	200
Total	**880**	**2,600**	**420**	**3,900**

The project will come to a decision point when the results of the test operation are evaluated. In case of satisfactory parameters, the consortium members will form a company for the further implementation of the project and the establishment of a geothermal power plant. In case of unsatisfactory test results, eligible Y2006 expenditures will be declared a loss and compensation will be paid by the GEF.

Operational cost estimates: operational costs have been estimated on the basis of reference data from the Husavik (Iceland) geothermal power plant. This is yearly 1.5-2 percent of capital costs. With planned commission at the second quarter of 2008, this is HUF 28-37 million in 2008 and HUF 56-74 million yearly afterwards.

[18] All in HUF.

Revenues: Yearly production at the planned 3.0 MW capacity for the planned 8,000 hours is 24.0 GWh. At the guaranteed average price of 22.46 HUF/kWh for green electricity this yields around HUF 560-800 million yearly.

Table4. MOL Cash-flow calculations

Name	unit	2006.	2007.	2008.	2009.	2010.	2011.	2012.	2013.
A., REVENUES									
Realized sales revenues	HUF millions	0.0	0.0	274.6	560.2	571.4	582.8	594.4	606.3
Other revenues	HUF millions								
Total revenues	**HUF millions**	**0.0**	**0.0**	**274.6**	**560.2**	**571.4**	**582.8**	**594.4**	**606.3**
B., EXPENDITURES									
Material-type expenditures	HUF millions	0.0	0.0	31.8	64.9	66.2	67.6	68.9	70.3
Personnel expenditures	HUF millions								
Depreciation and amortisation	HUF millions	0.0	0.0	195.0	195.0	195.0	195.0	195.0	195.0
Other costs	HUF millions								
Other expenditures	HUF millions	0.0	0.0	3.8	7.8	8.0	8.2	8.3	8.5
Total operating expenditures	**HUF millions**	**0.0**	**0.0**	**230.7**	**267.8**	**269.2**	**270.7**	**272.2**	**273.8**
C., PROFIT									
Operating profit	HUF millions	0.0	0.0	43.9	292.4	302.1	312.1	322.2	332.5
Profit/loss after taxation	HUF millions	0.0	0.0	36.9	245.6	253.8	262.1	270.6	279.3
Cash-flow generated	**HUF millions**	**0.0**	**0.0**	**231.9**	**440.6**	**448.8**	**457.1**	**465.6**	**474.3**
D., TOTAL CAPEX									
Total CAPEX	**HUF millions**	**880.0**	**2800.0**	**220.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Cash-flow employed	**HUF millions**	**880.0**	**2800.0**	**220.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Free cash-flow	**HUF millions**	**-880.0**	**-2800.0**	**11.9**	**440.6**	**448.8**	**457.1**	**465.6**	**474.3**

Name	unit	2014.	2015.	2016.	2017.	2018.	2019.	2020.	2021.
A., REVENUES									
Realized sales revenues	HUF millions	618.5	630.8	643.4	656.3	669.4	682.8	696.5	710.4
Other revenues	HUF millions								
Total revenues	**HUF millions**	**618.5**	**630.8**	**643.4**	**656.3**	**669.4**	**682.8**	**696.5**	**710.4**
B., EXPENDITURES									
Material-type expenditures	HUF millions	71.7	73.1	74.6	76.1	77.6	79.2	80.8	82.4
Personnel expenditures	HUF millions								
Depreciation and amortisation	HUF millions	195.0	195.0	195.0	195.0	195.0	195.0	195.0	195.0
Other costs	HUF millions								
Other expenditures	HUF millions	8.7	8.8	9.0	9.2	9.4	9.6	9.8	9.9
Total operating expenditures	**HUF millions**	**275.4**	**277.0**	**278.6**	**280.3**	**282.0**	**283.7**	**285.5**	**287.3**
C., PROFIT									
Operating profit	HUF millions	343.1	353.9	364.8	376.0	387.5	399.1	411.0	423.1
Profit/loss after taxation	HUF millions	288.2	297.2	306.5	315.9	325.5	335.2	345.2	355.4
Cash-flow generated	**HUF millions**	**483.2**	**492.2**	**501.5**	**510.9**	**520.5**	**530.2**	**540.2**	**550.4**
D., TOTAL CAPEX									
Total CAPEX	**HUF millions**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Cash-flow employed	**HUF millions**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Free cash-flow	**HUF millions**	**483.2**	**492.2**	**501.5**	**510.9**	**520.5**	**530.2**	**540.2**	**550.4**

Name	unit	2022.	2023.	2024.	2025.	2026.	2027.	Total
A., REVENUES								
Realized sales revenues	HUF millions	724.6	739.1	753.9	769.0	784.4	800.0	**13068.9**
Other revenues	HUF millions							**0.0**
Total revenues	**HUF millions**	**724.6**	**739.1**	**753.9**	**769.0**	**784.4**	**800.0**	**13068.9**
B., EXPENDITURES								
Material-type expenditures	HUF millions	84.0	85.7	87.4	89.2	90.9	92.8	**1515.2**
Personnel expenditures	HUF millions							**0.0**
Depreciation and amortisation	HUF millions	195.0	195.0	195.0	195.0	195.0	195.0	**3900.0**
Other costs	HUF millions							**0.0**
Other expenditures	HUF millions	10.1	10.3	10.6	10.8	11.0	11.2	**183.0**
Total operating expenditures	**HUF millions**	**289.2**	**291.0**	**293.0**	**294.9**	**296.9**	**299.0**	**5598.2**
C., PROFIT								
Operating profit	HUF millions	435.5	448.1	460.9	474.1	487.4	501.1	**7470.7**
Profit/loss after taxation	HUF millions	365.8	376.4	387.2	398.2	409.4	420.9	**6275.4**
Cash-flow generated	**HUF millions**	**560.8**	**571.4**	**582.2**	**593.2**	**604.4**	**615.9**	**10175.4**
D., TOTAL CAPEX								
Total CAPEX	**HUF millions**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3900.0**
Cash-flow employed	**HUF millions**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3900.0**
Free cash-flow	**HUF millions**	**560.8**	**571.4**	**582.2**	**593.2**	**604.4**	**615.9**	**6275.4**

Table 5. MOL Summary financial parameters

NPV	Million HUF	**477.3**
IRR	%	**10.86**
PI	HUF/HUF	**1.13**
Payback	year	**9.00**

2. Technical

Several proven technologies are available and are used worldwide to produce electrical energy from geothermal resources. Medium enthalpy projects, such as the one proposed for development in Hungary, use binary cycle technologies, which are fueled by moderate temperature fluids (i.e., 105°C to 180°C) from geothermal reservoirs.

In binary cycle power plants, hot geothermal fluids are passed through one side of a heat exchanger to heat a working fluid on the other side of the heat exchanger. The working fluid, usually an organic compound with a low boiling point such as iso-butane or iso-pentane, is vaporized and passed through a turbine to generate electricity. The geothermal fluid that has passed through the heat exchanger may be used in a direct use application such as an industrial or agricultural process if the direct use facility is near enough to the power plant and economically feasible.

The turbine-generators and work areas of the power plant are housed in a simple steel building, with cooling towers, piping and separators located on a small footprint site of only a few hectares. Production and injection wells are situated within a radius of not more than one kilometer from the power plant. Insulated pipelines from the production wells to the inlet to the turbines carry geothermal fluids. The production and injection pipelines can bridge over or pass under roads as well as allow, for example, farming activities to continue. The power project is then interconnected to the regional grid.

3. Fiduciary

This is a geological risk insurance with general terms as per those of the partial risk insurance facility under the GeoFund program. Disbursement is contingent on project parameters not reaching expected values, as stipulated in the Grant Agreement. In case of a loss incurred by the project developer due to lower than expected reservoir parameters, the GEF pays a certain percentage of this loss through the

partial guarantee window of the umbrella GeoFund Program. The guarantee facility will be managed by the GEF Trust Fund Unit in the Bank and no funds will flow to the grant recipient unless the event crystallize, then only the amount agreed in advance are paid to developer directly. Accordingly no fiduciary assessment is necessary for this project. From financial management perspective, this activity is considered low risk.

The project developer is the leading integrated oil and gas group in Central and Eastern Europe and the largest company in Hungary by sales revenues. MOL is a market leader in each of its core activities in Hungary and Slovakia. MOL shares are listed on the Budapest, Luxembourg and Warsaw Stock Exchanges and traded on the International Order Book of the London Stock Exchange.

Key financial data of the project sponsor (MOL), 2004, IFRS (US$ million)

Net sales revenues	8,890.00
EBITDA	1,628.18
Operating profit	1,134.55
Profit before taxation	1,194.09
Net income	951.36
Operating cash flow	1,474.55
Capital expenditures and investments	1,156.82
Return On Equity %	28.5
Return On Capital E %	23.2

Financial Reporting and Monitoring of Drilling Activities

For project monitoring purposes, a progress report on the drilling activities will be prepared by MOL quarterly and furnished to the Bank not later than one month after the period. The progress report will include a detailed time table for Exploration Activities and corresponding statement of expenses.

The progress report is required under the Grant Agreement that describes the proposed testing, drilling, and exploration activities (the "Exploration Activities") and the estimated costs and expenses for each itemized activities to determine the expenses (the "Insurable Expenses") to be covered by the GRI. Furthermore it defines the parameters of success, failure and partial failure and the methodology to calculate the compensation amount of GRI.

At the end of the project (insurance period of the drilling) the last quarterly report will be furnished to the Bank in lieu of the Recipient's Completion Report not later than 1 month after the closing date. A Verification Report prepared by an independent entity will be furnished to the Bank before the Closing Date of the Grant Agreement. The Verification report has to include an assessment of geothermal parameters by an independent entity satisfactory to the World Bank, an audited reports of the Eligible Expenses actually spent, and records of the Exploration Activities actually performed by the Beneficiary or its contractors.

Flow of funds

The World Bank would make funds available to MOL in accordance with the terms and conditions of the Grant Agreement. Funds will be disbursed from the Bank directly to the project beneficiary on the basis of the Verification Report.

Fees (Premium and Processing) will be paid by the beneficiary to the Bank in accordance with the Grant Agreement.

Disbursement Arrangements

The project is expected to be implemented over a period of about nine months, including the completion of accounts and the submission of the Verification Report.

The amount of GEF Grant funds to be disbursed will be determined in accordance with the Grant Agreement based on the claim laid down in the Verification Report. GEF Grant funds will be disbursed only in one installment within 30 days of the submission of the Verification Report. There are no special forms for initial filing of a claim under the GeoFund Program; therefore an EM, letter, or memorandum outlining details of loss will be sufficient.

The Maximum compensation amount will be adjusted based on the eligible insurable expenses actually spent as reported in the Verification Report. If the project is successful no payments will be made.

Disbursement will take place in accordance with the Bank's Disbursement Guidelines with the Verification Report as supporting documentation.

4. Social

This is a small pilot project with an expected electric capacity of not more than 2-5 MW. No social issues are foreseen.

5. Environment

Given the small scale nature of the project no significant environmental issues are involved, with negative impacts limited to the surroundings of the project site. These impacts are summarized below on the basis of the environmental impact assessment.

A. Construction works prior to test operation (well cleaning, bottom perforation, surface link)

- **Soil:** Land will be occupied (some 1 hectare radius around well) during construction works at the well sites. Pressure will be on soil during pipeline construction (10 m strip along pipeline).
- **Sub-surface water:** Local karst water level will temporarily change (200 m around well) to insignificant extent.
- **Air:** Limited CO2 and steam emissions (650 m around well) will occur.
- **Noise:** Ground works will pose noise pollution (100-130 m around facilities); the test operation output "whistle" can be heard (400-1200 m around facilities) for a short period.

B. Test operation (3-5 months)

- No significant environmental impacts are expected during this phase.

C. Power plant construction

- **Soil:** Pressure will be on soil during pipeline construction (10 m strip along pipeline); Land use change will occur (some 1 hectare radius around the power plant) once the power plant is constructed.
- **Noise:** Ground works will pose noise pollution (10 m around facilities)

D. Power plant operation

Sub-surface water: Local karst water level change (300-1000 m around well) to insignificant extent; significant layer temperature change (500-600 m around well)

In addition to hazardous and non-hazardous waste that will be produced during the construction works, sludge, as a by product of well cleaning and drilling will be produced. Disposal of all of these elements is performed by the project developer routinely in accordance with the relevant regulations. The treatment of hazardous wastes is regulated in Hungary by the 98/2001 (VI. 15.) Government decree and by the

16/2001 (VII. 18) decree of the Ministry of Environmental Protection. Hungary is a signatory to the Basel Convention on Hazardous Wastes since 1990.

Of all the expected environmental impacts, only the layer temperature change that occurs during production due to the re-injection of cooled geothermal fluid is of significance. This layer temperature change, however, is not expected to lead to decrease in the temperature of the reservoir during the 25 years lifetime of the project.

The positive environmental impact of the project is the reduction of carbon dioxide emissions on a national level.

The Bank considered whether OP7.50 should be triggered given the use of groundwater in somewhat close proximity to the border with Slovenia and Croatia. After a review of the geological, hydrologic and engineering aspects of the operation and site, OP7.50 was deemed not to be applicable. Key supporting factors are:

(i) groundwaters targeted for exploitation are not suitable for drinking water, being relatively high in salt content, over 100 degrees Celsius in temperature and under high pressure. Furthermore the "closed loop" project design, where fluids are reinjected (after some latent heat extraction) within the same producing horizon will maintain the resource in a sustainable fashion. Project impacts will be highly localized and controlled (within 1-2 kilometers of the wells) and 10 kilometers or more from the nearest international boundary. Thus, the project will have no transboundary impacts.

(ii) while it is possible that rock formations similar to those being tapped by the geothermal demonstration project might extend into Slovenia and Croatia (albeit at depth of 4 kilometers or more), we do not have any information that suggests these formations are contiguous with any recognized fresh drinking water supply aquifer shared between Hungary and its neighbors. In fact, the list of shared aquifers in Europe prepared by the UN/ECE and UNESCO does not include this aquifer.

Apart from OP 7.50 matters, the Hungarian licensing and Bank EA screening and review process suggests there is no measurable risk to any existing or potential use of geothermal waters for recreational/spa or energy extraction in nearby countries"

6. Safeguard policies

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP/GP 4.01)	[**x**]	[ ]
Natural Habitats (OP/BP 4.04)	[ ]	[x]
Pest Management (OP 4.09)	[ ]	[x]
Cultural Property (OPN 11.03, being revised as OP 4.11)	[ ]	[x]
Involuntary Resettlement (OP 4.12)	[ ]	[x]
Indigenous Peoples (OD 4.20, being revised as OP 4.10)	[ ]	[x]
Forests (OP/BP 4.36)	[ ]	[x]
Safety of Dams (OP/BP 4.37)	[ ]	[x]
Projects in Disputed Areas (OP/BP/GP 7.60)*	[ ]	[x]
Projects on International Waterways (OP/BP/GP 7.50)	[ ]	[x]

The Environmental Assessment (OP/BP 4.01) safeguards apply. The environmental screening category of the project is proposed to be B: potential adverse environmental impacts are limited, site-specific and

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

reversible. The project developer has already completed the EA process in accordance with national/EU requirements and has obtained the environmental license.

The environmental assessment process is governed by the 20/2001. (II.14.) Government decree (the Decree) in Hungary[19]. The licensing authority that issues the environmental license and that decides on the EA category of the project on the basis of the Decree's classification table (and on the basis of further relevant information) is the Regional Environmental, Nature Protection and Water Inspectorate.

Project types according to their likely categorization are listed in annexes A and B to the Decree. According to the decision of the licensing authority the MOL project falls under EA category B. The relevant specifics in annex B are as follows:

1. Utilization of sub-surface (thermal karst) waters: production from one resource, or resource group not less than 1,000 m^3/day but not more than 5 million m^3/year.
2. Re-injection into sub-surface waters: less than 3 million m^3/year.

Disclosure of project safeguards related documentation has taken place in accordance with the Decree. [20]. The disclosure package has been sent to the affected municipalities of Iklódbördőce and Csömödér. No comments from the affected municipalities or the population were received during the disclosure period.

7. Policy Exceptions and Readiness

The project requires no Bank policy exceptions.

Readiness Criteria:

ISSUES	STATUS
Fiduciary	Not applicable
Disclosure Requirements	All environmental disclosures will be completed following the decision meeting clearance.
Monitoring & Evaluation	M&E indicators have been prepared and incorporated into the project design and implementation arrangements and have been established during the negotiation.

[19] The description of this decree is included in a document called "MOL Hungarian Oil and Gas Company - Environmental Licensing Process". This document, which is in the project file, has been reviewed by the Safeguards unit.

[20] A summary of the EA process is in the project file.

Annex 21: IFC Management Approval for the GeoFund

EUROPE AND CENTRAL ASIA: GEOTHERMAL ENERGY DEVELOPMENT PROGRAM (GEOFUND)

THE WORLD BANK/IFC/M.I.G.A.

OFFICE MEMORANDUM - draft

DATE: December, 2005

TO: Rachel Kyte, Director, CES

FROM: Sandeep Kohli (Through Shilpa Patel, Manager, CESEF)

EXTENSION: 35317

SUBJECT: Management Approval for the GEF Funded, Joint World Bank-IFC GeoFund Initiative

Background to IFC Involvement with the Global Environment Facility

The Global Environment Facility (GEF) was established in 1994 to assist in the protection of the global environment and to promote environmentally sound and sustainable economic development. GEF and the International Bank for Reconstruction and Development (IBRD) executed an agreement on July 1, 1994 pursuant to which IBRD became an Implementing Agency for GEF, with the capacity to administer GEF funds for pursuing projects in keeping with the objectives of GEF. On May 31st, 1996, IBRD and International Finance Corporation (IFC) entered into an arrangement for the administration and management by IFC, of funds to be made available by IBRD from the GEF Trust Fund, for the financing of activities related to the GEF (hereafter called the 1996 Arrangement).

Pursuant to the 1996 Arrangement, GEF funded projects administered by IFC can be approved, administered and disbursed in accordance with IFC's rules and procedures, taking into account the specific requirements approved by the GEF Council for such projects. All of IFC's GEF funded projects are administered under the said 1996 Arrangement.

Project Background

IBRD, as an Implementing Agency for GEF, has GEF Council approval for US$25 million of funding for the Geothermal Energy Development Program (The GeoFund). This project aims at developing geothermal energy resources in countries of Eastern and Southern Europe, and Central Asia (the Region). The GeoFund will undertake to provide:

(a) Support to Governments in policy improvements and removal of barriers against the use of renewable energy resources in general, and geothermal energy in particular,
(b) Capacity building for geothermal energy development in the countries targeted,
(c) Impetus to the use of geothermal energy through the further development of these resources, and
(d) Development of a balanced portfolio of geothermal energy projects in the region, applying different geothermal technologies.

Using the 1996 Arrangement as the basis for cooperation, IBRD and IFC will work as partners on GeoFund. Each agency has its own area of expertise, and by combining these under a single initiative, the GeoFund seeks to comprehensively address issues that hold back the development of geothermal resources, and promote the development of projects in this area. This will involve the provision of

technical assistance for: (i) Capacity building to remove knowledge barriers; (ii) Policy reviews and amendments, and (iii) Project preparation as well as financial assistance to facilitate access to additional commercial financing on reasonable terms.

Proposed Role of Agencies

The GeoFund will be implemented in a series of individual subprojects in participating ECA countries during a period of eight (8) years. While GEF Council and CEO approval will be/has been obtained for the GeoFund, individual project Grant Agreements will not go to the GEF Secretariat for approval, but rather will be decided based on the rules of the agency in question (IFC or WB) that is implementing the said project. IFC will focus on projects which are either in the private sector, or are likely to lead to investments by private sector entities. Another area of focus is on projects that will be developed with the municipal sector. Preliminary discussions with IFC's Municipal Department has indicated an interest in such projects.

To assure high quality and the achievement of defined project goals, the GeoFund will be implemented on a project by project basis in a two phased approach. Each phase involves a number of projects and countries. This phased approach allows for adjustments and refining of the specifications of its instruments, according to the experience gained during project implementation, and changing market conditions. We believe that not only will this approach enhance project results, but it will also maximize the impact of the utilized funds.

The Start -up phase will be covered by US$11.5 million, and in the second phase a new set of projects will be developed and implemented as they become ready. Lessons learned during the start-up phase will be integrated into project design and implementation.

The list of likely projects is given in Table 1 at page 16. The disbursement levels shown are only indicative. Actual disbursements will depend on a thorough review of the projects by the responsible agency. It is proposed that IFC's focus be on Russia, Armenia and Turkey, though new geographies and projects could be added based on the experience gained, and market conditions. The experience gained during the project phase will inform the process for the second phase.

Three principal instruments of the GeoFund will be:

- A ***Technical Assistance Window***, to address barriers that retard the use of renewable energy resources and geothermal energy. It will also help set up or systematize geothermal databases, will contribute to dissemination of geothermal knowledge and know-how, and will help to identify and prepare/implement geothermal projects.
- An ***Investment Funding Window*** that would provide low cost loans, contingent and straight grants, covering part of the project cost through monetization of external benefits.
- A ***Geological Risk Insurance Window*** to partially insure project developers/investors against the short-term and medium-term geological risks.

It is proposed that a joint GeoFund Coordination Team (GCT) be set up, consisting of members from IBRD and IFC. From IFC side, two IFC representatives would be a part of the GCT; one of whom will be the Task Manager for the projects allocated to IFC. This team will meet periodically, and review input received from consultants on a pipeline of geothermal projects in the Region. This team will (a) sift through the data provided; (b) identify a shortlist of subprojects recommended for further implementation; (c) propose the respective agency responsible for implementation; (d) discuss at appropriate intervals during GeoFund implementation, the lessons learned, and appropriate modifications to the process in light of experience gained; and (e) report, as required, to the GEF Council and Secretariat. If there are

significant modifications in the program design that need GEF endorsement, these will be made either jointly by IBRD and IFC, or by IBRD alone, but with consultation and input from IFC. No changes will be made to the arrangement that adversely affect IFC, without the explicit approval of the IFC members on GCT.

IFC Participation and Role/s

The GCT is an advisory body, which provides the agencies with an initial screen of the subprojects, and facilitates the sharing of experiences and expertise. It is not a legal entity, and its function is to make recommendations to the agencies with respect to subproject implementation.

IFC sees its role primarily in the development of those subprojects where there is a significant possibility of private sector participation, or where the instruments used are particularly suitable for IFC's implementation. It would therefore be essential that the IFC members sitting on the GCT agree to the allocation of a particular subproject to IFC for implementation, prior to the next step being taken.

When a particular project is allocated by GCT to IFC, per the 1996 Arrangement, IFC will follow its own processes and project cycle for the implementation of the said subproject. The flowchart below (A) outlines what such a project cycle will be. Please note that the yellow boxes show the role of GCT, and all the white boxes refer to IFC processes.

As noted in the chart, project identification and early review of subprojects are done through GCT. This fits into the IFC project cycle, and the non-IFC members as well as the consultants are experts who help IFC arrive at the appropriate shortlist for recommendation to IFC Management. As the next step, IFC's Task Manager for the initiative conducts a more detailed due diligence and appraisal of the said subproject using its internal processes and expertise. He/she may also use consultants hired under the GeoFund to provide further input on the projects and/or use IFC staff/consultants as deemed appropriate.

The Task Manager will then convene an Investment Review meeting with the Investment Review Committee (IRC) (similar to PVMTI) consisting of IFC members, and one member from IBRD. The suggested IBRD member is the IBRD Task Manager for the GeoFund, or his designee. The constitution of the IRC will be shaped by the recommendations of the COSO review, which appear to favor a cross-functional review. More details on this will be provided upon further consultation.

Results of the detailed appraisal/due diligence will be presented to the IRC, irrespective of the recommendation. In cases where the project is viewed favorably by the IRC, the subproject proceeds to the next step in Flowchart A, i.e. negotiations with the counter-party/ies, to insure that there is agreement on the broad terms. In cases where the IRC returns a negative recommendation, the process outlined in Flowchart B is followed i.e. a format rejection letter is sent to GCT. There can also be situations where there are some caveats around the approval provided by the IRC. These caveats must be complied with, prior to proceeding to the next stage. In all cases, GCT will be informed of the decision taken at the IRC.

If the subproject is proceeding to the next step, a formal approval memo with the recommendation of the IRC is prepared, and the same must be ratified by the Manager of the Environment Finance Group (as designee of the CES Director). Reference will be made to this GeoFund Management approval memo, duly approved by the CES Department Director, and to the IRC recommendation. Based on the authority vested in the Manager for approval of subprojects, the subproject will be approved, and IFC's Task Manager will proceed with negotiating the project contract/s, and implementing the project.

Regular reporting by IFC on subproject progress to GCT will occur as part of the agenda on the regular meetings. Monitoring and Evaluation (M&E) practices will be discussed with IFC's internal team and

can also be discussed at the GCT meetings. More information on these practices will be made available, based on recommendations of the COSO (Committee of Sponsoring Organizations) review. However, the processes to be followed, will be those of IFC, and will be in line with similar practice for other GEF initiatives.

Other IFC Roles

Aside from IFC's role as the execution agency for certain subprojects, IFC's Task Manager and one additional member will be active participants in GCT. As part of GCT, they will opine on the projects that are to be executed by agencies other than IFC. Flowchart C lays out the processes that will be followed if IBRD is implementing a particular subproject. The point to note is that the processes followed post the recommendation from GCT will be those of the agency implementing the project.

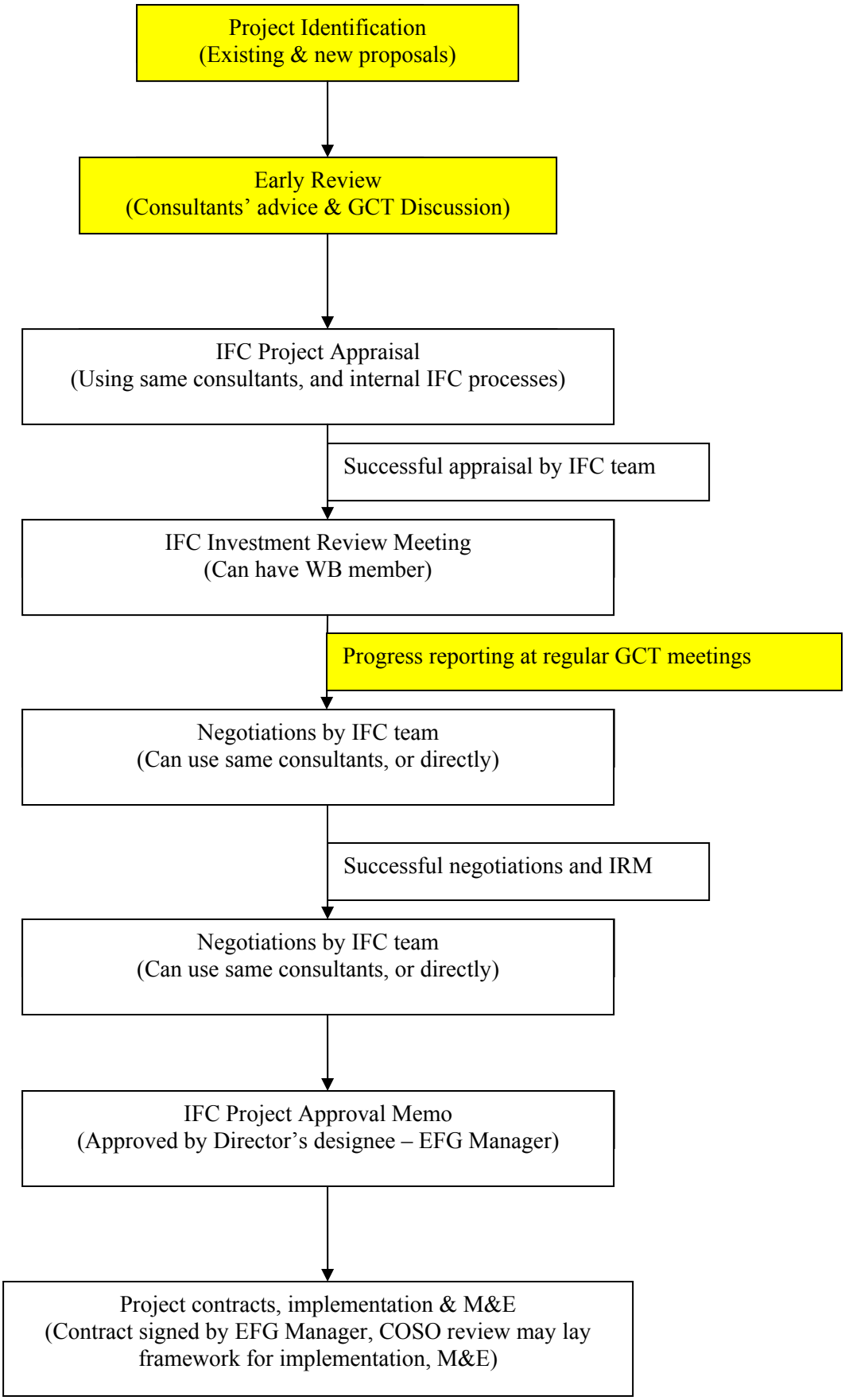
Please confirm your acceptance of above stated structure for IFC's involvement with IBRD under the GeoFund initiative by signing below.

Accepted and Agreed by:

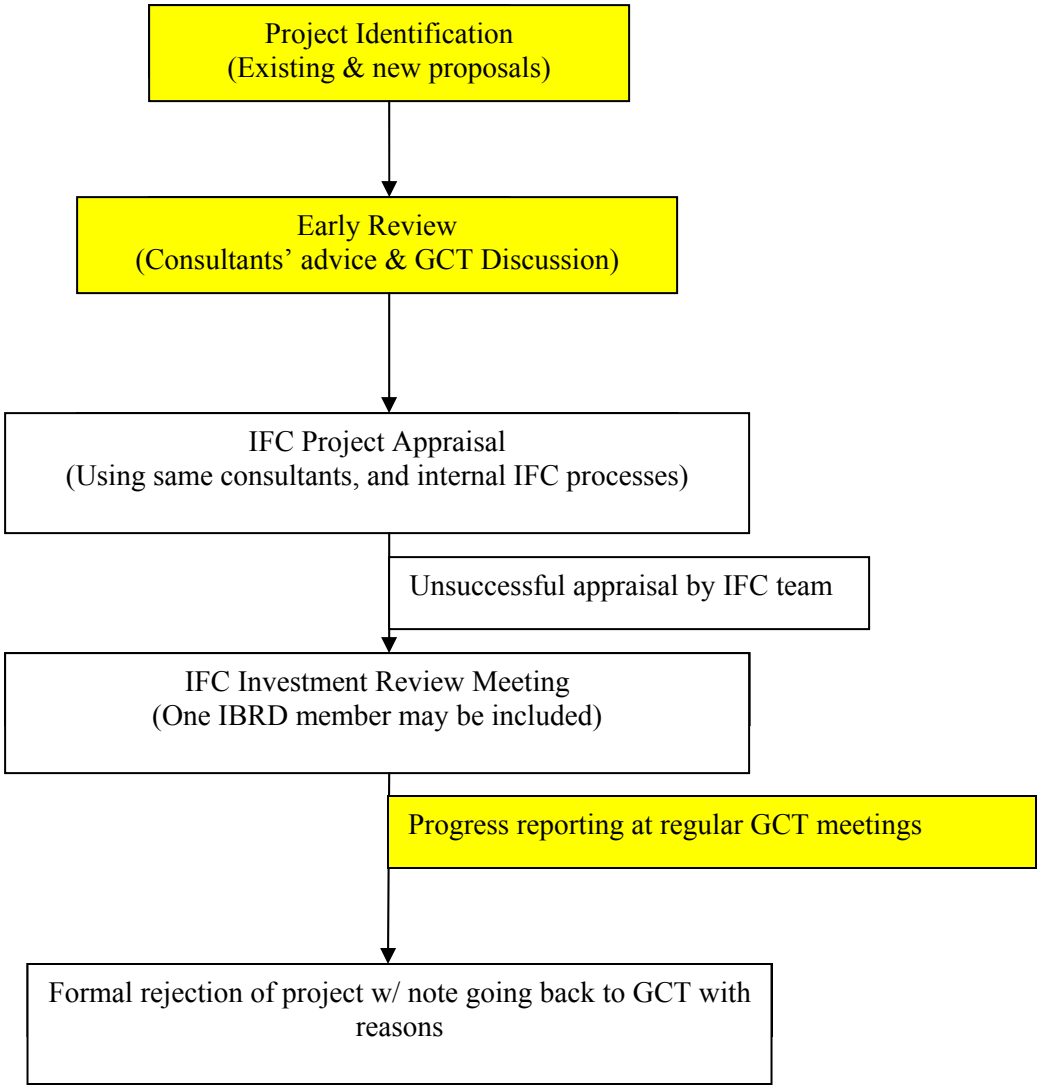
_____

Name: Rachel Kyte
Title: Director, CES
Date: _____

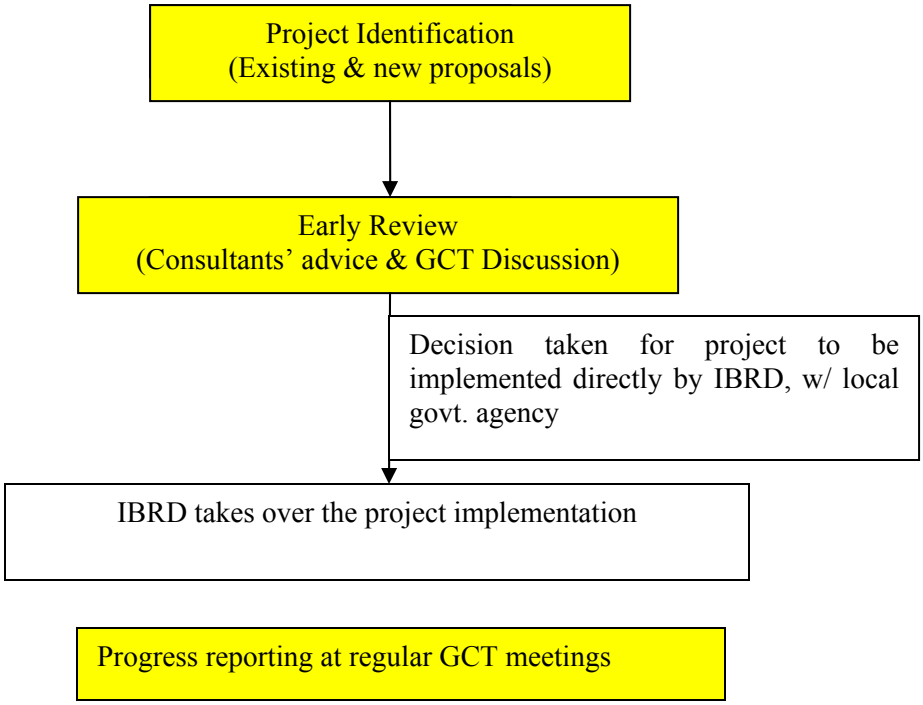
A. PROJECT IMPLEMENTED BY IFC: SUCCESSFUL APPRAISAL AND IRM REVIEW



B. PROJECT IMPLEMENTED BY IFC: UNSUCCESSFUL APPRAISAL AND/OR IRM REVIEW



C. PROJECT IMPLEMENTED BY AGENCY OTHER THAN IFC



KEY:

GeoFund Coordination Team (GCT) Decision Making/Reporting

IFC Internal Processes