



Global Environment Facility

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February 4, 2009

Dear Council Member:

The World Bank, as the Implementing Agency for the project, ***Regional (Czech Republic, Hungary, Bulgaria, Poland, Slovak Republic, Russian Federation): Development of Geothermal Energy in Europe and Central Asia and World Bank-GEF Geothermal Development Fund***, has submitted the attached proposed sub-project document for CEO endorsement prior to final approval of the sub-project in accordance with World Bank procedures.

The umbrella project proposal was approved by the Council in May 2003 for a total GEF financing of \$25 million. The attached document describes the third sub-project to be approved, through the World Bank as the Implementing Agency, against the \$25 million approved by the Council for the umbrella project:

- ***GEOFUND APL2 – Armenia Geothermal Project*** (\$1,500,000)


The Secretariat has reviewed the sub-project document. It is consistent with the umbrella proposal approved by the Council in May 2003, and remains consistent with the Instrument and GEF policies and procedures. I am therefore endorsing the above-mentioned sub-project.

We have today posted the proposed sub-project document on the GEF website at www.thegef.org. If you do not have access to the Web, you may request the local field office of the World Bank or the UNDP to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,



Monique Barbut
Chief Executive Officer and Chairperson



Attachment: Project Document
cc. Alternates, GEF Agencies, STAP, Trustee



REQUEST FOR CEO ENDORSEMENT/APPROVAL

PROJECT TYPE: FULL-SIZED PROJECT

THE GEF TRUST FUND

Submission Date: January 8, 2009

Re-submission Date

PART I: PROJECT INFORMATION

GEFSEC PROJECT ID: XXXX

GEF AGENCY PROJECT ID: P114409

COUNTRY(IES): ARMENIA

PROJECT TITLE: GEOFUND APL2 – ARMENIA GEOTHERMAL PROJECT

GEF AGENCY(IES): World Bank

OTHER EXECUTING PARTNER(S): Ministry of Energy and Natural Resources

GEF FOCAL AREA(S): Climate Change

GEF-3 STRATEGIC PROGRAM(S): OP#6 – Renewable Energy Use & Energy Conservation

NAME OF PARENT PROGRAM/UMBRELLA PROJECT: GEOFUND

Expected Calendar	
Milestones	Dates
Work Program (for GeoFund)	May 2003
GEF Agency Approval	February 2009
Implementation Start	April 2009
Mid-term Review (if planned)	N/A
Implementation Completion	October 2010

A. PROJECT FRAMEWORK (Expand table as necessary)

Project Objective: To assess the feasibility of exploratory drilling of the geothermal site with the estimated highest geothermal potential.

Project Components	Indicate whether Investment, TA, or STA**	Expected Outcomes	Expected Outputs	GEF Financing*		Co-financing*		Total (\$)
				(\$)	%	(\$)	%	
1. Technical Assistance	TA	Decision to “drill” or “not to drill”	Completed reports	1,500,000	83	310,000	17	1,810,000
2. Leveraged Financing ***	-	-	-	-	-	520,000	-	520,000
-	-	-	-	-	-	-	-	-
Total Project Costs				1,500,000	63	830,000	37	2,330,000

* List the \$ by project components. The percentage is the share of GEF and Co-financing respectively to the total amount for the component.

** TA = Technical Assistance; STA = Scientific & technical analysis.

***The co-financing likely to be leveraged if the TA outcome is successful

B. FINANCING PLAN SUMMARY FOR THE PROJECT (\$)

	Project Preparation*	Project	Agency Fee	Total at CEO Endorsement	For the record: Total at PIF
GEF	0	1,500,000	-	1,500,000	N/A
Co-financing	0	310,000		310,000	N/A
Leveraged financing	0	520,000		520,000	N/A
Total	0	2,330,000	-	2,330,000	N/A

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

C. SOURCES OF CONFIRMED CO-FINANCING, including co-financing for project preparation for both the PDFs and PPG. expand the table line items as necessary)

Name of co-financier (source)	Classification	Type	Amount (\$)	%*
-------------------------------	----------------	------	-------------	----

Government of Armenia	National Government	Cash and in-kind	300,000 in cash and 10,000 in-kind (staff time, office space, travel)	100
Government of Armenia	National Government	Cash and in-kind	520,000 cash and in-kind contribution likely to be leveraged if the TA outcome is successful	100
Total Co-financing			830,000	100%

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

D. GEF RESOURCES REQUESTED BY FOCAL AREA(S), AGENCY(IES) OR COUNTRY(IES)

<i>GEF Agency</i>	<i>Focal Area</i>	<i>Country Name/ Global</i>	<i>(in \$)</i>			
			<i>Project Preparation</i>	<i>Project</i>	<i>Agency Fee</i>	<i>Total</i>
N/A	N/A					
Total GEF Resources						

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

E. PROJECT MANAGEMENT BUDGET/COST - N/A

<i>Cost Items</i>	<i>Total Estimated person weeks</i>	<i>GEF (\$)</i>	<i>Other sources (\$)</i>	<i>Project total (\$)</i>
<i>Local consultants*</i>				
<i>International consultants*</i>				
<i>Translation, telecommunication and miscellaneous expenses**</i>				
Total				

* Provide detailed information regarding the consultants in Annex C.

** Provide detailed information and justification for these line items.

F. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

<i>Component</i>	<i>Estimated person weeks</i>	<i>GEF(\$)</i>	<i>Other sources (\$)</i>	<i>Project total (\$)</i>
<i>Local consultants*</i>	100	83,840	16,160	100,000
<i>International consultants*</i>	365.5	1,367,760	272,240	1,640,000
Total	465.5	1,451,600	288,400	1,740,000

* Provide detailed information regarding the consultants in Annex C.

G. DESCRIBE THE BUDGETED M&E PLAN:

The Board of Trustees and the management of the Renewable Resources and Energy Efficiency Fund (R2E2 Fund) will have the overall responsibility for project implementation and for monitoring of project outcomes. The data for the project outcome and the results indicators will be acquired from the reports submitted by the consultants selected to implement geothermal site investigation works. Since the R2E2 Fund has substantial experience with review and monitoring of studies under the Bank financed Renewable Energy and Urban Heating Projects, there is no need for capacity strengthening to ensure effective collection and analysis of project outcome indicators data. The costs associated with the monitoring and evaluation of the project outcomes are integrated into project costs and are estimated at US\$ 5,000.

PART II: PROJECT JUSTIFICATION

- A. DESCRIBE THE PROJECT RATIONALE AND THE EXPECTED MEASURABLE GLOBAL ENVIRONMENTAL BENEFITS:** Up to date, the private sector did not express interest in development of the proposed geothermal sites since the existing data was not informative enough about the potential of the geothermal sites. Thus, investments in development of geothermal energy were considered high-risk by the private sector. As a result, assessment of the feasibility of exploratory drilling of the geothermal site will increase the amount and precision of geothermal resources information available to the private sector. The global environmental objective is to remove the barriers to development of geothermal energy, and the development objective is to assess the feasibility of exploratory drilling of the geothermal site with the highest estimated geothermal potential.
- B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL PRIORITIES/PLANS:** The project is in line with the priorities outlined in the Energy Sector Strategy, National Program on Renewable Energy and Energy Efficiency and the PRSP, which prioritize strengthening of the country's energy security by facilitating the development of indigenous renewable energy resources.
- C. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH GEF STRATEGIES AND STRATEGIC PROGRAMS:** The project is consistent with the GEF Climate Change focal area strategy to promote on-grid renewable energy.
- D. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES:** The project has drawn from the Study on Identification of Prospective Geothermal Sites in the Republic of Armenia, a study financed from GEF grant under the Armenia Renewable Energy Project. The project will have synergies with a GEF grant activities under the IDA-GEF financed Renewable Energy Project to overcome barriers to the development of renewable energy resources through commercially sustainable activities. In particular, the project activities will generate information to determine the need for drilling of exploratory wells, which will then provide adequate information to the private sector to involve in development of geothermal resources. The project implementation will draw extensively from the experience of similar projects in the region. There are no other relevant government or donor funded project activities in the country for the project to coordinate with.
- E. DESCRIBE THE INCREMENTAL REASONING OF THE PROJECT:** Without the GEF project, the development of the geothermal-based electricity generation is unlikely to materialize due to lack of data on the potential of geothermal sites. Thus, the installed capacity of the grid connected renewable energy will be smaller and the green house gas emissions will be higher.
- F. INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS, THAT MIGHT PREVENT THE PROJECT OBJECTIVE(S) FROM BEING ACHIEVED AND OUTLINE RISK MANAGEMENT MEASURES:** The overall country risks are deemed low: the project itself, which involves only preliminary field investigations to determine the possible scope for future geothermal development, does not raise any macroeconomic risks. The investigatory activities also do not present any significant governance issues (the team will, of course, ensure proper fiduciary oversight of the feasibility study). The sector risks are also not considered large, given that Armenia has a good track record in improving energy sector performance, a well functioning regulatory agency and an ongoing successful effort to promote alternative energy sources. Further, since the project would only involve a feasibility study to assess the need for exploratory drilling there are few implementation risks which may impact the Project outcome. Overall risks are therefore considered low.
- G. EXPLAIN HOW COST-EFFECTIVENESS IS REFLECTED IN THE PROJECT DESIGN:** The project is structured in two phases to ensure that expenditures of phase 2 field investigation works (3D seismic survey) occur only after phase 1 field investigation works (Geological scouting and magneto-telluric studies) justify continuation of further geothermal site study works.


PART III: INSTITUTIONAL COORDINATION AND SUPPORT

- A. PROJECT IMPLEMENTATION ARRANGEMENT:** The project will be implemented by the Renewable Resources and Energy Efficiency Fund (R2E2 Fund), an NGO established by the Government Decree No 799 dated April 28, 2005, with the mandate to promote the development of renewable energy and energy efficiency markets in Armenia and to facilitate investments in these sectors. The project implementation as well as overall R2E2 Fund operations will be supervised by the Board of Trustees (BOT) consisting of qualified experts from public and private sector, thus, ensuring required professional expertise. The BOT is chaired by the Minister of Energy and Natural Resources. The R2E2 Fund has adequate capacity to implement the project due to solid professional

qualifications of its staff. Additionally, the R2E2 Fund has built up significant project implementation capacity as it is the implementing agency for the Renewable Energy Project, Urban Heating Project and the GPOBA Gas and Heating Project.

PART IV: EXPLAIN THE ALIGNMENT OF PROJECT DESIGN WITH THE ORIGINAL PIF: The proposed project is part of the GeoFund that was approved by Council under GEF-3 and prior to the introduction of the PIF. The project is aligned with the GeoFund's objectives and processing requirements.

PART V: AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for CEO Endorsement.	
 Steve Gorman GEF Executive Coordinator The World Bank	Emilia Battaglini, GEF Regional Coordinator Tel. and Email: (202) 473 3232 ebattaglini@worldbank.org Ms Ani Balabanyan, Task Team Leader Project Contact Tel. and Email:+37410 52-39-92, abalabanyan@worldbank.org

ANNEX A: PROJECT RESULTS FRAMEWORK

PDO/Global Environmental Objective	Project Outcome Indicators	Use of Project Outcome Information
<p>The project development objective is to assess the feasibility of exploratory drilling of the geothermal site with the highest estimated geothermal potential.</p> <p>The global environmental objective is to remove the barriers to development of geothermal energy.</p>	<p>Decision whether to drill or not to drill exploratory wells for the geothermal sites, based on the results of site investigation works</p>	<p>The outcome indicator will demonstrate whether the exploratory drilling of one or two wells is justified</p>
Intermediate Outcomes	Intermediate Outcome Indicators	Use of Intermediate Outcome Monitoring
<p>Geological field scouting completed</p>	<p>Surface geological map is produced containing fault structures, potential recharging zones, and the surface geothermal manifestations</p>	<p>Based on the geological scouting findings, the location and length of the MT profiles will be determined</p>
<p>MT study completed</p>	<p>Two cross sections with the visualization of the rock formation resistivity are produced; also the justification for performing 3D seismic is assessed</p>	<p>The findings of the MT sounding will justify the need for 3D seismic survey and will constitute the base for its location and design</p>
<p>3D seismic survey completed</p>	<p>3D images of the site subsurface structure with main fault zones and the depth, extent and thickness of permeable zones are produced; and at least 3 cross sections, of North-South orientation and 3 of East-West orientation are prepared</p>	<p>The interpretation of 3D survey results will identify main fault zones, the depth, extent and thickness of permeable zones, confirm identified potential geothermal aquifers, isolating layers, and the dimensions. It will allow the decision upon and determination of number and precise location of exploratory wells to verify geothermal resource potential.</p>
<p>Economic/financial analysis is completed</p>	<p>The economic and financial rates of return are assessed and sensitivity analysis conducted</p>	<p>The analysis will indicate whether based on the investigation works the geothermal site is economically and financially viable and the drilling of one or two exploratory wells is justified</p>

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

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

ANNEX C: CONSULTANTS TO BE HIRED FOR THE PROJECT

<i>Position Titles</i>	<i>\$/ person week</i>	<i>Estimated person weeks</i>	<i>Tasks to be performed</i>
For Project Management			
Local			
Project supervision consultant	500	5	General assistance to the task team in project supervision including economic and financial analysis of the feasibility of exploratory drilling of the geothermal sites
International			
Geothermal specialist/consultant	3,500	3	Quality assurance of reports produced by geothermal field work consultants and other support to the project task team as necessary
For Technical Assistance			
Local			
Field works supervision consultants	1000	100	Supervision over the implementation of scope of scouting, magneto-telluric and 3D seismic studies
International			
Geological field scouting consultants	4,500	22.5	Identification and mapping of the fault structures, potential recharging zones, and to record and describe the surface geothermal manifestations like hot and mineral springs, fumaroles and zones with hydro thermally alternated rocks; sampling and selected analysis of all springs and surface waters to describe the geochemical composition of waters; determination of age and provenience of spring-waters; development of surface geological maps containing all key geophysical, geological and other relevant indicators; determination of the location and length of the Magneto-Telluric (MT) profiles;
Magneto-telluric sounding survey consultants	4,500	89	Implementation of perpendicular profiles of MT sounding for each of the selected geothermal sites
Magneto-telluric sounding data interpretation consultant	4,500	22	Production of cross sections with the visualization of the rock formation resistivity; the cross sections should contain identification of the potential geothermal aquifers and isolating layers, with their thickness and depth of

			their occurrence; critical review of MT sounding results by a team of participating geoscientists
3D seismic survey consultants	4,500	200	3D seismic survey in form of grid of perpendicular profiles
3D seismic survey results interpretation consultant	4,500	22	Independent interpretation of 3D seismic survey results
Economic feasibility consultant	4,000	10	Assessment of the economic viability of the geothermal site with the highest estimated technical potential

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

- A. EXPLAIN IF THE PPG OBJECTIVE HAS BEEN ACHIEVED THROUGH THE PPG ACTIVITIES UNDERTAKEN. N/A**
- B. DESCRIBE IF ANY FINDINGS THAT MIGHT AFFECT THE PROJECT DESIGN OR ANY CONCERNS ON PROJECT IMPLEMENTATION. N/A**
- C. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES AND THEIR IMPLEMENTATION STATUS IN THE TABLE BELOW: N/A**

<i>Project Preparation Activities Approved</i>	<i>Implementation Status</i>	<i>GEF Amount (\$)</i>				<i>Co-financing (\$)</i>
		<i>Amount Approved</i>	<i>Amount Spent To-date</i>	<i>Amount Committed</i>	<i>Uncommitted Amount*</i>	
	(Select)					
	(Select)					
	(Select)					
	(Select)					
	(Select)					
	(Select)					
	(Select)					
Total						

* Uncommitted amount should be returned to the GEF Trust Fund. Please indicate expected date of refund transaction to Trustee.

Document of
The World Bank

Report No:

PROJECT DOCUMENT
ON A
PROPOSED GRANT
IN THE AMOUNT OF
US\$ 1.5 MILLION
TO THE
REPUBLIC OF ARMENIA
IN SUPPORT OF THE GEOTHERMAL ENERGY DEVELOPMENT PROGRAM
(GEOFUND2)

December 9, 2008

CURRENCY EQUIVALENTS
(Exchange Rate Effective August 30, 2008)

Currency Unit = Armenian Dram
AMD 302 = US\$1

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

3D	Three dimensional
APL	Adaptable Program Loan
ASRA	Accounting Standards of the Republic of Armenia
BOT	Board of Trustees
CFAA	Country Financial Accountability Assessment
CPAR	Country Procurement Assessment Review
EA	Environmental Assessment
EBRD	European Bank for Reconstruction and Development
ECA	Europe and Central Asia
EMP	Environmental Management Plan
FM	Financial Management
FMM	Financial Management Manual
FMR	Financial Management Report
GEF	Global Environmental Facility
GHG	Green House Gas
GPN	General Procurement Notice
GPOBA	Global Partnership on Output-based Aid
IDA	International Development Association
IFR	Interim Unaudited Financial Report
ISDS	Integrated Safeguards Data Sheet
JBIC	Japanese Bank for International Cooperation
MOE	Ministry of Energy
MT	Magneto-telluric
MW	Megawatt
NGO	Non-Governmental Organization
PDO	Project Development Objective
PEFA	Public Expenditure Financial Accountability Assessment
PFM	Public Financial Management
PFS	Project Financial Statements
PRSP	Poverty Reduction Strategy Paper
PSRC	Public Services Regulatory Commission
R2E2	Renewable Resources and Energy Efficiency
REP	Renewable Energy Project
SOE	Statement of Expenditures
TA	Technical Assistance
UHP	Urban Heating Project

Vice President:	Shigeo Katsu
Country Director:	Donna Dowset-Coirolo

Country Manager	Aristomene Varoudakis
Sector Manager:	Ranjit J. Lamech
Task Team Leader:	Ani Balabanyan

ARMENIA
GEOFUND 2: ARMENIA GEOTHERMAL PROJECT

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ARMENIA

GEOFUND 2: ARMENIA GEOTHERMAL PROJECT

PROJECT APPRAISAL DOCUMENT

EUROPE AND CENTRAL ASIA

ECSSD

Date: September 24, 2008	Team Leader: Ani Balabanyan
Country Director: D-M Dowsett-Coirolo	Sectors: Renewable energy (100%)
Sector Manager/Director: Ranjit J. Lamech	Themes: Climate change (P); Pollution management and environmental health (P); Vulnerability assessment and monitoring (S)
Project ID: P114409	
Focal Area: Climate change	
Environmental Assessment: Not Required	
Lending Instrument: Technical Assistance Grant	

Project Financing Data				
[] Loan [] Credit [X] Grant [] Guarantee [] Other:				
For Loans/Credits/Others:				
Total Bank financing (US\$m.): 1.50				
Proposed terms:				
Financing Plan (US\$m)				
Source	Local	Foreign	Total	
BORROWER/RECIPIENT	0.30	0.00	0.30	
Global Environment Facility (GEF)	0.00	1.50	1.50	
Total:	0.30	1.50	1.80	

Borrower: Republic of Armenia

Responsible Agency: Ministry of Energy and Natural Resources

Estimated disbursements (Bank FY/US\$m)									
FY	2009	2010	2011						
Annual	0.20	1.50	0.10						
Cumulative	0.20	1.70	1.80						

Project implementation period: Start April, 2009 End: October, 2010
Expected effectiveness date: February, 2009
Expected closing date: December, 2010

Does the project depart from the CAS in content or other significant respects? <i>Ref. PAD I.C.</i>	[] Yes [X] No
Does the project require any exceptions from Bank policies? <i>Ref. PAD IV.G.</i>	[] Yes [X] No
Have these been approved by Bank management?	[] Yes [] No
Is approval for any policy exception sought from the Board?	[] Yes [X] No
Does the project include any critical risks rated "substantial" or "high"? <i>Ref. PAD III.E.</i>	[] Yes [X] No

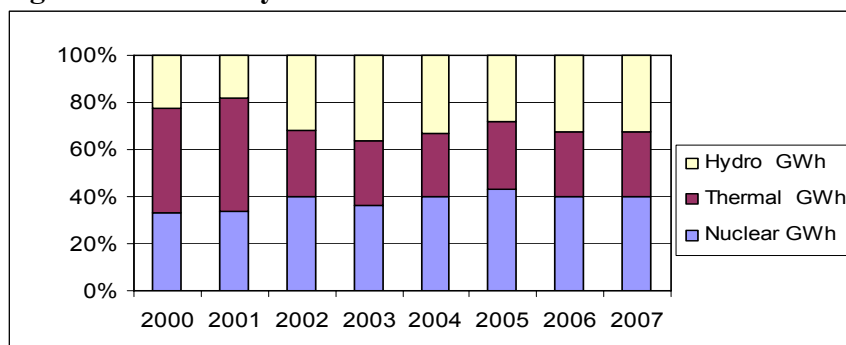
<p>Does the project meet the Regional criteria for readiness for implementation? [X]Yes [] No Ref. PAD IV.G.</p>
<p>Project development objective Ref. PAD II.C., Technical Annex 3 The project development objective is to assess the feasibility of exploratory drilling of the geothermal site with the estimated highest geothermal potential.</p>
<p>Global Environment objective Ref. PAD II.C., Technical Annex 3 The global environmental objective is to remove the barriers to development of geothermal energy.</p>
<p>Project description Ref. PAD II.D., Technical Annex 4 The Project will support technical assistance to conduct comprehensive investigations works. This component covers the following areas:</p> <p style="margin-left: 20px;">A.1. Technical Investigation works at Karkar and Gridzor geothermal sites in two phases</p> <p style="margin-left: 20px;">A.2. Operating costs of the implementing agency for this project</p>
<p>Which safeguard policies are triggered, if any? Ref. PAD IV.F., Technical Annex 10 The Project category is “C” as no negative or only very minor environmental impacts are expected to result from the TA activities.</p>
<p>Significant, non-standard conditions, if any, for: Ref. PAD III.F. Board presentation:</p> <p>Loan/credit effectiveness:</p> <ul style="list-style-type: none"> • The Subsidiary Agreement between the R2E2 Fund and the Government has been duly executed. • The Project Agreement between the R2E2 Fund and the Bank has been duly executed. • The legal opinions received on the Subsidiary Agreement, Project Agreement and the Grant Agreement have been duly addressed. <p>Covenants applicable to project implementation:</p> <ul style="list-style-type: none"> • The Government will make results of comprehensive field investigation works publicly available and will ensure that private sector involvement is done in a transparent and competitive manner. • The funding for the Phase II investigation works and project implementation under Component 1.A will be available only if Phase 1 investigation works result in identification of one site which proves to have the resistivity of the rock formation acceptable to the Bank, through duly applied testing and verified empirical data and scientific methods. • The R2E2 Fund will maintain a financial management system acceptable to the Bank. The project financial statements, including Statement of Expenditures (SOEs) and Designated Account Statements 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 report will be provided to the Bank within six months of the end of each fiscal year.

I. STRATEGIC CONTEXT AND RATIONALE

A. Country and sector issues

1. The Republic of Armenia has limited energy resources to satisfy its needs. Armenia does not have fossil fuel reserves. Thermal and nuclear power generation account for about 70% of the total electricity generation in Armenia (see Figure 1) and the country imports all of the fuel required for the operation of thermal and nuclear plants from uncompetitive markets. Moreover, the country is located in a geopolitically unstable region making it vulnerable to instability of fuel supply.

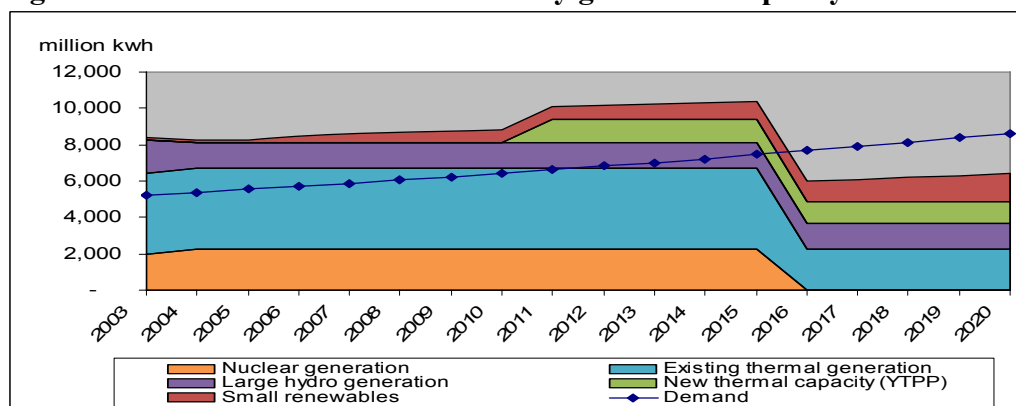
Figure 1: Electricity Generation Mix



2. The reforms in the country's energy sector have led to remarkable results. The sector's financial performance has greatly improved turning it into a major tax payer in the country; the payment discipline is robust; losses have reduced substantially and the overall efficiency and quality of supply have improved.

3. Currently Armenia has adequate electricity generation capacity to meet its demand, however, operating limitations, supply uncertainties, ageing and conditions of generation facilities and inadequate peak load capacity may jeopardize Armenia's ability to sufficiently meet both domestic and export demand in the future. In addition, as demand is expected to grow 2-3 percent annually, Armenia will have to invest significantly in new generation capacity and rehabilitation of existing capacity in order to continue to meet consumer needs (see Figure 2).

Figure 2: Armenia's forecasted electricity generation capacity and consumption



* Thermal capacity projection includes the new Yerevan thermal power unit of 210 MW installed capacity to be constructed through JBIC funding

4. The Government has prioritized the development of indigenous renewable energy resources in Armenia as a means to increase energy diversification and achieve a higher degree of energy security. The Energy Law, the Law on Renewable Energy and Energy Efficiency and the Energy Sector Strategy clearly articulate the importance of renewable resources and provide a framework for facilitating their development. Overall, the legal and regulatory framework in the country is supportive to renewable energy development. The electricity off-take is guaranteed for 15 years for each small renewable plant; and the Public Services Regulatory Commission (PSRC) guarantees the following tariffs for the same period: US\$ 0.056/kWh for newly constructed small hydro power plants on natural water flows, US\$ 0.115/kWh for wind and US\$ 0.108/kWh for biomass.

5. As the import prices of fossil fuels in Armenia move closer to the prices paid by European countries, the renewable-based electricity generation becomes increasingly competitive with other forms of electricity generation.

6. Armenia has an estimated 740 megawatt (MW) of small hydropower, wind and geothermal resources. The results of studies to estimate geothermal potential of the country suggest a high likelihood of the existence of geothermal resources which could be used for electricity generation purposes. The optimism is justified by the broad presence of young volcanic areas, numerous outcrops of mineral waters and the activity of tectonic-magmatic processes with relatively small geological age. Additionally, there are regions with abnormally high values of geothermal gradient and heat flow densities. Based on the results of studies on identification of prospective geothermal sites and subsequent discussions with international and local experts, the following prospective sites for further comprehensive field investigation works were proposed: (1) Karkar site, located on the Syunik plateau in the South Eastern part of Armenia, and (2) Gridzor site, located on the Gegham mountain plateau along the Western shore of Lake Sevan.

7. The existing studies provide either a brief assessment of the overall potential of the country for development of geothermal resources or did selective and limited field investigations for some of the identified sites. Therefore, the private sector's interest in development of geothermal energy resources in Armenia is very limited since no thorough site investigation works have been conducted yet and there are no confirmed deposits identified.

B. Rationale for Bank involvement

8. The Bank, with Global Environmental Facility (GEF) support, established the GeoFund with the sole purpose to assist the Europe and Central Asia (ECA) countries in increasing the use of geothermal energy. The proposed project is an integral part of that effort.

9. In addition, the Bank has experience and knowledge in implementing projects of GEF operational programs including the GeoFund. The Bank is active in the renewable energy sector of Armenia and is currently implementing the International Development Association (IDA)-GEF financed Renewable Energy Project (REP). Some geothermal energy project preparatory

works were financed from the IDA-GEF Renewable Energy Project, however, most of the funds under this project are committed and the financing of the field investigation works is not plausible. The Geothermal Development Project will further promote development of renewable energy in Armenia by enabling informed decision-making to further explore the geothermal resources through exploratory drilling. The GeoFund involvement promotes risk reduction in geothermal projects through TA and other means.

10. Finally, the Bank has knowledge and significant experience with geothermal projects globally. 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 and ensuring that policy reforms are consistent.

C. Higher level objectives to which the project contributes

11. The global environmental objective of the project is to remove the barriers to development of geothermal energy. The project is in line with the Poverty Reduction Strategy Paper (PRSP), which prioritizes strengthening of the country's energy security by facilitating the development of indigenous renewable energy resources. The project addresses the priorities outlined in the Energy Sector Strategy to diversify the energy resource base through reliance on renewable energy resources. The proposed project is also consistent with the current Country Assistance Strategy (June 30, 2004, N28991) for Armenia as it will enable Armenia to improve environmental sustainability through reduction of green-house gas (GHG) emissions. The project supports the GEF Operational Program #6: Promoting the adoption of renewable energy by removing barriers and reducing implementation costs.

II. PROJECT DESCRIPTION

A. Lending instrument

12. The project will be financed through a US\$ 1.5 million grant from the technical assistance (TA) window of the GEF supported GeoFund program. The grant will finance technical assistance for field investigation works at two geothermal sites.

B. Program objective and Phases

13. 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) lack of knowledge and information; (ii) weak institutional, policy, legal and regulatory systems, and (iii) weak financial systems. 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;

- 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 Direct Investment Funding window.

GeoFund Adaptable Program Loan (APL) phasing and triggers (presented in Annex 1, Section 2) are directly linked to the structure of the GeoFund program which is being implemented in a series of individual subprojects.

C. Project development objective and key indicators

14. The project development objective (PDO) is to assess the feasibility of exploratory drilling of the geothermal site with the estimated highest geothermal potential.

15. The key performance indicator is the decision whether to drill or not to drill exploratory wells for the geothermal sites, based on the results of site investigation works.

16. Conditional upon the outcome of the comprehensive field investigation works, further GeoFund support may be considered in an additional APL to Armenia. The support may be provided through the GeoFund's Direct Investment Funding window or Geological Risk Insurance window to help financing of investments enabling utilization of geothermal energy resources. Those investment costs may include the drilling costs of exploratory wells. The GeoFund may consider supporting part of the eligible drilling costs of one or two wells with the estimated depth of 3 km (indicative total amount: US\$6 million, of which US\$5.0 million from the GeoFund and US\$1.0 million from the Government).

D. Project components

Component 1: Technical assistance (US\$ 1.8 million, including GeoFund funding of US\$ 1.5 million and Government co-financing of US\$ 0.3 million) to conduct comprehensive investigations works. This component covers the following areas:

A. Technical Investigation (indicative amount of US\$ 1.74 million): The field investigation works at Karkar and Gridzor geothermal sites will be carried out in two phases. The second investigation phase will depend on the results of the first and will only be carried out if the results are positive enough to justify additional studies:

Phase I will include: (i) geological field works (scouting), (ii) magneto-telluric (MT) sounding study, (iii) interpretation of the results of the MT sounding; and (iv) supervision of the implementation of the scope of geological field works and MT sounding study.

Phase II will include: (i) a three dimensional (3D) seismic survey of the most prospective of the two geothermal sites, (ii) interpretation of the results of 3D seismic studies; (iii) supervision of the implementation of the scope of 3D seismic study; and (iv) assessment of the economic and financial viability of the geothermal site with the highest estimated technical potential.

B. Project Implementation (indicative amount of US\$ 60,000): Financing of the incremental operating costs of the implementing agency for this project.

E. Lessons learned and reflected in the project design

17. The Bank and GEF have been involved in the preparation and implementation of several geothermal district heating operations, such as in Lithuania (Klaipeda) and in Poland (Podhale, Stargard). The field investigation works were structured to include the key studies essential for ensuring acceptable reliability of the geological data to justify exploratory drilling. Moreover, the project's two-phased TA design drew from the international experience of similar projects to ensure efficient use of the project funding. In particular, no further site investigation works will be initiated if the first phase study results do not warrant continuation.

F. Alternatives considered and reasons for rejection

18. The following alternative project approaches were considered:

19. *Drilling of exploratory wells without further investigation.* This possibility was not pursued as the current data on any of the sites does not justify drilling of exploratory wells.
20. *Offering of the geothermal sites to the private sector for development.* This alternative was ruled out since the existing data on the potential of these sites makes them a high-risk undertaking for the private sector to be involved.

III. IMPLEMENTATION

A. Partnership arrangements

21. No International Financial Institutions or other donors have shown interest in the project as the availability of the geothermal resources is not confirmed at any of the sites.

B. Institutional and implementation arrangements

22. The project will be implemented by the Renewable Resources and Energy Efficiency Fund (R2E2) Fund, a non-profit organization established by the Government Decree No 799 dated April 28, 2005, with the mandate to promote the development of renewable energy and energy efficiency markets in Armenia and to facilitate investments in these sectors.

23. The project implementation, as well as overall R2E2 Fund operations, will be supervised by the Board of Trustees (BOT) consisting of qualified experts from the public sector, NGOs, and the private sector, thus, ensuring required professional expertise. The BOT is chaired by the Prime Minister.

24. The R2E2 Fund has adequate capacity to implement the project due to solid professional qualifications of its staff. Additionally, the R2E2 Fund has built up significant project

implementation capacity as it is the implementing agency for the REP, Urban Heating Project (UHP) and the Global Partnership on Output-based Aid (GPOBA) Gas and Heating Project.

25. The project funds will be made available to the R2E2 Fund after meeting the grant effectiveness conditions as per Section F.

C. Monitoring and evaluation of outcomes/results

26. The Ministry of Energy and Natural Resources will supervise the overall R2E2 Fund activities within the scope of the project and will ensure that the R2E2 Fund operations are well aligned with the policy objectives of the Government renewable energy policies.

27. The R2E2 Fund will have the overall responsibility for project implementation and for monitoring of project outcomes. The data for the project outcome and the results indicators will be acquired from the reports submitted by the consultants selected to implement geothermal site investigation works. Since the R2E2 Fund has substantial experience with reviewing and monitoring of studies under the IDA-GEF financed Renewable Energy Project and IDA financed Urban Heating Project, there is no need for capacity strengthening to ensure effective collection and analysis of project outcome indicators data. The costs associated with the monitoring and evaluation of the project outcomes are integrated into project costs.

D. Sustainability and Replicability

28. Project sustainability is ensured by the Government commitment as well as existing policies and regulations for the development of indigenous renewable energy resources. If field investigation works confirm availability of geothermal resources required for electricity generation, then the Government will proceed with exploratory drilling of the sites.

29. The proposed comprehensive site investigation works will create experience for exploratory works implemented in accordance with best international practices. Thus, the acquired experience may be applicable for other geothermal sites in the country and may also be used in other countries with similar geology.

E. Critical risks and possible controversial aspects

30. There are no major risks identified to impede achievement of the project development objective. The overall country and sector risks are also very modest. No controversial aspects were identified.

F. Loan/credit conditions and covenants

31. *Conditions for GEF grant effectiveness:*

- The Subsidiary Agreement between the R2E2 Fund and the Government has been duly executed.
- The Project Agreement between the R2E2 Fund and the Bank has been duly executed.

- The legal opinions received on the Subsidiary Agreement, Project Agreement and the Grant Agreement have been duly addressed.

32. *GEF Grant covenants:*

- The Government will make results of comprehensive field investigation works publicly available and will ensure that private sector involvement is done in a transparent and competitive manner.
- The funding for the Phase II investigation works and project implementation under Component 1.A will be available only if Phase I investigation works result in identification of one site which proves to have the resistivity of the rock formation acceptable to the Bank, through duly applied testing and verified empirical data and scientific methods.
- The R2E2 Fund will maintain a financial management system acceptable to the Bank. The project financial statements, including Statement of Expenditures (SOEs) and Designated Account Statements 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 report will be provided to the Bank within six months of the end of each fiscal year.

IV. APPRAISAL SUMMARY

A. Economic and financial analyses

33. No economic or financial analysis was conducted since the project only finances TA.

B. Technical

34. The investigation sequence encompasses: (i) geological field scouting involving the identification and mapping of fault structures, potential recharging zones, and the recording and description of surface geothermal manifestations; (ii) performing MT sounding for the two selected potential geothermal fields; (iii) interpretation of the results of MT sounding including production of cross sections with the visualization of the rock formation resistivity, and critical review of results to select the most promising geothermal field for further development, if any; (iv) execution of 3D reflection seismic surveying in form of grid of perpendicular profiles; (v) interpretation of the results of 3D seismic survey field works involving production of 3D images of the subsurface structure and preparation of cross-sections.

C. Fiduciary

35. **Procurement.** The organization of procurement work for the proposed project will be carried out by the R2E2 Fund which has a good track record of implementing Bank projects. The proposed project includes procurement of consulting services. The procurement for contracts under the Component A will be conducted by the R2E2 Fund in accordance with the Bank procurement guidelines and will follow standard Bank procurement methods. The R2E2 Fund prepared a draft procurement plan which will be agreed upon during negotiations and attached to the minutes of negotiations. During the implementation of the Project, the procurement plan will be updated by the R2E2 Fund as required in agreement with the Bank to reflect the actual project implementation needs. Further details related to procurement arrangements are outlined in Annex 8.

36. **Financial management.** The R2E2 Fund will be responsible for implementation of the Financial Management (FM) function of the project including, flow of funds, budgeting, accounting, reporting, and auditing. R2E2 Fund currently implements UHP, REP GPOBA Gas and Heat projects.

37. *Fiduciary Risk at the Project Level.* The FM arrangements of R2E2 Fund have been reviewed periodically as part of previous project supervisions and overall have always been found satisfactory. Based on the FM assessment, it was established that the R2E2 Fund has overall acceptable FM arrangements in place: particularly, (i) accounting and reporting is performed in adequate accounting software; (ii) the well systematized filing system allows keeping all supporting financial documentation; and (iii) annual audits of the active projects were satisfactory.

38. The overall financial management risk for the project before mitigation measures is moderate and after mitigation measures, the risk is low.

39. As the Project will be implemented in an environment where corruption can be perceived as an important issue, adequate mitigation measures have been put in place and will be closely monitored to ensure that the residual project risk is acceptable, including: (a) the Government's move towards e-procurement and use of public websites to disseminate tenders and announce results; (b) a formal internal control framework described in the Financial Management Manual; (c) the flow of funds mechanism agreed with the Recipient will be enforced; (d) the project financial statements will be audited by independent auditors and on terms acceptable to IDA; and (e) regular FM supervision and procurement prior and post reviews will be conducted to monitor and assess the corruption risk.

40. *Fiduciary Risk at the Country Level.* Based on the Country Financial Accountability Assessment (CFAA) and Country Procurement Assessment Review (CPAR) assessments of the fiduciary risk as significant and high, no elements of the country FM systems are currently planned to be used under the project. The use of the country Public Financial Management (PFM) systems for project implementation will be considered, as the Government progresses with the PFM reforms in internal and external audits, internal control framework, accounting standards, treasury and budgeting systems. As the banking arrangements with a local commercial bank (HSBC Bank Armenia) have been found satisfactory under active projects, they will remain in place during Geothermal project implementation, unless other banks in Armenia or the State Treasury become acceptable for opening designated accounts.

D. Social

41. The project includes only TA activities and no investment operation. Therefore no negative social impacts or issues in need of particular attention are foreseen.

E. Environment

42. The project includes TA activities that. The project category is “C” as no negative or only very minor environmental impacts are expected to result from the TA activities. In any case a simple environmental management plan (EMP) will be produced to instruct staff executing the field surveys to minimize any potential environmental impacts, such as preservation of vegetation, minimizing vehicle traffic, avoiding littering and accidental pollution and restoring any disturbances due to fieldworks (e.g. small craters from explosives during seismic survey).

43. If the outputs of the TA suggest that drilling of exploratory wells is justified, then the Intergraded Safeguards Data Sheet (ISDS) will be modified to reflect the change in Environmental Assessment (EA) category (from C to B) and consequently a comprehensive EMP for the drilling works will be financed under this project. The Terms of References (TORs) for the EMP as well as the EMP itself will be disclosed in-country and in the Infoshop.

F. Safeguard policies

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

G. Policy Exceptions and Readiness

44. The project requires no Bank policy exceptions.

* *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 or Program Background

ARMENIA: GEOFUND 2: ARMENIA GEOTHERMAL PROJECT

45. Since Armenia is located in a zone of high tectonic activity and recent volcanism, several studies have been conducted to make preliminary assessment of the geothermal potential of the country in general and some sites in particular. These studies have all confirmed existence of geothermal resources in territories of the country. Development of geothermal resources will enable the reduction of the reliance on imported fuels, increase country's energy security and contribute to reduction of green house gases and other pollutants. Additionally, geothermal is the most reliable form of renewable base-load power.

46. The 1998 USAID funded study¹ confirmed that Armenia has numerous low temperature (cooler than 100°C) geothermal resource areas located mostly within the belt of Quaternary volcanism and elevated heat flow that trends northwest-southeast through the central part of the country. The location and extent of some of these resources make them suitable to be utilized for space heating, greenhouse heating, other agricultural applications and expanded recreational use. Numerous Quaternary volcanic centers are present in the studied belt and geologic mapping confirmed the continuous nature of volcanism in these areas since the Lower Pliocene or Upper Miocene time. However, the study was limited in scope and geographical coverage and warranted additional efforts to expand the identified geothermal resources base. The study also suggested the possibility of the existence of geothermal resources at distinct zones of young volcanic activity within the belt of the Aragats Mountain massif (one of the sites to be explored under this project is located in the proximity) and related subsidiary volcanic centers at the northwestern end; the Gegham Mountains trending south-southeastward along the shore of Lake Sevan (in the proximity of Yeratoumber site to be explored within this project); the East-West trending Vardenis Mountains, located south of Lake Sevan; and the Karabakh Upland, which trends southeastward into the southernmost part of Armenia.

47. A number of seismic-exploratory, gravel magnetic, electro-exploratory, geothermal and geological studies have identified the Syunik volcanic plateau located in the south-east of the country as an attractive region with its geothermal resources. The geo-physical data (high geothermal gradient and heat flow, higher level of temperature of transformation of ferromagnetic to paramagnetic, presence of high conductive zones in the Earth's crust, seismic heterogeneity of one of the high-potential sites in the southern part of Armenia) indicated that Jermakhpur site in the southern part of Armenia can be of high-potential. A reconnaissance study, financed by the Danish Government and completed in April 1998, identified the Jermakphur area in Suinik as most suitable for electricity generation², estimated to have an electricity potential of 25MW. These findings have been confirmed by the additional geophysical and geochemical investigations carried out by the Ministry of Energy in 2004.

48. The 2001 European Bank for Reconstruction and Development (EBRD) funded study³ findings suggest that a narrow zone in the central part of Armenia (where the Yeratoumber site is

¹ Roger Hanneberger, David Cooksley and John Hallberg, "Geothermal Resources of Armenia," GeothermEx, Inc., 2000.

² Yerevan Geothermal Pilot Project – Reconnaissance Study, Petroleum Geology Investigators A/S, April 1998)

³ "Renewable Energy Resource Assessment: Armenia," EBRD, 2001

located) is considered to have the best potential. The geothermal gradient here reaches 500° C/km. The maximum measured temperature in the deeply occurring reservoirs was 140° C. Geothermal reservoirs in porous rocks containing high-temperature thermal water were investigated in some places confirming the likelihood of temperatures above 100 ° C at depths of over 2.5 km.

49. The 2007 GEF financed study⁴ to identify prospective high geothermal capacity sites in Armenia confirmed the high likelihood of existence of high-potential geothermal resources on the territory of Armenia. The estimated high likelihood of the presence of high-capacity geothermal resources is justified by the pervasiveness of young volcanism, numerous outcrops of mineral waters and the activity of recent-age tectonic-magmatic processes. Additionally, there are regions with abnormally high values of geothermal gradient and heat flow density recorded in the course of the implemented geothermal investigatory works. The study concluded that high-potential heat carriers (higher than 100° C) could be found in the regions of active manifestations of the most recent volcanism such as volcanic mountain shields of Syunik and Gegham and a few sites of relatively younger volcano sites surrounding the thick volcanic massif of Aragats.

50. While several studies have been undertaken to estimate the potential of the geothermal energy development in the country, private sector interest is very limited as there have been no comprehensive site investigation works conducted yet to confirm the availability of the geothermal resource.

51. The GeoFund is a region-wide and multi-country program using the financial instrument of a horizontal APL which allows for uninterrupted project implementation through right timing that also allows time for necessary adjustments and changes in project design.

52. **Program phases:** The GeoFund is being 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 is being implemented on a project by project basis.

53. The GeoFund is a new and innovative approach to barrier removal for the utilization of geothermal energy combining several 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.

54. **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.

55. Armenia meets the following policy triggers:

⁴ Identification of Prospective High Geothermal Capacity Sites in the Republic of Armenia,” Renewable Energy and Energy Efficiency, Armenia, 2007

- The Minister of Nature Protection, the GEF focal point, endorsed the GeoFund Program.
 - The Armenian Government endorsed the National Program on Renewable Energy and Energy Efficiency, which established the country program on RE development.
56. The Project triggers below were met:
- The Armenian government committed project co-financing in a ratio of 1:5 (US\$ 300,000).
 - The project was appraised according to Bank's guidelines.
 - Armenia meets the project eligibility criteria as described below.
57. **Project Eligibility:** Armenia complies basic eligibility criteria below for receiving support from the GeoFund:
- a) Armenia is an eligible country;
 - b) The project conforms to the laws, regulations, objectives, and respective development priorities of Armenia as reflected in the Law on Energy, Law on Energy Efficiency and Renewable Energy, energy sector regulations and the Energy Sector Strategy;
 - c) The project complies with applicable social, environmental and safeguard policies of the World Bank;
 - d) The project meets the requirements set out in the Bank's Articles of Agreement and the relevant provisions of World Bank Operational Manual;
 - e) The endorsement letter from the Minister of Nature Protection, the GEF Focal Point for Armenia, was submitted.

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

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58. The project design has benefited from past projects financed by the World Bank and other donors in the country.

Sector Issue	Project	Latest Supervision Ratings for Bank-financed projects only	
		Implementation Progress (IP)	Development Objective (DO)
Increase the share of renewable energy in the generation mix through elimination of barriers to development of renewable energy	Renewable Energy Project	S	S
Enable the successful adoption and continued use of clean, efficient, safe, and affordable heating in multi-apartment buildings and schools	Urban Heating Project	S	S
Improve the measurability and accountability of the electricity and revenue flows in the energy sector, reduce technical losses, increase system availability and improve financial sustainability of the sector companies.	Electricity Transmission and Distribution Project	S	S
Non-Bank financed			
Promote development of renewable energy in Armenia, mainly targeting small hydropower	Renewable Energy Project financed by KfW	N/A	N/A

Annex 3: Results Framework and Monitoring

ARMENIA: GEOFUND 2: ARMENIA GEOTHERMAL PROJECT

Results Framework

PDO/Global Environmental Objective	Project Outcome Indicators	Use of Project Outcome Information
<p>The project development objective is to assess the feasibility of exploratory drilling of the geothermal site with the highest estimated geothermal potential.</p> <p>The global environmental objective is to remove the barriers to development of geothermal energy.</p>	Decision whether to drill or not to drill exploratory wells for the geothermal sites, based on the results of site investigation works	The outcome indicator will demonstrate whether the exploratory drilling of one or two wells is justified
Intermediate Outcomes	Intermediate Outcome Indicators	Use of Intermediate Outcome Monitoring
Geological field scouting completed	Surface geological map is produced containing fault structures, potential recharging zones, and the surface geothermal manifestations	Based on the geological scouting findings, the location and length of the MT profiles will be determined
MT study completed	Two cross sections with the visualization of the rock formation resistivity are produced; also the justification for performing 3D seismic is assessed	The findings of the MT sounding will justify the need for 3D seismic survey and will constitute the base for its location and design
3D seismic survey completed	3D images of the site subsurface structure with main fault zones and the depth, extent and thickness of permeable zones are produced; and at least 3 cross sections, of North-South orientation and 3 of East-West orientation are prepared	The interpretation of 3D survey results will identify main fault zones, the depth, extent and thickness of permeable zones, confirm identified potential geothermal aquifers, isolating layers, and the dimensions. It will allow the decision upon and determination of number and precise location of exploratory wells to verify geothermal resource potential.
Economic/financial analysis is completed	The economic and financial rates of return are assessed and sensitivity analysis conducted	The analysis will indicate whether based on the investigation works the

		geothermal site is economically and financially viable and the drilling of one or two exploratory wells is justified
--	--	--

Arrangements for results monitoring

Project Outcome Indicators	Baseline	Target Values		Data Collection and Reporting		Responsibility for Data Collection
		2009	2010	Frequency and Reports	Data Collection Instruments	
Decision whether to drill or not to drill exploratory wells for the geothermal sites, based on the results of site investigation works	--	--	"drill" or "not to drill" decision made	once	Consultants' Reports	The R2E2 Fund and the consultants
Intermediate Outcome Indicators						
Surface geological map is produced containing fault structures, potential recharging zones, and surface geothermal manifestations	--	Surface geological map is produced with proposed areas for further investigations		once	Consultant's Report	The R2E2 Fund and the consultants
Two cross sections with the visualization of the rock formation resistivity are produced; also the need for performing 3D seismic is assessed	--	Two cross sections are produced and the justification for 3D survey is assessed		once	Consultant's Report	The R2E2 Fund and the consultants
3D images of the site subsurface structure with main fault zones and the depth, extent and thickness of permeable zones are produced; and at least 3 cross sections, of N-S orientation and 3 of E-W orientation are prepared. Drilling decision is supported by results from previous investigations and number, depth and location of exploratory wells are determined.	--	3D images of the site subsurface structure are produced; and the cross sections are prepared. Justification, number, depth and precise locations of potential exploratory wells is determined.		once	Consultant's Report	The R2E2 Fund and the consultants
The economic and financial rates of return are assessed and sensitivity analysis conducted	--		The economic and financial analysis is completed	once	Consultant's Report	The R2E2 Fund and the consultants

Annex 4: Detailed Project Description

ARMENIA: GEOFUND 2: ARMENIA GEOTHERMAL PROJECT

59. The project will provide TA for comprehensive field investigation studies. The studies of the geothermal sites are structured in a way to ensure that adequate information is acquired to justify further studies or discontinue investigation works.

60. The project consists of the following components:

61. **Component 1: Technical Assistance** (US\$ 1.8 million, including GeoFund funding of US\$ 1.5 million and Government co-financing of US\$ 0.3 million) to conduct comprehensive field investigations works. This component covers the following areas:

A. Technical Investigation: The investigation works will follow a phased approach ranging from more general, scouting type investigations covering larger areas of potential geothermal fields to consecutively more precise methods focused on areas delineated to bear higher potential for geothermal resources. Under the most positive scenario the investigations would finally lead to the decision to drill test wells. The investigations shall include various methodologies and shall be executed in phases:

(1) *Geological field scouting in Gridzor and Karkar sites (US\$ 100,000)*: (a) identification and mapping of the fault structures, potential recharging zones, and to record and describe the surface geothermal manifestations like hot and mineral springs, fumaroles and zones with hydro thermally alternated rocks; (b) sampling and selected analysis of all springs and surface waters to describe the geochemical composition of waters; (c) determination of age and provenience of spring-waters; (d) development of surface geological maps containing all key geophysical, geological and other relevant indicators; (e) determination of the location and length of the Magneto-Telluric (MT) profiles;

(2) *MT sounding survey for Gridzor and Karkar sites (US\$ 400,000)*: performing at least two perpendicular profiles of MT sounding for each of the selected sites. The results of the MT sounding survey will be interpreted by an independent company to ensure relevance, reliability and objectivity of the produced geological, geophysical and other relevant data.

(3) *Interpretation of MT data for Gridzor and Karkar sites (US\$ 100,000)*: (a) producing cross sections with the visualization of the rock formation resistivity; the cross sections should contain identification of the potential geothermal aquifers and isolating layers, with their thickness and depth of their occurrence; (b) critical review of MT sounding results by a team of participating geoscientists (geologist, geophysicist, expert in MT soundings and geo(hydro)chemist). The review should allow selecting the most promising geothermal field for further development, if any.

(4) *3D seismic survey (US\$ 900,000)*: If the outcome of the MT sounding and geological field scouting warrant further investigatory work, then 3D seismic survey will be performed in form of grid of perpendicular profiles. The length of the profiles and area of the survey will result

from the MT sounding findings. The 3D seismic survey will generate the outline of the subsurface structure and the depth of potential geothermal reservoir, its thickness and size, and the presence of major fault zones. The results of the 3D seismic survey will be interpreted by an independent company.

(4) *Interpretation of 3D seismic survey results (US\$ 100,000)*: (a) producing 3D images of the subsurface structure, which will identify main fault zones and the depth, extent and thickness of permeable zones; (b) preparing at least 3 cross sections, of N-S orientation and 3 of E-W orientation that are laid out in a way to positively confirm identified potential geothermal aquifers, isolating layers, and the dimensions such as extent, thickness and depth of their occurrence.

(5) *Supervision of field works (US\$ 100,000)*: Supervision over the implementation of the scope of technical investigation field works will be by an independent consultant.

(6) *Economic and Financial Feasibility (US\$ 40,000)*: Assessment of the economic viability of the geothermal site with the highest estimated technical potential.

B. Project Implementation (US\$ 60,000): Financing of the incremental operating costs of the implementing agency, including staff salaries, costs of audits, transportation and communication, and other necessary and reasonable activities directly related to project implementation.

Annex 5: Project Costs

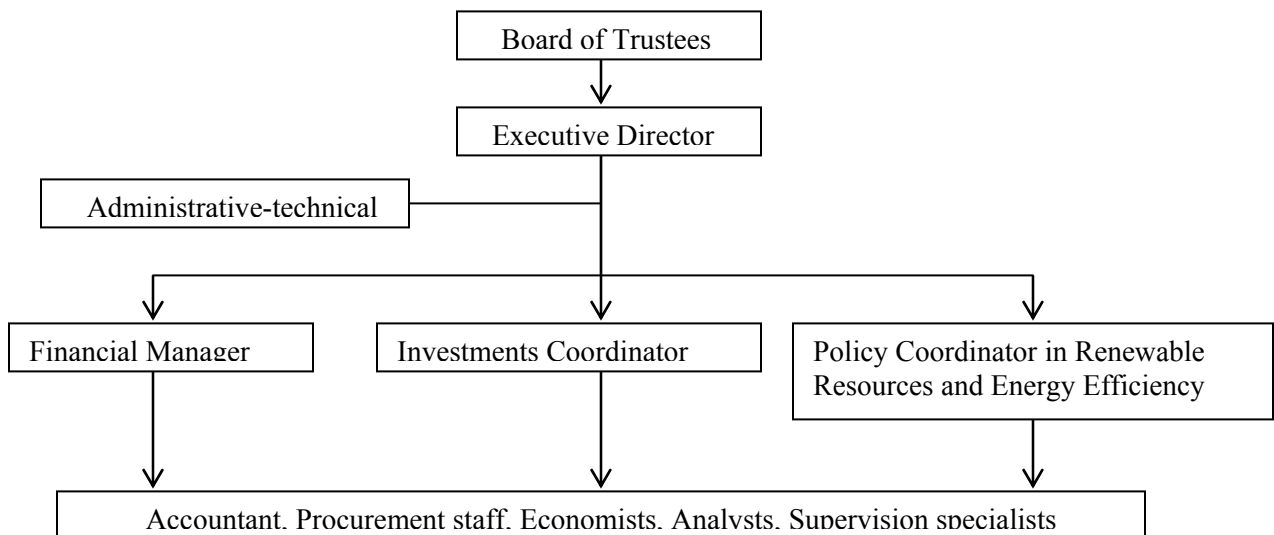
ARMENIA: GEOFUND 2: ARMENIA GEOTHERMAL PROJECT

Project Cost By Component and/or Activity	Local US \$million	Foreign US \$million	Total US \$million
1. Technical Investigation	US\$ 0.29	US\$ 1.45	US\$ 1.74
2. Project Implementation	US\$ 0.01	US\$ 0.05	US\$ 0.06
Total Baseline Cost	US\$ 0.30	US\$ 1.50	US\$ 1.80
Total Project Costs¹	US\$ 0.30	US\$ 1.50	US\$ 1.80
Total Financing Required	US\$ 0.30	US\$ 1.50	US\$ 1.80

Annex 6: Implementation Arrangements

ARMENIA: GEOFUND 2: ARMENIA GEOTHERMAL PROJECT

62. The project will be implemented by the R2E2 Fund, a revolving fund established with the objective to promote the development of renewable energy and energy efficiency markets in Armenia and facilitate investments in these sectors. The R2E2 Fund was set up as a non-commercial entity governed by the BOT and managed by a qualified management team under a director (see Figure 4 below). The overall framework for the R2E2 Fund operations is defined in the Charter, while the details of the principles and implementation rules governing the R2E2 Fund, including details on its scope of activities, financial instruments, governance structure, procurement and financial management systems are spelled out in the Operations Manual. The R2E2 Fund will undertake annual audits to ensure proper use of funds in the subprojects component.
63. The R2E2 Fund has adequate capacity to implement the project due to solid professional qualifications of its staff. Additionally, the R2E2 Fund has built up significant project implementation capacity as it is the implementing agency for the REP, UHP and the GPOBA Gas and Heating Project



Annex 7: Financial Management and Disbursement Arrangements

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64. **Country Issues:** According to the latest Doing Business Survey 2009, Armenia was the top-rated CIS country and scored well vis-à-vis many other developed and developing countries (44th out of 181). At the same time, in the latest Business Environment and Enterprise Performance Survey report, about 30 percent of businesses have indicated that corruption is a problem in doing business. A CPAR done in 2004 also concluded that based on the analysis of the legislative framework, procurement practices, institutional capacity and the opportunity for corruption, the environment for conducting public procurement in Armenia was one of high risk at that time.

65. The 2005 CFAA report concluded that the overall fiduciary risk⁵ in Armenia is significant. The key reasons are: (i) inadequate capacity of core control and supervisory agencies performing the audits within the public sector; (ii) although most of the basic laws are in place with respect to various entities' (private sector and public enterprises, including state non-commercial organizations) financial reporting, the compliance remains a problem and authorities need to improve the quality of auditing, monitoring and supervision. The ongoing Public Expenditure Financial Accountability Assessment (PEFA) assessment also demonstrates that some critical PFM elements including internal controls, internal and external audit, are still weak.

66. Based on the above assessments of the country present PFM system no elements of the country FM systems are planned to be used under the project. The use of the country PFM systems for the project implementation will be considered, as the Government progresses with the PFM reforms in internal and external audits, internal control framework, accounting standards, treasury and budgeting systems.

67. However, the fiduciary risk of the stand-alone FM arrangements for Bank-financed investment projects in Armenia is considered low. Specific procedures are developed by the project to secure proper financial accountability of this project and to minimize project FM risks. Additional FM arrangements in the project will include the audit of project financial statements by independent auditor and with term of reference acceptable to the Bank. As the banking arrangements with a local commercial bank (HSBC Bank Armenia) have been found satisfactory under active projects, they will remain in place during Geothermal project implementation, unless other banks in Armenia or the State Treasury become acceptable for opening designated/special accounts. The country risk is assessed to be moderate.

68. **Risk Assessment and Mitigation:** The overall FM risk for the project before mitigation measures is moderate and after mitigation measures, the risk is low. Although the project will be implemented in an environment of high perceived corruption, adequate mitigation measures are in place to ensure that the residual risk is acceptable. Table below summarizes the FM assessment and risk ratings of this project:

⁵ Risk of illegal, irregular or unjustified transactions not being detected, measured on a four point scale according to the CFAA Guidelines (low, moderate, significant or high).

	<i>FM Risk</i>	<i>Risk Mitigating Measures</i>	<i>Residual Risk</i>
INHERENT RISKS			
<i>Country level</i>			
Weak PFM institutions (additional information is included in country issues in the previous section)	S	R2E2 Fund is to maintain independent FM system, use of private auditors and commercial banks for DAs.	M
<i>Entity level</i>			
Risk of political interference in entity's management	M	Board composition and structure of R2E2 Fund will provide for independence of the entity.	L
<i>Project level</i>			
Project is small sized, with local commercial banks used by the Treasury for flow of Government Counterpart funds with some risk of delays in Treasury.	M	Implementation arrangements that allow close monitoring of activities under the project (including flow of funds) by the Bank.	L
OVERALL INHERENT RISK	M		L
CONTROL RISKS			
Budgeting. Good Budgeting system. Budget is prepared in much detail which is necessary for monitoring the project.	L	No additional mitigation measure required	L
Accounting. The R2E2 Fund utilizes adequate accounting software. The Fund needs to hire an experienced financial manager to fill in the vacancy.	M	Hire an experienced financial manager.	L
Internal Controls. Overall, the R2E2 Fund's Internal Control system is acceptable, while the Fund needs to hire an experienced financial manager to fill in the vacancy and improve segregation of duties.	M	Improve segregation of staff duties via recruitment of an experienced financial manager to fill in the vacancy.	L
Funds flow. Government and IDA funds will flow through commercial bank designated accounts.	L	No additional mitigation measure required	L
Financial Reporting. R2E2 Fund needs to enhance reporting arrangements, in order to ensure that there is a proper quality control procedure over preparation of accurate Financial Management Reports (FMRs). No significant issues have arisen in the audits of active projects and grants implemented by the R2E2 Fund regarding financial reporting.	M	Establish proper quality control procedure over preparation of acceptable Interim Unaudited Financial Reports (IFRs)/FMRs, particularly segregation of duties to be set up between functions of preparation of the IFRs and their review by different FM staff.	L
Auditing. The audit will be carried out by independent auditors acceptable to the Bank.	M	No additional mitigation measure required	M
OVERALL CONTROL RISK	L		L
OVERALL FM RISK	M		L

H – High

S – Substantial

M – Moderate

L – Low

69. **Strengths:** The significant strengths that provide a basis for reliance on the project FM system include: (i) adequate accounting software utilized by the R2E2 Fund, (ii) FM arrangements similar to active projects being implemented by the R2E2 Fund and found to be adequate, and (iii) no significant issues arisen in the audits of active projects being implemented by the R2E2 Fund.

70. **Weaknesses and Action Plan:** The R2E2 Fund needs to (i) improve its internal control system over contract management as well as its FM staffing, and hire an experienced financial manager to fill in the vacancy, (ii) enhance reporting arrangements, in order to ensure that there is a proper quality control procedure over preparation of acceptable FMRs, and (iii) update the Financial Management Manual (FMM) to reflect the specific activities of the new project.

71. **Implementing Entity:** The residual risk associated with the R2E2 Fund is low with low probability of external intervention to modify the structure and staff of the organization.

72. **Budgeting and Planning:** The R2E2 Fund is capable of preparing relevant budgets. The annual budget is based on procurement plan, and is prepared in much detail, which is necessary for monitoring of the project. It is classified by categories, components and sub-components, sources of funds. The risk associated with planning and budgeting is assessed as low.

73. **Accounting Staffing:** The financial department of the R2E2 Fund consists of a chief accountant, with prior extensive experience in accounting of another donor organization, a disbursement specialist, who previously worked as a bookkeeper at the predecessor Termosupply Project Implementation Unit, and a procurement specialist. The Fund recently hired a financial manager to fill in the vacant position. All the accounting staff participated in the regional joint FM and Disbursement workshop organized by WB in Yerevan in 2007. The accounting staff also is enrolled in ACCA courses. The risk associated with staffing before mitigation measures is moderate and after mitigation measures, the risk is low.

74. **Information Systems:** The R2E2 Fund uses a computerized accounting/reporting system developed on the base of 1C. The software has accounting, fixed assets, loan servicing and communities modules, and is capable of generating all statutory reports. The software automatically generates 1A and 1B forms of the FMRs. The risk associated with information systems is assessed as low.

75. **Accounting Policies and Procedures:** The accounting system of the R2E2 Fund is maintained according to Accounting Standards of Armenia (ASRA). The FMRs on the active projects were prepared and submitted on the accrual basis. It has been agreed to adopt accrual basis for the project reporting as well. The current chart of accounts is in accordance with ASRA and will be adapted to the project's requirements. The risk of accounting policies and procedures is considered as low.

76. **Internal Controls and Internal Audit:** Overall, the internal control system under the active projects was found to be satisfactory. However, the R2E2 Fund needs to improve several of its FM arrangements indicated above. All the payments made by the R2E2 Fund are formally authorized by the director and the financial manager. There is no petty cash box at the Fund, and all the payments are done via bank transfers. The requisition of office supplies is done as

follows: every quarter the Fund’s office manager collects the requisition notes from employees and submits those for the director’s approval. Upon approval and procurement of goods, financial manager with the office manger verifies the completeness of the goods procured. The payments under the contacts are made based on the acts of acceptance. Upon receipt of the invoice (or acceptance act), both the director and the financial manager authorize the payment, and the due amount under the contract is transferred to the supplier’s bank account. Considering the small size of the R2E2 Fund, no internal audit function is required neither exists. The risk associated with internal controls is considered as low.

77. **Financial Reporting:** Project management-oriented IFRs will be prepared under Geothermal project. The R2E2 Fund will produce a full set of IFRs every calendar quarter throughout the life of the project. The format of IFRs has been agreed during the assessment which includes: (a) Project Sources and Uses of Funds, (b) Uses of Funds by Project Activity, (c) Project Balance Sheet, (d) Designated Account Statements, and (e) SOE Withdrawal Schedule. These financial reports will be submitted to IDA within 45 days of the end of each quarter. The first quarterly IFRs will be submitted after the end of the first full quarter following the initial disbursement. Those requirements and IFRs formats are incorporated in the FMM. There was some inconsistency in the quality of the FMRs submitted on the active projects implemented by the R2E2 Fund and the quality control over financial reporting needs to be enhanced. The risk before mitigation measures is moderate and after those is low.

78. **External Audit:** The audit of Geothermal project will be conducted (i) by independent private auditors and on terms of reference acceptable to the Bank, and procured by the R2E2 Fund, and (ii) according to the International Standards on Auditing issued by the International Auditing and Assurance Standards Board of the International Federation of Accountants. The R2E2 Fund’s previous auditing arrangements are satisfactory to the Bank, and it has thus been agreed that similar audit arrangements will be adopted for Geothermal project, to include the Geothermal project financial statements. The sample terms of reference acceptable to the WB and to be used for the project audit was provided to the R2E2 Fund.

79. The annual audited project financial statements will be provided to the Bank within six months of the end of each fiscal year and also at the closing of the project. The contract for the audit awarded during the first year of project implementation may be extended from year-to-year with the same auditor, subject to satisfactory performance. The cost of the audit will be financed from the proceeds of the project.

The following table identifies the audit reports that will be required to be submitted by the project implementation agency together with the due date for submission.

<i>Audit Report</i>	<i>Due Date</i>
<i><u>Continuing Entity financial statements</u></i>	N/A
<i><u>Project financial statements (PFS).</u></i> The PFS include Project Balance Sheet, Sources and Uses of Funds, Uses of Funds by Project Activity, SOE Withdrawal Schedule, Designated Account Statement, and Notes to the financial statements, and Reconciliation Statement.	Within six months of the end of each fiscal year and also at the closing of the project

In addition, the Armenian Chamber of Control, the country's supreme audit institution, performs ad hoc external audits of the R2E2 Fund and the projects under its implementation. The risk associated with external audit is considered moderate.

80. **Funds Flow and Disbursement Arrangements:** To facilitate timely disbursements for eligible expenditures on services and operating costs the Borrower will open and operate, under terms and conditions acceptable to World Bank, a Designated Account in US dollars 150,000 to be maintained in the HSBC Bank Armenia. Project funds will flow from IBRD via the Designated Account or through the direct payment method. The Government funds will flow via the Treasury at the Ministry of Finance on the basis of payment requests. The risk associated with funds flow and disbursement is considered as low. The R2E2 Fund will be responsible for the appropriate accounting of the funds deposited into this account, for reporting on the use of these funds, and for ensuring that they are included in the audits of the financial statements. The R2E2 Fund will also report on the status of this account with any request for disbursement submitted to the World Bank.

81. The ceiling of the Designated Account will be US\$ 150,000. The R2E2 Fund will be responsible for submitting applications, along with appropriate documentation, showing funds utilized from the Designated Account on a quarterly basis, including detailed bank statements. Expenditures relating to the following contracts will be fully documented (i.e., invoices, etc.). Contracts under Consultant's Services for firms valued at US\$ 200,000 equivalent each or more and Consultant Services Contracts for individuals valued at US\$50,000 equivalent each or more.

Use of Statements of Expenditure (SOEs). Disbursements may be made against SOEs as follows:

Consulting contracts with firms, costing less than US\$ 200,000 equivalent each; and

Consulting contracts with individuals, costing less than US\$ 50,000 equivalent each.

82. **Supervision Plan:** As part of its project supervision missions, IDA will conduct risk-based FM supervisions, at appropriate intervals. During project implementation, the Bank will supervise the project's FM arrangements in the following ways: (a) review the project's quarterly IFRs as well as the project's annual audited financial statements and auditor's management letter and remedial actions recommended in the auditor's Management Letters; and (b) during the Bank's on-site supervision missions, review the following key areas (i) project accounting and internal control systems; (ii) budgeting and financial planning arrangements; (iii) disbursement management and financial flows, including counterpart funds, as applicable; and (iv) any incidences of corrupt practices involving project resources. As required, a Bank-accredited Financial Management Specialist will assist in the supervision process.

Annex 8: Procurement Arrangements

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83. **General:** Procurement for the proposed project will 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 revised on October 2006, and the provisions stipulated in the Legal Agreement. The various items under different expenditure categories are described in general below. For each contract to be financed by the grant, the different procurement methods or consultant selection methods, estimated costs, prior review requirements, and time frame 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.

84. **Advertisement:** A General Procurement Notice (GPN) will be published in the United Nations Development Business (UNDB) and dgMarket. The GPN will give a description of the consulting services contracts to be procured under the project and will invite all potential consultants to express interest and request additional information from the implementing agency. Expression of Interest (EOI) for consulting assignments estimated to cost US\$ 200,000 equivalent or above per contract will be published in UNDB (on-line), dgMarket and a national newspaper of broad circulation as the corresponding Request for Proposals become available. In addition, the Procurement Plan (including all formal updates), EOIs for all contracts as well as results of contract awards will be published on the external website of the R2E2 Fund.

85. The Implementing Agencies (R2E2 Fund) will follow the Bank's anti-corruption measures and will not engage services of firms and individuals debarred by the Bank. The listing of debarred firms and individuals is located at: <http://www.worldbank.org/html/opr/procure/debarr.html>.

86. Consultant Services grant (estimated to \$1.74 million) will include : (i) Geological field scouting (ii) magneto-telluric sounding study; (iii) three dimensional (3D) seismic survey of the most prospective of the two geothermal site if the outcome of the MT sounding and geological field scouting warrantee seismic survey; (iv) Interpretation of the results of the MT sounding and 3D seismic studies by an independent company to ensure relevance, reliability and objectivity of the produced geological, geophysical and other relevant data; (v) supervision over the implementation of the scope of technical investigation field works will by an independent consultant; (vi) assessment of the economic and financial viability of the geothermal site with the highest estimated technical potential. Consultant's services will include Quality and Cost Based Selections (QCBS), Consultant Qualifications (CQ), and Individual Consultants (IC). QCBS selection over US\$200,000 will be advertised in the UN Development Business on line version and dg-Market (Gateway) and in local media (one newspaper of national circulation or the official gazette) from which a short list of six firms will be established. For contracts estimated to cost less than US\$100,000, short lists may be based solely on national firms unless qualified international firms expressed interest. Contracts estimated at less than US\$200,000 will be procured following the CQ method. Individual consultants will be selected in accordance with Part V of the Consultants Guidelines.

87. After the contract signature the Recipient shall publish in the UNDB online and in dgMarket the name of consultant, price, duration, and summary scope of the contract.

88. **Operating Costs estimate to \$60,000:** The grant will finance the incremental operating costs of the R2E2 Fund to oversee and manage the grant. Operating costs will be incurred according to an annual budget satisfactory to the Bank and using the procedures described in the Project Operational Manual.

89. **Assessment of the Agency's Capacity to Implement Procurement**

90. The grant will be implemented by the R2E2 Fund that is implementing Urban Heating and Renewable Energy project.

91. An assessment of the procurement capacity of R2E2 Fund has been conducted by a Senior Procurement Specialist on June 2008 and is available in grant files. It was revealed the R2E2 Fund procurement officer has knowledge and experience to handle the procurement under the proposed grant. However, the existing load indicates that the Fund may need another procurement staff that will be dedicated for this grant and will work under the guidance of the existing procurement officer.

92. Based on the analysis of its legislative framework, the effectiveness of its regulatory institutions, the strength of its enforcement regime, the capacity of R2E2 Fund and its human resources and the risk of corruption, the assessment found that the environment for conducting procurement under the proposed project is at Medium Risk. At the completion of one year of implementation, the team will review the procurement capacity of the R2E2 Fund as well as the functioning of procurement with a view to making adjustments as necessary.

93. The grant may face the following potential risks during implementation:

- (i) The current R2E2 Fund procurement officer may lack capacity to undertake additional procurement for the proposed grant.
- (ii) The public officials, who will be involved in grant procurement as a member of technical or commercial evaluation committee are not familiar with procurement procedures, and may obstruct or delay the procurement process;
- (iii) Suitable consultants, required for the project, may not be available or interested in participating in competition required.

94. Based on the analysis made, the following actions are recommended to mitigate the above-mentioned risks.

- i. In order to ensure that the overall capacity of the R2E2 Fund to conduct procurement is built up at the same time as procurement under the grant is conducted in a timely,

economic and efficient manner; one full-time local procurement specialist with an IT/Geological field background will be recruited.

- ii. The latest version of the Bank's standard Request for Proposals (available on the website www.worldbank.org) will be used for all QCBS selection.
- iii. The R2E2 Fund procurement specialist will work with technical staff to foresee and reduce any potential delays in the procurement process. As major delay has been notified in other projects are due to delay in drafting the Terms of References.
- iv. The R2E2 Fund team will establish and maintain a database of consultants (firms and individuals, as well as an inventory of the available goods in the country).
- v. The Bank staff will review the efficiency of procurement under the Grant and the improvement in the procurement capacity of the R2E2 Fund team after one year of the grant effectiveness, and will make recommendations for further improvements as necessary.

95. **Procurement Plan:** The Recipient, at appraisal, developed a Procurement Plan for project implementation which provides the basis for the procurement methods. This plan has been agreed between the Recipient and the Bank Project Team. The Procurement Plan will be available in the project's database and on the Bank's external website. It will be updated annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

96. **Frequency of Procurement Supervision:** In addition to the procurement prior review to be carried out by the Bank staff on a regular basis, the capacity assessment report of the implementing agency has recommended supervision missions to visit the field every six months for first year to carry out ex-post review of procurement under the grant.

97. **Anticorruption Measures:** The Bank team intends to maintain customary oversight and will carry out prior review of all major contracts according to the thresholds that will be regularly reviewed and adjusted as needed in Procurement Plan. Initial set up thresholds are provided below in this Annex. The following measures will be carried out to mitigate corruption risk:

- Training of Borrower's fiduciary staff starting from the project launch and periodically thereafter customized to procedure and methods that would be required in the next 12 months period. Following the project launch will include on-the-job training during supervision missions and regional training provided by the RPM office for the countries in the region;
- Prior review: intensive and close supervision by Bank procurement accredited staff. In addition, all contract *amendments* will be subject to prior approval by the Bank;
- Post review: Bank supervision team will post review, including physical verification and site visits;

- Debarred Firms: appropriate attention will be given to the need to ensure that debarred firms or individuals are not given opportunities to compete for Bank-financed contracts;
- Complaints: all complaints by consultants will be diligently addressed and monitored in consultation with the Bank;
- Monitoring of contract awards: all contracts are required to be signed within the validity of the proposals and, in case of prior review contracts, promptly after the no objection was issued. Procurement Plan format shall include information on actual dates (of no objections and award) and will be monitored for cases of delay which will be looked at on a case-by-case basis to identify the reasons.
- Monitoring Payments: all contracts shall include bank account information. The bank account shall be in the name of the same consultant that submitted the bid and awarded the contract. Payments to local consultants shall be made in local currency only and paid to the accounts of banks located within the country.
- Timeliness of Payments: Payment to consultants will be monitored through semi-annual interim unaudited financial reports (IFRs) to ensure timely payments.

98. Details of the Procurement Arrangements Involving Consulting Services

Ref;	Description of Assignment	Estimated Cost	Selection Method	Review by Bank Prior/Post	Estimated Proposals submission Date
1	TA for Geological field works (scouting) of the two selected potential geothermal fields and Magneto-telluric (MT) sounding of the two selected potential geothermal fields	\$500,000	QCBS	Prior	October -2008
2	TA for Independent interpretation of the results of the MT sounding field works	\$100,000	CQ	Post	N/A
3.	TA for performing of three dimensional (3D) seismic survey	\$900,000	QCBS	Prior	April 2009
4.	Independent interpretation of the results of three dimensional (3D) seismic survey	\$100,000	CQ	Post	N/A
5.	Geothermal expert	\$140,000	IC	Post	N/A
6.	Incremental operating costs	\$60,000			

99. **Prior Review Thresholds:** The project procurement plan will indicate which contracts will be subject to prior or ex-post review. The following contracts will be subject to prior review:

- a. Contracts with consulting firms (\geq US\$200,000) and contracts with individual consultants estimated to cost US\$50,000 or more each; and
- b. Single source or direct contracting is also subject to prior review.

100. The remaining contracts will be subject to ex-post review. The above thresholds will be adjusted as the project implementation progresses and the R2E2 Fund acquire higher procurement capacity. Requisite changes will be reflected in updates to the procurement plan. \

Annex 9: Economic and Financial Analysis
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N/A.

Annex 10: Safeguard Policy Issues

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101. No safeguard policies are triggered by the project, as the bulk of activities will be technical assistance and the support of geological and geotechnical field investigation works with very minor environmental impact, as well as data processing and interpretation services.

102. Based on the discussions with the Borrower, local geophysical and geological specialists and a joint field trip undertaken by Armenian geologists and geophysicists as well as Bank experts it was agreed to geographically limit investigation works to the sites of Karkar and Gridzor. The project will be implemented in two phases that will correspond to the proposed sequencing of performing investigation works:

103. *Phase I* will include geological field works (scouting) and magneto-telluric (MT) sounding of the two selected potential geothermal fields. To promote quality execution of the field works the mission recommended that the interpretation of the results of the MT sounding field works be conducted by a company that is independent from the company performing MT sounding works. This ensures robustness of performed works by revealing any shortcomings of the field investigation works. The completion of Phase one should allow to assess whether further investigation works are justified and, if yes, select the most promising geothermal field for Phase two investigations.

104. *Phase II* will involve performing of three dimensional (3D) seismic survey. The 3D survey will allow sketching the outline of the subsurface structure and encompassing the depth of potential geothermal reservoir, its thickness and extent, and the presence of major fault zones. The mission recommended that the results of this survey also be interpreted by an independent company.

105. As both phases will be conducted with minimal environmental impact the safeguards category of the project according to the World Banks OP 4.01 has been determined to be “C”. The rationale supporting this category is that the project includes TA activities only that are not (yet) related to any investment operations and no negative environmental impacts are expected to result from these TA activities.

106. The prospective geothermal fields are located in pristine natural areas, thus, as a precautionary measure (despite the C classification) a simple environmental management plan (EMP) will be produced by the Borrower with assistance from the Bank team. This will provide clear guidance and instructions to field staff executing the surveys how to minimize any potential environmental impacts such as vehicle traffic, avoid littering and accidental pollution, care for and maximize preservation of vegetation and minimize disturbances to wildlife, and minimize and restore any disturbances to soils and vegetation due to fieldworks (e.g. vehicle tracks, campgrounds, small craters from explosives during seismic survey).

107. If the outputs of the TA suggest that drilling of exploratory wells is justified, then the ISDS will be modified to reflect the change in EA category (from C to B) and consequently a

comprehensive EMP for the drilling works will be financed under this project. The TORs for the EMP as well as the EMP itself will be disclosed in-country and in the Infoshop.

Annex 11: Project Preparation and Supervision
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	Planned	Actual
PCN review	May 25, 2008	June 2, 2008
Initial PID to PIC	July 15, 2008	August 26, 2008
Initial ISDS to PIC	July 15, 2008	August 26, 2008
Appraisal	July 7, 2008	August 5, 2008
Negotiations	January 2009	
GEF CEO Decisions	December 2008	
Board/RVP approval	February 2009	
Planned date of effectiveness	February 2009	
Planned date of mid-term review	N/A	
Planned closing date	December 2010	

Key institutions responsible for preparation of the project: The World Bank, Ministry of Energy and Natural Resources, Renewable Resources and Energy Efficiency Fund

Bank staff and consultants who worked on the project included:

Name	Title	Unit
Ani Balabanyan	Operations Officer (Task Team Leader)	ECSSD
Gevorg Sargsyan	Sr. Infrastructure Specialist	ECSSD
Arthur Kochnakyan	Consultant	ECSSD
Helmut Schreiber	Lead Environmental Economist	ECSSD
Kyoichi Shimazaki	Lead Financial Officer	FEU
Anarkan Akerova	Sr. Counsel	LEGEM
Arman Vatyan	Sr. Financial Management Specialist	ECSPS
Gurcharan Singh	Sr. Procurement Specialist	ECSPS
Wolfhart Pohl	Sr. Environmental Specialist	ECSSD
Heike Lingertat	ET Consultant	ECSSD
Piotry Dlugosz	Geothermal Specialist	

Bank funds expended to date on project preparation:

1. Bank resources:
2. Trust funds:
3. Total:

Estimated Approval and Supervision costs:

1. Remaining costs to approval:
2. Estimated annual supervision cost:

Annex 12: Documents in the Project File

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108. Mirijanyan, A. Identification of Prospective High Geothermal Capacity Sites in the Republic of Armenia. 2007
109. Hanneberger, Roger, et.al. Geothermal Resources of Armenia. GeothermEx, Inc., 2000.
110. Renewable Energy Resource Assessment: Armenia. EBRD. 2001
111. Minutes of the Project Concept Review Meeting.
112. Piotr Dlugosz, Wolfhart Pohl. Briefing Note on results from a mission to Armenia, July 27-31, 2008.

Annex 13: Statement of Loans and Credits
ARMENIA: GEOFUND 2: ARMENIA GEOTHERMAL PROJECT

Project ID	FY	Purpose	Original Amount in US\$ Millions				Cancel.	Undisb.	Difference between expected and actual disbursements	
			IBRD	IDA	SF	GEF			Orig.	Frm. Rev'd
P104467	2007	HLTH SYS MOD (APL2)	0.00	22.00	0.00	0.00	0.00	21.04	1.79	0.00
P099630	2007	Judicial Reform Project 2	0.00	22.50	0.00	0.00	0.00	16.95	-4.96	0.00
P094225	2007	SIF 3	0.00	25.00	0.00	0.00	0.00	9.77	-6.26	0.00
P099832	2006	AVIAN FLU - AM	0.00	6.25	0.00	0.00	0.00	3.50	2.48	0.00
P087011	2006	RUR ENT & AGRIC DEVT	0.00	20.00	0.00	0.00	0.00	6.54	-1.56	0.00
P083352	2006	RENEW ENERGY	0.00	5.00	0.00	0.00	0.00	2.43	0.27	0.00
P057880	2006	URBAN HEAT	0.00	15.00	0.00	0.00	0.00	3.66	-1.43	0.00
P087641	2005	YEREVAN WATER/WW SERVS	0.00	20.00	0.00	0.00	0.00	12.69	12.72	0.00
P060786	2004	PUB SECT MOD	0.00	10.15	0.00	0.00	0.00	6.03	5.00	0.00
P063398	2004	MUN WATER & WW	0.00	23.00	0.00	0.00	0.00	0.79	-0.74	0.00
P088499	2004	IRRIG DAM SAFETY 2	0.00	6.75	0.00	0.00	0.00	2.98	1.60	0.00
P087620	2004	SOC PROT ADMIN	0.00	5.15	0.00	0.00	0.00	1.22	0.76	0.76
P074503	2004	EDUC QUAL & RELEVANCE (APL #1)	0.00	19.00	0.00	0.00	0.00	4.77	3.52	-0.77
P073974	2004	HEALTH SYS MOD (APL #1)	0.00	19.00	0.00	0.00	0.00	4.06	3.33	2.30
P057847	2002	NAT RES MGMT	0.00	8.30	0.00	0.00	0.00	1.13	-0.76	0.00
P055022	2002	IRRIG DEVT	0.00	24.86	0.00	0.00	0.00	2.40	-5.49	-3.94
P064879	1999	IRRIG DAM SAFETY	0.00	26.60	0.00	0.00	0.00	3.65	2.65	2.74
Total:			0.00	278.56	0.00	0.00	0.00	103.61	12.92	1.09

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

FY Approval	Company	Committed				Disbursed			
		IFC				IFC			
		Loan	Equity	Quasi	Partic.	Loan	Equity	Quasi	Partic.
2002	ACBA Leasing	2.00	0.27	0.00	0.00	2.00	0.27	0.00	0.00
2004	Armeconombank	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
2000	Hotel Armenia	0.00	0.00	3.57	0.00	0.00	0.00	3.57	0.00
2004	Hotel Armenia	0.00	0.00	1.25	0.00	0.00	0.00	1.25	0.00
2006	Inecobank	3.00	1.30	0.00	0.00	3.00	0.00	0.00	0.00
2006	NAREK	5.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total portfolio:		12.20	1.57	4.82	0.00	7.00	0.27	4.82	0.00

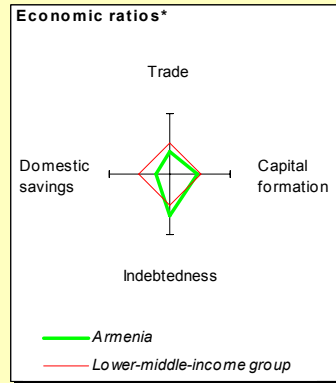
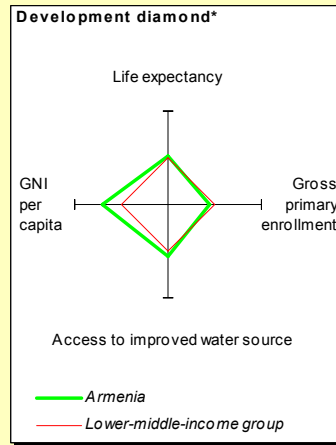
		Approvals Pending Commitment			
FY Approval	Company	Loan	Equity	Quasi	Partic.

Total pending commitment:	0.00	0.00	0.00	0.00
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Annex 14: Country at a Glance

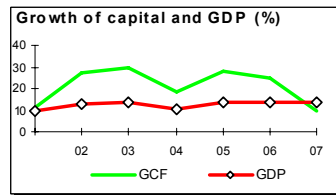
ARMENIA: GEOFUND 2: ARMENIA GEOTHERMAL PROJECT

POVERTY and SOCIAL	Armenia	Europe & Central Asia	Lower-middle-income		
	2007				
Population, mid-year (millions)	3.0	445	3,437		
GNI per capita (Atlas method, US\$)	2,640	6,052	1,887		
GNI (Atlas method, US\$ billions)	7.9	2,694	6,485		
Average annual growth, 2001-07					
Population (%)	-0.4	0.0	11		
Labor force (%)	-0.3	0.5	15		
Most recent estimate (latest year available, 2001-07)					
Poverty (% of population below national poverty line)	51		
Urban population (% of total population)	64	64	42		
Life expectancy at birth (years)	72	69	69		
Infant mortality (per 1,000 live births)	21	23	41		
Child malnutrition (% of children under 5)	4	..	25		
Access to an improved water source (% of population)	98	95	88		
Literacy (% of population age 15+)	99	97	89		
Gross primary enrollment (% of school-age population)	98	97	111		
Male	96	98	112		
Female	100	96	109		
KEY ECONOMIC RATIOS and LONG-TERM TRENDS					
	1987	1997	2006	2007	
GDP (US\$ billions)	..	16	6.4	9.2	
Gross capital formation/GDP	..	19.1	33.6	31.7	
Exports of goods and services/GDP	..	20.3	22.0	19.0	
Gross domestic savings/GDP	..	-18.9	19.2	16.9	
Gross national savings/GDP	..	0.3	31.6	29.1	
Current account balance/GDP	..	-18.7	-3.8	18.7	
Interest payments/GDP	..	0.8	0.3	..	
Total debt/GDP	..	38.9	32.5	..	
Total debt service/exports	..	5.1	7.0	..	
Present value of debt/GDP	23.0	..	
Present value of debt/exports	619	..	
	1987-97	1997-07	2006	2007	2007-11
(average annual growth)					
GDP	-6.9	10.7	13.3	13.7	7.6
GDP per capita	-5.1	11.2	13.6	14.0	7.6
Exports of goods and services	-28.4	16.5	-4.3	9.1	13.3



STRUCTURE of the ECONOMY

	1987	1997	2006	2007
(% of GDP)				
Agriculture	..	32.0	19.6	18.3
Industry	..	33.2	43.6	43.6
Manufacturing	..	24.4	16.8	15.1
Services	..	34.8	36.8	38.1
Household final consumption expenditure	..	107.7	69.5	73.8
General gov't final consumption expenditure	..	112	113	9.2
Imports of goods and services	..	58.3	36.5	33.8
	1987-97	1997-07	2006	2007
(average annual growth)				
Agriculture	-13	6.2	0.4	2.5
Industry	-15.9	13.7	18.5	11.8
Manufacturing	-8.9	6.5	-1.1	3.0
Services	7.3	11.7	19.4	24.3
Household final consumption expenditure	-3.9	6.8	14.1	16.4
General gov't final consumption expenditure	-2.0	8.7	19.8	17.4
Gross capital formation	-9.8	17.8	25.0	9.6
Imports of goods and services	-19.8	9.6	6.7	17.1



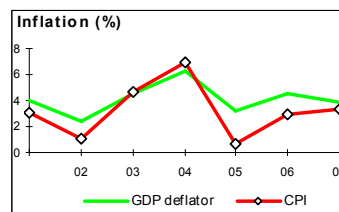
Note: 2007 data are preliminary estimates.

This table was produced from the Development Economics LDB database.

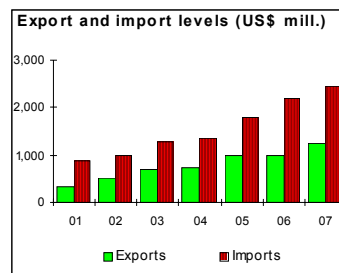
* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

PRICES and GOVERNMENT FINANCE

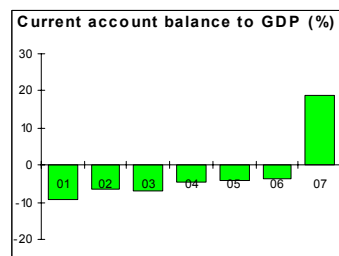
	1987	1997	2006	2007
Domestic prices				
<i>(% change)</i>				
Consumer prices	..	14.0	2.9	3.4
Implicit GDP deflator	..	17.7	4.6	3.9
Government finance				
<i>(% of GDP, includes current grants)</i>				
Current revenue	..	19.7	16.0	18.3
Current budget balance	..	-17	2.6	2.4
Overall surplus/deficit	..	-5.8	-15	-2.0

**TRADE**

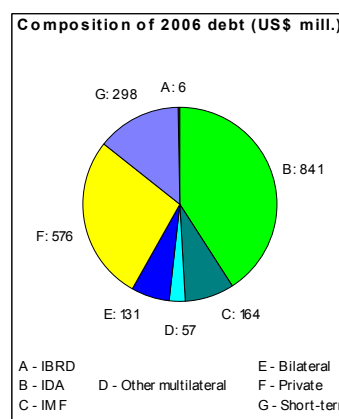
	1987	1997	2006	2007
<i>(US\$ millions)</i>				
Total exports (fob)	..	232	985	1,253
Gold, jewelry, and other precious stones	..	55	301	..
Machinery and mechanical equipment	..	32	21	..
Manufactures	..	100	310	349
Total imports (cif)	..	892	2,192	2,449
Food	..	273	341	..
Fuel and energy	..	208	351	..
Capital goods	..	118	501	647
Export price index (2000=100)	104	116
Import price index (2000=100)	122	135
Terms of trade (2000=100)	85	86

**BALANCE of PAYMENTS**

	1987	1997	2006	2007
<i>(US\$ millions)</i>				
Exports of goods and services	..	330	1407	1708
Imports of goods and services	..	953	2,328	3,032
Resource balance	..	-622	-921	792
Net income	..	99	99	104
Net current transfers	..	217	580	822
Current account balance	..	-307	-242	1,719
Financing items (net)	..	354	614	-1413
Changes in net reserves	..	-47	-372	-306
Memo:				
Reserves including gold (US\$ millions)	..	239	1072	1365
Conversion rate (DEC, local/US\$)	..	490.6	416.0	342.1

**EXTERNAL DEBT and RESOURCE FLOWS**

	1987	1997	2006	2007
<i>(US\$ millions)</i>				
Total debt outstanding and disbursed	..	638	2,073	..
IBRD	..	10	6	..
IDA	..	240	841	..
Total debt service	..	24	167	..
IBRD	..	1	1	..
IDA	..	1	13	..
Composition of net resource flows				
Official grants	..	34	56	..
Official creditors	..	100	66	..
Private creditors	..	0	108	..
Foreign direct investment (net inflows)	..	52	343	..
Portfolio equity (net inflows)	..	1	-1	..
World Bank program				
Commitments	..	107	57	..
Disbursements	..	77	64	..
Principal repayments	..	0	7	..
Net flows	..	77	57	..
Interest payments	..	2	7	..
Net transfers	..	76	50	..



Note: This table was produced from the Development Economics LDB database.

9/17/08

Annex 15: Incremental Cost Analysis

ARMENIA: GEOFUND 2: ARMENIA GEOTHERMAL PROJECT

Incremental Cost Analysis was carried out for the GeoFund program at the time of Board approval of the first tranche.

Annex 16: STAP Roster Review

ARMENIA: GEOFUND 2: ARMENIA GEOTHERMAL PROJECT

STAP review was carried out for the whole GeoFund program prior to the Board approval of the first tranche of the GeoFund program.

Annex 17: Maps

ARMENIA: GEOFUND 2: ARMENIA GEOTHERMAL PROJECT