Global Environment Facility

GEF

MOHAMED T. EL-ASHRY
CHIEF EXECUTIVE OFFICER
AND CHAIRMAN

April 7, 2000

Dear Council Member:

The World Bank, as the Implementing Agency for the project entitled, *Poland: Zakopane/Podhale Geothermal District Heating and Environment Project*, has attached the proposed project document for CEO endorsement prior to final approval of the project document in accordance with World Bank procedures.

The Secretariat has reviewed the project document. It is consistent with the proposal approved by the Council in May 1999 and the proposed project remains consistent with the Instrument and GEF policies and procedures. The attached explanation prepared by the World Bank satisfactorily details how Council's comments and those of the STAP reviewer have been addressed. I am, therefore, endorsing the project document.

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

Sincerely,

M. Hamed T. El-Ashry

Cc: Alternates, Implementing Agencies, STAP

GEF SECRETARIAT, 1818 H STREET NW, WASHINGTON, DC 20433 USA
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THE WORLD BANK/IFC/M.I.G.A.

OFFICE MEMORANDUM

DATE: March 14, 2000

TO: Mr. Mohamed El-Ashry, CEO/Chairman, GEF

FROM: Lars Vidaeus, GEF Executive Coordinator

EXTENSION: 34188

SUBJECT: ***POLAND: Zakopane/Podhale Geothermal District Heating and Environment Project***
Final Council Review/CEO Endorsement

1. Please find attached an electronic copy of the Project Document for the above-mentioned project for review by Secretariat staff, prior to circulation to Council and your final endorsement.

2. The project document is fully consistent with the objectives and scope of the proposal endorsed by Council as part of the May 1999 work program and reflects comments made during work program endorsement by GEFSEC, STAP, and Council members as follows:

Comment from GEF Council	**Response/ Comment**
Comments from Netherlands:	
Paras 1-3: (1) This project (with a duration of 9 years) aims at developing the geothermal resources in the Podhale region through the drilling of wells, the construction of a gas-fired peaking facilities and a district heating plant with distribution and service connections. Total GEF funding would amount to just over $5 million on a total investment of some US$85 million. (2) The development objective is the reduction of local air pollution caused by the existing coal-fired boilers and the associated global environmental objective is the reduction of CO2 emissions. (3) The GEF focal area is Climate Change and the project is considered to be a short-term project (page 37 of the GEF Operational Strategy). The criteria for short-term projects include: cost-effectiveness (low unit abatement cost), likelihood of success, country-driven and highest priority for national funding.	These comments on the project document submitted to the May 1999 GEF Council remain valid; no response appears to be needed. The only update based on the current version of the Project Document relates to Para 1: the total investment cost for the project is about **$81 million** rather than $85 million (see **Project Cost Table** on **pp. 7-8,** and detailed tables in **Annex 3** of the Project Document).
Para 4: The GEF cost per ton C is US$7.32	The proposal is for the GEF to pay $5.0 million for

based on a real discount rate of 11%.	carbon reductions of 730,933 tons, which represents a unit abatement cost of $6.84 per ton of carbon. These results are based on an 11.0% discount rate. As in the May 1999 submission, an additional $0.4 million is to be paid by the GEF for monitoring and evaluation of global environmental benefits, to a total GEF grant of $5.4 million. The incremental costs of carbon reduction are described in **Economic,** Section E-1 of **Summary Project Analysis,** and in **Annex 4**. The financial applications of the GEF grant are covered in **Financing Plan** and footnotes to it on **p. 2**; **Section C-1: Project Description**; **Project Cost Table** on **pp. 7-8**; Detailed Project Description on **p. 46; Annexes 3** and **5**.
Paras 5-6: (5) The proposal argues that the GEF grant could play a decisive role in assuring the financial viability of the project. The project economic internal rate of return (EIRR) without consideration of the global and domestic environmental benefits is only 8%, a value not sufficient to support the proposed World Bank loan. (6) A substantial portion (74%) of the GEF funding will be used as a subsidy to raise EIRR from 12.9 to 14.7, a level sufficient to allow World Bank approval of a loan of some 52% of total project costs. The GEF Operational Strategy and Operational programs however do not give any guidance regarding the level of economic internal rate of return deemed acceptable for GEF supported projects.	The project's economic internal rate of return (EIRR) without consideration of the global and domestic environmental benefits is 8.6%. Consideration of local environmental benefits then raises the EIRR to 11.9%, and addition of carbon benefits then increases the EIRR to 12.6% which is sufficient to support a World Bank loan. Without the GEF grant, the EIRR would be 11.9%, which is marginal for World Bank support **(Economic** - Section **E-1** of **Summary Project Analysis,** and **Annex 11, p. 98).** The comment is also correct that GEF does not specify a hurdle EIRR for projects that they support. The GEF does, however, require that sufficient financing be secured to assure project completion as a precondition of a grant agreement. Thus, the World Bank criterion for loan support becomes indirectly relevant for GEF approval. Private financing might be available, but at much higher costs which would threaten the market penetration rates that are critical to achieving the expected carbon reductions.
Para 7: The project involves a number of major risks related to the future market. The proposal suggests that these risks could be diminished through a number of activities, but it is not sure that these measures can be implemented in time. Given the criterion of likelihood of success, more attention to this subject is needed.	The comment suggests that greater attention be given to market risks and their mitigation. Risks in this project have been dramatically reduced by completion of the second doublet of geothermal wells and by elimination of the need for a fourth doublet due to the inclusion of absorption heat pumps into the project design (see Para 3 of this memo). Cost reductions from these changes translate to lower heat costs that increase the attractiveness of geothermal heat. In addition, the implementing company PEC/GP has now secured the exclusive right to negotiate for the Nowy Targ district heating supply. Also, PEC/GP has adopted a policy of only building distribution system links once sufficient heating consumers have contracted for long-term supply, which further reduces market risk. The discussion of risks and their mitigation has been expanded considerably in the current Project Document. It can be found in **Section**

	F on **Sustainability and Risks**, in the **Table** that follows, and in several other places throughout the document. Finally, an extensive set of sensitivity analyses has been completed that is most helpful in assessing the critical risk factors that influence unit abatement costs. These results are now included in **Annex 4 (p. 57-58)** of the Project Document.
Comments from France:	
Para 1: The use of low-temperature geothermal resources is an important issue from the viewpoint of both development and the global environment. The capital costs are large, as is the case with all extractive activities. Consequently, the use of incentives is justified in such projects.	The statement is appreciated; no response appears to be needed.
Para 2: The project raises the question of what level of incentives is appropriate, and what their sources should be (i.e., how they are broken down among the GEF, other international donors, the central government, and local authorities). Further consideration should be given to how these incentives are to be coordinated with conventional loan financing.	This comment asks for more detail on what level of incentives is appropriate, what sources should be used, and how incentives are to be combined with loan programs. The detailed financial modeling of the project that is now included in the Project Document answers these questions. The general principles underlying the justification of grants relate to the economic externalities. Externalities for this project include both local and global environmental benefits. Since the current market prices for fossil fuels do not reflect the full cost of their utilization, market interventions are justified to correct the resource allocation decisions being made based on underpriced fossil fuels. A further separation of interventions by source is based on the difference between local and global environmental benefits (LEBs and GEBs). LEBs accrue to the local population and should appropriately be financed by local or regional sources. Global economic benefits (defined by GEF willingness to pay) are limited to the incremental economic costs of the project. Traditional economic benefits (TEBs) can be covered by conventional project financing sources which include local loans, equity contributions, and the World Bank loan. A discussion of these benefits and their interaction is included in **Economic** - Section **E-1** of **Summary Project Analysis.** Although the match of financial resources to cover the respective benefits is not precise, these general principles have been used in defining the financial package for this project. Detailed **financial plans** are given in **Annexes 3** and **5** of the current Project Document.
Para 3: The Geotermia/Zakopane project was already submitted two years ago as part of the "Environment for Europe" process, and at that time it was considered questionable whether in	Previous submittals of this project questioned whether this project could be profitable in this location. The earlier version of the Project Document did not have the benefit of detailed financial modeling, which has

that location such a project could be profitable.	now been completed for the project. This material is now included as Annex 5 of the current Project Document. As part of the justification for the World Bank loan to the project, *pro forma* financial statements are required to show adequate financial rates of return. The FIRRs for the project are sufficient to meet World Bank criteria. It is true, as noted above, that neither the economic nor the financial rates of return for the project would be attractive if environmental benefits were not recognized (**Economic** - Section **E-1** of **Summary Project Analysis).**
Para 4: The amount of the grant seems particularly large, considering that this is an operation that, in theory, is supposed to break even, like any other commercial activity.	The proposed GEF grant of US$ 5.4 million corresponds to about $7 per ton of carbon equivalent and is well below the full incremental cost of the project (about US$8 million). Moreover, the grant is being provided in the year 2000 while the project costs have been taking place from 1995. Effectively, this further reduces the size of the GEF grant relative to the full incremental cost of the project. The overall amount of grants (including those from sources other than the GEF) is rather large indeed, but not disproportionate to the economic benefits that are not otherwise recognized in project returns from heat sales competing with underpriced fossil fuels.
Para 5: The project brings together a large number of financial partners. Their respective roles should be clarified during the project development process, and it must be ensured that the modalities can be replicated in the Polish context.	There are a large number of financial partners in the project and both the financial model and procurement plan provide clear matches between funds provided and the applications of those funds (**Financing Plan** and footnotes to it on **p. 2; Annex 6)**. While the exact financial package may not be replicated in other Polish projects, the underlying principles of justification and the modalities used to unify financial interests can be reapplied on future Polish projects.
Switzerland:	
Para 1: Project implementation at projected market penetration of the newly established district heating system in two towns allows the reduction of CO2 emissions by 70% as compared to a baseline. Additional local environmental benefits are significantly cleaner air during the winter months. Para 2: Geothermal energy is a renewable source which merits GEF support (less than 10% of total investment). Institutional arrangement and risk management strategy appears sound.	Comments are noted and appreciated. No response appears to be needed.

Changes made to the project design since Work Program entry:

3. **Optimization of technical design by adding the absorption heat pumps** (see Project Document, Section D: Project Alternatives Considered...; Secion E-3: Technical Aspects of Project Analysis, etc.). The results of technical and economic optimization done in late 1999 have shown that an economic optimum can be reached using three geothermal doublets (instead of four) if 33 MWth of heat pump capacity is added to the project design. The reduced electric pumping costs associated with 3 doublets are almost offset by the additional gas needed to drive the heat pumps. Thus, capital costs rather than operating costs are dominant in the economic assessment. The three-doublet, 33 MW heat pump solution reduces annual costs by about 3.1 percent compared to four doublets with no heat pumps. The savings in capital costs are about $1.7 million dollars while annual cost savings are approximately $133,000. Heat pumps with three doublets are preferred over the full range of possible heat pump investment costs examined. While these cost savings are not dramatic relative to the total project costs, the reduced risk in moving from 4 to 3 doublets is significant.

4. Moreover, the new technical solution has brought down the unit abatement cost to $6.84 per ton of carbon equivalent and increased the amount of carbon savings from 2.5 million tons to about 2.7 million tons of CO2 over the life of the project.

5. Please let me know if you require any additional information to complete your review of the project document prior to circulation to Council. We look forward to hearing from the Secretariat as soon as possible. Many thanks.

Attachments

The Project Document (PAD) of March 12, 2000.

Endorsement Letter of the GEF Focal Point (April 22, 1999)

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Document of
The World Bank and Global Environment Facility

Report No:

PROJECT DOCUMENT

ON A

PROPOSED LOAN IN THE AMOUNT OF US$38.2 MILLION EQUIVALENT and GLOBAL ENVIRONMENTAL FACILITY TRUST FUND GRANT

IN THE AMOUNT OF US$5.4 MILLION EQUIVALENT

TO PEC GEOTERMIA PODHALANSKA, S.A., WITH THE GUARANTEE OF THE REPUBLIC OF

POLAND

FOR A

PODHALE GEOTHERMAL DISTRICT HEATING AND ENVIRONMENT PROJECT

March 23, 2000

Energy Sector Unit
Europe and Central Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective March 1, 2000)

Currency Unit = Polish Zloty (PLN)
PLN 1= US$ 0.24
US$ 1 = 4.17

FISCAL YEAR
January 1 - - December 31

ABBREVIATIONS AND ACRONYMS

AHP	Absorption Heat Pump
(the) Bank	World Bank
CO2	Carbon dioxide
DEPA	Danish Environmental Protection Agency
DH	District Heating
EIA	Environmental Impact Assessment
EU	European Union
EU Phare	Support Program of the European Union for Central Europe
FMS	Financial Management Specialist
FSL	Fixed-Spread Loan
GCI	Global Carbon Initiative
GEB(s)	Global Environmental Benefit(s)
GEF	Global Environment Facility
GHG	Greenhouse gas
GJ	Gigajoule
g/l	Grams per liter
GOP	Government of Poland
GP	Geotermia Podhalanska
EMP	Environmental Management Plan
ICB	International Competitive Bidding
IDC	Interest During Construction
IS	International Shopping
LA	Legal Advisor
LACI	Loan Administration Change Initiative
LCS	Least-Cost Selection
LEB(s)	Local Environmental Benefit(s)
LPG	Liquefied Petroleum Gas
ug/m3	Microgram per cubic meter (a measure of ambient concentration of a pollutant in the air)
MT	Metric tons
MW	Megawatt
MWh	Megawatt-hour
MWhe	Megawatt-hour – electric
MWht	Megawatt-hour – thermal (heat-related)
NBF	Not Bank-Financed
NCB	National Competitive Bidding
NOx	Nitrogen Oxides

NS	National Shopping
NFOSGW	National Fund for Environmental Protection and Water Management
PAN	State Academy of Sciences (Krakow)
PEC	Przedsiebiorstwo Energetyki Cieplnej (District Heating Enterprise)
PEC/GP	District Heating Enterprise PEC Geotermia Podhalanska S.A.
PEC Tatry	PEC Tatry S.A. (former coal/coke based heating plant in Zakopane)
PGNiG	Polish Oil and Gas Company
PGP	Designation of wells (counting from 1: e.g. PGP 1)
PIP	Project Implementation Plan
PLN	New Polish Zloty
PMR	Project Management Report
PM10	Particulate matter less than 10 microns in diameter
QBS	Quality-Based Selection
QCBS	Quality-and Cost-Based Selection
S.A.	Spolka Akcijna (Joint Stock Company)
SA	Special Account
SECAL	Sector Adjustment Loan
SoE	Statement of Expenditure
S&I	Supply and Install (type of contract)
SO2	Sulfur dioxide
TJ	Terajoule
TSP	Total suspended particulate matter
UNFCCC	United Nations Framework Convention on Climate Change
URE	Energy Regulatory Office
US	United States (of America)
WHO	World Health Organization

Vice President:	Johannes Linn
Country Director:	Basil Kavalsky
Sector Manager:	Henk Busz
Team Leader:	Helmut Schreiber

PODHALE GEOTHERMAL DISTRICT HEATING AND ENVIRONMENT PROJECT

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POLAND

PODHALE GEOTHERMAL DISTRICT HEATING AND ENVIRONMENT PROJECT

Project Appraisal Document

Europe and Central Asia Region
ECSEG

Date: March 23, 2000	**Team Leader:** Helmut Schreiber
Country Manager/Director: Basil G. Kavalsky	**Sector Manager/Director:** Henk Busz
Project ID: P037339	**Sector(s):** PT - Thermal, PY - Other Power & Energy Conversion
Lending Instrument: Specific Investment Loan (SIL)	**Theme(s):** ENVIRONMENT; ENERGY
	Poverty Targeted Intervention: N
Global Supplemental ID: P057993	**Team Leader:** Helmut Schreiber
	Sector Manager/Director: Henk Busz
Supplement Fully Blended? Yes	**Sector(s):** VY - Other Environment

Project Financing Data

☒ Loan ☐ Credit ☒ Grant ☐ Guarantee ☐ Other (Specify)

Fixed-Spread Loan (IBRD) and Grant (GEF)

For Loans/Credits/Others:

Amount (US$m): 43.6

Proposed Terms:

Grace period (years): 4.5 **Years to maturity:** 13.5

Commitment fee: 0.85

Front end fee on Bank loan: 1.00%

Financing Plan: Source	**Local**	**Foreign**	**Total**
Government	0.00	0.00	0.00
IBRD	0.00	38.20	38.20
IDA			
AGENCY FOR INTERNATIONAL DEVELOPMENT	0.00	2.50	2.50
EUROPEAN UNION	0.00	18.20	18.20
GOVERNMENT OF DENMARK	0.00	0.60	0.60
LOCAL CONTRIBUTION	13.20	0.00	13.20
NATIONAL FUND FOR ENVIRON'L PROTECTION/WATER MGMT--POLAND	12.70	0.00	12.70
OTHER	4.60	0.00	4.60
POLISH ECOFUND	1.30	0.00	1.30
GLOBAL ENVIRONMENT FACILITY	0.00	5.40	5.40
Total:	31.80	64.90	96.70

Borrower/Recipient: PEC GEOTERMIA PODHALANSKA, S.A.

Responsible agency: PEC GEOTERMIA PODHALANSKA, S.A.

Contact information:
Address: Ul. Szymony 17a, 34-500 Zakopane, Poland
Contact Person: Mr. Piotr Dlugosz, President
Tel: +48(18) 2015041 Fax: +48(18) 2015044 Email:
Geoterm@geotermia.zakopane.top.pl
Pdlugosz@geotermia.zakopane.top.pl

Estimated disbursements (Bank FY/US$M):

FY	2001	2002	2003	2004	2005		
Annual	10.2	20.1	6.1	4.1	3.1		
Cumulative	10.2	30.3	36.4	40.5	43.6		

Project implementation period: 5 years
Expected effectiveness date: 07/31/2000 **Expected closing date:** 12/31/2004

Footnotes to the Financing Plan:

1) The proposed IBRD loan is a Euro-denominated Fixed-Spread Loan of Euro 38.3 million (US$ 38.2 million equivalent) with a final maturity of 13.5 years.
2) The financing plan shown here covers the period 1995 - 2004, including the historical contributions made by various stakeholders prior to the Bank's involvement in the project - specifically, the Polish National Fund for Environmental Protection and Water Management, the Polish EcoFund, and the European Union.
3) Of the total $5.4 million contribution of the Global Environment Facility (GEF), $5.0 million is the main GEF grant component to be received by the main executing company, PEC Geotermia Podhalanska, S.A. The remaining $0.4 million is an additional GEF contribution to cover the Monitoring and Evaluation component implemented by a different agency (to be identified).
4) The $13.2 million which appears in the category of "local contribution" represents the internally generated funds of PEC Geothermia Podhalanska plus the equity investments of the municipalities.
5) The contribution of the National Fund for Environmental Protection and Water Management includes about $9.4 million in equity investment.
6) The $4.6 million which appears in the category of "other" is the amount of local bank loans.

A. Project Development Objective

1. Project development objective: (see Annex 1)

The primary development objective of the Project is to reduce air pollution from local coal-fired space-heating boilers through increased utilization of clean energy resources such as geothermal heat and natural gas in the Podhale region of Southern Poland. This objective will be achieved by developing a geothermal district heating system with supplemental gas-fired peaking capacity to provide heat to seven municipalities of the Podhale area. This will displace individual heating systems by connecting their users to an efficient district heating system supplied by clean and renewable fuels.

Replacing polluting fuels will provide cleaner air and greater comfort for the inhabitants. Significant reductions in respiratory disease are anticipated from the decreases in emissions of particulates from coal and coke combustion. The proposed improvements will also reduce the environmental damage to the biota in the neighboring national parks and protected areas. The improved environmental quality of the Podhale area is also expected to make it more attractive for tourism.

2. Global objective: (see Annex 1)

The associated global environmental objective is to reduce CO2 emissions in order to help Poland meet its international obligations under the United Nations Framework Convention on Climate Change (UNFCCC). The reduction of greenhouse gas (GHG) emissions such as CO2 provides an additional motive for the Government of Poland to pursue the Project. It is expected that, for the whole area to be covered by the Project, CO2 emissions will be reduced by 2.7 million tons over the period from 1995 to 2024.

3. Key performance indicators: (see Annex 1)

The implementing company has prepared a set of monitoring indicators (physical/technical, operational, financial and environmental), including the key indicators which will be monitored and reported upon on a quarterly basis in the context of the Project Management Reports (PMRs). A list of monitoring indicators, acceptable to the Bank, was submitted to the Bank by the Borrower at negotiations. The indicators (see second column of Annex 1) include:

1. ambient concentrations of particulate matter and SO2 in the project area (Zakopane and Nowy Targ);
2. calculated CO2 emission reductions and cost per ton of reductions on an annual basis;
3. the number of district heating customers;
4. annual and cumulative heat delivery to customers;
5. annual and cumulative heat production, gas and electric consumption of Geotermia Podhalanska;
6. heat tariffs charged by Geotermia Podhalanska.

The final commitment to the monitoring indicators selected (including numerical targets as appropriate) will be made at the signing of the legal agreements by attaching an appropriate supplemental letter.

B. Strategic Context

1. Sector-related Country Assistance Strategy (CAS) goal supported by the project: (see Annex 1)

Document number: 16484-POL **Date of latest CAS discussion:** 04/14/97

Achieving environmental sustainability is a major development goal in the current CAS, including the issue of reducing emissions from many small, dispersed sources such as domestic heating (CAS, para 46). A geothermal energy project is specifically mentioned in the lending program formulated in the CAS (para 26). The environmental and sustainable energy sector development goals addressed by the Project are closely linked to the EU accession standards, which are also set as an important development benchmark in

the CAS. It is proposed that the Bank, in collaboration with EU-PHARE, assist Poland in planning investments that will maximize progress toward the environmental goals (set by national laws, EU directives and international agreements), and work on strengthening the capacity of municipalities to finance investments needed to carry out their environmental responsibilities (para 48). This seminal Project offers a rich blend of environmental and economic outputs and a co-financing structure that contributes directly to the CAS goals for Poland.

The Project also has a link to the CAS objective of ***sustaining private sector growth*** in needed infrastructure (para 26, 37, and Table 1, "Poland - Country Assistance Strategy Matrix, 1998 - 2000"). While the initial investments in the project have been dominated by public funding, Geotermia Podhalanska intends to use its profit margins to repurchase the stock from the public owners - especially, the National Fund.

1a. Global Operational strategy/Program objective addressed by the project:

The UNFCCC goal for Poland is to reduce CO2 emissions 6.0% from 1988 levels by 2010. Poland ratified the UNFCCC on July 28, 1994. The GEF grant to this project is a ***short-term response*** measure which means that the carbon reductions achieved will be low cost and low risk and that the National Government identifies the Project as a priority.

2. Main sector issues and Government strategy:

The Government of Poland has made much progress in ***achieving environmental sustainability***, especially in establishing short- and medium-term priorities; in preparing for the requirements of the EU environmental directives; in establishing environmental standards and a system of fining polluters; and in funding environmental projects. In the energy sector, while much progress has been made at large point sources in combating environmental pollution, the heating subsector in Poland, and in the Project area in particular, is still dominated by use of small, inefficient coal and coke boilers for heating of individual households. The resulting air pollution during the heating season has harmful effects on human health and probably constrains tourism development, the mainstay of the region’s commerce.

The Government's medium- to long-term ***energy policy and strategy*** call for energy security through cost-effective supply, at socially acceptable prices, and in an environmentally sustainable manner. These goals have been pursued consistently by the various Governments since the major economic reform of 1990 was launched in Poland. The energy policy and strategy is largely in line with the strategy of the EU for the energy sector.

The Bank has supported the reorientation of the Polish energy sector toward a market structure through a combination of policy support, technical assistance and lending operations. These were designed to assist the Government and energy sector participants to:

(a) phase out energy-related consumer subsidies as well as cross-subsidies between industrial and household energy consumers;
(b) lead toward decontrol of energy prices which should reach economic levels, and provide incentives for energy efficiency improvements;
(c) improve economic efficiency in the supply and use of energy;
(d) mobilize additional domestic and foreign private capital for investment; and
(e) address environmental issues.

As Poland enters the next phase of discussions on EU accession, these issues are becoming more urgent.

The Government established a ***program of sector reform*** with the help of the World Bank/ESMAP which

called for de-monopolization and restructuring the energy sector; commercialization and eventual privatization; decontrol of prices; and establishment of a new regulatory framework. The pricing and sector reform process has consistently moved in the right direction although some components of the reform program have been implemented faster than others.

In the ***network fuel subsectors (gas, electricity, district heat)*** average prices are increasingly reflective of economic cost. Explicit subsidies for municipal district heating tariffs were eliminated by the Government as of January 1, 1998. Cross-subsidies for small users of electricity and gas have been reduced.

The Energy Law of 1997 led to secondary legislation concerning heat, issued in 1998, and a deregulation of heat prices. Government has no longer a price control function. Instead, the Voivodship approves an energy master plan, while the Central Government's Energy Regulatory Office (URE) has the following functions: (i) give licenses to heat providers; (ii) review proposals of companies for tariff increases and either endorse them or reject them if deemed unjustified; (iii) intervene on the tariffs in response to customer complaints.

3. Sector issues to be addressed by the project and strategic choices:

The principal sector issues addressed by the Project are those of (i) environmental sustainability; (ii) cost-covering tariff setting in the district heating subsector; and (iii) seeking substantial involvement of the private sector.

Internalization of the environmental benefits of clean technologies is one of the key issues of energy pricing policy currently on the agenda in Poland. This Project provides an example of how this can be achieved when grant financing is available to cover both local and global environmental externatilites.

The project entity is committed to full financial sustainability and will pursue a tariff level and structure sufficient to cover economic costs. At the same time, the Project has to compete against suppliers of other types of fuels including natural gas, fuel oil, and clean coal. The tariffs set for geothermal heat will reflect economic costs once environmental benefits are credited. The Bank expects that the heat supply tariffs will include a specified rate of return on investment.

The Project demonstrates the mobilization of resources, and acceptance of responsibilities, by local jurisdictions for the promotion of clean energy. The Government encourages development and/or expansion of district heating on the basis of clean fuels (gas, geothermal, biomass etc.) with assistance from the National Fund for Environmental Protection and Water Management, a major contributor to the Project since 1995.

C. Project Description Summary

1. Project components (see Annex 2 for a detailed description and Annex 3 for a detailed cost breakdown):

Project Background

The initial phases of the Project aimed to exploit the geothermal reservoir in Podhale started in 1993. In 1993 - 1995, a pilot plant was constructed on the basis of the first geothermal doublet, which had been constructed under an earlier Government-funded initiative by the Polish Academy of Sciences. The first geothermal heat supply to the village of Banska Nizna started in 1995. The Bank's active involvement in the project started in 1995, when the second phase of the Project began. Geothermal heat supply to the village of Bialy Dunajec started in 1998.

Progress with customer connections to the geothermal heat network has been at the center of the Bank's assessment of this Project since the very beginning of its involvement. The current estimate is that ***about 400 TJ or nearly 33% of the ultimate target load can be considered secure*** at the time of the Bank's commitment to the Project (see Annex 2 for details).

The ***completed*** components of the second phase currently include: (i) second geothermal doublet, except the additional reinjection well as shown in the diagram below; (ii) geothermal base-load plant in Banska Nizna, currently at 15 MWt of heat-exchanger capacity and 28 - 32 MWt geothermal flow capacity based on the existing geothermal flow of 670 m3/h; (iii) 3.5 km out of 14.0 km of DH transmission line between the base-load plant and Zakopane; (iv) expansion of the DH distribution network of Bialy Dunajec and conversion to heat-exchangers of 27 households there; (v) 22 MWt gas-fired peak-shaving plant in Zakopane; (vi) conversion of ten coal-fired DH boilers in Zakopane to heat exchangers connected to the new DH network; and (vii) connection of 16 commercial customers out of the planned 172 in Zakopane and the villages, with 29 more to be connected by the end of 1999.

However, the available connections in Zakopane to the new DH network are currently receiving heat from the gas-fired peaking plant instead of geothermal heat because funds have not been available to connect Zakopane to the existing geothermal wells.

The geothermal wells completed and proposed:

	Doublet 1 (1993-1995)	Doublet 2 (1996-2000)	Doublet 3 (2000-2001)
Production	*	*	*
Reinjection	*	* *	*

Key:

* - completed wells (*note*: the completed wells are not considered part of the Project to be financed by the Bank);

* - wells to be drilled under the proposed Project.

The Project in its complete form will provide district heat to a majority of potential customers in the main Podhale Valley. The service area will extend about 14 km from the production wells to the City of Zakopane and about 7 km in the opposite direction from the well field to Nowy Targ (see map in Annex 12). The transmission line between the geothermal wells and Zakopane will be completed. In addition to the villages of Banska Nizna and Bialy Dunajec already receiving geothermal heat, the villages Poronin and Szaflary will be connected in 2000, and Koscielisko in 2002. Three district heating boiler houses in Nowy Targ will be connected in 2002. The main components of the entire Project (including the completed components as indicated above) are:

A. Production and Transmission of Heat, including:

- drilling seven geothermal wells (of which four wells are already completed) - three for production and four for reinjection. The production wells will extract low-enthalpy (~ 85 to 87.5° C temperature) geothermal waters in the Podhale basin to cover the base-load heat demand for the entire project service area;
- constructing a base-load geothermal district heating plant with a capacity of approximately 38 to 43 MWt (currently, at 15MWt heat exchanger capacity and 28 to 32 MWt geothermal resource capacity) delivering 1,015 TJ/year of geothermal heat;
- constructing an absorption heat pump plant with two associated gas-fired hot water boilers and a gas network pressure reduction station; with a total capacity of 33 MW, the plant will deliver 355 TJ/year of heat - 60% produced by gas firing and 40% by extracting additional heat from geothermal water;
- constructing a 48 MWt peak-load natural gas plant in Zakopane (currently at 22 MWt) and a similar plant in Nowy Targ (planned at 14 MWt) for a combined production of about 73 TJ/year of heat;
- expanding the existing district heating infrastructure in the Podhale area by building about 20 km of new pipelines for the transmission of hot water, constructing two gas transmission pipelines, electric connections, and pumping stations.
- small-scale acquisition of land for new drilling sites, constructing new buildings and expanding existing buildings for the production facilities.

B. Heat Distribution Network Development - constructing a new heat distribution network (about 80 km) for the Podhale area and connecting customers to this network.

C. Installation of Heat Exchangers and Meters in individual households and other buildings; this component also includes provision of miscellaneous tools and vehicles for the implementing company.

D. The Project Management component is aimed at institutional strengthening of PEC/GP, with an emphasis on the provision of technical consultant services and specialized services such as financial management and auditing.

E. The Monitoring and Evaluation component is aimed at monitoring and evaluating (M&E) the global environmental benefits from the Project. This will be based on a monitoring and evaluation protocol for carbon reduction projects developed with the assistance of the GEF. The objective is to make a credible assessment of carbon reductions, which in turn would help establish the potential for a broader introduction of geothermal district heating in Poland and elsewhere in Central and Eastern Europe.

The estimated costs by component are summarized in the table below:

Component	Sector	Indicative Costs (US$M)	% of Total	GEF financing (US$M)	Bank-financing (US$M)	% of Bank-financing
A. Production and Transmission of Heat	Other Power & Energy Conversion	43.20	49.2	3.63	17.96	47.0
B. Heat Distribution	Distribution & Transmission	24.30	27.7	1.37	12.81	33.5
C. Provision of Heat Exchangers, Meters, Other Goods	Other Power & Energy Conversion	4.60	5.2	0.00	1.60	4.2

D. Project Management	Institutional Development	0.45	0.5	0.00	0.40	1.0
E. Monitoring and Evaluation	Institutional Development	0.40	0.5	0.40	0.00	0.0
Physical contingencies		6.00	6.8	0.00	0.00	0.0
Price contingencies		2.60	3.0	0.00	0.00	0.0
Total Project Costs		81.55	93.0	5.40	32.77	85.8
Interest during construction		5.80	6.6	0.00	5.05	13.2
Front-end fee		0.38	0.4	0.00	0.38	1.0
Total Financing Required		87.73	100.0	5.40	38.20	100.0

Notes:

1) The template above does not allow for an entry of incremental working capital, which for the overall Project is estimated at about US$ 9.0 million, bringing the total financing required to about US$ 96.7 million (see Financing Plan on Page 1 and Annex 3).

2) The cost of US$ 5.8 under "Interest during construction" includes a guarantee fee charged by the Government of Poland in the amount of 2% of the loan.

2. Key policy and institutional reforms supported by the project:

The Project would contribute to better policy formulation in the following two areas:

First, the recognition of the role of local and global environmental benefits in justifying and financing the Project is an important precedent of internalization of such externalities in project selection (see more on this in Summary Analysis, Section E-1). The tie between grant funding and environmental accomplishment is an important enabling element that could materially impact the planning process for other projects in Poland and throughout Eastern Europe. This should be emphasized and considered by Polish policy makers as a possible model for new planning guidelines. The demonstration effect of commercial-scale introduction of geothermal energy made possible through such internalization may have a tangible impact on decisions made to support renewable energy development. The success of the Project should generate confidence in similar renewable energy projects considered by local authorities in Poland and elsewhere in Eastern Europe.

The second area relates to the demonstration effect from the gradual reduction of governmental shareholding in Geotermia Podhalanska, as now represented by the National Fund. Both PEC/GP and the National Fund favor repurchase of the shares by PEC/GP out of the company's operating income before any dividends are paid. PEC/GP is expecting to operate on a commercial basis without need for any subsidies as long as the heat tariffs cover the costs. Hence, the company will gradually transfer to private ownership as National Fund shares are repurchased. This will make PEC/GP much more "private" than most district heating companies in Poland, which will ensure greater autonomy for the company and possibly attract additional private investment. In addition, at mid-term review of Project implementation, the Bank and the Borrower will discuss the progress made regarding privatization, and the Borrower will undertake a study to develop a privatization strategy as needed.

3. Benefits and target population:

Four major groups will benefit from the Project. More than 4,200 individual households are expected to convert to geothermal energy for home heating. Their choices will reflect their desires for cleaner and more comfortable heat that requires less labor than handling coal. They will also avoid any replacement investments for new boilers for the next twenty years. Finally, they will avoid the use of high-cost electricity for summer water heating when their coal or coke boilers are not operating. Similarly, 172 larger loads are expected to convert for similar reasons. Most of the thirty-four boiler houses that were previously operated by Tatry but are now part of the merged Geotermia Podhalanska company will be converted to geothermal heat to improve efficiency, reduce labor requirements, and substantially reduce emissions. Nowy Targ is expected to convert three boiler houses to geothermal heat for both environmental and economic reasons.

Savings in fuel costs to each of the four groups reflect both the avoided purchase costs at the source and the avoided transport costs. The coal and coke for this area are generally transported to Podhale by train from sources about 200 km away. Local distribution is by truck.

The substitution of geothermal energy, distributed via district heating, for less benign fuels in households and commercial establishments will significantly improve the local air quality in winter. This major benefit will accrue to the residents of the Podhale area as well as to visitors to the area. The ski resort areas and surrounding tourist facilities are likely to gain from the Project as well - in terms of increased revenues due to the improved environmental conditions in the Podhale area.

Significant health benefits will accrue to the communities where large quantities of coal and coke are currently used for space heating. The main target populations live in the municipalities of Zakopane, Nowy Targ, Koscielisko, Szaflary, Banska, Bialy Dunajec and Poronin. It is expected that, over the course of the project, the annual mean concentrations of particulates in Zakopane will drop from the present level of about 65 ug/m3 to as little as 30 ug/m3 (see graph in Annex 11). The change will be especially dramatic during the heating season, when the concentration of TSP will be reduced by more than 2/3 - from the present level of almost 100 ug/m3 to about 30 ug/m3, close to the level currently observed in the summer time.

Benefits	Measured in Terms of:	Target Population
Cost savings; cleaner and more comfortable heat	• Improved efficiency • Reduced labor, fuel costs and other operating costs • Deferred capital investments	• 4,243 households in Zakopane and the villages • 172 large customers in Zakopane and the villages • Customers of former DH company in Zakopane (Tatry) • Customers of DH company in Nowy Targ
Improved air quality and improved health as a result	Reduced local concentrations of air pollutants, mainly TSP/PM10	• All residents living in seven municipalities, but especially in Zakopane and Nowy Targ • Tourists in the Podhale region

Global benefits	Reduced CO2 emissions	Global community
Demonstration of geothermal energy	Commercially and economically viable geothermal project	Poland and elsewhere in Central and Eastern Europe

Since the assessment of the Project is based on the comparison with a baseline scenario which also assumes significant environmental improvement (largely based on the assumed conversion to gas), it is important to estimate the environmental benefits of choosing the proposed Project in comparison with the baseline. Based on this approach, the Project is expected to reduce annual average concentrations of particulate matter in Zakopane by 7.8 - 14.3 ug/m3, which would result in local environmental benefits (LEBs) of about US$ 8.5 million (the net present value of the local environmental benefits achieved over the period from 1995 to 2024 discounted at 12% per year). Combined with the environmental benefits to areas outside Zakopane, the total LEBs from the Project are expected to be about US$ 14.5 million.

The substantial reduction in CO2 emissions resulting from the Project represents a global benefit and contributes to the climate change mitigation measures undertaken world-wide. Over the life of the geothermal plant the Project will prevent 2.7 million tons of CO2 from entering the atmosphere. The positive externality accruing to the global environment, if estimated at US$10.00 per ton of carbon (US$2.73 per ton of CO2) , would represent a global benefit of US$ 7.4 million.

The indirect benefit of demonstration of the commercial-scale and economically viable utilization of geothermal energy accrues to the entire country and the region.

4. Institutional and implementation arrangements:

The Project will be implemented by PEC Geotermia Podhalanska, S.A. (PEC/GP). PEC/GP was founded in mid-1998 as a result of a merger between Geotermia Podhalanska (GP) and the Tatry district heating company of Zakopane. Geotermia Podhalanska (GP) has been in operation as a corporation since 1994. After the merger, it is still a small company with a simple organization, only about 70 employees and a three-member Management Board. Existing departments within PEC/GP will carry out Project management. There will be no formally established PIU or Project Management Group.

As of July 1, 1998, PEC/GP is governed by a supervisory board consisting of six representatives drawn from the National Fund (3), the Municipality of Zakopane (2), and Hydrotrest (1). The Company is managed by the Management Board, consisting of the President, and two Vice Presidents.

The company's majority owner is the Polish National Fund for Environmental Protection and Water Management. The present ownership of PEC/GP is shown in the table below.

Shareholders	Shares	Percent
Bukowina Tatrzanska Municipality	496	0.2
Zakopane Municipality	38,068	12.7
Poronin Municipality	842	0.3
Koscielisko Municipality	619	0.2

Szaflary Municipality	993	0.3
Bialy Dunajec	794	0.3
National Fund	237,308	78.9
Hydrotest, S.A	9,936	3.3
PKL-PKP (Private Ski Lift Company)	1,490	0.5
Nowy Targ Municipality	993	0.3
Other Shareholders	9,170	3.0
TOTAL	300,709	100.0

The major milestones in Project implementation are described in Section C-1 and in Annex 2. A detailed Project Implementation Plan, developed jointly by the staff of PEC/GP and Bank staff, is available in the Project File.

Financial Management

Disbursement and Funds Flow: The financial management review shows that PEC/GP's financial management system is not yet ready for PMR-based disbursement. The Loan Agreement therefore allows for initial disbursement based on traditional disbursement methods with a timetable for moving to PMR-based disbursement at the mutual agreement of the Borrower and the Bank. It was agreed that the internal control procedures will be designed to cover both of these disbursement methods.

Accounting Procedures and Internal Control: For the most part, PEC/GP has sound accounting practices. However, most of the accounting procedures and routines are not documented and it was therefore agreed that an Operating Manual covering financial management, procurement and disbursement would be prepared. The financial management and disbursement sections will be given the highest priority and will be submitted for review by the Bank in good time before the Loan documents are passed on to the Board for approval (see Annex 6).

Accounting Systems: PEC/GP is currently using the accounting software Unisoft. This software does not have multi-currency capability and cannot therefore be used for statements in foreign currencies. Further, the reporting module has never been installed and it was therefore agreed that the LAN version of Fox Pro would be used for reporting from the accounting system. Fox Pro is able to produce all PMR-based reports (including reports in foreign currencies) in accordance with the Bank's format. Fox Pro's interface must be adapted to existing financial, planning, and technical software. PEC/GP will use consultants for this work. The deficiencies of the present version of Unisoft will be rectified in the new version, expected in September 2000. It was agreed that PEC/GP shall upgrade with this new version as soon as it is ready for commercial use. It is anticipated that the company will be ready for PMR-based disbursement at the beginning of 2001.

Staffing: PEC/GP's financial management organization system and procedures are simple. The financial director, one of the Vice-Presidents of the Managing Board, heads the financial and economic division, which has four accountants, including the chief accountant, and two part-timers for billing and economic issues. Staffing is on the low side and there is little capacity to free staff for training. The Project will

further increase the workload, and it will be necessary to employ at least one project accountant. It was agreed that this person would be in place in time to assist the financial management consultant.

Financial Reporting and Auditing Arrangements: PEC/GP's financial statements are to be prepared both in accordance with International Accounting Standards and Polish Accounting Law. The Project Financial Statements are to be prepared in accordance with the format provided by the Bank. Both the company and project statements will be audited by an independent auditor acceptable to the Bank, and the audit report will be submitted to the Bank within four months after the end of the fiscal year. The auditor for the period 2000 - 2004 will be financed from the Loan. The selection of this auditor shall be in accordance with the Bank's procurement guidelines, and to ensure continuity the appointment shall preferably be for the whole project period. The auditor must be appointed before October 1, 2000.

Project Reporting Arrangements: The quarterly Project Management Reports (PMRs) are to be submitted to the Bank within 45 days of the end of each quarter. When PMR-based disbursement is used, the PMR forms the basis for the advancement of funds to the Special Account. The PMR includes the following: (a) Financial Report (project sources and uses of funds, uses of funds by special activity, project balance sheet, project cash withdrawals, Special Account statement, project cash forecast); (b) Project Progress Report (output monitoring reports for contract management and unit of output by project activity); and (c) Procurement Management Report (procurement process monitoring for goods and works and consultants' services, contract expenditure reports for goods and works and consultants' services).

The operating and capital expenditure budgets for PEC/GP are to be included in the Progress Report for the third quarter together with the Project Annual Budget submitted for Bank approval. Financial progress reports on company performance are to be submitted on a semi-annual basis as part of the Progress Reports for the second and fourth quarters, and actual results will be compared with Plans and Budgets.

Market penetration strategy

A detailed market penetration study, conducted both from the economic and financial perspectives, assumes that 60% of the eligible households and 80% of the commercial large loads will convert to the district heating system operated by PEC/GP by the end of the Project period. It is estimated that the total cost of conversion to geothermal heat (consisting largely of the cost of in-house/on-site heat exchangers), to be borne by 4,243 households and 172 commercial large loads, will amount to about $13.5 million.

The original Project planning included a complicated tariff incentive scheme to stimulate conversions and to assist with conversion investments. However, given the increasing availability of financing from other sources, it has been decided to keep these expenditures outside the Bank Loan. Thus, the conversion costs are not included in the Project financing plan or cost tables, except for selected connection and heat exchanger costs of about $4.6 million (Section C-1 and Annex 3). These represent the connection costs for the district heating systems in Zakopane and Nowy Targ, as well as part of the costs of large load connections, and the cost of heat meters. In the economic calculations (Section E-1 and Annex 4), the full connection costs are accounted for.

For households and large loads, numerous sources are available to finance conversions to clean fuels. The Voivodship Fund for Environmental Protection offers loans and grants to loads larger than 50kW. For public institutions, the fund offers 50% grant on total investment and the rest must be from the customer's own sources; alternatively, a public customers can receive from the fund a soft loan at 7% for 7 years. For private properties, soft loans are offered. The BOS Bank, which is 40% owned by the National Fund, offers loans at 3 years for 12% or 4% above the inflation rate to any credit-worthy customer for heating

conversions. Those loan terms are quite attractive in Poland at this time since the inflation rate is about 8.0%.

Also, Geotermia Podhalanska has received some heat exchangers from a PHARE grant for both households and large loads that they are providing under two programs to consumers. The consumer can purchase the heat exchanger directly and pay a normal tariff. Alternatively, they can pay for the heat exchanger over ten years through an add-on to the normal tariff.

Finally, the EcoFund has offered Geotermia an additional 10 million PLN (about $2.5 million) as a grant to be used for conversions. This is expected to be used as a contingent risk management tool to stimulate conversions if market penetrations fall below targets.

D. Project Rationale

1. Project alternatives considered and reasons for rejection:

The fundamental rationale for the choice of geothermal energy development in Podhale is the availability of an economically exploitable geothermal reservoir, combined with an auspicious local geomorphology facilitating the natural recharge of the reservoir and creating a sufficient positive pressure at the point of extraction of geothermal water.

Alternative heat supply projects in the absence of the proposed Project would vary for different portions of the proposed geothermal Project service area. The first competitive alternative to be considered for Zakopane would be the development of a district heating system based on **natural gas.**

However, after consideration of gas versus geothermal district heating development, the City of Zakopane has given an exclusive franchise to geothermal heating in the area served by the proposed Project in Zakopane. For the most part, the areas selected for geothermal have the highest heat densities. Some of the area has also been historically supplied with district heating from the Tatry boiler houses. The project does include continued gas-firing of a few Tatry boiler houses that were recently converted from coal. In addition, gas is used for peaking and for heat pumps used to extract additional heat from the geothermal water.

In Nowy Targ, the district heating company has been tendering to see if gas conversion, continued coal use or geothermal would provide them with the most economic and environmentally acceptable heat source. After deliberations with the City of Nowy Targ, the company recently canceled the tender and announced that it is only negotiating with PEC/GP for supply to its three boiler houses. A decision by Nowy Targ is anticipated prior to the Bank loan effectiveness.

In the areas lying between Zakopane and Nowy Targ, the linear development pattern has resulted in heat densities that have been considered too low to support the development of district heating or natural gas networks. Reasonable alternatives to geothermal heat there (apart from continued use of existing fuels) would be conversion to expensive light fuel oil or LPG rather than natural gas network extensions. However, with both Zakopane and Nowy Targ committed to develop geothermal district heating systems, these areas can be supplied with geothermal heat from the main geothermal transmission line connecting Zakopane and Nowy Targ. The incremental cost of this option is much lower than that of any other alternative.

Secondly, **centralized gas-fired cogeneration** has also been considered. However, cogeneration in Poland

(especially small cogeneration) is not currently attractive because the buy-back rates for electricity are not specified, and it is difficult to get an adequate rate to support the incremental investment.

Within the scope of the geothermal solution, several alternatives have been considered to optimize the proposed Project, including:

- Various project scales to supply heat in alternative service areas;
- Alternative combinations of base-load geothermal resources, gas-fired heat pumps, and gas-fired peaking boilers to select the optimum capacity mix;
- Direct discharge of geothermal waters to area streams after heat extraction in lieu of reinjection;
- Addition of cogeneration capability to the peaking plants to supply some of the electricity needed for pumping.

Economic calculations have been the basis for selection of the preferred alternative in each of these cases except for the direct discharge alternative. The proposed plan has been selected over the alternatives because of superior economic results. Additional gas will be required for the heat pumps, but less electricity will be needed for pumping (see section E-3 for details). The decision to incorporate the absorption heat pumps in lieu of additional geothermal drilling not only reduces incremental costs but also serves to reduce the risk of disappointing geothermal drilling results.

The extension of the peak-load plant capacity to cogenerate electricity could be considered after the proposed Project is implemented. This relatively small project refinement could be added in the future if and when grid electric supply becomes expensive enough to justify the investment and when Geotermia Podhalanska begins to generate enough surplus to finance this addition from internal funds. It is less risky at this time to avoid additional investment until the cash flow is established.

The direct discharge alternative was dismissed because the salinity of the geothermal water, while much lower than for most geothermal projects, is above the standard allowed by Polish regulations for discharge to area streams (see Section E-6 for salinity data).

Baseline Scenario (no Project)

Because of the specific geographic orientation of the existing heat supplies and the main loads to be served, it is unlikely that integrated alternative projects covering the whole area would be considered in the absence of the proposed Project. However, the local interest in environmental improvement reinforced by increasingly stringent regulations on boiler replacement technologies suggests that the base case for comparison with the proposed project will not be a simple continuation of existing fuel combustion. Rather, a sizable shift to gas and fuel oil is anticipated if the geothermal project were not implemented.

Similarly to the project alternatives considered (see above), the baseline differs by geographic area. In the existing district heating area of Zakopane, the baseline assumes conversion of all existing coal-fired boiler houses to gas. In the other areas of Zakopane, the baseline for individual houses assumes conversions from coal and coke to oil and gas. Given the absence of specific plans for expansion of the gas network and the high costs of that option, oil has been selected as the most common new fuel. Some gas conversions are likely as areas now served by the existing gas network add some customers. In rural areas, no gas will be available because the load density is too low to support network expansion. In Nowy Targ, the key consideration affecting the baseline assumptions is the choice of fuel for three district heating boilers. The assumption currently adopted for the analysis is that the Nowy Targ boilers would remain on coal using cleaner technology which complies with the more stringent environmental regulations.

The geothermal system does not preclude the other alternatives with the possible exception of natural gas. Based on detailed cost comparisons and market survey results, the following assumptions have been used to define the base case (see also Annex 4 on Incremental Cost Analysis):

1. In Zakopane, all of the former Tatry boiler houses would be converted to gas by the end of 2003.

2. In Zakopane, the fuel shares for the 2,094 households that are expected to convert to geothermal would change as follows in the next decade:

Fuel	1998 Share (%)	2008 Share (%)
Coal	24.0	8.0
Coke	64.0	25.0
Oil	2.0	55.0
Gas	1.0	10.0
Other	9.0	2.0
Total	100.0	100.0

3. In Zakopane, the fuel shares for the 166 large loads that are expected to convert to geothermal would change as follows if geothermal were not available:

Fuel	1998 Share (%)	2008 Share (%)
Coal	5.0	0.6
Coke	82.9	22.9
Oil	7.9	64.4
Gas	0.8	10.6
Other (Electric)	3.3	1.7
Total	100.0	100.0

These fuel shares do not include efficiency adjustments for combustion of the different fuels.

4. Outside Zakopane and Nowy Targ, the expected alternative to geothermal would be continued use of existing fuels. Gas network expansion would not be economic in these sparsely occupied areas. The high cost of fuel oil and LPG, lower incomes in the smaller villages, and decreased exposure to severe air pollution suggest that fuels would not change in these areas without geothermal energy.

5. For Nowy Targ, definition of the base case depends on the assumptions regarding the outcome of competition between the coal and gas interests. The investment required for fully compliant coal technology (e.g., fluidized bed combustion) could be at least as high as for gas. It is anticipated that gas alternatives could be competitive with compliant coal combustion. However, considering the past reliance in Nowy Targ on coal and the power of the coal interests in the city, as well as the sense of uncertainty about the price of imported gas, the economic analyses reported here assume that Nowy Targ district heating system would remain coal-fired if geothermal was not chosen. A sensitivity analysis is presented in Annex 4 to show the impact on unit abatement costs if gas were the baseline choice.

2. Major related projects financed by the Bank and/or other development agencies (completed,

ongoing and planned).

Sector Issue	Project	Latest Supervision (PSR) Ratings (Bank-financed projects only)	
		Implementation Progress (IP)	Development Objective (DO)
Bank-financed			
Improved efficiency of district heat systems and reduction of heat losses	Heat Supply Projects:		
	- Gdansk	HS	HS
	- Gdynia	S	HS
	- Krakow	HS	HS
	- Katowice	S	S
	- Warsaw	S	S
Energy efficiency, greenhouse gas reduction	Coal to Gas Conversion Project	S	S
Hard coal sector restructuring	Hard Coal SECAL	S	S
Efficiency of power transmission and link with West-European power grid	Power Transmission Project	S	S
Energy efficiency and reduction of local pollution and GHG	Krakow Energy Efficiency Project (planned)		
Other development agencies			
As above and desire to develop non-polluting geothermal energy	Pyrzyce		

IP/DO Ratings: HS (Highly Satisfactory), S (Satisfactory), U (Unsatisfactory), HU (Highly Unsatisfactory)

In addition, the Geothermal project in Lithuania is a noteworthy example of introduction of low-enthalpy geothermal energy in the region. The first conclusions as to the success of the project may become possible by April 2000, when the geothermal plant is expected to start supplying heat to the city of Klaipeda.

3. Lessons learned and reflected in the project design:

Geothermal projects are capital intensive with large investment costs up-front that are difficult to predict accurately due to the uncertainties of drilling costs and reservoir yields. Thus, while the drilling costs and well yields to date have been better than anticipated, the current plan for completion of the Project envisages a reduced need for geothermal resources by incorporating gas-fired absorption heat pumps into the project design.

Because of the large investment needs, financial viability depends critically on the tariff level and rate of market penetration achieved. The merger with Tatry has assured conversion of 28 boiler houses serving the Zakopane district heating system. Intensive market analyses have been used to tailor proposals to 172 large loads and to develop realistic estimates of the share of the household market that can be reasonably expected to convert to geothermal energy. Incremental profitability studies have been used to select the sequence and limits to the service areas selected for geothermal service. These planning procedures merit replication in other comparable Projects.

The key link between measurable environmental benefits both at the local and global levels was not recognized in the early planning for this Project since funding was not tied to explicit achievement of this,

and GEF grants were not readily available at that time. The clear illustration of these linkages in establishing the funding package for this project will provide useful guidance for formulation of future projects to optimize the economic and environmental balance.

Some useful lessons can be drawn from the partially completed Pyrzyce project (not Bank-financed), where the annual production of geothermal energy is behind targets. The Danish EPA reports that the emission reductions are short of expectations accordingly, as those inhabitants not having access to the district heating network continue to use fossil fuels. The project highlighted the importance of: (i) an up-to-date and realistic marketing study to support the energy demand projections; (ii) a good marketing strategy that includes various categories of customers; (iii) adequate supervision during construction - particularly, in difficult natural conditions (the salinity of the geothermal waters in Pyrzyce is 14%, as opposed to less than 0.3% in Podhale). Nevertheless, the early problems have now been resolved, and, supported by the Danish EPA, consultants are helping Pyrzyce to bring the plant to full operation.

4. Indications of borrower and recipient commitment and ownership:

The shareholders of PEC Geotermia Podhalanska (the National Fund and local municipalities) are convinced of the beneficial impacts of pollution reduction. Therefore, they have strongly promoted the Project in public fora as well as with decisions-makers in the central and local governments. The National Fund has demonstrated its commitment as the majority shareholder in Geotermia Podhalanska and through additional direct funding contributions. In earlier phases of the Project, significant amounts of Project investment came from the National Fund and from the EcoFund. Their role has been especially critical because their contributions have been concentrated in the early part of the Project development when the perceived Project risks were the highest. During the period from 1995 to 1999, the following contributions of financial resources have been made:

Resources committed to the Project during period 1995 - 1999:

		PLN Million		US$	
Applications	Local	Foreign	Total	Million	Percent
Project Investment	**49.7**	**30.0**	**79.7**	**24.1**	**90.8%**
Financing Costs	**-**	**-**	**-**	**-**	**0.0%**
Changes in Working Capital	**8.1**	**-**	**8.1**	**3.1**	**9.2%**
Total	**57.8**	**30.0**	**87.8**	**27.1**	**100.0%**
Sources					
Internally Generated Funds	**0.0**	**-**	**0.0**	**-**	**0.0%**
Equity (National Fund holding over 80%)	**30.1**	**-**	**30.1**	**10.2**	**34.2%**
Grants	**14.8**	**25.7**	**40.5**	**12.3**	**46.1%**
Phare I	-	0.2	0.2	0.1	0.2%
Phare II	-	25.6	25.6	7.6	29.1%
National Fund	10.6	-	10.6	3.3	12.1%
EcoFund	4.2	-	4.2	1.3	4.8%
Local Loans	**17.3**	**-**	**17.3**	**4.6**	**19.6%**
Total	**62.1**	**25.7**	**87.8**	**27.1**	**100.0%**

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* Note: The contribution of the National Fund includes over $8.0 million in equity.

The conversion from using combustible fuels to geothermal energy is supported by the municipalities, in recognition of the economic value of attracting tourists and light commerce to the area, as well as of

reducing the costs of health and medical services and municipal maintenance (cleaning) of streets and buildings.

The municipalities have become shareholders of Geotermia Podhalanska and increased its capitalization by providing municipal assets including land, rights-of-way, and all facilities of the former Tatry District Heating Company. The City of Zakopane approved the merger of Tatry into Geotermia Podhalanska in 1997. The merger was completed in July 1998.

5. Value added of Bank and Global support in this project:

The promotion of renewable energy resources and linkage of environmental benefits to project funding, as well as leveraging of private sector participation are the areas in which the Bank can provide leadership. The Bank has played a critical role in developing the Project concept and coordinating co-financing for both Project preparation and implementation. The Bank's involvement also ensured careful assessment of Project risks and systematic consideration of the geological, technical, environmental and marketing issues involved. Moreover, the progress made towards privatization will be discussed with the Borrower at mid-tem review and, if needed, a privatization strategy will be developed (see Sections C-2 and G-2).

In the area of GHG emissions abatement, the role of the Bank is particularly strong. It has a demonstrated comparative advantage in mobilizing external co-financing for projects related to carbon abatement and possesses the methodology, monitoring and risk mitigation techniques needed to secure such funding. This has been demonstrated through the Bank's role as an implementing agency of the GEF and through experience with over US$ 6 billion worth of non-GEF projects in the Bank pipeline which involve GHG emission mitigation.

E. Summary Project Analysis (Detailed assessments are in the project file, see Annex 8)

1. Economic (see Annex 4):

○ Cost benefit NPV=US$ million; ERR = 12.6 % (see Annex 4)
○ Cost effectiveness
● Incremental Cost
○ Other (specify)

Economic analyses of this Project have been prepared under two project contexts which provide the limiting cases of interest. The entire Project extends from the first investments in 1995 through a ten year implementation period followed by 20 years of full-scale operation. An economic analysis on this basis is of interest to those wishing to determine the replicability of the project which is a common focus of GEF. The World Bank loan to the Project, however, will only be closed in 2000 with minor allowances for retroactive financing. The economic analysis supporting that loan views only the incremental costs beginning in 2000 as relevant. In recognition of the interest in both Project perspectives, economic rates of return have been calculated for both Project time lines. The two contexts are referred to as the "Complete Project" and the "Incremental Project" in the discussion that follows.

The estimates of **the economic rate of return** for the Complete Project indicate that heat cost savings alone would yield a rate of return of just 8.6 percent. Addition of estimated local environmental benefits would increase the rate of return to 11.9 percent. It should be noted that the discounting of local environmental benefits for this analysis includes a 3.0% risk premium to reflect the inherent uncertainties in the chain of causation between emissions and health damages. The GEF grant of $5.0 million received in 2000 then raises the EIRR to **12.6**%. While GEF could theoretically pay the full incremental cost of $8.0 million this

would raise the EIRR to 13.2% and does not appear necessary for the project economic justification. The grant of $5.0 million and associated EIRR of 12.6% appears sufficient and allows for the irreducible risks in long-term estimates of carbon reductions to be achieved. The reduction from full incremental costs of $8.0 to a grant of $5.0 million is a buffer for uncertainty that is similar in principle to the discounting premium applied to the local environmental benefits.

The EIRR for the Incremental Project based solely on heat cost savings is 15.9%. This return is much higher than for the Complete Project because of the investments that were completed prior to 2000 that are treated as sunk costs in this perspective. Adding carbon and local environmental benefits then increases the EIRR to 26.6%. This provides strong justification for this specific World Bank loan even though it is not indicative of return rates available for replicable geothermal projects.

Two forms of economic analysis are relevant to this Project. Conventional Bank loans are supported by demonstrations that the Project has an adequate economic internal rate of return (EIRR) relative to the other options considered for providing space and water heating to area residents and commercial establishments. A more specialized analysis of carbon emission impacts focuses on the incremental cost per ton of CO2 reduction for the proposed project compared to a most probable baseline scenario. The linkage between these two economic analyses is clarified below.

The basic **cost-effectiveness analysis** compares the Project investment and operation costs plus the needed conversion investments to be paid by consumers valued at economic prices with the life-cycle costs of the most probable alternative heating developments in each of the separable Project areas. For Zakopane, the baseline is conversion of the district heat system and the majority of households and large loads to natural gas or fuel oil during the next decade. The costs of conversion from present fuels and of gas or oil use would be paid by consumers. For Nowy Targ, the most probable baseline scenario for the district heat system is continued coal operation with modernization based on improved coal-fired technology in 2001. In the sparsely populated villages between Nowy Targ and Zakopane, continued use of existing fuels is the baseline alternative to geothermal. These cost comparisons provide a traditional economic analysis based solely on heating costs. Since the heat outputs for both scenarios are identical, the challenge is to find the most cost-effective method of satisfying unchanged demands.

As noted repeatedly in the discussion of project beneficiaries, improved local air quality and reduced carbon emissions are strong Project motivations. To capture the economic value of such improvements, changes in health costs have been estimated between the proposed and baseline Project scenarios. The reductions in health costs are labeled local environmental benefits (LEBs). The proposed and baseline scenarios also differ dramatically in terms of the carbon emissions over the life cycle of the project. The economic value of carbon reductions would most accurately be determined if a world market for carbon were operational, and prices of verifiable reductions were established. That market does not exist at this time. The clearest proxy is the payment available from GEF. The global environmental benefits (GEBs) for this study are based on GEF willingness to pay. The cost-effectiveness analysis used to support the World Bank loan is then based on cost differences between the baseline and the proposed Project net of LEBs and GEBs. The comparisons are clarified in the following table:

Item	**Baseline**	**Proposed**
Heat Demands	Heat(B)	Heat(P) = Heat (B)

Health Damages	HD(B)	HD(P) < HD(B)
Carbon Cost	Foregone GEF Payment	Zero
Heat Costs	Life Cycle (B)	Life Cycle (P)>Life Cycle (B)

Annual differences between the last two columns over the life of the project provide the basis for calculation of the EIRR used to support the Bank loan.

Two additional economic benefits have been identified but not quantified. Tourism is clearly the dominant economic activity in and around Zakopane. The economic impacts of the Project on tourism are undeniably positive but difficult to quantify in a rigorous way. Links between winter air quality and tourism in this prime ski area and between tourism and economic value added are not easily established. Double-counting of benefits is also a danger since the primary reason for conversion from cheaper coal to more expensive geothermal energy may be because of the perceived tourism impacts. The impact on biota in the neighboring national park is also positive but not easily expressed in dollars. The strategic approach to Project justification has been to first quantify the heat and health cost savings as the measurable local benefits. If the local plus the global benefits provide sufficient return, additional work on tourism and biota should not be required to justify the Project.

The **incremental cost analysis** compares the life cycle heating costs for the base case scenario and the geothermal Project which are alternative ways to provide the energy needed for heating and hot water purposes for the Podhale region. The relevant incremental costs are the present values of the differences between the costs shown in the bottom row of the table above. Carbon emissions for the base case scenario reflect the alternatives described above for each of the project areas. For the proposed Project, the carbon emissions come from the use of gas in the peaking plants, the heat pumps and the few converted district heat boilers and from coal-based generation of the electricity used for pumping in the geothermal system. The impacts have been calculated for the Project ramp-up period of 1995 - 2004 and for twenty years of full load operation thereafter. The difference between base case and Project emissions of CO2 during that period is estimated to be 2.7 million tons. The incremental costs are estimated at $8.0 million or $2.99 per ton of CO2 reduction. These calculations are based on a discount rate of 11.0%.

	Proposed	Base	Increment
Global Emissions - (Conversion area, 1995 - 2024)			
CO2 in tons	1,021,487	3,701,572	(2,680,086)
Carbon equivalent in tons	278,587.34	1,009,519.76	(730,932)
Costs in US$000 1995 NPV (@11%)			
Unit Abatement Costs			
Total USD/t CO2			$2.99
Total USD/tC			$10.97
GEF Contribution			
Total US$000			$5,000
GEF Cost $/tCO2			$1.87
GEF Cost $/tC			$6.84

2. Financial (see Annex 5):
NPV=US$ million; FRR = 14 % (see Annex 4)

Geotermia Podhalanska (GP) was founded as a joint stock company on December 30, 1993 with an initial share capital of about PLN 1.62 million (US$ 0.7 million equivalent). The Company's share capital was increased to PLN 10.7 million (US$ 4.4 million equivalent) in May 1995, and to a level of PLN 30.1 million (US$10.2 million equivalent) in 1999. There is a strong interest among the shareholders to see the first large geothermal Project in Poland succeed.

GP S.A. has operated since 1995, when the first demonstration connections of houses and public buildings to the heating system of a geothermal test well were established in the Gmina of Bialy Dunajec. Since then it has expanded its network and operations in that Gmina as well as in certain areas in Zakopane, which will be supplied initially by the gas-fired peak-shaving plant and subsequently linked with the geothermal system.

The income statements, fund flow statements, and balance sheets of GP S.A. for the period 1995 to 1997 (contained in the PIP) show that the company grew steadily to a level of assets of over PLN 42 million (about US$ 13 million). In 1998 GP S.A. merged with PEC Tatry. The year end balance sheet for the new PEC/GP shows assets amounting to PLN 82 million (US$24 million), mostly due to further investments and some assets of PEC Tatry (see below). The majority of the investments has gone into the drilling of a second doublet, the construction of the geothermal plant, the construction of the gas-fired peak-shaving plant, and the laying of the main pipe from Bialy Dunajec to Zakopane, as well as network development in these places. The income statements illustrate the results of operations from the small network in Bialy Dunajec, and the resultant losses are not indicative of the company's future development. The first "industry scale" heating season for GP S.A. was from autumn 1998 to spring 1999, after the merger with Tatry. The merged company's assets as of end 1999 amounted to PLN 90.4 million (about US$27.5 million), covering investments under Phase 1 and to a large extent Phase 2, as described in project description summary (see Section C). The funding of these investments until now has been made available by equity (about 35%), grants (48%) from National Fund, EcoFund, EU PHARE, USAID and Denmark, and local loans (17%).

The project scope to be considered by the Bank and GEF (Section C) would involve the remaining costs of PLN 321.5 million (US$ 73.0 million) as shown in the summary financing plan below:

PEC Geotermia Podhalanska: Financing Plan for the YEARS 2000 to 2004

Applications	PLN Million			US$ Million	Percent
	Local	Foreign	Total		
Project Investment	153.3	94.6	247.9	56.7	80.9%
Financing Costs	3.2	24.8	28.0	6.2	9.2%
Changes in Cash/Working Capital	27.1	-	27.1	5.9	8.8%
Miscellaneous	1.2	0.5	1.7	0.5	0.5%
M&E of GHG Abatement	0.8	0.8	1.6	0.4	0.5%
Total	185.5	120.7	306.2	69.6	100.0%
Sources					
Internally Generated Funds	50.1	-	50.1	10.7	15.4%
Equity	7.3	-	7.3	1.7	2.4%
Grants	-	80.8	80.8	19.0	27.3%
Phare II	-	45.0	45.0	10.5	15.1%
GEF	-	22.6	22.6	5.4	7.8%
USAID	-	10.5	10.5	2.5	3.6%
DEPA Grant	-	2.6	2.6	0.6	0.9%
IBRD Loan	-	168.0	168.0	38.2	54.9%
Total	57.4	248.7	306.2	69.6	100.0%

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Preliminary actual data for 1999 are the basis of operational and financial projections for the merged company. The merger with the Tatry DH company of Zakopane brought into the new company a number of important assets, including experienced personnel, the site of the peaking plant, the existing network of heat distribution as well as a substantial number of customers. A preliminary set of financial projections covering the period 1999 - 2006 has been prepared. The results are shown in Annex 5. The table below summarizes the results for the **year 2005** (the first year of steady state operation):

Summarized Income Statement (Year 2005)	**Units**	**Results**
Operating Revenue	PLN '000	52,758
Operating Costs	PLN '000	20,831
Operating Income	PLN '000	31,926
Depreciation	PLN '000	11,559
Net Financial Expenses	PLN '000	9,955
Net Income Before Tax	PLN '000	14,537
Net Income After Tax	PLN '000	11,085

Ratios (Year 2005)		
Operating Income/Revenue	Percent	61%
Net Income/Revenue	Percent	21%
Net Income/Net Fixed Assets	Percent	5%
Current Ratio	Times	7.2
Debt/Equity Ratio	Percent	45/55
Debt Service Coverage Ratio	Times	1.0
Financial Rates of Return (FIRR)		
FIRR before tax for overall Project from 1995:	Percent	9.5%
FIRR after tax for overall Project from 1995:	Percent	7.6%
FIRR before tax for Period 2000 to 2025:	Percent	14.0%
FIRR after tax for Period 2000 to 2025:	Percent	11.5%
FIRR on Total Equity (incldg. Grants) from 1995	Percent	13.5%
FIRR on Owners' Capital from 1995	Percent	27.8%
Return on Owners'Capital in Year 2005	**Percent**	**29.7%**

The financial projections demonstrate the soundness of the proposed Project and its company PEC/GP, as well as its proposed financing arrangements. As can be seen from Annex 5, the company's net losses incurred in 1998 and 1999 and projected for 2000 are resulting from its merger with the district heat company of Zakopane in 1998 and the new company's early operations with relatively few customers connected to the incomplete system. The company has obtained a bridge loan which will be repaid in the year 2000, when the proposed loan and grant funding becomes available. The level of grant funding, together with the existing equity base, give the Project a sound financial footing. PEC/GP would turn already profitable from year 2001, assuming that the rate of network completion and heat sales can be achieved as projected and the operating costs be kept as forecast. During the implementation period of the Project (years 2000 - 2004), the front-end fee, and loan interest on the proposed World Bank loan will be capitalized. Thereafter, the company would be able to service its debt gradually increasing its debt service coverage ratio from 1.0 to 1.2 or above. PEC/GP will be able to generate increasing levels of cash to fund growing portions of its own investments. The above table containing the financial parameters in the first year of steady state operation (2005) serves to illustrate the healthy position of the company.

Financial performance covenants have been agreed during negotiations as follows: maintaining (i) an adequate operating ratio (operating expenses over operating revenues): not higher than 90% for the fiscal year ending December 31, 2001, 85% for the FY2002, 80% for FY2003, and 75% thereafter; (ii) a debt-service coverage ratio (net revenues over estimated maximum debt-service requirements) of not less than: 1.0 from 2001 to 2006, 1.1 in 2007, and 1.2 thereafter; (iii) a debt-equity ratio of not greater than 55% to 45% until December 31, 2004; (iv) a cash generation to capital expenditures ratio of not less than

5% for the fiscal year ending December 31, 2001, not less than 10% for FY2002, and 35% thereafter, of the annual average of the Borrower's capital expenditures to be incurred during the three-year period commencing with the said fiscal year. As practically no investment would be needed after Project completion in the years of operation of the projection period, part of the cash generated from 2005 could be either distributed to shareholders in the form of dividends, or stock could be repurchased from the National Fund. During the Project implementation period the build-up of a substantial cushion of cash is to protect against the risk of a dry well or a slower than expected revenue generation.

Fiscal Impact:

Apart from the contingent liability associated with guaranteeing the loan, there will be no negative fiscal impact for the Government. PEC/GP is a commercial enterprise and will generate an adequate cash flow from its operations to repay the loan. Furthermore, during the period 1999 to 2005, the company is projected to contribute PLN 16.7 million (US$ 4.2 million) in income and property taxes. The total tax contribution for property and income tax will be almost PLN 195 million (US$49 million) over the 2000 to 2025 period.

3. Technical:

The geology of the Project has been thoroughly evaluated by a group of independent international consultants. The expectations for the geothermal resource productivity have been confirmed by the results from the first two doublets (the second doublet exceeding expectations). The production from the wells completed to date is already sufficient to provide 50-60% of the total geothermal requirements for the Project. The minimum estimated period between the drilling of the wells and any impact of the lower-temperature reinjection waters on the production wells has been estimated at well over 25 years. The design of the low-enthalpy geothermal system, including all major components below, has been carried out with the assistance of qualified consultants resulting in a state-of-the art complex. Some optimization will continue as new districts are being added gradually to the system.

· Drilling geothermal wells: In 1996 and 1997, two new geothermal wells were drilled with very good results. During hydrodynamic testing, production well Banska PGP-1 demonstrated a production rate of 750 m3/h and a reservoir temperature of 91 °C. These results significantly reduced the previously planned investment cost for the subsurface part of the Project. Reduction of investment costs is realized because fewer well doublets will need to be drilled based on the very high production rate from well PGP-1. To cover the heat demand for the entire Project including Nowy Targ and to have sufficient reserve capacity, only three more wells are needed - one for production and two for reinjection. This will bring the total number of geothermal wells to seven.

· Geothermal base-load plant (approximately 38-43 MWt): At the production well site, a new building to house the geothermal base-load plant has now been constructed, including geothermal heat-exchangers, pumps, filters, and ancillary equipment. The base-load plant was commissioned in late 1998. The building also includes living quarters for a full-time plant superintendent as required by Polish regulations for heating plant supervision. This base-load plant will be expanded to begin serving the Nowy Targ load in 2002.

· Absorption heat pumps (33 MWth). The results of technical and economic optimization done in late 1999 have shown that an economic optimum can be reached using 3 doublets if a 33 MWth heat pump capacity is added to the project design. The reduced electric pumping costs associated with 3 doublets are almost offset by the additional gas needed to drive the heat pumps. Thus, capital costs rather than operating costs are dominant in the economic assessment. The 3 doublet-33 MW heat pump solution reduces annual costs by about 3.1 percent compared to four doublets with no heat pumps. The savings in capital costs is about $1.7 million dollars while annual cost savings are approximately $133,000. Heat pumps with three

doublets are preferred over the full range of possible heat pump investment costs examined.

· While these cost savings are not dramatic relative to the total project costs, the reduced risk in moving from 4 to 3 doublets is significant. The possibility of adding a fourth doublet in the future while remaining within permit limits for total hot water extraction is also attractive. Geotermia Podhalanska has now accepted the 3 doublet solution and Project preparation is proceeding on that basis.

· Gas-fired peak-load plants: In Zakopane, a new building to house the 22 MWt peaking plant was constructed. The plant includes two gas boilers (2x11 MWt) as well as pumps, heat exchangers, filters, and ancillary equipment. The plant was tested in August, 1998 and is now supplying all of the Project heat to Zakopane. This plant will be expanded gradually to 48 MWt as additional service area is connected to the network. The 14 MWt Nowy Targ peaking plant is yet to be designed.

· District heating network: In 1997, 3.5 km of transmission network was constructed. This line will be extended to 14 km to link the geothermal base-load plant located in Banska Nizna with the Zakopane peak-load plant. The network within Zakopane has been developed further during the 1998 and 1999 seasons.

4. Institutional:

4.1 Executing agencies:

- The main executing agency of the Project is PEC Geotermia Podhalanska, S.A. (see the description in Section C-4).
- A final choice of the responsible agency for the M&E Component has not been made yet. The agencies currently being considered include the Polish EcoFund and the Krakow Office of the Polish Academy of Science.

4.2 Project management:

PEC Geotermia Podhalanska, S.A. is a small company with about 70 employees. While the staff is admittedly small in relation to the size of the Project, the management capacity is considered sufficient. This reflects both the technology and the history of development of this project. The Managing Director of Geotermia Podhalanska has been involved in this project since inception and has managed successfully to bring it to its current stage without the key financing component yet in place. Implementation of the Project with adequate financing in place should be relatively easy compared to development under scarce and insecure financing.

PEC/GP will receive continuing technical assistance from DEPA with regard to surface engineering design, construction and implementation of the Project. The completed Project offers a relatively simple technology to operate. The system is designed to a very high standard and maintenance expenses should be low. The merger with Tatry brought district heating expertise into the company. The geothermal part of the Project is largely automated and will not require large numbers of people to operate like coal plants.

In accordance with the Project's global objective, the Borrower is expected to employ a contractor acceptable to the Bank to undertake the monitoring and evaluation of CO2 reduction (by October 31, 2000). In monitoring the carbon reductions achieved, the responsible agency will be requested to follow the recommendations of the monitoring protocol (to be developed with GEF support), which will outline the necessary measures - including institutional and technical arrangements, incentives etc. - suitable performance indicators, and analytical tools to adequately and efficiently monitor, evaluate and report project benefits. The development of a standard monitoring procedure for carbon mitigation projects is

expected to test, and contribute to, the replicability of the Podhale Project concept.

By the end of year 2001, a report will be prepared on the progress achieved in the carrying out of the Project and integrating the results of the monitoring and evaluation of global environmental benefits (CO2 emission reduction). At that point, modifications may be proposed to the implementation plan as needed to ensure the achievement of the Project's objectives.

The roles of the National Fund (the majority shareholder) and EcoFund (potential implementing agency for the Monitoring and Evaluation component) in promoting, publicizing, monitoring and evaluating the Project will need to be discussed with the Borrower. The long-term expectation is that the National Fund will reduce their ownership share in the Project with their participation increasingly focused on promotional roles. The EcoFund has the capacity to implement the monitoring and evaluation of the Project's environmental benefits. The main focus of the M&E effort should be on tracking market penetration, financial performance of PEC/GP and confirmation of the environmental objectives achieved.

5. Environmental: Environmental Category: **B**

Summarize the steps undertaken for environmental assessment and EMP preparation

The primary, long-term environmental impacts of the Project are clearly positive both in terms of local and global emissions of air pollutants. Negative impacts are limited and related mostly to the temporary inconveniences associated with construction processes. No resettlement is required under the Project. There will be only limited land acquisition, for which a Land Acquisition Plan was prepared by PEC/GP as a condition of negotiation. Loan or GEF Grant proceeds will not finance land acquisition. In accordance with OP/BP/GP 4.01, the Borrower has prepared an Environmental Management Plan (EMP). The EMP was finalized and agreed upon during negotiations.

While generally not bad in comparison with some industrialized areas of Central and Eastern Europe, the air quality in Zakopane, and especially Nowy Targ, is characterized by elevated levels of suspended particulate matter due to coal combustion during the heating season.

Total suspended particulates (TSP) is the only kind of particulate matter for which measurements are currently available in the Podhale area. In Nowy Targ, both daily (24-hour average) concentrations and annual mean concentrations of TSP exceed the national standards (see Annex 11). In Zakopane, annual mean concentrations of TSP are within the national standard of 75 ug/m3, but daily average concentrations occasionally exceed the national standard of 150 ug/m3. The maximum daily average concentration observed in 1997 was about 2.5 times the national standard in both Zakopane and Nowy Targ. Concentrations of SO2 are within the norm for both Zakopane and Nowy Targ.

Besides the Polish national standards, comparisons have been made for daily (24-hour) average concentrations of TSP in Zakopane and Nowy Targ with other standards and recommended values, including the EU limit value (300 ug/m3), the WHO guidelines for Europe (120 ug/m3), etc. - see the

charts in technical addendum to Annex 11. It is obvious that both Zakopane and Nowy Targ will meet the EU limit value rather easily but are out of compliance with the WHO guidelines for Europe because of the heating season peaks. For black smoke (a rough proxy for PM10), the EU guide value is 100-150 ug/m3 for 24-hour concentrations and 40-60 ug/m3 for annual mean concentration. No EU guide value appears to exist for TSP, however the new EU Directive on Ambient Air Quality Assessment and Management (96/62/EC) sets the annual average concentration standard for PM10 at 30 ug/m3 effective January 1, 2005.

By suppressing the heating season episodes of high pollution, the Project can make it possible for the Podhale area to meet the WHO guidelines for Europe, as well the Polish national standard for 24-hour average concentration of PM10, which is envisaged to be tightened in 2005 from the current level of 125 ug/m3 to 50 ug/m3. It is quite unlikely that the Podhale area would be able to meet this latter standard with anything less than a massive conversion to geothermal heat.

Besides the seasonal patterns (heating vs non-heating season), the other factor contributing to occasional days of high pollution in the Podhale district is the atmospheric inversions, when pollutants tend to settle in the valley in which Zakopane is located. Concerns about the state of air pollution affecting the population's health have been of high priority to the municipalities, as once the area was known primarily for its clean air and pulmonary sanatoriums.

The air pollution problem is generally more serious in Nowy Targ than in Zakopane. There, the annual average ambient standard for particulates is substantially exceeded, and the daily average concentrations of TSP exceed the standard for 15% of the days in a year.

The decrease in steady state annual consumption of combustible fuels in Zakopane and Nowy Targ due to conversions to geothermal:

Cities/dwelling type	No. of customers	Coal/Culm (MT)	Coke (MT)	Oil (000 liters)	Gas (TCM)	Grid Coal (MT)
Zakopane Households	2,094	848	2,778	3,199	551	1,695
Zakopane Large Loads	166	132	5,692	8,385	1,304	784
Zakopane District Heat Boiler Houses	28	0	0	0	3,662	257
Nowy Targ District Heat Boiler Houses	3	13,988	0	0	0	412
Total Conversions	**2,291**	**14,968**	**8,410**	**11,584**	**5,517**	**3,148**

As described in detail in Annex 11, the reduction in the emissions of particulate matter are expected to be about 700 tons/year throughout the life of the Project. The total reduction in particulate emissions relative to the baseline will be between 14.9 and 18.3 thousand tons over the Project life. The avoided emissions of SO2 are expected to be about 1,434 tons/year in 1999-2004, 1,291 tons/year in 2005-2024, and 29.9 – 34.5 thousand tons over the life of the Project.

The environmental benefits to the Project area (Zakopane, Nowy Targ, and the villages in the conversion area), as well as to the outside recipients of air pollution from electricity generation, are estimated to be about US$14.5 million if the Nowy Targ boilers' continued coal-fired operation is accepted as the baseline scenario for Nowy Targ.

Because the peak-load plants and the heat pumps will be using natural gas, CO2 emissions will occur in the amount of 17,070 tons per year at steady state, as well as emissions of NOx. Electricity use for pumping will also lead to Project-related CO2 emissions of 22,860 tons per year from grid power plants, as well as NOx and other pollutants related to the combustion of fuel needed to generate electricity. During the environmental assessment of the Project, attention was given to NOx and other issues affecting the local environment of Zakopane. Similar assessments will be conducted for the proposed Nowy Targ peaking plant and for the gas-fired heat pumps. However, given the relatively small capacity of the gas-fired units and the superior combustion technology (low-NOx burners), no major concern is expected to be caused by the Project emissions.

The impact of the Project on other environmental media also needs consideration. Improperly designed or operated geothermal systems may pose some risk of contaminating drinking water. However, this Project employs a closed-loop design, in which this risk is minimized. The water is supplied to heat exchangers and then reinjected back into the reservoir without being in direct contact with the consumer or the environment.

The techniques involved in drilling wells, reclamation of land, well-head installations, connections, well testing, and geothermal reservoir management have been tested out on-site during the past three years with the assistance of technical experts from Denmark and the US. The Polish mining authority regulations for geothermal resource exploration and development have now fully evolved and have been implemented by Geotermia Podhalanska. These include detailed procedures for EIA and licensing subject to environmental compliance.

The mineralization of the geothermal waters used for the project is mostly in the range of 0.2 - 0.4 g/l, but in some strata of the geothermal reservoir it may reach about 3.0 g/l. This level of salinity is still remarkably low by comparison with other geothermal reservoirs currently under development in Poland and elsewhere in Europe - e.g., in Pyrzyce (140 g/l) or in Klaipeda, Lithuania, where the Bank is implementing a GEF-supported geothermal project. Nevertheless, the discharge of geothermal water into the mountain streams in the vicinity of a National Park is considered undesirable. For this reason, it is important to maintain the closed-loop system.

6. Social:

6.1 Summarize key social issues relevant to the project objectives, and specify the project's social development outcomes.

The tariff for geothermal heat is not going to be higher than for acceptable conventional alternatives because the local environmental and global carbon benefits will be internalized through grants. The current tariff is PLN29/GJ (in 1998 terms) for residential customers, and PLN32/GJ for large loads, whereas the district heat customers of the coal-fired system in Zakopane paid PLN40/GJ under the Tatry company, and Nowy Targ was paying PLN34/GJ.

In the future, tariff increases will mostly serve to compensate for local inflation. As noted earlier (Section B-2), according to the new secondary legislation, the Energy Regulatory Office (URE) provides a license for district heating operations. It would reject unfair tariff increases. PEC/GP has obtained its operating license and an endorsement of its tariff structure by URE.

Connection to geothermal energy requires a considerable up-front investment estimated at about $2,700 per household. Since market penetration estimates are limited to 60% of households in the areas with proposed access to the geothermal system, it is expected that many households would continue to use the existing fuels. E.g., it is not anticipated that large numbers of Polish highlander farmers would opt for geothermal heat. Those that can most readily afford to discontinue the effort and discomfort of coal heat are most likely to do so by taking an inexpensive loan from one of the local financial intermediaries (see section "Market penetration strategy" in Section C-4). Since free choice to continue present practices has been assumed, no social hardships are anticipated as a result of this Project.

If significant demand develops for geothermal heat by those currently unable to afford the required initial investment, the funds offered by the EcoFund to support conversions would be targeted to households with incomes below a certain level to mitigate any negative social impacts from the Project.

6.2 Participatory Approach: How are key stakeholders participating in the project?

The local public at large: A series of public meetings in Zakopane, with the presence of press, TV, radio.

Municipalities of Zakopane, Poronin, Koscielisko, Banska Nizna, Bialy Dunajec, Szaflary and Nowy Targ: Active involvement in Project development, permitting and shareholding in Geotermia Podhalanska; construction permits. A list of public meetings is available in the project file and as an attachment to the EMP.

Voivodships: Permits concerning meeting environmental standards.

Central Government: Permits of concession, approval of mining areas and drilling plans, approval of exploitation plans, grants and loans to Geotermia Podhalanska, shareholding in company.

6.3 How does the project involve consultations or collaboration with NGOs or other civil society organizations?

For projects expected to receive authorization to appraise/negotiate (in principle) prior to April 30, 2000, this section may be left blank.

6.4 What institutional arrangements have been provided to ensure the project achieves its social development outcomes?

For projects expected to receive authorization to appraise/negotiate (in principle) prior to April 30, 2000, this section may be left blank.

6.5 How will the project monitor performance in terms of social development outcomes?

For projects expected to receive authorization to appraise/negotiate (in principle) prior to April 30, 2000, this section may be left blank.

7. Safeguard Policies

Do any of the following safeguard policies apply to the project?

Policy	Applicability
☐ Environmental Assessment **(OP 4.01, BP 4.01, GP 4.01)**	☒ Yes ☐ No
☐ Natural habitats **(OP 4.04, BP 4.04, GP 4.04)**	☐ Yes ☒ No
☐ Forestry **(OP 4.36, GP 4.36)**	☐ Yes ☒ No
☐ Pest Management **(OP 4.09)**	☐ Yes ☒ No
☐ Cultural Property **(OPN 11.03)**	☐ Yes ☒ No
☐ Indigenous Peoples **(OD 4.20)**	☐ Yes ☒ No
☐ Involuntary Resettlement **(OD 4.30)**	☐ Yes ☒ No
☐ Safety of Dams **(OP 4.37, BP 4.37)**	☐ Yes ☒ No
☐ Projects in International Waters **(OP 7.50, BP 7.50, GP 7.50)**	☐ Yes ☒ No
☐ Projects in Disputed Areas **(OP 7.60, BP 7.60, GP 7.60)**	☐ Yes ☒ No

F. Sustainability and Risks

1. Sustainability:

Market Penetration: The market penetration of geothermal energy has been at the center of the Bank's assessment of this Project since the very beginning of its involvement. As mentioned in Section C-1 and discussed in more detail in Annex 2, about 400 TJ (or 33% of the project target for geothermal heat supply) is currently secure already. The sustainability of the progress with market penetration is an obvious key to the success of the Project, and early experience with market penetration should be closely monitored to improve the forecasts for future penetration rates.

PEC/GP's marketing database provides good data on the numbers of potential consumers. The existing heating fuel mix is also available based on survey data. Part of the Project monitoring effort will be to establish databases which show the percent of potential achieved within a two-year period after geothermal energy becomes available, and which update the data on fuel displacement. It should be emphasized that PEC/GP will not commit to construction of the supply system to specific areas until it has obtained agreement from a sufficient number of customers in that area to cover the costs of the extensions. This limits the financial exposure. Monitoring will also allow PEC/GP to identify barriers to conversion for certain types of consumers and to design incentive schemes to reduce those barriers if necessary.

Sustainability of the Project results will also depend on whether a customer that converts to geothermal energy will continue to use this source of heat over the long term. Once converted, the customer may or may not retain the option of reverting to the existing boiler system. For those who do, the continuing economic comparison would be between geothermal and fuel costs plus an allowance for comfort and labor differentials. It should be noted that those customers that obtain their heat exchangers from PEC/GP and

wish to pay through a tariff add-on will be required to continue on geothermal heat for 10 years or to pay the full remaining balance of the heat exchanger cost when they exit the system.

Financial Sustainability: For the year 2000, a tariff increase of about 15% in nominal terms has been approved by URE, which is higher than the local inflation but is justified based on real tariff declines in 1998 and 1999. The base case assumption in the financial model is for no tariff increases beyond local inflation after the year 2000. As long as the heat tariffs are allowed to cover the base costs (see section E-2 and Annex 5), neither operating subsidies nor excessive tariff increases are needed. The conversion rate projections are based on cost advantages to the customers that convert. The grant funding for local and global environmental externalities will contribute further to PEC/GP's revenues without a tariff increase. The financial analysis shows adequate rates of return based on heat prices that are below average for similar places in Poland. Of course, expanding the customer base is essential (see above), and PEC/GP is expending much effort in arranging long-term heat supply contracts.

Legal and Regulatory Environment*:* The passage of environmental, mining and energy legislation and the development of a supportive regulatory framework are important enabling factors for renewable energy development. The Project is dependent on mining sector regulations under the auspices of the Mining Law, which has now developed rules for geothermal energy with regard to the geothermal plant, and dependent on the Energy Law with regard to the district heating system for the full utilization of its benefits. Replication of projects of this kind would benefit significantly from a policy which taxes the users of polluting fuels and/or establishes the basis of granting funds for clean and renewable energy projects to cover measurable environmental benefits. In this regard, it is important to make sure that (i) the royalty for geothermal heat extraction, if applied to PEC/GP operations, is reasonable and transparent, and (ii) that the GEF Grant proceeds are not diverted to pay domestic taxes. Discussions on the latter subject with representatives of the Finance Ministry have indicated that, under the existing policy, the GEF Grant proceeds cannot be used by PEC/GP to pay taxes. However, being effectively an income stream for PEC/GP, GEF Grant proceeds are not automatically exempt from income taxation by the Government, although the Finance Ministry representatives have acknowledged the beneficial environmental character of the Project and the significance of this fact in making a decision on the applicable tax rates.

Long-term Commitment of the Implementing Agency: PEC/GP and the National Fund are both committed to the Project. The long-term expectation is that the National Fund will reduce its equity ownership and increasingly focus on promotional roles. The National Fund's shares in the company are expected to be gradually re-purchased by PEC/GP, which should further strengthen the company's stake in the Project's success.

Technical Sustainability and Risks: All yield and sustainability indicators for the geothermal resource are very positive to date. The minimum estimated period between the drilling of the wells and any impact of the lower-temperature reinjection waters on the productivity of the production wells has been estimated at well over 25 years. There are undoubtedly some remaining technical risks associated with a partially completed geothermal project. However, as noted earlier (Section E-3), the geothermal reservoir has been extensively studied, and production from the two completed doublets (out of three envisaged for the full project) is already sufficient to provide 50-60% of the total geothermal heat requirement for the full Project. The risk of insufficient geothermal flow rate has decreased dramatically with the completion of the second geothermal doublet. This risk is further reduced by the decision of PEC/GP to limit the number of wells drilled to only one more production well and two reinjection wells by introducing gas-fired absorption heat pumps, which will cover intermediate heat demand.

2. Critical Risks (reflecting assumptions in the fourth column of Annex 1):

Risk	Risk Rating	Risk Minimization Measure
From Outputs to Objective		
The impact of introducing the geothermal plant and modernizing the district heating system on local air quality does not meet expectations;	N	Environmental impact assessment to include a detailed study of ground-level concentrations expected from the displacement of coal- and oil-fired boilers by geothermal energy.
The CO2 reductions from the project are less (and/or more costly) than expected;	M	The risk of inappropriately chosen baseline assumption is minimized by thorough incremental cost analysis; Cost overruns, as the most likely reason for failing to produce low-cost carbon reductions, will be minimized by competitive selection of construction contractors, long-term heat supply and gas purchase contracts and financial accountability through a Bank-compliant financial system for PEC/GP.
International market risk related to (a) security of gas supply; (b) fluctuations of gas prices; (c) international prices of other fossil fuels falling to levels which make the geothermal plant uneconomic;	M	Utilization of both geothermal and gas-fired energy in the district heating plant and providing for sufficient capacities to cover most of the heat demand by either of the two, or both.
Domestic market risk: lingering subsidies on coal and coke making geothermal energy less economic;	M	Long-term contracts for heat supply with the customers; dialogue with the government/URE on geothermal tariffs; declining subsidies for coal/coke.

Market penetration of geothermal district heating is insufficient to achieve the Project's objectives;	M	(i) Lowering the geothermal heat tariffs through grant financing of environmental benefits; (ii) proactive marketing of the geothermal energy as an environmentally clean source of heat and dissemination of information about the sources of credit for the up-front conversion cost; (iii) long-term contracts with large and small customers - e.g., the distribution system to the remaining areas outside Zakopane (such as Koscielisko) will only be built if those loads are under long-term contracts; (iv) the merger with Tatry and the progress in securing large loads and the Nowy Targ load have substantially reduced market risk; (v) the additional PLN 10 million (about US$ 2.5 million) offered by the Polish EcoFund to Geotermia as a grant may be used to stimulate household conversions if market penetrations fall below targets.
Insufficient heat tariff adjustment to ensure adequate long-term financial performance of PEC/GP;	M	(i) Consistent effort to attract new customers to spread the fixed costs and realize the economies of scale; (ii) Annual dialogue with the URE on tariff adjustments.
Unforeseen environmental impacts from implementing the Project;	N	(i) Development of an Environmental Management Plan (EMP), including a Mitigation Plan and Monitoring Plan, acceptable to the Bank; (ii) Environmental mitigation measures included in the bidding documents for the construction companies contracted; (iii) Ongoing technical assistance from internationally recognized technical experts.
From Components to Outputs Renewable energy no longer regarded as a high priority by the Government of Poland;	N	Increasing emphasis by the Government and EU on renewable energy.
Geothermal reservoir insufficient to maintain geothermal flow and heat output and make geothermal competitive with fossil fuels;	M	Detailed geophysical surveys and mapping confirm adequacy of reservoir location and capacity.

The conversion from using combustible fuels to geothermal energy is not sufficiently supported by local policies; lack of awareness of the improved local environmental conditions;	M	Dialogue with local authorities and businesses emphasizing the benefits such as the economic value of attracting tourists and light commerce to the area, reduced social costs of health and medical services, and municipal maintenance (cleaning) of streets and buildings; marketing/ awareness raising campaign through the media.
Insufficient implementation capacity of the construction contractors to allow Project progress according to the staged development/ expansion plan;	M	Competitive bidding for construction contracts; training/TA as practicable.
Delays caused by additional regulatory requirements with respect to environmental assessment or construction permits, or granting exploitation concession;	M	Timely dialogue with the environmental and mining authorities.
Significant cost overruns (e.g., as result of insufficient geothermal reservoir potential) during construction phase;	M	Modular project design and staged implementation; competitive selection of construction contractors, long-term supply/purchase contracts and financial accountability through a Bank-compliant financial system for PEC/GP.
Disappointing drilling results from the remaining geothermal production well (third doublet).	M	Two out of three proposed production wells have already been drilled with good results (the second production well exceeding expectations). In the unlikely event of disappointing results from the third well, adjustments could be made to the technical design of the production plants - e.g., increase in the absorption heat pump capacity to extract more heat from given flows and/or installation of additional gas-fired boilers (with possible consideration of electricity cogeneration) at the peaking plant in Zakopane. As a last resort, system extension plans could be revised to limit the service area and resultant demand to reduce costs.
Overall Risk Rating	M	

Risk Rating - H (High Risk), S (Substantial Risk), M (Modest Risk), N(Negligible or Low Risk)

3. Possible Controversial Aspects:

The Bank has requested that details of the royalty scheme for geothermal resource utilization applicable to PEC/GP operations are made available to the Bank. This has been done, but the subject requires further

discussion. The geological law of 1994 allows for a royalty on underground resources. Such a royalty (extraction fee), may be imposed by the local Mining Authority for the extraction of geothermal water. However, considering the renewable nature of the geothermal resource and the closed-loop design of the geothermal heat utilization system, there is little justification for charching such a fee on this Project's operations. The Project has been instrumental to stimulate a dialogue with the Ministry of Environment on this subject, but the outcome is uncertain.

G. Main Conditions

1. Effectiveness Conditions

- Cross-effectiveness with EU co-financing and with the GEF Grant.
- The PIP, satisfactory to the Bank, shall have been adopted by the Borrower.

2. Other [classify according to covenant types used in the Legal Agreements.]

Conditions Prior to Board Presentation:

- Financial systems and controls satisfying the minimum fiduciary requirements of the Bank and GEF shall be in place; the elements of such a system and the steps to be taken are specified in the FMS Action Plan (see Annex 6, Financial Management).
- All licenses and permits pertinent to the Project operation (including the exploitation permit for the use of geothermal waters) shall have been obtained from the responsible authorities.
- Connection to the district heating network of residential consumers with projected heat purchases totaling not less than 16 TJ/year from 2001.
- Contracts with large consumers with projected annual sales totaling not less than 48TJ from 2001.
- Conversion of not less than 25 former Tatry boiler houses to geothermal energy.
- A letter of intent from Nowy Targ to negotiate exclusively with PEC/GP for future heat supply to three boiler houses with expected annual consumption of no less than 200 TJ with connection expected no later than 2002.
- A letter from the gas supplier indicating a willingness to supply the expected total peak demands of the project including the two peaking plants and the heat pumps.
- The requirements for the pressure reduction station at the connection to the gas line to be specified by the Borrower.

Financial Covenants:

- Project Management Reports generated by a professional database (such as Fox Pro) shall be introduced by December 31, 2000, with a view to moving to PMR-based disbursements from April 1, 2001.
- Financial performance covenants - i.e., maintaining (i) an adequate operating ratio (operating expenses over operating revenues) not higher than 90% for the fiscal year ending December 31, 2001, 85% for the FY2002, 80% for FY2003, and 75% thereafter; (ii) a debt-service coverage ratio (net revenues over estimated maximum debt-service requirements) of not less than 1.0 prior to 2006, 1.1 prior to 2007 and 1.2 thereafter; (iii) a debt-equity ratio of not greater than 55% to 45% until December 31, 2004; (iv) a cash generation to capital expenditures ratio of not less than 5% for the fiscal year ending December 31, 2001, 10% for the FY2002, and 35% thereafter, of the annual average of the Borrower's capital expenditures to be incurred during the three-year period commencing with the said fiscal year.
- Auditors, acceptable to the Bank, shall have been appointed by October 1, 2000.

Other Conditions:

The Borrower shall:

- Furnish to the Bank by October 31 of each year, an annual work program for the Project for the following calendar year, including procurement and financing plans.
- Furnish to the Bank quarterly progress reports on Project implementation, not later than 30 days after the end of the quarter.
- Carry out the Project in accordance with the PIP.
- Not later than October 31, 2000, employ a consulting firm acceptable to the Bank to undertake the monitoring and evaluation of CO2 reduction in accordance with the Project's global objective.
- Carry out of the necessary actions under the Environmental Management Plan and the Land Acquisition Plan in a timely manner, and include adequate information thereon in the Project Progress Reports.
- Ensure monitoring and evaluation, on an ongoing basis, in accordance with indicators acceptable to the Bank.
- Furnish to the Bank, on or about December 15, 2001, a report on the progress achieved in the carrying out of the Project and integrating the results of the monitoring and evaluation of global environmental benefits (CO2 reduction) and proposing modifications to the implementation plan as needed to ensure the achievement of the Project's objectives.
- At mid-term review of Project implementation (March 15, 2002), undertake in cooperation with the Bank, an assessment of the progress made regarding implementation of the Project.
- Commence implementation of the agreed privatization strategy by September 30, 2002, in accordance with a time schedule to be agreed upon with the Bank.

H. Readiness for Implementation

☒ 1. a) The engineering design documents for the first year's activities are complete and ready for the start of project implementation.
☐ 1. b) Not applicable.

☒ 2. The procurement documents for the first year's activities are complete and ready for the start of project implementation.
☒ 3. The Project Implementation Plan has been appraised and found to be realistic and of satisfactory quality.
☒ 4. The following items are lacking and are discussed under loan conditions (Section G):

- Implementation arrangements (including the final choice of the responsible agency) for monitoring the achievement of the project's objectives such as the global emission reductions.
- Project financial management system satisfactory to the Bank.

I. Compliance with Bank Policies

☐ 1. This project complies with all applicable Bank policies.
☒ 2. The following exceptions to Bank policies are recommended for approval. The project complies with all other applicable Bank policies.

An exception has been requested from the standard requirement of OP 12.10 (Retroactive Financing) with respect to the cut-off date for retroactive financing, which is proposed to be October 1998. This extension

beyond the normal limit of 12 months before loan/grant signing (expected in the summer of 2000) is in order to help fund significant up-front investments already made by the Borrower. The early investments between October 1998 and mid-1999 were essential to help complete the works before the start of the winter season of 1999/2000.

Helmut Schreiber	Henk Busz	Basil G. Kavalsky
Team Leader	**Sector Manager/Director**	**Country Manager/Director**

Annex 1: Project Design Summary

POLAND: PODHALE GEOTHERMAL DISTRICT HEATING AND ENVIRONMENT PROJECT

Hierarchy of Objectives	Key Performance Indicators	Monitoring & Evaluation	Critical Assumptions
Sector-related CAS Goal: Contribute to achieving environmental sustainability (includes addressing the issue of emissions from small, dispersed sources such as domestic heating);	**Sector Indicators:** Improving environmental quality (with special reference to air pollution); Progress towards EU directive compliance and towards accession to EU; Overall CO2 reduction in Poland;	**Sector/ country reports:** Government reports on the state of the environment in the country; Reports on progress in meeting EU accession standards (available from both Polish and EU sources); National Communications and other reports to UNFCCC;	**(from Goal to Bank Mission)** Achieving the goals of environmental sustainability in Poland contributes to increased economic well-being of its people;
GEF Operational Program Engage Poland (as well as other economies in transition) in activities aimed at cost-effective reduction of carbon emissions and demonstrate the potential of renewable (geothermal) energy in this regard;	Overall CO2 reduction in Poland; Contribution of renewable (geothermal) energy in this reduction.	National Communications and other reports to UNFCCC;	Achieving the objectives of UNFCCC contributes to increased economic well-being of the people in Poland.
Project Development Objective: Through the increased utilization of clean energy resources (such as geothermal heat and natural gas) in the Podhale region of Southern Poland, to reduce the air pollution from local coal-fired heat boilers.	**Outcome / Impact Indicators:** Marked reduction in the ambient concentrations of particulate matter (and SO2) in the geothermal conversion area.	**Project reports:** Data from air pollution monitoring stations in Zakopane and Nowy Targ.	**(from Objective to Goal)** Reduced air pollution from local coal-fired heat boilers in the project area contibutes to Poland's success in achieving overall environmental sustainability and has no undesirable counter-effects (e.g. attracting more tourists and light commerce to the Zakopane area does not conflict with other environmental objectives).

Global Objective: Achieve cost-effective reduction of CO2 emissions on a significant scale in order to help Poland meet its international obligations under UNFCCC.	CO2 emission reductions achieved (calculated), tons/year; Cost per ton of CO2 reduction.	Project progress reports incorporating the results of analyses under the Monitoring and Evaluation Component; reports on supervision missions, project evaluation reports (midterm and final);	The Government remains committed to the 6% reduction in CO2 by 2010. It supports investments in projects that maximize progress toward meeting environmental goals; Renewable energy remains to be regarded as a high priority by the Government of Poland.
Output from each component: Completion by 2005 of a well functioning, partially private district heating system providing heat at reasonable prices to 7 municipalities of the Podhale area (including Nowy Targ); 1,242 Terajoules of clean (geothermal and gas-based) heat delivered to customers by year 2005; 4,200 small customers, 172 large loads, 28 Zakopane DH boiler houses, 3 Nowy Targ DH boiler houses connected by year 2005.	**Output Indicators:** Full operation and the number of consumers on line /using the services; Tariffs at a reasonable/ competitive level; Total heat delivered, TJ.	**Project reports:** Project progress reports, including reports on supervision missions, project evaluation reports (midterm and final);	**(from Outputs to Objective)** Introducing geothermal plant and modernizing the district heating system leads to the elimination of coal-fired heat boilers on a scale capable of producing the expected impact on the air quality in the project area. Eliminating the emissions from the low-stack emission sources in the project area is effective in reducing the exposure of people to polluted air.

			(from Outputs to Global Objective): Compared with the baseline (or no-project scenario), the geothermal project results in low-cost CO2 reductions on a significant scale; Without geothermal heat, similar CO2 reductions could not be achieved even if conversions from coal and fuel oil to gas were pursued most aggressively.
Project Components / Sub-components: Geothermal baseload plant and wells;	**Inputs: (budget for each component)** Geothermal heat delivered as a percentage of total heat delivered to the project area (not less than 70%);	**Project reports:** Company reports: quarterly and annual progress reports during the ramp up phase, annual reports thereafter;	**(from Components to Outputs)** The prices for the heat supplied by Geotermia Podhalanska are high enough to ensure the financial viability of the company but affordable enough for many enough customers to connect. There is sufficient awareness of the economic and environmental benefits of geothermal district heating among the local people and municipal authorities to provide the necessary political support for the project. Geothermal reservoir sufficient to maintain geothermal flow and heat output and make geothermal competitive with gas;

Peak-shaving gas-fired heat plants and heat pumps; District heating network.	Gas use as percentage of total heat delivered (TJ) to the project area (not less than 30%); Network (the geothermal circuit, transmission pipeline network, and distribution pipeline network).		Sufficient market penetration rate of geothermal heat to ensure expected return on investment; Sufficient implementation capacity of the construction contractors to allow project progress according to the Project Implementation Plan.

Annex 2: Project Description

POLAND: PODHALE GEOTHERMAL DISTRICT HEATING AND ENVIRONMENT PROJECT

Project Background and Progress to Date

This district heating Project began in 1995 when the initial doublet, drilled for demonstration purposes by the Polish Academy of Sciences, was connected to about 200 households in Banska Nizna. The Bank first got involved at this point. Since 1995, the following additional Project components have been ***completed:***

- A second production well and one of two reinjection wells that will be used with it;
- Construction of the base-load geothermal plant including nearly 73% of the ultimate geothermal capacity;
- Completion of 3.5 km out of 14.0 km of district heat transmission line between the base-load plant and Zakopane;
- Expansion of the distribution network in Bialy Dunajec and connection of 27 additional households;
- Construction of the 22 MWt first phase of the gas-fired peaking plant in Zakopane;
- Conversion of ten coal-fired district heating boilers in Zakopane to heat exchangers connected to the new network (see Table A2-2);
- Connection of 45 (by the end of 1999) of the expected 172 large loads to the network.

Market penetration of geothermal energy has been at the center of the Bank's assessment of this Project since the very beginning of its involvement. The following summary assessment of the market penetration to date helps to clarify the current status of the Project in relation to the eventual targets.

Table A2-1

Subsector	**Customers - 2005**	**Annual Sales in TJ - 2005**	**Load connections secured (in TJ of annual demand) by end 1999**
Households	4,243	372.6	15.5
Large Loads	172	498.4	55
Zakopane DH	1 (28 Boiler Houses)	96.6	96.6
Nowy Targ DH	1 (3 Boiler Houses)	235.0	235.0
Total		**1202.6**	**402.1**

The Zakopane DH loads are virtually certain. The decision to convert these boiler houses to geothermal heat belongs to Geotermia Podhalanska since the merger with Tatry.

Table A2-2

	Originally	**As of December 1, 1999**	**At project completion**
Geothermal		10	28
Gas/Oil		17	

Coal	34	3	
Converted permanently to gas		4	6
Total	**34**	**34**	**34**

The Nowy Targ loads now also appear highly probable. A final decision by Nowy Targ is anticipated prior to Bank's final commitment on the loan.

Forty five of the 172 large loads are already connected (or confirmed as being connected) to geothermal energy by the end of 1999. Of these forty five, 16 customers were connected in 1998 and, in 1999, 29 more large loads are under construction. The annual heat demand from these 45 loads is about 55 TJ. This means that PEC/GP has connected 26 % of the large loads in terms of number and 11 % in terms of heat load. The remaining large loads are substantially larger on average than the first 45.

Approximately 15.5 TJ of household load is expected to connect before the end of 1999. In sum, this suggests that ***about 400 TJ or nearly 33% of the target load can be considered secure*** at the time of the Bank's commitment to the Project.

However, much of the network (most notably, in the city of Zakopane) is still being supplied by the gas-fired Zakopane plant until the connection to the base-load geothermal plant is completed.

The Full Project: Components, Phases and Detailed Description

To complete the full project, the following major components will be added from 2000 through 2004:

- The transmission line to Zakopane will be completed in 2000;
- One additional reinjection well will be drilled in 2000;
- One additional geothermal doublet (production well and reinjection well) will be drilled in 2001;
- An absorption heat pump plant (AHPP), a pressure reduction station and two gas pipelines will be built in 2001;
- Additional villages will be connected - including Poronin and Szaflary in 2000, and Koscielisko in 2002;
- The district heat boiler houses in Nowy Targ will be connected in 2002;
- The distribution network will be completed by 2003.
- Heat exchangers and meters will be installed in remaining households and large loads by 2004.

The Project in its complete form will provide district heat to a majority of potential customers in the main Podhale Valley. The service area will extend about 14 km from the production wells to the City of Zakopane and about 7 km in the opposite direction from the well field to Nowy Targ (see map in Annex 12). The transmission line between the geothermal wells and Zakopane will be completed. In addition to the villages of Banska Nizna and Bialy Dunajec already receiving geothermal heat, the villages Poronin and Szaflary will be connected in 2000, Koscielisko in 2002. Three district heating boiler houses in Nowy Targ will be connected in 2002. The main components of the full project (including the completed components as indicated above) are:

(a) drilling seven geothermal wells (of which four wells are already completed) including three for production and four for reinjection. The production wells will extract low-enthalpy (~ 85 to 87.5° C temperature) geothermal waters in the Podhale basin to cover the base-load heat demand for the entire project service area including both Zakopane and Nowy Targ;

(b) constructing a base-load district heating plant with a capacity of approximately 38 to 43 MWt

(currently, at 15MWt heat exchanger capacity and 28 to 32 MWt geothermal resource capacity), capable of providing about 1,015 terajoules (TJ) of geothermal heat;

(c) constructing an absorption heat pump plant (AHPP) with two associated gas-fired hot water boilers at the site of the base-load geothermal plant, gas network pressure reductioin station, and two gas pipelines - from the main gas transmission pipeline to the three AHPs at the base-load plant site (2.5 km), and from the main gas transmission pipeline to the peak-load plant in Nowy Targ (5-6 km); the total output of the AHPP will be 33 MW, of which 60% is gas-based and 40% is based on the additional extraction of heat from geothermal water; the total output from the AHPP will be 355 TJ.

(d) constructing a 48 MWt peak-load natural gas plants in Zakopane (currently at 22 MWt) and a similar plant in Nowy Targ (planned at 14 MWt) with total production of about 73 TJ of heat;

(e) acquisition of land, expanding existing buildings and constructing new buildings for the production facilities;

(f) expanding the existing district heating systems by some 100 km of new pipeline network, including the geothermal circuit, transmission and distribution pipelines, and connections to individual households and other consumers;

(g) installing heat exchangers and heat meters in individual households and other buildings;

(h) monitoring and reporting the environmental benefits from the Project (with special emphasis on carbon emission reduction), including the introduction of institutional and technical arrangements to monitor their achievement according to suitable performance indicators.

The Project implementation is divided into ***four phases***, as follows:

1. Phase 1 (1993 – 1995) (completed):

1.1. Developing and operating a pilot plant on the basis of the first geothermal doublet (two wells, one for production, one for reinjection - **Doublet #1**) at Banska Nizna and Bialy Dunajec.

1.2. Connecting over 200 households to the nearby pilot plant through a small DH distribution network.

Heat sales of 0.1 million GJ/year at the end of Phase 1.

2. Phase 2 (1996 – 2000):

2.1. Drilling of a second geothermal doublet (Banska PGP 1 and Bialy Dunajec PGP 2, i.e. (**Doublet #2 a**) (done).

2.2. Construction of a geothermal base-load plant in Banska Nizna (done).

2.3. Construction of 3.5 km of DH transmission line to Zakopane (done).

2.4. Expansion of the DH distribution network of Bialy Dunajec (done).

2.5. Conversion to heat-exchangers of 27 households in Bialy Dunajec (done).

2.6. Construction of a 22 MWt gas-fired peak-shaving plant in Zakopane (done).

2.7. Expansion of DH distribution network in Zakopane (ongoing).

2.8. Conversion of nine coal-fired boilers to heat exchangers and connection to the DH network (done).

2.9. Conversion of large customers and connection to the DH network (ongoing).

2.10. Hydrogeological tests of geothermal wells (in Poronin, Bialy Dunajec, Furmanowa, Chocholow and Banska) for estimation of resources (done).

2.11. Completing of the DH transmission network to Zakopane (about nine km).

2.12. Expanding the peak-load plant in Zakopane to 32 MWt.

2.13. Conversion of 18 boilers to heat exchangers and connection to the DH network in Zakopane and 75 large scale customers.

2.14. Drilling of injection well PGP 3 (**Doublet #2 b**).
2.15. Continuation of the DH distribution network in Zakopane (about 2100 individual customers).
2.16. Construction of a new administration building.

Heat sales of 0.7 million GJ/year at the end of Phase 2.

3. Phase 3 A (2000-2001):

3.1. Bringing on stream one new geothermal doublet (well PGP 4, well PGP 5 - **Doublet #3**).
3.2. Expansion of DH distribution networks in Koscielisko, Bialy Dunajec and Poronin (3 large scale and about 130 individual customers).
3.3. An absorption heat pump plant (AHPP), a pressure reduction station and two gas pipelines built.

Heat sales of 0.8 million GJ/year at the end of Phase 3A.

Phase 3 B (2001-2004):
3.3. Expanding the peak-load plant in Zakopane to 48 MWt.
3.4. Continuation of the DH distribution networks in Poronin and Bialy Dunajec (mostly individual customers (1,200)).

Heat sales of 0.9 million GJ/year at the end of Phase 3B.

4. Phase 4 (2001-2004):

4.1. Construction of the main DH transmission line to Nowy Targ (seven km) - 2001.
4.2. Construction of a DH distribution network in Szaflary (almost 600 individual customers).
4.3. Construction of the geothermal base-load plant for Nowy Targ.
4.4. Construction of a gas-fired peak-load plant at Nowy Targ (14 MWt).
4.5. Extension of the existing DH distribution network in Nowy Targ (about three km).

Heat sales of 1.2 million GJ/year at the end of Phase 4.

The geothermal heat supply to the villages of Banska Nizna and Bialy Dunajec started in 1995 and 1998, respectively, and the city of Zakopane was connected in 1999. Poronin and Szaflary will be connected in 2000, Koscielisko in 2002. Three district heating boiler houses in Nowy Targ would be connected in 2001. These cities and villages are all in the central valley of the Podhale basin. The model developed here can then be quickly adapted for use in other localities with geothermal resources, such as the towns of the eastern and western valleys of Podhale. To complete the system in the Central Valley under the Project will take till 2004.

By Component:

Project Component 1 - US$43.20 million

A. Production and Transmission of Heat. The production plant units, including the geothermal doublets, the geothermal heat exchange plant, two peak-load natural gas plants (Zakopane and Nowy Targ), a medium-pressure transmission pipeline, related pumping stations and pressure reducing equipment, as well as needed land and buildings.

Project Component 2 - US$24.30 million

B. Heat Distribution Network Development. The construction of distribution networks and connection of

custormers in Zakopane, Nowy Targ, and a number of villages in the main valley between these two cities.

Project Component 3 - US$ 4.60 million

C. Provision of Heat Exchangers, Meters, and Other Goods. The component provides for supply and installation of heat exchangers and heat meters. The customers will include district heating systems in Zakopane and Nowy Targ, other large loads (on a cost sharing basis), but exclude individual households. The cost covers heat exchangers, heat meters, and an installation fee. The component also includes provision of miscellaneous tools, equipment, and vehicles for PEC/GP.

Project Component 4 - US$0.45 million

D. Project Management. Provision of technical assistance for the implementation of financial management, including auditing.

Project Component 5 - US$0.40 million

E. Monitoring & Evaluation, through an independent agency, of the GHG reduction benefits from the Project - based on a monitoring and evaluation protocol for carbon reduction projects, to be developed with GEF assistance.

In addition to the above-mentioned base Project costs of **US$ 72.1 million** (for Components A, B, and C), as well as **US$ 0.85 million** for the institutional development Components D and E, the total Project cost estimates include:

(a) Physical contingencies of US$6.0 million, averaging about 8.3% of total base costs, and
(b) Price contingencies of US$2.6 million, averaging 3.7% of total base costs.

The total contingency allowance is thus **US $8.6 million**. No contingencies are included in the historic costs pre-1999. Physical contingencies on drilling of wells and on geological works have been estimated at 30%, whereas a 10% contingency has been allowed for all remaining items from 1999 onwards. Price contingencies are based on estimated expenditures (base costs in 1998-terms plus physical contingency) between 1999 and 2004 and take account of projected inflation in Poland, Germany and the USA.

The allowance for interest during construction, plus fees, amounts to **US$ 6.2 million**.

Finally, the incremental working capital is calculated at about **US$ 9.0 million**.

Annex 3: Estimated Project Costs

POLAND: PODHALE GEOTHERMAL DISTRICT HEATING AND ENVIRONMENT PROJECT

Table A3-1. Total Project Costs and Financing Required - 1995 to 2004:

	PLN Million			US$ Million			% of Total	% of Total	% of Total
	Local	Foreign	Total	Local	Foreign	Total	Base	Project	Financing
Production Units									
Wells	35.7	4.9	40.6	10.4	1.6	12.1	16.7%	14.9%	12.5%
Geothermal Plant	7.2	9.7	16.9	1.9	2.6	4.4	6.2%	5.5%	4.6%
Heat Pumps	0.0	12.7	12.7	0.0	3.2	3.2	4.4%	3.9%	3.3%
Gas Line	1.7	0.6	2.3	0.4	0.2	0.6	0.8%	0.7%	0.6%
Peak Plant Zakopane	8.0	6.3	14.4	2.3	1.9	4.1	5.7%	5.1%	4.3%
Peak Plant Nowy Targ	0.8	1.2	2.0	0.2	0.3	0.5	0.7%	0.6%	0.5%
Transmission	30.4	26.2	56.6	7.8	6.7	14.6	20.2%	18.0%	15.1%
Pumping Stations	1.0	1.9	2.9	0.2	0.5	0.7	1.0%	0.9%	0.7%
Land	1.2	0.0	1.2	0.4	0.0	0.4	0.6%	0.5%	0.4%
Building	4.1	0.0	4.1	1.0	0.0	1.0	1.4%	1.3%	1.1%
Other	1.7	4.1	5.8	0.4	1.1	1.6	2.2%	2.0%	1.6%
Production Units Total	91.8	67.7	159.5	25.2	18.0	43.2	59.9%	53.5%	44.6%
Distribution Network	69.9	24.5	94.5	18.0	6.3	24.3	33.7%	30.1%	25.1%
Heat Exchangers & Meters	0.0	17.7	17.7	0.0	4.6	4.6	6.4%	5.7%	4.7%
Total Base Cost	161.7	109.9	271.6	43.2	28.9	72.1	100.0%	89.3%	74.5%
Physical Contingency	16.0	8.6	24.6	3.9	2.1	6.0	8.3%	7.4%	6.2%
Price Contingencies	25.2	6.2	31.3	2.1	0.5	2.6	3.7%	3.3%	2.7%
Total Project Cost	202.9	124.6	327.5	49.2	31.5	80.7	112.0%	100.0%	83.4%
Project Management	1.2	0.5	1.7	0.3	0.1	0.5			0.5%
Monitoring & Evaluation	0.8	0.8	1.6	0.2	0.2	0.4			0.4%
IDC + Fees	3.2	24.8	28.0	0.7	5.5	6.2			6.4%
Increm.Working Capital 1/	35.2	0.0	35.2	9.0	0.0	9.0			9.3%
Total Financing Required	243.3	150.8	394.0	59.4	37.3	96.7			100.0%

1/ Incremental working capital consists of current assets less current liabilities (excluding short term loans) from 1995 to 2004

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Poland: Podhale Geothermal District Heating and Environment Project
Table A3-2. Costs and Financing Plans for Overall Project (1995 - 2004)

Applications	PLN Million			US$ Million	Percent
	Local	Foreign	Total		
Project Investment	202.9	124.6	327.5	80.7	83.1%
Financing Costs	3.2	24.8	28.0	6.2	7.1%
Changes in Cash/Working Capital	35.2	-	35.2	9.0	8.9%
Miscellaneous	1.2	0.5	1.7	0.5	0.4%
M&E of GHG Abatement	0.8	0.8	1.6	0.4	0.4%
Total	243.3	150.8	394.0	96.7	100.0%
Sources					
Internally Generated Funds	50.1	-	50.1	10.7	11.1%
Equity	37.4	-	37.4	11.9	12.3%
Grants	14.8	106.5	121.3	31.3	32.4%
Phare I	-	0.2	0.2	0.1	0.1%
Phare II	-	70.6	70.6	18.1	18.7%
National Fund	10.6	-	10.6	3.3	3.4%
EcoFund	4.2	-	4.2	1.3	1.4%
GEF	-	22.6	22.6	5.4	5.6%
USAID	-	10.5	10.5	2.5	2.6%
DEPA Grant	-	2.6	2.6	0.6	0.6%
Local Loans	17.3	-	17.3	4.6	4.7%
IBRD Loan	-	168.0	168.0	38.2	39.5%
Total	119.5	274.4	394.0	96.7	100.0%

Poland: Podhale Geothermal District Heating and Environment Project
Table A3-3. Costs and Financing Plan for the Bank/GEF Project (2000 - 2004)

Applications	PLN Million			US$ Million	Percent
	Local	Foreign	Total		
Project Investment	153.3	94.6	247.9	56.7	80.9%
Financing Costs	3.2	24.8	28.0	6.2	9.2%
Changes in Cash/Working Capital	27.1	-	27.1	5.9	8.8%
Miscellaneous	1.2	0.5	1.7	0.5	0.5%
M&E of GHG Abatement	0.8	0.8	1.6	0.4	0.5%
Total	185.5	120.7	306.2	69.6	100.0%
Sources					
Internally Generated Funds	50.1	-	50.1	10.7	15.4%
Equity	7.3	-	7.3	1.7	2.4%
Grants	-	80.8	80.8	19.0	27.3%
Phare II	-	45.0	45.0	10.5	15.1%
GEF	-	22.6	22.6	5.4	7.8%
USAID	-	10.5	10.5	2.5	3.6%
DEPA Grant	-	2.6	2.6	0.6	0.9%
IBRD Loan	-	168.0	168.0	38.2	54.9%
Total	57.4	248.7	306.2	69.6	100.0%

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Annex 4

POLAND: PODHALE GEOTHERMAL DISTRICT HEATING AND ENVIRONMENT PROJECT

INCREMENTAL COST ANALYSIS SUMMARY

Baseline

The region of Pohale is a well-known ski resort in the Tatra mountains in Southern Poland. With over two million visitations per year, tourism is the primary economic activity. The space and water heating needs in the area are currently met primarily through the burning of coal, coke or wood in individual household or commercial boilers or from the coal-fired district heating systems in the two dominant cities of Zakopane and Nowy Targ. Some commercial facilities have converted from coal to oil or gas boilers for environmental and convenience reasons. Most households use electric water heaters in the summer season when the boilers are not operating.

Natural gas distribution networks are the typical competitors for new district heating systems. Although natural gas is available in Zakopane, the villages between Zakopane and Nowy Targ are exclusively heated by atomistic household and commercial systems. Given the linear, low density development pattern in the valley, future gas networks are not probable on a standard commercial basis. In Nowy Targ, the proposed project would supply a potion ot the district heating system now supplied by three coal boiler houses. P roposals for replacement of these boilers have been taken from coal interests, gas interests and Geotermia Podhalanska.

The current Zakopane gas supply is sufficient for peak-load operation with the geothermal heating system and could provide about 70% of the total heat demand from anticipated geothermal heat customers in case of emergencies (as in temporary failure of the geothermal system). LPG is not an established alternative since storage and delivery capability are not developed and due to the relatively high price of this fuel. Conversion of coal and coke systems to fuel oil provides another conversion option.

Local air quality standards will require expensive upgrades of most coal and coke systems at time of replacement in the cities of Zakopane and Nowy Targ where pollutant concentrations exceed allowable standards. EU accession will probably further stiffen compliance requirements. For these reasons, the baseline for Zakopane assumes substantial migration from coal and coke to gas and oil during the next decade. For households, the ten year conversion target is roughly equal to the number of anticipated replacements of the existing home heating systems. For the Tatry boiler houses, conversion of all coke boilers to gas is aggressively assumed to be complete by the end of 2001. In Nowy Targ, the baseline evaluated here assumes replacement of the existing coal boilers with compliant coal technology by 2001. For the villages between Zakopane and Nowy Targ, gas extensions are not likely because of low heating densities. Continued use of existing coal and coke heating fuels would not be disadvantaged since the concentrations of major air pollutants are not expected to exceed standards in these more rural areas.

To summarize, the baseline includes conversion to gas for the Tatry district heat system and a new compliant coal district heat system in Nowy Targ by 2001. Individual households and large loads in Zakopane are assumed to convert to oil or gas at the time of replacement of existing heating systems over the next decade because compliance with emission regulations would make continued use of coal prohibitively expensive. In the villages between Zakopane and Nowy Targ, continued use of existing fuels is assumed because of cost advantages and since air quality regulations would not be limiting. The baseline thus includes all costs of compliance with Polish air quality regulations but does not achieve the same

levels of reduction in emissions as the proposed project.

GEF Proposed Project

The proposed Podhale Geothermal District Heating Project would exploit a rich reservoir of hot water to establish a new geothermal district heating system supplemented with gas-fired heat pumps and gas peaking plants. This new system would supply the space and water heating needs of residential and commercial consumers in an area that includes parts ofZakopane and Nowy Targ and the developed areas between these limiting nodes. The service area would extend about 14 km from the production wells to the City of Zakopane and about 7 km in the opposite direction from the well field to Nowy Targ.

The project has been under development since 1995, and feasibility work is practically completed. The feasibility study yielded encouraging results from a technical-engineering point of view, but it raised questions about the commercial viability of the project. Both economic and financial feasibility have now been assessd in detail and the project can be shown to meet or exceed World Bank investment criteria when environmental benefits are recognized. Economic feasibility depends on explicit recognition of the environmental costs of continued use of fossil fuels in terms of health-related costs. Financial viability depends on environmental grants to qualify the project for World Bank loan consideration. Without environmental grants, the heat price needed to achieve an adequate financial rate of return would substantially dampen the conversion prospects and related carbon reductions.

The economic costs of the project are $90.3 million including $13.1 million for heating system conversions paid for by the end users. These figures are expressed in constant 1999 USD and include 10 percent contingencies on all future outlays except for well drilling. The drilling contingency is 30 percent. Financial costs are presented in Annex 5.

Although the construction and investment periods extend from 1995 through 2004, the major investments will be completed by 2003. Annual economic operating costs at full scale operation in 2005 are anticipated to be about $3.5 million (in 1999 USD). The life cycle of the project has been chosen to extend through 2024 since this represents 20 years of full-scale operation and because of the long life of this technology without major reinvestments. The 1995 (BOY/11%) present value of the life cycle costs from 1995 through 2024 of the proposal is $70.1 million. Undiscounted life-cycle costs total about $181.3 million.

After full implementation, the geothermal system will produce about 1,444 TJ of heat annually of which 1,203 TJ will be sold. The difference represents transmission and distribution losses of about 10%. In addition, a few of the former coal-fired boiler houses in Zakopane that have recently been converted to gas-firing will produce about 20 TJ per year of which 17 TJ will be sold.

Because of the capital intensity and relatively long ramp-up period, the economics of the project are very sensitive to the pace and magnitude of the market penetrations achieved. Based on detailed market penetration studies and discussions with the district heating companies, the following sales forecasts were developed for 2005 when the system reaches full implementation:

Class	Number	Annual Sales (TJ)	Percent
Households	4 243	373	30.6%
Large Loads	172	498	40.8%
Zakopane DH	28	114	9.3%
Nowy Targ DH	3	235	19.3%
Total	**4 446**	**1 220**	**100.0%**

Additionality

To qualify for GEF grants the economic and financial impact of such credits on project realization must be demonstrated. This project relies centrally on a World Bank loan to cover a significant portion of the remaining investment costs. To obtain a World Bank loan, the project will need a sufficient economic internal rate of return (EIRR) and a sufficient financial internal rate of return (FIRR). At this point, it is clear that both the EIRR and FIRR will require recognition of the value of carbon reductions to meet World Bank investment criteria. The EIRR on the full project (1995 - 2024) is just 8.6% based solely on heating cost savings. The EIRR on the incremental project (2000 - 2024) is 15.9% based solely on heating cost savings but this ignores significant geothermal investments in prior years and is not then representative of a replicable project based on this technology.

Emission Reductions

The project will provide a sizable reduction in CO2 emissions as substantial volumes of coal, coke, gas and fuel oil combustion are replaced by geothermal and gas as the primary and peaking heating fuels. Based on the assumptions outlined below, the carbon reductions achieved through the project are estimated at about **2.7 million tons of CO2** (tCO2) over twenty years of full operation (2005 - 2024) and the ramp up period (1995 - 2004). This is equivalent to about 730.9 thousand metric tons of carbon (tC).

Baseline Emissions

CO2 emissions from the production of energy in the baseline were calculated on the basis of the following emission factors:

- coal: 0.33 tCO2 / MWh;
- coke: 0.37 tCO2 / MWh
- oil: 0.28 tCO2 / MWh
- gas: 0.20 tCO2 / MWh
- electricity 1.11 tCO2 / MWh at residential end user

Electric production on the Polish grid is coal-based so the coal factor is applied to displaced electric production. The average efficiency of the Polish electric production is 33% and transmission and distribution losses might be 10%, resulting in an emission factor of 1.11 tCO2 / MWh for electricity measured at the residential end-user.

Three types of consumers were distinguished:

- small consumers (households)
- large consumers using more than 300 GJ per year
- Zakopane and Nowy Targ district heating systems

Small consumers: Based on survey results, the current and projected baseline annual fuel use for the 4,243 households that are expected to convert to geothermal are shown in the following table.

Zakopane (2,094 HH)	**1998 TJ**	**1998 Percent**	**2008 TJ**	**2008 Percent**
Coal	71.2	23.1	23.7	0.39
Coke	189.9	61.6	74.2	29.2
Oil	4.2	1.4	115.2	45.3
Gas	2.1	0.7	20.9	8.2
Other	26.7	8.7	5.9	2.3
Electric	14.2	4.6	14.2	5.6
TOTAL	308.3	100.0	254.2	100.0
Villages (2,149 HH)				
Coal	177.7	60.9	177.7	60.9
Coke	60.3	20.7	60.3	20.7
Oil	0	0	0	0
Gas	0	0	0	0
Other	40.3	13.8	40.3	13.8
Electric	13.4	4.6	13.4	4.6
TOTAL	291.6	100.0	291.6	100.0
Total (4,243 HH)				
Coal	248.9	41.5	201.4	36.9
Coke	250.1	41.7	134.4	24.6
Oil	4.2	0.7	115.2	21.1
Gas	2.1	0.3	20.9	3.8
Other	67	11.2	46.2	8.5
Electric	27.6	4.6	27.6	5.1
TOTAL	**599.9**	**100.0**	**545.8**	**100.0**

The baseline conversion to gas and oil in Zakopane is readily apparent.

The expected conversion schedule, related residential heat sales and carbon emissions are as follows:

Year	Households Converted (Cum)	Total TJ Sold	Percent	T CO2
1995	130	7.8	2.1	1,039
1998	213	8.6	2.3	1,159
1999	223	9.7	2.6	1,501
2000	469	11.9	3.2	1,863
2001	1,569	68.7	18.4	10,837
2002	3,119	211.9	56.9	33,073
2003	4,196	335.3	90.0	51,830
2004	4,243	372.6	100.0	56,908
2005	4,243	372.6	100.0	56,199
2006	4,243	372.6	100.0	55,490
2007	4,243	372.6	100.0	54,781
2008 On	4,243	372.6	100.0	54,072

The base case carbon emissions from converting households increase as shown above. The strong growth in the early period is due to increased number of households converting to geothermal as the network is extended. From 2004 to 2008, baseline emissions continue to decrease because additional households are converting from coal or coke to gas or oil. In 2008, baseline residential CO2 emissions stabilize at 50,834 tons per year. The total base case emissions from the converting households from 1995 through 2024 are 1,171,668 tons of CO2.

Large consumers

There are 172 individual large loads, each using more than 300 GJ per year, that are expected to convert to geothermal based on cost comparisons with gas and oil options. To comply with environmental regulations at the time of boiler replacement, continued use of coal or coke would be rather expensive. These loads are concentrated in Zakopane with only 6 located in the villages. The 172 expected loads represent a penetration rate of about 80% of those that will have access to the geothermal network. Specific cost comparisons were made for a sample of 38 of these loads. The results for 34 loads now using coal or coke indicate that geothermal would cost less than 90% of continued use of the existing fuel for 81% of the GJ used. Comparisons for 4 loads now using oil show geothermal is less costly in each case.

The fuels used by the 172 loads are characterized in the following table. Again, the assumed baseline conversions to gas or oil within Zakopane are evident.

Zakopane (166 LL)	2008 TJ	2008 Percent
Coal	3.7	0.7
Coke	152	29.6
Oil	301.8	58.8
Gas	49.6	9.6
Electric	6.6	1.3
TOTAL	513.7	100.0
Villages (6 LL)		
Coal	0.7	0.6
Coke	1.6	1.4
Oil	115.7	98
Gas	0.0	0.0
Electric	0.0	0.0
TOTAL	118.1	100.0
Total (172 LL)		
Coal	4.4	0.7
Coke	153.6	24.3
Oil	417.6	66.1
Gas	49.6	7.8
Electric	6.6	1.0
TOTAL	631.8	100.0

The sales and carbon emissions trajectories for the large loads are:

Year	Large Loads Converted (Cum.)	Total TJ Sold	Percent	T CO2
1998	19	1.7	0.3	288
1999	46	22.3	4.5	3,399
2000	87	59.5	11.9	8,835
2001	167	394.4	79.5	67,586
2002	168	458.5	92.0	75,448
2003	169	459.1	92.1	60,058
2004	172	474.1	95.1	61,230
2005	172	498.5	100.0	58,930
2006	172	498.5	100.0	56,630
2007	172	498.5	100.0	54,330
2008 On	172	498.5	100.0	52,031

The total baseline emissions for 1995 –2024 for these 172 large loads are 1,331,256 tons of CO2.

Zakopane District Heat: In 1997, the district heat boiler houses in Zakopane were fired by coal (85%) and natural gas (15%). Prior to 1998, the Tatry boiler houses feeding the Zakopane district heating system operated identically in the baseline and with the proposed project. It is assumed that all of the boiler houses will switch to natural gas in the baseline by 2003. The following table shows the baseline heating fuel and electric consumption for the Tatry boiler houses beginning with 1998. Heat sales from the Tatry boiler houses remain constant from 1998 on but production declines based on the assumption that losses in the system would be reduced significantly.

Year	Production (TJ)	Coal Input (Mwh)	Gas Input (Mwh)	Electric Input (Mwh)	T CO2
1998	185.7	46,168	16,280	836	21,174
1999	173.3	39,361	18,510	780	19,046
2000	162.5	22,986	29,722	731	15,180
2001	152.9	9,396	38,853	688	11,935
2002	152.9	1,728	45,668	688	10,461
2003 On	152.9	0	47,204	688	10,129

The baseline emissions for the Tatry boiler houses are 367,042 tons of CO2 over the 1995 - 2024 period of operation.

***Nowy Targ District Heat*:** The 3 boiler houses to be connected are currently fired primarily by fine-grained coal. By 2003, these boiler houses will be converted to gas or geothermal or will be retrofitted with new coal boilers based on the tenders that are now being requested. The baseline assumes coal will be chosen. The baseline fuel inputs and related emissions are summarized in the following table:

Year	Production (TJ)	Coal Input (Mwh)	Electric Input (Mwh)	T CO2
2002 Part	117.5	54,398	529	18,480
2003 On	235	108,196	1,058	36,690

Total baseline CO2 emissions from the converted boiler houses from mid-2002 through 2024 are 831,606 tons.

Baseline Summary

The baseline emissions are summarized in the following table:

Source	Life Cycle Tons of CO2
Households	1,171,668
Large Loads	1,331,256
Zakopane District Heat	367,042

Nowy Targ District Heat	831,606
TOTAL	**3,701,572**

Project Emissions

Project CO2 emissions result primarily from electric pumping load and from use of gas in the peaking plants, in the heat pumps and in the Tatry plants that continue gas-firing.

Year	Production (TJ)	Coal (Mwh)	Gas (Mwh)	Electric (Mwh)	T CO2
1995	203.4	54,765	3,789	828	21,932
1996	198.7	60,572	6,587	880	24,697
1997	196.4	47,133	10,753	1,070	20,767
1998	164.8	33,921	10,149	781	15,440
1999	203.7	12,741	35,564	846	12,757
2000	220	2,520	45,395	2,336	12,581
2001	859.2	0	17,814	8,354	12,752
2002	1,262.6	0	40,720	15,329	25,006
2003	1,390.3	0	73,632	20,273	37,027
2004 On	1,464.0	0	85,349	20,782	39,930

Total carbon emissions under the proposed project are 1,021,487 tons of CO2 over the nominal project life.

Emission Reductions

Combining the detailed results from above provides the following aggregate changes in emissions and costs:

Plans and Differences	MT CO2	NPV LCC Costs (TUSD) 1995 (BOY/11%)
Baseline		
Households	1,171,668	$18,204
Large Consumers	1,331,256	$28,985
Zakopane District Heat	367,042	$9,553
Nowy Targ District Heat	831,606	$5,344
TOTAL	3,701,572	$62,086
GEF Alternative	1,021,487	$70,105
Difference	**2,680,086**	$8,019
Unit Abatement Cost ($/MT CO2)		**$2.99**
Unit Cost to GEF with Grant at 5.4 MUSD ($/MT CO2)		$2.01

These results are based on a discount rate of 11.0% which is the middle of the acceptable range for World

Bank projects. At 12%, the cost per ton of CO2 is $3.43 and at 10% the cost is $1.55 per ton of CO2.

The unit abatement costs for this project are centrally dependent on a large number of parameters and projections that are inherently uncertain. A wide range of sensitivity analyses have been completed to identify those parameters having the most significant influence on unit abatement costs. Results are summarized as follows:

Change Variable	**Base Value/ Multiplier**	**Changes**	**Cost/MT CO2**	**% Change from Base**
Base Case		None	$2.99	0.0%
Discount Rate	11.0%	12.0%	$3.80	27.0%
		10.0%	$1.96	-34.5%
Heating Coal Prices	1.0	1.1	$2.39	-20.1%
		0.9	$3.60	20.3%
Oil Prices	1.0	1.1	$2.43	-18.8%
		0.9	$3.56	19.0%
Gas Prices	1.0	1.1	$3.02	0.9%
		0.9	$2.96	-1.1%
Electric Marginal Cost	1.0	1.1	$3.04	1.6%
		0.9	$2.94	-1.7%
Project O&M Costs	1.0	1.1	$3.77	26.0%
		0.9	$2.21	-26.1%
Project Investment GP	1.0	1.1	$4.60	53.7%
		0.9	$1.39	-53.5%
Customer Conversion Costs to Geothermal	1.0	1.1	$3.23	8.0%
		0.9	$2.76	-7.8%
NT Gas Not Coal In Baseline	All Coal	All Gas	$3.50	17.0%
Baseline Fuel Costs				
Households	1.0	1.1	$2.59	-13.4%
		0.9	$3.40	13.6%
Large Loads	1.0	1.1	$2.28	-23.8%
		0.9	$3.71	24.0%
Zakopane Dist. Heat	1.0	1.1	$2.71	-9.4%
		0.9	$3.27	9.3%
Nowy Targ Dist Heat	1.0	1.1	$2.86	-4.4%
		0.9	$3.12	4.3%
Non-Fuel O&M Baseline				
Households	1.0	1.1	$2.81	-6.1%
		0.9	$3.18	6.3%
Large Loads	1.0	1.1	$2.73	-8.8%
		0.9	$3.25	8.6%
Zakopane Dist Heat	1.0	1.1	$2.96	-1.1%
		0.9	$3.02	0.9%
Nowy Targ Dist Heat	1.0	1.1	$2.97	-0.7%
		0.9	$3.02	0.9%

These results support the following conclusions:

1. The most critical factor examined here is the investment cost associated with the project. Fortunately, some of that cost has already been incurred and is not subject to uncertainty. In addition, contingencies of 30% on well drilling and 10% on all other items have been included. Lower costs than the estimates including contingencies are quite possible and would have significant beneficial impact.
2. Gas prices and the marginal costs of electricity are quite uncertain but have very limited impact since they impact both the baseline and the proposed project to a similar extent.
3. Results are fairly sensitive to oil prices because many loads have been assumed to convert to fuel oil in the baseline. Recent oil price developments suggest that prices are much more likely to be higher rather than lower than the base forecast. That will have a beneficial impact on unit abatement costs.
4. Discount rates have a significant impact but this is a predetermined investment criterion rather than a speculative future parameter.
5. There is no absolute way to determine whether Nowy Targ would have chosen coal or gas firing for the three boiler houses that will convert to georthermal had the baseline materialized. Had gas been chosen rather than coal, it is reassuring that the increase in unit abatement costs is limited to 17.0%.
6. Large loads are the dominant sector. This means that Geotermia Podhalanska can concentrate their marketing efforts on 172 loads that are expected to convert. In fact, they have followed exactly this strategy to date.
7. The most reasonable general expectation is that some parameters will be higher than expected and others lower than expected. From the sensitivity cases examanined it does not appear that the unit abatement costs will be likely to vary by more than 10 to 15% from the base estimates.

Annex 4.1

STAP Roster Technical Review

Summary

The project complies with the documentation requirements. The title page contains the required data on the project, funding and the prospective debtor and guarantor. The goals of the project are described clearly enough and presented in the required manner.

The main benefit is the reduction of CO2 emissions and at the same time a reduction of air pollution from particulates, sulfur oxides and nitrogen oxides from local coal boilers by switching to geothermal heat and also partially to natural gas.

The incremental costs are $7.42 per ton of CO2 when a 12% discount rate is assumed (10% discount generates a cost of only $5.63/t CO2).

The project was reviewed after the initial pilot phase was completed and first results support the project expectations. The Podhale geothermal project is **recommend** for implementation.

Project Objectives

- A 70% reduction of CO2 emissions in the area of Zakopane and Nowy Targ and thus an overall reduction of CO2 in Poland;

- Improving environmental quality (with special reference to air pollution) through the reduction in the use of energy generated from combustible fuels in the area; decisive reduction in the winter peak ambient concentrations of particulate matter and SO2 in the geothermal conversion area making sure that the Polish annual average standard for ambient air quality is met in Zakopane by the year 2000.

- Support sustainability by increasing geothermal energy use and replacing coal with this renewable energy source;

- Increase the use of renewables in Poland's energy balance;

Project Description

Baseline

The project baseline and alternative are projected on the following heat market in the Zakopane and Nowy Targ area (Southern Poland):

Class	Number	Annual Sales (TJ)
Households	4,243	402
Large Loads	172	508
Zakopane DH	24	97
Nowy Targ DH	3	235
Total	**4,442**	**1,242**

At the present time the market is covered mainly by coal and coke, minor consumers use natural gas. The baseline solution involves switching to natural gas in most sites and maintaining a consumption pattern of about 1/4 coal.

Proposed Alternative

The proposed Podhale Geothermal District Heating Project aims to exploit a rich reservoir of hot water to establish a new geothermal district heating system with supplementary gas peaking plants. The service area would extend about 14 km from the production wells to the City of Zakopane and about 7 km in the opposite direction from the well field to Nowy Targ.

The main project components are:

- drilling five geothermal wells including two for production and three for reinjection in addition to the two doublets already in place

- constructing a new base-load district heating plant with a capacity of approximately 60 to 70 megawatts (MW), with about 1,075 terajoules (TJ) of heat provided from geothermal sources

- constructing new peak load natural gas plants in Zakopane (42 MWt) and Nowy Targ (12 MWt) with production of about 305 TJ of heat

- developing the district heating network (about 100 km), including the geothermal circuit, transmission and distribution pipelines, and connections to individual households and other consumers.

Costs and Benefits

CO2 reduction and respective costs are shown in the following table:

Plan	CO2 Emissions (MT)	1995 (BOY) NPV LCC Costs ($000)

Baseline Small Consumers Large Consumers Zakopane DH Nowy Targ DH **Total**	 1,265,720 1,386,176 186,895 **3,258,154**	 $16,314 $25,488 $4,183 $6,436 **$52,421**
Alternative	**1,232,604**	**$67,442**
Difference	**2,025,551**	**$15,021**

The incremental economic costs of the Project compared to the baseline expressed as 1994 present value depend centrally on the real discount rate chosen. Normal World Bank discount rates are from 10.0 to 12.0 percent. The incremental costs over this range of rates are summarized in the following table.

Real Discount Rate	Incremental Cost ($ mln)	Cost per ton CO2
10.0	$11,402	$5.63
11.0	$13,453	$6.64
12.0	$15,021	$7.42

Risks and Issues Requiring Attention

The project's major risks are connected with the future market:

- Domestic market risk – lingering subsidies on coal and coke making geothermal energy less economic;
- Market penetration of geothermal heating is insufficient to ensure expected return for the investors in the Project;
- Insufficient heat tariff adjustment to ensure adequate long-term financial performance of Geotermia Podhalanska;

The study shows that the project developer is aware of the risks and proposes a rational solution which could diminish the risks:

- Long-term contracts for heat supply with the customers; dialogue with the government on geothermal tariffs.
- Sufficient time and effort allocated to marketing the geothermal energy as an environmentally clean source of heat; long-term contracts with large customers.
- Dialogue with the municipalities on tariff adjustments with simultaneous effort to attract new customers to spread the fixed costs and realize economies of scale.

- Proactive marketing; long-term contracts with the large customers (see the same item earlier in the table).

When the activities mentioned above are implemented in time the overall risk can be considered to be at an acceptable level.

Borrower and Proposed Financing

The Borrower

The Project will be implemented by Geotermia Podhalanska, SA (GP). GP's majority owner is the Polish National Fund for Environmental Protection and Water Management. The initial pilot phase of the project began supplying 185 homes with geothermal heat in 1995. Full-scale implementation should now be completed during a seven-year period from 1998 through 2004.
Geotermia Podhalanska (GP) has been in operation since 1994 as a corporation. In January of 1998, GP merged with the Zakopane district heating company previously called Tatry. Total employment for the merged companies is about 100. The Company has utilized technical assistance (TA) from Danish and US experts in geological exploration, exploitation, environmental management, marketing and financial planning. This TA is expected to continue during the next several years.

The Major Shareholders	**Shares**	**Percent**
Zakopane Municipality	38,068	12.7
National Fund	237,308	78.9
TOTAL	275,376	91.6

Costs and Financing

Project costs are as follows:

Component	**Category**	**Indicative Costs (US$M)**	**% of Total**
Production Plant	Physical	42.6	55.3
Transmission-Distribution Plant	Physical	23.9	31.0
Tatry Boiler House Conversions	Physical	0.7	0.9
Subtotal:		67.2	87.2
Contingencies:		6.6	8.6

Interest during construction		2.3	3.0
Incremental working capital		1.0	1.3
	Total	**77.1**	**100.0**

The ensured funding comes from the following sources:

Geotermia Podhalanska Equity	7.5
National Environmental Fund Equity	3.2
Internal cash generation	1.9
Ekofund	1.3
Local Loan Funds	1.9
European Union/PHARE Programme	8.0
European Union PHARE 2 (under discussion)	10.0
Danish Ministry of Environmental Protection (DEPA)	1.5
Carbon Investment Fund	4.5
IBRD Loan	34.0
TOTAL	73.8

(The differences between the two tables are in "Interest" and "Working Capital")

Consistency with GEF Program and Country Assistance Strategy

The Objective of the Project complies with GEF goals very well. It represents one of the best approaches which can serve as a pilot project for other areas in CEE.

Achieving environmental sustainability is a major development goal in the current CAS, including the issue of reducing emissions from many small, dispersed sources such as domestic heating. This project offers a rich blend of environmental and economic outputs and a co-financing structure that contributes directly to the CAS goals for Poland.

The Podhale geothermal Project also supports the CAS objective of ***sustaining private sector growth.*** Promotion of growth in needed infrastructure through expanded private sector investment is identified.

Conclusions

I highly recommend the Podhale geothermal Project for implementation.

Prague, March 8, 1999
Jaroslav Marousek

SEVEN Prague

Annex 4.2

POLAND

Podhale - Geothermal and Environment Project

Response to STAP Reviewer's Comments

According to the STAP reviewer, "the objective of the Project complies with GEF goals very well. It represents one of the best approaches which can serve as a pilot project for others in CEE". On that basis, the STAP has "highly recommended" the Podhale Project for implementation.

No suggestion were made for further improving the Project.

Annex 5: Financial Summary

POLAND: PODHALE GEOTHERMAL DISTRICT HEATING AND ENVIRONMENT PROJECT

Financial Projections for PEC Geotermia Podhalanska S.A.
A. Key Assumptions and Discussion of Results

1. Macroeconomic Indicators

Projected Inflation Rates in Poland and abroad, as well as the rates in major equipment-producing countries are as follows:

Year:	1999	2000	2001	2002	2003	2004	2005
Polish Inflation Index:	9.6%	7.5%	6.5%	5.5%	4.5%	4.0%	3.5%
Import Inflation Index PLN (70%Germany, 30%USA):	0.00%	3.4%	3.6%	3.7%	3.7%	3.2%	2.9%

Projected Exchange Rates between key currencies (PLN, EURO, US$) are as follows:

Year:	1999	2000	2001	2002	2003	2004	2005
PLN/USD	4.0	4.2	4.3	4.5	4.6	4.7	4.7
PLN/EURO	4.4	4.2	4.3	4.5	4.6	4.7	4.7
USD/EURO	1.1	1.0	1.0	1.0	1.0	1.0	1.0

Projected Energy Prices in Poland, as applicable to PEC Geotermia Podhalanska:

Year:	1999	2000	2001	2002	2003	2004	2005
Electricity (nom., PLN/MWh)	192.1	214.2	232.4	245.2	256.2	266.5	275.8
Escalation rate (inc. inflation)	12.0%	11.5%	8.5%	5.5%	4.5%	4.0%	3.5%
Gas (nom., PLN/SCM)	0.52	0.56	0.60	0.64	0.67	0.70	0.73
Escalation rate (excl. inflation)	-0.1%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%

Following real increases of 4% and 2% in the years 2000 and 2001, respectively, the electricity price escalates at the inflation rate from year 2002. The gas price escalates at a yearly rate of 0.5 percent above inflation. Heat price forecasts are discussed in the section below.

2. Revenues

Heat Sales from three different sources (Geothermal, Absorption Heat Pumps, Existing Boilers) have been projected on the basis of key customers demands (Large Loads, Residential Consumers, Existing DH Systems in Zakopane and Nowy Targ) (figures in Giga Joule (GJ), total heat sales in GJ and TPLN):

Year:	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Heat Sales in Thousand GJ							
Residential	7.9	11.7	68.7	211.9	335.3	372.6	372.6
Large Loads	22.3	86.2	394.4	458.4	459.1	474.1	498.5
Boiler Houses (Zakopane DH)	33.3	58.9	96.6	96.6	96.6	96.6	96.6
Boiler Houses (Nowy Targ DH)	0	0	0	117.5	235.0	235.0	235.0
TOTAL Geothermal Sales	63.5	156.8	559.7	884.4	1126.0	1178.2	1202.6
Tatry Non-Geothermal Sales	54.3	28.84	17.3	17.3	17.3	17.3	17.3
Total Heat Sales (Thousd. GJ)	**117.8**	**185.7**	**577.1**	**901.7**	**1143.3**	**1195.5**	**1219.9**
Total Heat Sales (TPLN)	**3999.8**	**6942.9**	**22488.6**	**35501.5**	**45947.4**	**49878.1**	**52757.7**
Average Heat Price (PLN/GJ)	**33.95**	**37.39**	**38.97**	**39.37**	**40.19**	**41.72**	**43.25**
Escalation rate (inc. inflation)	-10.2	10.1	4.2	1.0	2.1	3.8	3.7

In addition to heat sale revenues, there will be further revenues from heat exchanger sales financed during the first two years by the European Union.

Heat prices for residential, large loads and historic DH customers in Zakopane and at the geothermal base load plant averaged PLN 37.81/GJ in 1998, mostly due to high sales prices of the former Tatry company. Average prices dropped to PLN 33.95/GJ in 1999 due to tariff alignment among customers in the context of the merger between Tatry and Geotermia Podhalanska (GP). However, this average still reflects special pricing offered to the initial customers connected to the pilot geothermal system in 1995. As the new geothermal system is completed and large number of consumers are converted, average base prices, expressed in 1998 terms will converge by 2001 on PLN 29.00/GJ for residential consumers and Nowy Targ district heating, PLN 34.25/GJ for large contractual loads, and PLN 36.35/GJ for previous Zakopane district heating companies. These base prices in 1998-terms have been established largely on competitive considerations, and are in line with or even below the Poland-wide average heat price for small and medium sized cities. Base prices for different customer groups have been projected to increase at the Polish rate of inflation, after the completion of tariff alignment at the end of year 2001. The tariffs for the year 2000 have already been approved by the Energy Regulatory Agency (URE). Average prices in nominal terms are expected to develop as shown in the table above. As the number of large loads and residential customers,

with relatively low tariffs, will build up to demand the highest heat loads, average prices for the system will remain below inflation until the steady state operation is reached in 2004.

The current decree on heat tariff regulation allows price increases due to inflation of costs, and in particular due to fuel price increases, so the projection assumptions are deemed realistic.

3. Operating Costs

During steady state operations, nearly 60% of operating costs are resulting from use of gas (30% - for AHP operations and the peak shaving plants) and electricity (29% - for operations of pumps and equipment to handle the geothermal (primary) circuit at the geothermal base load plant and the secondary circuit (transmission pipelines and distribution systems)). The remaining costs comprise maintenance (10%), personnel, and administration (together 30%). Environmental fees are very small (essentially on the emissions resulting from use of gas). The extraction fee, calculated at 10% on heat sales at the point of the geothermal heat exchangers, would amount to almost a zloty per GJ and would account for over 5% of total operating costs. This fee should not be charged, as the energy recovered from the geothermal water is renewable (the geothermal water is reinjected). Total operating costs and their key components are shown below for the period 1999 to 2005 (in thousand current PLN):

	1999	2000	2001	2002	2003	2004	2005
Electricity	231.6	324.9	1,944.4	3,761.7	5,198.0	5,541.5	5,735.5
Gas	1,510.3	3,794.7	1,096.4	2,613.4	4,933.7	5,970.3	6,209.1
Coke/Coal	470.3	44.8	34.3	-	-	-	-
Oil	63.3	135.7	-	-	-	-	-
Pollution Tax	25.3	11.2	10.3	11.2	11.6	12.7	13.5
Extraction Fee (under discussion)	15.0	20.0	435.3	694.8	903.0	981.0	1038.0
Maintenance	36.5	50.0	780.8	1,452.0	1,639.7	1,774.8	1,844.6
Staff & Labor	1,181.1	1,697.6	2,876.7	2,855.6	2,984.1	3,103.4	3,212.0
General & Administrative	2,690.7	2,687.6	2,341.4	2,470.2	2,581.4	2,684.6	2,778.6
Other	-	446.7	-	-	-	-	-
Total Operating Costs	**6,224.1**	**9,213.0**	**9,519.6**	**13,858.9**	**18,251.5**	**20,068.3**	**20,831.3**

Gas use is projected to peak at about 8.13 million m3 per year. Its 1999 price is PLN 550 per 1000 m3 (US$138/1000 m3), based on the fixed annual payment and the tariff per m3. This price is projected to increase by 0.5% per year in real terms.

Electricity use picks up sharply over the years until 2002 and then stabilizes at around 20.8 GWh per year. Its 1998 price averaged PLN 186 per MWh and is currently sold at PLN 193 per MWh to the geothermal plant (PLN 223 per MWh to the fossil-fired system). After a moderate yearly increase until the year 2001, the electricity price is projected to rise with inflation (i.e. remain stable at the real price in 2001 terms of PLN 186 per MWh). Electricity use at the fossil-fired system declines to insignificant amounts.

The maintenance costs for equipment and plant of the project is assumed to gradually rise to a steady state level equivalent to about 0.9% of the actual investment costs for these items, and is assumed to be inflated from the 1999 level at Polish national inflation applicable to investments.

Personnel cost in 1999 is based on a staff of about 60 full-time staff (expected to grow to 90 persons by

2002). From year 2003 onwards, total personnel costs will increase in line with inflation. The estimates beyond 2004 are conservative, as the number of workers of PEC/GP are likely to decline after project implementation, but no decrease has been accounted for.

General and administrative costs amount currently to about one-third of the total operating costs. They will decrease to about 13% of total operating costs by 2005 and will stabilize from year 2002 in line with inflation.

4. Capital Costs and Total Financing Required

Total Project Costs and Financing Required for the overall Project (1995 to 2004) are shown in Annex 3. The total investment cost for the overall Project (1995 to 2005) is estimated at about PLN 327.5 million (US$ 80.7 million). The base cost estimate (PLN 271.6 million or US$72.1 million) includes the historic costs (pre-1999) as well as projections in 1999 terms. Estimates were based on actual experience to date, taking account of country of origin and prevailing exchange rates. The base cost estimates in 1999 terms are based on an exchange rate of PLN 4.0 to the US dollar. The base cost estimates distinguish three items:

a) The production units (PLN 159.5 million), including geothermal doublets (PLN 40.6 million), geothermal base load plant and absorption heat pumps (PLN 29.6 million), a gas line (PLN 2.3 million); two natural gas-fired peak-load plants (Zakopane, PLN 14.4 million and Nowy Targ, PLN 2.0 million), a medium-pressure heat transmission pipeline (PLN 56.6 million), related pumping stations and pressure reducing equipment (PLN 2.9 million), as well as needed land, buildings, and miscellaneous items (PLN 11.1 million)
b) The distribution networks (PLN 94.5 million) in Zakopane, Nowy Targ and a number of villages in the main valley between these two cities, as well as
c) The costs of connection of customers (enterprises and households), including boiler conversion, heat exchangers and heat counters (PLN 17.7 million, not including all customer costs).

The total Project cost estimates include:

a) Physical contingencies (PLN 24.6 million), averaging about 8.3% of total base costs, and
b) Price contingencies (PLN 31.3 million), averaging 11.5% of total base costs or about 13% of remaining expenditures in zloty terms.

No contingencies are included in the historic costs pre-2000. Physical contingencies on drilling of wells and on geological works have been conservatively estimated at 30%, whereas a 10% contingency has been allowed for all remaining items from 2000 onwards. Price contingencies are based on estimated expenditures (PLN base costs in 1999-terms plus physical contingency) between 2000 and 2004 and take account of projected inflation in Poland, Germany and the USA, as highlighted in the macro section above.

Total financing required for the overall Project from 1995 to 2004 will amount to PLN 394.0 million or US$96.7 million.
Since 1995 until end 1999 a total of 79.7 PLN million (US$ 24.1 million) have been spent, funded by equity, and grant contributions from local institutions (National Fund, EcoFund), the EU, the US, and Denmark. Increases in Working Capital have brought total financing required until end 1999 to PLN 87.8 million or US$ 27.1 million.

The Bank is considering the partial Project between 2000 and 2004. For this slice of the investment, capital costs including physical and price contingencies are estimated to amount to PLN247.9 million (US$56.7 million). Total financing required also calls for funding of capitalized interest during construction and financial fees, as well as further build-up of incremental working capital. The Bank will further require financial management system improvements to allow for the new format of Project management Reports. GEF requires monitoring of CO2 emissions. Allowing for these items, total financing required will amount to PLN 306.2 million, or US$ 69.6 million for the partial Project of 2000 to 2004.

5. Financing Sources and Plan

Financing sources to date (US$ 27.1 million equivalent) have consisted of equity, grant contributions from the National Fund, the EcoFund, EU Phare, USA and Denmark, as well as local loans (see Annex 3).

For the partial Project (2000 to 2004) (see table below), funding is envisaged to come from additional equity (PLN 2.7 million in 2000 and PLN 4.6 million in 2001), from grants from EU Phare (Euro 10.5 million equivalent), USAID (US$2.5 million), as well as from Denmark (US$0.6 million equivalent). A GEF grant of US$5.4 million equivalent is provided to recognize the substantial contribution in CO2 reduction of the Project. The World Bank is considering to provide a loan of US$38.2 million equivalent.

PEC Geotermia Podhalanska Financing Plan for the years 2000 to 2004

	PLN Million			US$	
Applications	Local	Foreign	Total	Million	Percent
Project Investment	153.3	94.6	247.9	56.7	80.9%
Financing Costs	3.2	24.8	28.0	6.2	9.2%
Changes in Cash/Working Capital	27.1	-	27.1	5.9	8.8%
Miscellaneous	1.2	0.5	1.7	0.5	0.5%
M&E of GHG Abatement	0.8	0.8	1.6	0.4	0.5%
Total	185.5	120.7	306.2	69.6	100.0%
Sources					
Internally Generated Funds	50.1	-	50.1	10.7	15.4%
Equity	7.3	-	7.3	1.7	2.4%
Grants	-	80.8	80.8	19.0	27.3%
Phare II	-	45.0	45.0	10.5	15.1%
GEF	-	22.6	22.6	5.4	7.8%
USAID	-	10.5	10.5	2.5	3.6%
DEPA Grant	-	2.6	2.6	0.6	0.9%
IBRD Loan	-	168.0	168.0	38.2	54.9%
Total	57.4	248.7	306.2	69.6	100.0%

Financing Plan for the overall Project (1995 to 2004) is shown in Annex 3.

6. The World Bank Loan

The financial model has projected the loan alternatively on the basis of an annuity type repayment or a level principal repayment. The client has decided to favor the annuity type loan, which provides him with a

stable repayment pattern.

After thorough and detailed discussion with the appraisal mission the client has chosen a new Fixed Spread Loan (FSL) with the following characteristics:

- Repayment schedule fixed at commitment
- Grace period 4.5 Years
- 9 years of annuity type of repayment (4.5% annual escalation rate for principal)
- Final maturity 13.5 Years
- Average maturity: 9.5 Years
- EURO currency based
- Lending Rate (LIBOR 3.47%@6 months + Fixed Spread @55 basis points, resulting in a rate of about 4.02% at present)). The model has used an interest rate of 4.5%.
- Interest and loan charges (front-end fee, commitment fee of 0.35%) to be capitalized from loan effectiveness until July 2004.
- Possibility to convert to Fixed Interest Rate or to buy a cap or collar on the interest rate.
- Loan closing date on December 31, 2004, six months after the Project Completion Date.

The model projects the required loan amount to be at US$ 38.2 million equivalent.

7. Projected Income Statement

The projected income statements for the period 1998 to 2006 are attached in section (B) below. They contain revenues and operating costs as projected under items (A) (2) and (3) above. In addition they contain interest earnings on cash balances as calculated at the interest rate on deposits projected to prevail in Polish commercial Banks, as well as projected interest charges on local loans and on the World Bank loan (except for the capitalized period). They further contain projected foreign exchange losses estimated on the basis of projected exchange rate changes between the Euro and the Polish Zloty. The foreign exchange loss, expressed in Zlotys, is linked to the EURO Loan of the World Bank, and results from the assumed gradual devaluation of the Zloty vis-à-vis the EURO.

The income statement also shows taxes calculated at prevailing rates of taxation and taking account of the latest taxation law.

Finally, the income statement shows dividend payments at the rate of 25% of operating income after deduction of depreciation, starting in year 2005, i.e. after completion of the Project in 2004. Shareholders of PEC/GP are, of course, free, within the constraints of the energy law and the decree on heat, to weigh payments of dividends against potential real term reductions of tariffs.

8. Projected Funds Flow Statement

The sources of funds comprise the projected capital increase in 2000 and 2001, as well as the different local and foreign loans and grants as spelled out above. In 1999 PEC/GP has taken on a bridge loan amounting to a total of almost PLN10 million to cover its investment requirements during the time until the new financing will become available in year 2000. Through World Bank loan's and GEF grant's retroactive financing of contracts procured under World Bank guidelines until mid-2000, the company will be able to repay the local loan. Interest, commitment fees, and the front-end fee of 1% on the World Bank loan will be

capitalized during the construction period (4.5 years), so that PEC/GP's operations will only be burdened with interest payments on the Bank loan, once steady-state operations have been reached in 2005. Therefore, the sources side includes not only the World Bank loan's disbursements against the investment expenditures but also funding of the financial charges until mid-2004. As a result of increasing operations, the sources of funds resulting from internal cash-generation (operating profit plus depreciation) are projected to rise rapidly already from 2001.

On the applications side, the most important impact during project implementation comes from the ongoing investments under the Project and the repayment of the bridge loan. From 2005 the full impact of the annuity payments (almost PLN 25 million per year until final maturity in 2013) will have to be faced by the Company. The shielding of the company from World Bank loan debt-service during the construction period (through the grace on loan repayments, and through financing of capitalized financial charges until mid 2004), will allow the company to build up a cash-cushion (accumulated to PLN 24 million by end 2004), to safeguard it when debt service starts its full impact in 2005. Based on the projections, the cash cushion would remain well above PLN 22 million troughout the life of the World Bank loan. The cushion would reach PLN 50 million by 2014, after the World Bank loan has been fully repaid, despite annual dividend payments growing from PLN 5 million in 2005 to almost PLN 8 million in 2013.

9. Projected Balance Sheet

The balance sheets of PEC/GP are built on the results of the newly merged company in 1998 and planned build-up of assets and liabilities in 1999 (preliminary data of mid-February 2000). From there, they have been projected to show the effects for two years after completion of loan repayments. On the asset side, the build-up of fixed assets assumes an average two year construction period ("started investments" or "work in progress") for project components before they are transferred into the operational fixed assets. This is considered realistic as the climatic conditions in the Podhale Valley only allow construction activities between March and November. Under the heading of current assets there is a gradual reduction of inventories to operational levels (1% of total fixed assets). At the same time current assets reflect the growing cash cushion which remains at about PLN 22 million, until the World Bank loan has been repaid. PEC/GP can influence its amount of retained cash by adjusting the rate of dividend pay-out, if need be down to zero levels. Assuming the projected net profits and a 50% pay-out ratio, dividends would rise from PLN 5 million in 2005 to almost PLN 8 million in 2013.

On the liability side, the projections take account of the growing contributions in the form of equity, local and foreign grants, and local and foreign loans. Total equity consists of owners paid-up capital and retained earnings. For the calculation of the debt-equity ratio, grants have been considered quasi-equity. The substantial operational losses in the early years of project implementation are a result of the relatively small number of customers initially connected. This will change as the first distribution networks are completed and more customers start benefiting from the system. The high loss in 2000 (PLN 5 million) results from the guarantee fee to the Polish Government on the World Bank loan which cannot be financed out of the loan and is therefore expensed.

10. Financial Ratios, Sensitivity Analysis and Conclusions

The financial projections demonstrate that PEC/GP has a sound and healthy future ahead of itself, provided it can manage to implement the Project in the conservatively estimated time frame, can keep costs under control, and obtains tariff levels which would safeguard an adequate revenue stream.

Financial ratios for the Project have been shown in the attachment. Most importantly, operating income over total revenue is never expected to drop below 60% after project completion, debt builds up to a maximum debt equity ratio of 50/50, and the debt service coverage ratio rises from an acceptable 1.0 in 2005 to above 1.2 from 2008 onwards. A cash generation ratio is not meaningful within the model after Project completion, as the company is not forecast to undertake major investments beyond the Project. Nevertheless, a cash generation ratio has been set conservatively at 35% of total investments considered. Based on the models assumptions and a project life of 25 years, the financial internal rate of return (FIRR) for the overall project from 1995 to 2025 is about 10% before consideration of financing arrangements. The marginal rate of return after tax (8%) further illustrates the capital intensive nature of the project and the slippage in execution over a number of years due to lack of financing.

The FIRR on the Project under consideration (2000 to 2004) is more attractive, if only because some of the risky aspects of the overall Project have already been dealt with, and the investment until 1999 is not taken into account. The resulting return on the remaining investment is 14% before tax and 12% after tax.

However, unlike the economic analysis, the financial analysis cannot rely on environmental benefits. Instead, these substantial benefits have been monetized in the form of grants which make the project attractive in financial terms also for private investors. Thus the FIRR on total equity is estimated to be about 14%, and the FIRR on paid-in capital is even 28% as the capital base as such is relatively small (high leverage).

Sensitivity analyses have been carried out with regard to changes in capital costs, operating costs, revenues, and implementation time (slippage of execution by a year). Individually the impact of increases of 10% of capital or operating costs, of increase in gas or electricity costs, or a reduction by 10% of revenues would be tolerable ranging between one and three percentage point reductions. A combination of all of these effects would be intolerable, leading to a return below 8%.

However, the full combination of all negative effects would be an unlikely event: operating costs would typically increase when energy cost (gas and electricity) increase. In such a case a commensurate increase of heat prices would be justified, and this is to some extent manageable by PEC/GP and its key shareholders, and is allowed under the heat energy legislation. The project cost estimates have safe-guarded against too steep project cost rises by allowing for substantial physical and price contingencies. Big capital costs are embedded in the distribution network. If PEC/GP finds that it has difficulties to connect a sufficiently large number of heat loads in a given area, it will only proceed with network construction if it can improve the heat load curve in that area through promotion of the system. A delay of project execution is possible, but in that case also the expenditures would be delayed. In any case the recently re-designed time table of the Project (which took account of the concerns of the World Bank appraisal team and prudent company management decisions) is conservative and has been incorporated into the financial model. Nevertheless, PEC/GP should watch for a steady build-up of its heat load by getting a sufficient number of customers connected as soon as possible.

The sensitivity analysis also investigates the effect of setting the extraction fee (which the model assumes at 10%, the maximum possible amount) at zero. In that case the results improve on average by 30 to 40 basis points on all FIRR's, and of course, the financial situation of the company would improve. Since it is considered that the geothermal energy is renewable, there really is no justification for charging an extraction fee which would further jeopardize the competitiveness of geothermal energy vis-a-vis alternative fossil-fuel-based energies whose extraction is indeed depleting those resource over time.

Summary of Sensitivity Analysis									
	Base Case	Cap.Cost Plus 10%	Opg.Cost Plus 10%	Revenue down 10%	Delay by One Year	Base Year Gas Price up 25%	Power Price Real Incr. 2% p.a.	Extraction Fee set at zero %	Polish Inflation up by 20%
FIRR Bef.Tax 1995-2025	9.5%	8.5%	8.7%	7.6%	9.4%	8.9%	9.1%	9.8%	10.3%
FIRR Aft.Tax 1995-2025	7.6%	6.6%	6.6%	5.3%	6.7%	7.1%	7.2%	7.8%	8.3%
FIRR Bef.Tax 2000-2025	14.0%	12.7%	13.0%	11.5%	14.3%	13.3%	13.6%	14.5%	15.0%
FIRR Aft.Tax 2000-2025	11.5%	10.3%	10.4%	8.7%	10.3%	10.9%	11.1%	11.9%	12.4%
FIRR on Investors' Capital	27.8%	27.8%	25.6%	23.8%	25.2%	27.0%	27.5%	28.2%	28.6%
FIRR on Total Equity	13.5%	13.5%	12.4%	11.0%	12.4%	13.0%	13.2%	13.9%	14.0%

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B. Financial Summary for Revenue Earning Project Entity
PEC Geotermia Podhalanska, S.A.
Years ending December 31: 1998 (Actual), 1999 (Preliminary) to 2006 (Projected)

PLN Million, Current Terms (1999)

	ACTUAL	Prelim Actual	PROJECTED						
YEAR	1998	1999	2000	2001	2002	2003	2004	2005	2006
Income Statement Items									
Revenues:									
Heat Sales Total	4.9	4.0	6.9	22.5	35.5	45.9	49.9	52.8	54.4
Geothermal	0.9		5.8	21.8	34.7	45.2	49.1	51.9	53.5
Fossil	4.0		1.1	0.7	0.8	0.8	0.8	0.9	0.9
Heat Exchangers	0.4	0.2	4.4	0.0	0.0	0.0	0.0	0.0	0.0
Other	0.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Revenues:	6.0	4.2	11.4	22.5	35.5	45.9	49.9	52.8	54.4
Operating Expenses:									
Geothermal	2.5		8.4	8.9	13.4	17.8	19.6	20.4	21.0
Fossil	3.7		0.7	0.6	0.4	0.4	0.5	0.5	0.5
Total Operating Expenses	6.2	4.7	9.1	9.5	13.9	18.3	20.1	20.8	21.5
Operating Income	-0.2	-0.5	2.3	13.0	21.6	27.7	29.8	31.9	32.9
Depreciation	0.6	1.5	2.2	5.1	8.9	11.1	11.5	11.6	11.5
Net Financial Costs	-0.4	1.7	5.8	1.7	4.4	3.9	2.7	10.0	6.7
Income from Grant Transfer	0.0	0.4	0.7	2.6	4.1	4.1	4.1	4.1	4.1
Net Income Before Taxes	-0.4	-3.3	-5.0	8.7	12.5	16.8	19.7	14.5	18.8
Taxes (on Income, Property, Local)	0.1	0.1	0.2	1.8	3.0	3.9	4.6	3.5	4.4
Net Income	-0.6	-3.4	-5.2	6.9	9.6	13.0	15.1	11.1	14.4
Fund Flow Statement Items									
Sources of Funds:									
Total Internally Generated Funds	2.1	-0.5	2.9	12.6	18.2	24.5	27.7	30.2	33.4
Change in Workg.Cap. O.T.C.&S.T.Debt	-12.3	2.9	0.9	1.4	-0.1	0.4	-0.7	-1.7	0.7
Change in Equity	4.5	0.0	2.7	4.6	0.0	0.0	0.0	0.0	0.0
Phare II Grant	0.0	0.0	24.7	20.3	0.0	0.0	0.0	0.0	0.0
GEF Grant	0.0	0.0	21.1	0.0	0.0	0.0	0.0	0.0	0.0
Other Grants	26.7	0.0	13.1	0.0	0.0	0.0	0.0	0.0	0.0
Local ST Loans	0.0	10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Local LT Loans	7.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IBRD Loan	0.0	0.0	36.4	81.8	35.1	7.1	7.6	0.0	0.0
Total Sources	28.2	12.6	101.8	120.6	53.2	32.0	34.5	28.5	34.1
Applications of Funds:									
Investment	34.4	10.6	73.6	104.3	55.2	14.3	0.5	0.0	0.0
Capitalized Financing Costs	0.0	0.0	1.6	2.4	6.1	7.1	7.6	0.0	0.0
Debt Service Payments	0.1	1.9	16.6	2.9	2.2	1.9	2.1	26.7	24.8
Taxes	0.1	0.1	0.2	1.8	3.0	3.9	4.6	3.5	4.4
Dividend Payments	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	5.3
Total Applications	34.6	12.7	92.0	111.4	66.4	27.2	14.7	35.2	34.5
Net Cash Flow	-6.4	0.0	9.9	9.2	-13.2	4.8	19.8	-6.7	-0.4
Closing Cash Balance	0.3	0.3	10.1	19.3	6.2	11.0	30.8	24.1	23.7

Balance Sheet Items									
Total Current Assets	15.7	15.0	17.6	27.1	15.4	21.1	42.5	36.4	36.3
Total Fixed Assets	66.3	75.4	148.4	251.5	307.6	321.5	321.1	311.9	300.4
Total Assets	82.0	90.4	166.0	278.6	323.0	342.6	363.6	348.3	336.6
Short-Term Liabilities	4.8	17.2	0.7	2.3	3.8	5.0	5.9	4.8	5.8
Long-Term Liabilities	7.2	7.0	43.4	125.1	162.6	172.2	181.3	165.2	147.6
Net level of Grants	40.5	40.1	98.3	116.1	112.0	107.8	103.7	99.6	95.5
Equity (Capital and Reserves)	29.5	26.1	23.6	35.1	44.7	57.6	72.8	78.8	87.8
Total Liabilities	82.0	90.4	166.0	278.6	323.0	342.7	363.7	348.3	336.7

Financial Ratios	Actual	Prelim. Actual	Projected						
	1998	1999	2000	2001	2002	2003	2004	2005	2006
Opg. Cost+Depr.+Taxes/Revenue	117%	149%	101%	73%	72%	72%	73%	68%	69%
Operating Income/Revenue	-4%	-11%	20%	58%	61%	60%	60%	61%	60%
Net Income/Revenue	-9%	-80%	-46%	31%	27%	28%	30%	21%	26%
Net Income/Net Fixed Assets	-3%	-13%	-11%	7%	6%	6%	5%	4%	5%
Current Ratio (times)	3.3	0.9	25.2	11.6	4.1	4.2	7.2	7.6	6.3
Debt /(Debt +Equity)	9%	10%	26%	45%	50%	49%	49%	45%	42%
Equity/(Equity+ Debt)	91%	90%	74%	55%	50%	51%	51%	55%	58%
Debt/Total Liabilities	9%	19%	26%	45%	50%	50%	50%	47%	44%
Debt Service Coverage Ratio	1.4	-0.3	0.0	3.7	7.0	11.1	11.2	1.0	1.2
Cash Generation Ratio	-30%	4%	-17%	9%	21%	89%	252%	n.a	n.a
Return on Paid-in Capital	-2%	-11%	-16%	18%	26%	35%	41%	30%	39%
Return on Capital +Retained Earnings	-2%	-13%	-22%	20%	21%	22%	21%	14%	16%
Return on Total Equity (incl.grants)	-1%	-5%	-4%	5%	6%	8%	9%	6%	8%

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Annex 6: Procurement and Disbursement Arrangements

POLAND: PODHALE GEOTHERMAL DISTRICT HEATING AND ENVIRONMENT PROJECT

Procurement

Goods and works will be procured in accordance with World Bank *Guidelines: Procurement under the IBRD Loans and IDA Credits* (as issued in January 1995, revised January and August 1996, September 1997, and January 1999). Consulting Services, technical assistance and training will be procured in accordance with the Bank's Guidelines: *Selection and Employment of Consultants by World Bank Borrowers, January 1997*, revised September 1997 and January 1999. The Bank's Standard Bidding Documents, Request for Proposals and Forms of Consultants' Contract will be used. Goods and technical assistance to be financed by the co-financiers will be procured in accordance with the public procurement regulations or the regulations and practices of each co-financier. A general procurement notice will be published in the Development Business of the UN not later than February 2000.

Retroactive financing. The project includes retroactive financing of up to 10% of the Loan amount and 20% of the Grant funds for the contracts for civil works, goods and consultant services procured in accordance with the Bank procurement guidelines and for which payments were made no earlier than one year before the date of the appraisal mission. This extends the retroactive horizon back to October 1998. Such an extension is justified based on the peculiar history of the Project, which has proceeded rather far along prior to the Bank's decision to support it financially (see section C-1 and Annex 2 for an overview of the completed phases of the Project). Indeed, the company has taken a bridge loan from a local commercial bank to cover financing needs prior to availability of the Bank Loan and GEF Grant.

Costs for Retroactive Financing (in US$ million equivalent)

Expenditure Type	*Source of Funding*		Total Cost
	IBRD Loan	GEF Grant	
Goods	0.35	0.00	0.35
Works	2.95	1.00	3.96
Supply & Install	0.00	0.00	0.00
Consultant Services	0.31	0.00	0.31
Total:	**3.62**	**1.00**	**4.62**

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Procurement methods (Table A)

PEC/GP has invested considerable resources into the Project at the initial stages of its development. According to the procurement plan updated by PEC/GP during appraisal, the total financing requirement for the remaining project components stands at about $US 68.2 million. This is consistent with the $US 73.0 million estimate for the 2000 - 2004 financing requirements given in Table A3-3 of Annex 3, after accounting for the fact that the latter estimate includes changes in working capital (US$ 9.3 million) and the price paid by PEC/GP for the land (about US$ 0.1 million) while the former estimate, on the other hand, includes retroactive financing (about US$ 4.6 million). Of the total amount of US$ 68.2 million, the

Bank is proposed to finance $US 38.2 million, and the GEF will provide an additional US$ 5.4 million. Table A-1 illustrates the procurement arrangements for the remaining project components.

Table A-1: Project Costs by Procurement Arrangements

(in US$ million equivalent)

Expenditure Category	*Procurement Method*				Total Cost
	ICB	NCB	Other	N.B.F.	
Goods	3.88	0.00	0.38	0.30	4.55
	(3.88)	(0.00)	(0.38)	(0.00)	(4.26)
Works	10.75	18.10	0.00	6.47	35.33
	(10.75)	(18.10)	(0.00)	(0.00)	(28.86)
Supply & Install	3.59	0.00	0.00	15.95	19.54
	(3.59)	(0.00)	(0.00)	(0.00)	(3.59)
Consultant Services	0.00	0.00	1.47	1.14	2.61
	(0.00)	(0.00)	(1.47)	(0.00)	(1.47)
Financing Charges and IDC	0.00	0.00	5.43	0.76	6.19
	(0.00)	(0.00)	(5.43)	(0.00)	(5.43)
Total:	**18.22**	**18.10**	**7.27**	**24.63**	**68.23**
	(18.22)	**(18.10)**	**(7.27)**	**(0.00)**	**(43.60)**

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Notes:

1. Figures may not total exactly due to rounding.
2. Figures in parenthesis are the amounts to be financed by the Bank Loan and GEF Grant. All cost include contingencies.
3. Goods-ICB: Includes two contracts (US$3.88 million) of which one (US$3.57 million) is funded by GEF, the other one is retroactively financed from the Loan.
4. Goods-Other: Includes six IS contracts (US$0.38 million) of which one (US$0.04 million) is for retroactive financing from the Loan.
5. Works-ICB: Includes three contracts (US$10.75 million).
6. Works-NCB: Includes 17 contracts (US$18.10 million), of which seven are retroactively financed contracts (US$3.96 million); one of these seven contracts (US$1.00 million) is for GEF funding.
7. Supply & Install-ICB: Includes 7 contracts (US$3.59 million), of which one contract (US$ 0.37 million) is for GEF funding.
8. Consultant Services-Other: Includes: (a) four LCS contracts (US$0.56 million) of which one (US$0.14 million) for retroactive financing from the Loan; (b) two QCBS contracts (US$0.67 million, of which one contract for US$0.40 million is the GEF-financed Monitoring and Evaluation component); (c) three CQ contracts (US$0.09 million) of which two (US$0.06) are funded by GEF, and the third contract for retroactive financing from the Loan; (d) and five miscellaneous contracts for retroactive financing (US$0.14 million).
9. Financing charges and Interest During Construction (IDC), while not procurement items, are included

in the table as items to be financed from the Bank Loan. The amount of US$ 5.43 million comprises a 1% front-end fee, a capitalized commitment fee, and an IDC equal to the capitalized interest on the Bank Loan.

10. Retroactive financing (not separated in the table above), amounts to a total of US$ 4.62 million. This is within the limits of 10% of the IBRD Loan amount and 20% of the GEF Grant. All the contracts financed retroactively are subject to acceptable procurement procedures.
11. N.B.F. = Non-Bank/Non-GEF financed: US$24.63 million.

Consultants Services will be procured through the Quality and Cost Based Selection (QCBS) procedures. Such contracts will be advertised in the UN Development Business and in a national newspaper for expression of interest, from which a shortlist will be drawn. For contracts estimated to cost less than US$200,000, the short list may consist entirely of national firms, at least three. Contracts of a routine nature will be procured through the Least Cost Selection method (LCS). Consultants contracts for training and study tours will be procured following the Selection Based on Consultants' Qualification (CQ). Individual experts for project coordinators will be selected in accordance with Part V of the Consultants Guidelines. Candidatures will be advertised, and selection will be made on the basis of comparison of qualification experience.

Table A-2: Consultant Selection Arrangements
(in US$ million equivalent)

Expenditure Category	*Procurement Method*					Total Cost
	LCS	QCBS	CQ	Individuals	N.B.F.	
Constulant Services						
	0.56	0.67	0.09	0.14	1.14	**2.61**
	(0.56)	(0.67)	(0.09)	(0.14)	(0.00)	**(1.47)**

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Notes:

1. LCS Least-Cost Selection
2. QCBS: Quality- and Cost-Based Selection
3. CQ: Selection based on Consultants'Qualification
4. N.B.F: Non-Bank/Non-GEF Financed
5. Figures in parentheses are the amounts to be financed by the Bank Loan/GEF Grant**.** All cost include contingencies.

Thresholds for Procurement Methods

The following thresholds will apply to the procurement methods used under the Project. Aggregates are given in the footnotes to the procurement table (Table A-1):

For Goods:

International Competitive Bidding (ICB): US$200,000 or more, per contract

International Shopping (IS): Less than US$200,000

For Works:

ICB for Works: US$3,000,000 or more

National Competitve Bidding (NCB): less than US$3,000,000

For Supply & Install contracts:

International Competitive Bidding (ICB): US$200,000 or more, per contract

International Shopping (IS): Less than US$200,000

NCB can be conducted in accordance with the Unlimited Tendering procedure of the public procurement law of Poland, subject to the following conditions: a point system will not be used; domestic preference will not be applied; international bidders will not be excluded from bidding; no restriction will be imposed on the use of foreign labor (except for unskilled labor) and materials; and the NCB bidding documents will be satisfactory to the Bank.

Prior review thresholds (Table B)

The following thresholds will be used for prior review:

- All ICB (for goods, works, and S&I contracts)
- First NCB (for works)
- All consulting contracts with firms estimated at US$ 100,000 or more
- All consulting contracts with individuals estimated at US$ 25,000 or more.

Table B: Thresholds for Procurement Methods and Prior Review

Expenditure Category	Contract Value Threshold	Procurement Method	Contract Subject to Prior Review
	(US$ Thousands)		(US$ Thousands)
1. Works	>3,000	ICB	10.75
	>200	NCB	18.10
2. Goods	>200	ICB	3.88
3. Supply & Install	>200	ICB	3.59
4. Consultant Services	>200	QCBS	0.67
Total:			**US$ 36.99 million** or 84.8% of Total Bank /GEF-Funded

Section 1: Capacity of the Implementing Agency in Procurement and Technical Assistance requirement review

Procurement capacity assessment of the project entity was carried out in July 1999. The scope of the assessment covered legal aspects, the procurement cycle management, organization and functions related to procurement, support and control aspect, and record keeping. From the procurement point of view, the project has been placed in the average risk category. The assessment includes an Action Plan for strengthening PEC/GP's capacity to conduct procurement. The main elements of the Action Plan are as follows: (i) PEC/GP should nominate before loan signature, and arrange training for, one of its existing staff as a procurement officer responsible for Bank-financed procurement; (ii) a project procurement launch workshop will be held just after negotiations but in any case no later than effectiveness; (iii) PEC/GP should put in place a computerized procurement monitoring system within three months of loan effectiveness; (iv) during the first year of project implementation, two procurement supervision missions should be conducted; thereafter, annual procurement supervision missions (v) a minimum of ten contracts representing different procurement methods (not subject to prior review) should be reviewed on an ex-post basis.

Country Procurement Assessment Report or Country Procurement Strategy Paper status: March 15, 1996. New draft report has been prepared and is currently under review.	Are the bidding documents for the procurement actions of the first year ready by negotiations Yes [ ] No [x]

Section 2: Training, Information and Development on Procurement

Estimated date of Project Launch Workshop 03/00/2000	Estimated date of publication of General Procurement Notice 02/00/2000	Indicate if there is procurement subject to mandatory SPN in Development Business Yes [x] No [ ]	Domestic Preference for Goods Yes [x] No [ ]	Domestic Preference for Works, if applicable Yes [ ] No [x]

Retroactive financing Yes [X] No [ ] Explain: The project includes retroactive financing of up to 10% of the loan and 20% of the Grant for contracts concluded in accordance with Bank procurement guidelines.	Advance procurement Yes [ ] No [x] Explain

Explain briefly the Procurement Monitoring System: A procurement monitoring system will be established by the Borrower within three months of loan effectiveness which will collect and keep up to-date all procurement data. The PCT will use this data in progress reports to the Bank.

Co-financing: Explain briefly the procurement arrangements under co-financing: None

Section 3: Procurement Staffing

Indicate name of Procurement Staff or Bank's staff part of Task Team responsible for the procurement in the Project: Name: Naushad Khan, Senior Procurement Specialist, Ext: 32699
Explain briefly the expected role of the Field Office in procurement: The Resident Mission does not have an accredited procurement staff. However, the project officer in the RM is familiar with procurement. He will serve as a liaison between the procurement staff at headquarters and the beneficiary procurement staff.

Disbursement

Allocation of loan/grant proceeds (Table C)

Both the IBRD Loan and the GEF Grant are expected to be disbursed over a period of 4 - 5 years. The anticipated completion date is June 30, 2004 and the closing date is December 31, 2004. Disbursements will follow traditional Bank disbursement procedures and will be made against eligible expenditures. Table C-1 below shows estimated disbursements during the life of the Project, and Tables C-2a and C-2b show allocation of Loan and Grant proceeds. The Project includes retroactive financing of US$ 4.62 million (within the limits of 10% of the IBRD Loan amount and 20% of the GEF Grant) to finance the activities under the Project already completed by the Borrower, subject to acceptable procurement procedures.

Table C-1: Expected Disbursement of the World Bank Loan and the GEF Grant (US$ million equiv.)

Bank Fiscal Year	2001	2002	2003	2004	2005
World Bank Loan	7.2	18.0	6.0	4.0	3
Cumulative	7.2	25.2	31.2	35.2	38.2
GEF Grant	3.0	2.1	0.1	0.1	0.1
Cumulative	3.0	5.1	5.2	5.3	5.4
Total Loan and Grant	**10.2**	**20.1**	**6.1**	**4.1**	**3.1**
Total Cumulative	**10.2**	**30.3**	**36.4**	**40.5**	**43.6**

Note: The above disbursement profile is more conservative than shown in the financial projections.

Table C-2a: Allocation of Bank Loan Proceeds (in US$ million equivalent):

Expenditure Category		Project Parts/Components	Estimated cost	Loan amount allocated	% of Expenditures to be Financed
1. WORKS:					
	A	Production and Transmission of Heat	12.724	11.210	70%
	B	Heat Distribution	14.699	12.950	
	C	Heat Exchangers & Meters, Other Goods	0.433	0.381	
	D	Project Management	0.000	0.000	
Subtotal:			**27.856**	**24.542**	
2. GOODS:					
	A	Production and Transmission of Heat	0.122	0.107	100% of foreign expenditures, 100% of local expenditures (ex-factory cost) and 80% of local expenditures for other items procured locally
	B	Heat Distribution	0.311	0.274	
	C	Heat Exchangers & Meters, Other Goods	0.101	0.089	
	D	Project Management	0.153	0.134	
Subtotal:			**0.687**	**0.605**	
3. SUPPLY & INSTALL:					
	A	Production and Transmission of Heat	1.673	1.474	For works 70%, for goods, 100% of foreign expenditures, 100% of local expenditures (ex-factory cost) and 80% of local expenditures for other items procured locally
	B	Heat Distribution	0.000	0.000	
	C	Heat Exchangers & Meters, Other Goods	1.548	1.364	
	D	Project Management	0.000	0.000	
Subtotal:			**3.221**	**2.838**	
4. CONSULTANT SERVICES:					
	A	Production and Transmission of Heat	0.659	0.633	100%
	B	Heat Distribution	0.079	0.076	
	C	Heat Exchangers & Meters, Other Goods	0.024	0.023	
	D	Project Management	0.244	0.234	
Subtotal:			**1.005**	**0.965**	

5. IDC and other capitalized charges on loan:				
	IDC and Commitment Fee	**5.048**	**5.048**	According to Article II of Loan Agreement
6. Front-end fee:				
	Financing Charges	**0.382**	**0.382**	According to Article II of Loan Agreement
7. Premia for caps/collars:				
	Financing Charges	**-**	**0.700**	According to Article II of Loan Agreement
8. UNALLOCATED:			**3.120**	
TOTAL:		**38.200**	**38.200**	

Table C-2b: Allocation of GEF Grant Proceeds (in US$ million equivalent):

Expenditure Category		Project Parts/Components	Estimated cost	Grant amount allocated	% of Expenditures to be Financed
1. WORKS:					
	A	Production and Transmission of Heat	0.000	0.000	70%
	B	Heat Distribution	1.003	0.899	
	C	Heat Exchangers & Meters, Other Goods	0.000	0.000	
	E	Monitoring and Evaluation	0.000	0.000	
Subtotal:			**1.003**	**0.899**	
2. GOODS:					
	A	Production and Transmission of Heat	3.570	3.200	100% of foreign expenditures, 100% of local expenditures (ex factory cost), and 70% of local expenditures for other items procured locally
	B	Heat Distribution	0.000	0.000	
	C	Heat Exchangers & Meters, Other Goods	0.000	0.000	
	E	Monitoring and Evaluation	0.000	0.000	
Subtotal:			**3.570**	**3.200**	
3. SUPPLY & INSTALL:					
	A	Production and Transmission of Heat	0.000	0.000	100% of foreign expenditures, 100% of local expenditures (ex factory cost), and 70% of local expenditures for other items procured locally
	B	Heat Distribution	0.365	0.327	
	C	Heat Exchangers & Meters, Other Goods	0.000	0.000	
	E	Monitoring and Evaluation	0.000	0.000	
Subtotal:			**0.365**	**0.327**	
4. CONSULTANT SERVICES:					
	A	Production and Transmission of Heat	0.062	0.058	100%
	B	Heat Distribution	0.000	0.000	
	C	Heat Exchangers & Meters, Other Goods	0.000	0.000	
	E	Monitoring and Evaluation	0.400	0.376	
Subtotal:			**0.462**	**0.435**	
5. UNALLOCATED:				**0.540**	
TOTAL:			**5.400**	**5.400**	

Use of statements of expenditures (SOEs):

Statements of Expenditures (SOE) will be used for: (a) works contracts estimated to cost less than US$3,000,000 each; (b) goods contracts and S&I contracts less than US$200,000; (c) consultant contracts with firms less than US$100,000, (d) consultant contracts with individuals costing US$25,000 equivalent or less each. The minimum application size for payments directly from the Grant account or for issuance of Special Commitments is 20 percent of the special account authorization. Full documentation in support of SOE will be retained by PEC/GP for at least two years after the closing date of the Loan/GEF Grant. This information will be made available for review by Bank missions during project supervision and by auditors. Annual audits will be required to specifically comment on the propriety of SOE disbursements and the quality of the associated record-keeping.

Special account:

To facilitate disbursements, the Borrower will open two Special Accounts, one for the Loan and another for the Grant funds, before Loan/Grant effectiveness and maintain them until Project completion. The Special Accounts will be drawn upon to meet payments to contractors, suppliers and consultants under the project. The Special Accounts will be established in a commercial bank on terms and conditions satisfactory to the Bank.

The initial allocations to the Special Accounts will be limited to US$1 million from the Loan and US$1 00,000 from the GEF Grant. The initial allocation may be increased up to the authorized allocation of US$ 2 million and US$400,000 from the Loan and the Grant, respectively, once the aggregate disbursements of US$5 million and US$500,000 from the Loan and the Grant, respectively, are reached, by submitting the relevant withdrawal applications. Replenishment applications should be submitted at least every three months and must include reconciled bank statements as well as other appropriate supporting documents. Project accounts will be operated for discrete activities and funded from the Special Accounts set up to administer transactions in Euro, based on disbursement applications signed by the authorized officials.

Once the Bank and the Borrower have established that a PMR-based reporting system is fully operational (expected not later than December 31, 2000), the replenishment of the Special Accounts would be based on the quarterly forecasts of disbursements as projected in the PMRs. The authorized allocation for the Special Accounts under PMR-based disbursement will have a limit of US$7 million from the Loan and US$1 million from the GEF Grant.

Financial Management

Corporate Governance: PEC/GP's corporate governance has three tiers: (i) the Shareholders' Meeting, (ii) the Supervisory Board, and (iii) the Management Board (the Board of Company Directors).

The Shareholders' Meeting is PEC/GP's highest decision-making body. The two main shareholders are the National Fund for Environmental Protection and Water Management (77.81%) and the municipality of Zakopane (13.09%). The remaining shareholders include other participating municipalities and a number of small investors.

The Supervisory Board has six members (3 from the National Fund, 2 from the municipality of Zakopane, and 1 representing the other investors) who meet once a month. The representatives of the majority shareholder, the National Fund, are the most active and place great emphasis on the financial control of the

company. The company's financial performance is a standing item on the agenda.

The Management Board consists of the company's president and two vice-presidents, of which one is the financial director. PEC/GP was created from a merger of two small companies in June, 1998 and the corporate culture and procedures are still those of a small company. As a result, most of the power in the company is concentrated to the Management Board and all important decisions are made by this group. Thus all payments must be authorized by two board members, which is advantageous from a purely internal control point of view.

Disbursement and Funds Flow: PEC/GP has requested the World Bank and the Global Environment Facility (GEF) to support the project with a loan and grant respectively. PEC/GP has expressed a preference for PMR-based disbursement. However, the financial management review shows that PEC/GP' s financial management system would need to be enhanced in order to fulfill the Bank's requirements for this type of disbursement. Thus the Loan Agreement allows for initial disbursement based on traditional disbursement methods with the possibility of moving to PMR-based disbursement at the mutual agreement of the Borrower and the Bank. It was agreed that the internal control procedures will be designed to cover both of these disbursement methods.

Accounting Procedures and Internal Control: For the most part, PEC/GP has sound accounting practices. These include limited access to computers, authorization rules, document flow, etc., but these routines are usually not documented, and it is therefore difficult to obtain a full understanding of the nature and design of the procedures and methods that together constitute the company's internal control structure. This makes it more difficult for new staff, new auditors, as well as other interested parties, to quickly acquire a clear picture of the accounting system, control procedures and other elements of the overall control structure. A prerequisite for an adequate financial management system is documentation of current routines and procedures. It was agreed that an Operating Manual covering financial management, procurement and disbursement would be prepared. The financial management and disbursement sections of the manual must cover all procedures for accounting (including document flow), budgeting, job descriptions for financial and project staff, fund flow diagrams with details, and organization structure showing areas of responsibility for project implementation. As they are a condition for Board presentation, these sections of the manual must be given the highest priority and be submitted for review by the Bank in good time before the Loan documents are passed on to the Board for approval (see Action Plan below).

Accounting Systems: PEC/GP is currently using the domestic accounting software Unisoft. This software will be able to produce project financial statements in PLN, but it does not have multi-currency capability and cannot therefore be used for statements in foreign currencies. Further, the accounting software has to be strengthened to make direct automatic reporting possible, and the number of digits in the Chart of Accounts must be extended to make it possible to include the new categories needed for project accounting. It was agreed that the LAN version of Fox Pro would be used for reporting from the accounting system . The advantage that this software has over Unisoft's reporting module is that it can produce all PMR-based reports in accordance with the Bank's format. However, to make the PMR-reporting automatic, Fox Pro's interface must be adapted to existing financial, planning, and technical software. PEC/GP will use consultants for this work.

Unisoft will launch a completely new version of its accounting software in September 2000. This version will have multi-currency capability, be multi-lingual, and have enhanced security. It was agreed that PEC/GP shall upgrade with this new version as soon as it ready for commercial use. It is anticipated that the company will be ready for PMR-based disbursement at the beginning of 2001. Proceeds from the loan

have been allocated for financing this upgrade.

Staffing: PEC/GP's financial management organization system and procedures are simple. There is only one accounting unit and most transactions are standardized and fairly straightforward. The most common categories are geothermal heat, coal for the Tatry plant, and gas and power delivery. The financial director heads the financial and economic division, which has four accountants, including the chief accountant, and two part-timers (50% each) for billing and economic issues. The staffing level is on the low side, and vacations and other absences place a heavy burden on the remaining staff. Further, there is little capacity to free staff for training. The project will further increase the workload, and it will be necessary to employ at least one project accountant. It was agreed that this person would be in place in time to assist the financial management consultant.

Evaluation of Current and Past Audit Reports: PEC/GP was established on June 30,1998 through a merger between Tatry SA and Geothermia, Podhale. The only financial statements available for PEC/GP are for the second semester of 1998, and were audited by the Polish audit company REW-BI. The opinion was unqualified and there was no management letter. The same auditor audited the first semester for both of the merging companies prior to their fusion Even in these instances the opinions were unqualified and there were no management letters. Prior to 1998, Tatry SA had a series of self-employed sole auditors, while Geothermia has used REW-BI since 1995. Audit reports for these earlier years are only available in Polish and the opinions are unqualified. All financial statements up to the end of 1999 are in accordance with Polish Accounting Law only. The short list for the selection of auditor for 1999 had been prepared and the selection was to be made before the end of the year.

Financial Reporting and Auditing Arrangements: PEC/GP's financial statements (income statement, balance sheet and cash flow statement) are to be prepared both in accordance with International Accounting Standards and Polish Accounting Law. The Project Financial Statements are to be prepared in accordance with the format provided by the Bank. Both the company and project statements will be audited by an independent auditor acceptable to the Bank, and the audit report will be submitted to the Bank within four months after the end of the fiscal year. The audit reports will contain the auditors' opinion on compliance with financial and other covenants under the Loan. The audit report on the Project Financial Statements shall also contain a separate opinion on the operation of the Special Account. The auditor for the period 2000 - 2004 will be financed from the Loan. The selection of this auditor shall be in accordance with the Bank's procurement guidelines, and to ensure continuity the appointment shall preferably be for the whole project period. The auditor shall be appointed before October 1, 2000.

Project Reporting Arrangements: The quarterly Project Management Reports (PMRs), which should be seen as a part of the Progress Reports, are to be submitted to the Bank within 45 days of the end of each quarter. When PMR-based disbursement is used, the PMR forms the basis for the advancement of funds to the Special Account. It is also used for project management purposes to track project progress, procurement and disbursement. The PMR includes the following: (a) Financial Report (project sources and uses of funds, uses of funds by special activity, project balance sheet, project cash withdrawals, Special Account statement, project cash forecast); (b) Project Progress Report (output monitoring reports for contract management and unit of output by project activity); and (c) Procurement Management Report (procurement process monitoring for goods and works and consultants' services, contract expenditure reports for goods and works and consultants' services).

The operating and capital expenditure budgets for PEC/GP are to be included in the Progress Report for the third quarter together with the Project Annual Budget submitted for Bank approval. Financial progress reports on company performance are to be submitted on a semi-annual basis as part of the Progress

Reports for the second and fourth quarters, and actual results will be compared with Plans and Budgets.

PEC/GP has been given a presentation and documentation covering PMR requirements. The Bank will create a set of PMR forms specifically tailored to the proposed Project.

Action Plan for Financial Management Systems and Procedures

1	a) Consultant to be appointed to prepare the Operating Manual (Covering Financial Management, Procurement and Disbursement).	As soon as possible
	b) Project Accountant acceptable to the Bank to be appointed at the same time as Consultant to assist with preparation of Operating Manual.	Same as above
2	a) Present the financial management and disbursement sections of Operating Manual (fiduciary requirements) for review by the Bank . b) Present the remaining part of Operating Manual for review by the Bank .	Prior to Board Presentation June 1, 2000
3	The Chart of Account amended to cover the project accounting (Reports 1-A, 1-B, 1-C, and 1-D.	April 1, 2000
4	Fox Pro ready for both financial and PMR reporting (integrating accounting, planning and technical data)	June 1, 2000
5	a) Present shortlist of auditors and terms of reference acceptable to the Bank.	Prior to Board presentation
	b) Appointment of Auditor acceptable to the Bank .	October 1, 2000
6	Train accounting staff to prepare financial statements in accordance with International Accounting Standards.	July 1, 2000
7	Completed implementation and testing of the new, upgraded version of Unisoft.	Dec. 31, 2000
8	Produce full Project Management Reports (and quarterly thereafter)	April 1, 2001
9	Consider a move to PMR-based disbursements	April 1, 2001

Annex 7: Project Processing Schedule

POLAND: PODHALE GEOTHERMAL DISTRICT HEATING AND ENVIRONMENT PROJECT

Project Schedule	Planned	Actual
Time taken to prepare the project (months)		
First Bank mission (identification)		
Appraisal mission departure	11/25/99	11/30/99
Negotiations	02/14/2000	02/14/2000
Planned Date of Effectiveness	07/31/2000	

Prepared by:

ECSEG, ECSSD

Preparation assistance:

ENV

Bank staff who worked on the project included:

Name	Speciality
Helmut Schreiber	Team Leader
Christian Duvigneau	PIP/Financial Model
Duane Kexel	Incremental Cost Analysis, Financial Model
Victor Loksha	Environmental Economics
Naushad Khan	Procurement
Enar Wennerstrom	FMS
Zoe Kolovou	Legal Counsel
Joseph Formoso	Disbursement

Annex 8: Documents in the Project File*

POLAND: PODHALE GEOTHERMAL DISTRICT HEATING AND ENVIRONMENT PROJECT

A. Project Implementation Plan

Draft of January 7, 2000.

B. Bank Staff Assessments

- Poland Geothermal and Environment Project (Podhale): Report on the Assessment of the Capacity of the Implementation Agencies to Conduct Procurement (by Naushad Khan and Arben Maho): July 1999.
- Comments on the Draft Project Appraisal Document of 12-Sep-99 (by Rachid Benmessaoud): 09/16/99.
- Poland: Podhale-Zakopane Geothermal Project (Comments by Henk Busz on the same draft): 09/17/99.

C. Other

Working draft reports and spreadsheet models:

- Incremental Cost Analysis. Excel spreadsheet model. File: gefic32.xls, 03/06/00 (by Duane Kexel).
- Financial Model. Excel spreadsheet. File: zakfin18joc0200.xls. 02/17/00 (by Christian Duvigneau and Duane Kexel).
- Local Environmental Benefits Analysis. Excel spreadsheet model. File: vleb-march31-99.xls. 03/31/99 (by Victor Loksha).
- Ecological Assessment and Environmental Benefits of Geothermal Development in the Podhale Area of Poland. Zakopane/Krakow, June 1998 (by Paul Teleki, et al).
- Environmental Management Plan - final draft (by Karl Gruber), 02/15/00.
- Average Gas and Electricity Prices. Excel spreadsheet. rev. 09/10/99 (by Anders Andersen).
- Technical Analysis of Poland: First Geothermal District Heating Project (Podhale/Zakopane). Final Draft. 12/19/99. (by Lars T. Hansen, Henning Sloth, Asgar Goth, et. al.).
- Poland - Geothermal District Heating and Environment Project (Podhale): Responses to Henk Busz and Rachid Benmessaoud Comments on Draft PAD of 12-Sep-99 (by the Project Team): 09/29/99.

Documents available at PEC/GP in Polish:

Environmental Impact Studies

- *Zalozenia Metodyczne do Projektu Badan Sejsmicznych: Temat: Niecka Podhalanska - 3D. Krakov, listopad 1999.* - A description of the methodology and scope of work for the 3D seismic survey (to be implemented in 2000). Developed by *Geofizyka Krakow Sp. z o.o.*
- *Ocena Oddzialywania na Srodowisko Projektowanej Magistrali Cieplowniczej Od Granicy Gminy Bialy Dunajec Do Granicy Gminy Zakopane.* - Environmental impact assessment for the disctrict heat transmissoin line (segment from the Bialy Duanajec Gmina border to the Zakopane Gmina border). By Eko-Studio, s.c. (Biuro Analiz Opracowan i Projektow Ochrony Srodowiska). Nowy Sacz, June 1998.

- *Ocena Oddzialywania na Srodowisko: Siec Cieplownicza Geotermalna* - Environmental impact assessment for the disctrict heat distribution network in Zakopane. By ProGeo, Nowy Sacz. In 14 volumes, December 1996 - November 1999.
- *Obliczenie Emisji i Stezen Zanieczyszczen z Kotlowni Szczytowej Gazowo - Olejowej, Celem Wydania Decyzji o Dopuszczalnej Emisji. Object: Kotlownia szczytowa gazowo - olejowa w Zakopanem przy ul. Lukazczyka* - A dispersion study for the gas-fired peaking plant in Zakopane. December 1997.
- Rozporzadzenie Ministra Ochrony Srodowiska, Zasobow Naturalnych i Lesnictstwa - A decree of the Minister of the Environment (maximum allowable concentrations of contaminants in water for surface discharge), No. 503, 5 November 1991.

*Including electronic files

Annex 9: Statement of Loans and Credits

POLAND: PODHALE GEOTHERMAL DISTRICT HEATING AND ENVIRONMENT PROJECT

Project ID	FY	Borrower	Purpose	Original Amount in US$ Millions				Difference between expected and actual disbursements[a]	
				IBRD	IDA	Cancel.	Undisb.	Orig	Frm Rev'd
PL-PE-55988	1999	GOVERNMENT OF POLAND	WHOLESALE MKT. II	11.12	0.00	0.00	10.63	1.60	0.00
PL-PE-57957	1999	GOVERNMENT OF POLAND	HARD COAL SECAL	300.00	0.00	0.00	291.13	0.00	0.00
PL-PE-8616	1999	POMORSKIE HURTOWE	WHLSLE MARKETS PRJ I	15.90	0.00	0.00	7.17	1.60	0.00
PL-PE-35082	1998	CENTRUM	MUNICIPAL FINANCE	22.00	0.00	0.00	19.86	10.16	0.00
PL-PE-53796	1998	BISE AND PBK	FLOOD EMERGENCY	200.00	0.00	0.00	160.51	102.33	0.00
PL-PE-8593	1998	GOVT. OF POLAND	ROADS II	300.00	0.00	0.00	285.63	23.95	0.00
PL-PE-36061	1997	MINISTRY OF TRANSPORT	PORT ACCESS & MGMT.	67.00	0.00	0.00	50.64	7.49	0.00
PL-PE-8595	1996	GOVERNMENT OF POLAND	BIELSKO-BIALA WATER	21.50	0.00	0.00	11.79	9.35	0.00
PL-PE-8604	1996	BIELSKO-BIALA AQUA S.A.	POWER TRANSMISSION	160.00	0.00	0.00	96.93	47.56	0.00
PL-PE-8614	1995	POLISH POWER GRID CO	KATOWICE HEAT SUPPLY	45.00	0.00	0.00	24.44	23.53	0.00
PL-PE-8610	1994	KATOWICE DISTRICT HEATING	FORESTRY DEVELOPMENT	146.00	0.00	42.00	2.46	22.45	2.45
PL-PE-8599	1993	GOVT. OF POLAND	ROADS	150.00	0.00	0.00	2.00	2.00	0.00
PL-PE-8571	1991	REPUBLIC OF POLAND	PRIVATIZN & RESTRUCT	280.00	0.00	47.28	63.75	111.04	63.76
PL-PE-8576	1991	REPUBLIC OF POLAND DISTRICT HEATING ENTITY	HEAT SUPPLY RESTRUCT	285.00	0.00	82.50	12.10	149.54	12.04
			Total:	2,003.52	0.00	171.78	1,039.04	512.60	78.25

POLAND

STATEMENT OF IFC's

Held and Disbursed Portfolio

31-Jul-1999

In Millions US Dollars

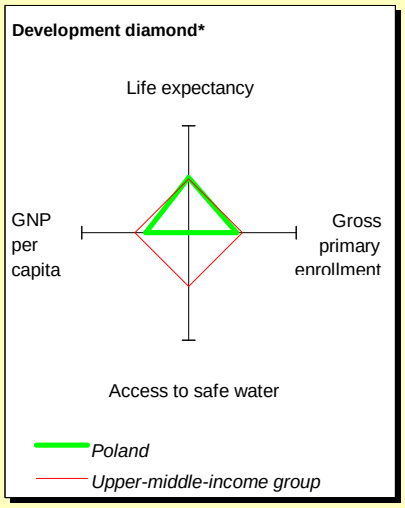
		Committed				Disbursed			
		IFC				IFC			
FY Approval	Company	Loan	Equity	Quasi	Partic	Loan	Equity	Quasi	Partic
1990	EDB-Piotr Ostrow	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.00
1991	CHEMAGEV	0.23	0.00	0.00	0.00	0.23	0.00	0.00	0.00
1992	Philips Poland	2.50	0.00	0.00	0.00	2.50	0.00	0.00	0.00
1993	BONA	1.30	0.00	0.00	0.00	1.30	0.00	0.00	0.00
1993	Huta Warszawa	28.13	4.49	0.00	0.00	12.23	3.75	0.00	0.00
1993	PEF-Poland	0.00	0.00	2.17	0.00	0.00	0.00	1.67	0.00
1993	Sandoglass	13.91	8.27	0.00	5.02	13.91	8.27	0.00	5.02
1994	Peters	5.58	1.00	0.00	0.00	5.58	0.88	0.00	0.00
1995	Globi Retailing	0.00	0.00	10.00	0.00	0.00	0.00	10.00	0.00
1995	Nesky	0.00	1.87	0.50	0.00	0.00	1.87	0.50	0.00
1995/97/98	Intercell	0.00	0.00	11.51	0.00	0.00	0.00	11.51	0.00
1996	Baltic Malt	5.07	0.00	1.94	0.00	5.07	0.00	1.87	0.00
1996	Pam Bank	15.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
1996/97	Gaspol	0.00	0.00	5.98	0.00	0.00	0.00	5.98	0.00
1997	CPF	0.00	0.00	1.60	0.00	0.00	0.00	0.99	0.00
1997	Norgips	10.57	0.00	0.00	19.89	10.57	0.00	0.00	19.89
1998	BWP S.A.	0.00	0.00	1.75	0.00	0.00	0.00	1.75	0.00
1998	Global Hotels	0.00	0.00	3.60	0.00	0.00	0.00	2.67	0.00
	Total Portfolio:	82.34	15.63	39.05	24.91	56.44	14.77	36.94	24.91

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

Annex 10: Country at a Glance

POLAND: PODHALE GEOTHERMAL DISTRICT HEATING AND ENVIRONMENT PROJECT

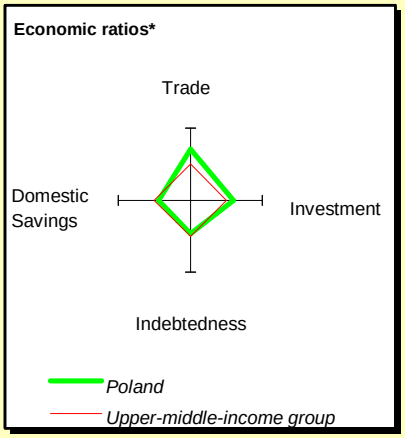
POVERTY and SOCIAL	Poland	Europe & Central Asia	Upper-middle-income
1998			
Population, mid-year *(millions)*	38.7	473	588
GNP per capita *(Atlas method, US$)*	3.900	2.190	4.860
GNP *(Atlas method, US$ billions)*	150.9	1.039	2.862
Average annual growth, 1992-98			
Population *(%)*	0.1	0.1	1.4
Labor force *(%)*	0.8	0.6	2.0
Most recent estimate (latest year available, 1992-98)			
Poverty *(% of population below national poverty line)*	24	..	..
Urban population *(% of total population)*	65	68	77
Life expectancy at birth *(years)*	73	69	70
Infant mortality *(per 1.000 live births)*	10	23	27
Child malnutrition *(% of children under 5)*	..	..	..
Access to safe water *(% of population)*	..	..	79
Illiteracy *(% of population age 15+)*	0	4	11
Gross primary enrollment *(% of school-age population)*	96	100	108
Male	97	101	..
Female	96	99	..



KEY ECONOMIC RATIOS and LONG-TERM TRENDS

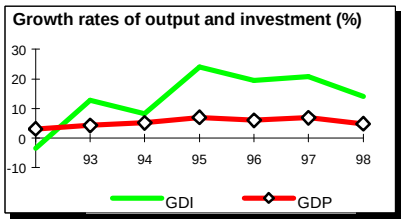
	1977	1987	1997	1998
GDP *(US$ billions)*	..	..	147.9	157.5
Gross domestic investment/GDP	..	..	24.7	27.0
Exports of goods and services/GDP	..	..	25.7	20.7
Gross domestic savings/GDP	..	..	20.4	18.7
Gross national savings/GDP	..	..	20.4	22.6
Current account balance/GDP	..	..	-2.9	-4.4
Interest payments/GDP	..	..	0.9	1.1
Total debt/GDP	..	..	27.0	30.5
Total debt service/exports	..	..	7.9	..
Present value of debt/GDP	..	..	24.2	..
Present value of debt/exports	..	..	110.7	..

	1977-87	1988-98	1997	1998	1999-03
(average annual growth)					
GDP	..	3.6	6.8	4.8	5.2
GNP per capita	..	3.5	6.7	5.3	5.0
Exports of goods and services	..	13.5	12.2	9.2	8.4

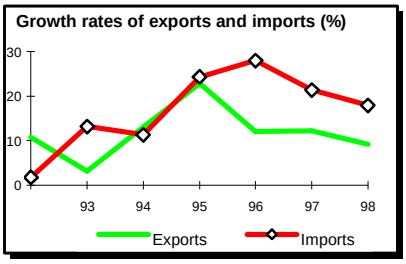


STRUCTURE of the ECONOMY

	1977	1987	1997	1998
(% of GDP)				
Agriculture	..	..	5.6	..
Industry	..	..	37.5	..
Manufacturing	..	..	22.5	..
Services	..	..	56.9	..
Private consumption	..	..	63.5	..
General government consumption	..	..	16.1	..
Imports of goods and services	..	..	30.0	..



	1977-87	1988-98	1997	1998
(average annual growth)				
Agriculture	..	-1.0	0.6	..
Industry	..	4.4	10.8	..
Manufacturing	..	..	..	..
Services	..	..	..	..
Private consumption	..	4.2	6.9	4.2
General government consumption	..	2.6	3.5	..
Gross domestic investment	..	8.9	20.8	14.1
Imports of goods and services	..	18.8	21.4	17.9
Gross national product	..	3.7	6.8	5.4



Note: 1998 data are preliminary estimates.

* 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.

Additional
Annex No.: 11

Summary Analysis of Local Environmental Benefits

1. The analysis of local environmental benefits was carried out by Bank (ECSSD) staff during two missions to Zakopane in August though October, 1998. The main purpose of the analysis done during these visits was to estimate the magnitude of the local environmental benefits from the Project in order to establish the additionally of the resources sought from the Global Environment Facility (GEF). The funding provided for climate change mitigation projects is not intended to cover local benefits. Only once the costs to achieve these benefits are covered by the Borrower or by another donor agency (e.g., EU PHARE) can supplemental funding be sought from GEF.

ENVIRONMENTAL BENEFITS, (US$1000)
Case 1. DH boilers in Nowy Targ switch to gas in the baseline:

	Health benefits	Visibility benefits	Total env. benefits
Zakopane	8,099	377	8,476
Nowy Targ	0	0	0
Villages	1,932	47	1,979
Outside project area	592	0	592
TOTAL (PV at 12%):	**10,622**	**424**	**11,047**

Case 2. Coal-fired DH boilers in Nowy Targ in the baseline:

	Health benefits	Visibility benefits	Total env. benefits
Zakopane	8,099	377	8,476
Nowy Targ	3,408	83	3,491
Villages	1,932	47	1,979
Outside project area	592	0	592
TOTAL(PV at 12%):	**14,030**	**507**	**14,538**

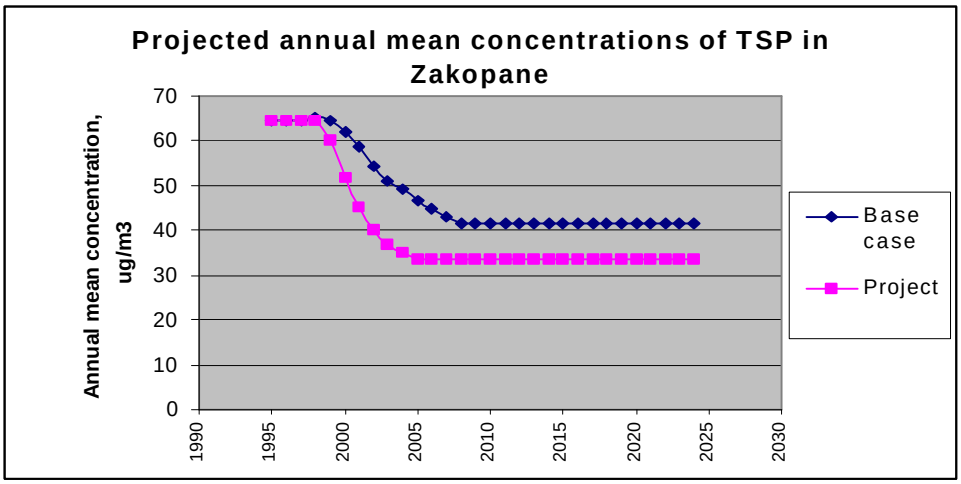
2. According to the local environmental benefits model developed by ENV /1/ and applied by ECSSD staff for this analysis, the Podhale Geothermal Project can generate local environmental benefits of about US$ 11.0 - 14.5 million, depending on the assumptions made for the baseline fuel in Nowy Targ, where two distinct options (switching to gas and staying on coal) are available in addition to the geothermal conversion of the three district heating boilers in the project area. Staying on coal is regarded as more likely, and thus Case 2 should be the main case to consider.

3. The project can reduce annual average concentrations of particulate matter in Zakopane by 7.8 - 14.3 ug/m3, which would result in local environmental benefits of about US$ 8.5 million (the net present

value of the local environmental benefits achieved over the period from 1995 to 2024 discounted at 12% per year). *Note:* ug/m3 = microgram per cubic meter of ambient air.

4. Most of the local environmental benefits from the project result from the reduction in particulate emissions, which will improve the health of the local population.

5. Due to the absence of any significant industrial activity in the area, air quality in Zakopane is not bad overall. Indeed it is quite good in the summer time. In 1997, the annual mean concentration of TSP and SO2 were 68 and 35 um/m3, respectively. This is within the national ambient standards for annual mean concentrations, which are 75 ug/m3 for TSP and 40 ug/m3 for SO2. However, air pollution by particulates arising from burning fuel during the winter months is a legitimate concern for both Zakopane and Nowy Targ (see Technical Addendum 1 to this Annex). The seasonal differences in average ambient concentrations in Zakopane reflect the contribution of heating sources. In 1997, the heating season average concentrations of TSP (calculated as the average of the 24-hour concentrations for the season) was close to 100 ug/m3. During the non-heating season, the concentration of TSP was much lower, with the seasonal average at about 30 ug/m3. The same pattern has been observed in earlier years, although comparisons are complicated by the varying location of the measurements. The national standard in Poland for 24-hour mean concentration of TSP is 150 ug/m3. This standard was exceeded for about 7.5% of monitored days during 1997 /2/. Fig. 1 in Technical Addendum 1 to this Annex shows the degree of exceedance. The maximum daily average concentration observed was about 2.5 times the national standard.



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Note: The graph shows concentrations of total suspended particulates (TSP) -- the only kind of particulate matter for which direct measurements are available in Zakopane. However, the entire difference between the concentrations of TSP for the base and project cases is assumed to be due to the reduction in particulate matter originating from combustion of fuels, which consists predominantly of particles less than 10 microns in size (i.e., PM10). Therefore, for the reduction in ambient concentrations of particulate matter attributable to the project, no difference is assumed between TSP and PM10 (i.e. the entire amount of particulates is assumed to be in the category of PM10).

The environmental health benefits model used for this analysis employs the dose-response functions applied in a number of World Bank projects. Epidemiological evidence increasingly suggests that health impacts due to exposure to PM_{10} occur at ambient levels well below current international standards and are approximately linear with exposure levels. The evidence is less clear for sulfur dioxide. In the analysis, we have assumed that no threshold levels exist for PM_{10}, but there is a threshold for sulfur dioxide. For simplicity, it was assumed that the threshold corresponds to the national standard in Poland for annual average concentration of SO_2, which is 40 ug/m^3.

To value the expected reductions in mortality and morbidity, the analysis uses estimates developed in the United States based on the costs of health care, wage rates, and the willingness to pay to reduce the risk of death. These values are selected from the lower end of the U. S. range and adjusted to reflect differing income levels between Poland and the United States. To reflect the growth of the willingness to pay for a cleaner environment as income grows, a growth factor of 2.5% (in real terms) was included in the calculation of health benefits. As the point of reference, the 1997 GDP per capita for in Poland was used (US$ 3,510 per year – calculated on the basis of the exchange rate for the year).

In addition to the impact of the project on health, the reduction in air pollution will bring other benefits such as lower costs of maintenance for buildings and equipment, improvements in the attractiveness of the area for both visitors and local residents, and less damage to vulnerable ecosystems (amenity benefits). While the calculation of the full range of these types of benefits was clearly beyond the scope of this analysis, the calculation of visibility benefits was undertaken in an attempt to gauge some of these difficult-to-quantify benefits based on conservative willingness to pay estimates.

6. As illustrated by the above graph for Zakopane, the project will allow reduction of the annual mean concentrations of particulates from the present level of about 65 ug/m3 to as little as about 35 ug/m3. The impact will be especially dramatic during the heating season, when the concentration of TSP will be reduced from the present level of almost 100 ug/m3 to about 40 ug/m3. The environmental benefits will be significant - even by comparison with the rather optimistic baseline, which also assumes substantial reduction in particulate emissions resulting from fuel switching (mainly, to gas and light fuel oil).

7. The benefits from reducing the SO2 emissions are of less significance due to much lower damage per ton emitted and based on the understanding that the ambient concentrations of SO2 in the project area do not exceed the critical ("threshold") level. However, the role of SO2 emissions as a contributor to the formation of particulate matter is substantial.

According to the information provided by the local district heating company, the heating season in Zakopane starts between September 1 and October 1, and ends in late April – early May. The patterns of monthly concentrations of particulate matter and SO_2 suggest that the self-heating households sharply reduce burning fuel in April and do not tend to start heating their homes until late September. The heating season can thus be defined as end-September through mid-April.

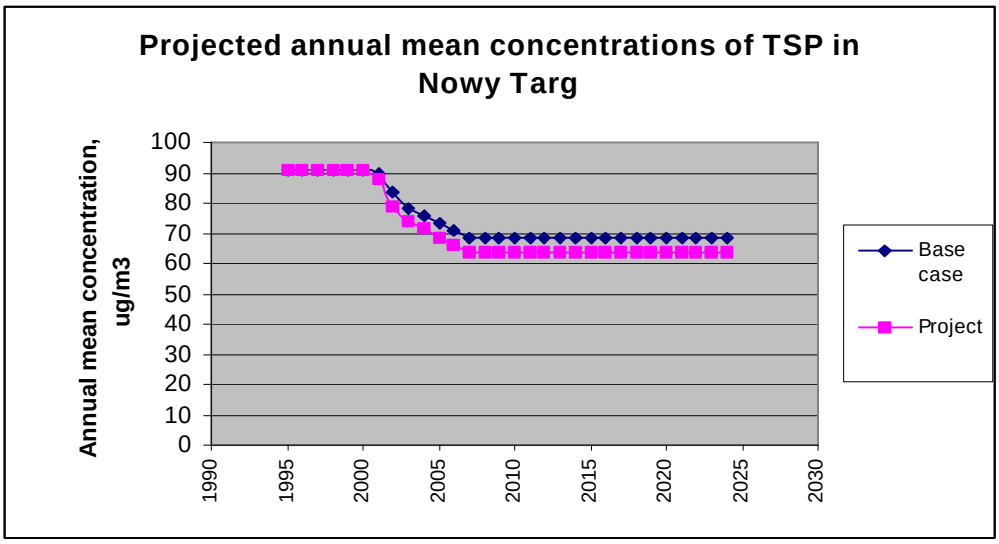
The agency responsible for monitoring the local air quality (*Wojesodzka Stacja Sanitarno-Epidemiologiczna,* Nowy Sacz, ul. Pzemiesinicza 5) has provided 1997 data for Zakopane and Nowy Targ for total suspended particulates (TSP – *Pyl Zawieszony, Ogolem*) and SO_2 concentrations. While an ambient standard for fine particulates (*Pyl Zawieszony, PM10*) also exists in Poland, PM_{10} is not monitored in the project area. An earlier analysis for the Podhale area conducted by the Bank (ENVPE) staff was based on 1994 data obtained from the same source. The comparison of 1997 and 1994 data gives the impression of a substantial increase in the observed concentrations of particulate matter – especially, in the case of Nowy Targ. However, the value of this comparison is diminished by the fact that the measurements were taken at different locations both in Zakopane and Nowy Targ. In the case of Zakopane, the new measurements were about 800-900 meters away from the old location in the residential area and closer to the industrial zone (at *ul. Chramcowki 19* as opposed to *ul. Kosciuszki 9,* which was the case in 1994).

	Zakopane, 1997		Nowy Targ, 1997		**Poland standard**	**Poland standard**	**WHO guidelines for Europe**	**World Bank trigger value**
ug/m3	**TSP**	**SO2**	**TSP**	**SO2**	**TSP**	**SO2**	**TSP**	**TSP**
Annual average	67.4	34.9	94.5	25.2	75	40		80
Summer ave.	30.3	17.6	47.5	7.9				
Winter ave.	98.8	49.6	134.4	39.8				
Seasonal difference	68.5	32.0	86.9	32.0				

8. While the air quality in Zakopane is within the national standard for the mean annual concentration of TSP and seldom exceeds the standards for the daily average concentrations, the air pollution problem is more serious in Nowy Targ. There, the annual average ambient standard for particulates is substantially exceeded, and the daily average concentrations of TSP exceeded the standard for 15% of days in 1997. Fig. 2 in Technical Addendum 1 to this Annex shows the degree of exceedance. The maximum daily average concentration observed was about 2.5 times the national standard.

9. If, in the baseline scenario, the Nowy Targ district heating boilers are expected to switch to gas by the year 2001, then the high emissions of particulates from the boiler plants in the project area will not be expected to persist in either baseline or the proposed project case. In that case, the expected environmental benefits accruing to Nowy Targ due to the project will be negligible compared with those in Zakopane, even though the current environmental situation in Nowy Targ is considerably worse. With Nowy Targ staying on coal in the base case, the environmental benefits accruing to it will amount to approximately US$ 3.5 million (the net present value of the local environmental benefits achieved over the period from 1995 to 2024 discounted at 12% per year) due to a reduction of annual average concentration of

particulates by about 4.7 ug/m3 as illustrated by the graph below. It is assumed that, even with the coal-based district heating, Nowy Targ would find ways to comply with the Polish national standards for particulates over the next few years.



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10. The district heating boilers in Nowy Targ and some of the larger ones in Zakopane are outfitted with mechanical cyclone filters for particulate emission control. In the baseline for Zakopane, it was assumed that no new cyclones would be installed because the plants would be switching to gas relatively soon. The efficiency of the existing cyclones is about 75%. The boiler plants outfitted with cyclones currently generate about 40% of heat supplied by the heat boilers of the former Tatry district heating company of Zakopane (now merged with Geotermia Podhalanska).

11. The environmental benefits from the project are augmented by the prevalence of low-stack sources which will be displaced once the project plants come on line. In Zakopane, small boilers used by the households and small commercial entities constitute the bulk of the emissions. The height of the smoke-stacks rarely exceeds 15 meters and, as a rule, the boilers are not outfitted with any emission control equipment. The number of emission sources can be estimated based on the number of loads targeted by Geotermia Podhalanska for connection to geothermal energy and natural gas. In Zakopane and neighboring villages, more than 4,200 households and over 172 commercial loads ("large loads") can be potentially connected. In addition, there are 32 district heating boiler plants in Zakopane, 29 of which are proposed to be replaced by heat exchangers connected to the project geothermal and gas-fired plants.

12. The bulk of the emissions and associated health impacts is related to the burning of coal and coke. Coke, with a heating value of 27.6 GJ/ton and ash content of 9 -10%, has a sulfur content of 0.6% and is used mostly by households and commercial entities such as mini-hotels. Coal used by households has a heating value of about 28 GJ/ton and an ash content similar to that of coke. However, the district heating plants in Nowy Targ and Zakopane also use low-quality coal dust (culm), which has a heating value of about 20 GJ/ton, ash content of at least 21%, and a sulfur content of about 1%.

Table: Emission factors in tons per million toe (1toe = 41.868 GJ)

	TSP			SO2
	Small boilers/furnaces	Large loads	Power plants	
Coal, coke	35,000	45,000	110,000	60,000
Light fuel oil	1,400	1,400		9,700
Wood	40,000			17,000

Note: the TSP emission factors are before/without particulate control; when particulate control is available, the emission factor is multiplied by (1-e) where e is the efficiency of particulate control equipment; in the calculations for this annex, the PM control equipment of district heating boilers was assumed to be 75%; for power plants, e = 95%.

13. By comparison with the baseline scenario and the status quo, the only negative impact of the proposed project on air quality is due to the emissions from the two gas-fired peaking plants in Zakopane and Nowy Targ. In addition, both the geothermal and gas-fired plants would use electricity generated elsewhere in Poland. However, when all the sources using electricity in the baseline are considered, the project saves more electricity than it uses. The net effect of this saving generates domestic environmental benefits of about US$ 0.6 million over the period through the year 2024. The impact of electricity generation on the balance of environmental costs and benefits is greatly mitigated by the availability of highly efficient particulate control equipment and high smoke stacks of the power plants. In this calculation, the dispersion coefficient used for high-stack sources (power plants) was about 1/17 that of a low-stack source. Thus this impact is much smaller than the environmental benefits achieved in Zakopane and the neighboring villages by reduced emission from low and mostly uncontrolled sources.

14. The physical amounts of emission reduction relative to the baseline scenario are summarized in the table below. The reductions for Nowy Targ correspond to the case of continued use of coal in the baseline.

Table: Emission reductions against the baseline scenario: Total Suspended Particulates (TSP) and SO2.

	Emission reduction, tons					
	TSP from low sources	TSP from high stacks	TSP from all sources	SO2 from low sources	SO2 from high stacks	SO2 from all sources
Annual reductions during initial expansion period (1999-2004):						
Zakopane	348	0	**348**	602	0	**602**
Nowy Targ	83	0	**83**	110	0	**110**
Villages	163	0	**163**	258	0	**258**
Outside project area	0	106	**106**	0	463	**463**
Subtotal:	***595***	***106***	***701***	***970***	***463***	***1,434***
Annual reductions at steady state (2005-2024):						
Zakopane	240	0	**240**	455	0	**455**
Nowy Targ	147	0	**147**	196	0	**196**
Villages	263	0	**263**	418	0	**418**
Outside project area	0	51	**51**	0	222	**222**
Subtotal:	***651***	***51***	***702***	***1,069***	***222***	***1,291***
Entire project cycle reductions (period 1995-2024):						
Zakopane	6,914	0	**6,914**	12,732	0	**12,732**
Nowy Targ	3,443	0	**3,443**	4,591	0	**4,591**
Villages	6,304	0	**6,304**	9,990	0	**9,990**
Outside project area	0	1,653	**1,653**	0	7,213	**7,213**
TOTAL	**16,661**	**1,653**	**18,314**	**27,313**	**7,213**	**34,525**

15. With the Nowy Targ boilers switching to gas in the baseline scenario, the bottom-line emission reductions are as follows:

TOTAL without Nowy Targ reductions (gas baseline assumption)	**13,218**	**1,653**	**14,871**	**22,722**	**7,213**	**29,934**

16. As shown in the Tables above, the reduction in the emissions of particulate matter are expected to be about 701-702 tons/year throughout the life of the project (1999-2024). The total reduction in particulate emissions relative to the baseline will be between 14.9 and 18.3 thousand tons over the project life. The avoided emissions of SO2 are expected to be about 1,434 tons/year in 1999-2004, 1,291 tons/year in 2005-2024, and 29.9 - 34.5 thousand tons over the life of the project.

17. The integration of the local environmental benefits analysis with the incremental cost analysis of CO2 emission reduction and with the overall economic analysis of the project has been discussed earlier. Before accounting for the global benefit of CO2, the inclusion of local environmental benefits into the EIRR allows to bring the economic rate of return to 11.9% percent. While this renders the project marginally feasible on these grounds alone, the recognition of the willingness to pay for global environmental benefits (carbon reductions) substantially strengthens project economics and allows the project to achieve an EIRR of 12.6%. It is only with carbon benefits that the EIRR significantly exceeds 12.0% assumed to be the common hurdle rate of return for Bank-financed projects. Thus, the rationale for GEF grants for CO2 reduction remains strong after accounting for the local environmental benefits.

Footnotes to Annex 11:

/1/ The model has been developed by Gordon Hughes and Ksenyia Lvovsky, and applied for this analysis by Victor Loksha. A discussion of the model is available, i.a., in K. Lvovsky and G. Hughes, *Addressing the Environmental Costs of Fuels*, paper presented at the World Congress of Environmental Economists, Venice, Italy, June 1998.

/2/ The actual proportion of days with exceedances was probably a little higher because the number of observations during the winter months was somewhat smaller than during summer.

Technical Addendum 1 to Annex 11

Fig. 1. TSP: 24-hour mean concentrations in Zakopane

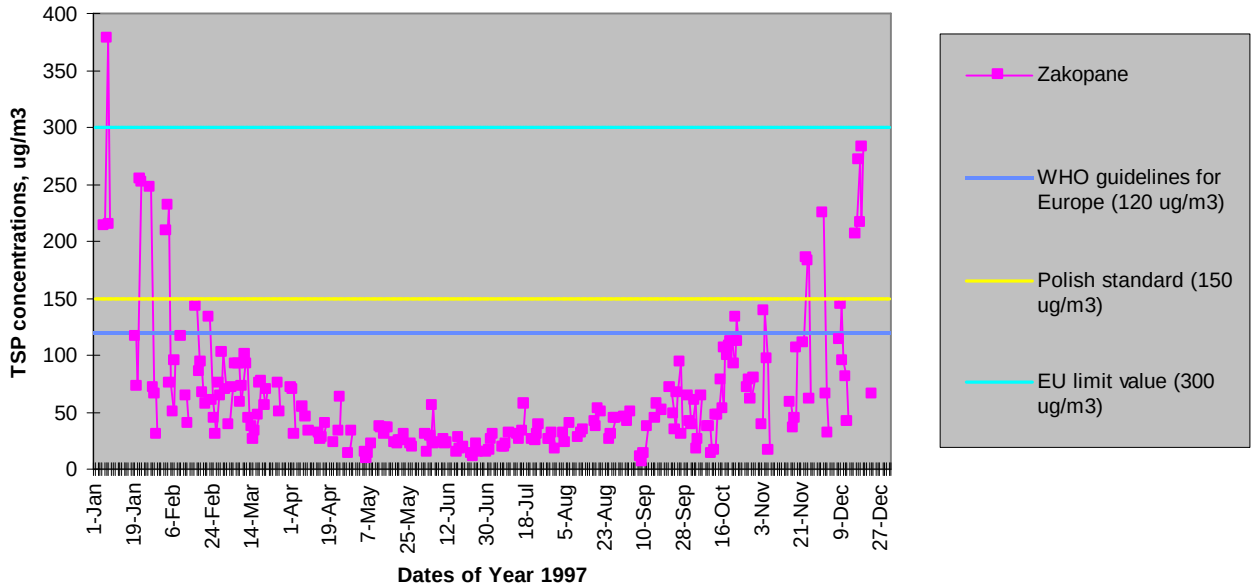
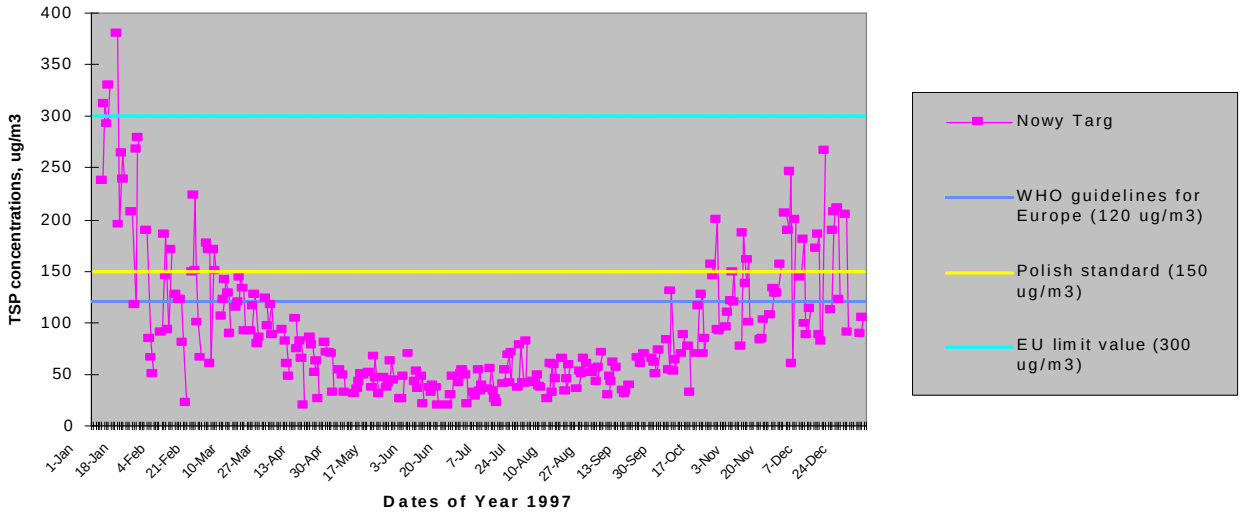


Fig. 2. TSP: 24-hour mean concentrations in Nowy Targ in 1997



Measures of annual mean concentration (ug/m3):

63.2 =annual average (mean) in Zakopane

75 = Polish standard for annual mean concentration

80 = World Bank "trigger value"

150 = EU limit value

Measures of annual mean concentration (ug/m3):

91.6 =annual average (mean) in Nowy Targ

75 = Polish standard for annual mean concentration

80 = World Bank "trigger value"

150 = EU limit value

Additional
Annex No.: 12

Map: Location of Geothermal Wells in the Podhale Region

ATTACHED SEPARATELY

Additional
Annex No.: 13

Environmental Management Plan

1) The EMP (main report)

EMP Podhale-02-28-00.d

2) Annex 6: Monitoring/Reporting Formats (to be inserted into main report).

Monit_Formats.xls

Note: 2 copies of the EMP were hand-carried to the InfoShop on March 2, 2000, attn: Tonya Ceesay (JB1-082)