

**Document of
The World Bank**

Report No:

**PROJECT APPRAISAL DOCUMENT
ON A
PROPOSED
GRANT FROM THE
GLOBAL ENVIRONMENT FACILITY TRUST FUND
IN THE AMOUNT OF SDR 4.4 MILLION¹
TO THE
CZECH REPUBLIC
FOR THE
KYJOV WASTE HEAT UTILIZATION PROJECT**

June 21, 1998

**Rural Development and Environment Sector Unit and Energy Sector Unit
Europe and Central Asia Region**

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¹ US\$ 5.8 million equivalent.

CURRENCY EQUIVALENTS

Currency Unit = Czech Koruna (CZK)

Exchange Rate (March 23, 1998):

US\$ 1.00 = CZK 34.14

CZECH FISCAL YEAR:

January 1 - December 31

ABBREVIATIONS AND ACRONYMS

CAS	- Country Assistance Strategy
CEZ	- Ceske Energeticke Zavody (regional supplier of electric power)
CHP	- Combined Heat and Power
CO₂	- Carbon Dioxide
CR	- The Czech Republic
DH	- District Heating
EA	- Environmental Assessment
EE	- Euroenergy, s.r.o. (consultants for economic and energy matters)
ENECO	- Energoconsult Praha, a.s. (consultant for technical matters)
EU	- European Union
FIRR	- Financial Internal Rate of Return
GA	- Grant Agreement (legal agreement between the Czech Republic and IBRD)
GEF	- Global Environment Facility
GHG	- Greenhouse Gases
GNP	- Gross National Product
GW	- Gigawatt
GWh	- Gigawatt-hour
HEX	- HEX Capital, s.r.o. (financial consultants)
IBRD	- International Bank for Reconstruction and Development
ICB	- International Competitive Bidding
IEA	- International Energy Agency
JME	- Jihomoravska Energetika, a.s. (South Moravian Power Company)
JMP	- Jihomoravska Plynarenska, a.s. (South Moravian Gas Utility)
kV	- Kilovolt
M&E	- Monitoring and Evaluation
MEAS	- Moravská Elektroenergetická, a.s. (electricity generating and trading company)
MG	- Moravia Glass, a.s. (holding company)
MoE	- Ministry of Environment of the Czech Republic
MoK	- Municipality of Kyjov
MW	- Megawatt
MWe	- Megawatt of Electric Power
MWh	- Megawatt-hour
MWt	- Megawatt of Thermal Output Power
NBF	- Non-Bank-Financed
NCB	- National Competitive Bidding
NO_x	- Nitrogen Oxides
PA	- Project Agreement (legal agreement between IBRD and TPK)
PCD	- Project Concept Document
PFMR	- Project Financial Management Reports
PIP	- Project Implementation Plan

PM	- Particulate Matter
PR	- Public Relations
PRIBOR	- Prague Interbank Offered Rate
SAR	- Staff Appraisal Report
SCM	- Standard Cubic Meter
SO_x	- Sulfur Oxides
TA	- Technical Assistance
tCe	- Tons of Carbon Equivalent
tCO₂	- Tons of Carbon Dioxide
TPK	- Teplarna Kyjov, a.s. (a Czech joint-stock company created in January 1997 to build and operate a steam-gas CHP plant)
UNFCCC	- United Nations Framework Convention on Climate Change
UPS	- Uninterruptible Power Supply
VAT	- Value-Added Tax
VMG	- Vetropack Moravia Glass, a.s. (glass bottle factory)

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Country Director: Roger Grawe
Sector Leaders: Michele de Nevers and Henk Busz
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100

**CZECH REPUBLIC
KYJOV WASTE HEAT UTILIZATION PROJECT**

Project Appraisal Document

CONTENTS

A. Project Development Objectives

1. Project Development Objectives and Key Performance Indicators

B. Strategic Context

1. Sector-Related CAS Goals and GEF Operational Program Supported by the Project
 - a) Sector-Related Country Assistance Strategy (CAS) Goals Supported by the Project
 - b) GEF Operational Strategy/Program Objective Addressed by the Project
2. Main Sector Issues and Government Strategy
3. Sector Issues to be Addressed by the Project and Strategic Choices

C. Project Description Summary

1. Project Components
2. Key Policy and Institutional Reforms Supported by the Project
3. Benefits and Target Population
4. Institutional and Implementation Arrangements

D. Project Rationale

1. Project Alternatives Considered and Reasons for Rejection
2. Major Related Projects Financed by World Bank, GEF and/or Other Development Agencies
3. Lessons Learned and Reflected in the Project Design
4. Indications of Borrower Commitment and Ownership
5. Value Added of World Bank/ GEF Support in the Project

E. Summary Project Analyses

1. Economic
2. Financial
3. Technical
4. Institutional
5. Social
6. Environmental Assessment
7. Participatory Approach

F. Sustainability and Risks

1. Sustainability
2. Critical Risks
3. Possible Controversial Aspects

G. Main Grant Conditions

1. General
2. Conditions of Board Presentation
3. Effectiveness Conditions
4. Other Conditions

H. Readiness for Implementation

I. Compliance with Bank Policies

Annexes:

Annex 1	Project Summary and Risks Table 1. Project Design Summary Table 2. Critical Risks
Annex 2	Detailed Project Description
Annex 3	Estimated Project Costs
Annex 4	Incremental Cost Analysis
Annex 5	Financial Analysis Annex 5.1 Financial Summary of Teplarna Kyjov and its Main Shareholders Annex 5.2 Inflation and Price Increase Assumptions, Financial Ratios, and FIRR for Teplarna Kyjov, a.s. Annex 5.3 Financing Plan
Annex 6	Procurement and Disbursement Arrangements Table A. Project Costs by Procurement Arrangements Table B. Allocation of Grant Proceeds
Annex 7	Project Processing Budget and Schedule
Annex 8	Documents in Project File
Annex 9	Statement of Loans and Credits Table A. IBRD Loans and IDA Credits in the Operations Portfolio Table B. Statement of IFC's Committed and Disbursed Portfolio
Annex 10	Country at a Glance

Additional Annexes:

Proposed Organizational Chart of Teplarna Kyjov, a.s.
Map (Number IBRD 29526)

Czech Republic
Kyjov Waste Heat Utilization Project

Project Appraisal Document

Europe and Central Asia Region
ECC07 Country Department: Czech Republic

Date:	June 21, 1998	Task Team Leaders:	Helmut Schreiber/ Christian Duvigneau (Alternate)
Country Director:	Roger Grawe	Sector Leaders:	Michele de Nevers/ Henk Busz
Project ID:	CZ-GE-45572	Program Objective Category:	EN (Environmentally Sustainable Development)
Sector:	Environment and Energy	Focal Area:	Climate Change
GEF Supplement ID:			
Lending Instrument:	GEF Grant	Program of Targeted Intervention:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

Project Financing Data ☐ Loan ☐ Credit ☐ Guarantee ☒ Grant ☐ Other [Specify]

For Loans/Credits/Others:

Amount (US\$m): 5.8

Proposed terms: ☐ Multicurrency ☐ Single currency, specify
 Grace period (years): ☐ Standard Variable ☐ Fixed ☐ LIBOR-based
 Years to maturity:
 Commitment fee: %
 Service charge: %

Financing plan (US\$m):

Source:	Local	Foreign	Total
Shareholders	3.8	3.2	7.0
GEF Grant	0.0	5.8	5.8
LT loan facility	8.0	3.3	11.3
Commercial ST loan	0.3	-	0.3
State Environmental Fund*	0.4	0.1	0.5
* Decommissioning of 13 existing boiler stations; installation of heat exchangers.			
Total:	12.5	12.4	24.9

Recipient: Czech Republic, Ministry of Environment

Responsible agency: Ministry of Environment

Executing agency: Teplarna Kyjov, a.s. (TPK)

Estimated disbursements (Bank FY/US\$m):	1999	2000
Annual	5.8	0.0
Cumulative	5.8	5.8

A. Project Development Objectives

1. Project Development Objectives and Key Performance Indicators (see Annex 1)

The major objective of the Project is to decrease the emissions of greenhouse gases (GHG). This objective would be achieved by means of increasing the efficiency and reliability of the heat supply to the City of Kyjov, and of the heat and power supply to the Vetropack Moravia Glass, a.s. (VMG) factory, through intensified use of waste process heat generated at VMG. Associated Project objectives are to (a) demonstrate gas-fired combined-cycle cogeneration in the Czech Republic, where this technology has not been widely used; (b) stimulate technological and institutional changes that would promote energy efficiency through developing combined-cycle heat and power (CHP) systems for joint industrial and municipal purposes; (c) achieve local environmental benefits by reducing the share of coal and lignite in the fuel-mix for heat and power generation; and (d) demonstrate the possibility of cooperative efforts between the Czech Ministry of Environment (MoE) and the private sector in enhancing the environmental benefits from such a project.

Background: VMG is the largest glass bottle manufacturer in the country producing for both domestic and export markets. Currently, the glass production facility produces substantial volumes of waste heat continuously. The recent reconstruction of furnace 52 at VMG, coupled with the proposed CHP, offers an opportunity for much greater use of waste heat for both heat and electricity production. Such reconstructions occur at intervals of about seven years. As part of this reconstruction program, Teplarna Kyjov, a.s. (TPK) – a joint-venture of Moravia Glass, a.s. (a holding company), the regional gas and electricity distribution companies JMP and JME, and the City of Kyjov – has agreed to sell heat on a contract basis to VMG, the City of Kyjov, and the hospital in Kyjov. A combined heat and power (CHP) plant will combine waste heat from VMG and new supplemental gas-firing to produce heat and electricity that will be sold. It is envisaged that the Project will provide for the heating needs of the Kyjov district heating system, the heating and electricity needs of VMG, and will sell all excess electricity to the regional electric distribution company, JME. It is anticipated that on-site generation will provide a more reliable electric supply than the current delivery via the 22 kV distribution network. Frequent voltage flickers now cause substantial difficulty with VMG's control systems, resulting in production problems. Although reliability may be much improved by installation of an uninterruptible power supply (UPS) system, the on-site generation provides additional supply security.

The Project outcomes can be measured in terms of the differences in energy inputs required to produce the same quantities of heat and electricity with and without the Project. Without the Project, the relevant efficiencies would be for heat production at VMG, heat production at 15 local boiler houses in Kyjov, and electric production in new base-load lignite plants in the CEZ system, the dominant state-owned supplier of electric energy in the region. Improved reliability of the heat and electric supply can be measured in terms of the frequency and duration of outages at the VMG plant with appropriate consideration of the contribution of other improvements such as the installation of UPS systems. Emissions of particulate matter, SO₂, NO_x, and CO₂ can also be compared quantitatively for the with- and without-project scenarios. Estimates of CO₂ emissions will be required at the VMG plant, at the Kyjov district heating boilers and at the new CEZ lignite plants. Measurements of NO_x will be taken at these measuring points at the VMG plant and in Kyjov on a regular basis. The demonstration impact of the Project is difficult to measure precisely, but the total number of combined cycle CHP projects joining industrial and district heating interests in the Czech Republic, and the number of projects with active MoE support, can be readily tracked. The requests for project data or visits can also be monitored. In addition, MoE is planning a series of dissemination / public relations (PR) seminars.

B. Strategic Context: Sector-Related CAS Goals and GEF Operational Program Supported by the Project

1-a. Sector-related Country Assistance Strategy (CAS) Goals Supported by the Project (see Annex 1)

The Project supports goals of the 1991 CAS for Czechoslovakia (the last full CAS prepared for the former country), including reduction of greenhouse gas emissions, modernization of municipal infrastructure and private sector energy infrastructure; contributing to regional development; and helping to improve the environment by reducing air pollution, including transboundary pollution. An updated Bank's Assistance Strategy on the Czech Republic, discussed in the context of Project Document No. P-6008-CZ (August 16, 1993) contains the objective of more efficient generation and transmission of electricity, which the Project directly supports.

1-b. GEF Operational Strategy/Program Objective Addressed by the Project

The Czech Republic signed the United Nations Framework Convention on Climate Change (UNFCCC) in October 1993 and is prepared to sign the Kyoto Protocol of December 1997. The first National Communication was submitted by the country in September 1994. The Czech Republic agreed to undertake efforts to reduce GHG emissions and to meet the requirement of stabilizing emissions at or below 1990 levels by the year 2000. In Kyoto, the country committed to reduce GHG emissions by 8% from the 1990 level.

The Project is clearly a country-driven effort. The Government of the Czech Republic has proposed this Project for GEF financing following a complicated and lengthy process of project identification, analysis, and priority setting. Initially, about 10 projects were identified as eligible for GEF financing, but the proposed Project has been selected in close cooperation with the Government. The Project is in line with the national objectives, as articulated in the National Communication.

The Project meets the criteria for activities to be funded under the GEF *short-term response measures* for climate change projects. Cogeneration / district heating has been identified as a priority measure in the first Czech National Communication to the UNFCCC submitted in September 1994. Incremental cost analysis shows that the Project is likely to have a unit abatement cost of US\$ 2.9-3.3 per ton of CO₂ (US\$ 10.6-12.1 per ton of carbon equivalent). Thus, as a short-term response measure, the Project meets both key criteria of national priority and cost-effectiveness in CO₂ emission reduction. } GEF

With respect to the long-term objectives, the Project could also be a small vehicle towards *removing barriers to energy conservation and energy efficiency*. The barriers to be addressed include the institutional weaknesses and lost market opportunities resulting from the lack of information about the feasibility and significance of the low-cost CO₂ reductions offered by CHP generation at industrial sites with the utilization of heat for residential purposes. Pricing policy distortions such as low residential tariffs for electricity, gas and district heat also represent a barrier to better heat utilization, although, in 1998, the Government has started to address these distortions. They are being addressed through an ongoing dialogue with the Government in the context of this Project, as well as in the broader context of the proposed EU accession.

In discussions with the Ministry of Environment, Bank missions discussed the possibility that returns on investment beyond the current expectations could be used by the implementing agency for additional measures towards GHG emission reduction. This has to be specified further during project implementation.

2. Main Sector Issues and Government Strategy

The energy sector in the Czech Republic (CR) faces a set of challenges common with many other Central and

Eastern European countries. The planned economies of the pre-1989 era measured progress in terms of increasing energy consumption and did not properly recognize the true cost of indigenous resources (in the Czech Republic, mostly coal) versus world prices. The Czech Republic ranks near the highest in the world in energy consumed per unit of national income produced. The economic transformation that began in 1990 required major adjustments to world markets and led to an initial drop of 22 percent in GNP in 1991 and 1992. Energy consumption did not, however, decline proportionately. Between 1993 and 1996, the Czech economy grew at an average annual rate of 4.1%, but electricity consumption increased even faster, at 4.3% per year. This due to a substantial increase of demand in the household sector, whereas industry had a demand growth of only 1.5%, indicating that intensity of electricity in the industrial sector is finally on the decline. During 1997, GDP has grown by 1%, but the overall electricity demand fell by almost 2%, reinforcing this positive trend for the entire economy. Nevertheless, energy conservation and demand side management are important areas to be encouraged by appropriate Government policies.

In 1992, a comprehensive Energy Sector Review was prepared for Czechoslovakia. At the same time, and because of the close relation of the issues involved, a Joint Environmental Study was compiled at the request of the Government. This study was a joint effort of the Federal, Czech and Slovak Governments, the European Community, the United States, and the Bank. The main energy policy issues identified in the Energy Sector Review were: (a) setting and maintaining the level and relative structure of energy prices based on economic cost; (b) establishing a regulatory framework for natural monopolies to ensure efficient operation, long-term pricing, and increased private sector participation; (c) establishing a schedule for liberalizing prices of tradable energy products (oil, gas, and coal); (d) promoting energy conservation and efficiency; (e) reforming the taxation policies applicable to energy to encourage conservation and to reduce environmental problems; (f) rationalizing the power sector investment program to ensure least-cost development; (g) restructuring the coal sector by closing high-cost mines and promoting privatization of the remaining mines; (h) diversifying crude oil and natural gas sources and strengthening the strategic role of the Czech and Slovak Republic in the European energy network; (i) implementing measures to reduce the level of air and water pollution created by the energy sector, and encouraging the use of less polluting fuels.

Most of these issues, with a varying degree of success, have been tackled by the Government of the Czech Republic. Energy prices have been raised and are moving closer to the economic levels for gas, power and district heating (but household prices, particularly for power and gas, are in need of further increases). This has contributed to some energy conservation and reduction of price discrepancies and cross-subsidies among consumer categories (industry versus households). Household prices of gas and electricity have been increased in January 1998 due to an increase of the VAT rate from 5% to 22%. In July 1998, household prices are to grow by 27% for gas and by 24 for electricity. District heat prices above CZK 350/GJ (US\$10/GJ) are still being subsidized, but these subsidies are expected to be removed in the second half of 1998.

On the institutional side, the Government has unbundled the power and gas sectors, with strict separation between generation and distribution functions. Furthermore, a small Energy Regulatory Administration has been established at the Ministry of Industry and Trade to regulate gas and power prices to final consumers (price transparency) in close cooperation with the Ministry of Finance (price policy). A broad-based Energy Law was enacted in 1994, with 13 regulatory decrees issued subsequently. At present, amendments to the Energy Law of 1994 are under preparation, one dealing with technical aspects, another dealing with conformity with EU regulations (liberalization of the energy market and trade: price transparency, deregulation, strengthening of the regulatory body).

Given the strong growth expectations for the energy sector, and considering the need for sector improvements in the context of European Union (EU) accession (sector liberalization and sector competitiveness), the CR faces significant challenges in promoting energy efficiency, influencing fuel choices, and in improving and protecting air quality and the general environment. Reliance on domestic coal and lignite, large-scale central power stations, and inefficient energy usage as a default future scenario is not attractive. Changing that

scenario is a public sector challenge.

The key policy instruments in shaping the future Czech energy sector will be energy pricing and procedures for influencing the selected mix of new electric generating capacity. Continued reliance on Russia as the predominant source of natural gas maintains concerns about the security of supply and magnifies the uncertainty of future prices. Failure to recognize externalities in the pricing of coal provides excessive incentive to perpetuate and expand its use. CR has passed legislation requiring the regional utilities to purchase power produced by off-system generators but has not intervened in setting the prices to be paid for this power. CR has also passed aggressive air quality mandates that force significant improvement by 1998, but has not dealt with household emissions which are significant for local air pollution. Finally, the public sector is not currently empowered to intervene in power quality or reliability issues between consumers and the regional power companies.

Bank Group Assistance in the Energy Sector: As an instrument to assist implementing the strategies above, in 1992/93 the Bank prepared the Power and Environmental Improvement Project - CZ-PE-8381. Initially conceived for both parts of the Federation, it was redirected to the Czech Republic only after its formation. The objectives of this project were to improve power plant efficiency; to reduce air pollution in northern Bohemia and thereby improve the environment and health of the local population, and to reduce the transboundary flow of emissions; to modernize the transmission system; and to facilitate the interconnection of the Central European and West European power grids. These objectives were to be accomplished in the context of overall reform of the energy sector. To this end, the project was designed to: (a) reduce the total consumption of pollution-causing lignite through power plant efficiency improvements; (b) curtail power plant emissions by means of flue gas desulfurization; (c) reduce dust and fly-ash pollution from power plants; (d) increase the reliability, efficiency and economy of the CEZ transmission system; (e) assist in improving investment planning and corporate management and organization. The proposed GEF Project is in line with objectives (a), (c), and (d) above, and builds on the lessons to date.

3. Sector Issues to be Addressed by the Project and Strategic Choices

The recognition of common interests between regional electricity distributors, regional gas distributors, private industry with large heat and electric demands, and local district heating companies is an important precedent. The use of waste heat for both heat supply to a city and an industrial consumer, as well as electricity generation (CHP Plant Concept) addresses the need for energy conservation and efficiency. The formation of a new joint stock company specifically for this purpose demonstrates both commitment and a visible model for replication or modification in future projects. The commitment of this diverse group of investors to a gas-dependent project should build technology awareness and confidence in the future availability and reasonable pricing of natural gas. This ownership structure also internalizes the electric buy-back contract that is so often a barrier to cogeneration and other renewable energy projects. The prevalence of district heating systems throughout Central and Eastern Europe provides an attractive market for the development of efficient cogeneration projects. This coupling of industrial and district heating needs will provide useful data on a project at the high end of the heat load spectrum which allows it to compete with base-load thermal electric plants.

Energy pricing policy cannot be significantly influenced by such a small project. Nevertheless, there have been useful discussions in the context of project preparation with representatives of Ministry of Industry and Trade and Ministry of Finance to discuss the advantages of price liberalization and the impact of pricing policies on energy utilization.

This Project will include contractual annual sales of significant amounts of electricity to the regional electric company. The sizing of the GEF support has been based on the costs avoided by CEZ, including an adjustment for avoided transmission losses. This avoided cost concept as the basis for payments to

cogenerators could be considered as a national policy possibility. The Project can impact the net revenues of both CEZ and the local electric distribution company.

GEF assist { The Project does not directly address all externalities associated with coal/lignite burning, but the use of GEF funding would implicitly establish a minimum value based on CO₂ reductions. If that value becomes available for future projects, there will be demonstration effects from this Project. Of course, the Project will also help to significantly reduce the local air pollution (SO₂, particulate matter). It fully meets the environmental standards of the Czech Republic, as well as those of the World Bank.

C. Project Description Summary

1. Project Components (Annex 2: detailed description; Annex 3: detailed cost breakdown)

The Project consists of the following components (summarized also in a table below).

Component A: Combined Heat and Power Plant (CHP Plant)

The construction of a new **CHP Plant** is the core component of the Project and the major cost item (about US\$ 20 million). It consists of the construction of a combined heat and power plant using combined cycle gas firing at the Vetropack Moravia Glass Factory (the Glass Factory) in Kyjov. The nominal output of the CHP plant is designed to be 23 MW of electricity and 18.5 MW of heat, including excess process heat drawn from VMG. The CHP Plant is designed as an electricity and heat generation combined-cycle plant with two gas turbines with a combined nominal output of 16 MW of electricity; an exhaust gas boiler; a condensing bleeder turbine with a nominal output of 10 MW of electricity; a 22 kilovolt transformer station; a water treatment station; heat exchangers and pumps; and a hot water pipeline connection. The CHP Plant's principal components will be housed in the former boiler house and adjacent new buildings at the VMG manufacturing site. TPK has executed long-term rental agreements for the land and facilities to be used by the Company. The CHP Plant will use waste heat and natural gas as a primary fuel input. Teplarna Kyjov and JMP have finalized a 10-year agreement for the supply of natural gas to the CHP Plant. In addition, the Company has executed a long-term contract for the use of heat from exhaust gases from VMG's glass manufacturing processes. TPK considers that the CHP Plant will meet all relevant existing and anticipated Czech and European Union emission and noise regulations. In September 1997, the Hodonin Environmental Authority approved the CHP Plant's environmental impact study. In March 1998, the Company was granted the site permit requested from the Kyjov planning authorities in December 1997.

Component B: Replacement and Retrofitting of Boilers at the Glass Factory

Replacement of one existing boiler at the Glass Factory with a new waste heat recovery boiler and the retrofitting of one existing boiler at the Glass Factory. To one glass furnace, a new steam-producing waste-heat gas-fired boiler will be added. Another furnace will be converted to steam production with increased capacity.

Component C: Construction and Reconstruction of Buildings at the Glass Factory

Reconstruction of existing buildings at the Glass Factory to house the CHP Plant and water treatment plant; and construction of administration offices, storage facilities and an electric transformer station building at the Glass Factory.

Component D: Modernization and Expansion of the District Heating Network of Kyjov

Establishment of a centralized district heating network for the City of Kyjov capable of carrying a thermal

output of 19MW through the supply and installation in a channel-free design of pre-insulated pipes of about 6 kilometers in length, together with accompanying instrumentation and control cables. The existing district heating network of Kyjov will be modernized and expanded to connect new consumers and allow greater utilization of excess heat. Components A-D will be implemented by TPK.

Component E: Decommissioning of Gas-Fired Boilers and Replacement with Heat Exchangers

Decommissioning of gas-fired boilers in 13 separate boiler houses in the City of Kyjov and installation of heat exchangers and linkages with the centralized district heating network. Heat from the TPK system will be exchanged to the City's secondary system. The City of Kyjov's district heating enterprise will be responsible for implementing this component.

Component F: Project Supervision and Dissemination Activities by the MoE

This component consists of providing technical assistance and training to MoE and TPK for project monitoring and supervision, and carrying out dissemination activities. This will enable the MoE to conduct the overall oversight of TPK's activities under the Project with respect to environmental compliance and GHG emission reduction, as well as public relations activities and training as appropriate.

(Exchange Rate: US\$ 1 = 34.14 CZK)

<u>Component</u>	<u>Implementing agency</u>	<u>Category</u>	<u>Cost Incl. Contingencies (US\$000)</u>	<u>% of Total</u>	<u>GEF Financing (US\$000)</u>	<u>% of GEF-financing</u>
A. CHP Plant (Package K1)	TPK	Physical	20,350	81.6%	5,044	24.8%
B. Replacement and Retrofitting of Boilers at the Glass Factory (New Boiler # 52 and Retrofit of Boiler #53)	TPK	Physical	1,560	6.3%		
C. Construction and Reconstruction of Buildings at the Glass Factory	TPK	Physical	745	3.0%		
D. Modernization and Expansion of District Heat Network of Kyjov (Package K2)	TPK	Physical	1,638	6.6%	656	40.0%
E. Decommissioning of Gas-Fired Boilers and Replacement with Heat Exchangers	City of Kyjov, Teplo Kyjov	Physical	520	2.1%		
F. Project Supervision and Dissemination Activities	MoE	TA	120	0.5%	100	83.3%
TOTAL:			24,933	100.01%*	5,800	23.3%

* The values do not add up precisely to 100% due to rounding.

2. Key Policy and Institutional Reforms Supported by the Project

In addition to making the Kyjov Project happen by making the cogeneration option more attractive to the

private investors, GEF involvement provides assistance to the MoE in formulating appropriate positions on the pricing policy issues with respect to fuel, heat, and electricity buy-back. In the dialogue with the Ministry of Industry and Trade and the Ministry of Finance, the Project was used to discuss energy pricing issues. Of course, the leverage of a small Project is limited in the context of major policy issues such as energy pricing.

3. Benefits and Target Population

The direct beneficiaries of the Project are the existing and new district heat consumers in the City of Kyjov, the citizens of Kyjov at large (reduction of local pollution), VMG, the regional electricity distribution company and the regional gas distribution company. VMG and JME will receive cleaner, more reliable electricity, VMG and Kyjov will purchase heat at competitive costs, and the local gas distribution company will have a major long-term contract to supply gas. Additional expansions of the district heating system of Kyjov will be attractive since the incremental cost would be very low as additional waste heat is utilized.

The Project will displace power production at a lignite plant in the CEZ system with related decreases in emissions. The global environment will benefit from the reduction in greenhouse gas emissions: CO₂ reduction through improved energy efficiency and avoided alternative power generation is estimated to amount to about 2.87 million tons over the 20-year life of the Project.

The Project will also eliminate the harmful NO_x emissions from the 13 boiler stations that are located near residential areas in Kyjov. It should be noted that total NO_x emissions could increase, but optimization of the burners and stack height at the new CHP plant will be capable of mitigating this impact. This issue has been thoroughly vetted in the public environmental review process, and the population of the City and the surrounding region are supporting the Project in full awareness of the potential increase in NO_x emissions.

On-site electric generation at VMG is expected to provide a more reliable power supply than that currently available from the regional grid. The regional electric utility also expects to purchase electricity from this project at a cost that is below what it must now pay to its power supplier. Thus, other electric consumers served by the regional power company will benefit both from increased reliability and from any pass-through of cost savings offered by the regional utility.

The regional gas utility (JMP) will gain a major load under a secure long-term contract. As long as the price of this gas is greater than JMP's incremental costs, this will allow JMP to spread its fixed costs over a greater volume of sales, and can benefit the other gas consumers in this distribution area.

To the extent that the Project can promote the use of combined-cycle technology and waste heat utilization for joint industrial and community purposes, and assuming that future low-cost funding programs would help translate environmental benefits into financial incentives, many areas throughout the Czech Republic could benefit from the Project.

4. Institutional and Implementation Arrangements

Implementation of the Project started in Spring 1997, and is expected to be completed by December 31, 1999. The Closing Date would then be June 30, 2000, i.e., six months after the Project Completion date.

Teplarna Kyjov, a.s (TPK) is the lead implementing agency for the Project which is responsible for its execution. TPK was created with the objective of constructing, owning, and operating the CHP Plant, which is to be located in Kyjov, at the manufacturing site of VMG, the Kyjov-based designer and manufacturer of glass products. The CHP Plant will sell electricity to VMG and JME, and heat to the Kyjov Municipality, the regional hospital in Kyjov, and to VMG. TPK intends to commence heat supply in the fourth quarter of 1998 and to begin supplying electricity in Spring 1999. At the end of March 1998, TPK signed a Shareholders'

Agreement in which a new strategic investor (Isar-Amperwerke/Bayernwerk/Viag) joined the present shareholders. TPK selected Bayerische Vereinsbank AG as the preferred provider of the long-term loan facility and expects to obtain the firm commitment letter approved by the appropriate credit committee of Bayerische Vereinsbank AG by 17 July 1998. More details are available in Section E-4 (b).

Ministry of Environment. While TPK has the main responsibility for carrying out the Project, the Ministry of Environment (MoE) is the designated government agency responsible for (a) supervising and monitoring Project implementation and operations, including overseeing financial management issues related to the GEF Grant; (b) promoting, publicizing, and evaluating the Project, and (c) providing and coordinating training to staff of the Ministry, of Project beneficiaries, and other interested parties in Project conceptualization, preparation, implementation, and monitoring the results. MoE is responsible for developing and carrying out a Monitoring and Evaluation (M&E) Program for the Project.

The Project implementation responsibilities by component will be structured as follows. Components A to D (CHP Plant, Replacement and Retrofitting of Waste Heat Boilers at the Glass factory, Buildings, and Centralized District Heating Network) are the responsibility of TPK; Component E (Replacement of boilers in 13 boiler houses with heat exchangers, and connection to the Centralized DH Network) is the responsibility of the City through its heat company Teplo Kyjov; Component F (Project Supervision and Monitoring, Promotion, PR, and Training) is the responsibility of the Ministry of Environment.

The responsibilities of the participating parties in Project implementation are specified in a set of contractual agreements, including a turn-key contract for delivery and installation of the CHP Plant; a similar contract for district heating network modernization and expansion; a long-term gas supply agreement between TPK and JMP; Off-take Agreements for Electricity between TPK and JME; the same between TPK and VMG; Off-take Agreements for Heat between TPK and its major clients (VMG, the Municipality of Kyjov, and the Kyjov hospital); a Waste Heat Purchase Agreement for TPK to purchase waste heat generated by glass manufacturing processes from VMG; a Rental Agreement between TPK and MG for lease of land and facilities at VMG; and an agreement between the State Environmental Fund of the Czech Republic and the Municipality of Kyjov (MoK) for the purposes of financing Part E of the Project.

D. Project Rationale

1. Project Alternatives Considered and Reasons for Rejection

The alternative projects, originally considered, included three options that provide all of Kyjov's heating needs but three different outputs of electricity. In each case, production of heat and power uses VMG waste heat and supplemental gas firing. Maximum heat production is 18.0 MWt for each case while the gross average electric capacities are 7.64 MWe (Option B2), 9.65 MWe (Option B1) and 23.8 MWe (Option A). Operation for 8,400 hours per year would then produce between 64 GWh and 200 GWh of electricity annually for these alternatives.

Another alternative (Option D) is a mixed heating solution in which VMG net waste heat capacity would provide 90% of the combined City and hospital heat demands. This would mean supplying as much of Kyjov's heating need as possible from waste heat boilers, but all electricity would continue to be produced in CEZ central station power plants. This alternative offers a very low local investment cost (about \$2.8 million) and a very simple contractual heat sale from VMG to the City. As such, it represents the kind of conventional project which is likely to be implemented if no GEF financing were available. For these reasons, this alternative is chosen as the Baseline for the purposes of GEF incremental cost analysis (see Annex 4).

The alternative proposed for GEF financing (Option A) maximizes CO₂ reductions relative to this Baseline, and is the most cost-effective one in CO₂ reduction terms among all the alternatives considered. A more

detailed analysis of Options A (the Project) and D (the Baseline) is presented in Annex 4 on Incremental Cost Analysis.

2. Major Related Projects Financed by the World Bank, GEF and/or Other Development Agencies (completed, ongoing and planned)

Sector issue	Project	Latest Supervision (Form 590) Ratings* (Bank-financed projects only)	
		Implementation Progress (IP)	Development Objective (DO)
Bank-financed Energy Sector Efficiency, Environment, Economic Management	Czech Republic: Power and Envir. Improvement Project: CZ-PE- 8381, FY92; SAR No. 10071-CZ.	S	S
IFC-financed Energy Sector Efficiency, Environment, Utilization of Coal and Gas	Czech Republic: Energy Center Kladno Project: CZ-5028, FY97.	S	S

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

The Bank's portfolio in the Czech Republic is currently not large. But energy and environment sector lending is well represented in the Bank Group's lending portfolio, as compared to other sectors. This is due to the **Czech Republic: Power and Environment Improvement Project (CZ-PE-8381)**, which started in FY92. IFC recently (FY97) made funding available for the US\$ 400 million **Energy Center Kladno Project (CZ-5028)**, which will generate electricity for CEZ, produce heat for the City of Kladno, and steam and heat for an Industrial Complex. A summary of the lending portfolios of IBRD and IFC is given in Annex 9.

Apart from the GEF/Bank operation, the Ministry of Environment of the Czech Republic has at least one important precedent for industrial waste heat utilization with GHG reduction benefits – the *Waste Heat Energy Project in Vratimov*. Vratimov is a small industrial town in the heavily polluted region of Northern Moravia. The Vratimov project was undertaken as part of the "Healing the Atmosphere" program of the Czech Government. The Government used revenues from fines for air pollution to give Grants and loans for fuel-switching and other clean air projects. As a result of this project, a steel factory, Nova Hut in the City of Ostrava, is now providing most of the heat to the district heating system. The experience of the Czech Ministry of Environment in managing an environmental fund to achieve this result testifies to a substantial national knowledge base, which increases the likelihood of success of the Kyjov Project.

3. Lessons Learned and Reflected in the Project Design

The MoE GEF project identification process accentuates the differences between public and private sector planning procedures in the Czech Republic. The main problem is the lack of familiarity with Bank/GEF criteria and procedures. Long-run incremental economic cost analysis of power production by CEZ, for example, would not be a common focus. Rather, companies may look at the price that they think they might be able to negotiate with the regional power supplier as the basis for valuing electricity production. Alternatively, they may consider the effort to sell to the grid to be excessive, and propose simple heat production, rather than a more efficient cogeneration option. The key lesson from this experience is that future extension of the program in the Czech Republic or elsewhere will require either much clearer application procedures, or technical assistance, to assure that projects are properly prepared and presented for consideration as

environmental improvement projects. Future application of this project concept in the Czech Republic would benefit most directly from a clearly established pricing policy for the purchase of cogenerated electricity, although such policy is not a prerequisite for the success of this Project.

The analysis of the Kyjov Project clearly shows that the incremental CO₂ reductions are relatively large compared to the incremental costs, when electric production is increased in gas-fired combined cycle CHP projects like this one. The identification of incremental energy and capacity costs for CEZ lignite plants and the total amount of expected near-term additions of such capacity provides a valuable set of reference parameters for use in evaluating other similar projects.

A key lesson learned from the experience of the Czech Government with the Vratimov waste heat project in Northern Moravia is that the local industry is willing to work jointly with the government in the area of energy efficiency, because it sees it as an opportunity to realize concrete gains while also helping the government to improve the environment through pollution reduction. Similarly to the Teplarna Kyjov enterprise discussed below, a joint-stock company, Teplo Vratimov, was specially created with the purpose of receiving a loan on affordable terms for a waste heat utilization project.

4. Indications of Borrower Commitment and Ownership

Teplarna Kyjov (TPK) is a new joint-stock company which has been formed specifically to develop this project. TPK was founded on January 21, 1997, and was legally registered on February 5, 1997. TPK has acquired clear title to all project rights by purchase from Sage Company of the US, the original promoter of the Project. TPK has been capitalized initially at 90.0 million CZK (USD 2.73 million). The capitalization has subsequently increased to CZK 131.3 million (about US\$ 3.8 million). In March 1998, a strategic private investor has been selected for additional equity interests, and total equity subscriptions will amount to CZK 215 million (US\$ 6.2 million) with an additional agio of CZK 25 million (US\$ 0.7 million).

TPK is clearly committed to the Project and is under significant pressure to implement the Project as soon as possible. Specifically, TPK recognizes the obligation to provide heat to the City by the fall of 1998. The company has initiated several key studies that demonstrate its commitment and awareness of the critical path for Project completion. Key initiatives include:

- a) TPK retained ENECO of Prague to conduct an environmental assessment sufficient to meet the dictates of the Czech law; to provide Project engineering; and to manage the procurement process in accordance with World Bank procedures. ENECO has also conducted a public hearing and a public relations campaign to inform local residents about the Project;
- b) TPK has retained a private financial consultant, HEX Capital, to prepare a comparison of financing options and a business plan to govern the Project;
- c) TPK has obtained all environmental approvals without significant opposition, and also has obtained all necessary building permits by March 31, 1998;
- d) TPK's most critical contracts are prepared in final form and ready to be signed in Spring 1998, or are already signed; in particular the three turn-key contracts, constituting over 90% of its total investment under the Project, have been signed on April 23, 1998.

TPK has met with World Bank consultants to discuss the project plans in detail and has promised close cooperation in the future in providing all information that is required to support the GEF application.

5. Value Added of World Bank/ GEF Support in the Project

As elsewhere in Central and Eastern Europe, the single greatest obstacle to implementation or expansion of energy savings projects in the Czech Republic is the lack of financing. Projects that would generate much greater energy and environmental savings per dollar spent than similar projects in Western economies go unrealized because of scarcity and expense of capital. Many "win-win" opportunities capable of bringing both economic and environmental gains are missed as a result.

The Bank's involvement through GEF in this Project provides the needed financial incentive to extend the Project from the baseline alternative with no electric generation to the alternative which provides the largest electrical output and the greatest global environmental benefit. By covering the incremental costs of moving to the maximum cogeneration alternative, the Bank/GEF makes it possible to internalize CO₂-related externalities and to implicitly assure that the Project is credited with the economic value of incremental electrical energy and capacity. In addition to making the Project happen, GEF involvement can provide assistance to MoE in leveraging and in developing appropriate positions on fuel pricing and electric buy-back pricing policy issues. Without GEF involvement, there is little to suggest that the concept of the Project will be generalized throughout the Czech Republic or elsewhere.

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

1. Economic (supported by Annex 4):

☐ Cost-Benefit Analysis

☒ Cost-Analysis: ☒ Incremental Cost ☐ Other (Specify)

The incremental cost analysis compares two alternative projects that would utilize waste heat from the VMG Kyjov factory to supply heat to the City. With a minimal investment of \$2.8 million to cover interconnection and integration of the district heating system and a waste heat boiler addition, 90% of the City's heat requirements could be provided without cogeneration of electricity. The maximum use of the available waste heat can, however, provide all of the City's heat plus the heat required by the regional hospital in addition to producing 21 to 23 MW of electricity over an 8,400 hour operating period (less maintenance) each year. For the base case, the electric production would be produced in new lignite-fired power plants somewhere on the Czech grid. Production in those plants would have to be higher by an estimated 4.0% on peak and 2.5% on energy to account for transmission losses.

The local investment for the Baseline scenario would be approximately \$2.8 million versus \$24.7 million for the proposed case. The Baseline, however, also includes the investment needed for equivalent lignite-fired electric generating capacity which is estimated at \$37.2 million. The present worth equivalents of the investment streams, based on a 12.0% real discount rate, are \$23.5 million for the proposed Project and \$31.7 million for the Baseline. On the other hand, the proposed gas-fired plant has higher operating costs than the lignite-fired units in the base case. The incremental life cycle operating costs of the proposed plan are \$16.7 million. Combining the investment and operating cost analyses yields a net incremental cost of about \$8.5 million. The difference in CO₂ emissions during the life of the Project is 2.87 million tons. The unit abatement cost amounts to \$2.98 per ton of CO₂ or \$10.91 per ton of carbon.

Given the amount of the Grant actually secured from the GEF (US\$ 5.8 million equivalent), the actual unit abatement costs to the GEF can be considered to be US\$ 2.02 per ton of CO₂ or US\$ 7.42 per ton of carbon equivalent.

2. Financial (see Annex 5): FIRR= 18.4 % with Grant; 13.8 % without Grant.

Discussions with GEF have indicated assistance levels in the \$5.0 to \$6.0 million range for potential GEF

Grant, to make the Project financially viable (the full amount of incremental costs of over US\$ 8 million is not required for the Project's financial viability). The financial analysis of the Project has been updated in this PAD to reflect TPK ownership and the contracts that will govern pricing of Project inputs and outputs. The contractual treatment of prices for gas, for heat sold to VMG to Kyjov and to the hospital, and for electricity sold to JME have been taken into account.

Projections in 1998 terms on the basis of almost 30% of project costs funding in the form of equity, almost 25% of project cost funding through the GEF Grant, and the remainder in the form of long-term debt, demonstrate that this new green-field project would initially be financially tight with its cashflow, but move into a more positive situation from about 2002 and would become comfortable as long-term debt would have been repaid by 2007 (10 year loan at PRIBOR + 125 basis points). On the other hand, project financing without the Grant would lead to an unacceptably high debt burden which the Project could not withstand and therefore would require additional injections of capital. TPK, with the help of its financial consultant (HEX), has identified a strategic equity investor who entered into a Shareholders Agreement with the existing shareholders of TPK. Also, a commercial bank for loan funding, selected on the basis of invitation to make offers for lending to TPK, is in the process of finalizing the loan agreement. The financial projections rely on the latest information, i.e. the shareholders agreement and the conditions of the proposed commercial loan.

A discussion of TPK and its shareholders, findings of financial projections of TPK, and a preliminary financing plan are shown in Annexes 5.1 to 5.3. The ratios in Annex 5.2 Summary Tables highlight the key findings of the financial projections, with the Grant (Case A) and without the Grant (Case B). They also illustrate the need for the Grant from a financial point of view. Projections of investment costs, operating costs and expected revenues, all expressed in constant 1998 terms, only yield a Financial Internal Rate of Return (FIRR) on overall investment of about 12.9% (Case C). Assuming real term increases of energy prices (electricity, gas and heat) improves this FIRR to 13.8% (Case B). With the proposed GEF Grant portion for TPK of US\$ 5.7 million (about CZK 194 million), the FIRR will move close to 18.4% (Case A), thereby making the environmentally desirable project also attractive for a private investor (see Annex 5.2).

From a financial accounting perspective, the Bank emphasizes that the GEF Grant is to cover part of the costs of assets which eventually need to be replaced. It is therefore recommended that the Grant be treated as a balance sheet item (cash inflow on the asset side, quasi-equity on the liability side) and not as an income statement item, to allow for full depreciation of assets financed by the Grant, and to avoid taxation of a substantial portion of the Grant. Considering the tight financial situation of Teplarna Kyjov during early years of operation, even with the Grant, the proposed accounting treatment is essential. While this treatment would deviate from normal treatment of Government-channeled grants under Czech legislation, it should suffice to clarify the proposed accounting treatment of the Grant in a footnote to the financial statements of the Company. The tax-free treatment of the Grant has been confirmed by the Ministry of Finance.

3. Technical

Some minor technical issues have recently been resolved and the three turn-key contracts for delivery and installation of the CHP Plant have been signed on April 23, 1998. The design has been fine-tuned in terms of steam temperatures and pressures to achieve maximum utilization of waste heat and electricity production. This has been an optimization rather than a fundamental change in the conceptual design of the Project.

To reasonably assess the efficiency improvement from this Project, the difference between efficiencies with and without the Project will be measured and reported on a systematic basis. The basis for efficiency calculations with and without the Project has been agreed upon as part of the Grant Agreement.

4. Institutional

a. Executing Agencies

Tepłarna Kyjov (TPK), the implementing agency for the Project, was founded on January 21, 1997, as a joint venture of JMP, JME, Moravia Glass, a.s. (MG), a holding, and MEAS, an electricity trader and generator. TPK will provide a 1.7% percent interest in the new company to the City of Kyjov. In addition, in December 1997, TPK invited potential private investors and commercial banks to submit offers for (a) purchasing additional shares in the company (strategic investor), and (b) providing commercial loans for funding of the Project. At the end of March 1998, TPK signed a Shareholders' Agreement among the present shareholders and the selected strategic shareholder, which calls for an increase of share capital to a level of CZK 215 million plus an agio of CZK 25 million. TPK is expected to obtain a firm commitment letter from Bayerische Vereinsbank AG by 17 July 1998 and to sign an agreement with it in or about July 1998, which will provide a loan of US\$ 11.3 million equivalent. The strategic investor, Isar-Amperwerke/Bayernwerk/Viag, has made a commitment to provide a technical expert to assist in Project implementation and start-up.

TPK, assisted by its consultants, has the full responsibility for the execution of the Project. All shareholders have committed to the objectives of the Project. The Shareholders Agreement includes, i.a., their commitment to meet cost overruns in Project execution and cash shortfalls during early operation (see Section G-4a of this PAD). The shareholders will cause TPK to carry out the Components A to D of the Project (essentially the CHP Plant with buildings and connections to the heat network of Kyjov) under TPK's responsibility with due diligence and efficiency and in conformity with appropriate administrative, financial, engineering and environmental practices.

MoK and its heating company Teplo Kyjov will execute Component E of the Project (shut-down of heat-only boilers, installation of heat exchangers, and linkage to the city network). Teplo is experienced in doing these works.

The role of MoE in promoting, administering, publicizing, and evaluating the Project (Component F of the Project) has been clarified during appraisal and includes oversight of the GEF Grant disbursement, Project publicity and promotion, and coordination of the monitoring and evaluation program (M&E Program). Additional assistance to MoE, needed for training staff and launching a public information campaign, will be covered by Grant funds.

b. Project Management

Staffing and Organization: TPK is in charge of managing the core of the Project. Currently, TPK has six employees including two accountants with financial management expertise. When the CHP Plant reaches full operation, TPK will employ approximately 18 individuals in administrative, operating, and maintenance positions. The Company has identified available and qualified personnel for all anticipated positions. The expected average monthly employee wage is over CZK 19,000 (US\$ 555/month), including mandatory social security payments. The small number of employees is justified, given (a) a strong consultant support, particularly during project execution; (b) a very small number of institutional customers (5 companies), which allows for a very simple billing system.

Consulting Services: TPK obtains consulting services from Energoconsult Praha (ENECO) for technical matters, from Euroenergy Praha (EE) on economic and energy sector related matters, and from HEX Capital Praha (HEX) on financial and funding aspects. Thus, the combined team of TPK, ENECO, EE and HEX constitutes a well qualified professional team which is able to prepare and implement the Project.

Upon completion of the construction phase, TPK is expected to have an organizational structure as shown in the Organizational Chart in the Additional Annexes (attached at the end of this PAD).

c. Financial Management Monitoring and Evaluation (M&E)

Accounting and Financial Management System: TPK's computerized accounting and financial management systems are being set up to be effective and simple. This is possible because (a) the Project will be executed basically relying on three major turn-key contractors, (b) the operations of the system relies on few inputs (largely, waste heat, gas delivery, and operational maintenance) and (c) the company only has to bill five institutional customers. The two well qualified financial and accounting experts of the company are supported by an excellent financial management consultant (HEX Capital) who has established the financial projections for the Company. Moreover, the strategic shareholder (Isar-Amperwerke) has agreed with TPK to provide a project specialist with expertise in Financial Management to support the Company during project implementation and early operation. These arrangements are satisfactory for funds flow monitoring and control as well as for financial management.

Review of prior years' audited financial statements and Selection of Audit Firm: TPK has started its existence in early 1997. The audit of the 1997 statements is being carried out by a small auditing firm unknown to the Bank. TPK has been requested to utilize in the future an auditor with affiliation to the International Federation of Accountants (IFAC) (e.g., Chamber of Auditors of the Czech Republic), with the capacity to provide audits in the English language, and with expertise in International Accounting Standards (IAS) and International Standards on Auditing (ISA). The selection of an auditor acceptable to the Bank is a dated covenant (by October 31, 1998).

Accounting and Auditing Standards to be Applied: It has been agreed with TPK and its shareholders that accounting standards, to be used in the financial reporting for both TPK as an entity and for the Project, will conform to International Accounting Standards. The annual audits for both TPK as an entity and for the Project will be in compliance with International Standards of Auditing. For purposes of efficiency and cost effectiveness (as the majority of Project disbursements are scheduled to be managed by TPK), the selection and use of one audit firm to conduct audits of both TPK and the Project will be promoted with MoE and TPK.

Financing of the Audit: The costs of annual audits of TPK and its Project components will be covered by TPK. The costs of the annual audit of the overall Project accounts will be covered by MoE.

Monitoring and evaluation (M&E) procedures have been carefully designed for the Project both for verification of expected results and as inputs to the publicity program. Data to be monitored on an annual basis will include thermal (waste heat and gas) inputs, outputs and sales, electricity outputs and sales and the related revenues; monthly peak demands and energy taken from the grid and the related costs; the frequency and duration of power outages or disruptive voltage fluctuations; emission levels of CO₂; and concentrations of particulate matter, SO₂, and NO_x.

d. Reporting

Project Reporting: During Project execution quarterly reports, comprising (1) Project Financial Management Reports (PFMRs), (2) Project Progress Reports and (3) Environmental Reports, will be submitted to the Bank by TPK and MoE as follows:

Project Financial Management Reports: TPK and MoE will prepare quarterly PFMRs on the financial aspects of project implementation and on the appropriate use of Grant funds for their respective Project components. MoE will be responsible for submission of the consolidated PFMRs to the Bank. The PFMR formats and currencies in which they are to be presented will be agreed by negotiations. On an annual basis, as per Grant Agreement, the Project as well as the accounts of TPK will be audited. The audited reports of the Project will be submitted to the Bank by MoE, the annual audit of TPK's accounts will be submitted by TPK within six months after the fiscal year (i.e. by June 30 following the end of each fiscal year).

Project Progress Reports: Progress Reports on the progress and status of Project implementation will be prepared by TPK for components (A) to (D), by MoK/Teplo for component (E), and by MoE on the overall Project. The consolidated Progress Reports will be forwarded along with the PFMRs to the Bank on a quarterly basis.

Project Environmental Reporting: TPK will provide the necessary detail of project inputs and outputs and environmental monitoring on a quarterly basis to MoE and the Bank in order to allow the preparation of comprehensive environmental M&E Reports, to be prepared by MoE and its consultants. MoE will submit to the Bank quarterly reports regarding the environmental performance of TPK, in relation to a without project case, in a format to be agreed by negotiations.

Implementation Completion Report (ICR): After Project completion, MoE will provide an implementation completion report in a format and scope to be agreed with the Bank. This ICR will contain the needed inputs from TPK, MoK/Teplo and MoE for their respective components.

5. Social

The proposed Project has significant beneficial effects through improved energy efficiency (use of waste heat), improved heat supply, and reduced local pollution. It creates jobs during its implementation (over 100) and about 18 permanent positions. It has no negative social implications.

6. Environmental Assessment: Environmental Category ☒ A ☐ B ☐ C

The Project is classified as a Category A project as per the Bank's Environmental Assessment OD 4.01. Because the Project involves new construction and energy production based on the use of combustible fuels (natural gas), Category "A" is appropriate, even though the new CHP capacity is fairly small, and the overall net effect of the Project on the environment is clearly positive. Implementing a formal Environmental Impact Assessment (EIA) according to Category A standards gives an extra assurance that no environmental impacts are overlooked.

An EIA was carried out by KWI of Austria in the Spring and Summer of 1997, was completed successfully, and was accepted preliminarily by the MoE on July 22, 1997. Public hearings were conducted in the area of potential environmental impact in September 1997. The only issues which were raised were noise pollution and NO_x pollution in relation to stack height. It was agreed that noise levels were to be studied in a comprehensive study covering also the existing glass factory of VMG (study now in progress). It was shown that the NO_x issue was marginal, particularly when compared with the much higher levels from auto exhaust of the nearby roads. MoE, the local authorities and the World Bank have accepted the EIA.

7. Participatory Approach

Key stakeholders, in a narrow sense, are the present shareholders of TPK, namely VMG, JME, JMP, MEAS, the City of Kyjov, and the 'strategic' investor Isar-Amperwerke, a subsidiary of Bayernwerk. In a broader sense, the real stakeholders comprise customers of the district heating company of the City and the population of Kyjov and its surroundings at large, who will be benefiting through substantially reduced local air-pollution through cleaner electricity generation. Very early on, during project identification and early preparation, meetings were held with the community at large to discuss project objectives, costs and benefits and the GEF concept. Municipalities and in particular their Mayors took the lead in organizing and conducting these public meetings. Not only the project scope and concept were refined during these meetings, but also environmental concerns regarding NO_x and noise pollution were fully addressed. The population at large was sensitized to the environmental benefits of the approach. The result was that the Project was fully endorsed by the local community. Moreover, during a regional mayors' meeting, the Project was featured as an example of good

cooperation between private and public sector. The intended PR campaign in the Region and throughout the Czech Republic will further disseminate the Project's benefits and demonstration character.

F. Sustainability and Risks

1. Sustainability

The client's ownership and implementation capacity: The MoE's commitment to the Project is known to the Bank. The interest of VMG in using the Project to provide more reliable power supply is also well-established. However, due to the commercial orientation of the Project, perhaps even more critical is the commitment of TPK who is being sponsored by MoE as the executing agency for the GEF Grant. While commitment of TPK to the Project is strong, TPK is a new company with no proven record. Therefore, the commercial bank as well as the World Bank/GEF will rely heavily on the strong shareholders for security of the contracts and long-term sustainability of the TPK enterprise.

The shareholders have signed in late March 1998 an agreement confirming their readiness to closely cooperate in Project implementation and operation and to jointly meet unexpected cash shortages. This agreement calls upon them for making sufficient financial contributions in a timely manner. This will be reinforced by the inclusion of several effectiveness conditions for the GEF Grant centered on making sufficient equity and debt financing available to TPK (see section G-1).

The long-term financial sustainability of the Project will depend to some extent on the evolving pricing policy framework. TPK's success in cash-flow generation will hinge upon the prices of electricity and heat sold, as well as the price of natural gas it will buy. In the medium term (up to 10 years), TPK can rely on the agreed off-take contracts. The financial projections for Teplarna Kyjov show sustainability if real price increases for electricity and heat, occurring at varying rates between 2.0% and 3.0% per year, reflect to a large extent the price developments of the key operating cost, namely gas. Price adjustment formulae in the off-take agreements for power and heat assign an 80% weight to the gas costs. Moreover, the Czech Republic will need to move toward a pricing structure which reflects economic costs as it makes its transition toward EU accession.

The demand-side uncertainties of the TPK operation are relatively minor. VMG is a financially healthy enterprise, and its closure, or a move to another location, are not contemplated. Other major consumers of the Project outputs, including the Kyjov hospital and the residential users of Kyjov, are also certain to remain in place during the Project life. The final consumer of consequence is JME which will be strongly motivated to demonstrate the success of the Project because of its ownership interest as long as the project outputs remain competitive with the wholesale tariffs from the grid.

Replicability of the Project relates to the sustainability of the Bank/GEF's effort to bring about carbon emission reduction in the Czech Republic and other East-European countries through local cogeneration. The availability of the GEF Grant will cushion the price-related risks faced by TPK. As prices start approaching economic cost levels, similar projects will become feasible with less and less grant support.

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

Risks related to the implementation capacity of TPK and reliability of the contractual arrangements will be mitigated, inter alia, through consultant support, and through introducing several financial covenants into the legal agreement as specified in Section G below. A firm Shareholders' Agreement satisfactory to the Bank, and a firm Project Agreement with TPK, will mitigate these risks, and in particular will minimize the risks of investment cost overruns, cash shortfalls, and insufficient working capital availability. The risks associated

with the works and goods delivery by the private subcontractors are minimized by a rigorous competitive bidding procedure and firm contractual agreements. The strength of the contractual framework (off-take agreements, gas supply agreements, rental agreements), which forms the basis of the commercial viability of the Project, has been proven by the fact that over 35 private investors competed to participate in the Project, and about 10 commercial banks made offers to provide long-term financing for the Project.

The technological risk, per se, is very low. Gas-fired cogeneration cycles have proven reliable and operationally robust world-wide. Cogeneration is clearly more efficient than the existing district heating system. While the size of the CHP plant is small, its superior technology – an on-site unit based on the modern gas-fired cogeneration cycle – and the use of industrial waste heat, will bring net efficiency gains to the centralized heat and power supply system in the City of Kyjov.

Market risks of the Project are intrinsically linked to the prevailing pricing policy framework, which was discussed above under the heading of sustainability (section F-1). The dialogue with the Czech Government on lifting the price controls for residential heat and power should contribute to lowering the Project's price risks. In the medium term, the company will be able to maintain its market on the basis of cooperation among motivated shareholders and sound off-take agreements.

Social and political risks: Considerations of social sensitivity of the pricing issue might preclude the Government from allowing the residential tariffs for heat and power to reach the point of full cost recovery during the next five to ten years. Lingering price controls in the long run could have an adverse impact on TPK's ability to recover the full Project costs. A successful dialogue with the Czech Government on macroeconomic reform could strengthen the Project's economic foundations. It is expected that the proposed EU accession will lead to further energy sector reform and restructuring, including gradual price adjustments to eventually cover economic costs. As the discussions during all stages of Project preparation have shown, the Czech Government counterparts are fully committed to the Project and clearly see its benefits to their constituents. The risk of resistance from the established suppliers is further reduced by the relatively small scale of the proposed CHP plant operation.

Risks for the Project's global environment objectives: At the Project implementation and operation stages, the risk for the GHG reduction goals would arise if the added capacity of Teplarna's CHP plant were not offset by reduced output from the CEZ plants servicing the same area. This is unlikely to happen, however, as TPK and JME have an off-take agreement, and the CEZ output must be reduced accordingly.

The Overall Project Risk is measured on the basis of all of the critical risks discussed above, as well as in the broader context of achieving the Project's main purpose - to reduce the GHG emissions. From this perspective, one of the risks is that UNFCCC targets set for the Czech Republic might be seen by the Government as easily achievable, even if it fell short of fulfilling the objectives of the Project. Furthermore, the Government might not be sufficiently motivated to pursue carbon reduction projects in the absence of a readily available carbon trading system. However, this attitude is not likely to prevail as the Government learns to appreciate the synergies of CO₂ reduction with other efforts aimed at readily recognized priority objectives (technological modernization, international competitiveness of the industry, local pollution reduction), and the importance of these tasks in light of the EU accession. A sustained dialogue with the Czech Government on heat and power tariffs, conducive to better cost recovery from public utility operations, could also contribute to lowering the overall Project's price risks.

3. Possible Controversial Aspects

The greatest potential controversy would relate to the issue of future pricing policy for grid purchases from cogenerators and the regulatory treatment of the savings realized when a utility buys at less than its avoided costs.

The local noise pollution represents a minor issue being investigated.

G. Main Grant Conditions

1. General

Grant conditions will be reflected in a GEF Grant Agreement with the recipient and the Project Agreement with TPK as the major executing agency. The shareholders are committed under a shareholders agreement signed March 31, 1998, to meet any cash shortfalls during Project implementation and early operation.

2. Conditions of Board Presentation

These relate to the licenses and permits to be obtained (achieved), signature of a Principal Shareholders' Agreement (signed); signature of certain minor off-take and purchase agreements acceptable to the Bank (partly achieved); signature of rental agreements acceptable to the Bank between TPK and VMG (regarding land, boilers, structures, buildings, and offices) (achieved); provision of at least six qualified staff acceptable to the Bank on TPK's payroll (achieved); signature of a Grant Agreement between State Environmental Fund and MoK for replacement of 13 boiler houses by heat exchangers (signed on April 30, 1998); and signature of a cooperation agreement between TPK and MoK (signed on April 28, 1998). All these above agreements would, of course, have to be acceptable to the Bank.

3. Effectiveness Conditions

Conditions of effectiveness will be:

- a) A minimum equity level of CZK 215 million, plus an agio of CZK 25 million has been committed and a level of CZK 150 million has been paid in;
- b) A sufficient level of long-term debt has been secured on reasonable terms and conditions to assure completion of the financing plan; the loan agreement between TPK and the commercial bank is to be acceptable to the Bank;
- c) Agreements regarding the off-take of heat and electricity and purchases of gas and waste heat will have been signed on terms and conditions acceptable to the Bank;
- d) A Sub-Grant Agreement between MoE and TPK and an Implementation Agreement between MoE and MoK, both acceptable to the Bank, have been executed.

4. Other Conditions

- a) Obligations of meeting Cost-Overruns and Cash-shortfalls: Considering that TPK is a very new company with no record to go on, the commercial bank as well as the World Bank/GEF will rely much on the strength of the main shareholders, and on a sound and disciplined performance of the company. The shareholders, under a Shareholders Agreement dated March 31, 1998, have committed to meet:
 - (i) unforeseen investment cost overruns;
 - (ii) unexpected cash-shortfalls particularly during early operations.

The GEF Grant Agreement will allow the Bank to suspend disbursement if the Shareholders are in breach of the above obligations under the Shareholders Agreement.

b) Financial covenants applicable to TPK:

- (i) An auditor acceptable to the Bank has been appointed by October 31, 1998.
- (ii) Current Ratio Covenant: The current ratio is a measure of effectiveness and efficiency of the company's use of working capital and of its likely liquidity, in case of adverse developments, as it measures current assets over current liabilities. TPK, as a new company, should show a current ratio of at least 1.1 from 2003 until 2004 and 1.3 thereafter;
- (iii) Debt Service Coverage Covenant: To assure re-payment of loans, TPK would have to have a minimum debt service coverage ratio of 1.1 from 2002 until 2004 and 1.3 thereafter. The ratio is defined as 1.3 times total cash generated from operations over total debt-service payments (interest plus principal);
- (iv) Cash-Generation Covenant: TPK would have to produce, for each of its fiscal years after its fiscal year ending on December 31, 2001, funds from internal sources equivalent to not less than 30% of the annual average of TPK's capital expenditures incurred, or expected to be incurred, for that year, the previous fiscal year, and the next following fiscal year;
- (v) Conditions of sound financial management, quarterly and annual reporting, including audited financial statements, provision of a completion report, environmental monitoring and reporting, etc., will apply. Special requirements will be needed to assure that the CO₂ reductions expected are actually realized.

H. Readiness for Implementation

- [x] The engineering design documents for the first year's activities are complete and ready for the start of project implementation.
- [x] Essential procurement steps for the Project have been completed. Three turn-key contracts have been signed on April 23, 1998.
- [x] The Project Implementation Plan has been reviewed and found to be realistic and of satisfactory quality. It is presently being updated to reflect recent contractual agreements and firmer implementation arrangements (including firmer cost estimates and financial arrangements).
- [x] The following items are being finalized and are discussed under loan conditions (Section G):
 - complete Financing Plan
 - signature of Agreements on Off-take and Purchases.

I. Compliance with Bank Policies

- [x] This Project complies with all applicable Bank policies.

[signature]

Task Team Leaders: Helmut Schreiber/Christian Duvigneau (Alternate)

[signature]

Sector Leaders: Michele De Nevers/Henk Busz

[signature]

Country Director: Roger Grawe

Annex 1
Project Summary and Risks
The Czech Republic: Kyjov Waste Heat Utilization Project

Table 1
Project Design Summary

Narrative Summary	Key Performance Indicators	Monitoring and Evaluation	Critical Assumptions
Sector-related CAS Goal:			<i>(Goal to Bank Mission)</i>
<p>Improve efficiency of the Czech Republic's energy sector (i.e., through more efficient generation and transmission of electricity).</p>	<p>National measures of energy intensity and energy efficiency to improve (as per IEA statistics).</p>	<p>Appropriate reports furnished to the Bank by local M&E consultant/ MoE on a semi-annual basis.</p>	<p>The Czech Republic is committed to energy sector competitiveness in light of the proposed accession to the European Union;</p> <p>Government is committed to an increasing use of market forces in the energy sector, and cost recovery in regulating the economic activities of natural monopolies.</p>
<p>GEF Goal:</p> <p>Implement and thus demonstrate highly cost-effective, priority and replicable means for reducing GHG emissions in the Czech Republic.</p>	<p>Reduction of GHG measured both in absolute terms and per unit of heat and power generated and delivered to the end-user;</p> <p>Demonstration effect achieved / increased awareness – measured, i.e., by the growing number of proposals to undertake similar projects, inquiries about the Project, etc.</p>	<p>A national system of monitoring GHG emissions to be in place to watch progress over time;</p> <p>MoE to monitor and provide the information on proposals to replicate the Project's experience.</p>	<p>The Czech Government's commitment to achieving the targets of the UNFCCC and National Communication on GHG reduction;</p> <p>Public and private investors are convinced of the attractiveness and replicability of the Project's experience;</p> <p>The participants in the Project are willing to cooperate with the MoE and NGOs on information dissemination.</p>
<p>Project Development Objective:</p> <p>Reduce emissions of GHG from the Kyjov district heating system, simultaneously increasing the energy efficiency and reliability of heat and</p>	<p>Improved reliability of heat and power supply (known by reduced frequency and duration of outages) to VMG plant and Kyjov residents;</p>	<p>Records of the billings of customers to show reasonable and competitive price levels; records kept by Teplarna Kyjov</p>	<p><i>(Objective to Goal)</i></p> <p>TPK is allowed by the Government to gradually raise the prices of heat and power to levels close to the economic costs; The small on-site unit based on the modern gas-fired</p>

Narrative Summary	Key Performance Indicators	Monitoring and Evaluation	Critical Assumptions
<p>power supply to the Vetropak Moravia Glass (VMG) factory and heat supply to the City of Kyjov.</p> <p>Achieve local environmental benefits by reducing the proportion of lignite in the fuel-mix for heat and power generation</p>	<p>Energy efficiency gains measured as energy inputs required per unit of heat and electricity with and without the Project.</p> <p>Reduction in annual emissions from the plants of the Kyjov district heating system and lignite power plant displaced by the new CHP plant (with special reference to SO_x and particulate matter);</p> <p>Reduced concentrations of local pollutants such as SO_x and particulates in the residential areas close to the lignite-fired plants of the CEZ system and local boiler houses.</p>	<p>(TPK) and the utilities to demonstrate the progress with respect to pricing, frequency of outages and complaints from the end-users;</p> <p>The progress reports by TPK to include appropriate energy efficiency indicators comparable over time.</p> <p>Kyjov Teplo to provide the annual statistics on emissions from its boiler plants; CEZ to provide the same on the lignite plant concerned;</p> <p>Three monitoring stations measuring local pollution levels before and after project start-up.</p> <p>Environmental Assessment Report</p>	<p>cogeneration cycle has efficiency advantages over the centralized heat and power supply systems such as CEZ and Kyjov Teplo district heating system;</p> <p>The Project displaces power production at one lignite plant of the CEZ system, and heat production from 13 district heating stations located near residential areas in Kyjov;</p> <p>TPK uses natural gas to operate the new CHP plant and does not switch to other fuels;</p> <p>A relative price structure conducive to the substitution of natural gas for coal and lignite.</p>
<p>Global Objectives:</p> <p>Mitigate GHG emissions</p>	<p>Reduction in the GHG emissions relative to the without-project scenario, ton/ year;</p> <p>Average cost of CO₂ abatement (against the reference scenario) not to exceed US\$ 15 per ton of carbon.</p>	<p>Annual company reports on progress with respect of GHG reduction (assisted by MoE);</p> <p>The data on the costs of the GHG mitigation measures from the company reports, Bank mission reports, etc.</p>	<p>The new CHP plant displaces the respective power output currently supplied by the regional power supplier (CEZ);</p> <p>No significant cost overruns beyond the high-cost scenarios included in the sensitivity analysis for the costs of GHG reduction.</p>

Narrative Summary	Key Performance Indicators	Monitoring and Evaluation	Critical Assumptions
Outputs:	The annual amount of power delivered to the users (approximately 57 GWh to VMG and 126 GWh to the regional electric grid), heat delivery (approximately 197 TJ, including 55 TJ to VMG, 55 TJ to the Hospital, and 87 TJ to the City of Kyjov).	Regular reviews of TPK's implementation progress reports, annual company reports, the Kyjov City government and NGO sources;	<i>(Outputs to Objective)</i> Contractual agreements finalized between the participating companies; Implementation of the Project and its components proceeds according to the Project Implementation Plan.
Project Components/Sub-components: (see Annex 2 for Project description)	<p>CHP plant constructed - US\$m 20.35;</p> <p>New boiler installed to replace boiler # 52, and boiler # 53 retrofitted - US\$m 1.56;</p> <p>Buildings for CHP and auxiliary facilities set up - US\$m 0.75;</p> <p>The existing district heat network of the city expanded and modernized - US\$m 1.64;</p> <p>13 gas-fired boilers replaced with heat exchangers connected to the district heating network - US\$m 0.52;</p> <p>Supervision of the Project, training and public relations activities undertaken by MoE - US\$m 0.12.</p>	Regular project reports monitored against the benchmarks set forth in the implementation plans prepared by each of the participating companies;	<i>(Components to Outputs)</i> Sufficient start-up capital available to TPK, ensured by the inclusion of appropriate effectiveness conditions into the Legal Agreement on the GEF Grant; Sound performance of suppliers and good project coordination.

Table 2
Critical Risks

Risk	Risk Rating	Risk Minimization Measure
Considerations of social impact of the pricing issue might preclude the Government from revising the price structure and levels for network energies.	M	<p>Firm off-take agreements between TPK and customers, for an initial 10-year period, acceptable to the Bank;</p> <p>Public outreach program by TPK supported by MoE, focusing on the negative fiscal and environmental aspects of energy subsidies and inadequate pricing;</p> <p>Dialogue with the Government on macroeconomic reform.</p>
Lack of effective project coordination.	N	Close working interactions with MoE and the Project implementation team, including the placement of the Task Leader in the region, as well as with TPK's consultants.
The risk of disagreement between the participating companies.	M	Contractual purchase and off-take arrangements, Shareholders Agreement, and covenants of the Grant Agreement and Project Agreement.
Market or technological developments that would force major production changes at the VMG plant or other industrial users of TPK's output.	N	Contractual arrangements and financial covenants of the Legal Agreements for the GEF Grant.
Lack of start-up financing for TPK to implement the Project.	N	Inclusion of the corresponding effectiveness condition into the Legal Agreements for the GEF Grant.
Inadequate performance of private contractors.	M	Appropriate incentive structure by including the requirement of cost-overruns and cash shortfalls to be met by the shareholders as part of the Legal Agreements.
<p>UNFCCC targets set for the Czech Republic might be seen by the Government as easily achievable without fulfilling the objectives of this and similar projects;</p> <p>The Government might not see enough benefit in pursuing GHG abatement projects in the absence of a functioning carbon trading system.</p>	M	Emphasize the synergies of CO ₂ reduction with other efforts aimed at readily recognized priority objectives (reliable heat and power supply to the residential sector, technological modernization of the industry, local pollution reduction) and their importance in light of EU accession.
The Overall Risk Rating	M	

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

Annex 2

Kyjov Waste Heat Utilization Project

Detailed Project Description

PROJECT COMPONENT A (US\$ 20.35 million) – Combined Heat and Power Plant (CHP Plant):

Construction of a combined heat and power plant using combined cycle gas firing at the Vetropack Moravia Glass Factory (the Glass Factory) in Kyjov including the supply and installation of two gas turbines; an exhaust gas boiler; a condensing bleeder turbine; a transformer station; water treatment station; heat exchange and pumping station; hot water pipeline connection; connection to the electric grid and gas supply network connection; and preparation of design and technical documentation.

The CHP Plant represents the core component of the Project. The plant will combine waste heat from VMG and supplemental gas-firing to produce heat and electricity that will be sold. It is envisaged that the Project will provide for the heating and electrical needs of VMG; the heating needs of the existing and new customers of the integrated Kyjov district heating system, and will sell the remaining electricity output to the regional electric distribution company, JME. It is anticipated that on-site generation will provide a more reliable electric supply than the current delivery via the 22 kV distribution network.

The CHP Plant's nominal output is designed to be 23 MW of electricity and 18.0 MW of heat in both hot water and steam forms. The CHP Plant is designed as an electricity and heat generation combined cycle plant with two gas turbines with a combined nominal output of 16 MW of electricity; an exhaust gas boiler; a condensing bleeder turbine with a nominal output of 7 MW of electricity; a 22 kilovolt transformer station; a water treatment station; heat exchangers and pumps; a hot water pipeline and a connection to the City grid. The CHP Plant is to be located in Kyjov, Czech Republic. With the exception of the pipeline distribution system, the CHP Plant's principal components will be housed in the former boiler house at the VMG manufacturing site and in the newly constructed auxiliary building. TPK has executed long-term rental agreements for the land and facilities to be used by the Company.

The CHP Plant will be fueled by VMG waste heat and by natural gas. TPK and JMP have negotiated a 15-year agreement for the supply of approximately 40 million cubic meters of natural gas to the CHP Plant each year. In addition, the Company has executed a long-term contract for the purchase of waste heat from VMG's glass manufacturing processes.

The Company believes that the CHP Plant will meet all relevant existing and anticipated Czech and European Union emission and noise regulations. In May 1997, the Hodonin-Environmental Authority approved the CHP Plant's environmental impact study. The Company submitted a request for a site permit to the Kyjov planning authorities in December 1997 and received the permit in January 1998.

The CHP Plant is to be commissioned in two phases. At the estimated time of completion of the first phase in October 1998, TPK will supply heat initially from rented mobile boilers, then from the completed first phase (early 1999). When the second phase is completed in the second quarter of 1999, the CHP Plant will commence electricity generation.

After completion of the second phase, the CHP Plant initially is expected to sell approximately 184 GWh of electricity and about 151,600 GJ of heat per year. In 2001 and beyond, the CHP Plant is expected to increase its sales of hot water for heating to 196,600 GJ per year. Pursuant to a long-term contract with JME that is subject to completion and a long-term contract with VMG that has already been signed, JME and VMG will purchase approximately 127 GWh and 57 GWh, respectively, of electricity each year.

The Company also has signed a long-term contract to supply hot water for heating to VMG and has negotiated several additional heat off-take contracts which are subject to completion, including a 10-year contract for the

sale of heat to the Kyjov municipality and a 15-year contract for the sale of heat to the Kyjov regional hospital. Pursuant to these contracts, the Kyjov municipality, the Kyjov regional hospital, and VMG initially would make annual purchases of hot water for heating of approximately 86,600 GJ, 55,000 GJ, and 10,000 GJ, respectively. In 2001 and beyond, VMG's annual purchases are expected to increase from 10,000 GJ to 55,000 GJ.

Procurement Package K1 provides for the essential equipment and installation for the CHP plant to be set up by the Project. After selection of the lowest evaluated bidder and a no-objection from the Bank in December 1997, TPK had finalized discussions with the selected bidder, CKD of the Czech Republic, to achieve the critical optimization prior to contract signature, which took place on April 23, 1998.

The bulk of the GEF Grant financing – about US\$ 5 million out of the total 5.8 million expected to be available for the Project – will be made available under the CHP Plant component.

PROJECT COMPONENT B (US\$ 1.56 million) – Replacement and Retrofitting of Boilers at the Glass Factory:

Replacement of one existing boiler at the Glass Factory with a new waste heat recovery boiler and the retrofitting of one existing boiler at the Glass Factory. Specifically, the new waste-heat steam-producing boiler at furnace #52 and the converted hot water boiler at furnace #53 will both be gas-fired.

PROJECT COMPONENT C (US\$ 0.745 million) – Construction and Reconstruction of Buildings at the Glass Factory:

An existing building of VMG will be modified, with certain additions to be constructed alongside. Specifically, this will include reconstruction of existing buildings at the Glass Factory to house the CHP Plant and water treatment plant; and construction of administration offices, storage facilities and electric transformer station building at the Glass Factory. At the site preparation stage, some unneeded structures will be demolished.

PROJECT COMPONENT D (US\$ 1.638 million) – Modernization and Expansion of District Heating Network of Kyjov:

Establishment of a centralized district heating network for the City of Kyjov capable of carrying a thermal output of 19MW through the supply and installation in channel-free design of pre-insulated pipes of about 6 kilometers in length together with accompanying instrumentation and control cables.

The delivery of goods and services for this component is covered by Procurement Package K2. After selection of the lowest evaluated bidder and a no-objection from the Bank in October 1997, a turn-key contract has been signed with the lowest bidder for whom the Bank's no-objection has been obtained. This package includes the connecting pipeline from the VMG plant site to the City district heating system plus the TPK costs for integration of the City heating system. The component involves delivery and installation of 6 km of pre-insulated pipe with diameters varying from 80 mm to 350 mm, in channel-free design, with accompanying instrumentation and control (I&C) cable. The K2 Contract allows for the digging of trenches, the supply and installation of pipes and cables and the closing and professional coverage of trenches.

The current cost estimates for Teplarna Kyjov to make connections to the district heating system is US\$1.638 million, of which US\$ 0.187 million is for connecting the hospital.

Grant funding in the amount of US\$ 0.656 million will be available from the GEF for this component.

PROJECT COMPONENT E (US\$ 0.52 million) – Decommissioning of Gas-Fired Boilers and Replacement with Heat Exchangers:

The component involves decommissioning of 13 boiler houses (with two to three boilers each) and installation of heat exchangers within these buildings. Heat from the TPK system will be exchanged to the City's secondary system. The City of Kyjov's district heating enterprise will be responsible for this component. This component will be funded by a grant from the State Environmental Fund.

PROJECT COMPONENT F (US\$ 0.12 million) – Project Supervision and Dissemination Activities by the Ministry of Environment:

This component will enable the MoE to conduct the overall oversight of TPK's activities under the Project with respect to environmental compliance and GHG emission reduction. Moreover, MoE will help disseminate the project concept, technology and philosophy through public relations, including seminars, training, etc. US\$ 0.10 million (83.3% of the total amount) is expected to be in the form of Technical Assistance and will be covered by the GEF Grant.

Project Timing

Implementation of the Project started in Spring 1997. Contract signature of the three turn-key contracts took place on April 23, 1998. The Project Completion Date is December 31, 1999. The Closing Date would then be June 30, 2000, i.e. six months after the Project Completion date.

PROJECT COMPONENT 2 (US\$ 0.52)
Replacement with Heat Exchangers

These projects (each) and the
will be exchanged to 10

reduction of 13.4 million
bushels. Heat flow

the cost
of heat

figures w
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in the City of Kyoto's de
be funded by a grant from

PROJECT 7 (U
Environment

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This component will enable the MCT to conduct the overall oversight of CTR activities under the project
with respect to environmental compliance and HCT emission reduction. Moreover, MCT will help disseminate
the project concept, technology and philosophy to reach related stakeholders, including government, business, etc. US\$
0.10 million (83.3% of
covered by the GEF Grant

Page 10

implementation of the project started in spring 1999. The
phase on April 15, 1999. The Project Completion Date is 10
June 30, 2000, i.e. six months after the Project Completion



Annex 3
Kyjov Waste Heat Utilization Project
Estimated Project Costs
1 US\$ = 34.14 CZK

Project Component	Implementing	CZK Million			US\$ Million			Percentage	Percentage
		Local	Foreign	Total	Local	Foreign	Total		
A. CHP Plant	TPK								
CHP Plant (a)		278.4	340.2	618.6	8.15	9.97	18.119	75.1%	72.7%
Electric Connection		3.2	0.8	4.0	0.09	0.02	0.117	0.5%	0.5%
Gas Connection & Regulation		14.4	3.6	18.0	0.42	0.11	0.527	2.2%	2.1%
Technical Documentation		15.8	19.3	35.0	0.46	0.56	1.025	4.3%	4.1%
Subtotal, component A:		311.7	363.9	675.6	9.13	10.66	19.789	82.1%	79.4%
B. Replacement and Retrofitting of Boilers	TPK	30.0	20.0	50.0	0.88	0.59	1.465	6.1%	5.9%
C. Construction and Reconstruction of Buildings	TPK								
Demolitions		9.3	1.0	10.3	0.27	0.03	0.302	1.3%	1.2%
Auxiliary Building (Civil Part)		10.6	1.9	12.5	0.31	0.05	0.366	1.5%	1.5%
Subtotal, component C:		19.9	2.9	22.8	0.58	0.09	0.668	2.8%	2.7%
D. Modernization and Expansion of District Heating	TPK								
District Heat Network Integration		28.3	18.9	47.2	0.83	0.55	1.382	5.7%	5.5%
Hospital Connection Costs		4.8	1.2	6.0	0.14	0.04	0.176	0.7%	0.7%
Subtotal, component D:		33.1	20.1	53.2	0.97	0.59	1.558	6.5%	6.2%
E. City Connection Costs	City, Teplo	14.0	3.5	17.5	0.41	0.10	0.513	2.1%	2.1%
F. Project Supervision	MoE	1.8	2.3	4.1	0.05	0.07	0.120	0.5%	0.5%
Total Base Cost		410.6	412.6	823.2	12.03	12.09	24.111	100.0%	
Contingencies									
Physical Contingencies (b)		14.2	11.6	25.8	0.41	0.34	0.754		3.0%
Price Contingencies (c)		2.3		2.3	0.07		0.067		0.3%
Total Project Cost		427.02	424.19	851.22	12.51	12.43	24.933		100.0%

- a) Capital expenditures associated with the CHP Plant include the final negotiated price after optimization, but exclude the import duty of CZK 19,142,000 which represents full import duty (goods are expected to be financed from the proceeds of the Grant and therefore exempt from duty);
- b) A physical contingency of 10% was allowed for the civil works under Component C for which the level of effort and associated cost requirements may vary more significantly than for other components; 2.5% for the CHP Plant Component turn-key contract (excluding connections and technical documentation); 5% for the rest of the items; no physical contingency was allowed for Components E and F.
- c) Price contingencies of 1.5% have been allowed for all items except Components A and D (where the prices are already set under the Procurement Packages K1 and K2), and Component F, for which no price contingency has been allowed.

Annex 4

Kyjov Waste Heat Utilization Project Incremental Cost Analysis

Broad Development Goals and Baseline

The Project supports the broad development goals of the Czech Republic including the reduction of greenhouse gas (GHG) emissions, modernization of municipal infrastructure and private sector energy infrastructure, and helping to improve the environment by reducing air pollution. The Bank's Assistance Strategy on the Czech Republic, discussed in the context of Project Document No. P-6008-CZ (1993), contains the objective of more efficient generation and transmission of energy, which the Project directly supports.

The Baseline. The project options originally considered included three alternatives that would provide all of Kyjov's district heating needs but three different outputs of electricity. In each case, waste heat from VMG and supplemental gas firing are used to meet the heat and power needs both at VMG and elsewhere in Kyjov. Maximum heat production is 18.0 MWt for each case while the gross average electric capacities are 7.64 MWe, 9.65 MWe, and 23.8 MWe for different options considered. Operation for 8,400 hours per year would then produce between 64 GWh and 200 GWh of electricity annually for these alternatives.

Another option for energy development in the City of Kyjov, denoted in this report as Option D, would provide 90% of the combined City and hospital heating needs (127.4 TJ) from VMG waste heat. The remaining 10% would come from occasional operation of the most efficient existing district heating boilers (8.7 TJ) and of the existing hospital boilers (5.5 TJ). VMG would internally supply 55.0 TJ of its own heating needs. In this instance, VMG waste heat would be used to supply as much of the City's heating need as possible from waste heat boilers, but all electricity would continue to be produced in CEZ central station power plants. This option can be characterized as an "enhanced business-as-usual" scenario, in which the waste heat is utilized but no special effort is made to maximize the GHG emission reductions. As such, it represents the kind of conventional project which is likely to be implemented if no GEF financing were available. For these reasons, Option D is chosen as the *Baseline* for GEF incremental cost analysis.

Given the importance of a correctly chosen baseline scenario, and the impact that the assumptions made can have on the outcome of the incremental cost calculation, some additional details of Option D have been subjected to a sensitivity analysis described in the final sections of this Annex. The influencing factors analyzed include the costs of electric capacity additions by CEZ in the absence of the Project, reserve capacity allowance, possible changes to the fuel price, and investment costs of the proposed Project.

The Baseline CO₂ Emissions. The annual emissions of CO₂ for the Baseline scenario relate to the combustion of gas in the sporadic operation of the Kyjov district heating boilers and to the combustion of lignite in grid power plants to generate electricity. The CO₂ emissions in metric tons are calculated as 0.2 x MWh of gas input and 0.4 x MWh of lignite input. Table A4-1 presents the emissions estimates.

Global Environmental Objectives

The major overall objective of the Project is to reduce the GHG emissions from the Kyjov district heating system. The Project's global environmental objective – to contribute to climate change mitigation – will be measured in terms of accomplishing this specific task. The GHG emission reduction impact is expected as a result of introducing a new, clean and efficient gas-fired CHP plant to displace electricity generated from carbon-intensive solid fuels such as lignite; reducing unnecessary fuel burning by utilizing waste heat; and modernizing the existing district heating system to increase its efficiency. The combined effect of these measures, as quantified in this Annex, represents the direct GHG mitigation impact expected from the Project.

This objective is being met under the cost-effectiveness constraint set approximately at 10-15 US\$/tCe for the cost of carbon abatement calculated over the life of the Project.

Table A4-1
CO₂ Emissions
Baseline

Item	Units	Quantity	Reference Years
DH Gas Consumption	GJ/year	12,731	1999 on
	MWh/year	3,536	1999 on
Hospital Gas Consumption	GJ/year	8,088	1999 on
	MWh/year	2,247	1999 on
Total Gas Consumption	Standard cubic meters (SCM)/year	615,000	1999 on
	MWh/year	5,783	1999 on
CO ₂ Emissions From Gas	ton/year	1,157	1999 on
Electric Generation ex Plant	MWh/year	188,652	2001 on
Generation Efficiency	%	34	2001 on
Fuel Input for Electric Gen.	MWh/year	554,860	2001 on
CO ₂ Emissions from Electr.	ton/year	221,944	2001 on
Total CO ₂ Emissions	tCO ₂ /year	223,100	2001 on
Twenty-Year CO ₂ Emissions	tCO ₂	4,360,971	1998-2018
The same, in tons of Carbon Equivalent	tCe	1,189,356	1998-2018

To the extent that the Project can generate information dissemination and policy dialogue in the country, it also serves the long-term objective of removing the barriers to energy conservation and energy efficiency. However, the incremental cost analysis presented here deals only with the directly quantifiable GHG reduction impacts of the former kind.

The Proposed Alternative

The Proposed Alternative (also referred to as "Option A" or "The Project" elsewhere in the report) consists of the installation of a combined cycle gas-fired cogeneration system at VMG, including two gas turbines and one steam turbine with a combined gross average electric capacity of 23.8 MW (net average capacity of 21.9 MW). Annual output of this system would be 55 TJ of heat supplied to VMG; 55 TJ to the Kyjov Hospital and 86.6 TJ of heat to the City. In addition, this system would produce 57,485 MWh of electricity for VMG use and supply 126,566 MWh to the regional electric grid at full operation in 2002.

Thus, the Project would not only utilize waste heat from VMG, but also produce gas-fired steam and electricity to displace grid production of electricity in lignite-fired power plants and some local gas-fired boiler production of district heat.

It should be noted that both the Baseline and Proposed Alternative represent significant improvements over the existing situation in which VMG's waste heat is not utilized, all electric requirements are met from grid supply, and Kyjov's heating requirements are met from a combination of coal-fired and gas-fired heating plants. However, the GEF involvement provides the needed financing to extend the Project from the Baseline alternative with no electric generation to an alternative which provides the largest electrical output from the Project and the greatest global environmental benefits. Covering the incremental costs of moving to the maximum cogeneration alternative makes it possible to internalize CO₂-related externalities and to implicitly assure that the Project is credited with the economic value of incremental electrical energy and capacity.

The CO₂ emissions under the Proposed Alternative. For the Proposed Alternative, the remaining CO₂ emissions are from the combustion of gas in the CHP plant. Table A4-2 presents the estimates of these emissions.

Table A4-2
CO₂ Emissions
Proposed Alternative

Item	Units	Quantity	Reference Years
Gas Consumption	SCM/year	40,240,000	2000 on
Gas Consumption	MWh/year	378,256	2000 on
CO ₂ Emissions	ton CO ₂ /year	75,651	2000 on
Twenty-Year CO ₂ Emissions	ton CO ₂	1,495,447	1998-2018
Twenty-Year Reduction (vs Baseline)	ton CO ₂	2,865,524	1998-2018
The same, in tons of carbon equivalent	tCe	781,507	1998-2018

Scope of Analysis

Since most of the impacts of the Project will be at the level of the TPK company, the scope of this analysis mostly includes the company itself and, inevitably, its suppliers and customers. System-wide effects, such as the impact on the centralized power system from the new CHP plant, have also been taken into account as the costs and GHG emissions associated with the production of displaced CEZ electricity have been incorporated. Most of the calculations for the analysis are done on year-by-year data with a twenty-year time horizon (see Table A4-10). The expected real escalations in gas prices are integrated into the calculations. The life-cycle costs are discounted to a 1998 present value at a discount rate of 12 percent. The sensitivity analysis undertaken to test the robustness of the results examined the significance of various assumptions with respect to fuel pricing, amount and cost of new power capacity additions, and the cost of lignite-fired power generation.

Costs

Summary. The incremental costs calculated for this analysis represent the difference in the present value of two life-cycle cost streams. The first stream is associated with the Baseline scenario (Option D) in which VMG simply provides waste heat to the City of Kyjov district heating system and to the hospital in the City. The residual City and hospital heating requirements (about 10 % of the total) would be supplied by peak load firing of some of the City's existing gas boilers and by similar use of the existing hospital boilers. Unneeded gas and coal-fired boilers in the City would be retired. In this plan, all VMG electrical needs are supplied through the regional distribution company (JME) which buys the power from CEZ.

The second cost stream represents the Proposed Alternative (Option A), which consists of the installation of a combined cycle gas-fired cogeneration system at VMG, including two gas turbines and one steam turbine with a combined net average electric capacity of 21.9 MW. The life-cycle costs of the Proposed Alternative are **\$66.9 million** versus **\$58.3 million** for the Baseline in which VMG waste heat is supplied to the City without cogeneration of electricity. The CO₂ reductions attributable to the Project are from displaced grid production of electricity in new lignite-fired power plants and from greater use of VMG waste heat by the City and by the hospital. The difference in CO₂ emissions is **2,865,524 tons** over the 1998-2018 operating period. The unit abatement cost per ton of CO₂ is **\$2.98**, or **\$10.91** per ton of carbon. The comparative costs are further discussed in the text below.

Investment cost of the Proposed Alternative. Tenders have now been issued for the Proposed Alternative project on the presumption that GEF funding is likely to be approved. The base investment costs from the tenders received and from estimates by TPK's engineering consultant, ENECO, are:

Table A4-3
Investment Costs
Proposed Alternative

Exchange Rate: US\$ 1 = 34.14 CZK

Item	Cost, US\$ 000	1998 Present Value
By Teplarna Kyjov:		
CHP Plant	18,572	17,351
Electric Connection	123	123
Gas Connection and Regulation	553	504
Technical Documentation	1,076	1,076
Replacement and Retrofitting of Boilers	1,538	1,579
Demolitions	332	372
Auxiliary Building	403	403
DH Network Integration	1,451	1,451
Hospital Connection	185	185
Subtotal:	24,233	23,044
By others:		
City Connections	513	477
TOTAL:	24,746	23,521

* In this economic analysis, the physical contingencies are included but price contingencies are not; MoE supervision is not included; this explains the minor differences compared to the investment costs presented in Section C-1 and Annex 2.

The investment costs in the Baseline scenario (Option D). The investment costs for VMG are relatively small since only a hot water heat recovery boiler, plus the investment in the heat distribution system, would be required. The cost to VMG would amount to about US\$ 2.8 million (see Table A4-4). The remaining investment costs for Option D to provide the same output as Option A would be for additional electric grid capacity.

Table A4-4
Investment Costs
Baseline

Item	Units	Quantity	1998 Present Value	Reference Years
Electric Capacity – New	US\$/ kW	1,250		
	US\$ 000	32,757	27,300	1998-2001
Electric Capacity – Purchases	US\$/kW-year	48		
	US\$ 000	1,660	1,382	1999-2000
Total Electric Capacity Costs	US\$ 000	34,417	28,682	
Heat Supply by VMG	US\$ 000	2,830	3,000	1997-1998
TOTAL:	US\$ 000	37,247	31,682	1997-2001

Informal discussions with CEZ in late 1996 confirmed its intentions to add 600 MW of base load coal or lignite-fired capacity by 2002 and another 300 MW by 2005. CEZ also plans to add 300 MW of gas-fired combustion turbines by 2002 and another 200 MW by 2005. These planned increments are in addition to the completion of the nuclear plant at Temelin. The cost of such capacity including precipitators and an FGD system was estimated at \$1,250 per kW. The average electric capacity provided in Option A is 21,911 kW. Grid capacity to serve loads in the Kyjov region would have to be greater by the amount of transmission losses which have been estimated at 4%. With an additional allowance for a 15% reserve capacity, the electric investment cost for Option D is calculated at \$32.8 million ($=21,911 \text{ kW} \times 1.04 \times 1.15 \times \$1,250/\text{kW}$).

It should be expected that the new lignite plants will require at least four years for construction and could not be on line prior to 2001 even if started in 1997. The VMG project expects to provide electricity to the regional grid by 1999. For Option D to provide equivalent capacity in 1999, purchases would be required at a cost of \$48 per kW-year, which is the annualized cost of a new combustion turbine based on investment of \$400 per kW and a 12% discount rate. The purchase costs add about \$1.7 million to the total costs of the Base case in 1999 and 2000.

To summarize, the total investment costs for the Baseline scenario are about **\$37.2 million** versus **\$24.7 million** for the Proposed Alternative.

Operating Costs for the Proposed Alternative. The operating costs for the proposed project are comprised of fuel (gas) costs, labor costs, and operation and maintenance costs for the CHP plant and for the district heating distribution system. Approximately 90 percent of total operating costs are for gas purchases. The costs at 1998 prices can be estimated as:

Table A4-5
Steady State Operating Costs
Proposed Alternative

Item	Units	Quantity	1998 Present Value	Reference Years
Gas Use	SCM 000	40,240		2001
Gas Price	US\$/ SCM 000	131.67		2001
Gas Cost	US\$ 000	5,298	3,771	2001
Other Operating Costs	US\$ 000	387	275	2001
TOTAL:	US\$ 000	5,685	4,047	2001
	US\$ 000	117,960	43,335	1998-2018

For the Baseline, the annual operating costs include the gas cost for operating the City district heat boilers on a sporadic basis, the non-fuel operating and maintenance costs for the City boilers and for the distribution network, and the fuel and O&M costs for grid production of electricity. The estimated operating costs at 1998 price level are summarized in the following table:

Table A4-6
Steady State Operating Costs
Baseline

Item	Units	Quantity	1998 Present Value	Reference Years
City Boilers Gas Use	SCM 000	376		2001
Hospital Gas Use	SCM 000	239		2001
Total Gas Use	SCM 000	615		2001
Gas Price	US\$/ SCM 000	131.67		2001
Heating Gas Cost	US\$ 000	81	58	2001
Heating O&M	US\$ 000	203		2001
Heating Total:	US\$ 000	6,258	2,654	1998-2018
Electric Energy	US\$ 000	2,777		2001
Electric Fixed O&M	US\$ 000	737		2001
Electric Total	US\$ 000	3,514		2001
Electric Energy	US\$ 000	54,411	19,733	1998-2018
Electric Fixed O&M	US\$ 000	13,266	4,260	1998-2018
Electric Total	US\$ 000	67,677	23,992	1998-2018
TOTAL:	US\$ 000	3,798		2001
	US\$ 000	73,935	26,646	1998-2018

Production costs for the new lignite plants that come on line in 2001 have been based on CEZ data that indicate a cost of \$14.72 per MWh for fuel and variable O&M. Until those plants are available, the energy

would come from existing units that we have assumed would have variable costs that are 5.0% higher than the new units. These are rather conservative costs of lignite generation.

The present value of the twenty-year cost streams. The following table summarizes the incremental cost calculations for the proposed plan compared to the Baseline. The detailed calculations are provided at the end of this Annex in Table A4-10.

Table A4-7
Incremental Cost Summary
(1998-2018)

	Units	Proposed	Base	Difference
Investment	US\$ 000	23,521	31,682	-8,161
Operating	US\$ 000	43,335	26,646	16,689
Gas	US\$ 000	39,238	1,033	38,205
Total	US\$ 000	66,857	58,328	8,528
CO ₂ Emissions	tCO ₂	1,495,447	4,360,971	2,865,524
C Emissions	tCe	407,849	1,189,356	781,507
Unit Abatement Costs:	US\$			
per tCO ₂				2.98
per tCe				10.91

A summary table for the incremental impacts of choosing the Proposed Alternative over the Baseline project is given as follows:

Table A4-8
Benefit Analysis Summary
(1998-2018)

	Proposed	Base	Increment
Domestic Benefits/ Impacts			
-	Waste heat used for both heat and electric production	Waste heat used for part of heat production	Increased use of waste heat
	Reliable power supply to VMG	Reliability of power supply to VMG uncertain	Improvement in power supply reliability
Local* Emissions, tons (1998-2018):			
a) NO _x	3,753	6,098	- 2,345
b) CO	1,396	1,835	- 438
c) SO ₂	9	31,006	- 30,997
Global Emissions, tons of carbon dioxide (tCO₂)	1,495,447	4,360,971	-2,865,524
Global Emissions, tons of carbon equivalent	407,849	1,189,356	- 781,507
Costs:			
Investment (US\$ 000)	23,521	31,682	-8,161
Operating (US\$ 000)	43,335	26,646	16,689
TOTAL (US\$ 000)	66,857	58,328	8,528
Unit abatement cost, US\$/ tCO₂			2.98
Unit abatement cost, US\$/ tCe			10.91
GEF contribution:			
(US\$ 000)			5,800
Unit abatement cost to GEF, US\$/ tCO₂			2.02
Unit abatement cost to GEF, US\$/ tCe			7.42

* The local emissions refer to the level of the City of Kyjov. The emission reduction at that level does not rule out an increase in emissions in the vicinity of the CHP plant. However, these increases are not expected to cause ambient concentrations to exceed the Czech, or the World Bank, environmental standards.

Sensitivity Analysis. To test the robustness of the incremental cost results, several sensitivity cases have been considered as summarized in Table A4-9 below. The dependent variables in question were the unit abatement cost and the total incremental cost which limits the size of the potential carbon grants. The dominant factors influencing the outcome of incremental cost calculations are the allowance made for reserve capacity in the Baseline and the cost of electric capacity in the CEZ system. If no allowance is made for additional reserve capacity, the unit abatement cost increases to US\$ 4.41 per ton of CO₂. A 10% increase in investment cost of the proposed Project would increase the unit abatement cost to \$3.80/tCO₂. On the other hand, if the investment cost for new lignite plants is assumed to be \$1,472/kW (a figure supplied by CEZ) rather than \$1,250/kW, the unit abatement cost may drop to as low as \$1.02 per ton of CO₂. The results of the incremental cost analysis appear to be rather less sensitive to the dynamics of gas prices, the unit abatement costs hardly

exceeding \$3.3/ tCO₂ in any of the cases analyzed.

Table A4-9
Sensitivity Analysis

Change Case Assumption	Base Case	Incremental Cost US\$ 000	Incremental Cost/tCO ₂
No Change from Base		8,528	2.98
Gas Border Price Escalation			
0.00%	0.47%	6,880	2.40
1.00%	0.47%	9,559	3.34
Transgas Margin Escalation			
0.00%	-1.00%	9,016	3.15
-2.00%	-1.00%	8,088	2.82
Gas Distribution Margin			
6.00%	8.00%	7,896	2.76
10.00%	8.00%	9,161	3.20
Discount Rate			
10.00%	12.00%	10,148	3.54
14.00%	12.00%	7,305	2.55
Electric Capacity Cost (US\$/kW)			
1,472	1,250	2,823	1.02
Electric Reserve Required			
0.00%	15.0%	12,645	4.41
Cases Above Combined			
\$1,472/0.0%	\$1,250/15.0%	7,771	2.71
Investment Cost Increase			
10.0%	0.0%	10,880	3.80

Conclusions. A comparison of the costs faced by VMG/ TPK in the case of the two respective options (Baseline and Proposed Alternative) suggests that, from a private perspective, the Baseline option has the advantage of much lower investment costs. The analysis above (see Tables A4-3 and A4-4) indicates that the Baseline option would allow VMG to supply the City of Kyjov with most of its heating needs with a limited investment of about \$2.8 million. The Proposed Alternative (Option A) provides attractively priced, reliable electricity to VMG and to JME and much more dramatic reductions in CO₂ emissions, but at a much larger investment cost of about \$24.7 million.

Since the incremental cost calculation also needs to incorporate the avoided investment cost by the CEZ estimated at about \$ 37.2 million for the Baseline scenario, the difference between the two cases is reduced to about \$8.5 million, the former still being more expensive due to higher operating costs. Thus, as given in Table A4-8 and the detailed Table A4-10, the incremental life cycle cost of the proposed plan is \$8.528 million, which corresponds to a unit abatement cost of \$2.98 per ton of CO₂ or \$10.91 per ton of carbon equivalent. This characterizes the Proposed Alternative (Option A) as a highly cost-effective GHG reduction project eligible to GEF funding under the short-term financing mechanism. The estimate of \$8.5 million shows the upper limit of the GEF Grant which could potentially apply to the Project. Given the amount of the Grant actually being provided by GEF (US\$ 5.8 million equivalent), the actual unit abatement costs paid by the GEF can be considered to be US\$ 2.02 per ton of CO₂ or US\$ 7.42 per ton of carbon equivalent.

Process of Agreement

The parameters and assumptions used in the incremental cost analysis are based on information collected as part of project preparation and appraisal. The analysis has been presented to the Czech MoE prior to negotiations and represents the basis for the provision of the GEF grant to the Czech Republic in the amount agreed upon in the negotiated documents (GA and PA).

Table A4-10

	Unit	Year	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1998 (NPV)
		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018		
Baseline																									
Investment cost	US\$ 000	1,415	6,329	5,525	20,702	3,276	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31,662	
Operating cost	US\$ 000	0	522	1,914	3,078	3,798	3,798	3,799	3,799	3,799	3,800	3,800	3,800	3,801	3,801	3,802	3,802	3,802	3,803	3,803	3,804	3,804	3,805	3,805	26,646
Fuel/Energy	US\$ 000	0	417	1,711	2,876	2,858	2,858	2,859	2,859	2,859	2,860	2,860	2,860	2,861	2,861	2,862	2,862	2,862	2,863	2,863	2,864	2,864	2,865	2,865	20,766
Other	US\$ 000	0	105	203	203	940	940	940	940	940	940	940	940	940	940	940	940	940	940	940	940	940	940	940	5,881
Total cost	US\$ 000	1,415	6,851	7,439	23,781	7,074	3,798	3,799	3,799	3,799	3,800	3,800	3,800	3,801	3,801	3,802	3,802	3,802	3,803	3,803	3,804	3,804	3,805	3,805	58,326
CO2 emissions	ton CO2		6,014	12	213,895	223,100	223,100	223,100	223,100	223,100	223,100	223,100	223,100	223,100	223,100	223,100	223,100	223,100	223,100	223,100	223,100	223,100	223,100	223,100	4,360,871
Coal (power)	ton CO2		0	12	212,738	221,944	221,944	221,944	221,944	221,944	221,944	221,944	221,944	221,944	221,944	221,944	221,944	221,944	221,944	221,944	221,944	221,944	221,944	221,944	4,331,825
Gas	ton CO2		6,014		1,157	1,157	1,157	1,157	1,157	1,157	1,157	1,157	1,157	1,157	1,157	1,157	1,157	1,157	1,157	1,157	1,157	1,157	1,157	1,157	29,146
Proposed Alternative																									
Investment cost	US\$ 000	1,240	10,885	12,821	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23,521
Operating cost	US\$ 000	0	1,471	4,059	5,945	5,685	5,706	5,727	5,748	5,771	5,794	5,818	5,854	5,891	5,928	5,967	6,005	6,045	6,085	6,126	6,168	6,211	6,254	6,254	43,335
Gas	US\$ 000	0	0	3,140	5,281	5,298	5,316	5,333	5,351	5,369	5,388	5,406	5,437	5,468	5,500	5,532	5,564	5,597	5,630	5,664	5,698	5,733	5,767	5,767	38,366
Other	US\$ 000	0	1,471	920	363	387	390	393	397	402	407	412	417	423	429	435	441	448	455	462	470	478	487	487	4,970
Total cost	US\$ 000	1,240	12,156	16,800	5,645	5,685	5,706	5,727	5,748	5,771	5,794	5,818	5,854	5,891	5,928	5,967	6,005	6,045	6,085	6,126	6,168	6,211	6,254	6,254	66,857
Gas input (@ 33.84 MJ/\$CH4)	MWh	46,264	244,106	378,256	378,256	378,256	378,256	378,256	378,256	378,256	378,256	378,256	378,256	378,256	378,256	378,256	378,256	378,256	378,256	378,256	378,256	378,256	378,256	378,256	7,477,234
CO2 emissions	ton	9,253	48,821	75,651	75,651	75,651	75,651	75,651	75,651	75,651	75,651	75,651	75,651	75,651	75,651	75,651	75,651	75,651	75,651	75,651	75,651	75,651	75,651	75,651	1,495,447
Increment																									
Incremental cost	US\$ 000																								8,528
GHG abatement	ICO2																								2,865,524
GHG abatement	ICe																								781,507
Unit abatement cost	US\$/ICO2																								2.98
Unit abatement cost	US\$/ICe																								10.91

Annex 5

Kyjov Waste Heat Utilization Project Financial Analysis

Annex 5.1

Financial Summary of Teplarna Kyjov and its Main Shareholders

Teplarna Kyjov (TPK) was founded by JMP, JME, Moravia Glass, and MEAS. As the capital requirements for a new CHP Plant are substantial, TPK has successfully identified a foreign strategic investor to inject additional equity into the nascent company. The shareholders have recently signed an agreement with the following planned ownership structure. Kyjov City will also be included in the final share distribution:

	Company	Original Shares	Present Shares	Planned Shares	Final Share Distribution
		In percent			
1	JMP	39.50	38.02	23.25	22.63
2	JME	25.50	38.02	23.25	22.63
3	MG	21.00	14.37	8.79	8.37
4	MEAS	14.00	9.58	5.86	5.86
5	Kyjov City	0.00	0.00	0.00	1.67
6	Isar-Amperwerke	0.00	0.00	38.84	38.84
	Total ^(a)	100.00	99.99	99.99	100.00
	Total Share Capital in CZK	90.0	131.5	215.0 ^(b)	215.0 ^(b)

(a) The shares may not add up precisely to 100% due to rounding;

(b) Excluding CZK 25 million in form of an agio.

Jihomoravská Plynárenská a.s. (JMP, the South Moravian Gas Utility) was registered in Business Court in Brno, register B, section 1246 on 1 January 1994 under number 49970607. JMP is the sole natural gas distributor in South Moravia and the largest Czech regional gas distribution company, as measured by 1996 revenue. In 1996, JMP registered revenues of approximately CZK 7.6 billion, realized after-tax profit of approximately CZK 207 million, and employed an average of 2,291 individuals. JMP sold approximately 2.4 billion cubic meters of natural gas in 1996, of which approximately 96 percent was purchased from CPP s.p. Transgas o.z., the dominant Czech natural gas importer and exporter.

Jihomoravská Energetika a.s. (JME, the South Moravian Power Company) was registered in Business Court in Brno, register B, section 1233 on 1 January 1994 under number 49970194. JME is the sole electricity distributor in South Moravia and the second largest Czech regional electricity distribution company, as measured by 1996 revenue. In 1996, JME had revenues of approximately CZK 12 billion, earned after-tax profit of approximately CZK 425 million, and had an average of 2,346 employees. JME sold about 8,039 GWh of electricity in 1996, approximately 92 percent of which was purchased from CEZ, the dominant Czech electricity generation company.

Moravia Glass (MG) was registered in Business Court in Brno, register B, section 172 on 1 December 1990 under number 00149390. MG is a holding company with ownership stakes in several Czech glass-making and other enterprises. In 1996, MG had revenues of about CZK 95 million. It had a loss of about CZK 34 million, mostly due to the sale and related financial losses of Moravia Usobrnó.

Czech Republic
Kyjev Waste Heat Utilization Project
Inflation and Price Increase Assumptions, Financial Ratios, and FIRR for TPK,
Case A

Annex 5.2
Financial Summary, Page 1

	Projected	Projected	Projected	Projected	Projected	Projected	Projected	Projected	Projected	Projected	Projected
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2008
INFLATION AND PRICE INCREASE ASSUMPTIONS											
Inflation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Real Increase In Price Of Electricity											
JME	1.8%	4.8%	2.5%	1.9%	1.9%	1.9%	1.4%	1.4%	1.4%	1.4%	1.3%
VMG	3.0%	3.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Real Increase In Price Of Natural Gas	2.8%	7.5%	3.9%	2.9%	3.0%	2.9%	2.2%	2.2%	2.1%	2.1%	2.1%
RATIOS (Case A)											
Operating Income as % of Revenue	37.2%	40.7%	41.9%	41.4%	40.9%	40.3%	39.9%	39.6%	39.2%	38.9%	38.9%
Net Income Available to Shareholders as % of Revenue	-28.0%	-2.9%	3.5%	7.2%	10.0%	12.4%	14.2%	12.4%	13.5%	13.6%	13.6%
Return on Equity	-39.0%	-7.4%	8.4%	15.1%	17.4%	17.8%	19.8%	18.3%	20.5%	19.3%	19.3%
Return on Assets	-6.4%	-1.2%	1.7%	3.7%	5.4%	7.0%	8.7%	8.6%	10.7%	10.4%	10.4%
Return on Average Fixed Assets	-2.2%	-0.3%	0.4%	0.9%	1.4%	2.0%	2.6%	2.6%	3.2%	3.8%	3.8%
Debt Service Coverage (times)	-7.6	0.6	1.1	1.2	1.4	1.5	1.7	1.5	1.7	-	-
Current Ratio (times)	1.0	0.3	0.5	1.7	3.8	6.0	6.5	4.5	4.1	6.5	6.5
Total Debt over Total Assets	57.8%	55.2%	49.5%	42.4%	34.9%	26.6%	19.0%	10.6%	0.0%	0.0%	0.0%
Equity as percent of Total Assets	16.4%	16.3%	19.6%	24.7%	31.2%	39.0%	43.9%	46.9%	52.2%	54.0%	54.0%
Expenditures Funded by Internal Sources (%)	-0.6%	-20.6%	212.6%	N/A	1924.6%	2435.7%	646.4%	N/A	N/A	N/A	N/A
IRR on Total Investment less Grant =	18.4%	NPV @ 12%=CZK	246,008								

Czech Republic
Kyjev Waste Heat Utilization Project
Inflation and Price Increase Assumptions, Financial Ratios, and FIRR for TPK,
Case B

Annex 5.2
Financial Summary, Page 2

	Projected 1999	Projected 2000	Projected 2001	Projected 2002	Projected 2003	Projected 2004	Projected 2005	Projected 2006	Projected 2007	Projected 2008
INFLATION AND PRICE INCREASE ASSUMPTIONS										
Inflation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Real Increase In Price Of Electricity										
JME	1.8%	4.8%	2.5%	1.9%	1.9%	1.9%	1.4%	1.4%	1.4%	1.3%
VMG	3.0%	3.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Real Increase In Price Of Natural Gas	2.8%	7.5%	3.9%	2.9%	3.0%	2.9%	2.2%	2.2%	2.1%	2.1%
RATIOS (Case B)										
Operating Income as % of Revenue	37.2%	40.7%	41.9%	41.4%	40.9%	40.3%	39.9%	39.6%	39.2%	38.9%
Net Income Available to Shareholders as % of Revenue	-41.9%	-16.7%	-10.9%	-9.7%	-8.2%	-6.7%	-5.4%	-3.4%	-4.7%	-4.3%
Return on Equity	-76.3%	-107.1%	-294.6%	160.2%	58.2%	32.7%	21.2%	7.6%	7.4%	6.5%
Return on Assets	-9.5%	-6.9%	-5.2%	-5.1%	-4.9%	-4.4%	-4.1%	-2.9%	-4.6%	-5.0%
Return on Average Fixed Assets	-3.2%	-1.7%	-1.3%	-1.2%	-1.2%	-1.1%	-1.0%	-0.7%	-1.1%	-1.2%
Debt Service Coverage (times)	-5.0	0.4	0.8	0.8	0.8	0.8	0.9	0.9	0.8	1.3
Current Ratio (times)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Debt over Total Assets	86.4%	91.5%	95.8%	100.5%	105.3%	110.2%	115.4%	133.7%	157.1%	170.6%
Equity as percent of Total Assets	12.5%	6.4%	1.8%	-3.2%	-8.4%	-13.6%	-19.3%	-38.2%	-62.3%	-76.7%
Expenditures Funded by Internal Sources (%)	-9.8%	-49.8%	-529.0%	N/A	-1462.9%	-1206.1%	-987.2%	N/A	N/A	N/A
Overall IRR on Total Investment =	13.8%	NPV @ 12%=CZK	85,905							

Annex 5.2
Financial Summary, Page 3[illegible]

Czech Republic Kyjov Waste Heat Utilization Project Financing Plan (a)

Year Ending 31 December (CZK 000, Current Terms)	With Grant		Without Grant	
	1998	1999	1998	1999
Source Of Funds				
Cash At The Beginning Of Period	24,081	1,000	24,081	1,000
Net Internal Cash Generation (b)	(33,235)	43,959	(38,844)	19,248
GEF Grant (c)	80,150	133,465	0	0
Long-Term Commercial Bank Funds (d)	108,000	277,000	108,000	277,000
Other Long-Term Loans	0	0	0	0
Short-Term Funds (Revolver) (e)	68,098	(50,821)	133,857	107,355
Equity Receipts From Shareholders (f)	176,900	0	176,900	0
TOTAL SOURCES OF FUNDS	403,994	404,603	403,994	404,603
Application Of Funds				
Project Investment CHP Plant (g)	272,822	393,413	272,822	393,413
Project Investment HD Network (h)	47,176	0	47,176	0
Other Investments				
Boiler Construction/Reconstruction (i)	31,000	0	31,000	0
Auxiliary Building (Civil Part)	11,500	0	11,500	0
Electric Connection	4,000	0	4,000	0
Gas Connection & Regulation	3,000	15,000	3,000	15,000
Hospital Connection Costs (j)	6,000	0	6,000	0
Technical Documentation (k)	4,000	0	4,000	0
Total Investments (l)	379,498	408,413	379,498	408,413
Interest During Construction	0	0	0	0
Incremental Working Capital	23,496	(5,256)	23,496	(5,256)
TOTAL FINANCING REQUIRED	402,994	403,157	402,994	403,157
CASH AT THE END OF PERIOD	1,000	1,446	1,000	1,446

Exchange Rates (As Of 23 March 1998)	
CZK/DEM	18.63
CZK/FRF	5.56
CZK/GBP	56.78
CZK/USD	34.14
CZK/DMK	4.89

- (a) Data reflect the audited 1997 financial statements of Teplárna Kyjov and assume that (i) the GEF grant becomes effective in August 1998 and is drawn as required to finance cap.expenditures; TPK borrows long-term funds using 10-year facility with a floating interest rate of Pribor plus 125 basis points.
- (b) Net Internal Cash Generation is calculated as Income Available to Shareholders plus Depreciation plus Capitalized Interest Expense (which is included on the Income Statement in Interest Expense).
- (c) Amount of GEF Grant is calculated as CZK equivalent of USD 5.15 million plus CZK 18 million associated with optimization of the co-generation cycle. Size of drawdowns in 1998 and 1999 is estimated.
- (d) Size of facility long-term debt facility excludes capitalized interest.
- (e) Without GEF grant, amount of funds drawn from revolver exceeds revolver capacity. Thus, theoretical additional equity investment would be required.
- (f) In 1998, Equity Receipts From Shareholders includes unpaid share subscription of CZK 26.9 million (December 31, 1997), expected share capital increase of CZK 125 million and share premium of CZK 25 million paid by an external investor.
- (g) Capital expenditures associated with the CHP Plant are calculated on the basis of the CKD Turn Key Contract for package K1, less CZK 17 million in import duty (represents import duty on goods expected to be financed from the proceeds of the grant and therefore exempt from import duty).
- (h) It is assumed that imported goods required for District Heat Network Integration will be financed from the proceeds of the GEF grant. Consequently, capital expenditures associated with District Heat Network Integration exclude import duty.
- (i) In 1998, CZK 31 million represents capital expenditures associated with the reconstruction of the first VMG boiler. Additional capital expenditures of CZK 19 million are expected to be incurred in 2000 when the second VMG boiler undergoes reconstruction.
- (j) Hospital Connection Costs represents cap.expenditures associated with reconstruction of the Kyjov hospital heat exchange station (incurred by TPK).
- (k) Cap.expenditures of CZK 31 million for technical documentation were incurred in 1997. Additional cap. expenditures of CZK 4 million expected for 1998.
- (l) Total Investments do not include any price contingency costs.

Date: April 10, 1998; Source: Financial Statements of TPK

Annex 6

Kyjev Waste Heat Utilization Project Procurement and Disbursement Arrangements

Procurement

Procurement methods (See Table A)

Goods

The following procurement packages have been procured through ICB in accordance with the "Guidelines - Procurement under IBRD loans and IDA credits", January 1995, Revised January and August 1996.

Project component A - the CHP plant. Procurement Package K1 provides for the essential equipment and installation for the CHP plant to be set up by the Project. After selection of the lowest evaluated responsive bidder and a no-objection from the Bank in December 1997, a contract has been signed on April 23, 1998.

Project component D - Modernization and expansion of the existing district heating network. This is covered by Procurement Package K2. After selection of the lowest evaluated responsive bidder and a no-objection from the Bank in October 1997, a contract has been signed on April 23, 1998 with the lowest bidder, for whom the no-objection statement from the Bank had been obtained.

Consultant Services and Training

The GEF Grant includes US\$ 100,000 for consultant services, public relations activities and training. These will be pursued in accordance with the "Guidelines - Selection and Employment of Consultants by World Bank Borrowers", January 1997, Revised September 1997. Consultants shall be selected in accordance with the procedure applicable to selection of individuals. The training program and terms of reference for individual consultants will be subject to Bank's prior review.

Prior review thresholds

The procurement packages for the two turn-key contracts (K1 and K2) had been subject to Bank's prior review.

Consultant contracts for firms equal to or in excess of US\$ 100,000 will be subject to Bank's prior review, as will consultant contracts for individuals equal to or in excess of US\$ 50,000.

Disbursement

Retroactive financing

To help improve TPK's cashflow during 1998, early expenditures of the major turn-key contract K1 (which has been signed on April 23, 1998 - i.e., after appraisal), incurred prior to effectiveness of the Grant, will be eligible for retroactive financing in the amount of up to US\$ 1,000,000 (17.5% of the Grant portion to be provided to TPK).

Allocation of Grant proceeds (See Table B)

The allocation of Grant proceeds is given in Table B, which also indicates the financing for the various categories of expenditures. The Grant would essentially be used to fund portions of contract expenditures of packages K1 and K2.

Use of statements of expenses (SOEs)

Disbursement for contracts for services of, or above US\$ 100,000 equivalent for firms and US\$ 50,000 equivalent for individuals would be made against full documentation, and for those less than this amount will be made against Statements of Expenditures (SOEs). For project supervision, training and public relations, disbursements will be made on the basis of SOEs. Full documentation in support of SOEs would be available for review during supervision by Bank staff and for annual audits, which will be required to specifically comment on the propriety of SOE disbursements and the quality of the associated record-keeping.

Special account: N/a

Annex 6, Table A: Project Costs by Procurement Arrangements¹

(in US\$ million equivalent)

Expenditure Category	Procurement Method				Total Cost (including contingencies)
	ICB	NCB	Other	N.B.F	
1. Works					
Construction and reconstruction of buildings at the Glass Factory				0.745 (a)	0.745
2. Goods and Works					
Turn-key Contracts:					
Procurement Package K1 - equipment and installation for the CHP plant	20.350 (5.044)				20.350 (5.044)
Replacement and retrofitting of boilers	1.560				1.560
Procurement Package K2 - Modernization and Extension of District Heat Network	1.638 (0.656)				1.638 (0.656)
Turn-key contract with the City/ Teplo Kyjov:					
Decommissioning of gas-fired boilers and replacement with heat exchangers				0.520	0.520
3. Services					
Engineering costs (b)					
Training of personnel (TA) (c)					
Project supervision and dissemination activities by MoE			0.120 (d) (0.100)		0.120 (0.100)
TOTAL	23.548 (5.700)		0.120 (0.100)	1.265	24.933 (5.800)

¹ For details on presentation of Procurement Methods refer to OD11.02, "Procurement Arrangements for Investment Operations." Details on Consultant Services can be shown more easily in the Table A1 format (additional to Table A, where applicable).

- (a) Contract between a civil contractor and TPK is already underway;
- (b) Included in the procurement packages K1 and K2 (turn-key contracts);
- (c) Included in procurement package K1;
- (d) Consulting services, training and public relations;

Note: N.B.F. = Not Bank-financed (includes elements procured under parallel cofinancing procedures, consultancies under trust funds, any reserved procurement, and any other miscellaneous items). The procurement arrangement for the items listed under "Other" and details of the items listed as "N.B.F." need to be explained in footnotes to the table or in the text.

Figures in parenthesis are the amounts to be financed by the GEF Grant.

Annex 6, Table B: Allocation of Grant Proceeds

Expenditure Category	Amount allocated in US\$	Financing Percentage
(1) Goods and Works:		
a) Component A of the Project (equipment and installation for the CHP plant under Procurement Package K1);	4,540,000 (a)	100% of foreign expenditures, 100% of local expenditures (ex-factory cost), and 70% of local expenditures for other items procured locally
b) Component D of the Project (Modernization and Extension of District Heat Network under Procurement Package K2)	590,000 (b)	
(2) Services:		
Project supervision by MoE, training and public relations	90,000 (c)	100%
(3) Unallocated		
	580,000 (d)	
Total	5,800,000 (e)	

- (a) 22% of contract
(b) 36% of contract
(c) 75% of services
(d) 10% of GEF Grant
(e) 23% of project

Annex 7 **Kyjev Waste Heat Utilization Project** **Project Processing Budget and Schedule**

A. Project Budget (US\$000)	<u>Planned</u> (At final PCD stage)	<u>Actual</u>
FY 96		17.8
FY 97		118.6
FY 98		258.0
B. Project Schedule	<u>Planned</u> (At final PCD stage)	<u>Actual</u>
Time taken to prepare the project (months)		
First Bank mission (identification)	06/1996	06/1996
Appraisal mission departure	03/1998	03/17/1998
Negotiations	05/1998	06/1998
Planned Date of Effectiveness	10/1998	/ /19

Prepared by: Ministry of Environment, Teplarna Kyjev, a.s.

Preparation assistance: GEF

Bank staff and key consultants who worked on the Project included:

Name	Specialty
Helmut Schreiber	Team Leader
Christian Duvigneau	Alternate Team Leader, Financial Analysis
Victor Loksha	Environmental Economist (Consultant)
Duane Kexel	Economist (Consultant)
Friedrich Janitschek	Technical Specialist (Consultant)
Friedrich Kapusta	Environmental Impact Analysis (Consultant)
Bernie Baratz	Environmental Specialist
Naushad Khan	Procurement Specialist
Joseph Formoso	Disbursement Specialist
Sandra Durham	Financial Management Specialist
Alessandra Iorio	Lawyer
Jocelyne Albert	GEF Specialist
Samuel Fankhauser	GEF Specialist
Charles Feinstein	GEF Specialist

Annex 8
Kyjov Waste Heat Utilization Project
Documents in the Project File*

A. Project Implementation Plan

Teplarna Kyjov, a.s., Business Plan, August 15, 1997

B. Bank Staff Assessments
Preparation Mission Report*
Environmental Assessment*

C. Other

- Jihomoravská Plynárenská (JMP), a.s., Annual Report, 1996;
- Jihomoravská Energetika (JME), a.s., Annual Report, 1995;
- Větrovacká Moravia Glass (VMG), Annual Report, 1995;
- Moravia Glass, a.s., (MG) Holding, Annual Report, 1995-96
- Hex Capital: Teplarna Kyjov a.s., Preliminary Request for Proposals, Dec. 32, 1997*
- Hex Capital: Data Book 1 and Data Book 2 in context of inviting commercial bank and strategic investor proposals, Feb. 1998.

***Including electronic files.**

Annex 9. Statement of Loans and Credits Table A

Status of Bank Group Operations in Czech Republic IBRD Loans and IDA Credits in the Operations Portfolio

Project ID	Loan or Credit No.	Fiscal Year	Borrower	Purpose	Original Amount in US\$ Millions				Difference Between expected and actual disbursements a/		
					IBRD	IDA	Cancellations	Undisbursed	Orig	Frm	Rev'd
Number of Closed Loans/credits: 3											
<u>Active Loans</u>											
CZ-PE-8381	IBRD34740	1992	CEZ	Power & Envn. Improv	246.00	0.00	0.00	91.32	91.30	0.00	
Total					246.00	0.00	0.00	91.32	91.30	0.00	
					<u>Active Loans</u>	<u>Closed Loans</u>	<u>Total</u>				
Total Disbursed (IBRD and IDA):					154.68	460.28	614.96				
of which has been repaid:					11.86	54.96	66.82				
Total now held by IBRD and IDA:					234.14	405.32	639.46				
Amount sold					0.00	0.00	0.00				
Of which repaid					0.00	0.00	0.00				
Total Undisbursed					91.32	0.00	91.32				

a. Intended disbursements to date minus actual disbursements to date as projected at appraisal.

b. Rating of 1-4: see OD 13.05. Annex D2. Preparation of Implementation Summary (Form 590). Following the FY94 Annual Review of Portfolio performance (ARPP), a letter based system will be used (HS = highly Satisfactory, S = satisfactory, U = unsatisfactory, HU = highly unsatisfactory): see proposed Improvements in Project and Portfolio Performance Rating Methodology (SecM94-901), August 23, 1994.

Note:

Disbursement data is updated at the end of the first week of the month.

Annex 9. Statement of Loans and Credits

Table B

Czech Republic
STATEMENT OF IFC's
Committed and Disbursed Portfolio
As of 30-Nov-97
(In US Dollar Millions)

FY Approval	Company	Committed				Disbursed			
		IFC				IFC			
		Loan	Equity	Quasi	Partic	Loan	Equity	Quasi	Partic
1992	Mokra	0.00	17.61	0.00	0.00	0.00	17.61	0.00	0.00
1992	Zivnostenska	0.00	5.42	0.00	0.00	0.00	5.42	0.00	0.00
1994	Autokola	9.39	0.00	2.85	12.30	9.39	0.00	2.85	12.30
1994	Beronit	3.81	0.00	0.00	0.00	3.81	0.00	0.00	0.00
1995	Plzensky	25.61	0.00	8.54	17.08	25.61	0.00	8.54	17.08
1995	Sumperk	3.07	0.00	1.27	0.00	3.07	0.00	1.27	0.00
1997	Kladno	43.55	0.00	15.00	24.19	7.74	0.00	15.00	4.82
1997	Nova Hut	73.17	0.00	0.00	170.74	0.00	0.00	0.00	0.00
Total Portfolio:		158.60	23.03	27.66	224.31	49.62	23.03	27.66	34.20

Approvals Pending Commitment

		Loan	Equity	Quasi	Partic
1995	ZIVNOSTENSKA 2	9.07	0.00	0.00	0.00
Total Pending Commitment:		9.07	0.00	0.00	0.00

Annex 10. Czech Republic at a Glance

8/20/97

POVERTY and SOCIAL

	Czech Republic	Europe & Central Asia	Upper-middle-income
Population mid-1996 (millions)	10.3	479	479
GNP per capita 1996 (US\$)	4,620	2,180	4,540
GNP 1996 (billions US\$)	47.7	1,043	2,173

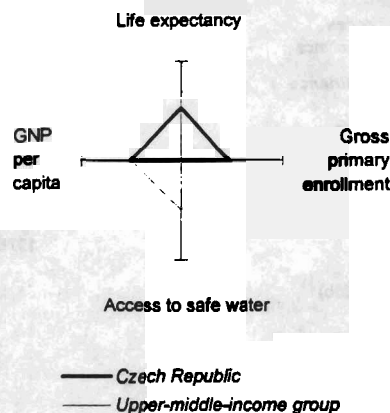
Average annual growth, 1990-96

	Czech Republic	Europe & Central Asia	Upper-middle-income
Population (%)	-0.1	0.3	1.5
Labor force (%)	0.4	0.5	1.8

Most recent estimate (latest year available since 1989)

Poverty: headcount index (% of population)			
Urban population (% of total population)	65	65	73
Life expectancy at birth (years)	73	68	69
Infant mortality (per 1,000 live births)	8	26	35
Child malnutrition (% of children under 5)
Access to safe water (% of population)	86
Illiteracy (% of population age 15+)	13
Gross primary enrollment (% of school-age population)	100	97	107
Male	100	97	..
Female	100	97	..

Development diamond*



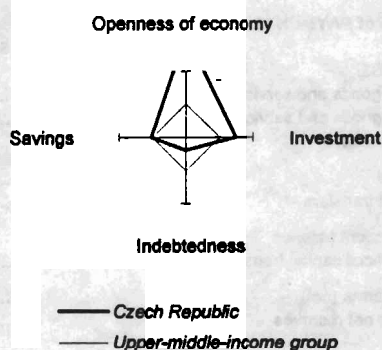
KEY ECONOMIC RATIOS and LONG-TERM TRENDS

	1975	1985	1995	1996
GDP (billions US\$)	..	27.6	47.2	52.1
Gross domestic investment/GDP	..	27.6	27.8	30.9
Exports of goods and services/GDP	59.3	56.9
Gross domestic savings/GDP	..	27.6	23.3	22.9
Gross national savings/GDP	24.3	22.3
Current account balance/GDP	-2.9	-8.6
Interest payments/GDP	..	0.7	1.4	1.5
Total debt/GDP	..	12.5	36.4	39.8
Total debt service/exports	8.8	8.0
Present value of debt/GDP	36.0	..
Present value of debt/exports

(average annual growth)

	1975-85	1986-96	1995	1996	1997-05
GDP	..	-1.7	5.1	4.4	..
GNP per capita	..	-0.6	7.0	4.4	..
Exports of goods and services	7.9	5.3	..

Economic ratios*



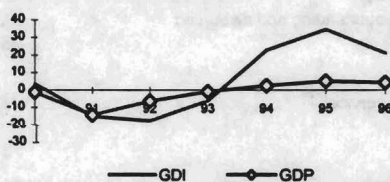
STRUCTURE of the ECONOMY

	1975	1985	1995	1996
(% of GDP)				
Agriculture	..	6.9	5.1	4.8
Industry	..	60.0	40.3	38.5
Manufacturing	25.9	25.2
Services	..	33.1	54.6	56.8
Private consumption	57.3	57.9
General government consumption	19.4	19.2
Imports of goods and services	63.8	65.0

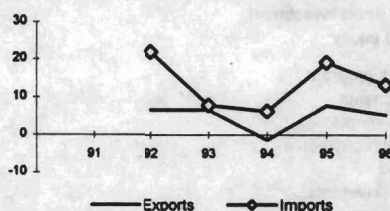
(average annual growth)

	1975-85	1986-96	1995	1996
Agriculture
Industry
Manufacturing
Services
Private consumption	6.4	6.0
General government consumption	-4.3	1.9
Gross domestic investment	..	0.9	34.6	21.2
Imports of goods and services	19.2	13.3
Gross national product	..	-1.3	6.9	4.4

Growth rates of output and investment (%)



Growth rates of exports and imports (%)



Note: 1996 data are preliminary estimates. Figures in *italics* are for years other than those specified.

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

PRICES and GOVERNMENT FINANCE

Domestic prices

(% change)

Consumer prices

Implicit GDP deflator

Government finance

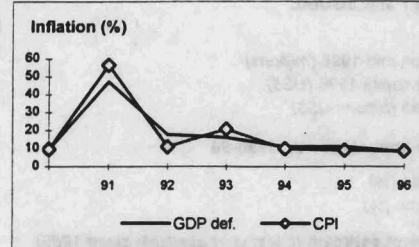
(% of GDP)

Current revenue

Current budget balance

Overall surplus/deficit

	1975	1985	1995	1996
Consumer prices		2.3	9.1	8.8
Implicit GDP deflator		1.7	11.2	8.2
Current revenue	35.1	34.1
Current budget balance	4.1	3.9
Overall surplus/deficit	0.6	-0.1



TRADE

(millions US\$)

Total exports (fob)

n.a.

n.a.

Manufactures

Total imports (cif)

Food

Fuel and energy

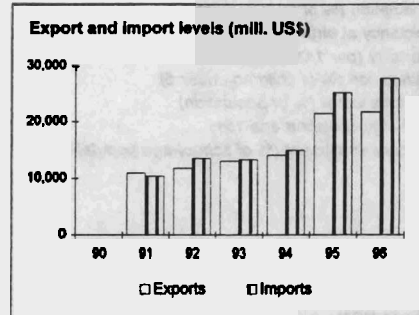
Capital goods

Export price index (1987=100)

Import price index (1987=100)

Terms of trade (1987=100)

	1975	1985	1995	1996
Total exports (fob)	21,463	21,703
Manufactures
Total imports (cif)	25,140	27,674
Food	1,673	1,915
Fuel and energy	1,975	2,415
Capital goods	9,350	10,620
Export price index (1987=100)
Import price index (1987=100)
Terms of trade (1987=100)



BALANCE of PAYMENTS

(millions US\$)

Exports of goods and services

Imports of goods and services

Resource balance

Net income

Net current transfers

Current account balance,

before official capital transfers

Financing items (net)

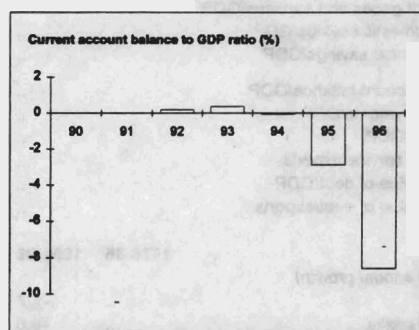
Changes in net reserves

Memo:

Reserves including gold (mill. US\$)

Conversion rate (local/US\$)

	1975	1985	1995	1996
Exports of goods and services	28,180	29,654
Imports of goods and services	30,016	33,841
Resource balance	-1,836	-4,187
Net income	-106	-680
Net current transfers	579	391
Current account balance, before official capital transfers	-1,362	-4,476
Financing items (net)	8,820	3,648
Changes in net reserves	-7,458	828
Reserves including gold (mill. US\$)	13,984	12,489
Conversion rate (local/US\$)	..	17.2	26.5	27.1



EXTERNAL DEBT and RESOURCE FLOWS

(millions US\$)

Total debt outstanding and disbursed

IBRD

IDA

Total debt service

IBRD

IDA

Composition of net resource flows

Official grants

Official creditors

Private creditors

Foreign direct investment

Portfolio equity

World Bank program

Commitments

Disbursements

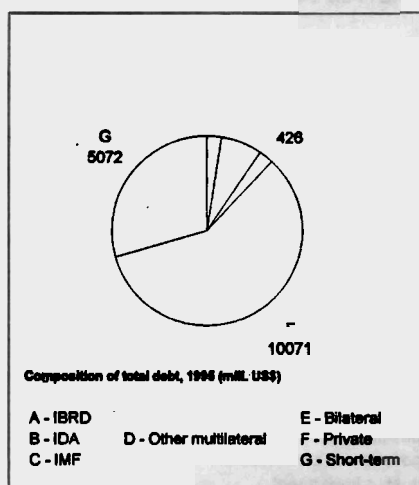
Principal repayments

Net flows

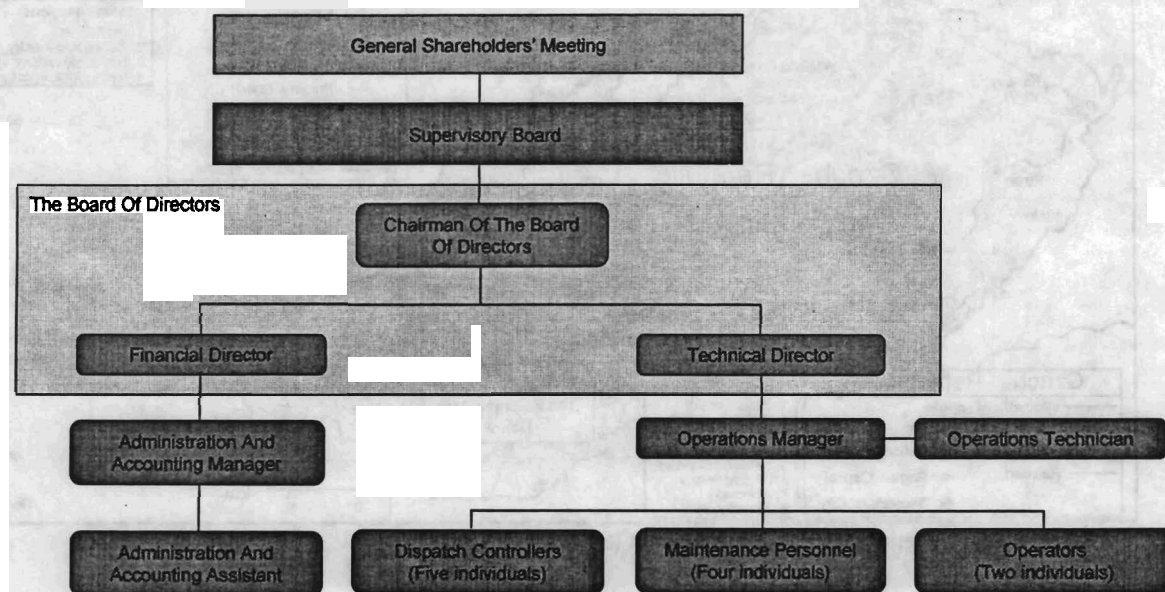
Interest payments

Net transfers

	1975	1985	1995	1996
Total debt outstanding and disbursed	..	3,458	17,190	20,748
IBRD	..	0	434	435
IDA	..	0	0	0
Total debt service	..	836	2,625	3,820
IBRD	..	0	28	39
IDA	..	0	0	0
Official grants	..	0	45	..
Official creditors	..	-16	34	..
Private creditors	..	-119	2,946	..
Foreign direct investment	..	0	2,526	1,388
Portfolio equity	..	0	82	..
Commitments	..	0	0	0
Disbursements	..	0	57	42
Principal repayments	..	0	0	10
Net flows	..	0	57	32
Interest payments	..	0	28	29
Net transfers	..	0	29	3



**Proposed Organizational Chart Of Teplárna Kyjov, a.s.
(Upon Completion Of Construction)**



The Location of the City of Kyjov The Czech Republic Kyjov Waste Heat Utilization Project



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