PROPOSAL FOR REVIEW

PROJECT TITLE:	**CZECH REPUBLIC: KYJOV WASTE HEAT UTILIZATION PROJECT**
GEF FOCAL AREA:	Climate Change
COUNTRY ELIGIBILITY:	Ratified FCCC on October 7, 1993
TOTAL PROJECT COST:	US$19.07 million
GEF FINANCING:	US$5.09 million
GOVERNMENT COUNTERPART FINANCING:	US$4.00 million
COFINANCING:	TEPLARNA Kyjov US$9.98 million
ASSOCIATED IBRD PROJECT:	None
GEF IMPLEMENTING AGENCY:	World Bank
EXECUTING AGENCY:	Ministry of Environment
LOCAL COUNTERPART AGENCY:	TEPLARNA Kyjov
PROJECT DURATION:	3 years
GEF PREPARATION COSTS:	None

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
INTERNATIONAL DEVELOPMENT ASSOCIATION

Europe and Central Asia Regional Office
EC1 Country Department

Project Concept Document

Czech Republic

Kyjov Waste Heat Utilization Project

Date: February 28, 1997 [X] Draft [ ] Final

Task Manager: Helmut Schreiber Country Manager:
Project ID: Focal Area: Climate Change POC:
Lending Instrument: PTI: [X] Yes [ ] No

Project Financing Data [ ] **Loan** [ ] **Credit** [ ] **Guarantee** [x] **GEF Grant** [ ] **Other [Specify]**

For Loans/Credits/Others:

Amount (US$m/SDRm):
Proposed **Terms:** [ ] To be defined [ ] Multicurrency [ ] Single currency
Grace period (years): [ ] Standard Variable [ ] Fixed [ ] LIBOR-based
Years to maturity:
Commitment fee: %
Service charge: %
Financing plan (US$m): $19.067

Source	Local	Foreign	Total
Government	$4.0		$4.0
Cofinanciers		$9.975	$9.975
IBRD/IDA			
GEF		$5.092	$5.092
Other (specify)			

Borrower: TEPLARNA Kyjov
Guarantor:
Responsible agency(ies): Ministry of Environment

For Guarantees: [ ] Partial Credit [ ] Partial risk

Proposed coverage:
Project sponsor:
Nature of underlying financing:
Terms of financing:
Principal amount (US$m)
Final maturity
Amortization profile
Financing available without guarantee: [ ] Yes [ ] No
If yes, estimated cost or maturity:
Estimated financing cost or maturity with guarantee:

Block 1: Project Description

1. Project development and Global objectives .

The main purpose of this project is to decrease harmful emissions of greenhouse gases. The resulting objective will be to increase the energy efficiency and the reliability of heat and power supply of the Vetropak Moravian Glass factory and the City of Kyjov district heating system. **Other project objectives include: demonstration of gas-fired combined cycle cogeneration in the Czech Republic** where this technology has not been frequently used; demonstration of the benefits of combining the production of industrial process heat and district heat for a city; and demonstration of the possibility of cooperative efforts between the Czech Ministry of Environment and the private sector in enhancing the environmental benefits from such a project.

Background: Vetropak Moravian Glass (VMG) in Kyjov 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 nearly continuously. Within the next few months, VMG will reconstruct one of their glass furnaces which offers an opportunity for significant energy savings and environmental gains. Such reconstruction occurs at intervals of about 7 years. As part of this reconstruction program, Terplana/Kyjov on behalf of the Ministry of Environment, is now responsible with VMG and the City of Kyjov to develop a combined-cycle alternative in which waste heat will be used in part to produce process heat and electricity and the other part will be provided to the City as the primary heat source for their district heating system. In addition to securing needed process heat, VMG wishes to increase the reliability of the electricity supply from the regional utility, JME. Frequent voltage flickers now cause substantial difficulty with VMG's control systems, resulting in production problems. Thus, the project includes on-site power generation and an additional connection to the regional grid.

The project outcomes can be measured in terms of the differences in energy inputs required to produce of the same quantities of heat and electricity with and without this 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 on the CEZ system. Improved reliability of the heat and electric supply can be measured in terms of the frequency and duration of outages at the VMG plant Emissions of NO_x, SO_x, and CO_2 can also be compared quantitatively for the with and without project scenarios. Measurements or estimates will be required at the VMG plant, at the Kyjov district heating boilers and at the new CEZ lignite plants. 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.

2. Project components: The major physical project components include the CHP plant, additions to the Kyjov heat distribution system and a new electrical connection to the 110 kV electric grid. The estimated costs are:

Component	Category	Indicative Costs (US$M)	% of Total
Construction of CHP Plant	Physical	14,788 ($4.5) GEF	77.6
Extension of Heating System	Physical	1,752 ($0.56) GEF	9.2
New Tie Line to 110 kV	Physical	2,119	11.1
Financing Capital	Other	408	2.1
	Total	19,067	100.00

3. Benefits and target population:

The direct beneficiaries of the project will be the consumers of heat in the city of Kyjov and VMG. Both of these groups will receive cleaner, more reliable electricity and heat at lower costs.

The project will displace power production at an unspecified lignite plant on the CEZ system with related decreases in emissions. It will also eliminate the harmful NO_x emissions from the 15 district heating stations that are located near residential areas in Kyjov. The global environment will benefit from the reduction in greeenhouse gas emissions.

The project will also improve the reliability of power supply for the regional electric utility (JME) which currently experiences outages due to overloading of the existing transmission and distribution system during periods of peak demand. The regional electric utility also expects to purchase electricity from this project at a cost that is below what they must now pay their 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 also gain a major load under a secure long term contract. As long as the price of this gas is greater than their incremental costs this will allow them to spread their fixed costs over a greater volume of sales and can benefit the other gas consumers in this distribution area.

To the extent that this project is leveraged through demonstration of combined-cycle technology for joint industrial and community purposes and through possible piggy-back funding programs that convert environmental benefits to financial incentives, many areas throughout the Czech Republic could benefit from this project.

4. Institutional and implementation arrangements:

The Czech Ministry of Environment has been the lead agency in identifying potential projects for GEF funding and is expected to continue as the lead implementing agency. The role of MOE in loan administration, project oversight and reporting, and monitoring and evaluation will be agreed to during appraisal. Other donors, notably the European Union, have expressed interest in financing this activity, as well as a public awareness/information campaign about the environmental benefits of this project. These will be critical to the wide replicability of the project. Both of these activities will be implemented by the Ministry of Environment.

Block 2: Project Rationale

5. CAS objective(s) supported by the project: Document number and date of latest CAS discussion:

GEF operational Strategy/Program Objective addressed by the project: 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, as submitted in September, 1994. Economic analysis shows that the project has a unit abatement cost of $1.90 per MT of CO2 or about $7 per ton of carbon equivalent, well within the indicative range of cost effectiveness of $10 tC.

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, 12 projects were identified as eligible for GEF financing, but the proposed project has been selected by the Government as its top priority, both in terms of its national objectives, as articulated in the national communication, but also in terms of its relative cost effectiveness.

6. Main sector issues and Government strategy:

The energy sector in the Czech Republic faces a common set of challenges with many other Eastern European countries. The planned economies of the pre-1989 era measured progress in terms of energy consumption and did not properly recognize the true cost of indigenous resources 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. Since 1993, the Czech economy has been growing but energy consumption has grown faster and energy intensities have continued to increase. From 1Q 1995 to 1Q 1996, electric consumption grew by 10.4% while GNP increased by 5.0%.

Given the strong growth expectations for the energy sector, the CR faces significant challenges in promoting energy efficiency, influencing fuel choices and 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 the public sector challenge.

The key policy instruments in shaping the future Czech energy sector will be energy pricing, air quality regulation 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 the public sector

role in financing the required investments. Finally, the public sector is not currently empowered to intervene in power quality or reliability issues between consumers and the regional power companies.

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

The project will provide seminal answers to several energy pricing questions. The recognition of common interests between regional electric distributors, regional gas distributors, private industry with large heat and electric demands and local district heating companies is an important precedent. The formation of a new joint stock company specifically for this project demonstrates both commitment and a visible model for replication or modification in future projects. The testimony of this disparate group of investors to a gas-dependent project should build technology awareness and confidence in the future availability and reasonable pricing of natural gas.

The incremental costs to be financed by GEF in this instance are tied to incremental fuel costs for natural gas. If natural gas prices rise by more or less than anticipated here, the issue of the appropriate level of public sector support of the project may arise. A grant repayment scheme indexed to actual future gas prices could be used to true-up the actual level of support. The countervailing argument is that risks and rewards should both be recognized. Future gas prices could prove to be much higher or much lower than the forecasts used to establish the incremental costs. Project developers stand to lose if the prices are much higher and gain if they are much lower. If the risks are symmetric, no indexing may be necessary.

To complete this project which provides significant annual energy to the regional electric company will require an agreement for compensating the project developer (Teplarna Kyjov) for the power provided. The sizing of the GEF support has been based on the costs avoided by CEZ plus an adjustment for 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 net revenues of both CEZ and the local electric distribution company. The distribution of benefits between these two parties can be established through the tariff setting authorities of the MOEC.

The project does not directly address the full externalities associated with coal/lignite burning but the use of GEF funding would implicitly establish a minimum value for CO_2 reductions. If that value will be made available to future projects, there will be spread effects from this project. The project provides many opportunities for MOE to leverage the results although the specific course of action has not yet been determined.

8. Project alternatives considered and reasons for rejection

The alternative projects considered include 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 MW for each case while the electric capacities are 7.64 Mw, 9.65 Mw and 21.63 Mw. Operation for 8,400 hours per year would then produce between 64,176 MWh and 181,692 MWh of electricity annually for these alternates.

Another alternate considers use of VMG waste heat exclusively to meet VMG heating needs and to produce electricity as a by-product. Net average electric capacity in this case would be 1.4 MW and annual electric production would be 11,760 MWh.

A final alternative is a mixed heating solution in which VMG net waste heat capacity of 7.8 MW would provide 28,267 MWh of heat in the five winter months and 19,002 MWh of heat in the other months to VMG, the City of Kyjov, the hospital. the flour mill and the dairy. The remaining 6,345 MWh of winter heating load would come from the existing district heat boilers in Kyjov. This residual equals approximately 12.0% of the total annual heat demand. In this instance, VMG waste heat would be used to supply as much of the City's heating needs as possible from waste heat boilers but all electricity would continue to be produced in CEZ central station power plants. Project financial and economic analyses show that this alternative is commercially viable without public sector support, and this alternative thus serves as the baseline for GEF incremental cost analytical purposes.

The alternative proposed for GEF financing maximizes CO_2 reductions relative to this baseline, and is the most cost-effective in CO_2 reduction terms of all the alternatives considered. Both the baseline and the GEF alternatives will meet Czech national air emissio standards (anticipated for 1998).

9. Major related projects financed by the Bank and/or other development agencies (completed, ongoing and planned).

Sector issue	Project	Latest Form 590 Ratings (Bank-financed projects only) IP	DO
Bank-financed			
Other development agencies			

10. Lessons learned and reflected in proposed 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 was lack of familiarity with Bank/GEF criteria and procedures. As well, 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 electric 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.

The analysis of the Kyjov project clearly shows that the incremental CO_2 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 evaluation of other potential projects.

11. Indications of borrower and recipient commitment and ownership:

Teplarna Kyjov (TK) is a new joint-stock company which has been formed specifically to develop this project. TK was founded on 21 January 1997 and was legally registered on 7 February 1997. TK has acquired clear title to all project rights by purchase from SAGE. TK has been capitalized at 90.0 million CK (USD 3.33 million.

TK is clearly committed to the project and is under significant time pressure to implement the project as soon as possible. They have initiated several key studies that demonstrate their commitment and awareness of the critical path for project completion. Key initiatives include:

1. TK has retained ENERGOCONSULT of Prague to conduct an environmental assessment sufficient to meet the dictates of Czech law; to provide project engineering and to manage the procurement process in accordance with World Bank procedures. ENERGOCONSULT will also conduct a public hearing and a public relations campaign to inform local residents about the project.
2. TK has retained a private financial consultant to prepare a comparison of financing options and a business plan to govern the project.
3. TK intends to retain the Energy Institute in Brno to conduct a reliability study to verify the desired levels of electric reliability at VMG and the most cost effective means of providing the desired level of reliability.
4. TK has the most critical contracts prepared in draft form and expects to have contracts signed by May, 1997.
5. TK expects to obtain all environmental approvals without significant opposition and expects to have all building permits by November, 1997.
6. TK has met with World Bank consultants to discuss the project plans in detail and have promised close cooperation in the future in providing all information that is required to support the GEF application.

12. Value added of Bank and GEF support:

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 from the project and the greatest global environmental benefits. By covering the incremental costs of moving to the maximum cogeneration alternative, the Bank makes it possible to internalize CO_2-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 this 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 this project will be generalized throughout the Czech Republic.

Block 3: Project Preparation

13. Has a project preparation plan been agreed with the borrower (see Annex 2 to this form)	[x] Yes Date Submitted: April 1997	[ ] No Date Expected: MM/DD/YY
14. Has borrower drafted a project implementation plan (See Attachment for suggested content)	[ ] Yes Date Submitted: to be submitted June, 1997	[ ] No Date Expected: MM/DD/YY
15. Advice/consultation outside country department	[x] Within the Bank: C.Feinstein, ENVGC, P. Kalas, EMTEN	[x] Other development agencies: Duane Kexel (Power System Engineering) F. Janitschek (Consultant, Austria) S. Kolar (Center for Clean Air Policy, Czech) STAP Reviewer: Technical Review (attached) The reviewer stronger supports the project. He has made suggestions re: the incremental cost analysis a. the institutional arrangements, both of which have been incorporated into the revised draft.

16. Issues Requiring Special Attention

a. Economic

[ ](list issues below, e.g., fiscal impact, pricing distortions, etc.) [ ] To be defined [ ] None

Economic evaluation methodology:	[ ] Cost benefit	[ ] Cost effectiveness	[ ] Other [specify]	Incremental cost analysis

(a) and (b) Economic/Financial

Given the uncertain future of natural gas prices in the CR and the substantial influence of those prices on the incremental costs that this project seeks as a grant from GEF, the possibility exists that the level of public support provided will ex post prove to be too large or too small. One can argue that the risks are symmetric and simply allow the future to evolve to the benefit or detriment of the project sponsors that bear the risk. Alternatively, the grant agreement could provide for "true-up" settlement payments drawn from an escrow account. Such payments would be indexed to the actual price of natural gas in future years.

It should be recognized that the long run marginal costs of electric energy and capacity used in the incremental cost analysis and the forecast of expected capacity additions have been based on data from the 1994 Annual Report from CEZ supplemented by informal discussions with CEZ staff. CEZ is a private company and has historically treated key planning data as confidential trade secrets. Although the current estimates of these key parameters are believed to be realistic, they are not currently backed by full CEZ documentation. A policy stance that mandates payment of avoided costs for power sold to the grid would force establishment of appropriate pricing to guide such investments but could be difficult to achieve.

The August 1996 study of this project included a financial analysis of the project with SAGE as the developer that indicated that a GEF grant of USD 8.6 million would be required to meet bank coverage requirements for the financial structure that was anticipated. The incremental cost analysis based on economic costs that is part of this PCD shows an incremental cost for the Alternative recommended for GEF support of about USD 5.1 million. TK could potentially consider many different financial alternatives than were available to SAGE and should face different risks since they control the contracts needed for project success. TK has been

advised that it may be quicker and less intrusive to rely on the economic analysis for sizing the GEF grant request than to seek a larger amount based on financial considerations which could be subject to more debate. TK's financial planning efforts should carefully consider this issue.

b. Financial
[ ](list issues below, e.g., cost recovery, tariff policies, financial controls and accountability, etc.) [ ] To be defined [ ] None

c. Technical
[ ](list issues below, e.g., appropriate technology, costing, etc.) [ ] To be defined [ ] None
To reasonably assess the efficiency improvement from this project, the difference between efficiencies with and without the project should be measured and reported on a systematic basis. The basis for efficiency calculations with and without the project should be agreed upon as part of the grant agreement.

d. Institutional
[ ](list issues below, e.g., project management, M&E capacity, administrative regulations, etc.) [ ] To be defined [ ] None
The role of MOE in promoting, administering, publicizing and evaluating this project will be clarified during appraisal. If additional assistance to MOE is needed for training staff and/or launching a public information campaign, other grant funds will likely be made available to the Government to do so, most likely from the European Union.

e. Social
[ ] (list issues below, e.g., gender, protection of indigenous and other vulnerable groups, etc.) [ ] To be defined [x] None

f. Resettlement
[ ] (list issues below, e.g., resettlement planning, compensation payments.) [ ] To be defined [x] None

g. Environmental

i. Environmental issues: Major: [x] To be defined [x] None
Other:

ii. Environmental category: [x] A [ ] B [ ] C

iii. Justification/Rationale for category rating:

iv. Status of Category A assessment: EA start-up date: prior to appraisal (June 1997)
Date of first EA draft:
Current status:

v. Proposed actions

vi. Status of any other environmental studies:

vii. Local groups and NGOs consulted: (List names):

viii. Borrower permission to release EA: [ ] Yes [ ] No

ix. Other remarks:

Preparation Implementation Operation

h. Participatory Approach

Beneficiaries/community groups	C	C	C
Intermediary NGOs			
Academic institutions	IS	IS	IS
Local government	C	C	C
Other donors	C	C	C
Other			

This project has thus far been developed primarily by TK in collaboration with the Ministry of Environment, regional electric and gas utilities, and the private sector, and local district heating companies. Through the preparation process, TK was formed and now has ownership of the project.

The public consultation process, which will include meeting, as relevant, with NGOs, will be undertaken early in 1997 as part of the environmental assessment. Findings and recommendations will be incorporated into the project design.

TK is developing an information dissemination strategy for broadly informing the public of project achievements and results as they become available. It is anticipated that the MOE will disseminate information on technology innovation, economics/financial analysis, and environmental benefits of the project to a wide range of private and public sector actors. This will ensure broad dissemination of findings plus increase the project's potential for replication throughout the country. This activity will be financed by additional grant support to the MOE from sources other than the GEF. (The EU has expressed interest in financing this activity).

i. Sustainability

Gas-fired cogeneration cycles have proven very reliable and operationally robust world-wide. It is therefore near certain that the investment will be used as intended and will provide the anticipated benefits over the operating life of the CHP plant. VMG is a financially healthy enterprise, and its closure or the disappearance of the Kyjov hospital or other major consumers of project outputs during the project life seems quite unlikely. The primary risk to sustainability is exorbitant future gas prices which could force futur fuel switching to a dirtier fuel. However, given the diversity of European natural gas supplies and expected fuel market trends this does not seem likely.

j. Critical Risks (see fourth column of Annex 1):

	Risk	Risk Rating	Risk Minimization Measure
Project outputs to development objectives			
Project components to outputs			
Overall Risk Rating			

The key evaluative questions are whether or not the expected project heat and power outputs will be produced once the CHP plant is completed and whether or not the estimated CO2 reductions will take place.

The primary threat to expected production would be from market or technological developments that would force major production modifications at the VMG plant or at the hospital, dairy or flour mill in Kyjov. These risks have not been formally assessed but successful contracting would seem to verify the expectations of the involved parties that the planned future is plausible. This risk would be modest.

The proposed technology is not complex or unproved. The gas turbine is expected to be very reliable. The technical or performance risk of the project is low.

The incremental costs developed to date rely centrally on estimates of future gas prices and on the costs of CEZ-generated power which is displaced by this project. Future gas prices are highly uncertain but this risk can be controlled by indexing or by the judgment that the risks of higher or lower prices than estimated are symmetric and therefore offsetting. The risk that gas prices will differ from what is assumed is substantial but the cost of being wrong is limited by the size of the grant and by the offsetting potent The appraisal mission will establish a framework for setting the appropriate gas prices. The Bank will address issues of secto... policies as part of its country dialogue.

k. 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.

Additional environmental concerns may be identified during the assessment process but no major issues are currently anticipated.

Block 4: Conditionality Framework

17. [ ] [Identify the critical policy and institutional reforms sought, and where appropriate, the likely areas of conditionality.] [ ] To be defined

Block 5: Checklist of Bank Policies

18. This project involves (check applicable items):

[ ]	Indigenous peoples	[ ]	Riparian water rights
[ ]	Cultural property	[ ]	Financial management
[ ]	Significant environmental impacts	[ ]	Financing of recurrent costs
[ ]	Natural habitats	[ ]	Local cost sharing
[ ]	Gender issues	[ ]	Cost-sharing above country three-year average
[ ]	Involuntary resettlement	[ ]	Retroactive financing above normal limit
[ ]	Significant consultation	[ ]	Disputed territory
[ ]	Significant participation	[ ]	Forestry
		[ ]	Other

19. Describe issue(s) involved:

Block 6: Task Team/Review Arrangements/Management Decisions

20. Composition of Task Team (see Annex 2)

21. Review Arrangements and Schedule (see Annex 3)

22. Management Decisions

Issue	Action/Decision	Responsibility

Total Preparation Budget: (US$000)
Cost to Date: (US$000)

GO [ ] NO GO [ ] Further Review [Expected Date]

[signature]
Task Manager:

[signature]
Country Manager:

Annex 1

Project Design Summary

Narrative Summary	Key Performance Indicators[1]	Monitoring and Supervision	Critical Assumptions and Risks
CAS Objective			**(CAS Objective to Bank Mission)**
• Reduce greenhouse gas emissions. • Modernize municipal infrastructure and private sector energy infrastructure. • Contribute to regional development. • Help improve environment by reduction of air pollution, including transboundary pollution.	• Disbursment of funds, implementation of project • Reduction of CO_2 emissions • Reduction of other emissions	• Continued discussion with Government during Project Supervision • Monitor progress of project, disbursement of funds • Monitor reduction of emissions	*Assumptions*: Continued commitment of Government and implementing agency to implement the project, to environmental improvements at global (greenhouse gas reduction), regional, and local levels. *Risks*: Commitment to project wanes. Delays in project implementation.
Project Development and Global Objectives			**(Development Objectives to CAS Objective)**
Improve the global and regional environment by reducing harmful emissions through system modernization and extension. • Reduce customers' energy bills through investment in system improvements. • Energu Savings		• Continued discussion with all parties involved during Project Supervision.	*Assumptions*: The municipalities, the privat investor, the district heating companies and the national Government fully in support of Project objectives. *Risks*: Lack of coordination among different players could interfere with speedy preparation and implementation of Project
Project Outputs			**(Output to Development Objectives)**
• Modernized, more efficient energy production and heat supply chain (CHPs distribution network). • Reduced level of air pollution: . reduction of CO2 . reduction of particulate matter . reduction of SO2 . reduction of NOx			*Risk of Delay*: Slow execution might interfere with scheduled efficiency gains. Difficulties in implementing project could interfere with pollution reduction and increase costs for consumers.
Project Components			**(Components to Outputs)**
• Construction of CHP plant • Extension of Heating System • New Tie Line ot 110 kV • Financing Capital			*Few technical risks*. Project Management would require strengthening. Procurement abilities need to be developed.

[1] Baseline and targeted values should be shown, with the latter divided into values expected at mid-term, end of project and full impact.

ANNEX 2

MINISTRY OF THE ENVIRONMENT OF THE CZECH REPUBLIC
International Relations Department

Vršovická 65, Praha 10, the Czech Republic
Phone: (+ 420 2) 6712 2767 Fax: (+ 420 2) 6731 0490

Nr. 330/97
Praha, March 7, 1997

Dear Mr. Schreiber,

The Czech Republic requests assistance from the Global Environment Facility for the Kyjov Waste Heat Utilization Project. As you know, the project has been prepared by your team in close cooperation with representatives from our Ministry and Czech Consultants. The project is consistent with the objective of the Czech strategy for reduction of greenhouse gases and is of high priority for this project. We also feel that the project meets GEF eligibility criteria. The proposed USD 5 million grant would help undertake an activity which will have major demonstration effect throughout our country. The Ministry of Environment will secure the non-incremental cost financing for this investment. It is envisaged that these costs will be covered by the beneficiary institution - Teplárna Kyjov.

In addition, the Ministry plans, in close cooperation with the World Bank, to undertake seminars to disseminate the experiences from this project. Other activities to reduce greenhouse gas emissions through renewable energy projects (mainly biomass), jointly identified by the Ministry and the World Bank, will also be supported by the Ministry. The next steps regarding these projects will discussed and prepared with the World Bank. A detailed plan regarding these additional activities will be presented in May 1997.

Sincerely,

Ing. Alexandra Orlíková, CSc.,
Director, International Relations Department

Mr. Helmut Schreiber
Sr. Environmental Economist
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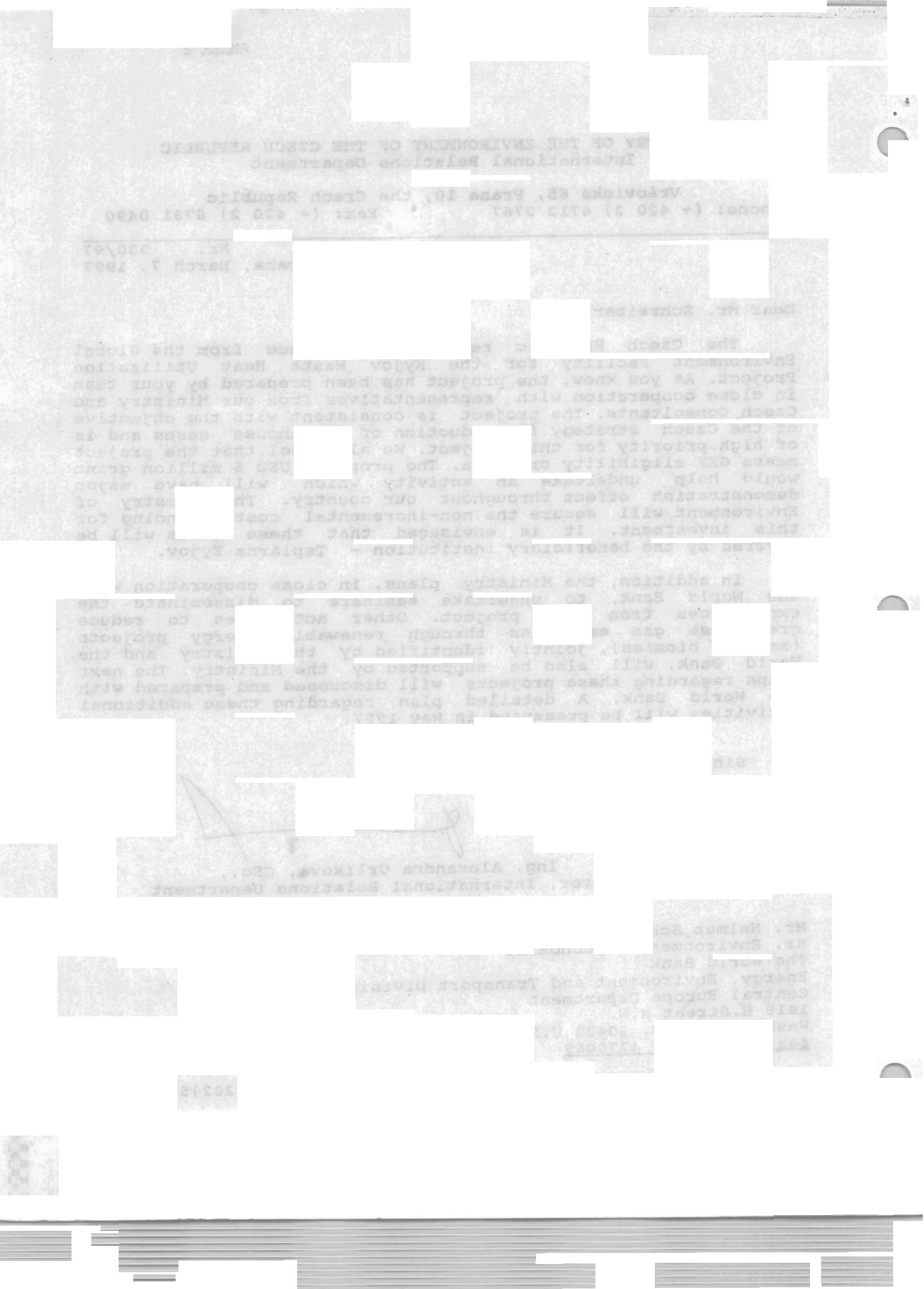

TECHNICAL REVIEW
CZECH REPUBLIC
KYJOV WASTE HEAT UTILIZATION PROJECT

Peer Review

Preliminary Draft of Project Concept Document
KYJOV PROJECT, THE CZECH REPUBLIC

I. Introduction

This review was prepared upon the request of Mr. Helmuth Schreiber, from the World Bank. The reviewed papers and initial input data were submitted by Mr. Duane T. Kexel and Mr. Friedrich Janitschek, consultants to the World Bank.

The key paper assessed in this review was „Preliminary Draft of Project Concept Document (PCD), Kyjov Project". The main source of background information was „GEF Incremental Cost Analysis Vetropak Moravian Glass Project, Kyjov". Both papers were prepared by the consultants to the World Bank, Mr. Kexel and Mr. Janitschek.

II. Methodology

The reviewed paper was compared to „Guidelines for Completing the Project Concept Document for Investment Operations Supported by the Global Environment Facility" (hereafter referred to as the Guidelines). In addition, previous work and knowledge of the GEF principles and incremental-cost calculation were used in the event that the guidelines were not exact enough. Finally, the whole project was reviewed in regard to the current economic environment in the Czech Republic, and the potential business risk was also considered from a detached point-of-view.

As the project implements relatively new and advanced technology (in the Czech energy scene), it was difficult to compare this project with other similar business ventures in the country. Due to the very limited time for review, I was not able to verify all input data used in the economic calculations. I relied in part on previous experience in evaluating cogeneration technologies in the Czech Republic and made use of some parallels.

III. Consistency with the Guidelines

Generally speaking, the paper carefully follows the Guidelines, and I have not found any paragraph in the Guidelines that was not answered in the PCD. (The only exception to this statement might be paragraphs 13 and 14, which were missing in the Guidelines and were subsequently skipped in the PCD; and paragraph 5, which had not yet been delivered.) The following remarks are additional recommendations for improving or explaining - but not significantly changing - the PCD text.

1. Project Development Objectives

The project objectives should make a distinction between those effects that would appear even without GEF contributions and those would only be realized with them. This gain can be derived from cash-flow analysis prepared for the calculation of incremental costs. Thus, if the baseline alternative includes a new connection to a 110 kV transmission line, the main contribution of the GEF project cannot be given as increasing the reliability of the power supply. Increased reliability is an actual feature of the project, but reliability will be also increased in the baseline alternative. Outages were caused by low capacity of the distribution network, and the 110 kV connection should eliminate them at all, even in the baseline scenario.

2. Project Components

The cost of New Tie Line to 110 kV should relate to alternative A (or B1) but not to D as stated ($2.119.000). Moreover, it is not thoroughly clear why the cost of the connection differs so much:

Alternative A	$1.926.000
Alternative B1	$1.296.000
Alternative D	$2.119.000
Alternative D1	$1.426.000

4. Institutional and Implementation Arrangements

The third paragraph has to be updated. The activity of the Ministry of Economy (MOEC) has been terminated last year and the Ministry does not exist any more. According to the Energy Law the Ministry of Industry and Trade (MOIT) is responsible for energy-sector regulation. Nevertheless, energy prices can still be changed only by the Ministry of Finance (MOF). This arrangement slows down any changes in the price structure, and any special agreements among the Ministries (MOE, MOIT, MOF) on project conditions will be very difficult.

The MOEC should be substituted by the MOIT in all of the following paragraphs.

6. Main Sector Issues and Government Strategy

First paragraph: Since 1993 energy intensities do NOT increase when measured by primary energy sources. The only exception is electricity intensity, which increases continuously.

7. Sector Issues Addressed by the Project

The tariff-setting authority is the MOF. The MOIT prepares proposals.

16. Issues Requiring Special Attention

I fully support the importance of future gas prices; this is very well explained in this chapter. Other aspects are also dealt with correctly (after changing the MOEC to the MOIT, of course). I have only one suggestion: to mention the unwillingness of CEZ to acknowledge any emission reductions from energy production in any CHP plant other than those belonging to CEZ. Should such a statement be necessary, emission reductions would be difficult to show. Otherwise, I agree that the estimate of emission reductions is logical and possible.

IV. General comments on CHP plant business in the Czech Republic

The PCD draft gives preference to variant A, which not only fully covers the needs of the Vetropak Kyjov glassworks, but also gives the greatest amount of electricity to the power grid. From the perspective of reductions in greenhouse-gas emissions, this plan is clearly the most effective. The big supply of energy to the power grid from the gas-fired combined cycle technology should reduce electricity production in the coal-lignite power plants of CEZ, and this substitution should bring lower CO_2 emissions. Lower costs per ton of CO_2 also make this plan more attractive.

The outlook from the perspective of business risk will be somewhat different. In the current situation, the problem with new cogeneration sources is that they must compete with the average costs of CEZ and not with marginal costs. The average costs at which CEZ supplies (with a profit) electricity to individual distribution companies ranges between 1.05 CZK/kWh and 1.10 CZK/kWh. The usual cost of electricity from cogeneration sources in the Czech Republic is higher. A successful business plan is always based on two components: the utilization of electricity by oneself or directly for a specific client, where the price is higher, and for a distribution company, where the price is always lower. Therefore, those projects where the proportion of sales to the power grid are relatively small are the successful ones. Increasing sales to the power grid brings lower profits and higher risks; therefore, the setting of

prices between CEZ and distribution companies is an arbitrary concern of state regulating. If the distribution companies get a lower price, they will tend to refuse or not meet previously agreed promises to buy energy from cogeneration sources, particularly if they are not contractually obliged to.

From this perspective, variant B1 is unquestionably less risky than variant A. Variant B1 is far less dependent on the purchase price of electricity, because 70% of production is consumed by the Vetropak company and only the remaining electricity is supplied to the power grid. In variant A, 75% of the of electricity produced is supplied, which makes the project far more dependent on the purchase price.

I therefore recommend that variant A be labeled as unambiguously advantageous from the perspective of GEF, while in terms of business risk variant B1 is more acceptable.

This aforementioned risk is partially eliminated by a suitable ownership structure of the TK company, which should build and operate the gas-fired combined cycle unit. The participation of JME (the distribution company that will buy the electricity) represents a certain guarantee that the purchase price of the energy will be acceptable. Yet if variant A is accepted, it will be best to contractually ensure the purchase of electricity and the pricing range as stated in paragraph 11. (In the section „The key contracts that are being prepared".) The final decision on alternative A should be made only after this contract, including energy-price obligations, is signed.

The Czech power sector is facing significant changes due to a new approach to regulation now under preparation. It would be impossible to predict the long-term effects of this approach, especially given the current changes in the energy network connection and the EU energy market.

V. Conclusion

The project is well prepared and meets the criteria put forth by GEF for PCD. I recommend that the preparation of the project and follow up negotiations be continued.

Prague, February 19, 1997

CALCULATION OF INCREMENTAL COST

Czech Republic: Kyjov Waste Heat Utilization Project

GEF Incremental Cost Analysis

Broad Development Goals and Baseline

1. The energy sector in the Czech Republic faces a common set of challenges with many other Eastern European countries. The planned economies of the pre-1989 era measured progress in terms of energy consumption and did not properly recognize the true cost of indigenous resources 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. Since 1993, the Czech economy has been growing but energy consumption has grown faster and energy intensities have continued to increase. From Q1 1995 to Q1 1996, electric consumption grew by 10.4% while GNP increased by 5.0%.

2. Given the strong growth expectations for the energy sector, the Czech Republic faces significant challenges in promoting energy efficiency, influencing fuel choices and 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 the public sector challenge.

3. The key policy instruments in shaping the future Czech energy sector will be energy pricing, air quality regulation and procedures for influencing the selected mix of new electric generating capacity. Continued reliance on Russia as the predominant source of natural gas raises concerns about the security of supply and exacerbates the uncertainty of future prices. Failure to recognize externalities in the pricing of coal provides excessive incentives to perpetuate and expand its use. The Czech Republic 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. The Czech Republic has also passed aggressive air quality mandates that force significant improvement by 1998 but has not dealt with the public sector role in financing the required investments.

4. Vetropak Moravian Glass (VMG) in Kyjov, Czech Republic 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 on a near continuous basis. During January to April 1997, VMG will reconstruct one of their glass furnaces which offers an opportunity for significant energy savings and environmental improvements. Such reconstruction occurs at about a seven year interval.

5. Among the energy investment alternatives examined is a mixed heating solution in which VMG net waste heat capacity of 7.8 MW would provide 28,267 MWh of heat in the five winter months and 19,002 MWh of heat in the other months to VMG, the City of Kyjov, and other medium-sized users of energy: the local hospital. the flour mill and the dairy. The remaining 6,345 MWh of winter heating load would come from the existing district heat boilers in Kyjov. This residual equals approximately 12.0% of the total annual heat demand. In this instance, VMG waste heat would be used to supply as much of the city of Kyjov's heating needs as possible from waste heat boilers but all electricity would continue to be produced in CEZ (the Czech Electricity Utility) central station power plants. New electric capacity would be provided by CEZ as part of the 900 MW of new coal-fired plants that they intend to add to the grid during the next decade; this scenario assumes that new lignite capacity will be added by 2001 on the grid.

6. Project financial and economic analyses show that this alternative, alone among the alternatives studied, is viable without public sector support. If the proposed GEF project is not completed, it is assumed that this alternative will be implemented nonetheless. The alternative thus serves as the Baseline for GEF incremental cost analytical purposes.

7. The GEF project outcomes can be measured in terms of the differences in energy inputs required to produce of the same quantities of heat and electricity with and without the project. Without the GEF 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 (marginal) base load lignite plants on the CEZ system.

Global Environmental Objectives

8. The main purpose of this project is to cost-effectively decrease harmful emissions of greenhouse gases through increasing the energy efficiency of the heat and power supply of the Vetropak Moravian Glass factory and the City of Kyjov district heating system. Other project objectives include: demonstration of gas-fired combined cycle cogeneration in the Czech Republic where this technology has not been frequently used; demonstration of the benefits of combining the production of industrial process heat and district heat for a city; and demonstration of the possibility of cooperative efforts between the Czech Ministry of Environment and the private sector in enhancing the environmental benefits from such a project.

Alternative

9. As part of the VMG reconstruction program, VMG and the city of Kyjov have worked together to develop the gas combined-cycle alternative proposed for GEF financing in which waste heat will be used in part by VMG and to produce electricity. The other part will be provided to the city of Kyjov as the primary heat source for their district heating system. Heat will also be supplied to a local hospital, a mill and a dairy in Kyjov. A newly formed joint stock company call Terplana Kyjov (TK) is now the project developer that will provide the project outputs to VMG, to the regional electric utility (JME), and to the city of Kyjov under contractual agreements.

10. In the proposed GEF Alternative, 100% of the heat requirements of Kyjov will be met from the VMG plant. The GEF Alternative will provide 21.63 MW of new electric capacity at the VMG site in 1999. Operating 8,400 hours per year this provides 181,692 MWh of electricity per year at this location. Approximately 30% of the additional electric capacity is needed by VMG while the rest will be available to the grid.

11. In addition to utilizing waste heat, VMG wishes to increase the reliability of the electricity supply from the regional utility, JME. Frequent voltage flickers now cause substantial difficulty with VMG's control systems resulting in production problems. Thus, the project includes consideration of both on-site power generation and an additional connection to the grid.

Scope of the Analysis

12. The system boundary is essentially national and includes the VMG factory, the City of Kyjov and households/enterprises connected to its district heating system, Kyjov enterprises relying on stand-alone boiler heating systems, and the national electricity grid.

13. Incidental domestic benefits of the cogeneration system include reduced emissions of NOx, SOx and particulates, and reduced coal ash disposal and other domestic externality costs associated with coal production, transport and use. In both the baseline scenario and in the GEF alternative, the 1998 Czech national emission standards for NOx and SOx will be met.

Costs

14. The incremental costs of the proposed alternatives depend centrally on the projected electric and fuel costs used to evaluate both Baseline and GEF Alternative energy production. The following sections present the basis used for estimation of the long run marginal costs of electricity, coal and gas

15. *Long Run Marginal Electric Costs* - Estimates of the marginal electric costs are based on data from and discussions with CEZ. Data from their 1994 Annual Report and the capacity expansion plans informally indicated by CEZ suggest that they plan to add 900 MW of new coal-fired generation by 2005. CEZ has evaluated gas-fired combined cycle units and have concluded that they would not be economical to operate more than 2,500 to 3,000 hours per year. The split between lignite and hard coal is not clear at this time but it is reasonable to assume that lignite plants will be dispatched ahead of hard coal plants because of lower variable operating costs. Since the proposed plant at VMG will run 8,400 hours per year, it is reasonable to assume that it would displace power from new lignite-fired plants with required flue-gas desulfurization (FGD) systems.

16. Capacity and operating costs for new lignite plants in the Czech Republic have been estimated based on data provided by CZK and additional data compiled by OECD. That data indicates that a cost of $1,500 per kW and annual non-fuel O&M costs of 2.1% to 4.5% of investment costs are plausible estimates of the cost for new capacity including an FGD

system. The $1,500 per kW investment figure plus 2.5% for annual non-fuel O&M has been adopted. Lignite costs for 1996 are estimated by CEZ at $13.90 per MWh based on a plant efficiency of 34%. This figure can vary dramatically by location because of the large transport component. This analysis has adopted a figure of $15.00 per MWh for 1997. The analysis also assumes real escalation at 1.0% per year to reflect increases in labor costs. For a baseload plant that generates 7,000 hours per year, a 30 year plant life, and a 12.0 percent discount rate (applied to Czech Republic), these cost parameters would indicate a base total generation cost per kWh of $0.043. The difference in operating hours of the proposed plant (8,400) and a baseload lignite plant (7,000) is covered by assuming that the grid power comes from multiple facilities each with the same cost parameters.

17. No incremental transmission investments to supply power to the southern Moravia area have been assumed but both the capacity and energy costs have been increased by 2.5% to allow for transmission losses from the generator to this area.

18. The difference in time needed to construct the proposed versus lignite plants requires another adjustment to assure that both plans represent the same output. The next lignite plants could be complete by 2001 while the planned GEF Alternative would begin producing electricity for the grid in 1999. Electric energy from the grid in 1999 and 2000 is assumed to come from existing plants with somewhat lower efficiencies than new lignite plants. Thus, the energy costs are assumed to be 5.0% higher than from the new lignite plants. To equilibrate the capacity available from the proposed and base plans, it is assumed that capacity purchases from utility scale combustion turbines would cover the differences in 1999 and 2000. The cost of these purchases is based on $350 per kW, 12% real interest rate and a 20 year life. This results in an annual cost of $46.85 per kW-year.

19. *Long Run Marginal Coal Costs* - The coal costs that are relevant to the analysis are for the small amount of coal that could still be required in the Baseline to provide some of the district heat supply for Kyjov. At this time, the delivered price of coal to Kyjov is 1,000 CZK ($37.04) per MT with a calorific value of 14.5 MJ/kg. This represents a current cost of about $2.55 per GJ. This is believed to be a reasonable estimate of the free market price for this coal. As for the lignite, real escalation is estimated at 1.0 percent per year.

20. *Long Run Marginal Gas Costs* - The Czech Republic currently imports most of its gas supply from Russia. A small amount of gas is domestically produced and serious consideration is being given to securing a second source from Norway. The 1996 relevant gas prices are:

	CZK/SCM	USD/SCM
Czech Border Price (From GASPROM)	2.43	0.0900
Transgas Price to JMP (Regional Utility)	2.78	0.1030
SAGE Estimate of Cost to Kyjov District Heat	3.62	0.1340
Preliminary Contract Price For CHP (1997)	3.47	0.1285

This indicates 43% to 49% added to the border price to cover the costs of transmission and distribution. These transport and distribution charges are similar to those found in other Eastern European countries who purchase from GASPROM.

21. The future price of gas from GASPROM is difficult to specify but it is reasonable to assume that it will increase at the same rate as the world oil price which provides the primary competitive constraint. The oil price forecasts that have been considered include the 1997 Annual Energy Outlook by USDOE and World Bank projections. A simplified composite view suggests the following:

Period	Real Escalation Rate
1997 - 2007	2.0 %
2007 - 2018	1.0 %

Rates of increase equivalent to these have been adopted for the present analysis. All of the gas consumption figures are based on a heating value of 35.2 MJ/SCM.

Investment Costs

22. The total investments in USD ('000) required for the two plans are:

	Baseline	GEF Alternative
At VMG	$4,748	$19,067
Capacity Purchases (1999-2000)	$2,026	$0.00
Grid Power Plant	$33,256	$0.00
Total	$40,030	$19,067

23. Increased reliability of electric supply to VMG has been included in both the Baseline and the proposed GEF Alternative through investment in an additional 110 kV grid connection at a cost of about $2.1 million since TK will probably make this investment in either instance.

Incremental Costs

24. Twenty-year total CO_2 emissions are 4,288,180 MT for the Baseline and 1,608,171 MT for the GEF Alternative, thus the potential reduction is 2,680,009 MT. The present worth of life-cycle costs for the GEF Alternative is $59,424,000 compared to the Baseline , which costs $54,332,000. Thus the incremental cost of the GEF Alternative is $5,092,000, or $1.90 per MT of CO_2 reduction. Various sensitivity cases on discount rate and future fuels price inflation have been considered to test the robustness of these results. The incremental costs under the plausible scenarios considered range from about $3.4 million to $7.8 million.

	Baseline	GEF Alternative	Increment
Global Environmental Benefit	4,288,180 tonnes CO_2	1,608,171 tonnes CO_2	2,680,009 tonnes CO_2
Domestic Benefit	Electricity: 181,692 MWh/yr Heat: 159.0 TJ/year	Electricity: 181,692 MWh/yr Heat: 159.0 TJ/year	0 0
Costs	$54,332,000	$59,424,000	$5,092,000

Process of Agreement

25. Agreement on the application of incremental costing methodology to the specific project at hand was reached via an exchange of memoranda between the Bank and the Czech authorities in August 1996. The agreed methodology was used by consultants responsible for the project preparation study, which was reviewed and found acceptable by the Bank pre-appraisal mission during its September 1996 visit. The cost parameters will be verified at appraisal and formally agreed at project negotiations.