Document of
The World Bank

Report No: ICR00001116

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(Loan No.70570)

ON A

LOAN

IN THE AMOUNT OF EUR9.0 MILLION AND US$7.5 MILLION
(EQUIVALENT TO US$15 MILLION TOTAL AMOUNT)

TO

MIEJSKIE PRZEDSIEBIORSTWO ENERGETYKI CIEPLNEJ S.A. W KRAKOWIE
(THE MUNICIPAL DISTRICT HEATING ENTERPRISE OF KRAKOW)

WITH THE GUARANTEE OF

THE REPUBLIC OF POLAND

FOR A

KRAKOW ENERGY EFFICIENCY PROJECT

June 24, 2009

Sustainable Development Department
Central Europe and Baltics Country Unit
Europe and Central Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective December 2008)

Currency Unit = New Polish Zloty (PLN)
PLN1.0 = US$ 0.34
US$1.0 = PLN 2.91

FISCAL YEAR
[January 1 – December 31]

ABBREVIATIONS AND ACRONYMS

CAS	Country Assistance Strategy
CHP	Combined Heat and Power Plant
DH	District Heating
DHW	Domestic Hot Water
EBRD	European Bank for Reconstruction and Development
EIRR	Economic Internal Rate of Return
EPSC	Energy Performance Service Contract
ESCO	Energy Service Company
ESMAP	Energy Sector Management Assistance Program
FM	Financial Management
GEF	Global Environmental Facility
HOB	Heat-Only Boiler
ISR	Implementation Status Report
M&E	Monitoring and Evaluation
MOE	Ministry of Economy
MPEC	Municipal District Heating Enterprise in Krakow
MTR	Midterm Review
PAD	Project Appraisal Document
PIP	Project Implementation Plan
PIU	Project Implementation Unit
PLN	Polish zlotych (per June 2009 the exchange rate was 1 US$ = 3,2 PLN)
SH	Space heating
TA	Technical Assistance

Vice President:	Shigeo Katsu, ECAVP
Country Director:	Theodore Ahlers, ECAVP
Sector Manager:	Ranjit Lamech, ECSSD
Project Team Leader:	Peter Johansen, ECSSD
ICR Team Leader:	Peter Johansen, ECSSD

POLAND
KRAKOW ENERGY EFFICIENCY PROJECT

CONTENTS

A. Basic Information			
Country:	Poland	Project Name:	Krakow Energy Efficiency Project
Project ID:	P065059	L/C/TF Number(s):	IBRD-70570
ICR Date:	06/25/2009	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	MUNICIPAL DISTRICT HEATING CO. OF KRAKOW
Original Total Commitment:	USD 15.0M	Disbursed Amount:	USD 18.3M
Environmental Category: B			
Implementing Agencies: Ministry of Economy MPEC			
Cofinanciers and Other External Partners:			

B. Key Dates				
Process	**Date**	**Process**	**Original Date**	**Revised / Actual Date(s)**
Concept Review:	10/19/1999	Effectiveness:		07/09/2002
Appraisal:	10/16/2000	Restructuring(s):		
Approval:	06/07/2001	Mid-term Review:	07/15/2006	06/06/2006
		Closing:	12/31/2007	12/31/2008

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes:	Moderately Satisfactory
Risk to Development Outcome:	Moderate
Bank Performance:	Satisfactory
Borrower Performance:	Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)			
Bank	**Ratings**	**Borrower**	**Ratings**
Quality at Entry:	Satisfactory	Government:	Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Satisfactory
Overall Bank Performance:	Satisfactory	**Overall Borrower Performance:**	Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	Highly Satisfactory
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA):	None
DO rating before Closing/Inactive status:	Moderately Satisfactory		

D. Sector and Theme Codes		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
District heating and energy efficiency services	100	100
Theme Code (as % of total Bank financing)		
Climate change	40	40
Other urban development	40	40
Pollution management and environmental health	20	20

E. Bank Staff		
Positions	**At ICR**	**At Approval**
Vice President:	Shigeo Katsu	Johannes F. Linn
Country Director:	Theodore O. Ahlers	Michael F. Carter
Sector Manager:	Ranjit J. Lamech	Hinderikus Busz
Project Team Leader:	Peter Johansen	Rachid Benmessaoud
ICR Team Leader:	Peter Johansen	
ICR Primary Author:	Sati Achath	

F. Results Framework Analysis

Project Development Objectives (from Project Appraisal Document**)**
The PDO was to improve energy efficiency of the heating systems in the Malopolskie Voivodship (the Krakow region). This would be achieved by: (a) continuing the Modernization program for the's district heating systems; (b) helping consumers decrease their heat energy consumption by improving the energy efficiency at the end-user level; and (c) developing in Krakow the knowledge and mechanisms necessary for financiers to fund end-user energy efficiency projects.

Revised Project Development Objectives (as approved by original approving authority)
The PDO was not revised.

(a) PDO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Unit consumption of energy to heat one m2 under comparable weather conditions (MJ/m2)			
Value quantitative or Qualitative)	660 MJ/m2	578 MJ/m2		537 MJ/m2
Date achieved	07/02/2002	12/31/2008		12/30/2008
Comments (incl. % achievement)	Achieved better than target was planned to reduce by 82MJ/m2 but actually achieved 123 MJ/m3. That is 150% of target.			
Indicator 2 :	Consumer satisfaction index (number of consumers claiming they are satisfied or very satisfied with MPEC's services)			
Value quantitative or Qualitative)	76.5%	85.0%		92.8%
Date achieved	07/01/2002	12/31/2008		03/31/2009
Comments (incl. % achievement)	Achieved better than target was planned to increase satisfactin by 8.5 points but actually achieved 16.3 points. That is 192% of target.			

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	ESCO retrofit sales (cumulative million PLN)			
Value (quantitative or Qualitative)	0	94		31
Date achieved	07/01/2001	12/31/2008		11/30/2008
Comments (incl. % achievement)	Right on target. 100% achievement.			
Indicator 2 :	Level of ESCO cofinancing from commercial banks (cumulative million PLN)			
Value (quantitative or Qualitative)	0	22		7
Date achieved	07/01/2002	12/31/2008		05/30/2008
Comments	Loans from commercial banks reached 32% of target. They were loans			

(incl. % achievement)	guaranteed by MPEC, so the financial viability of a stand-alone ESCO was not demonstrated.			
Indicator 3 :	Level of ESCO cofinancing from borrowers			
Value (quantitative or Qualitative)	12.1%	30%		30%
Date achieved	07/01/2002	12/31/2008		12/31/2008
Comments (incl. % achievement)				

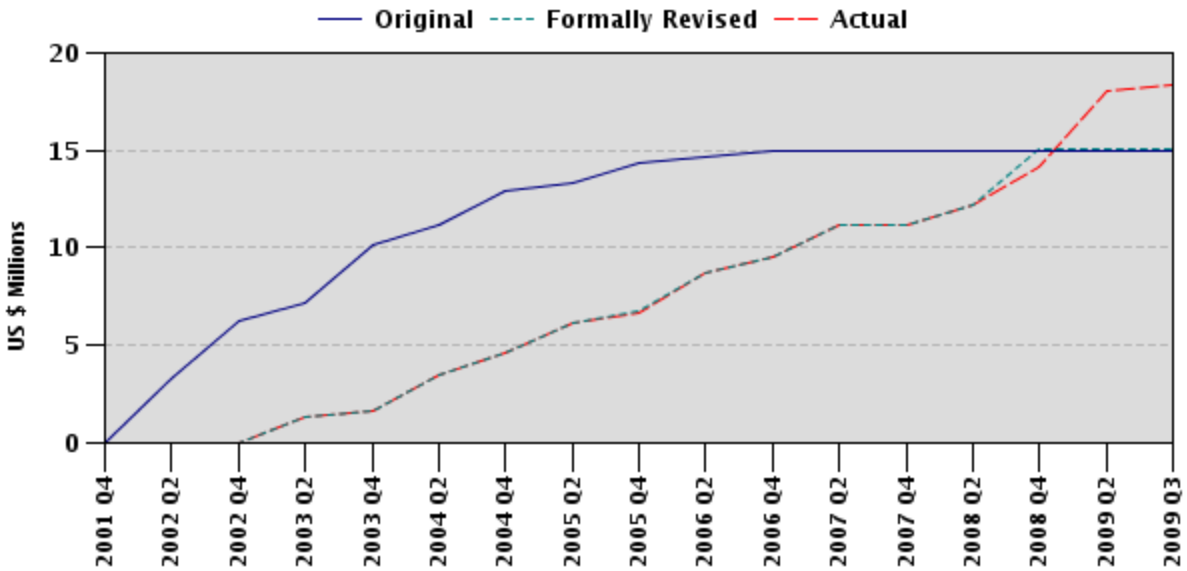
G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	DO	IP	Actual Disbursements (USD millions)
1	06/29/2001	Satisfactory	Satisfactory	0.00
2	12/18/2001	Satisfactory	Satisfactory	0.00
3	06/27/2002	Satisfactory	Satisfactory	0.00
4	11/26/2002	Satisfactory	Satisfactory	1.03
5	06/11/2003	Satisfactory	Satisfactory	1.50
6	12/04/2003	Satisfactory	Satisfactory	3.41
7	05/26/2004	Satisfactory	Satisfactory	4.39
8	09/02/2004	Satisfactory	Satisfactory	4.86
9	11/24/2004	Satisfactory	Satisfactory	6.10
10	06/02/2005	Moderately Satisfactory	Satisfactory	6.66
11	06/06/2006	Moderately Satisfactory	Satisfactory	9.48
12	06/28/2007	Moderately Satisfactory	Moderately Satisfactory	11.14
13	06/26/2008	Satisfactory	Satisfactory	14.11
14	12/29/2008	Moderately Satisfactory	Satisfactory	17.99

H. Restructuring (if any)

Not Applicable

I. Disbursement Profile



1. Project Context, Development and Global Environment Objectives and

1.1 Context at Appraisal

Country and Sector Background: At appraisal, the City of Krakow had about 750,000 inhabitants, of which about 100,000 were students. About 70% of all residential and 50% of all commercial buildings in Krakow and in the adjacent Skawina were connected to district heating. In the 1990s, the City of Krakow made significant advances in reducing air pollution from many small, inefficient low-stack emission sources burning coal or coke, largely by either converting them to gas-firing or connecting them to the centralized district heating system supplied by more efficient combined heat and power plants. The City had also made significant progress in improving energy efficiency and environmental performance of the district heating system. These successes resulted from the implementation of programs such as the Bank-funded Heat Supply Restructuring and Conservation Project in Krakow (Loan 3381-POL), the Bank/Global Environmental Facility (GEF)-funded Coal-to-Gas Conversion Project (GETT F028665 and NOR TF023647) and other supply and limited demand-side programs in Krakow (such as the Polish-American Low Emission Sources Program).

Until the end of 1997, as part of the Government's efforts to control inflation, limits were set by the Ministry of Finance on the amount of tariff increases the district heating (DH) enterprises could make. While this control played an important role in pressuring the DH enterprises to increase efficiency, it substantially reduced their gross margins, which adversely affected their profitability and cash flow levels. This delayed the implementation of the modernization programs as the level of internal cash generated by most DH enterprises was inadequate to meet their resource requirements. During this period, the sector's financial difficulties were exacerbated by increasing accounts receivable and bad debts of industrial enterprises.

Polish case studies had identified the following barriers to energy efficiency project development in the building sector.

(a) *Difficulties in Arranging Financing.* Many Polish building owners had insufficient access to project financing for up-front investment costs for energy efficiency retrofit projects that would reduce the energy bills.

*(b) Inadequate Information***.** The building owners, the occupants and the local banks lacked information about the financing aspects of energy-saving investments, the implementation experiences of others, and the ability to use energy savings to finance some building renewal.

(c) Commitment Risk. Disbelief in the possibility of savings and fear of disruption to building occupants stalled energy management actions that might otherwise have been fundable. Basically, commercial banks and building owners perceived too much risk to enter into financing arrangements based on energy management programs from Energy Service Companies (ESCOs).

(d) High Transaction Costs. Energy efficiency projects were relatively small and carried high transaction costs, especially when using new and unfamiliar procedures such as energy performance contracting. Especially where the benefits were considered small, building owners were reluctant to incur these costs.

(e) Institutional Constraints. While Poland had considerable technical expertise relative to energy efficiency in buildings, an adequate institutional structure was not yet in place to help building owners overcome many of the barriers listed above.

Rationale for Bank assistance: The project supported the Country Assistance Strategy[1] (CAS) objectives of promoting much needed infrastructure growth, including a greater role for the private sector, and achieving environmental sustainability. The project would achieve this by: (i) improving energy efficiency throughout the heat supply chain by reducing the energy intensity of district heating and end-user systems; (ii) establishing and developing an unregulated institutional structure and business with possible private participation to develop the market for energy efficiency projects; and (iii) establishing the financing incentives that would improve the availability of local funding for energy efficiency projects as well as maximize local participation for maximum sustainability.

The Bank's involvement was regarded as essential for: (i) continuing the policy dialogue, including the Energy Sector Management Assistance Program (ESMAP) assistance to the Energy Regulatory Authority in support of sector policy development and tariff regulations that were conducive to private sector participation; (ii) helping the municipal District Heating enterprise in Krakow (MPEC) finance its minimum DH investment programs that would improve the quality, affordability and delivery of district heating and hot water services in Krakow; and (iii) helping MPEC improve its financial performance to a level sufficient for private or commercial financing.

1.2 Original Project Development Objectives (PDO) and Key Indicators (*as approved*)

The PDO was to improve energy efficiency of the heating systems in the Malopolskie Voivodship (which includes Krakow). This would be achieved by: (a) continuing the modernization program for the City's district heating systems; (b) helping consumers decrease their heat energy consumption by improving the energy efficiency at the end-user level; and (c) developing in Krakow the knowledge and mechanisms necessary for financiers to fund end-user energy efficiency projects.

Key Indicators were:
Outcome-level indicators:

- Increased customer satisfaction (quality of services as measured by an annual random survey of apartment owners and building owners in DH core areas)
- Quantified energy savings and associated emission reductions of local air pollutants (sulfur dioxide, nitrogen oxides and particulates) and of greenhouse gases (carbon dioxide)
- Energy service company (ESCO)[2] annual sales and level of cofinancing

[1]: Document number: No. 16484-POL Date of latest CAS discussion: 09/16/1999; Date of CAS Progress Report: August 25, 1999

[2] An ESCO is a company that offers energy efficiency services and financing on a concept whereby the ESCO finances the EE investment in an end-user's facilities and is paid back via a pledge on end-user savings.

Output-level indicators:

- *For the end-user:* Competitiveness and affordability of district heating and hot water services within the project's target areas.
- *For MPEC:* Increased efficiency of the district heating system
- *For the ESCO:* Market penetration in the public and private building sectors

1.3 Revised PDO (as approved by original approving authority) and Key Indicators, and reasons/justification

The PDO was not revised.

1.4 Main Beneficiaries,

MPEC's existing clients. The direct beneficiaries were MPEC's existing clients who would benefit from being connected to a more efficient district heating network with lower operating costs, providing better service and controllable heat use. However, all Krakow residents would benefit as the environment improved and as the economy expanded, since new customers could be added to the distribution network without the need to raise funds to invest in additional supply and transmission capacity.

The two large combined heat and power plants (CHP Krakow and CHP Skawina) would benefit from the improved efficiency of the district heating system as MPEC expanded its market for domestic hot water and connected new customers to the CHP-supplied DH system. Specifically, the expansion of MPEC's domestic hot water market would lead to: (i) a better utilization of the cogenerated heat throughout the year; and (ii) a lower temperature of the hot water in the system returning to the CHP sources, which in turn would increase the operational efficiency of the cogeneration units.

All owners and occupants of existing residential, commercial and public buildings in the Krakow region would also enjoy these benefits, starting from the first year the energy efficiency retrofit investment was made, at no risk or up front investment. Then, once the investment has been repaid, they would also benefit from lower energy bills.

The state and municipal authorities would also benefit from the project, since: (i) the quality and delivery of district heating (a municipal service) would improve; and (ii) the utility ESCO financing mechanisms would relieve the already constrained state and municipal budgets from the up-front capital investment required for the energy efficiency measures in public buildings, and would lower the future operating budgets through reduced energy bills.

All residents of the region would benefit from the reduced environmental impacts of more efficient energy services to buildings in the region and from the reduction in low emission sources as more coal-fired boilers were either eliminated or converted to gas. As a result of the increased efficiency at the CHP plants, the environmental emissions from the CHP sources, including trans-boundary pollutants, would be reduced. The Polish society would also benefit, as Poland's contribution to greenhouse gases emissions were reduced.

Local engineers and contractors. The ESCO activity would develop energy management retrofit skills of local engineers and contractors. It would also draw new energy technologies into the marketplace where they could be seen for other applications.

1.7 Original Components (*as approved*)

The project consisted of three components as follows:

Component 1. District heating modernization (Program of US$ 50.7 million of which IBRD contributed US$ 3.6 million plus EUR 4.5 million)

The DH modernization component of the project was built upon the achievements of the completed project (Loan 3381-POL) by continuing the implementation of the original Rehabilitation Optimization Program with the aim of making district heating more efficient, affordable and environmentally friendly. The measures financed by IBRD under this component consisted of: (i) installation of network loops (3.5 km in total) between the main heat sources, CHP Krakow and CHP Skawina; (ii) installation of 365 out of the 600 modem compact substations to be installed under the six-year program in order to replace about 1,000 old hydro-elevator substations; and (iii) the replacement of 17 km out of the 68 km of network pipelines to be replaced under the six-year program.

Component 2. ESCO Financing (Program of US$ 27 million of which IBRD contributed US$ 3.6 million plus EUR 4.5 million)

For the purpose of this project, MPEC created a fully owned daughter company for demand side energy efficiency investments on an ESCO model. The company was called POE, which is the Polish acronym for ESCO. The US$ 8.0 million equivalent IBRD loan proceeds for the ESCO component would be used to finance energy saving capital investments (principally goods, materials, and installation works). POE would implement these investments in the premises of a client under an energy performance service contract to be entered into between POE and the client. The costs of other ESCO's services including project development and preparation activities, overhead and profit margins, would be financed by local banks and POE's operating funds. All project financing costs incurred by POE would be repaid by the client from the guaranteed savings. The total investments including own contribution and commercial bank financing were estimated at US$ 27 million.

POE would assume full responsibility for the technical performance and credit risks of projects financed from the IBRD loan. Examples of existing building energy efficiency retrofits, eligible for Bank financing, would include: (i) reduction of building heat losses through weatherization and/or insulation as well as new windows; (ii) improved control of the heat supplied through installation of thermo static control valves, reflective screens behind radiators and temperature controls in customers facilities; (iii) improved efficiency of site boilers or heat exchange efficiency with the heating network; (iv) reduction of electrical loads through high efficiency lighting, motors, fans and pumps; and (v) reduced electrical consumption through control of operating periods and/or matching power draw to variable loads.

Component 3 Technical assistance component (US$ 0.3 million - all IBRD)

This component would involve external consulting services, as and when needed, to support MPEC and POE in the areas of development of business strategy, energy auditing, measurement and verification of savings, and legal aspects of performance contracting.

1.8 Revised Components

The components were not revised.

1.9 Other Significant Changes

There were no changes in the project's design, scope and scale, and implementation arrangements. However, there were changes in the project's schedule and funding allocation as mentioned below:

Project Schedule. The closing date of the project was extended twice by six months each, first from December 31, 2007 to June 30, 2008,and then to December 31, 2008. The extensions were granted following requests from MPEC and POE relating to a reallocation of funds from the ESCO component to the DH component (see below) and delayed construction of two major works under the DH component.

Funding allocations. During implementation, the Loan Agreement was revised three times to reallocate funds among expenditure categories. The reallocations are shown below.

The ***first reallocation*** *of funds in October 2004 was* as follows:

- A transfer of US$ 1,140,000 from Category 7 (Unallocated) of the US$ tranche of the Loan to Category 1 (Goods under Part A of the Project)
- A transfer of US$ 285,000 from Category 7 to Category 2 (Supply and Installation of Equipment)
- A transfer of EUR 1,376,000 from Category 7 of the EUR tranche of the Loan to Category 1
- A transfer of EUR 344,000 from Category 7 of the EUR tranche of the Loan to Category 2

The ***second reallocation*** *of funds in December 2007 was* as follows:

- A transfer of US$ 82,739.89 and EUR 244,436.18 respectively from Category 1 to Category 2
- A transfer of US$ 2,215,109.89 and EUR 1,676,329.92 respectively Category 3 (Energy Performance Service Contracts) to Category 2
- A transfer of US$ 150,000 and EUR 180,000 respectively from Category 4 (Consultants Services) to Category 2.

The ***third reallocation*** *of funds in August 2008 was* as follows:

- US$ 527,000 from Category 3 to Category 1, and US$ 183,000 from Category 3 to Category 2

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

Lessons of earlier operations taken into account. Project design and implementation drew extensively on the completed Heat Supply Restructuring and Conservation Project in Krakow (Loan 3381-POL) and on similar Bank projects in other cities. Actual DH investment costs and implementation performance data were used to confirm that the proposed rehabilitation investments were economic and that the associated implementation and procurement arrangements were efficient.

The project design also benefitted from lessons learned from previous demand-side energy efficiency efforts in the Krakow region. Starting in 1990, the Polish-American Low Emission Sources Program had accomplished a number of energy efficiency projects in the region, from an integrated supply and demand-side perspective. MPEC participated in about half of the projects. Since the success of individual projects within that program varied considerably, MPEC staff had gained valuable insight into the technical, management, and business factors that contributed to successful energy efficiency projects.

The project design and the ESCO creation had benefitted from lessons learned by public utilities in North America, which were actively and successfully using the ESCO approach through fully-owned subsidiaries to both achieve substantial energy savings and provided valuable services that involved long-term collaboration with customers. During project preparation, MPEC and POE benefited from this North American experience through US and Canadian technical assistance.

Risks and Risk Mitigation Measures. The table below shows the risks and mitigation measures identified in the Project Appraisal Document (PAD) along with a brief commentary on how the risks evolved during implementation.

Original Perceived Risk	Risk Rating	Original Mitigation Measure	Results
Local banks will be unwilling to lend to the ESCO client starting in year 3.	H	1. Introducing ESCO concept to the banking industry through workshops. 2. Assisting local banks in developing sustainable financing arrangements for POE and for the ESCO clients. 3. Fostering competition among local banks based on a pipeline of viable ESCO projects 4. Encouraging early involvement of one bank in the pilot projects. 5. MPEC to consider temporarily increasing equity commitment to penetrate the market.	Local banks were happy to lend to POE with MPEC guarantee. No effort was made to arrange for local banks to lend to clients, since MPEC was happy to back all POE loans and was not concerned about its own debt level until 2008.
POE will be unable to carry on its balance sheet the cost of 100% of the ESCO projects in years 1 and 2, then declining to a lower limit of 40% by year 5 and thereafter.	S	Same as above.	POE's balance sheet was not dissociated from MPEC's, due to MPEC's guarantee of ESCO loans. Therefore POE had no problems borrowing.
Public institutions will view the ESCO contracts as debt instruments but not as payments of savings from the operating budgets.	S	1. Resolution of the City of Krakow provided agreement for POE to prepare and implement energy efficiency projects in municipal buildings, following ESCO concept and using IBRD financing. 2. Working with public institutions to adopt policies supporting ESCO financing arrangements.	Public institutions had debt capacity so this was not an issue.

Projected savings are not achieved	M	1. During project preparation, extensive IBRD-funded technical assistance/on-the-job training was given to ESCO staff. 2. During implementation: (i) the ESCO to hire qualified engineering consultants to help in ESCO project design and implementation and (ii) the Bank to review the first five ESCO projects regardless of size, thereby setting the standard for quality at entry of project design, and to monitor savings results and take corrective actions. 3. Comparison of saving predictions against benchmarks before ESCO projects were committed.	Total actual energy savings exceeded projections for most projects where savings were measured.
Interest rates will impose payback periods that are unacceptable to the ESCO clients.	M	1. Adapt retrofit project designs and scope, sales techniques, and target market to fit the economic situation. Prevailing tariff regulation combined with EU accession provided for elimination of price distortion. 2. MPEC to consider increasing its equity contribution during the period of high interest rates.	Interest rates remained low.

Adequacy of participatory processes. Two-way consultative sessions with public interest groups and stakeholders were undertaken and focused on project-related environmental issues (consistent with the environmental management plan requirements). MPEC used an external environmental communications expert to conduct these sessions, financed from the PHRD grant. The results of these sessions were recorded in the minutes and formed an integral part of the environmental management plan. MPEC would incorporate any relevant recommendations in the project design and implementation.

A strong participatory program was prepared to inform the public and to engage key stakeholders. The public participation program included: (i) information sharing activities; and (ii) consultative participation activities at two levels, at the program level or a class of potential customers, and at the individual project level.

2.2 Implementation

The project was not restructured and it was never at risk. The Bank conducted a Midterm Review (MTR) in June 2006, and assessed progress to date on all project components, the implementation issues and the actions to be taken to ensure the successful completion of the project.

The following factors affected project implementation:

Positive
The DH component was successful because it was executed very well. The Bank worked with a professional organization that needed little prompting and technical advice. Along the way, MPEC managed to involve substantial funds from Europe to support the implementation.

The ESCO component built a team of engineers and construction supervisors focused on energy saving projects. In total it created about 60 TJ of savings. The total value of the work was 31 million PLN. Substantial improvements were reported by owners of the first of the affected buildings, as well as improvements in the condition of building equipment, which helped create demand in other facilities.

Negative
Implementation of the ESCO component was affected by the following issues:

- POE was unable to develop partnerships with local grant funding agencies that would support a turnkey service so that POE could continue to effectively compete in the building renewal market after the GEF Grant was completed.
- Rapid acceleration of labor costs which lengthened paybacks of energy retrofit projects, requiring more client co-financing and decreasing client willingness to undertake projects, or reduced project size.
- Insufficient investment by MPEC in POE to enable it to:
    - develop a marketing and sales approach that would find ways around barriers in new markets.
    - develop independent relationships with commercial banks.

The background for these issues is presented in more detail in Section 3.2 (B).

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

M&E design. Step-by-step monitoring, verification and evaluation were critical in this project, and were to be conducted by MPEC. The format, contents and frequency of implementation progress reports were agreed upon and were included in the Project Implementation Plan (PIP). They formed an integral part of the project financial and management reports (FMR). The latter were specifically tailored to the project and included, inter alia, performance indicator data, specified monitoring data and evaluations as a basis for the mid-term review and for definition of key implementation issues requiring management attention. MPEC had adequate methods for collecting these data. The Project Implementation Plan for the ESCO component defined the POE management reports needed in addition to the FMRs.

M&E implementation. MPEC was regularly collecting data according to both the technical and financial indicators developed during project preparation. These data were closely monitored and the actual figures were compared with the target values. For example, under technical indicators, data on fuel consumption, heat production, electric production, heat losses and breakdowns in the main DH system were monitored and analyzed. The periodic ESCO sales projection reports were the focus of the Bank supervision of ESCO performance, and the basis of periodic teleconferences between POE and the Bank supervision team.

M&E utilization. Appropriate data collected from MPEC and POE were evaluated and used to inform decision-making, e.g. for the reallocation of funds. There was no need to hire specific consultants for M&E from the technical assistance (TA) Component. The ongoing M&E was very useful. It clearly indicated the performance of the two components and was used as the background for the decision to reallocate funds from the ESCO component to the DH component in order better to serve the development objectives.

2.4 Safeguard and Fiduciary Compliance

An Environmental Plan was developed by the ESCO, basically defining the processes that would be followed to ensure adherence to all local ordinances in the design and construction of client projects. Compliance was ensured through bringing environmental experts on supervision missions and checking compliance reporting. There were no significant deviations or waivers from the Bank safeguards and fiduciary policies and procedures during the implementation of the project.

2.5 Post-completion Operation/Next Phase

(a) Transition arrangements.

The *DH component* will be followed up by a European Bank for Reconstruction and Development (EBRD)-financed project that mainly focuses on pipeline replacements. The EBRD/EU financing is part of a new DH modernization program of MPEC that will last till year 2010. MPEC is a solid company with strong commitment to providing efficient heating services and there is a very good chance that the results achieved under this project will be sustained.

ESCO component: POE will continue with the same business model—but without access to IBRD financing. The completion of the Bank loan has coincided with the tightening of global credit which also will restrain MPEC's possibility to provide guarantees for loans to POE. POE will therefore be facing a difficult time until the financial crisis is over. However, POE seems to have enough work in hand to be able to maintain a reasonable level of activity in 2009. The following year will present some big challenges for the company but if they come through that intact, the prospects for long-term survival will be good since the EE market is expected to start booming when the financial crisis is over because of the huge investments needed to reach the ambitious targets set in Poland's National Energy Efficiency Action Plan[3].

(b) *List of performance indicators*. The same set of monitoring and evaluation indicators that were developed under the project will be used as part of the MPEC's and POE's regular operations.

*(c) Follow-on project***.** A follow-on project is not recommended. The current availability of EU funds removes the need for further Bank lending for DH work. As to the ESCO operation the limited access to local financing means that some international loans could be useful for POE. However, with both EBRD, KfW and EIB in principle offereing credit lines that can be tapped for ESCO operations there is no need for a new IBRD loan. However, the Bank should consider promoting the ESCO concept on a broader scale and especially to promote the use of ESCOs to leverage subsidy funds (for public buildings like schools and hospitals) since it is foreseen that many subsidies will be directed toward building renovations during the coming years.

(d) Suggested priority and optimum timing of any future impact evaluation. It will be important to make an evaluation after two years of project closing to see the project outcomes. By that time it will be clear whether a viable ESCO concept has been developed by PEO.

[3] The NEEAP is prepared for the European Commission and it shows how Poland will meet its obligation to save 9% of its energy consumption in the period 2008-2016

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

The project objectives were clear, relevant, and important to Poland's economic development. They were timely and appropriate to the needs of the country's energy sector. The project was, and remains, consistent with the Bank's assistance strategy for Poland. In particular, the ESCO component's key objective of opening up commercial banks for savings financing remains very relevant in light of the current global credit tightness.

3.2 Achievement of Project Development Objectives

***Moderately Satisfactory*.** The project was partially successful in achieving its objective. The DH Component performed well and contributed to improved energy efficiency and decreased unit heat consumption in the heating system in the Krakow region. These changes have resulted in increased consumer satisfaction. The DH Component was also instrumental in reducing thermal and water losses.

The ESCO Component fell short of expectations because of several challenges as mentioned below. On the one hand the ESCO Component managed to demonstrate the potential of the ESCO concept in Poland and in particular the usefulness of this concept to leverage budget or subsidy funds for public building upgrades, as indicated by the co-financing percentage. On the other hand the ESCO Component did not manage to produce a fully sustainable ESCO with a business plan that would indicate increasing turnovers in the coming years.

The details of the project's achievements and shortcomings are as follows:

A. The DH Component

Connection of New Consumers. Since year 2000, the number of customers increased by 47% from 3,308 to 4,465 in 2008. About 1000 customers, 25% of the total, are now served continuously with domestic hot water replacing inefficient individual heating in, mostly electric, water boilers. The primary energy consumption of the electric water boilers would have been more than five times higher than the incremental energy consumption for the DH system.

Network Loops. MPEC is now able to purchase more heat from the cheapest available heat source because the southeast network branch has been connected to the Skawina CHP plant with a 3.5 km pipeline and a booster pump station in Wola Duchacka. Moreover, the network loop has improved security of supply. An accident on the main supply pipeline of EC Krakow in 2007 would have left a population of 150,000, a quarter of Krakow population, without heating for days if the loop had not allowed for an alternative route to serve the customers until the leak was repaired.

Reduction in thermal and water losses. Thermal losses of the network have declined from 11.9% in year 2000 to a level of 10.8-11.0 %. Since 2000, the water losses from the DH system have declined 24% from 410 to 330 thousand m^3 even though more consumers are now connected. The overall water consumption of MPEC has declined even more, 34% from 687 to 451 thousand m^3.

Energy savings.

Modernization of Boilers and Substations. In the district heating system, about 9,000 building nodes exist, each of which is connected to several buildings. All group substations are automated using temperature controllers. MPEC has continued assembling modern substations by themselves. The number of efficient, compact heat exchanger stations has increased 59%, from 1,688 to 2,681 units, thus having increased energy savings both on the customer side and in the network. Some of the old group substations with old pipes were eliminated and compact building level substations with small pipes were installed instead. By the year 2009, practically all of the 983 hydro-elevator systems in operation in year 2000 had been eliminated and the buildings had been equipped with modern compact substations.

Replacement of Heating Networks. Since year 2000 the length of pre-insulated pipelines has doubled from 149 km to 310 km, thus covering 41% of the total network length of 758 km (in 2008).

Environmental benefits.

Connection to Municipal Heating System. In the early nineties, there were a large number of coal-fired heat-only-boilers (HOBs) in Krakow. By the end of 2006, MPEC had rehabilitated all its own HOBs as well as some privately owned ones--in total 386 HOBs by either connecting customers supplied from these boilers to its DH system or converting these boilers to gas-firing. During the project, 12 boilers with 7.2 MW in total were eliminated, and about half of those customers have been connected to the DH system. The other half (equal to 5 boilers with 4.8 MW capacity), have been fitted with a new, more efficient gas boiler.

B. The ESCO component

The main achievement of the ESCO Component was the energy retrofits of 29 schools in and around Krakow. The table below presents the performance indicators.

Performance indicator (cumulative total)		**Actual (cumulative total)**	**Fraction achieved**
Sales of EE retrofits	94,000,000 PLN	31,000,000 PLN	33%
Amount of commercial bank financing used	22,000,000 PLN	7,000,000 PLN	32%
Energy savings	380,000 GJ	61,000 GJ	16%
Profit	1,800,000 PLN	1,400,000 PLN	78%

The above table shows that:

- POE sales were well below expectations. POE found substantial challenges in selling a new product in a new market. POE's market penetration was poor, though a market survey showed that substantial energy retrofit work was being done by others in the region. Two thirds of POE's retrofit business was in schools, one of the Business Plan's target sectors. Original expectations were for annual sales of about PLN 24 million by the end of the loan period. The peak year had about 8 million and the final year about PLN 3 million of retrofit sales.

- The firm used far less commercial bank funding than targeted because of the low sales and MPEC's desire to use World Bank funds first. However, in terms of the percentage of total funding accounted for from commercial sources the original target of 23% was achieved. This shows that the leveraging of commercial financing is achievable, which is an important outcome for the project.

- For all the projects where POE developed savings estimates or provided guarantees, total actual savings have exceeded estimates.

- POE's profit level came quite close to the target. However, this is partly because a substantial portion of POE's revenues come from profitable engineering work primarily for MPEC as well as from energy audits prepared for paying clients.

The primary reasons for the key shortfall in ESCO sales were:

- *A broad Polish client culture of seeking grants before taking energy efficiency action*. This culture was engendered by other government grant systems and established a market expectation for the high status projects of replacing windows and external insulation on buildings. POE did not focus on selling project paid entirely from savings. Instead it focused on finding projects eligible for a GEF grant that was made available through another Bank implemented project[4] and/or where the client had the significant co-investment funds to enable projects with very long payback from energy savings.

- *A lack of POE flexibility to develop sales tactics for new and evolving market situations*. POE did not manage to create products suited to: the market expectations of grants, the legacy of former rigid public procurement methods, and rapidly escalating construction prices. POE adopted its own sales approach, seeking clients with funds, and responding to public tenders. It failed to develop projects that did not need client co-financing and only as the World Bank loan and the GEF grant came to an end, POE began to think creatively about finding ways to serve clients where the savings could pay for 100% of the investment.

- *The original Business Plan identified an expectation that MPEC would inject* PLN 11 million in the early years. It only injected PLN 2 million, preferring instead to guarantee POE loans.

- *MPEC's focus on using GEF grant funds distracted POE* from seeking business that was unconstrained by Bank objectives and procedures. The GEF Grant became the primary driver of sales and though commercial banks were interested in POE's business because of MPEC's full guarantee, POE did not develop these relationships to access markets beyond the World Bank's objectives.

[4] The Poland Energy Efficiency Project, financed by an $11 million grant from the Global Environment Facility

3.3 Efficiency

A. District heating Component

The Economic Analysis was carried out for the years 2002-2005, as presented in Annex 3. The summary of the outcome of the analysis is presented in the Table below compared with the expectation given in PAD.

Main benefits	**PAD**	**ICR**
Coal savings (thousand tons/y)	71.1	64.3
Gas savings (mill. m3/y)	-	22.2
System efficiency (64% in 2000)	71%	70.50%
EIRR[5]	21.8 %	43%

The EIRR value of the ICR is substantially higher than foreseen in the PAS due to the dramatically increased fuel prices compared to year 2002.

The largest contributor to the positive EIRR is the fuel savings, which is consistent with the main objective of the project. The second largest contributor is the productivity improvements, which comprise staff productivity and system downsizing benefits. The third largest contribution to the positive EIRR is related to the improved maintenance situation of the DH system, which consists of reduced costs of repair as well as of lower consumption of water. The fourth largest contribution comes from the improved environment due to less pollution.

B. ESCO Component:

The economic analysis was carried out by using the materialized investments of PLN 31.4 million as input. The investment costs of PLN 31.4 million were spread over the years 2004-2009 but for the analysis they were converted to a one-time investment made in 2008 by using the inflation rates of the past years. The value of the one-time investment in 2008 was estimated at PLN 33.0 million.

To estimate the economic output, the measured energy savings for the 29 schools have been assumed to be constant at 2008 level from 2008 to 2027.

The estimate of EIRR is negative (-2%), because (i) the analysis ignores the benefits from the higher comfort (inside winter temperature often increased from 17-18 to 21-22 centigrade), the esthetic enhancement and the improved learning environment of the rehabilitated schools, and (ii) the investment costs contain also some engineering services to MPEC which do not have corresponding benefits to include in the analysis.

[5] Economic Internal Rate of Return

According to the reporting of POE, the benefits of the project at the end are as follows:

- Capacity savings 4.5 MW that is 27% of the initial heat supply capacity of 16.7 MW;
- Energy savings of 23.2 TJ that is 23% of the initial heat supply of 99 TJ; and,
- Cost savings of PLN 1.3 million per year that is 31% of the initial energy supply costs of PLN 4.2 million.

3.4 Justification of Overall Outcome Rating

Rating: ***Moderately Satisfactory***

Based on the discussion given in Sections 3.2 and 3.3, the overall outcome is rated as Moderately Satisfactory.

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

N/A

(b) Institutional Change/Strengthening

(particularly with reference to impacts on longer-term capacity and institutional development)

The project facilitated the creation of an ESCO in the Malapolskie region. The ESCO demonstrated how to conduct energy retrofits, mostly in schools for the City of Krakow and showed how it is possible to permanently reduce the rate of air emissions, and substantially improve occupant comfort and the learning environment. This sets a possible example for others to follow. However, the project did not demonstrate sustainable non-grant funded methods of developing and financing turnkey energy retrofits. The long term sustainability of the firm after project closure is uncertain, though it may remain in the energy engineering business.

(c) Other Unintended Outcomes and Impacts (positive or negative)

None.

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

MPEC makes frequent consumer surveys. They show that consumer satisfaction has increased from 78.7% definitively satisfied or rather satisfied in 2001 to 92.8% in 2008 (see Annex 7).

POE ESCO held public forums for potential clients. These were helpful in creating interest and potential leads. POE retained a consultant in 2008 to survey client perceptions of POE and the ESCO business. This non-scientific survey indicated acceptance of POE's work and a belief amongst potential clients that energy efficiency projects should not require client co-investments.

4. Assessment of Risk to Development Outcome

Rating: ***Moderate***

The M rating is based on a comprehensive view of the risks from the two components.

The achievements of the DH component are highly sustainable. There is little risk that the achieved savings or comfort improvements will be reversed.

The achievements of the ESCO Component are less sustainable. It has failed to demonstrate a viable business model for energy efficiency services; the key development objective. POE has demonstrated the significance of grants and owner co-financing in supporting long payback measures.

To achieve the level of market penetration that would be required to meet the development objectives POE would have to transform itself to be able to: (a) perform the financial engineering needed to sell savings financed retrofits; and (b) creatively sell to get around market expectations of grants and resistance to public procurement of turnkey services. It is uncertain whether POE's recent declarations of recognition of market opportunities will be supported by equity from MPEC, or if POE personnel are capable of transforming the firm into a real ESCO.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry

Rating: ***Satisfactory***

The project's overall quality at entry received a " Highly Satisfactory" rating from the Quality Assurance Group (QAG). This was comprised of Highly Satisfactory ratings for: Strategic Relevance and Approach; Fiduciary Aspects; Policy and Institutional Aspects; and Implementation Arrangements; and Satisfactory rating for the: Technical, Financial and Economic Aspects; Poverty and Social Aspects; Environmental Aspects; and Risk Assessment and Management. The QAG Panel remarked that the project: (a) was very well conceived; (b) focused on high priority issues in the Polish economy; (c) was built on the Bank's considerable policy and institutional knowledge in the energy (and specifically the heating) sector; and (d) added a new, innovative energy efficiency element onto the base of an experienced operating company that has successfully implemented a previous Bank financed project.

According to the ICR team, the Bank's performance in the identification, preparation, and appraisal of the project was satisfactory. During preparation and appraisal, the Bank took into account the adequacy of project design and all major relevant aspects, such as technical, financial, economic, and institutional, including procurement and financial management. In addition, major risk factors and lessons learned from other earlier projects in the energy sector were considered and incorporated into the project design.

Project preparation was carried out with an adequate number of specialists who provided the technical skill mix necessary to address sector concerns and a good project design. The Bank provided adequate resources in terms of staff weeks and dollar amount to ensure quality preparation and appraisal work. The concept of the project was clear in terms of institutional development, its implementation was articulated in terms of specific market penetrations by different types of products, together with specifically identifiable environmental benefits.

The preparation team prepared and delivered a presentation on the project for various stakeholders (including 15 prospective clients, business partners and contractors) invited by MPEC and the ESCO. This presentation led to useful discussion and subsequent short focused meetings with small focus groups or individual clients. The team also carried out the procurement project launch workshop for the Project Implementation Unit (PIU) at MPEC and the ESCO team. The presentation led to useful discussion on the procurement methods to be used both for the district heating and ESCO component.

The project was consistent with the CAS and government priorities in the sector at the time. The project, which was mentioned explicitly in the CAS, made a broad contribution to several important policy elements contained in the CAS, including continuing the process of extending reforms in the energy sector, reducing the effective costs of supplying and delivering energy to consumers, mobilizing the private sector for energy investments, and bringing about associated beneficial environmental impacts. The project was also highly compatible with the Bank's sector strategy for the energy sector.

(b) Quality of Supervision

Rating: ***Satisfactory***

The Bank's performance during the implementation of the project was satisfactory. The task team focused on the project's development impact. The Bank allocated sufficient budget and staff resources for supervision. The task team regularly prepared Aide-Memoires from visits and memos from periodic teleconferences with POE. The team alerted MPEC about issues found during project execution, and encouraged prompt corrective action. However, these normal procedures were insufficient to help POE understand the complexities of selling and financing ESCO services in virgin markets that have been spoiled by a grant mentality of clients. It is unclear how conventional supervision could have better directed MPEC in following the initial Business Plan, which did address most of the issues POE faced.

The Implementation Status Reports (ISRs) realistically rated the performance of the project both in terms of achievement of development objectives and project implementation. The Bank's procurement and financial management staff worked with the MPEC staff to explain the rules and procedures to be applied during project implementation, with regard to procurement of goods and works, and selection of consultants, accounts and audits, based on the Loan and Project Agreement.

The Bank's Financial Management Unit has consistently performed the financial management supervision of the project within the framework of the general Bank supervision mission. The task team carried out a Mid-Term Review in June 2006. Based on the recommendations of the MTR, measures were taken to ensure improvement in implementation performance. The task team also monitored safeguard and fiduciary compliances. The most recent FM rating was MU.

(c) Justification of Rating for Overall Bank Performance
Rating: ***Satisfactory***

Based on the Bank performance during lending phase and supervision as discussed above, overall Bank performance is rated as Satisfactory.

5.2 Borrower Performance
(a) Government Performance
Rating:

Not applicable, as the MPEC was the Borrower.

(b) Implementing Agency or Agencies Performance
Rating: ***Satisfactory***

MPEC had requested the Bank's support for this project as a follow-on project of the Heat Supply Restructuring and Conservation Project and had shown high commitment and strong ownership throughout the project preparation. The involvement of MPEC's senior corporate management had been intense and sustained. MPEC Management and Supervisory Board, its General Assembly of Shareholders and the City of Krakow all had endorsed the project and the Bank loan.

MPEC made many significant contributions to project design and was instrumental in conceiving the scope and nature of the operation and was highly motivated to rapid implementation, as could be seen from the identification of several pilot contracts for the ESCO concept. Throughout the preparation cycle MPEC responded promptly and substantively to all Bank requests for information, advice, and action. There was strong evidence of both ownership and commitment to the challenges of starting an ESCO. Given the close ties of MPEC to the City of Krakow, and its general importance to the local community, MPEC was a strong local political champion for this project.

Financial Management (FM). The staffing was adequate, taking into account the size of the project and entities**.** Flow of funds arrangements was adequate. Project did not use Special Accounts. All payments were done through direct payments to suppliers or reimbursements. There were no problems with the counterpart financing. However, quarterly FMRs were provided with consistent delays and were not always fully acceptable, due to previous delays in submission of audit reports and due to the fact that some audits were performed by ineligible auditors.

Procurement Arrangements. Procurement of all works, goods and technical services under the project followed the Procurement Guidelines "*Procurement under IBRD Loans and IDA Credits*". MPEC did the procurement for the ESCO component as well as the district heating component. Procurement of goods and services for POE's contracts prepared for public tenders needed special procurement procedures. MPEC proposed local "Commercial Practices" which the Bank approved. POE found the Bank's procurement procedures restrictive, even after approval of its own "Commercial Practices" process. However POE did not aggressively seek to develop commercial bank funded projects to avoid the need to follow Bank rules.

(c) Justification of Rating for Overall Borrower Performance
Rating: ***Satisfactory***.

In light of the MPEC performance as discussed above, the overall performance of the Borrower was satisfactory.

6. Lessons Learned

- When appraising a borrower for an entrepreneurial business, especially in a new market such as the one for ESCO services, the Bank should focus on the capacity of the borrower to be flexible and entrepreneurial. The Bank should consider if the right type of entrepreneurial people will be available to spearhead this new business model and if not, how such skills/attitudes can be brought in to the project.

- When lending to a borrower that will enter an unfamiliar market, initial loan planning should focus on listing risks and mitigation strategies, and ensuring adequate liquidity to cover acceptable contingencies.

- The opening of ESCO markets requires changes in the thinking of many stakeholders. The Bank should plan to provide direct technical assistance to a variety of entities beyond the borrower. For example support to the establishment of an association of energy efficiency contractors to assist dialogue between governments, clients and the industry.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

POE's statements in Annex 7:

- that more than 30 projects were implemented on the "pure" ESCO formula is somewhat misleading (Item I). The firm did no turnkey design/build projects which might be called "pure" ESCO. Audit, design and construction activities were all done under separate contracts and rarely all three for the same client.
- that there needed to be market research, marketing strategies and materials developed at the outset (Item V) is surprising to the Bank team. Substantial marketing preparation work was sponsored by the Bank to:
    - analyze the market, with MPEC's help, in the initial Business Planning phase;
    - provide two sales training missions which produced model marketing materials;
    - train staff in technical preparation of marketable initial projects; and
    - develop legal and public procurement model documents.
- that the Loan terms restricted POE's flexibility and access to electrical savings is difficult to understand (Item V). There were no limits on the use of Bank funds for electricity savings, and no limits on the firm's use of commercial financing for any emerging needs beyond the World Bank's target market.
- that there should have been a conference of Bank sponsored ESCOs (Item V) is inaccurate. There was one such attempt at group communication in Washington, before launch. One-on-one study tours with other ESCOs were encouraged, following proper process. POE went on two such study tours to Canada and Croatia.

(b) Cofinanciers

n/a

(c) Other partners and stakeholders
(e.g. NGOs/private sector/civil society)

n/a

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in USD Million equivalent)

(Total rows and percentage column will be calculated by the system)

Components	Appraisal Estimate (US$ million)	Actual /Latest Estimate (US$ million)	Percentage of Appraisal
District Heating Modernization Program	50.67	97.85	193%
ESCO Financing	26.92	3.13 *	12%
Technical Assistance	0.30	0.00	0%
Total Baseline Cost	77.89	100.98	130%
Physical Contingencies		0.00	
Price Contingencies		0.00	
Total Project Costs	77.89	100.98	130%
Project Preparation Facility (PPF)		0.00	
Front-end fee (IBRD only)	0.15	0.15	100%
Total Financing Required	78.04	101.13	130%

(a) Co-financing

Source of Funds	Type of Financing	Appraisal Estimate (US$ million)	Actual/Latest Estimate (US$ million)	Percentage of Appraisal
Government		47.04	0.00	0
IBRD/IDA		15.00	18.30 **	122%
Other Private Commercial Sources		16.00	82.83	518%

*** 244,890.11 USD + 2,157,295.99 EUR**

**** 6,515,231.42 USD + 8,952,808.64 EUR (**because of the appreciation of the Euro against the US Dollar since the project start the total disbursement is equivalent to USD18.3 million)

Annex 2. Outputs by Component

Component 1. District Heating Modernization Program

District Heating Modernization component financed:

(a) installation of network loops between the main heat sources of Krakow and Skawina,
(b) installation of modern compact substations, and
(c) replacement of network pipelines.

The following equipment was purchased and installed during the period 2003 – 2008 for the DH Modernization Program: pumps, automatic control equipment, control valves, differential pressure valves, reduction valves, safety valves and accessories, heat exchangers brazed plate, expansion vessels, strainers, desludgers, heat meters, and pre-insulated pipes.

Component 2. ESCO Financing

POE provided energy management services to 29 schools. The services included:

(a) assistance to consumers to identify energy saving opportunities within buildings and from other energy uses as appropriate;
(b) ESCO financing;
(c) Implementation of energy efficiency measures (see below); and
(d) repayment from verified energy savings

The actual building improvements consisted of: repair or replacement of windows and doors; thermal insulation of walls, roofs and internal piping; and modernization of the central heating system including new piping and controls.

Component 3. Technical Assistance

The funds for the Technical Assistance Component were never used and ended up being reallocated to other components.

Annex 3. Economic and Financial Analysis
(including assumptions in the analysis)

Approach and Results

District Heating Component

The EIRR of the project has been estimated at 43% while 21.8% was the estimate in the PAD.

The economic analysis was carried out by comparing the project scenario to business as usual, i.e. a situation without any major investments in system expansion or rehabilitation.

The input values are based on 2008 prices. The time series values of degree days, annual inflation rates, consumption of various types of energy and water, capacities, water temperatures, flue gas emissions, man power, customer base, maintenance breaks and eliminated boilers were obtained from MPEC.

The investment costs were received from MPEC. The investment costs of the project comprise the financing received from World Bank, EBRD, EU as well as use of MPEC's own funds, because the project has been an integral Development Program of MPEC.

For degree day normalization, the heat energy was divided into two parts: (i) the weather dependent room space heating (SH) load and domestic hot water (DHW) load. The latter was then subtracted from the heat energy. The remaining SH load was adjusted to a normal year by multiplying the SH load of the actual year by the ratio of the degree days of the normal year per actual year. Thereafter, the DHW load was added back again to the heat energy.

The benefits were allocated to (i) energy efficiency, (ii) maintenance, (iii) productivity and (iv) improving the environment as presented in the following.

Energy Efficiency

Substation replacement is assumed to have reduced heat consumption of the existing customers by 6%, due to that practically all substations have been equipped with weather controllers. In the energy balance, the efficiency of all the substations of the MPEC system together has increased from 92% in year 2000 to 98% in year 2008. Thus, MPEC has reached the level of substation automation that prevails in older EU member countries.

New pipelines replacing the existing ones are assumed to have reduced the thermal losses of the original network by 20% in energy terms from 11.2% (2001) to 10.1% (2008) of heat production. The level of losses is already good, since the losses of similar large systems in Northern Europe (Finland, Sweden) are between 5-10% of the produced heat energy.

DHW expansion has substituted electricity and natural gas fired water heaters with DH. Based on MPEC management's opinion, about 80% of the converted water heaters function with gas and the balance of 20% with electricity. In the past 8-year period, the share of DHW of the total heat sales has increased from 5% to 9%. The number of DHW customers is now 993, which is 22% of the total number of customers of MPEC already. The economy of DHW expansion is based on the current practice according to which the customers would continue using individual gas and electric heaters in their apartments instead of centralized DHW provided by the project.

Elsewhere in Europe, it is typical that both DHW and SH are served by DH. Therefore, MPEC is approaching a European level of performance.

Small boiler elimination comprises elimination of a small number of small boilers (HoBs). Either the consumers of such boilers have been connected to the DH system or the customers are now served from a new gas fired boiler, the selection depending on economy. All eliminated HoBs have been owned by outsiders, since MPEC had already eliminated its own boilers by year 2000.

New space heating customers are assumed to use 400 GJ/m2, which is about 25% less than the average of MPEC being just above 530 GJ/m2. During the 8-year period, the heated floor area has increased by 10% to 15.7 million m2. Without the Project, the customers are assumed to be heated by new gas fired boilers.

Power production in efficient CHP mode produces benefits due to the fact that both CHP plants in Krakow have excess heat production capacity, which can be used for heating the new customers. Simultaneously, the new heat load has allowed the CHP companies to generate more electric energy in cogeneration mode, which has substituted condensing power generation elsewhere. Both the DHW expansion and the connected new floor area have resulted in fuel savings in CHP compared to condensing power generation. The incremental primary energy factor (incremental fuel used/incremental heat produced) at the CHP plant is assumed to be 0.5 compared to 1.1 with individual gas boilers and 1.6 with small coal boilers. On the power side, the primary energy factor of electric power (= fuel used/power generated) is assumed to be 1.3 with CHP and 2.5 with condensing power generation.

Maintenance

Investments are deferred caused by replacing the existing old pipelines that have an estimated lifetime of about 15 years with modern pre-insulated pipelines that have 30-40 years lifetime (in the calculation 30 years is used). Since year 2002 the length of pre-insulated pipelines at MPEC has doubled from 149 km to 310 km. Of the doubling, some 41 km were used for system expansion and the balance of 119 km for replacing the existing ones. This equals 17.0 km of replaced pipelines per year.

Damage to pipelines are prevented due to the construction of new pipelines. The damage density has dropped about 50% from 0.13 repairs/km in 2001 to 0.07 repairs /km in 2008. Assuming that one repair costs about PLN 35,000, equal to $10,000, some maintenance cost savings have been achieved during the years. The latest value achieved by MPEC is in line with the common practice prevailing in Finland, Sweden and Germany, where the value is about 0.1 repairs per km.

Water consumption has been reduced from 660,000 thousand to 452,000 thousand m^3 a year due to new heat exchangers and pipelines. The reduced consumption has resulted in reduced need to heat make-up water to 75^oC temperature level as well as lower costs of the treated water. The replenishment rate of the network water volume has been reduced from 11 to 7 times a year. In Finland and Sweden, the replenishment rate is about 1 per year; in other words, the water volume of the network will be replenished only once a year. Therefore, MPEC has been doing well so far, but there is still some way to go.

Productivity

New capacity additions have been deferred by better use of existing heat production capacities when new consumers connect to the system. Some 300 MW of individual gas boiler capacity is assumed to have been added in the business as usual scenario during the 8 year project period when a part of the excess capacity of the CHP plants has been put into use. Moreover, due to improved control systems in substations, some benefits have been achieved in reduced need of production capacity as well.

Productivity is improved by using less manpower but increasing sales. During the 8 year period, the staff has reduced 14% whereas sales DHW and SH have increased. Therefore, the productivity in terms of connected floor area per staff has increased 27% to 22,000 thousand m2/person while, due to energy savings of customers, the productivity in terms of GJ/person has remained rather constant. At MPEC as a heat transmission and distribution organization, there may still be a small potential to improve the staff productivity. In Turku Energy Ltd in Finland, for instance, being 80% dependent on heat purchase and the balance of 20% own heat production and the DH system being about the half of the size of Krakow, the staff productivity is 18 GJ/staff whereas 13 at MPEC.

Environment

The environmental impact has been reduced mainly by reduced primary energy consumption but in some few cases by converting polluting heat sources to gas as well. The sophisticated flue gas cleaning systems of the CHP plants together with reduced primary energy consumption have resulted in substantial benefits for the environment. The unit costs of environmental benefits have been taken from the Implementation Completion Report of the previous Krakow project by a conservative assumption that the unit costs today would not be lower than some 8 years ago.

Table 1: Input values of analysis

Fuel prices

Price of coal used at CHP plants	605	PLN/ton	23	GJ/ton	26,29	PLN/GJ
Price of coal/coke used at HOB's	665	PLN/ton	23	GJ/ton	28,92	PLN/GJ
Gas price (MPEC)	1,35	PLN/m3	36	MJ/m3	37,52	PLN/GJ

Cost of treated water 2,49 PLN/m3

Exchange rate 3,5 PLN/USD

Lifetime of fixed assets

Preinsulated pipes and fittings	30	years
Modern Substations	20	years

Unit cost of emissions	Low stack	High stack		ton/TJ kg/fuel GJ
SO2	1138	928	PLN/ton	0,80
Nox	1400	630	PLN/ton	0,29
CO2	18	18	PLN/ton	92
Dust and particulates from CHP	7560	210	PLN/ton	0,06
Dust and particulates from HoBs				0,70

Staff unit cost 50231 PLN/a

Inflation	2001	2002	2003	2004	2005	2006	2007	2008
	5,5%	1,9%	0,8%	3,5%	2,1%	1,0%	2,5%	0,0%
	1,06	1,02	1,01	1,04	1,02	1,01	1,03	1,00
	1,19	1,12	1,10	1,09	1,06	1,04	1,03	1,00
	1,06	1,075	1,084	1,122	1,145	1,157	1,185	1,185
Degree days		2800	3065	2828	3023	3524	3177	3286

Investment costs (th PLN)	2001	2002	2003	2004	2005	2006	2007	2008	Total
MPEC	37 677	24 850	19 598	19 893	39 000	42 123	39 953	18 326	203 743
World Bank	0	3 741	5 776	6 850	5 746	5 159	1 968	2 818	32 059
Others (EU, EBRD, ..)	0	1 482	1 216	1 582	177	16 676	28 869	34 111	84 113
Total	37 677	30 073	26 590	28 325	44 923	63 958	70 790	55 255	319 915

Substations								
Replacements								
number (#)	75	153	186	119	88	220	303	1 144
capacity (kW)	11 300	23 500	28 200	18 600	12 700	33 800	45 500	173 600
New ones to new customers								
number (#)	66	57	43	84	90	78	127	545
capacity (kW)	35 100	24 300	22 200	19 500	20 000	26 700	26 900	174 700

Networks (km)								
Replacements								
DN up to 200	0,4	0,8	5,0	7,2	4,4	32,2	44,4	94,4
DN 200 - DN400	0,3	0,1	0,3	0,1	1,8	3,4	7,3	13,3
DN from 400 up	0,3	0,1	0,4	1,6	5,4	2,5	1,1	11,3
Extensions								
DN up to 200	6,4	5,0	2,6	5,7	8,0	5,0	8,9	41,6
DN 200 - DN400	1,5	1,4	0,5	0,0	0,0	0,4	0,5	4,2
DN from 400 up	1,1	0,0	0,0	0,0	0,0	0,0	0,0	1,1

Table 2: Results of Economic Analysis DH Component

		2002	2003	2004	2005	2006	2007	2008	2009	2025
A Fuel Savings										
Fuel energy savings (Table 3)	TJ	292	444	747	951	1 268	1 612	2 014	2 189	2 189
Gas savings	TJ	84	149	251	365	494	602	800	800	800
Coal savings	TJ	207	295	496	587	775	1 010	1 213	1 388	1 388
Fuel cost savings	M PLN	8,6	13,4	22,5	29,1	38,9	49,1	61,9	66,5	66,5
B DH System Maintenance										
1 Deferred Replacement Investments (Table 4)										
Replaced pipelines	km	16	16	16	16	16	16	16	0	0
Cost savings	M PLN	1,3	2,6	3,9	5,2	6,5	7,8	9,1	10,4	10,4
2 Reduced Maintenance (Table 6)										
Without Project: number of damages		110	110	110	110	110	110	110	110	110
Cost of one damage repair	PLN	*35 000*	*35 000*	*35 000*	*35 000*	*35 000*	*35 000*	*35 000*	*35 000*	*35 000*
Repair costs	M PLN	3,9	3,9	3,9	3,9	3,9	3,9	3,9	3,9	3,9
With Project: number of damages		113	96	113	100	93	78	51	51	51
Cost of one damage repair	PLN	*35 000*	*35 000*	*35 000*	*35 000*	*35 000*	*35 000*	*35 000*	*35 000*	*35 000*
Repair costs	M PLN	4,0	3,4	4,0	3,5	3,3	2,7	1,8	1,8	1,8
Savings compared with 2001 level	M PLN	-0,1	0,5	-0,1	0,4	0,6	1,1	2,1	2,1	2,1
3 Water Losses (Table 7)										
Losses without Project	th.m^3	660	660	660	660	660	660	660	660	660
Losses with Project	th.m^3	687	612	712	722	726	638	538	452	452
Reduced Loss	th.m^3	-27	48	-52	-62	-66	22	122	208	208
Unit Cost of Water	PLN/m^3	*2,5*	*2,5*	*2,5*	*2,5*	*2,5*	*2,5*	*2,5*	*2,5*	*2,5*
Savings in Water Costs	M PLN	-0,1	0,1	-0,1	-0,2	-0,2	0,1	0,3	0,5	0,5
C Productivity Improvement										
1 Staffing										
without Project (constant)	prsns	851	851	851	851	851	851	851	851	851
with project in real terms	prsns	814	789	776	763	747	736	733	733	733
Unit cost of staff year	PLN/prs	*50 231*	*50 231*	*50 231*	*50 231*	*50 231*	*50 231*	*50 231*	*50 231*	*50 231*
Savings in staff cost	M PLN	1,9	3,1	3,8	4,4	5,2	5,8	5,9	5,9	5,9
2 Down-sizing Benefits (Table 8)	M PLN		0,0	0,0	0,0	0,0	0,0	0,0	11,2	11,2
D Air Pollution Abatement										
1 **SO_2**										
SO2 reduction	Mg	166	236	397	469	620	808	971	1 111	1 111
Unit cost of saved emissions of CHP	*PLN/Mg*	*928*	*928*	*928*	*928*	*928*	*928*	*928*	*928*	*928*
Savings of emission	M PLN	0	0	0	0	1	1	1	1	1
2 **NOx**										
Nox reduction	Mg	85	129	217	276	368	467	584	635	635
Unit cost of saved emissions of CHP	*PLN/Mg*	*630*	*630*	*630*	*630*	*630*	*630*	*630*	*630*	*630*
Savings of emission	M PLN	1	1	1	2	2	3	4	4	4
3 **CO_2**										
CO2 reduction	Mg	23 597	35 208	59 205	73 811	98 140	125 608	155 238	171 165	171 165
Unit cost of saved emissions	*PLN/Mg*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*
Savings of emission	*M PLN*	0	1	1	1	2	2	3	3	3
4 **Particles and Dust**										
HoBs' emissions without Project	Mg	65	65	65	65	65	65	65	65	65
HoBs' emissions with Project	Mg	65	50	50	30	30	10	4	4	4
HoBs' reduction in emissions/a	Mg	0	15	15	35	35	55	61	61	61
Unit cost of saved emissions	*PLN/Mg*	*7 560*	*7 560*	*7 560*	*7 560*	*7 560*	*7 560*	*7 560*	*7 560*	*7 560*
Savings of emission	M PLN	0	0	0	0	0	0	0	0	0
Summary of Benefits										M PLN
Total Savings										
WITHOUT environmental benefits	M PLN	12	20	30	39	51	64	79	97	97
WITH environmental benefits	M PLN	13	21	33	43	56	70	87	105	105
Investment costs	M PLN	-30	-27	-28	-45	-64	-71	-55		
Net Cash Flow (without environmental)										
WITHOUT environmental benefits	M PLN	-18	-7	2	-6	-13	-7	24	97	97
WITH environmental benefits	M PLN	-47	-5	4	-2	-8	-1	32	105	105
EIRR										
WITHOUT environmental benefits		**43 %**								
WITH environmental benefits										
NPV (10%)										
WITHOUT environmental benefits		**$373 million PLN**								
WITH environmental benefits		**$397 million PLN**								

ESCO Component

Investment Costs

According to the tables provided by POE, the WB financing of POE has amounted to USD 3.078 million equal to PLN 8.8 million in total and the rest of PLN 22.6 million from the clients. Therefore, the total investment costs have been PLN 31.4 million.

Benefits

According to the reporting of POE, the cumulative energy savings of the project have been 61.4 TJ during the years 2003-2008. In Table below, the cumulative energy savings given in PIP and of the actual design carried out by POE during the years have been presented.

In the EIRR analysis this is converted to an annual saving that starts by 3.7 TJ/y and then rises to 23.2 TJ/y when the full effect of all the investment is felt.

Year	PIP	Actually Designed
	GJ	GJ
2002	-	
2003	3 000	932
2004	25 000	3 340
2005	80 000	6 765
2006	160 000	18 070
2007	260 000	36 814
2008	380 000	61 424

Table 9: Economic Analysis of ESCO

		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2027
Benefits													
Capacity	MW					1,0	2,0	3,0	4,5	4,5	4,5	4,5	4,5
Energy	TJ					3,7	3,7	3,4	23,2	23,2	23,2	23,2	23,22
Cost savings	m PLN					0,7	0,9	1,1	1,3	1,3	1,3	1,3	1,3
Investments	m PLN	-2,4	-4,1	-0,3	-7,1	-8,3	-6,4	-2,9	-31				
Inflation		1,12	1,10	1,09	1,06	1,04	1,03	1,00					
In 2008 value	m PLN	-3	-4	0	-8	-9	-7	-3					
One-time	m PLN							-33,0					
Net cash flow	m PLN							-31,9	1,3	1,3	1,3	1,3	1,3
IRR (years 2008-2027)								-2 %					

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
Lending (from Task Team in PAD Data Sheet)			
Rachid Benmessaoud	TTL/ Lead Energy Specialist	ECSIE	Team Leader
Snezana Mitrovic	Sr. Procurement Specialist	ECSPS	Team member
Elzbieta Sieminska	Procurement Specialist	ECSPS	Team member
John Cowan	ESCO Management Consultant	ECSIE	Consultant
Karl Enar Wennerstrom	Financial Management and Financial Analysis	ECSIE	Financial Management Specialist
Arto Nuorkivi	District Heating Engineer and Economic Analysis	ECSIE	Consultant
Bernard Baratz	Environment Management	ECSSD	Environmental Specialist
Jose F. Molina Financial Products and Services	Environment Management	BDM	Sr. Financial Officer
Zoe Kolovou	Counsel	LEGEC	Lawyer
Joseph Paul Formoso	Disbursement	LOAG1	Disbursement Officer
Rozena Serrano	Program Assistant	ECSSD	Team member
Frederick T. Day	ESCO Sales and Marketing	ECSSD	Consultant
Martin Adelaar	Market Analysis and Business Planning	ECSIE	Consultant
Thomas Brett	ESCO Client Contracts and Financing Arrangements	ECSIE	Consultant
Joseph Deringer	Energy Auditing and Architectural Engineering	ECSIE	Consultant
Steve Schiller	Measurement and Verification of Energy Saving Contracts	ECSIE	Consultant
Supervision (from Task Team Members in all archived ISRs)			
Peter Johansen	TTL/ Sr Energy Specialist	ECSSD	Team Leader (2003-present)
Rachid Benmessaoud	TTL/ Lead Energy Specialist	ECSIE	Team Leader (until 2003)
Pawel Kaminski	Sr Energy Specialist	ECSIE	Team member
Roman Palac	Operations Officer	ECSSD	Team member
Ryszard Malarski	Environmental & Infrastructure	ECSSD	Consultant

Names	Title	Unit	Responsibility/ Specialty
	Specialist		
Iwona Warzecha	Sr Financial Management Specialist	ECSPS	Team member
Angelica A. Fernandes	Procurement Analyst	ECSPS	Team member
John Cowan	ESCO Management Consultant	ECSSD	Consultant
Arto Nuorkivi	District Heating Consultant	ECSSD	Consultant
Rozena Serrano	Program Asst.	ECSSD	Team member

b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
Lending		
FY99		41.45
FY00	16	80.38
FY01	23	109.20
FY02		0.03
FY03		0.00
FY04		0.00
FY05		0.00
FY06		0.00
FY07		0.00
FY08		0.00
Total:	39	231.06
Supervision/ICR		
FY99		0.00
FY00		0.00
FY01		0.00
FY02	11	73.24
FY03	12	69.78
FY04	4	35.39
FY05	9	48.48
FY06	20	110.61
FY07	19	80.93
FY08	11	79.31
FY09	2	30.75

Annex 5. Beneficiary Survey Results
(if any)

See Annex 7

Annex 6. Stakeholder Workshop Report and Results
(if any)

See Section 3.6

Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR

Comments from POE

Value of the project:

Great research value – the activities in the ESCO formula, as suggested by the World Bank prior to 2000, were realized in Poland by just a few companies. There were only a few successful implementations in the classical ESCO formula; the ventures usually comprised certain ESCO elements. A number of them were not professionally prepared and ended up in the companies' bankruptcy filings or lawsuits.

POE ESCO was founded as a model ESCO company in Poland (apart from Siemens BT that was created by EBRD). The last four years of business activity is evidence that it is possible to carry out such ventures in Poland. POE ESCO is able to present more than thirty objects that were realized according to the "pure" ESCO formula, which substantially increases the value and credibility of the company. It is a large base of "good practice".

The quality of the World Bank team's contribution

The World Bank, represented by R. Benmesaud, P. Johansen, R. Pa□ac, R. Malarski, J. Cowan, and J. Herzl, has utilized great invention in searching for ideas for ESCO development in Poland. At meetings and in the exchanged correspondence, these inventive ideas for Poland were discussed, concerning off-balance-sheet financing, the promotion of the services of a facilitator, and the system of guaranteeing the loans.

Awarding the GEF grant in turn generated numerous investments in the Ma□opolska region and made it possible to perform a number of audits, draw up many studies, and organize various training courses.

What worked the best

The acceptance procedures in the first five capital projects were carried out very efficiently.

The exchange of correspondence between the World Bank and POE ESCO ran smoothly. P. Johansen provided answers promptly. The employees of the Polish branch of the Bank were always helpful and engaged themselves in the process of solving the problems that arose in relation to the project.

All visits and reviews were very well prepared and organized. Early agreement on the subjects to be discussed along with the respective expectations enabled both parties to prepare well for each discussion. The meetings were also conducted excellently.

The co-operation between POE ESCO and BGK, on the operational level, also ran smoothly. The Bank's employees endeavoured to clearly specify their expectations. They explained all the necessary procedures in an understandable way, took part in the annexes preparation process as well as in the process of the best possible use of the provisions of the contract.

What did not work at all

The payments from the World Bank (and BGK) to the ESCO subcontractors were often delayed (especially at the beginning of each project). As far as the construction works are concerned, the delays were short, of a few days only, while in the case of Technical Assistance, the delays were sometimes even more than one month long.

The resignation from initiating the facilitator's services came as great disappointment; the facilitator's task was supposed to be to arrange the projects in the ESCO formula in Poland.

The co-operation with the Ministry of Economy did not go well at any level. The project of the World Bank was not received well there. Seemingly, perhaps five directors managed the GEF grant in the three-year period in BGK.

At the final stage, the use of the TA grant was increasingly difficult. The criteria were imprecise and variable. Certain procedures were unclear, e.g. the purchase of flight tickets, hotel payments, and financing the participation in conferences. We took the decisions of the World Bank concerning the reduction of the budgets of individual items with great regret, since the level of reduced budgets made it impossible to carry out the works as planned.

The Guarantee Fund probably became the most expensive and worst working element of the entire Programme. The banks shall not accept the guarantees of a fund that does not take on the risk and formulates unrealistic reporting obligations. Unfortunately, the transformed guarantee fund was not widely accepted by commercial banks. In the face of MPEC being no longer able to guarantee loans, and facing the fact that the guarantee fund was not accepted by those respective banks, POE ESCO was forced to change and expand the activity profile.

What should be executed differently next time

Bearing our experience in mind, I believe that greater emphasis should be placed on marketing and Public Relations in the first stage of the project's organization. A lot of work was performed in order to prepare the venture's business plan, and only later on the market research was carried out. Effective marketing strategies were neither formulated nor implemented. High quality promotion materials and campaigns should have been made and executed between 2001 and 2002.

The GEF grant resources that enabled the partial minimization of the effects of the above-mentioned deficiencies were provided very late from the second half of 2005. (After five years of poor activities). This happened at a time when the company, due to the lack of success and financial problems, was endangered with the possibility of liquidation. The MPEC Supervisory Board was striving to do this.

In my opinion, the World Bank and their consultants' approach was too limited regarding the character and changing market conditions in Poland. Already at the beginning of 2007, a strong recommendation concerning participation in the saving electrical energy market should have been issued. Unfortunately, up until 2006 I had a feeling that the suggestions and recommendations had been treated by the company management as those of a global character: if something worked in a given country in a given way, it must also work in Poland likewise. This was the reason for the increasingly more noticeable differences in the opinions of the bank's representatives and of the members of the company's management board, as well as the tension between them.

The three above-mentioned issues make it possible for me to advance a thesis that, from the time perspective, the Croatian model was a better one. It was definitely more expensive for the World Bank and the owners of the HEP company, in which the authorities of which had tolerated the lack of profitability in HEPESCO for a very long time. Next time, perhaps, in such a situation the World Bank should take part in the process of the creation of similar entities at higher levels than the level of management of the mother company. According to the agreement, the Bank should also have the level of further investment contribution to POE ESCO clearly specified, as well as the obligations concerning the guarantees. In Krakow, the "contamination" of the POE ESCO profile was caused by pressure from the MPEC Supervisory Board, which did not want to tolerate supplementary payments towards the POE ESCO's capital.

The World Bank should be more flexible in the procedures of granting orders in small projects. The agreement concerning a wider scope of work to be ordered to subcontractors via the contracts with flat rates would take away great risk from ESCO and would make it possible to make a fair

basis of subcontracting companies. In the currently used model, ESCO takes on all possible risks– the change of the interest rates, currency rates, changes in the prices for subcontracted services, and guarantees of savings. This model supports the creation of non-market prices for POE ESCO services or the dangerous increase of risk.

The currently realized programme did not make it possible to finance the modernization of lighting in Poland via the traditional market procedures based upon the Public Procurement Law. If POE ESCO had teams of contractors with selected flat rates, they would be able to participate in a greater number of tenders and initiate them more effectively.

The World Bank introduced unrealistic limitations on the budget in the TA part. It forced POE ESCO to contribute with their own company resources more than was agreed to in the grant agreement. It resulted in the fact that less than half of the available resources were not used, and they were directed to the non-effective guarantee programme. The World Bank acted, as if it was afraid, perhaps unnecessarily, to contact POE ESCO and exchange the respective experience with other similar companies in the world. They could have been more open to the study visits (accounted for in the grant agreement) or could have organize one or two conferences (workshops) for all the companies, the establishment of which was the World Bank's initiative.

The World Bank should verify the number of reports, summaries, and translations of the documents into the English language that they expect to receive. This especially concerns the tender documentation for construction works. Some tenders required the translation of an incredible one thousand pages, while only Polish companies participated in the proceedings. For POE ESCO, this was of course a cause of considerable expenses.

Brief evaluation of DH Component

Municipal District Heating Enterprise of Krakow
MPEC S.A. in Krakow

Implementation Completion Report

Krakow Energy Efficiency Project, Poland

World Bank Loan # 7057 POL

Krakow
March 2009

The Project name:

Krakow Energy Efficiency Project (further – Project).

The Project beginning date:

The Loan Agreement between International Bank for Reconstruction and Development (the Bank) and Miejskie Przedsiebiorstwo Energetyki Cieplnej S.A. w Krakowie (Municipal District Heating Enterprise of Krakow) (the Borrower) was signed on April 16, 2002 and established under the laws of the Republic of Poland.

The Guarantee Agreement was ratified on April 16, 2002 by the Republic of Poland (the Guarantor) in the name of which the Ministry of Finance acts, and International Bank for Reconstruction and Development.

The Agreement came into force on July 9, 2002 after signing by the World Bank of the Declaration of Effectiveness of the Agreement.

The Project closing date:

December 31, 2007 according to the Loan, finally, according to the Letter "Extension of the Closing Date" dated June 17, 2008 established by the World Bank on December 31, 2008 (financial accounts shall remain open during the Grace Period i.e. till April 30, 2009).

The financing sources:

World Bank – total amount USD 15 mill equivalent divided into two tranches of the Loan :
USD 7.5 million and EUR 9.0 million

The last disbursement was dated February 5, 2009.
On the day of February 5, 2009 the disbursed balance of the Loan was:
USD 6,515, 231.42 and **EUR 8,952,808.64**

The undisbursed balance of the Loan i.e. **EUR 47,191.36** and **USD 984,768.58** was cancelled according to the letter of the World Bank "Cancellation of Loan Proceeds" dated February 27, 2009.

Choice of Loan Product

Fixed-spread, disbursement-linked LIBOR-based loan, denominated in two currencies, US dollars and Euro, (11.5 years of maturity with 4 years grace, level repayments of principal).

On March 25, 2004 we requested for Conversion of IBRD Fixed-Spread Loan Interest Rate Conversion: **fixed rate of interest to variable rate of interest** and notify the Bank to terminate the Automatic Interest Rate Fixing for all tranches both in US Dollars and Euro which were disbursed and to be disbursed. We obtained the World Bank approval dated April 15, 2004.

Description of the Project

The objective of the Project is to improve energy efficiency of the heating systems in the Krakow region by:

a) continuing the modernization program of the district heating system of the City of Krakow

b) helping consumers to decrease heat energy consumption by improving energy efficiency at the end-user level

c) developing the knowledge and mechanisms necessary to fund end-users energy efficiency projects

Project consists of DH Component (a) and ESCO Component (b)&(c).

District Heating Modernization (DH Component)

1. Installation of network loops between the main heat sources of Krakow and Skawina
2. Installation of modern compact substations
3. Replacement of network pipelines

Annex 1 - Performance Monitoring (PAD)

The Development Objective of the project is to improve energy efficiency and to reduce emission of atmospheric pollutants in the Krakow region by:

1. Improving the quality and delivery of district heating and hot water services in Krakow;
2. Helping Consumers to decrease the energy consumption by improving the energy efficiency of their buildings;
3. Developing in Krakow the knowledge and mechanisms necessary for financiers to fund energy retrofit projects so that the energy market’s price signals can motivate energy efficiency.

The key **outcome-level performance** indicators for the Development Objective include:

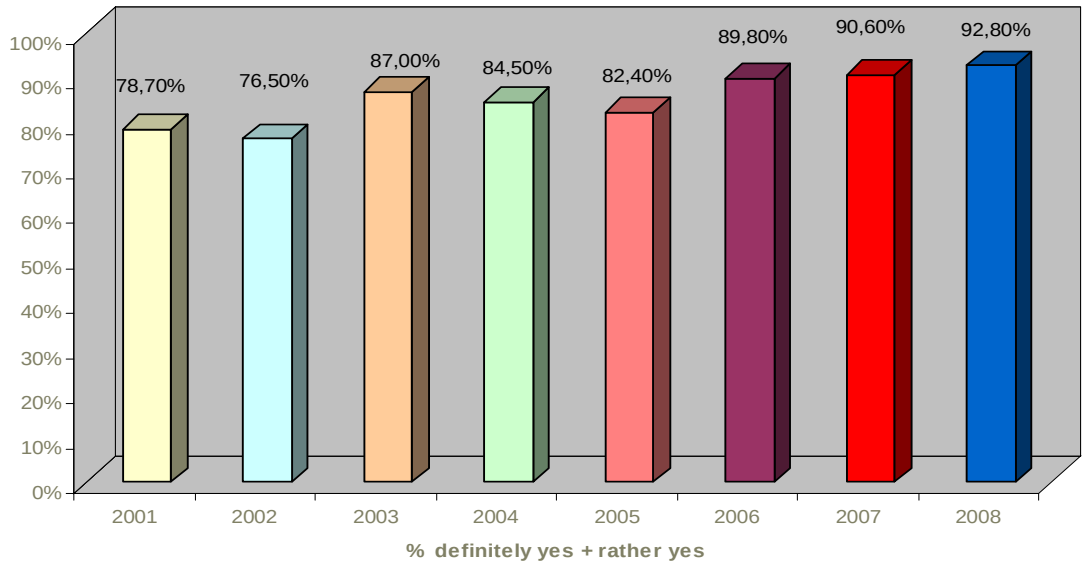
- **Increased customer satisfaction**
- **Quantified energy savings and associated emission reductions of local air pollutants**
- **ESCO annual sales and level of co-financing.**

Increased customer satisfaction

Each year there is a poll organized by KHK Krakow in which the customers are requested to respond to the following question: "Are you satisfied with quality of services provided by MPEC S.A.?"

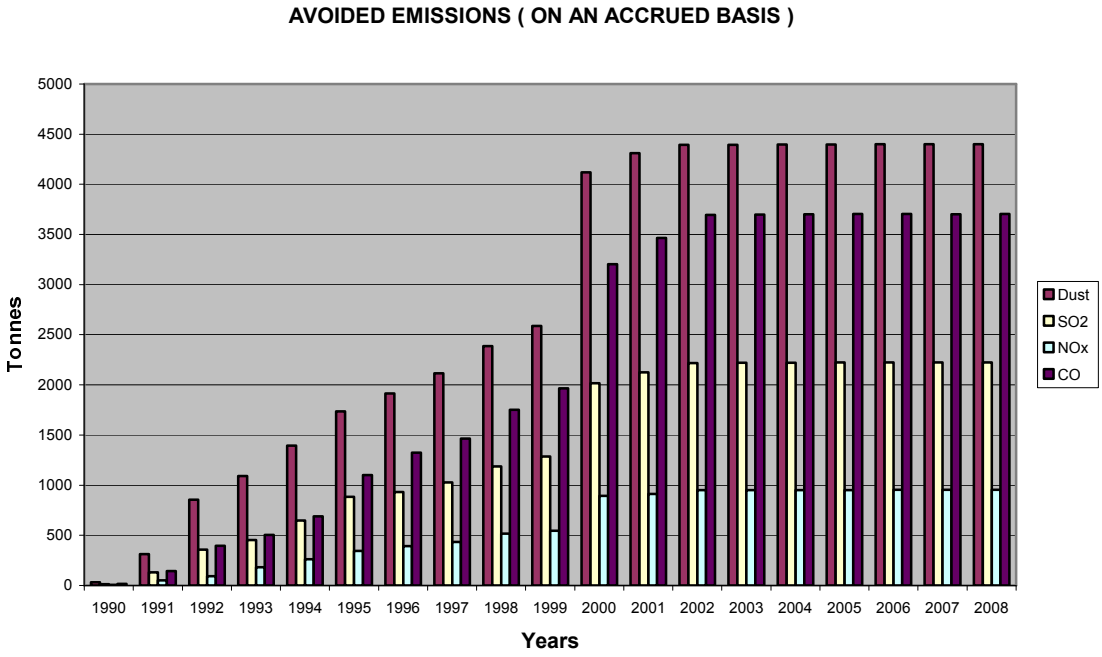
The results covering all period of Project i.e. the years 2002 – 2008 are given in the table below and in the chart.

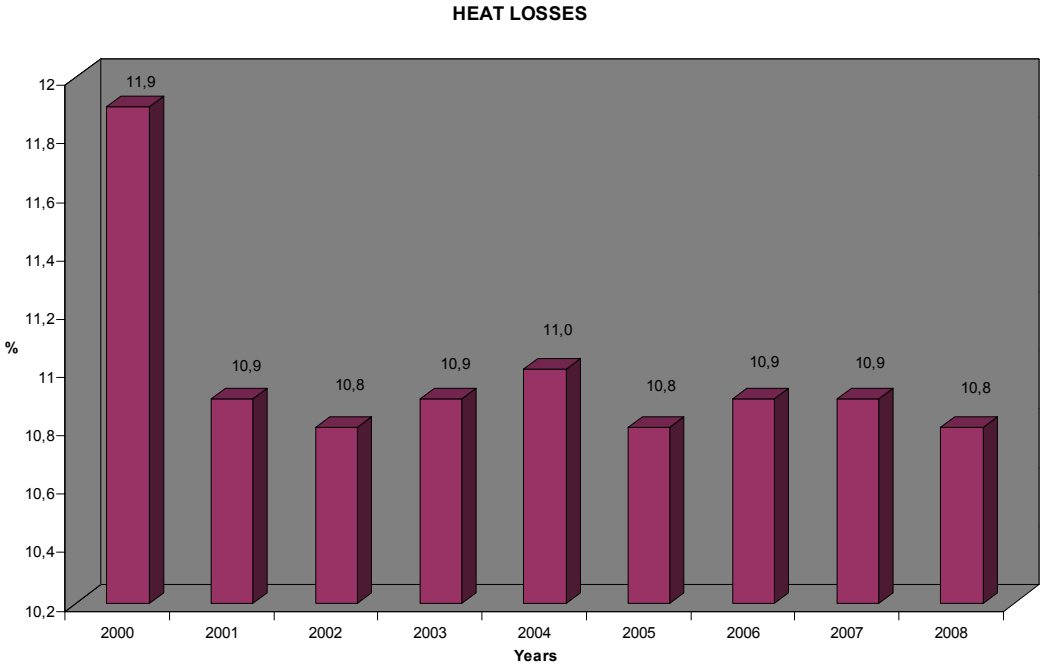
	2001	2002	2003	2004	2005	2006	2007		2008	
		%					Number	%	Number	%
Definitely yes	**21,1%**	**16,2%**	**22,3%**	**15,3%**	**10,7%**	**21,4%**	**186**	**24,4%**	**256**	**23,9%**
Rather yes	**57,6%**	**60,3%**	**64,7%**	**69,2%**	**71,7%**	**68,4%**	**505**	**66,2%**	**737**	**68,9%**
Rather no	**12,8%**	**15,1%**	**7,8%**	**9,4%**	**11,9%**	**4,2%**	**39**	**5,1%**	**39**	**3,6%**
Definitely no	**4,8%**	**5,4%**	**2,8%**	**3,7%**	**2,7%**	**0,7%**	**10**	**1,3%**	**12**	**1,1%**
I don't know, hard to say	**3,7%**	**3,1%**	**2,4%**	**2,5%**	**3,0%**	**5,3%**	**23**	**3%**	**25**	**2,3%**
Total	**100,0%**	**100,0%**	**100,0%**	**100,0%**	**100,0%**	**100,0%**	**763**	**100,0%**	**1069**	**100,0%**

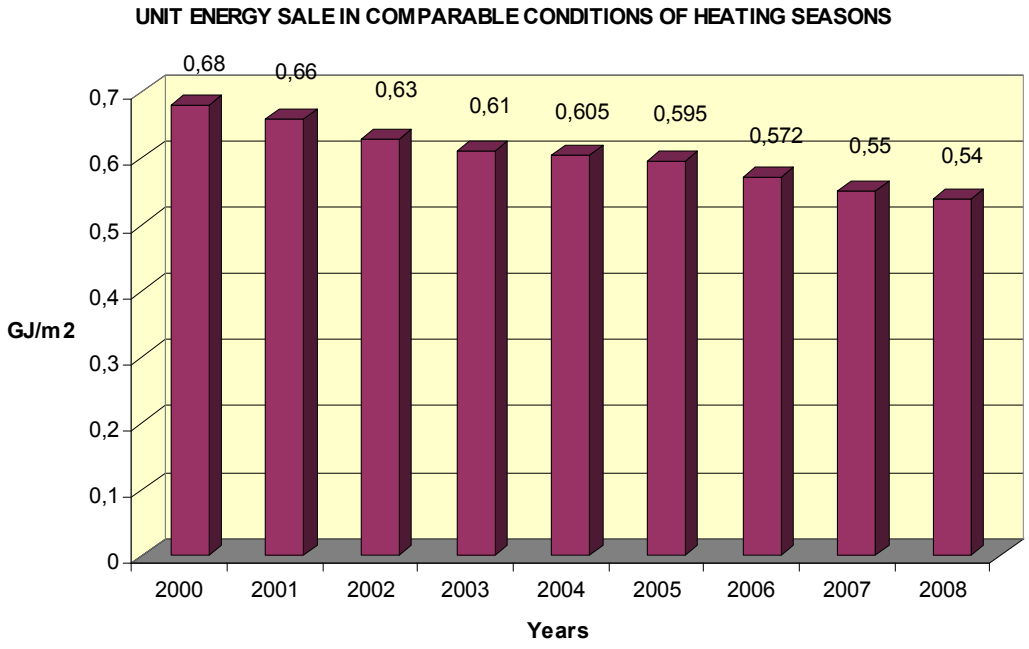


During the project implementation i.e. from the year 2002 to the year 2008 the level of customer satisfaction increased from the level of 76.50% to the level of 92.80%.

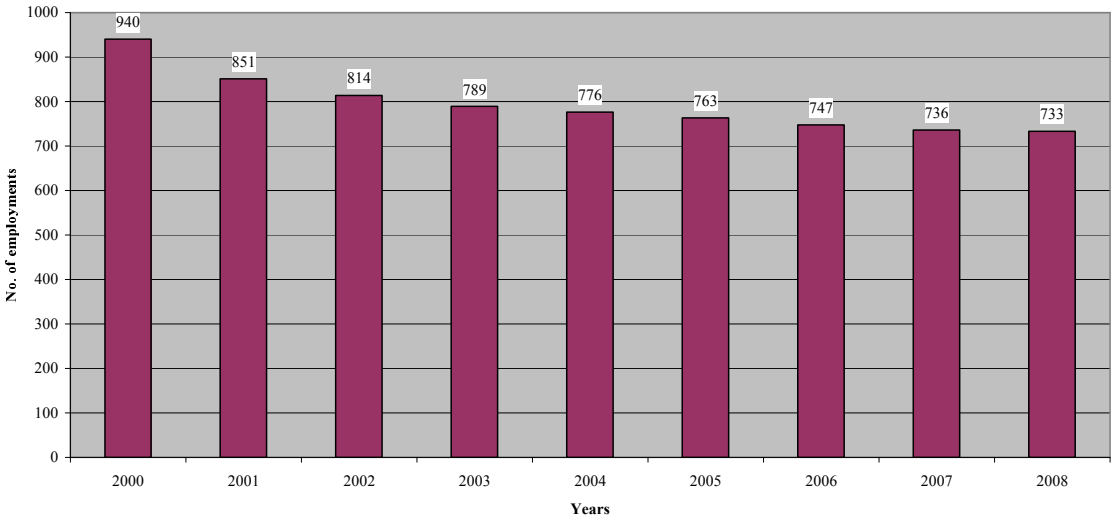
Quantified energy savings and associated emission reductions of local air pollutants



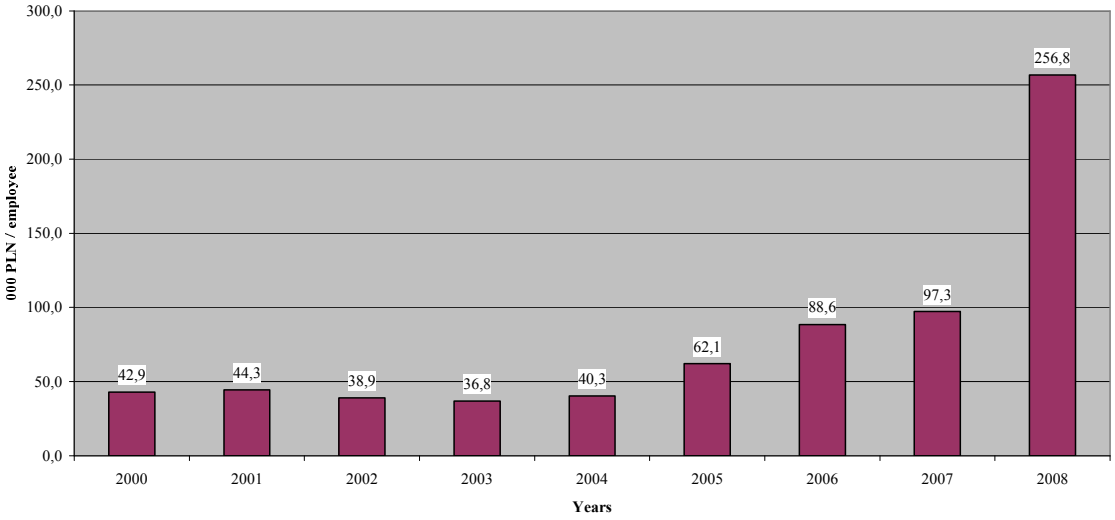




ANNUAL
AVERAGE EMPLOYMENT



INVESTMENT INPUT
AS ON ONE EMPLOYEE



The Project results in environment

The Project results in environment concern mainly the decrease of harmful emissions into atmosphere and reduction of heat energy losses in DH network. A reduction of pollution is obtained due to the use of up-to-date equipment and rehabilitation of existing equipment.

The modernization of DH system allows to improve the ecological situation in the region.

The Project goals:

- **For the End-users**: competitiveness and affordability of district heating and hot water services within the project's target areas;
- **For MPEC**: Increased efficiency of the district heating system
- **For the ESCO**: Market penetration in the private and public buildings sectors

Assessment of outcomes of Project implementation

The Project implementation have positive influence on the heat supply reliability, as well as increase the quality of heating and hot water supply and considerably increase the quantity of heat supply to the consumers. The considerable saving is achieved by elimination of heat energy losses through heat network pipeline investments. A reduction of the operational costs of DH network maintenance is expected owing to the increase of equipment and system reliability.

PROCUREMENT FOR DH COMPONENT		CONTRACT AMOUNT in PLN NET VALUE	CONTRACT AMOUNT in USD gross VALUE	NUMBER OF BIDS
Strategic Development				
Network Loops	S&I DN 600,	3 737 464,11	964 445,85	5
	S&I DN500,	2 693 061,88	746 603,35	
	S&I DN400,	2 123 034,55	589939,7	
	S&I DN300,	524 160,23	145 894,10	
	PUMPING STATION ZAKRZÓWEK	2 493 234,00	880 873,28	
Modernization and Retrofits				
Modernization of group substation	PUMPING STATION WOLA DUCHACKA	1 537 940,00	432 530,79	2
	PUMPING STATION W□OSKA	1 368 979, 63	617 037,21	
Replacement of Heating Networks	PROCUREMENT OF PREINSULATED PIPELINES,	1 467 733,40	406 411,69	9
	S&I DN700 PODGÓRSKA,	1 243 598,95	444 827,82	
	PROCUREMENT OF PREINSULATED PIPELINES,	2 779 588,28	1 002 604,90	
	PREINSULATERD PIPELINES WITH COMPONENTS,	2 540 127,63	898 549,93	
	S&I DN500 RONDO MOGILSKIE,	1 182 775,24	465791,8	
	S&I PREINSULATED PIPELINES 6 TASKS	2 653 805,18	1 001 319,56	
	S&I TURN KEY KORABNIKI SKAWINA	5 954 718,60	3 095 161,39	
	S&I GRZEGÓRZECKIE ROUNDABOUT DN 700&500	4 887 184,03	2 780 924,33	
	S&I CONNECTION OF NEW CUSTOMERS	1 531 352,00	842 100	
Heat Efficiency				
DH Automation: heat exchangers	PUMPS,	481 221,00	151 242,35	8
	AUTOMATIC CONTROL EQUIPMENT,	1 714 322,37	470 758,22	
	EXPANSION VESSELS,	660 253,00	182 665,46	
	STRAINERS AND DESLUDGERS,	159 838,50	44 758,67	
	BRAZED PALTE HEAT EXCHANGERS,	***EUR*** 128 216,00	149 274,72	
	BALL VALVES,	1 173 279,57	328 519,81	
	FLAP VALVES	367 782,12	102 603,42	
	FLAP VALVES	686 442,77	249 680,16	
DH Automation: heat meters	PROCUREMENT OF HEAT METERS	3 193 981,00	977 771,90	2
	DELIVERY OF A SYSTEM FOR REMOTE READ OUT OF HEAT METERS TASK 1 AND 2	698 933,00	298 503,33	

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

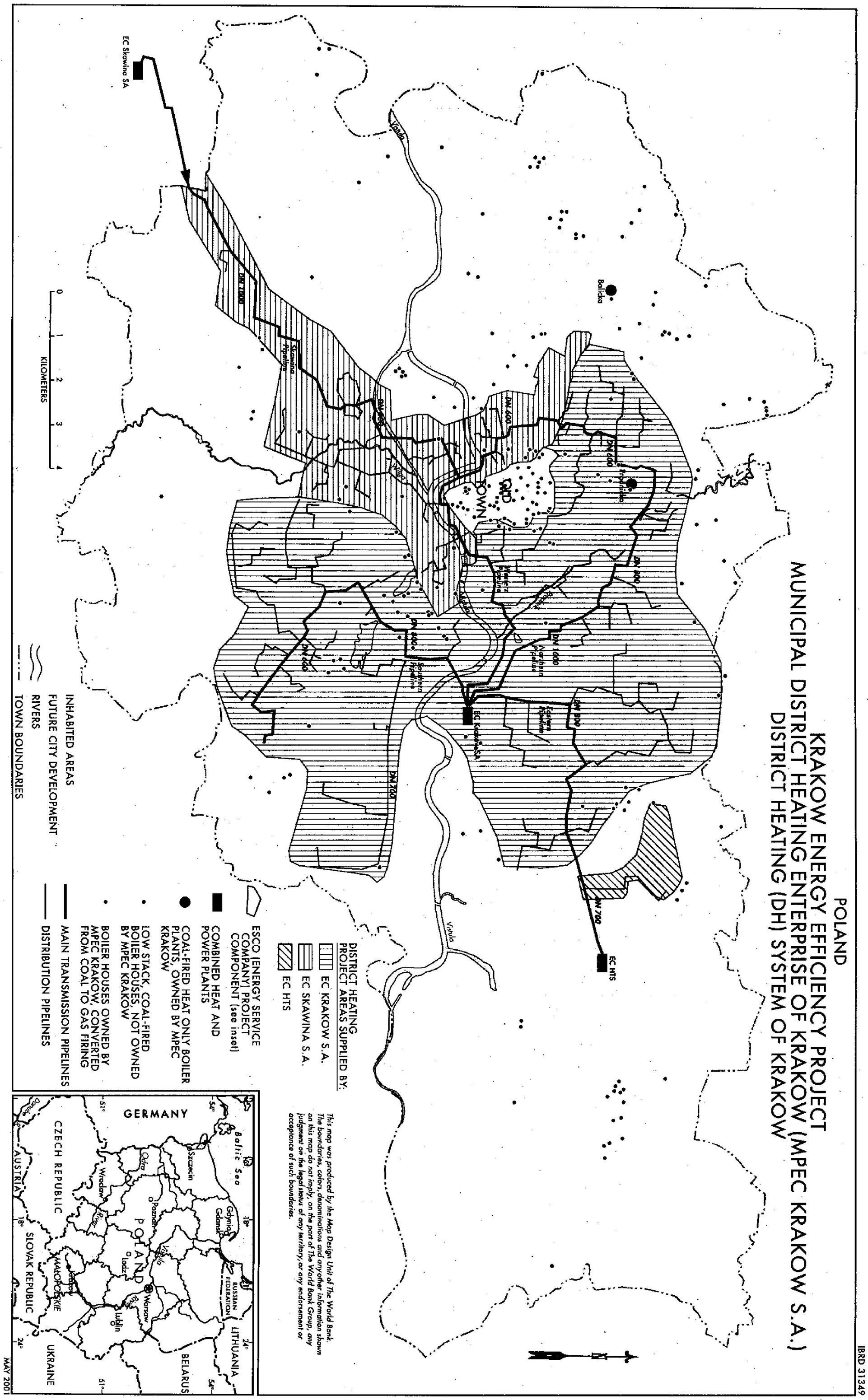
See Sections 3.6 and Annex 7.

Annex 9. List of Supporting Documents

- Project Implementation Plan
- Aide Memoires, Back-to-Office Reports, and Implementation Status Reports.
- Project Progress Reports.
- Project Appraisal Document for Poland: Krakow Energy Efficiency Project, dated May 9, 2001 (Report No: 20969-POL)
- Borrower's Evaluation Report dated April 2009
- Economic analysis of the Project

*including electronic files

Annex 10. Map


POLAND
KRAKOW ENERGY EFFICIENCY PROJECT
MUNICIPAL DISTRICT HEATING ENTERPRISE OF KRAKOW (MPEC KRAKOW S.A.)
DISTRICT HEATING (DH) SYSTEM OF KRAKOW
DISTRICT HEATING PROJECT AREAS SUPPLIED BY:
EC KRAKOW S.A.
EC SKAWINA S.A.
EC HTS
ESCO (ENERGY SERVICE COMPANY) PROJECT COMPONENT (see inset)
COMBINED HEAT AND POWER PLANTS
COAL-FIRED HEAT ONLY BOILER PLANTS, OWNED BY MPEC KRAKOW
LOW STACK, COAL-FIRED BOILER HOUSES, NOT OWNED BY MPEC KRAKOW
BOILER HOUSES OWNED BY MPEC KRAKOW, CONVERTED FROM COAL TO GAS FIRING
MAIN TRANSMISSION PIPELINES
DISTRIBUTION PIPELINES
INHABITED AREAS
FUTURE CITY DEVELOPMENT
RIVERS
TOWN BOUNDARIES
KILOMETERS
0
1
2
3
4
EC Skawina SA
EC Krakow S.A.
EC HTS
OLD TOWN
Vistula
GERMANY
CZECH REPUBLIC
AUSTRIA
SLOVAK REPUBLIC
UKRAINE
BELARUS
LITHUANIA
RUSSIAN FEDERATION
POLAND
Baltic Sea
IBRD 31349
MAY 2001