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IMPLEMENTATION COMPLETION AND RESULTS REPORT  
(IBRD-43240)

ON A

LOAN

IN THE AMOUNT OF US\$200.00 MILLION EQUIVALENT

TO

UKRAINE

FOR THE

KYIV DISTRICT HEATING IMPROVEMENT PROJECT

December 18, 2007

Sustainable Development Department  
Ukraine, Belarus and Moldova Country Unit  
Europe and Central Asia Region

## CURRENCY EQUIVALENTS

Exchange Rate Effective November 30, 2007

Currency Unit = Hrivnya (UAH)

1.00 UAH= US\$ 0.20

US\$ 1.00 = 5.05 UAH

FISCAL YEAR

January 1 – December 31

## ABBREVIATIONS AND ACRONYMS

CAS	Country Assistance Strategy
CHP	Combined-Heat-and-Power
DH	District Heating
EBRD	European Bank for Reconstruction and Development
ERR	Economic Rate of Return
FRR	Financial Rate of Return
FSU	Former Soviet Union
GOU	Government of Ukraine
GDP	Gross Domestic Product
HOB	Heat-Only-Boiler
ICB	International Competitive Bidding
ICR	Implementation Completion and Results Report
IMF	International Monetary Fund
KMDHC	Kyiv Municipal District Heating Company
LPG	Liquefied Petroleum Gas
M&E	Monitoring and Evaluation
MOF	Ministry of Finance
MTR	Midterm Review
NERC	National Electricity Regulatory Commission
PIU	Project Implementation Unit
PMR	Project Monitoring Reports
VAT	Value Added Tax

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Country Director: Paul Bermingham

Sector Manager: Charles Feinstein

Project Team Leader: Pekka Salminen

ICR Team Leader: Pekka Salminen

**UKRAINE**  
**KYIV DISTRICT HEATING IMPROVEMENT PROJECT**

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MAP IBRD No. 28701

<b>A. Basic Information</b>			
Country:	Ukraine	Project Name:	KIEV DISTRICT HEAT
Project ID:	P044832	L/C/TF Number(s):	IBRD-43240
ICR Date:	12/18/2007	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	UKRAINE
Original Total Commitment:	USD 200.0M	Disbursed Amount:	USD 159.7M
<b>Environmental Category: B</b>			
<b>Implementing Agencies:</b> Kyivenergo			
<b>Cofinanciers and Other External Partners:</b>			

<b>B. Key Dates</b>				
Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	10/08/1996	Effectiveness:	04/12/1999	04/12/1999
Appraisal:	03/03/1997	Restructuring(s):		
Approval:	05/21/1998	Mid-term Review:		07/24/2002
		Closing:	12/31/2004	06/30/2007

<b>C. Ratings Summary</b>	
<b>C.1 Performance Rating by ICR</b>	
Outcomes:	Moderately Unsatisfactory
Risk to Development Outcome:	Substantial
Bank Performance:	Satisfactory
Borrower Performance:	Moderately Satisfactory

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

<b>C.3 Quality at Entry and Implementation Performance Indicators</b>			
Implementation Performance	Indicators	QAG Assessments (if any)	Rating
Potential Problem Project at any time (Yes/No):	Yes	Quality at Entry (QEA):	None

Problem Project at any time (Yes/No):	Yes	Quality of Supervision (QSA):	None
DO rating before Closing/Inactive status:	Moderately Unsatisfactory		

<b>D. Sector and Theme Codes</b>		
	<b>Original</b>	<b>Actual</b>
<b>Sector Code (as % of total Bank financing)</b>		
District heating and energy efficiency services	100	100
<b>Theme Code (Primary/Secondary)</b>		
Climate change	Secondary	Secondary
Other urban development	Primary	Primary
State enterprise/bank restructuring and privatization	Primary	Primary

<b>E. Bank Staff</b>		
<b>Positions</b>	<b>At ICR</b>	<b>At Approval</b>
Vice President:	Shigeo Katsu	Johannes F. Linn
Country Director:	Paul G. Bermingham	Paul J. Siegelbaum
Sector Manager:	Charles M. Feinstein	Hossein Razavi
Project Team Leader:	Pekka Kalevi Salminen	Carolyn Gochenour
ICR Team Leader:	Pekka Kalevi Salminen	
ICR Primary Author:	Sati Achath	

## **F. Results Framework Analysis**

### **Project Development Objectives (from Project Appraisal Document)**

The project would: (a) replace and increase heat production capacity to better meet existing and expected future demand and to improve the reliability and service levels in the Kiev DH system; (b) extend the life of, increase the efficiency of, and enhance conservation of the Kyiv district heating system through rehabilitation and introduction of modern technologies and materials; and (c) promote sound cost recovery policies and practices and the commercialization and institutional strengthening of project district heating companies, identify the most efficient institutional and corporate structure for provision of district heating in Kyiv and ways to facilitate the eventual privatization of the service, and support project implementation.

### **Revised Project Development Objectives (as approved by original approving authority)**

**(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
<b>Indicator 1 :</b>	Added heat generation capacity			
Value quantitative or Qualitative)	None	940Gcal/h (the target value was reduced compared to appraisal as a result of cancelling a number of project packages for installing new heat capacity)		540Gcal/h
Date achieved	12/30/1997	12/30/2006		10/15/2007
Comments (incl. % achievement)	The target is not met because the heating plants Pozniaki (2*100 Gcal/h) and CT-1 (2*100 Gcal/h) could not be completed due to lack of funds.			
<b>Indicator 2 :</b>	Replaced DH pipes			
Value quantitative or Qualitative)	None	Installed: 168 km (single pipe)		168 km (single pipe) procured; 130 km installed
Date achieved	12/30/1997	12/30/2006		02/15/2007
Comments (incl. % achievement)	All planned pipes were procured but only about 75% have been installed because of lack of financing from Kyivenergo's own and loan funds. The remaining pipes will be installed by Kyivenergo by 2011.			
<b>Indicator 3 :</b>	Accounts receivable			
Value quantitative or Qualitative)	248 days	70 days		61 days for 2006
Date achieved	12/30/1999	10/31/2005		10/15/2007
Comments (incl. % achievement)	The target was met. The overall improvement in accounts receivable during the project was significant, from 248 days to 61 days.			
<b>Indicator 4 :</b>	Debt service coverage			
Value quantitative or Qualitative)	1.7	1.5		6.7 for 2006
Date achieved	12/30/2000	10/31/2005		10/15/2007
Comments (incl. % achievement)	This target was met.			
<b>Indicator 5 :</b>	Current ratio			
Value quantitative or Qualitative)	1.09	1.2		0.62 for 2006

Date achieved	12/30/2000	10/31/2005		10/15/2007
Comments (incl. % achievement)	This target was not met.			

**(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
<b>Indicator 1 :</b>	Intermediate outcomes are not stated in the SAR dated April 1998.			
Value (quantitative or Qualitative)				
Date achieved				
Comments (incl. % achievement)				

**G. Ratings of Project Performance in ISRs**

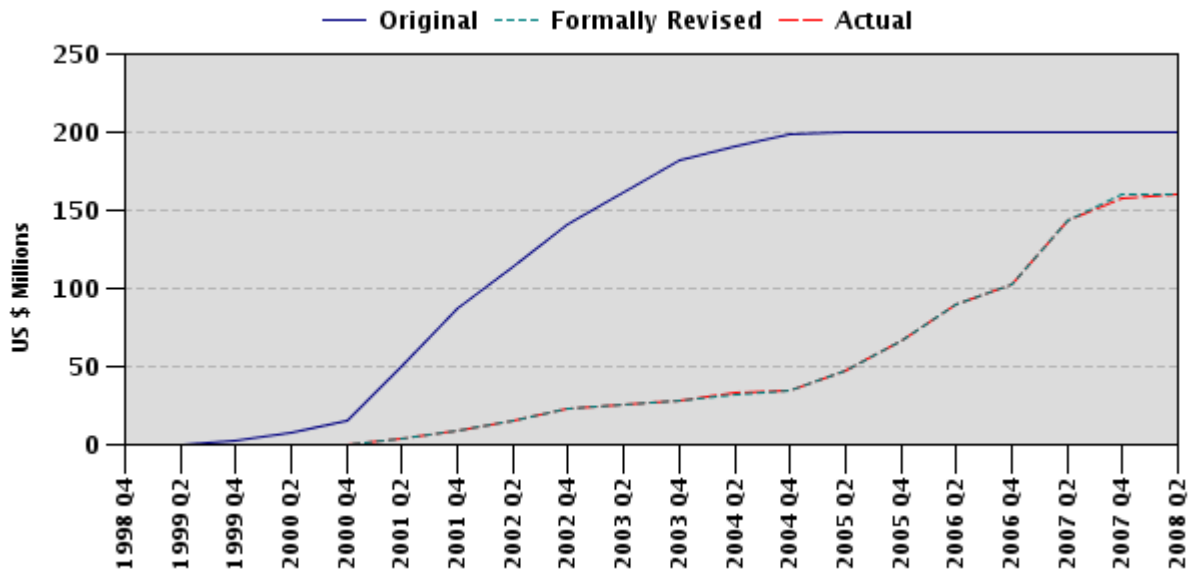
No.	Date ISR Archived	DO	IP	Actual Disbursements (USD millions)
1	07/02/1998	Satisfactory	Satisfactory	0.00
2	12/16/1998	Satisfactory	Satisfactory	0.00
3	06/23/1999	Satisfactory	Satisfactory	0.00
4	10/25/1999	Satisfactory	Satisfactory	0.00
5	05/25/2000	Satisfactory	Satisfactory	0.39
6	10/19/2000	Satisfactory	Satisfactory	2.67
7	03/27/2001	Satisfactory	Satisfactory	5.55
8	06/25/2001	Satisfactory	Satisfactory	8.79
9	11/27/2001	Satisfactory	Satisfactory	12.73
10	03/12/2002	Satisfactory	Satisfactory	19.93
11	03/14/2002	Satisfactory	Satisfactory	19.93
12	08/07/2002	Satisfactory	Satisfactory	24.38
13	12/03/2002	Satisfactory	Satisfactory	25.35
14	04/02/2003	Satisfactory	Satisfactory	27.80
15	08/19/2003	Satisfactory	Satisfactory	29.60
16	01/09/2004	Satisfactory	Satisfactory	32.65
17	06/14/2004	Satisfactory	Satisfactory	34.55
18	10/28/2004	Satisfactory	Satisfactory	44.51
19	06/07/2005	Moderately Satisfactory	Moderately Satisfactory	64.17
20	11/28/2005	Moderately Unsatisfactory	Moderately Unsatisfactory	86.60

21	06/27/2006	Moderately Satisfactory	Moderately Satisfactory	103.04
22	03/13/2007	Moderately Satisfactory	Moderately Satisfactory	151.90
23	06/28/2007	Moderately Unsatisfactory	Moderately Unsatisfactory	157.90

## H. Restructuring (if any)

Not Applicable

## I. Disbursement Profile





## **1. Project Context, Development Objectives and Design**

*(this section is descriptive, taken from other documents, e.g., PAD/ISR, not evaluative)*

### **1.1 Context at Appraisal**

**Country and Sector Background:** In 1998 Ukraine, the second largest country in Europe by area with a population of over 50 million people, was struggling to transform its flagging post-Soviet economy into one based on market principles, despite more than six years of efforts to that end. Sluggish economic reforms and rampant hyperinflation during the first three years after Ukraine gained independence from the Soviet Union in August 1991, combined with the external shocks of sharply higher energy prices and reduced sales to traditional markets, significantly compounded the economic situation. According to official statistics, the Ukrainian economy had slumped by nearly 60% from 1991 to 1997. Living standards had also fallen sharply and poverty had become more widespread. Annual per capita Gross Domestic Product (GDP) had declined from US\$1,250 in 1995 to US\$ 1,020 in 1997. The Government had accumulated over US\$2.5 billion of wage arrears and debts to the public sector by the end of 1997.

Ukraine has vast coal resources, important oil and gas resources and significant hydro, wood, peat and uranium resources. Crude oil and natural gas resources were declining, but were still significant. Remaining proven and probable reserves were 190 million tons of oil and 1,400 bcm of natural gas. The shallower and larger, oil and gas pools in the Dnieper-Donetsk and Carpathian regions were rapidly being depleted. These deposits were being replaced by reserves in smaller, deeper and less productive reservoirs, which were more expensive to find, drill-up and produce, to the point that a large part of the reserves appeared to be uneconomic. Hydro resources were significant but were almost fully developed, while wood and peat resources appeared to have greater potential. Energy demand in Ukraine was characterized by high energy intensity of industrial output and the high share of industry in final energy consumption, due to the low thermal efficiency of energy consumption technologies and high share (about 40% in 1995) of industry (iron and steel, basic chemicals) in GDP. Energy consumption per capita was about 3,000 kilograms of oil equivalent (koe) in 1996, which was high compared to Western European standards.

Since 1991, energy fuel prices had skyrocketed and approximated world market levels. Most notable were the prices of natural gas and crude oil, utilized primarily in heat and electricity production. The price increases of energy inputs were translated into higher prices for essential services, especially electricity and heat. Electricity, gas and coal prices were set by the central government, while district heating (DH), Liquefied Petroleum Gas (LPG), heating oil, peat and wood prices were set by local governments. Household energy prices covered 50-80% of costs, with household DH prices, outside of Kyiv, covering 80% of costs. The difference between costs and prices was covered by subsidies from the central and local governments and/or by cross-subsidies from industrial to household consumers (particularly for DH).

The Kyiv District Heating system, with a capacity of about 8,600 Gcal/h and networks totaling 2,300 km, was the third largest in the countries of the Former Soviet Union (FSU), after the Moscow and St. Petersburg systems, and was thought to be the third largest in the world. In Kyiv, the DH system provided most of the heat and hot water for urban dwellers as well as steam for industry, produced in Combined Heat and Power (CHP) or in Heat Only Boiler (HOB) plants and transported through pipeline networks to substations to buildings. Since independence, maintenance of the Kyiv DH system had been under-funded, resulting in serious corrosion of present assets, especially in external corrosion of pipelines, due to the deteriorating and ineffective pipeline waterproofing. Heat and water losses were high as compared to Western systems, with heat losses in the transmission and distribution systems estimated at about 20% overall.

***Rationale for Bank assistance:*** The project was consistent with the Bank's overall Country Assistance Strategy (CAS) in Ukraine, discussed by the Bank's Board in June 1996, as well as the interim strategy in the CAS Progress Report, which assigned emphasis to the energy sector and sought to support Ukraine's efforts to improve energy efficiency by replacing or rehabilitating old production facilities, networks and substation equipment. The strategy also called for greater efforts in energy conservation, pricing and ownership. The project was also fully consistent with the Government's energy strategy, and aimed to support energy conservation, improvement of the efficiency of energy facilities and environmental conditions, and rehabilitation of existing plants. The efficiency gains would lead to lower costs of heat production and operation, thereby resulting in more affordable heat tariffs and lower requirements for social assistance. Most importantly, the quality and reliability of heating services would be improved for the growing demand. At the same time, institutional development programs for concerned energy agencies would help strengthen their management and operations.

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

The project's objectives were the following: (i) replace and increase heat production capacity to better meet existing and expected future demand and to improve the reliability and service levels in the Kyiv DH system; (ii) extend the life of, increase the efficiency of and enhance conservation of the Kyiv DH system, through rehabilitation and introduction of modern technologies and materials; and (iii) promote sound cost recovery policies and practices and the commercialization and institutional strengthening of project DH companies, identify the most efficient corporate and institutional structure for provision of DH in Kyiv and ways to facilitate the eventual privatization of the service, and support project implementation. (The objectives are taken from the SAR. The objectives in the Loan Agreement were worded slightly differently, but had the same meaning.)

## Key Indicators:

*\*Technical:* Gas consumption (million m<sup>3</sup>), Gas into Plant; Total Fuel Consumption (gas and mazut); Monthly Overall Efficiency %; Circulation Pumps' Electricity Consumption; Added Make-up Water

*\*Financial:* Accounts Receivable, Debt Service Coverage Ratio, Current Ratio, and Average Heat Tariff; Residential Heat Tariff as % of Average Heat Tariff; and Average Retail Electricity Tariff (US cents/KWh)

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

The objectives were not revised.

### 1.4 Main Beneficiaries,

- The project was expected to have significant economic benefits for *Ukraine*, related to savings from the improved efficiency of the DH system, the avoidance of a supply deficit and the improvement of space heating and hot water service levels and reliability in the capital city of Kyiv.
- The project would also have substantial financial benefits for the *heat utilities* related to fuel and operational cost savings and increase in sales revenue.
- *Residents of Kyiv* were expected to receive improved quality and reliability of heat and electricity supply, resulting from the rehabilitation and construction of electric substations and boiler plants. In addition, installation of individual heat meters would enable consumers to pay only for the actual heat used. The installation of better quality boilers with improved ecological characteristics would result in reduction of environmental emissions.

### 1.5 Original Components (as approved)

The project consisted of the following three components:

**Component 1. Heat Production Capacity Improvement.** This component included replacement (560 Gcal/h) and construction of new boilers (1,580 Gcal/h) along with rehabilitation of other boilers in the main DH system, to alleviate the existing deficit of heat production capacity and to better meet the existing and growing demand.

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\* These indicators were monitored in the semi-annual progress reports, but not taken into the ICR.

**Component 2: DH Rehabilitation.** This component included; (i) a substantial program of transmission (80 km) and distribution (15 km) pipeline and network improvements in the main DH system; (ii) water treatment and substation (1,500) improvements including heat meters; (iii) construction of a stack in the city center, to address the deteriorating technical conditions and outmoded technology; and (iv) rehabilitation of an electric substation (2 x 40 MVA) and power cables in the city center to provide adequate electric supply for boiler houses and DH pumping equipment.

**Component 3: Institutional Support.** This component consisted of the following activities:

(a) **Restructuring Study of the Kyiv DH Companies:** to review options for the most efficient institutional and corporate structure for DH in Kyiv, to identify the requirements for effective management, corporate and operations systems and to provide support for implementing the study recommendations;

(b) **Implementation Support and Audits:** including consultancy services for detailed design, construction supervision, procurement and disbursement, and auditing services for the incremental auditing costs of the project; and

(c) **Training and Equipment:** for training of the management and staff of the DH companies in the areas of procurement and disbursement, introduction of international accounting standards, computerized billing, and environmental issues, among other things, and provision of office equipment, computers and software.

## 1.6 Revised Components

The components were not revised.

## 1.7 Other significant changes

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

*The project schedule* was revised twice. In response to government request, the project closing date was extended first by two years, from December 31, 2004 to December 31, 2006. The extension was needed because the disbursement of Loan proceeds had reached only US\$45.1 (or about 23% of the original Loan amount of US\$ 200 million) by November 2004 and hence project objectives could not have been met by the original closing date of December 31, 2004. The closing date was further extended by six months to June 30, 2007, in order to complete the five remaining contracts and provide time to Kyivenergo to get internal approval to negotiate arrangements for the additional financing.

*The project's scope and scale.* After the merger of Kyivenergo and Kyiv Municipal DH Company (KMDHC) in December 1998, activities such as secondary pipe replacement and rehabilitation of substations were to be implemented by Kyivenergo under the project. The size of the sub-component was remarkably scaled down because the European Bank for Reconstruction and Development (EBRD) withdrew from the planned financing because of Kyivenergo and Kyiv City refusal to accept some conditions of the lending proposed by EBRD.

In November 2004, the rehabilitation of CT-2 Heating Plant was dropped from the project and \$40 million was cancelled out of the proceeds of the Loan due to the inability of Kyivenergo to fully utilize this amount before the revised closing date of December 31, 2006. At closing, the Loan was 99.8% disbursed (US\$159.68 million), with \$320,755 undisbursed and US\$40 million cancelled.

*Funding allocations.* (i) As part of the Midterm Review (MTR) conducted in July 2002, agreement was reached that a number of activities originally planned to be financed by the World Bank Loan in the amount of US\$13.55 million were no longer urgently needed. Further agreement was reached that about US\$10 million of these funds would be utilized for installation works for goods already procured but not yet installed (i.e., pre-insulated pipes and valves and equipment for Pozniaki plant), in order to speed up the project implementation which was hampered by insufficient counterpart funds.

(ii) In April 2003, \$9 million was reallocated from Category (1) (i) (Goods under Parts A and B of the project) to Category (2) (Works including installation of equipment, under Parts A and B of the project).

(iii) In February 2006, \$14 million was reallocated from Category (1) (i) to Category 2, and \$100,000 was reallocated from Category 3 (Consultant services and training) to Category 4 (Incremental Operating Costs).

*Other amendments to the Loan Agreement.* (i) In April 2002, the legal agreement was amended to allow the use of savings in the Loan account for: (a) rehabilitation of heat distribution networks and heat substations, including heat meters; and (b) provision of a heat networks dispatching center. In addition, the location of the water treatment investments was changed from TETS-5 to TETS-6.

(ii) In April 2003 the loan agreement was amended to allow the use of loan proceeds for additional works/installation activities in order to speed up project implementation.

(iii) Following a change in the Bank's policy framework governing the eligibility of expenditures in World Bank financing, which was approved by the Board on April 13, 2004, and the Board approval of country financing parameters for Ukraine on March 29, 2005, the Loan Agreement was amended in February 2006 to allow 100% financing (previously it used to be 80%) of the local expenditures under the contracts concluded after November 1, 2005. This change in policy released Kyivenergo from the need to co-finance these contracts, helped to start the installation of the equipment and mainly

complete the Pozniaki heat boiler plant (to serve rapidly growing Kharkovsky district of Kyiv), by the project closing date of December 31, 2006, and also guaranteed that the contractors were paid in a timely manner after the works were performed.

## 2. Key Factors Affecting Implementation and Outcomes

### 2.1 Project Preparation, Design and Quality at Entry

During preparation, the project design took into account lessons learned from previous Bank-supported DH projects in Poland, China, Estonia and Latvia. Likewise, the design considered the risk factors, and appropriate measures were adopted to mitigate all major risks identified at appraisal. The project also provided a participatory framework during preparation of the project.

#### *Lessons Learned from previous Bank-assisted projects.*

- Strong project ownership and advanced preparation of project components is necessary for timely implementation
- Decentralized project management arrangements work far better than centralized arrangements
- The relationship between prices and incomes changes rapidly in countries in transition and the heating service which appears largely unaffordable will become easier to afford in a relatively short period of time
- End-user efficiency improvements, which initially appeared difficult to support due to building ownership and affordability reasons, may be possible to support on a pilot level
- There is the possibility to redress the financial difficulties of DH companies during project preparation through tariff increases and settlement of arrears by major debtors, including households
- Strong support from municipalities is needed to resolve collection and payment issues.

***Risks and their mitigation.*** As the first DH investment project in Ukraine, the project faced a number of risks, and the measures mentioned below were taken to mitigate them:

Risk	Mitigating measure
The implementation capacity of project agencies in carrying out an investment program of this order of magnitude to-date was untested and might result in a longer implementation period than expected.	To reduce this risk, the detailed implementation arrangements were fully identified and agreed with the project agencies prior to project start-up and adequate staffing arrangements were put in place. In addition, bidding documents for the first year's procurement activities were prepared by Loan negotiations, and international and local engineering consultants would assist project agencies with the technical implementation of the project.

Risk	Mitigating measure
Heat tariff increases may not be implemented in a timely manner for political or other reasons	Given the commitment by the Government, Kyiv Municipality and DH companies to adjust heat tariffs frequently during the period of energy price increases, the risk of the heat tariff increases not being implemented was expected to be relatively small. Monitoring performance in these areas would be a major focus of attention during Bank supervision.
Uncertainty existed about how effective the social assistance program for households would be, and this had the potential to negatively impact the financial position of DH companies. If the social assistance program was not working properly, arrears of consumers' heat bills would increase.	A package of measures to improve means testing and other aspects of the social assistance program was currently under discussion with Kyiv Municipality for consideration for inclusion in the complementary Kyiv Public Buildings Energy Efficiency Project. Monitoring performance in this area would also be a key focus of attention during supervision of the project.

***Adequacy of participatory processes.*** The project preparation involved consultation with the customers of Kyivenergo, Kyiv City, and the Ministry of Fuel and Energy regarding the design of the project and priorities of the project activities. For example, the social assessment was based on: (a) structured in-depth interviews and focus group discussions with residential DH consumers and (b) a survey administered to 365 households in Kyiv.

## **2.2 Implementation**

The project was not restructured and no changes were made to the design. The project was at risk due to the lack of counterpart funds which prevented Kyivenergo from implementing on time the project activities that were to be fully financed by the company.

As mentioned in Section 1.7, the Bank conducted a MTR in July 2002, 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. Based on the recommendations of the MTR, an Action Plan was prepared by Kyivenergo to speed up the project progress, which included the following key elements:

*(i) Strengthening Project Management.* In the area of project management, a decision was taken to supplement the project organization with a Deputy Project Manager who would be primarily responsible for managing the procurement process.

*(ii) Expediting the Procurement Process.* Further actions that could ensure more timely execution of procurement activities included the following:

- (a) rather than continuing to utilize direct contracting, Kyivenergo would conduct competitive tenders for the selection of the design institutes which would

prepare the technical specifications, in order to better manage the quality and schedule of deliverables;

- (b) Kyivenergo's project management would make available the prior technical specifications already utilized, including any revisions made during the bidding period and implementation, to Kyivenergo's technical departments and design institutes, in order to simplify and speed up the preparation of specifications for the new similar packages;
- (c) instead of appointing new Evaluation Committees for each procurement package, Kyivenergo would make greater use of experienced evaluators from the previous tenders in order to expedite the evaluation process; and
- (d) Kyivenergo's Deputy Project Manager would follow-up more closely on internal approvals required for each stage of the procurement process, including contract signing.

***Factors affecting project implementation.***

The Project implementation was adversely affected due to the following factors:

- Delayed effectiveness of the Bank Loan which was postponed by about six months awaiting Parliamentary ratification of the project
- The lengthy period for establishing payment arrangements for local suppliers in Hrivnya
- The Project Manager, who was also Chairman of the Board of Kyivenergo, was not able to devote sufficient attention to the project during a significant part of the time in the first 3-4 years
- High turnover of staff in the Project Implementation Unit (PIU)
- Kyivenergo's limited experience in international procurement, resulting in a slow and cautious approach to each stage of the procurement process
- Inexperience of local and international bidders in preparing responsive bids in accordance with the requirements of the bidding documents, causing delays in successfully concluding contracts, a number of which had to be re-bid
- The temporary cancellation by the Ministry of Finance (MOF) of the exemption of Value Added Tax (VAT) and duties on imported goods which delayed the project by more than six months, until the exemption was reinstated, as Kyivenergo was not able to finance an unexpected additional 30% of the project cost



- Disagreement between Kyivenergo and the MOF over the arrangements for opening and utilizing the Special Account
- Project implementation was adversely affected by the persistent lack of counterpart financing caused by low tariffs for households, which were below the cost recovery level (about 70% of cost recovery level). For example, due to the lack of counterpart funding, very little progress was achieved in implementing the components on the Pozniaki boiler plant and CT-1 Heating Plant. Similarly, there was a high level of accounts receivable and outstanding debts for gas, which also affected Kyivenergo's ability to implement the project on schedule.
- Dispute between Kyivenergo and Kyiv City regarding hot water/cold water arrangements for buildings and the lack of regulations in Kyiv City concerning the requirements of building owners with regard to heat meter and heat substation installation, both of which delayed the preparation of the heat metering and heat substation components.
- The implementation of the gas pipeline and the gas pressure reduction station for Pozniaki heating plant was delayed because of: (i) difficulty in obtaining the right of way for the gas supply pipeline in the area of Kyiv Oblast resulting in delays of about three years; (ii) lack of co-financing from Kyivenergo, and (iii) the protracted negotiations between Kyivenergo and the gas supply company, Kyivtransgaz, concerning the final arrangements for maintenance and servicing of the gas pipeline and the gas pressure reduction station.
- Higher than expected installation costs and limited installation capacity of local contractors resulted in slow installation.

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

Indicators were developed to monitor the performance of the operation of the heat production plants and the whole DH system in Kyiv. Some of the Technical Indicators included: Fuel Consumption, Heat Production, and Plant Efficiency, District Heating Circulation Pumps' Electricity Consumption, Water Quality, Monitoring of Breakdowns in the Main DH systems. In addition, Financial Indicators such as Accounts Receivable, Debt Service Coverage Ratio, Current Ratio, and Average Heat Tariff were also developed. Kyivenergo had adequate methods for collecting these data.

**M&E implementation.** Kyivenergo 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, electricity production, heat losses and breakdowns in the main DH system were monitored and analyzed.

**M&E utilization.** Appropriate data collected from Kyivenergo's semi-annual reports of indicators was evaluated and used to inform decision-making on certain activities. For example, concerning the expansion of the heat generation capacity, the data on slower than expected growth of heat demand was used to cut some of the planned hot water boilers out of the project.

**Sustainability of the M&E arrangements.** After the project's implementation period, Kyivenergo is planning to continue the M&E arrangements already in place and utilize them for decision-making processes.

## **2.4 Safeguard and Fiduciary Compliance**

*Safeguard issues.* The project was subject to World Bank Operational Directive 4.01 Environmental Assessment (at the time of appraisal, OD 4.00) and was rated a category "B" project. An environmental review was prepared for the project and included an Environmental Mitigation Plan, which was followed during project implementation. The environmental impact of the investments was generally positive due to improved energy efficiency, reduction in water wastage and other energy efficiency improvements.

There were no major safeguard issues related to the implementation of the project.

*Fiduciary issues.* The project was not in compliance or complied with delays with the following financial covenants in the Project Agreement and Loan Agreement:

- Audit reports for FYs 2004, 2005 and 2006 were provided with a delay of over three months. Project Monitoring Reports (PMRs) for 2006 were provided to the Bank with delay.
- The project also did not fully comply with all of the financial performance indicators, specified in the Project Agreement. However, it met two (accounts receivable, debt service coverage) of the three financial indicators listed as PDO Indicators. Especially the overall improvement in accounts receivable was significant, from 248 days to 61 days.

## **2.5 Post-completion Operation/Next Phase**

- a. Transition arrangements.

Kyivenergo being a well established organization, appropriate technical, commercial and institutional provisions are already in place to ensure effective and regular operation of the investments financed by the project. While the regular operation, including repair and maintenance will be managed by Kyivenergo staff, construction and installation works will continue to be undertaken mostly by contractors. Kyivenergo will be recruiting new employees in case of any shortage of staff resulting from retirement or resignations. Kyivenergo's training institute has sufficient capacity to train new staff and enhance the skills and capacity of existing staff. The supplier companies will be responsible for training the staff on new equipment delivered.

On the other hand, Kyivenergo is dependent on Kyiv City for its financial resources. As discussed in Section 2.2, because of low tariffs on household heating, Kyivenergo's financial situation is fairly weak. Based on the government legislation, Kyiv City is obliged to compensate Kyivenergo for the difference between heat cost and heat tariff for households. However, there are substantial arrears owed by Kyiv City to Kyivenergo. For example, for 2007 this compensation is estimated at UAH 517 million (about US\$100 million) and has not yet been fully paid.

The Bank had proposed to provide additional financing of US\$40.0 million to complete the rehabilitation of the CT-1 Heating Plant in Kyiv, to replace old district heating pipes with modern pre-insulated pipes, and to finance annual audits of Kyivenergo's financial statements and project financial statements. This additional financing did not go to the Board because of Kyivenergo's inability and Kyiv City's unwillingness to provide, according to the toughened current Ukrainian legislation, 150% collateral to MOF under the new sub-loan agreement.

The major issue is for Kyivenergo to get additional financing for completing the CT-1 Heating Plant. The two boilers have already been procured. It is estimated that for the installation of these boilers, \$30-40 million would be needed.

*Lessons incorporated in the arrangements for post-completion operation.* Based on the lessons learned from the project Kyivenergo has adopted the following measures: (i) before the project Kyivenergo did not have a specialist on international procurement and implementation of a large scale project. These skills were developed during the project by training specialists from different subsidiaries of the company which formed a functioning working group for implementation, and (ii) economic/financial evaluation of investment alternatives was developed based on examples of the project and is now used within the company before investment decisions are made.

*List of performance indicators.* The following set of monitoring and evaluation indicators will continue to be used as part of Kyivenergo's regular operations:

- Added Heat Generation Capacity
- Replaced DH Pipes
- Accounts Receivable
- Debt Service Coverage
- Current Ratio

*Follow-up project.* The Bank has requested Kyivenergo to prepare an investment plan for the next five years, and based on this request, Kyivenergo is currently preparing a proposal for the construction of 110 kV electricity substations and for the reconstruction and replacement of existing cable lines. For heat generation, Kyivenergo is also interested in the completion of the third CHP unit at TETS-6. After receiving the investment plan, the Bank would discuss with the Government of Ukraine (GOU) and the management of Kyivenergo the possibility of having a follow-on project. A district heating project is not

envisaged in the recently approved Country Partnership Strategy (CPS), but it is possible that it could be financed as a component of another project in the CPS.

### **3. Assessment of Outcomes**

#### **3.1 Relevance of Objectives, Design and Implementation**

The project's objective is still relevant, and important to Ukraine's economic development. It is timely and appropriate to the current needs of the country's energy sector. The project is also consistent with the Bank's CAS for Ukraine. Both the CAS (26448-UA) dated September 2003, which covered the period 2004-2007(26448-UA), and the CAS Progress report (32250-UA) dated May 2005 highlight the importance of the energy sector in Ukraine, both on the macro level to contribute to the resolution of fiscal problems through financial discipline, as well as to address environmental issues through improved energy efficiency. The Bank is continuing to emphasize the need for attention to limit the risks that the energy sector poses for macroeconomic and fiscal sustainability, and assure that the energy needs of the economy are met satisfactorily. In addition, the government is also aiming to improve the technical performance, governance and financial viability of the energy sector; and to upgrade national infrastructure.

Improvement of energy efficiency continues to be one of the key elements of the government's strategy to reduce the high energy intensity of the Ukrainian economy. Taking into account the increased gas prices in Ukraine, the efficiency of heat generation is in line with the government's and the Bank's energy policy. In addition, the objective of the project is in line with the Bank's dialogue with the Government as outlined in the CAS (2003- 2007) and further elaborated in two recent papers discussed between the Government and the Bank in 2006: '*Challenges Facing the Gas Sector*' and '*Addressing Challenges in Provision of Heat, Water and Sanitation*'.

#### **3.2 Achievement of Project Development Objectives**

***Moderately Unsatisfactory.*** The project was only partly successful in achieving its objectives, as demonstrated by the following:

(i) *Improving heat production capacity of the Kyiv District Heating System.*

Three hot water boilers each of 180 Gcal/h heat capacity (one at TETS-5 and two at TETS-6) have been installed and put into operation and have enabled Kyivenergo to provide additional heat supply of 540 GCal/h, to housing and social facilities in some areas of Kyiv. In addition, these three hot water boilers, have improved the reliability and security of heat supply consumers in the respective areas of Kyiv both because of additional heating as well as replacement of old unreliable valves and other equipment with new. Another impact is the lower operation and maintenance costs because of the reduced electricity consumption of the pumps.

*The CT-1 Heating Plant* supplies heat to downtown Kyiv and its rehabilitation has been one of the main components of the project. The plan was to replace two boilers which have not been used for a long time with modern and efficient boilers (2\*100 Gcal/h), construct a new stack for the whole plant, construct new power supply lines and a gas pressure station. All the equipment has been purchased and delivered. The stack and cable lines are in operation, but the two boilers have not been installed because of the unexpectedly high costs of installation works. As mentioned in Section 2.5, additional loan funds of US\$40 million to complete the installation could not be provided before the project closing on June 30, 2007. Since two hot water boilers, the main equipment under the project, are not in operation, there is no impact of this subcomponent in improving the heat production capacity.

*Pozniaki Heating Plant:* The construction of the Pozniaki heating plant has experienced many difficulties during project implementation including: (i) difficulty in obtaining the right of way for the gas supply pipeline in the area of Kyiv Oblast resulting in delays of about three years; and (ii) lack of co-financing from Kyivenergo. The plant is not yet in operation in 2007. Kyivenergo expects to complete the remaining installations including about two km of gas pipeline by the end of 2008. As in the case of the CT-1 Heating Plant, since the scheduled activities were not completed, there is no impact of this subcomponent in improving the heat production capacity.

*Achievement of this objective is moderately unsatisfactory.*

(ii) *Rehabilitating and introducing modern technologies and materials into the Kyiv District Heating System.*

**District heating system.** Replacement of old heat and hot water supply pipe by pre-insulated pipe has decreased significantly heat losses and increased the operational life of the heating mains. Out of the planned installation of 168 km (168 km single pipe is equal to 84 km double pipe channel) of pre-insulated pipe, 130 km (single pipe) have been installed. The remaining pipes will be installed by Kyivenergo's own financing by 2011.

Installation of new modern equipment in the heat substations replacing obsolete and physically worn-out equipment has made it possible to optimize the operational schedule of the heating system and increase energy savings. Likewise, installation of about 1560 ultrasonic heat meters has resulted in improved payments by customers for consumed heat energy. In addition, radio-modules have created a system of remote readings of heat meters that has significantly decreased man-hours and increased the volume of data handled.

**Power supply of district heating system.** Installation of SF-6 modules of OPTIGIM type at two 110 kV substations has increased the reliability and safety of 110 kV switching units operation, extending their service life and decreased operational costs.

Application of modern microprocessor protection and control devices has resulted in increased safety of electric equipment, increased operational reliability of consumer power supply networks and has provided the possibility of data collection and handling for the substations' control systems (MicroSCADA). Creation of substations control systems in turn will considerably increase the reliability of their operation.

The Electric Substation was completed in 2002 as planned and it supplies power to downtown Kyiv. Without it there would be deficit of power of about 30 MW in 2007. The substation supplies new developments in downtown including new businesses, public buildings, and apartment buildings. The benefit from the new substation is that it has allowed the area to be supplied by power from the grid which is less expensive and generated from a mixture of coal, natural gas and hydropower. The alternative would likely have been to supply power from individual open cycle gas turbines. The difference in the cost of power supplied from the open cycle gas turbines compared to power from the grid is the main benefit of the substation. In addition there is a reduction in operating costs because the substation is new.

*Achievement of this objective is satisfactory.*

*(iii) Promoting sound cost recovery policies and practices.*

**Establishment of electricity tariffs.** In September 2005, in accordance with Cabinet of Ministers of Ukraine's resolution on transfer to unified retail tariffs for electricity, the new scheme of electricity supply and unified tariffs for legal entities was adopted. Consequently, electricity tariffs are given on a monthly basis for each electricity generating company in Ukraine.

Electricity tariffs for individuals, established by National Electricity Regulatory Commission (NERC), were defined in March 1999 and in December 1999 VAT was imposed on electricity sales. In May 2006, electricity tariffs for residential customers were increased by 25% and since September 2006 electricity tariffs were again increased by 25%.

**Establishment of heat tariffs.** Heat tariffs are established by the Kyiv City Government. In accordance with Section 4.03 of the Loan Agreement between the Bank and GOU, the City of Kyiv shall adjust heat tariffs for Kyivenergo on a regular basis to such levels as shall enable Kyivenergo to cover the costs of production, transmission and distribution, operation and maintenance, interest payments, allowances for depreciation and contributions to its reserves.

Tariffs for heat for individuals and legal entities were changed in December 2006 from the average 54.42 UAH/Gcal and 72.37 UAH/Gcal to average 132.41 UAH/Gcal and 136.82 UAH/Gcal, respectively.

In 2007, however, being a politically and socially sensitive issue, heat tariffs for individuals were decreased to 94.44 UAH/Gcal with retroactive effect from December 1, 2006. Tariffs for legal entities were further changed on 1 February 2007 and are currently 171.62 UAH/Gcal. The municipality of Kyiv is compensating the losses due to the lower than cost recovery level to Kyivenergo as obliged by the law. These arrangements provide Kyivenergo annually funds, which will cover the heat generation and transmission costs. However, the funds from the municipality are not provided in a timely manner, which results in difficulties in financial planning of the company. At the same time, it is worth mentioning that the increases in average heat tariffs combined with the payments from Kyiv City Government mean that cost recovery, while still not yet

adequate, has considerably improved compared to the situation when the project began.

*Achievement of this objective is moderately unsatisfactory.*

(iv) *Supporting institutional strengthening and commercialization of Project district heating entities.*

(a) Kyivenergo and Kyiv City changed the institutional structure for DH by merging the heat distribution networks and the small, isolated heat networks with the main heat production and transmission system which has resulted in improvements in efficiency in the supply of heat and hot water.

(b) A number of reforms were introduced regarding the heat tariff structure and in billing and collection of heat bills, which were aimed at improving the financial performance of Kyivenergo.

(c) An institutional study to review options for the most efficient institutional and corporate structure of Kyivenergo was carried out by German consultants, and completed with a final workshop held in February 2005. The workshop was attended by key stakeholders including Kyiv City, Kyivenergo, Parliament, State and Housing and Communal Service Committee and others. The audience largely supported the consultant's recommendations on ways to improve the efficiency of Kyivenergo through various restructurings. Kyivenergo, a beneficiary of the study, has started applying the consultant's proposals, especially divesting non-core activities such as construction, guard services, and repair works.

(d) About 1000 specialists from Kyivenergo participated in the numerous training courses, workshops (installation, commissioning, operating and maintenance) held by the suppliers of the equipment and materials.

(e) The project has created a strong positive influence on skill level of Kyivenergo personnel. During preparation and implementation phases of the project the PIU staff attended workshops on project management, procurement and financial management which were conducted by the Bank. For example, the project has helped Kyivenergo staff improve the speed of implementing bidding processes. In each and every branch there is a special group for conducting the bidding process, including evaluating bidding documents, contract preparation, and monitoring of the contracting process.

*Achievement of this objective is satisfactory.*

### **3.3 Efficiency**

The efficiency of results vary greatly among the six sub-components. Three sub-components were satisfactorily completed and have real Economic and Financial Rates of Return (ERR and FRR) which are above the cost of capital (estimated to be 10%). These three sub-components are: (i) the new boilers for the thermal heating plants TETS 5 and

TETS 6; (ii) the new electric substation; and 3) the heat substations and heat meters sub-component. The district heating transmission and distribution rehabilitation component has an ERR and an FRR which are substantially below the cost of capital as a result of the long delays in implementation. The Pozniaki Heating Plant and CT-1 Heating Plant Components are not yet completed although they are expected to be completed within the next two to three years. Their final ERRs and FRRs are unknown but are likely to be below the cost of capital. Thus the results of this project are very mixed with three economically efficient sub-components and three sub-components which are probably not efficient. Overall the project should probably be rated as *marginally inefficient*, taking into account the fact that the results of the two sub-components are not known at this time.

### **3.4 Justification of Overall Outcome Rating**

Rating: *Moderately Unsatisfactory*

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

### **3.5 Overarching Themes, Other Outcomes and Impacts**

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

The project has had a positive impact on poverty alleviation. Improvements in heat services are beneficial to all customers of Kyivenergo, especially to the poor who cannot afford investments in individual heating sources.

#### **(b) Institutional Change/Strengthening**

See Section 3.2 (iv)

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

There was no unintended outcome or impact of the project.

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

N/A

## **4. Assessment of Risk to Development Outcome**

Rating: *Substantial*



- Those investments already completed under the project are sustainable. On the other hand, there is the risk of not obtaining sufficient funds for the completion of two boiler plants in the CT-1 Heating Plant and also to continue financing other rehabilitation works.
- Because tariff increases are a politically and socially sensitive issue Kyiv City continues to be reluctant to increase the tariff for household heating. Unless this tariff is adequately raised to cover the actual cost of operation, Kyivenergo will not be in a position to make investments for maintenance, rehabilitation, and new construction. Besides, huge arrears owed by Kyiv City to Kyivenergo as compensation to recover all expenditures, including the actual cost of operation (because of the low tariff on household heating), is making Kyivenergo's financial situation more vulnerable.

## **5. Assessment of Bank and Borrower Performance**

### **5.1 Bank Performance**

#### **(a) Bank Performance in Ensuring Quality at Entry**

Rating: *Satisfactory*

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, including the technical, financial, economic, institutional, procurement and financial management aspects. In addition, major risk factors and lessons learned from previous Bank-supported DH projects were considered and incorporated into the project design.

Preparation of the project included environmental studies consistent with the requirements of: (i) the Ukrainian Ministry of Protection of Natural Environment; (ii) 1992 Law of Ukraine for the Protection of the Environment; and (iii) the provisions of World Bank Operational Directive 4.00 on Environmental Policies. In accordance with these procedures, an environmental review, consistent with the requirements for a category "B" project for the boiler houses, CHP plant, DH piping, Center electric substation and rehabilitation components was performed. A social assessment, to appraise the impacts of the lack of adequate heat and hot water on residential DH consumers in Kyiv, was carried out during the appraisal of the project. The social assessment was based on: (a) structured in-depth interviews and focus group discussions with residential DH consumers and (b) a survey administered to 365 households in Kyiv.

The Bank had a consistently good working relationship with the Borrower and the implementing agency during preparation and appraisal.

#### **(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, and the project was adequately supervised and closely monitored. The task team regularly prepared Aide-Memoires, alerted the Government and Kyivenergo about issues found during project execution and facilitated corrective actions. 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 Kyivenergo staff to explain the rules and procedures to be applied during project implementation, with regard to procurement of goods and works, selection of consultants, accounts and audits. The Bank's financial management specialist reviewed the project's financial management arrangements as to their adequacy and acceptability to the Bank. The assessment included a review of project staffing, accounting, flow of funds, internal controls, co-financing, budgeting, reporting, auditing, and also a review of a sample of transactions.

The Bank carried out a MTR of the project in July 2002. In addition to the topics covered under the semi-annual progress reports, the MTR included an in-depth review of the economic viability of the project components, based on actual costs and benefits achieved to-date, and of the overall institutional and financial viability of Kyivenergo. Based on the recommendations of the MTR, measures were taken to ensure improvement in implementation performance.

The Bank team assisted Kyivenergo in designing a medium and long term heating sector strategy, and developing the necessary institutional and legal framework. The Bank team provided detailed technical and strategic comments on the institutional study to review options for the most efficient institutional and corporate structure of Kyivenergo.

The task team conducted workshops to present the findings and recommendations of the consultants, and prepared its comments on the recommendations of the consultants, and then they were sent to the government agencies concerned for taking decisions. The Bank team also arranged for Kyivenergo's management and representatives of Kyiv City to visit Germany and Finland to get acquainted with institutional arrangements of municipal utilities.

The task team also provided intensive hands-on support to Kyivenergo to put in place project management, procurement and financial management arrangements. The Bank conducted numerous workshops on project management, procurement and financial management, which resulted in a well-trained group at Kyivenergo and eventually improved the speed of implementing bidding processes.

The Bank team arranged contacts between Kyivenergo and Krakow (Poland), Riga (Latvia), and Tallinn (Estonia) District Heating companies which Kyivenergo's staff visited to get acquainted with implementation of similar projects. Kyivenergo staff also

visited Helsinki to get acquainted with a Western DH system. Technical, tariff and financial aspects were discussed during the visits.

The task team discussed with the GOU and Kyivenergo management the possibility of providing additional funding for completion of the CT-1 heating plant. Taking into account the importance of the CT-1 heating plant, as the main heat source for the downtown area, the task team recommended to the Bank management to consider processing additional funding for the completion of the installation and civil works at CT-1 in an amount of US\$ 40 million.

The Bank's country office in Kiev provided an active supporting role, especially in terms of coordinating with the officials of Kyivenergo and the government.

### **(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: *Satisfactory*

The government's commitment to achieve the development objectives was strong at the project concept and preparation stages. It also ensured that the participatory process during project preparation was adequate. The government consistently maintained its commitment throughout project implementation. Appropriate levels of review and approval were usually in place; financial accountability and follow-up was mostly observed; and documentation was maintained properly for periodic review.

Nonetheless, the continuous political changes at the government level during the entire project implementation period, and in the final years of the project, also at the municipal level, made it difficult for Kyivenergo to have continuous support on important legislative and regulatory improvements. This was the case especially in 2005-2007, when the gas price in Ukraine increased rapidly. The increase in heat tariffs became a hot political topic during the local elections. The debate finally caused the municipality to lower already agreed tariffs, and the collection rate temporarily dropped because some top politicians advised the population not to pay their heating bills.

The government's relationship and coordination with the Bank were satisfactory. The government officials worked closely with the Bank's project team on a continual basis, and cooperated fully with the task team. The MOF's internal procedures, especially for disbursements, were implemented in a smooth way, even though at times there were

some delays. Transition arrangements for regular operation of supported activities after Loan closing are deemed adequate.

**(b) Implementing Agency or Agencies Performance**

Rating: *Moderately Satisfactory*

As explained earlier, the project implementation started very slowly because of various reasons, such as the Project Manager, who was also Chairman of the Board of Kyivenergo, not devoting sufficient attention to the project during a significant part of the time in the first 3-4 years, slow and bureaucratic approval procedures within the company, and high turnover of staff in the PIU. These adverse factors resulted in slow disbursement and a few amendments in the Loan Agreement.

Similarly, project implementation was seriously affected by the persistent lack of counterpart financing from Kyivenergo. Due to the lack of counterpart funding, the installation works could not be financed as was planned, and many implementation activities were seriously delayed. In particular, two boilers in CT-1 Heating Plant could not be installed, and construction and installation works in Pozniaki heating plant were not completed under the project.

The PIU within Kyivenergo was well staffed, and managed professionally. It was generally effective in carrying out various aspects of project management, such as accounting, financial management, procurement arrangements, and reporting activities:

*Accounting.* Accounting information was controlled by the chief accountant of the Company who had access to the data entered under the project. The cycle of initiation of the contract – acceptance of the work –preparation of the financial documents – payment approval – payment- was properly segregated and controlled by different departments. Staffing of the financial management functions was acceptable. The functions of accounting and financial management were properly arranged.

*Financial Management.* Kyivenergo's performance in Financial Management was overall moderately satisfactory for the following reasons: (i) improvements were needed in the contents and presentation of PMRs; (ii) PMRs were submitted with a delay; (iii) audit reports were submitted with a delay; and (iv) according to the audit of 2004 financial statements, Kyivenergo did not comply in 2004 with two out of three financial covenants, namely accounts receivable and current assets ratio. The non-compliance was largely due to sector-wide issues with loss-making tariffs established by municipalities and difficulties in collecting heat bills from households residing in multi-apartment buildings, and electricity bills from water supply and sewerage companies. The audit report of Kyivenergo for 2005 was qualified, and the management letter addressed a number of weaknesses in the internal control system of the entity.

*Reporting.* Kyivenergo prepared semi-annual progress reports which were generally submitted to the Bank within one month after the end of each semester. The progress reports included, among other things, information regarding: (a) overall progress of the project, (b) costs for each contract and for the total project, (c) procurement actions, (d) financial performance, (e) compliance with covenants under the Loan, (f) issues affecting project implementation and (g) performance monitoring indicators.

*Procurement Arrangements.* Procurement of all works, goods and technical services under the project followed the Procurement Guidelines “*Procurement under IBRD Loans and IDA Credits*”.

### **(c) Justification of Rating for Overall Borrower Performance**

Rating: *Moderately Satisfactory*

In light of the Government and Kyivenergo performance as discussed above, the overall performance of the Borrower was moderately satisfactory.

## **6. Lessons Learned**

According to the Borrower, the lessons learned are:

- For a project of this kind, even if the heating system is designed locally, it is important to use the services of advisors on a regular basis for updating technical know-how and learning international best practices on the technical design and other aspects of heating systems.
- For boilers, it is better to have one contractor for both goods supplied and installation works. This would insure that responsibility is not divided and that the total costs are known from the start.
- Considering that Kyivenergo did not have previous experience in dealing with a project financed by an international organization, for a huge project such as this, it would have been better to implement it in a phased manner with fewer components. This approach would have enabled Kyivenergo’s management to implement the project more effectively and efficiently.
- It is necessary to allocate substantial amount of funds for installation works in the Loan Agreement itself, so that even if the Government does not meet its commitments on heat tariffs, the implementation of the investment program would not suffer. Similarly, while preparing the business plan, it is important for the beneficiary to provide adequate reserves from its own funds for installation and other works, so that even if there is delay in getting funds from bilateral or multilateral institutions installation, maintenance, and investment activities will not be adversely affected.

- In light of the political sensitivity of raising the heat tariff on households and effective cost recovery, it is worth considering alternative means of reducing the impact of price hikes on the poor. There are better targeted means than flat rate tariff reductions, including social transfer systems and life line tariffs.
- Tariff setting and price regulation should be separated from the municipalities which would reduce the political pressure on heat tariffs. This would provide a possibility for a sustainable financial planning within the heating companies. In Kyiv this was especially a problem at the end of the project in 2006-2007 after the gas prices increased drastically and the setting of heat tariffs became a political debate in the press. As a result, the prices were reduced much below the cost recovering level.
- Training of the key staff involved in the project, not only from PIU but from the subsidiaries as well, should be conducted in the very beginning of the project implementation.
- In order to harmonize delivery and installation phases, supply and installation (turnkey) contracts should be used whenever applicable.
- The Company structure should be modified in the very beginning of the project implementation in order to ensure adequate and timely support from subsidiaries involved in the Project.

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

### **(a) Borrower/implementing agencies**

Comments and corrections on the draft ICR received from Kyivenergo have been incorporated in the text of this ICR.

### **(b) Cofinanciers**

EBRD had planned to co-finance the project for the Kyiv Municipal DH Company (KMDHC) but after the merger of Kyivenergo and Kyiv Municipal DH Company (KMDHC) EBRD withdrew from the planned financing because of Kyivenergo's and Kyiv City's refusal to accept some conditions of the lending proposed by EBRD.

### **(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 US\$ million equivalent)

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

Components	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
<b>Kyivenergo</b>			
Heat Production Capacity Improvement	140.6	55.1	40%
District Heating Rehabilitation	71.5	163.3	228%
Institutional Support	0.5	1.0	200%
<b>Total Baseline Cost</b>	<b>212.6</b>	<b>219.4</b>	103%
Physical Contingencies	21.2	-	
Price Contingencies	17.4	-	
<b>Total Project Costs</b>	<b>251.2</b>	<b>219.4</b>	87%
Project Preparation Fund	0.0	0.0	
Front-end fee IBRD	0.0	0.0	
Import Duties	3.1	0.0	
<b>Total Financing Required</b>	<b>254.3</b>	<b>219.4</b>	86%
<b>Kyiv Municipal DH Company</b>			
Secondary Pipe and Substation Rehabilitation *	54.7	0	
<b>Total Financing Required</b>	<b>308.9</b>	<b>219.4</b>	71%
* Kyiv Municipal DH Company was merged to Kyivenergo and this part of the project was implemented partly under Heat Distribution Component			

### (b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
World Bank		200.0	159.7	80%
EBRD		40.0	0.0	-
Project Agency: Kyivenergo		54.2	59.7	110%

## **Annex 2. Outputs by Component**

### **1. HEAT PRODUCTION CAPACITY IMPROVEMENT COMPONENT**

#### **(i) Pozniaky Boiler Plant Subcomponent**

The equipment was supplied for completion of the 1st stage of the Pozniaki heating plant including the Gas Pressure Reduction Station (GPRS), gas pipeline (10.1 km), Automated Control System (ACS), pipes (27.2 km), 0,66-10 kV cables and wires (245.7 km), valves (1620 pcs.), heat insulation materials, electrical and auxiliary equipment.

Most of the construction and electrical installation works (over 90%) are completed. The complex of works on hydro testing of water heating boilers, DH pipelines, and steam pipelines is also completed. Pre-commissioning works on ACS, heat and mechanical equipment are in progress. 6.5 km of gas pipelines were installed, but only part of the gas supply pipeline is completed and the plant has not been put into operation. The remaining works and commissioning will be done by Kyivenergo's own funds by end 2008.

In addition to the investments at the Pozniaki heating plant this sub-component included power supply line to Pozniaki, which also supplies electricity to the area. The following works were fully completed: (i) power supply to Pozniaki Boiler Plant electrical substation (110 kV) Osokorky was built and put into operation; (ii) the power transmission line (110 kV) from Kharkovskaya to Osokorky (2.3 km) was built and put into operation; (iii) electrical substation Kharkovskaya was rehabilitated, including replacement of 10 circuit breakers of 110 kV; (iv) power cables (10 kV) between the Pozniaky heating plant and the electrical substation Osokorky were installed, and (v) the fiber optic communication network between the power and heat supply units of Kyivenergo, fibre optic cable (42.2 km) with accessories and multiplex equipment was purchased and is being installed by Kyivenergo.

#### **(ii) CT-1 Rehabilitation Subcomponent**

##### **Plant site subcomponent**

For the rehabilitation the CT-1 heating plant the following equipment was supplied: (i) 2 hot water boilers of 100 Gcal/h each; (ii) 2 steam boilers of 25 t/h each; (iii) equipment for the water treatment plant (WTP); (iv) a 90 m stack for the whole plant; and (v) other electrical and technical equipment.

The following works were performed, including dismantling of old water heating boilers, disassembling of old buildings, reconstruction of sections of the heat main pipeline. Construction of a new GPRS is underway and WTP construction are in progress under Kyivenergo's own financing. Installation and commissioning of a three-pipe stack was completed and in operation for two existing boilers.

However, the main equipment, two hot water boilers (2 \* 100 Gcal/h), could not be installed because of lack of Kyivenergo's own and loan financing and Kyivenergo's inability to obtain approval to negotiate the additional financing loan from the Bank. Kyivenergo plans to install the boiler equipment under their financing by 2010.

In addition to the investments at the site of CT-1 heating plant the following power cable and electric substation investments were fully completed under the CT-1 sub-component: (i) to supply power to the CT-1 heating plant and to other consumers in the area, an electrical substation (110 kV) CT-1 was built; (ii) electrical substations Bastionna and Politekhnichna were rehabilitated; (iii) 110 kV substations Vokzalna and Solomenska, which provides backup power to CT-1, are



under rehabilitation with Kyivenergo's own financing (iv) power cable (110 kV ) lines between electrical substations Oktyabrskaya and Stankozavodska (1.6 km) and between substations Oktyabrskaya and Polytekhnichna" (3.2 km) were built; and (v) and fiber optic communication network between power and heat supply units of JSC Kyivenergo fiber optic cable with accessories and multiplex equipment was purchased and is being installed by Kyivenergo.

(iii) TETS-5 and TETS 6 Rehabilitation and Expansion Subcomponent

One hot water boiler of 180 Gcal/h was installed in TETS 5. Rehabilitation of internal DH networks was carried out.

Two hot water boilers of 180 Gcal/h each were installed in TETS 6. Rehabilitation of internal DH networks was carried out.

## **2. DH REHABILITATION COMPONENT**

### **(i) Pipes and Valves Replacement Subcomponent**

168 km of preinsulated pipes together with valves and compensators were supplied, of which about 130 km of pipes were installed and are in operation and 3254 pieces of valves were installed. The remaining preinsulated pipes will be installed by Kyivenergo's financing by 2011.

### **(ii) Substation Center Subcomponent**

Cable power transmission lines between the electric substations (110 kV) Centre and Bastionna (3.1 km), substations Center and Vokzalna (2.6 km), and substations Vokzalna and Polytekhnichna (0.4 km) were built and put in operation, which made it possible to put in operation the substation Center (110 kV). The substation Center provides power to downtown Kyiv. To incorporate the new substation Center into Kyiv power supply system 45 km of 10 kV underground power cable was laid.

To provide data transmission from substation Center to the Dispatch Center of the Central Region Cable Networks and to arrange dispatch/technology communication channels, 5.3 km of fibre optic cable line was constructed.

### **(iii) Heat Metering and Heat Meters (DH Distribution Networks Subcomponent)**

About 1950 heat metering units (including heat meters and temperature regulators) and 18 individual heat substations were supplied, of which about 1560 heat metering units and 17 individual heat substations were installed.

## **3. INSTITUTIONAL SUPPORT COMPONENT**

In accordance with the Loan Agreement an international consultant carried out the institutional study, aimed at reviewing options for the most efficient institutional and corporate structure of Kyivenergo.

The study has been completed with a final workshop held in February 2005 and attended by key stakeholders including Kyiv City, Kyivenergo, Parliament, State and Housing and Communal Service Committee and others. The audience largely supported consultant recommendations on ways to improve the efficiency of Kyivenergo through various restructuring.

Kyivenergo, a beneficiary of the study, has started applying the consultant proposals, specifically divested non-core activities such as construction, guard services, and repair works.

Besides, about 1000 specialists from Kyivenergo participated in the numerous training courses, workshops (installation, commissioning, operating and maintenance) held by the suppliers of the up-to-date equipment and materials.

At the initial stage of the Project implementation consultancy services in the areas of detailed design and procurement were provided.

### **Annex 3. Economic and Financial Analysis**

The Project has six components broken down into two groups. The first group is heat production and capacity improvements while the second group is district heating rehabilitation and electricity. Four of these components are completed but two components have not yet been completed although they are expected to be completed in the next two-three years. The ERR for all four completed components together is 13%. This is reasonable, especially, since as discussed below, it probably underestimates the benefits. This potential underestimation occurs because the price of gas used in calculating this ERR was the price paid by Kyivenergo for Russian Gas- which was mostly below the market price meaning the price paid by non Ukrainian Customers. The financial rate of return for the four components is estimated at 7%. This excludes corporate income taxes but includes the impact of various duties and social overheads as described in the SAR.

#### **Heat Production Capacity Improvement Components:**

At appraisal there was a significant deficit in heat generation capacity and in addition the city of Kyiv was expanding and population growing which resulted in the conclusion that the heat demand would grow and there would be an urgent need for additional generation capacity. The city has grown but the heat demand has not grown as expected because of energy savings and new buildings, especially commercial buildings, which use gas in individual boilers for heating purposes. The heat production components were reduced during the project to better reflect the real heating needs of Kyiv.

There are three heat production components. One of these components was completed successfully. This is the additional boiler capacity for TETS 5 and 6. The other two components have not been completed. In that sense they are unsatisfactory, although it is possible that in the longer run, when they are completed, they could have positive rates of economic return.

#### **TETS-5 and TETS-6 Component:**

The two major heat sources in Kyiv are TETS-5 and 6 (Combined heat and power (CHP) plants 5 and 6). The project included additional hot water boiler capacity for these heat sources to cover the heat generation deficit. In 1998, 2 hot water boilers (2\*180 Gcal/h) were installed, one in TETS-5 and one in TETS-6. These boilers supply heat during the winter to cover the peak demand. In 2004 an additional boiler of 180 Gcal/h was installed at TETS-6. The heating units at TETS-5 have been nearly fully loaded every winter basically without reserve capacity, because TETS-5 also supplies an area on the left bank of the Dnipro-river, which will be supplied from the Pozniaki plant once it is completed.

The boilers at TETS-5 and 6 were installed early in the project and have been in operation since late 1998. The benefits are:

- Additional heat production and sale which is made possible by the higher capacity of the plants, due to the new boilers.,
- Lower operation and maintenance costs mainly because of the reduced electricity consumption of the pumps,

The economic analysis gives the economic rate of return as 23.4% for these boiler investments. The estimate in the SAR was 25%. The estimated FRR for this component is 22% compared to 18% in the SAR.

### Pozniaki Heating Plant:

The construction of the Pozniaki heating plant has experienced many difficulties during project implementation including; (i) difficulty obtaining the right of way for the gas supply pipeline in the area of Kyiv Oblast resulting in delays of about 3 years, and (ii) lack of co-financing from the Ukrainian side. The plant is not yet in operation in 2007. Kyivenergo expects to complete the remaining installations, including about two km of gas pipeline, by the end 2008.

The economic analysis of this component could not be done because the component is not complete.

### CT-1 Heating Plant:

The CT-1 heating plant supplies heat to downtown Kyiv and its rehabilitation has been one of the main components of the project. The plan was to replace two boilers which have not been used for a long time with modern and efficient boilers (2\*100 Gcal/h), construct a new stack and a new water treatment facility for the whole plant and construct new power supply lines and a gas pressure station. All the equipment has been purchased and delivered. The stack and cable lines are in operation, but the two boilers have not been installed because of the unexpectedly high costs of installation works. The Bank and Kyivenergo tried to process additional loan funds of US\$ 40 million to complete the installation, but because of the new conditions of the sub-loan agreement (150% collateral in the first place, and higher margin of on-lending), the Ukrainian sub-borrower could not meet the on-lending terms and the additional funds could not be provided. Kyivenergo plans to finance the installation of the boilers from local sources and expects to complete the plant in 2010.

Since the main equipment under the project, two hot water boilers, are not in operation, the economic analysis for this component can not be completed.

### **DH Rehabilitation and Electric Components:**

There are three such components. All of them can be viewed as satisfactory although the transmission and distribution rehabilitation component would have to be viewed as marginally satisfactory since it took so long to complete and the ERR is low. All of these components involve saving natural gas either directly or indirectly ( electricity substation). The gas price used is the one paid by Kyivenergo. However, this price was, during most of the period, substantially below the market price where the market price is defined as the price paid by most non Ukrainian Customers for the same gas from Gazprom. If this “ market price” is used for natural gas instead of what Kyivenergo paid, it would raise substantially the ERRs for all three of these components.

### District heating transmission and distribution rehabilitation component

This component was planned to be implemented based on the principle that the loan proceeds would be used for purchasing goods (pipes, valves etc) and local co-financing would be used to finance the installation works. In the beginning of the project the above financing principle worked and the pipes procured in 1999 and 2000 were installed using Kyivenergo’s own funds. However since 2001 Kyivenergo could finance the installation of only a small portion of the procured pipes. In 2003 the loan agreement was amended allowing the use of loan proceeds for installation works. This accelerated the installation works but the earlier delays, higher than expected installation costs and limited installation capacity of local contractors, resulted in slow

installation. By the Fall of 2007 about 130 km of pipes (about 65 km dual pipe channel) had been installed and put into operation. About 40 km of pipes (20 km dual pipe channel) are still in storage and according to Kyivenergo will be installed by the end of 2011.

As a result of the slow installation works, the investments were made (pipes purchased ) but they were not installed on time and therefore the benefits in terms of better efficiency and reduced leakages were not achieved as soon as planned.

Benefits:

- Reduced thermal losses due to replacement of the pipes in the worst condition,
- Reduced water losses,
- Reduced operation, maintenance and repair costs,
- Improved reliability of heat supply,

The ERR for this component is 3.0%. The estimate in the SAR was 15%. The estimated FRR for this project is negative while in the SAR it was 13%.

#### Electric Substation Center:

The Substation Center was completed in 2002 as planned and supplies power to downtown Kyiv. Without it there would be a deficit of power of about 30 MW in 2007. The substation supplies new developments in downtown including new businesses, public buildings, and apartment buildings.

In calculating the ERR it was assumed that had this new and higher capacity substation not been built, this part of downtown Kyiv would have been supplied with additional power by open cycle gas turbines using natural gas since this is the least cost alternative. The benefit from the new substation is that it allowed the area to be supplied by power from the grid which is less expensive and generated from a mixture of coal, natural gas and hydropower. The difference in the cost of power supplied by the open cycle gas turbines compared to power from the grid is the main benefit of the substation. In addition there is a reduction in operating costs because the substation is new. The ERR is 27%. This is about the estimate in the SAR which was 26%.

The FRR for this component uses the price at which electricity is sold as the value of the electricity rather than the cost of operating an open cycle gas turbine. The resultant FRR is 17.7% compared to 14.0% in the SAR.

#### Heat Substations and Heat Meters:

This component consisted of heat meters, heat substations and heat exchangers. About 1560 heat metering units with automatic temperature regulation, a small number of individual building level substations and heat exchangers for heating and hot water were installed between 2002 and 2007. The economic benefits are energy savings in buildings (10 -15%) resulting in reduced gas consumption in heat generation.

Other benefits are:

- Better customer service and customer satisfaction, since they are less likely to get too much or too little heat.

The calculated ERR is 14.4%. The estimate in the SAR was 27%. The financial rate of return is 12.7% compared to the SAR estimate which was also 27%.

The table below summarizes the results of the Economic and Financial Analysis.

**ECONOMIC AND FINANCIAL RESULTS COMPARED TO SAR**

<b>Components</b>	<b>SAR ( Forecast)</b>		<b>Actual</b>	
	ERR	FRR	ERR	FRR
<b>Heat Production</b>				
TETS 5 and 6	25%	18%	23.4%	22%
Pozniaki Heat Plant	15.5%	10.7%	n.a.	n.a.
CT-1 Heat Plant	30.3%	29.4%	n.a.	n.a.
<b>DH Rehabilitation and Electric Components</b>				
DH Rehabilitation	15%	13%	3.0%	Neg.
Electric Substation	26%	14%	27%	17.7%
Heat Substations +meters	27%	27%	14.4%	12.7%

## Annex 4. Bank Lending and Implementation Support/Supervision Processes

### (a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
<b>Lending</b>			
Carolyn Gochenour	Financial Analyst	ECS4IN	Team Leader
Pentti Aro	District Heating and Power Engineer	ECS4IN	District Heating Specialist
Eugen Finkel	Consultant	ECS4IN	Social Scientist
Luis Gutierrez	Consultant	ECS4IN	Energy Economist
Pekka Salminen	Consultant	ECS4IN	District Heating Specialist
Antanasijje Kocic	Consultant	ECS4IN	Power Engineer Specialist
Konstantin Skorik	Research Analyst	ECCUA	Research Analyst
Dmitry Slusarchuk	Research Analyst	ECCUA	Research Analyst
<b>Supervision/ICR</b>			
Carolyn Gochenour	Sr. Financial Analyst	ECSIE	Program Team Leader
Pekka Salminen	Sr. Energy Specialist	ECSSD	Team Leader (as of April 2006)/Procurement Specialist
Pentti Aro	District Heating and Power Engineer	ECSIE	District Heating and Power Engineer
Yuri Miroshnichenko	Operations Officer	ECCUA	Operations Officer/Task Team Leader (Jan 2005 – April 2006)
Konstantin Skorik	Operations Officer	ECCUA	Operations Officer
Enar Wennerstrom	Financial Management Specialist	ECSIE	Financial Management Specialist
Jann Masterson	Operations Officer	ECSSD	Operations Officer
Irina Babich	Financial Management Specialist	ECCU2	Financial Management Specialist
Vitaly Kazakov	Financial Management Specialist	ECCUA	Financial Management Specialist
Sati Achath	Consultant	ECSSD	ICR Author
Dmytro Glazkov	Operations Analyst	ECCU2	Operations Analyst
Rozena Serrano	Program Assistant	ECSSD	Program Assistant

### (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)
<b>Lending</b>		
FY96		0.0
FY97		0.0
FY98		265.86
FY99		3.90
<b>Total:</b>		269.76

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
<b>Supervision/ICR</b>		
FY00		131.51
FY01		87.68
FY02		128.22
FY03		97.70
FY04		99.11
FY05		99.09
FY06		86.51
FY07		53.88
FY08		26.98
<b>Total:</b>		<b>705.66</b>

**Note: Staffweeks are no longer supported by Bank Information**



**Annex 5. Beneficiary Survey Results**

*None*

**Annex 6. Stakeholder Workshop Report and Results**

*None*

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

Joint Stock Company  
"Kyivenergo"

Implementation Completion Report

Kyiv District Heating Improvement Project, Ukraine

World Bank Loan # 4324 UA

Kyiv  
August 2007

The Project name:

Kyiv District Heating Improvement Project (further – Project).

### **The Project beginning date:**

The Loan Agreement was ratified by the Parliament of Ukraine on March 23, 1999.

The Law was published in the mass media on April 1, 1999 and counseled by the Ministry of Justice on April 9, 1999.

The Agreement came into force on April 12, 1999 after signing by the World Bank of the letter-of notification concerning effectiveness of the Agreement.

### **The Project closing date:**

June 30, 2007 (financial accounts shall remain open till October 31, 2007).

The financing sources:

- World Bank -USD 200 mln.(Loan Agreement of 14.10.1998). In accordance with the letter from the World Bank of 01.12.2004 the total amount of investment was reduced from USD 200 to 160 mln.
- JSC Kyivenergo - USD 59.7 mln.(as of 01.11.2007)

The necessity of Project implementation

Kyivenergo is among the ten biggest Ukrainian producers of electrical power and the biggest producer of heat energy in Ukraine. The established structure of the Company provides the whole technological cycle from production to realization of heat and electrical power directly to the consumers, and reflects strategy of Kyiv City State Administration (KCSA) directed to creation of the integrated power complex in Kyiv.

Heat supply system in Kyiv historically developed through creation of powerful sources of heat supply and distribution heat substations, interconnected by extensive heating networks.

The low payment capacity of a considerable part of the consumers and the unprofitability of heat energy tariffs negatively affected the financial state of the Company, prevented if from conducting timely modernization and repair of heat supply sources, heat substations and networks.

The development rates of city infrastructure and house construction outgrew the development rates of Kyiv energy system. At present the connected heat load of the consumers in some districts of the city exceeds the installed capacity.

Transportation and distribution of heat to the consumers are performed via heat pipeline networks; the total length of which is about 2300 km in double-pipe calculation, one third of them have been in operation over 25 years.

Maintenance of power equipment in appropriate technical condition needs yearly increases of costs for its services, reconstruction and modernization, and a considerable part of the equipment needs complete replacement.

Thus, the main technical problems in the operation of the district heating supply in Kyiv at the time of Project preparation were:

- Under capacity of heat supply sources in some districts of the city.
- Necessity of very old boiler plants replacement (with more than 50 years service life period) in the city center and construction of new heat supply sources in the district Pozniaky for providing needs of housing construction counting on over 300000 people.
- Necessity of new higher stack construction at CT-1 (H=90 m), the low stacks of which created local ecological problems.
- Under capacity of equipment and obsolete technology of water treatment facilities used at CT-1 for makeup of heat networks water losses.
- Big losses of heat energy and water owing to ineffective pipelines insulation and out-of-date pipeline laying technology of heat networks resulting in heavy maintenance expenses and necessity of pipeline and equipment replacement before the end of their designed operation life.
- Under capacity and low reliability of heat energy supply in the city center and to important consumers, such as the Parliament of Ukraine, the Ministry, the President Administration, the underground, the embassies and the representations of the foreign countries.

In order to solve the above mentioned problems Kyivenergo together with KCSA in April 1995 applied to the IBRD management with a request for a loan to carry out the reconstruction of the district heating network in Kyiv.

The Loan Agreement between Ukraine and the IBRD was concluded on October 14, 1998. The World Bank provided the Loan in the amount of USD 200 mln. with the repayment term of 20 years, including 5 years of grace period, which corresponded to the Project implementation period, with the variable interest rate LIBOR+0.5%. The Loan repayment period is 15 years. The Ministry of Finance of Ukraine has on lent the Loan to Kyivenergo in accordance with the terms and conditions of the IBRD and a rate increase of 0,5% for reimbursement of administration costs and risks relating to the sub-loan.

Some problems (long procedure of Loan ratification, unregulated legislation for taxation of goods imported to the territory of Ukraine in the framework of the Project, considerable indebtedness of consumers for heat and electricity, long-term uncertainty of payments, unprofitability of heat tariffs), that arose during preparation and implementation of the Project, resulted in the delay of its implementation and prevented Kyivenergo from financing the Project in the specified scope. As a result, the component "Rehabilitation and expansion of Boiler Plant CT-2" was excluded from the scope of the Project.

On December 1, 2004 at the request of Ukraine the World Bank canceled part of the Loan in the amount of USD 40 mln. and extended the closing date to the end of 2006.

In January 2006 the World Bank approved the decision concerning 100% financing of the contracts with the local suppliers/contractors that were concluded after November 1, 2005.

In December 2006 the World Bank took the decision concerning the prolongation of Project implementation till June 30, 2007.

On June 21, 2007 the World Bank informed Kyivenergo about the provision of a four months grace period (30.06.2007-31.10.2007) for further operations regarding applications for loan funds for eligible expenses incurred before the Loan closing date.

#### The Project components

The Project consists of the following components:

1. *Pozniaky Boiler Plant (completion of construction).*
2. *CT-1 Heating Plant rehabilitation.*
3. *Rehabilitation and expansion of CHP-5 and CHP-6.*
4. *Electrical substation "Center".*
5. *Replacement of DH networks pipelines and valves.*
6. *Installation of heat metering devices and reconstruction of heat substations.*

#### **The Project importance**

The project importance's is in achievement of maximum levels of power supply, system operation reliability, improvement of the ecological situation in the region, arrangement of comfortable conditions for citizens and the possibility of city infrastructure development as a whole.

#### The Project goals:

- Modernization and replacement of equipment at heat sources in order to increase heat sources capacity, resulting in improvement of existing and expected future needs and increase of Kyiv DH network reliability and service level;
- Increase of heat energy sources power supply reliability
- Operational life extension, effectiveness increase, and improvement of DH network maintenance by means of rehabilitation and implementation of up-to-date technologies and materials.

#### **The Project implementation**

Since the beginning of Project implementation, Kyivenergo has concluded 70 contracts for equipment supply and work performance in total amounting to over USD 171 mln., of which USD 160 mln. were to be paid from the World Bank Loan. Under these contracts USD 159.7 mln. has been paid.

Table 1

Allocation of used loan funds according to the project components

<i>Components</i>	Used loan funds, USD mln.
Pozniaky Boiler Plant (completion of construction)	21,8
CT-1 Heating Plant rehabilitation	53,9
CHP-5 rehabilitation	0,9
Rehabilitation and expansion of CHP-6	4,5
Construction of electrical substation “Center”	1,2
Replacement of DH networks pipelines and valves	68,5
Installation of heat metering devices and reconstruction of heat substations	7,9
Project Audit and financial statement of Kyivenergo	1,0
Total	159,7

Since the beginning of Project implementation the following results were obtained according to the components:

*1. Pozniaky Boiler Plant (completion of construction)*

The equipment for construction completion of the 1<sup>st</sup> stage of the Pozniaky Boiler Plant were supplied. These consist of the Gas Reduction Station (GRS), gas pipeline (8.3 km), Automated Control System (ACS), pipes (27.2 km), cables and wires 0,4-10 kV (245.7 km), valves (1620 pcs.), heat insulating materials, electrical and auxiliary equipment.

Over 90% of construction, installation and wiring works were performed as well as a complex of works for the hydraulic testing of hot water boilers, pipelines of DH water and steam pipelines. Start-adjusting work of ACS, heat-mechanic equipment are being carried out. A gas pipeline 6,5 km long was installed.

To provide reliable power supply to the Pozniaky Boiler Plant, the substation (s/s) 110 kV Osokorky was built with the installation of two 40 MVA, 110/10 kV transformers. Reconstruction of relay protection for process control automation at s/s Kharkivska and s/s Pozniaky was performed. For power supply to s/s Osokorky the cable line 110 kV Kharkivska-Osokorky was built (14.8 km of 110 kV cable was laid). The rehabilitation of s/s Kharkivska including replacement of ten 110 kV circuit breakers was carried out. In order to connect back-up transformers of Pozniaky Boiler Plant to the 10 kV switchgear of s/s Osokorky the 15 km of 10 kV cable was laid.

Putting into operation of s/s Osokorky will allow it to provide connection to a 40 MW load from the housing and social sector.

To arrange the information exchange system between heat and power supply units of JSC Kyivenergo 42.2 km of fiber optic cable with accessories and multiplex equipment were purchased.

## *2. CT-1 Heating Plant rehabilitation*

There were supplied: 1) 2 hot water boilers with capacity of 100 Gcal/h each 2) 2 steam boilers with capacity of 25 t/h each with auxiliary equipment, 3) equipment for the Water Treatment Plant (WTP), 4) a stack H=90 m, and 5) electrical equipment.

The following preparation work was performed: the old hot water boilers were dismantled, a section of heat pipeline was reconstructed, and stacks from two existing boilers were dismantled. The construction of a new GRS is being continued. The construction work for the WTP is being performed. The installation and putting into operation of a three-pipe stack was performed. Two existing boilers after dismantling of old stacks, were connected to the new stack.

In order to provide reliable power supply to the CT-1 heating plant and other consumers the 110 kV s/s CT-1 will be built by the end of 2007. Power supply to the s/s CT-1 is provided by taps from 110 kV cable lines “Bastionna-Vokzalna” and “Politekhnichna-Center”, being a part of a tandem link 110 kV CHP-5-Zhovtneva. Moreover, the rehabilitation of 110 kV s/s Bastionna and Politekhnichna is completed and rehabilitation of 110 kV s/s Vokzalna (connected to the above mentioned link), and also 110 kV s/s Solomenska, (that provides backup power supply to CT-1) are being carried out. The 110 kV cable lines “Center-Vokzalna” and “Vokzalna-Politekhnichna” (18 km of cable) were laid and put into operation. The 110 kV cable lines “Zhovtneva-Mototsykletna” and “Zhovtneva-Politekhnichna” (30 km of 110 kV cable) were built. The new draw-in technology of cable laying for saving of forest park areas was applied here.

To establish an information exchange system between heat and power supply units of JSC Kyivenergo 87 km of fiber optic cable with accessories and multiplex equipment were purchased.

## *3. Rehabilitation and expansion of CHP-5 and CHP-6*

Three hot water boilers each of 180 Gcal/h heat capacity (one at CHP-5 and two at CHP-6) were installed and put into operation. Putting into operation of these boilers allows Kyivenergo to provide additional heat supply to housing and social facilities with a population more than 200 000 citizens. The rehabilitation of the inner-plant heating network with replacement of old valves was carried out.

## *4. Construction of electrical substation Center*

In order to increase power supply reliability in the central part of Kyiv during conditions of under capacity and low reliability of power supply, the 110 kV s/s Center was put into operation with the installation of two power transformers with a total capacity of 80 MVA, and a cable power transmission line, 110 kV «Center – Bastionna» (18.7 km of 110 kV cable), was built and put into operation. To connect the new 110 kV substation Center to Kyiv power supply network 45 km of 10 kV underground cable was laid.

Putting into operation of s/s Center will save 9.8 mln. kWh of electrical power till 01.01.2008 owing to a decrease in transformer losses and cable lines, and 106 mln. kWh during the period of 2000-2018.

In order to provide data transmission from the substation Center to the Dispatch Center of the Central Region Cable Networks (DC CRCN) and to arrange dispatch process communications the 5,3 km fibre optic cable line was constructed.

*5. Replacement of DH network pipelines and valves*

There were supplied 168 km of preinsulated pipes and valves for the heating network; 130 km of pipes and 3250 units of valves were installed.

*6. Installation of heat metering devices and reconstruction of substations*

There were supplied 18 Individual Heat Substations (IHS), 1950 heat metering devices. 1560 units of heat metering devices were installed and 17 IHS were installed in dwelling houses.

Installation of new, modern equipment instead of out-of-date and old equipment enables Kyivenergo to optimize the operational schedule of the heating network, to arrange and improve payments for consumed heat as well as to increase energy saving due to the possibility of lowering expenses on heating and hot water supply control.

Table 2

Project costs per component (in USD)

Components	Appraisal Estimate (US\$ million)			Actual (as of 01.11.2007) (US\$ million)			Percentage of Appraisal		
	Local	Foreign	Total	Local	Foreign	Total	Local	Foreign	Total
1. Pozniaki Boiler Plant	10.1	23.0	33.1	12.3	21.8	34.1	122%	95%	103%
2. CT-1 Rehabilitation	3.8	22.8	26.6	3.4	53.9	57.3	89%	236%	215%
3. CT-2 Rehabilitation	3.3	43.6	46.9	0.5		0.5			
4. CHP-5 Rehabilitation and Expansion	6.2	11.8	17.9	1.6	0.9	2.5	26%	8%	14%
5. CHP-6 Rehabilitation and Expansion	7.3	10.7	18.0	4.6	4.5	9.1	63%	42%	51%
6. Electric Substation "Center"	2.9	6.9	9.8	7.0	1.2	8.2	241%	17%	84%
7. Pipe and Valves Replacement	10.4	44.4	54.8	19.5	68.5	88.0	188%	154%	161%
8. Heat Distribution Networks	-	-	-	1.7	7.9	9.6			
9. Design and Supervision	5.0	0.0	5.0	9.1	1.0	10.1	182%		202%
10. Total Baseline Cost	49.0	163.1	212.1	59.7	159.7	219.4	122%	98%	103%
11. Physical Contingencies	4.9	16.3	21.2	-	-	-			
12. Price Contingencies	3.0	14.4	17.4	-	-	-			
13. Total Project Costs	56.9	193.8	250.7	59.7	159.7	219.4	105%	82%	88%
13'. Total Project Costs (w/o CT-2)	53.6	150.2	203.8	59.2	159.7	218.9	110%	106%	107%
14. Project Preparation Facility (PPF)	0.0	0.0	0.0	0.0	0.0	0.0			
15. Front-end fee (IBRD only)	0.0	0.0	0.0	0.0	0.0	0.0			
16. Total Financing Required	56.9	193.8	250.7						

## **The World Bank and Kyivenergo performance**

Taking into consideration the complexity and the scope of the Project, the World Bank activities on preparation and implementation of the Project included continuous supervision and support of the Borrower in case of problems, which could influence the Project implementation.

Special attention should be paid to the World Bank consultations during Project implementation. So, under the component "*Installation of heat metering devices and rehabilitation of substations*", financed at the expense of saved funds on the Project, the World Bank communicated the experience of the Riga DH supply Company in eliminating group substations and their replacement them with IHS, which clearly showed the considerable technical, financial and economic advantages they had in comparison with the group substations. Moreover, the World Bank provided assistance during the preparation of the technical specifications for the Project and Kyivenergo financial statements audits.

In order to increase the effectiveness of expenditure of the World Bank funds and the rate of Project implementation as well as to solve the problem of lack of own floating funds in 2004, Kyivenergo requested the World Bank to reallocate funds from the category Goods to the category Works. This reallocation provided the opportunity to finance the construction and installation works from the loan account and significantly speeded up putting into operation the purchased equipment.

In order to monitor the state of Project implementation World Bank missions were constantly carried out. They promoted the efficient solving of the current problems and speeded up Project implementation.

### **Assessment of outcomes of Project implementation**

The Project implementation will have positive influence on: the heat supply reliability, as well as increase the quality of heating and hot water supply to dwellings, public-service and administrative buildings, and considerably increase the quantity of heat supply to the consumers.

Due to the use of up-to-date equipment and rehabilitation of existing equipment a reduction of fuel spending for production of heat energy per unit will result. The considerable saving is achieved by the halving of heat energy losses through heat network pipeline insulation. A reduction of the operational costs of DH network maintenance is expected owing to the increase of equipment reliability.



Table 3

Index	1999	2000	2001	2002	2003	2004	2005	2006	2007 1 <sup>st</sup> half year
Reducing of heat losses in pipelines, Gcal/h	71	2957	10861	20140	31960	39168	50895	35773	42018
Reducing of damage number in DH network, pcs.	-	4	7	17	18	24	52	50	26
Average operational life of pipelines, year	17.9	21,0 <sup>1</sup>	22,0	22,9	24,1 <sup>2</sup>	24,4	24,2	24,7	24,7

<sup>1)</sup> the old networks of KGTKE connected;

<sup>2)</sup> the old networks of GTE connected

The Project results in environment concern mainly the decrease of harmful emissions into atmosphere because of effectiveness increase of fuel usage, reduction of heat energy losses in DH network. The introduction of effective water treatment system, reduction of water losses in heat supply systems also shall contribute to lowering of environment pollution.

The infrastructure development of heat supply system in new districts will promote the plans of KCSA concerning the residential construction, directed to the satisfaction of people demand in habitation receiving, that will considerably improve the social climate in the city.

#### Influence of institutional development

The Kyiv District Heating Improvement Project is the first investment project in the field of DH supply in Ukraine, which solves the most important needs of Kyiv City. The modernization of outdated equipment allows to increase the operation reliability of power complex, to improve the ecological situation in the region, and create comfortable conditions in dwelling, public-service and administrative buildings, that is one of the conditions of Kyiv transformation into city of civilized European type.

Preparation of this Project implementation was carried out in the close cooperation of responsible representatives of Ukrainian Government and state regulating authorities with representatives of IBRD resulting in gaining of positive experience in creation of the conditions for implementation of the international projects.

This Project allowed to gain the experience in holding of the international competitive bidding, preparation of the contracts for the equipment supply and work performance.

## **Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders**

N/A

## **Annex 9. List of Supporting Documents**

- Project Implementation Plan
- Staff Appraisal Report for Ukraine: Kyiv District Heating Improvement Project, dated April 24, 1998 (Report No: 16432 UA)
- Aide Memoires, Back-to-Office Reports, and Implementation Status Reports.
- Project Progress Reports.
- Borrower's Evaluation Report dated August 2007







\*including electronic files



# UKRAINE

## KYIV DISTRICT HEATING IMPROVEMENT PROJECT

### KYIV DISTRICT HEATING SYSTEM IN THE YEAR 2000

-  TETS-COGENERATION PLANTS
-  DISTRICT HEATING BOILER PLANTS
-  PUMPING STATIONS
-  UNDERGROUND DH PIPING
-  SERVICE AREA BOUNDARIES
-  ROADS

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