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IMPLEMENTATION COMPLETION REPORT
(CPL-37400; SCL-3740A; SCPM-3740S; COFN-03280)

ON A

LOAN

IN THE AMOUNT OF US$ 38.4 MILLION EQUIVALENT

TO

THE REPUBLIC OF ESTONIA

FOR A DISTRICT HEATING REHABILITATION PROJECT

JUNE 23, 2000

Energy Sector Unit
Europe and Central Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective February 1, 2000)

Currency Unit = Estonian Kroon (EEK)
15.94 EEK = US$ 1.00
US$ 1 = 0.06

FISCAL YEAR
January 1 to December 31

ABBREVIATIONS AND ACRONYMS

CAS	=	Country Assistance Strategy
CHP	=	Combined-Heat-and-Power
CO	=	Carbon Monoxide
CO2	=	Carbon Dioxide
DH	=	District Heating
EBRD	=	European Bank for Reconstruction and Development
EIB	=	European Investment Bank
ERR	=	Economic Rate of Return
EU	=	European Union
FRR	=	Financial Rate of Return
FSU	=	Former Soviet Union
G24	=	Group of 24
HOB	=	Heat-only-Boiler
ICB	=	International Competitive Bidding
MW	=	Megawatt
NEAP	=	National Environmental Action Plan
NCB	=	National Competitive Bidding
NGO	=	Nongovernmental Organization
NOx	=	Nitride Oxides
PIU	=	Project Implementation Unit
SO2	=	Sulphur Dioxide

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ESTONIA
DISTRICT HEATING REHABILITATION PROJECT
IMPLEMENTATION COMPLETION REPORT

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Map No. IBRD 28038 - Map of Estonia

Project ID: P008400	*Project Name:* District Heating Rehabilitation Project
Team Leader: Carolyn Gochenour	*TL Unit:* ECSEG
ICR Type: Core ICR	*Report Date: June 23, 2000*

1. Project Data

Name: District Heating Rehabilitation Project

L/C/TF Number: CPL-37400; SCL-3740A; SCPM-3740S; COFN-03280

Country/Department: ESTONIA

Region: Europe and Central Asia Region

Sector/subsector: PY - Other Power & Energy Conversion

KEY DATES

			Original	*Revised/Actual*
PCD:	01/15/93	*Effective:*	10/31/94	10/31/94
Appraisal:	01/27/94	*MTR:*	05/29/96	05/29/96
Approval:	05/26/94	*Closing:*	12/31/99	12/31/99

Borrower/Implementing Agency: Republic of Estonia/Ministry of Economy, Eesti Energia, Tallinn, Tartu and Parnu Municipalities

Other Partners: European Investment Bank, Governments of Sweden, Finland and Denmark

STAFF	Current	At Appraisal
Vice President:	Johannes F. Linn	Wilfred Thalwitz
Country Manager:	Basil G. Kavalsky	Basil G. Kavalsky
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Team Leader at ICR:	Carolyn Gochenour	Carolyn Gochenour
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2. Principal Performance Ratings

(HS=Highly Satisfactory, S=Satisfactory, U=Unsatisfactory, HL=Highly Likely, L=Likely, UN=Unlikely, HUN=Highly Unlikely, HU=Highly Unsatisfactory, H=High, SU=Substantial, M=Modest, N=Negligible)

Outcome: S

Sustainability: L

Institutional Development Impact: H

Bank Performance: S

Borrower Performance: S

	QAG (if available)	ICR
Quality at Entry:		S
Project at Risk at Any Time:	Yes	

3. Assessment of Development Objective and Design, and of Quality at Entry

3.1 Original Objective:

The Project's objectives were to:

(a) ***reduce fuel costs and import requirements*** through efficiency improvements and by increasing the use of indigenous fuels in heat production, in compatibility with environmental and nature protection principles;

(b) ***bring about energy efficiency and economy in major district heating (DH) systems*** through rehabilitation and introduction of modern technologies and equipment;

(c) ***improve environmental conditions in affected areas*** by improving the efficiency of fuel use, facilitating the conversion or replacement of boilers from the use of heavy fuel oil and coal to peat and wood fuels, reducing wastage of water in DH systems, and promoting the environmentally sound use of peat and wood as DH fuels; and

(d) ***support the strengthening and restructuring of DH institutions, facilitate their eventual privatization, and help develop the energy sector*** through consultancy and advisory services, training and provision of equipment and software.

The project's objectives were clearly defined and in line with the Government's energy sector policy and strategy which had been prepared during project preparation and in close cooperation with the Bank. Indeed, various energy sector studies, executed in preparation of the Project, were helpful to chart the course for energy sector reform and restructuring. The Government's Statement of Energy Policy and Strategy, in line with the Government's overall economic reform program of market liberalization and increasing participation of the private sector, suggested that significant structural reform as well as investments were needed in the sector. The Policy Statement also emphasized that the Government would retain, at least in the medium term, full ownership of certain key facilities (oil shale and oil-shale based electricity generation) considered strategic, and which might only be privatized later. The emphasis on rehabilitation/modernization of existing facilities and diversification of the primary fuel base to reduce the need for costly imports of fuel oil, coal and gas, logically singled out the heating sector as the highest priority focus for support by international donors, as the power sector was based on locally-mined oil shale. The supply of oil and gas from Russia had been interrupted in the early 1990's at occasions, and the heating supply during the cold winter of 1992/93 was unsatisfactory as a result. Thus, the Government had a strong interest to increase security of supply by diversifying more into alternative, local fuels. This further explains the strong focus of the Project on DH.

A Country Assistance Strategy (CAS) (Report 13539-EE), prepared almost simultaneously with the project appraisal, also emphasized the Government's priority with regard to energy sector restructuring. It further underlined the need for institutional reform, decentralization of certain energy sector functions to municipalities and their eventual privatization, in line with the Government's energy sector policy and strategy. The Project further responded to the more general CAS objective of "ensuring that infrastructure services are efficient and facilitate a supply response." In 1993, the Government decided to transfer ownership of DH facilities and related obligations and responsibilities to the municipalities. Inexperienced municipalities had difficulties to operate their DH systems efficiently. The Project, with its institutional

and investment components, therefore was designed to help the major cities of Estonia as well as smaller communities to familiarize themselves with the economics and operations of DH systems and to improve efficiency and environmental compliance.

Last but not least, the project's objectives emphasized the need for environmental sustainability of the DH sector, again in line with the Government's sector strategy and the CAS objectives. Thus, the Project was designed to assist the municipalities and facility operators to address the major air pollution issues which were imminent in the inherited systems, and to provide the needed investments for reducing air pollution to below acceptable limits under the emerging environmental legislation of the country. The National Environmental Action Plan (NEAP) and the Environmental Policy Statement of Estonia, issued in 1997, and having already in mind the intended European Union (EU) accession, emphasized among its 10 key priorities the reduction of negative environmental effects from the energy sector and the improvement in air quality, which were among the key objectives of the Project.

3.2 Revised Objective:

The original project objectives were maintained throughout project implementation.

3.3 Original Components:

The Project comprised: (a) one component of small boiler conversions and replacements in small municipalities throughout Estonia (Part A), (b) three DH rehabilitation components (in Tallinn (Part B1), Tartu (Part B2), and Parnu (Part B3)), (c) improvement of an existing combined-heat-and-power (CHP) plant at Iru/Tallinn (Part C), and one institutional support program for project agencies, providing consulting and advisory services, training and equipment and software for these institutions (Part D).

The original investment allocation was as follows: Small Boiler Conversion/Replacement Program: US$ 12.8 million; Tallinn DH Rehabilitation: US$ 22.5 million; Tartu DH Rehabilitation US$14.3 million; Parnu DH Rehabilitation: US$5.0 million; Iru CHP Plant Improvement: US$ 5.8 million; and Institutional Support Program: US$ 4.1 million, yielding a total project cost of US$ 64.5 million. Of this amount, the World Bank was to finance US$ 38.4 million, allocating its funds to support components A, B1, B2, C and D.

The remaining investment requirements were to be financed by the European Investment Bank (EIB) (US$ 4.4 million equivalent) for component B3 and additions to B1; the Swedish Government (BITS, later changed to Sida) (US$ 10 million) to co-finance components (A and B2); other donors (US$ 3.8 million) for component (D); and the project agencies (US$ 7.9 million) for the remaining portions of their respective components. Interest during construction and incremental working capital requirements were also to be provided by the project agencies. The investments under the Project complemented already ongoing investments funded with support from EBRD, G24, bilateral agencies (e.g. Government of Denmark, Swedish NUTEK) and local sources.

A policy component, which would have acted like a sector adjustment loan (see the Poland Heat Supply Restructuring Project, for an example), was not included and was probably not necessary, as the size of Estonia and the importance of the District Heating Rehabilitation Project gave the Bank's supervision staff regular access to the Government during the entire duration of project preparation and implementation. Government sector policy in the DH sector had become largely sound as a result of project preparation and intensive discussion of Government policies and strategy during that period. The Energy Policy and Strategy Statement of the Government was largely adhered to during project implementation. Moreover,

the institutional support component included technical assistance for developing a legal and regulatory framework for the energy sector. The sound preparatory work of the Government supported through technical assistance during the project period culminated in a new, market-oriented legal framework for the energy sector in 1997 and approved by Parliament in 1998. The EU, in its efforts to support Estonia in reaching the requirements under the acquis communautaire, also provided technical support and some funding to help bring about the energy reforms. Moreover, the EU assisted in helping the country move in line with EU environmental directives and regulations.

3.4 Revised Components:

No major revision of project components was undertaken.

However, within the small boiler conversion/replacement component, the emphasis on conversions was reduced. The size of the boiler replacement component was maintained, whereas the size of the boiler conversion was scaled down to about 25% of the original estimate. The main reasons for this change was: (a) large efforts were made to convert boilers not only by the World Bank and Sida but also with funds from the EU, Swedish NUTEK, EBRD, and others, which created a competition with the best projects going first; (b) in many cases, the sizes of existing oil-fired boilers were simply too large when heat demand decreased, so the efficiency of a boiler after conversion would not be adequate; (c) the costs of conversions turned out almost as high as replacements in most cases; (d) in some sub-projects, municipalities went ahead with own financing; and (e) in some cases, the source of fuel could not be ascertained, the commitment of the municipality was insufficient or the overall project was not feasible.

In the case of the Iru CHP Plant component, during implementation the smoke stack of the plant started to deteriorate and needed replacement because of the low capacity utilization and intermittent use of the boilers in Iru which caused the surphur in the flue gases to condense on the inner surface of the mantle of the stack. Funding in the amount of US$ 2.9 million for this additional item was obtained from the Bank Loan through reallocation of funds from the small boiler conversion program, which was scaled down, and the Tallinn component, since EIB was providing additional funding for Tallinn (amendment of November 5, 1996).

In the case of the Tallinn DH rehabilitation component, a separate Project Agreement between the newly established joint-stock company AS Tallinna Soojus, formed by merging the network and distribution companies, and the Bank was signed on November 25, 1998, to allow completion of that sub-component directly with the new company.

In the case of the Parnu DH rehabilitation component, two boilers, originally envisaged for conversion, were completely replaced, as a result of bid prices for conversion and replacement not differing significantly.

3.5 Quality at Entry:

There was no quality-at-entry-review undertaken for this Project, which had been prepared in 1993. However, the Project could build on a number of energy sector and sound feasibility studies of the individual project components funded by bilateral sources (Denmark, Finland, Sweden) and undertaken under the guidance of World Bank staff. Moreover, there were a number of investment projects under early implementation in Estonia at the time of appraisal funded with support of EBRD and other multilateral and bilateral sources, early lessons of which were taken into account. Last but not least, the Project benefited significantly from the experience made during implementation of earlier DH projects in the Eastern and

Central Asia Region, and notably the major Heat Supply Restructuring Project in Poland (Project Number P008576). In particular, early lessons of implementation, time requirements, organizational arrangements and unit costs for network rehabilitation could be applied in this Project.

At the time of project preparation and appraisal, the DH sector in Estonia, like in many other former centrally-planned economies, was characterized by high inefficiencies in its systems layouts and operations, high costs, with primary energy inputs (other than oil shale), i.e., gas and fuel-oil, rapidly moving towards world market pricing, and with high levels of water losses, as well as air pollution. In the Soviet period, heat tariffs had been extremely low. When fuel inputs (mostly gas and oil, but also some coal) started to be sold at world market prices in the early 1990's, the Estonian Government made valiant efforts to raise tariffs to recover rising costs. But consumers, whose incomes did not rise at the same pace, had increasing difficulties to pay and, in extreme circumstances, ceased to pay altogether, which increased receivables of the DH companies significantly. This, compounded by the fact that further needed increases of heat tariffs started to meet political opposition, led to a deteriorating financial situation of some DH companies. For a while, only industrial customer tariffs were increased, which led to increasing cross-subsidization of residential customers and caused some industries to abandon the DH system, producing heat from alternative sources. Thus, remedial action was only possible through major rehabilitation, while simultaneously assisting the municipalities to help raise tariffs to cost recovering levels for all customers of modernized facilities. In this context, special measures for social assistance had been put in place already in Estonia prior to the Project to provide assistance to heat customers near or below the poverty level.

Small Boiler Conversion/Replacement Component: This component was prepared by Estonian agencies with the assistance of Danish consultants. It was designed to address the problem of many small municipalities, which had highly polluting oil- or coal-fired boiler facilities that were too inefficient under the new market-oriented economy. The use of local fuels, such as peat, wood, wood chips, bark and saw dust, had been shown to reduce operating costs of the converted or rebuilt facilities significantly. At the time of appraisal, many communities had submitted sound proposals for conversion to local fuels, or even complete replacement, of existing boilers. An assessment of the feasibility of many of these projects showed interestingly high returns. The quality of entry of this components is considered therefore as "Satisfactory."

Tallinn, Tartu and Parnu District Heat Rehabilitation Components: Based on their respective feasibility studies, sound investment components forecast the rapid improvement of performance after implementation. The studies were carried out by internationally-renowned consultants and formed a good basis for appraisal. However, in all studies, demand forecasts were overly-optimistic in their assumptions that demand for heat would grow again from the low point of the 1992/93 winter. The studies failed to consider the impact of growing tariffs on demand. The Bank team, in close cooperation with the project agencies, revised these optimistic growth scenarios significantly downwards. On the other hand, assumptions regarding estimated implementation time and costs, as well as projected efficiency gains and environmental performance were largely realistic. The familiarity of the Bank team with ongoing investments in the country's DH sector and similar projects elsewhere further facilitated appraisal and allowed for some correction of the studies' short-comings. The quality of entry of these components is rated "Satisfactory."

Iru CHP Plant Improvement Component: This was a plant which had been built during the period 1978-89, but was not being utilized at its full capacity as it could not compete with the lower-cost, oil shale power plants in Northeast Estonia, due to lags in adjusting oil shale prices to full cost recovery levels. However, it was expected that the utilization of Iru would increase in the near future and that it would be a lower cost source of heat for Tallinn than the existing heat-only-boilers (HOBs). The project preparation

efforts included a study of alternative plant improvements designed to improve plant efficiency, using different scenarios of fuel, heat and electricity costs. The selected alternative focused mainly on improvements of the heat-only equipment, as domestic and export demand for electricity over the next 5-7 years was expected to be met from production from the power stations in Northeast Estonia. The selected alternative was realistic and fit into the focus of the Project. The quality of entry of this component is considered "Highly Satisfactory."

Institutional Support Component: This component was designed to provide training in project management, efficiency improvements and environmental management as well as consulting services for effective DH management and operations systems, including financial management, company restructuring as well as procurement and disbursement. It also included a component for the development of a legal and regulatory framework needed under the market based, privately-oriented sector. The component, together with project investments, would help to prepare the DH companies for privatization through improvement of assets, operations and management systems. Funding for the component was to come largely from bilateral sources, including the EU, Denmark, Finland, Sweden and the DH companies' own funds. The quality of entry of this component is considered "Satisfactory."

4. Achievement of Objective and Outputs

4.1 Outcome/achievement of objective:

The overall achievements of the project objectives are judged to be "Satisfactory" and better. The Project has substantially met the original objectives to: (a) reduce fuel costs and import requirements; (b) increase energy efficiency; (c) improve environmental conditions in affected areas; and (d) restructure and strengthen the DH companies, to facilitate their eventual privatization.

Reduction in Fuel Costs and Import Requirements: This Project has made excellent progress in the reduction of fuel costs during the period of implementation, which is highly likely to be sustained over the life of the investments.

Fuel substitution (biomass and peat for oil and gas) in order to reduce fuel costs and increase security of heat supplies was one of the key objectives of the small boiler component, as well as the Tartu and Parnu DH rehabilitation components. During 1999, the savings from use of local fuels instead of imported fuels were calculated at about EEK 20 million (over US$ 1.4 million) for the small boiler program. This number is likely to be significantly higher in 2000 at about EEK 25 million (over US$ 1.7 million), as 1999 had unusually low oil prices. If the Tartu DH system were operated as originally designed with the peat and wood-fired boilers used as base load, the fuel cost savings of over EEK 10 million (US$ 0.7 million) in 1999 could be increased to about EEK 20 million (US$ 1.4 million) or more, as the converted boilers are being utilized at only about one half of their intended capacity. In Parnu, fuel cost savings of over EEK 4 million (US$ 0.3 million) achieved in 1997 will be achievable again in 2000 under the presently prevailing oil prices.

These savings have had a direct impact on the balance of payments situation of the country. The share of local, renewable energy in Estonia's heating sector is reported to have increased from 3.5% in 1993 to 11% in 1998. The Project has greatly contributed to this development. Reduction of fuel costs further resulted from energy efficiency improvements discussed below. These reductions also have had a direct impact on the balance of payments situation and are estimated to have even exceeded the savings from fuel substitution.

Energy Efficiency Increases: The Project has made efficiency gains in the areas of heat production, transmission, distribution and consumption. In the production process, the specific fuel consumption has been reduced by an estimated 5% to 10%, on average. The renovation of the transmission and distribution networks and installation of variable speed pumps has led to significant energy savings, again estimated in the order of up to 10% heat and pumping losses. Very dramatic reductions in water losses have also been achieved through the switch from direct to indirect domestic hot water connections, amounting to a decrease of over 85% in Tallinn, of almost 90% in Tartu and over 90% in Parnu. The heat consumption in buildings equipped with renovated substations has been estimated to have been reduced by about 24%, on average.

Environmental Improvements: This Project has been remarkable in reducing local air pollution, as well as emissions of greenhouse gases (CO_2) harmful in the context of climate change. The following table illustrates the reductions of emissions during the project implementation period:

Emissions Reduction 1993-1999

	Unit	SO2	NOx	Dust	CO2	CO	Ash/Slugs
Iru CHP	t	-1,432	-686	-10	12,012	n.a.	n.a.
Tallinn DH System	t	3,501	297	11	509,250	n.a.	n.a.
Tartu DH System	t	n.a.	n.a.	n.a.	12,352	n.a.	n.a.
of which Ropka Boiler	t	34	99	16	n.a.	463	53
of which Luunja Boiler	t	286	187	15	n.a.	1,461	1,815
Parnu DH System	t	24	-31	257	n.a.	1,209	7
Small Boilers	t	696	134	2	46,393	n.a.	n.a.
Total	t	3,108	-1	291	580,007	3,133	1,875
Total without Iru CHP	t	4,540	685	301	567,995	3,133	1,875

The "negative reductions," i.e., increases of emissions at the Iru CHP Plant are due to the fact that the plant has produced about 3.5 times as much electricity in 1999 at 460 GWh as compared to the level of 108 GWh of 1993. However, CO_2 reduction at Iru CHP is positive, as the plant switched essentially from almost exclusive oil-firing in 1993 to a large proportion of gas-firing (45% in 1999). While the emissions from Iru have increased in Tallinn, the increased electricity production from gas at Iru has reduced the need for an equivalent amount of electricity production from the heavily polluting oil shale-fired condensing plants in Northeast Estonia.

The very positive performance in the Tallinn DH System is due to two effects: (a) heat production from the various boiler houses was reduced by about 20%, as generally demand declined in the city; and (b) the DH company also substituted gas for oil (gas representing almost 10% in 1993 increased to over 70% in 1999). In 2000, the performance will further improve when Iru CHP Plant will provide a greater share of heat produced in CHP-mode to the DH system, due to the completion during 1999 of the connection of the central and eastern DH networks.

In the Tartu and Parnu DH systems, the positive performance, with significant reductions, is largely due to the switch from oil and/or gas to peat and wood products (chips, bark, saw dust). However, in Tartu, the performance could be significantly better if the boilers converted under the Project to peat and wood-firing were operated as base-load boilers and the old gas-fired boilers were operated as peak-load boilers. In such case, CO_2 reductions could be increased to an estimated 33,000 tons (as compared to the 12,000 tons achieved in 1999). Certainly, the emissions' reductions have meant a major improvement already.

In the small boiler component, performance has been estimated for the 36 completed projects and is significant, in particular with regard to CO_2 reductions. The savings are likely to be considerably larger, as these projects have served as models which have by now been copied in many other small municipalities and villages.

Overall, the savings illustrate the significant improvement of the local environment as well as the contributions to mitigation of climate change.

Restructuring of the District Heating Companies:

Tallinn DH Company Restructuring: The restructuring of the two DH companies in the Tallinn involved their merger into one company, which took place as originally planned. On April 17, 1996, Tallinna Soojusvork, previously owned by Eesti Energia and including the DH networks and large boiler houses, was merged with Linnasoojus, owned by the Municipality and including the distribution networks and

small boiler houses, to become Joint-Stock Corporation AS Tallinna Soojus. The new company is wholly owned by Tallinn Municipality, in line with the Government's objectives for decentralizing DH activities to local authorities. The company has, with its own funds, undertaken improvements to its management and operations systems and reorganized its internal structure to one more consumer-oriented, in line with the new market economy. The merger has contributed to improving system efficiency, by allowing the better optimization of daily operations and investments and by the elimination of duplication of functions and personnel.

Iru CHP Plant: While an explicit plan for restructuring Iru CHP Plant was not included under the Project, various discussions and studies were undertaken as to whether Iru should remain with Eesti Energia or be merged with AS Tallinna Soojus. In the end, it was decided to retain Iru as part of the Eesti Energia, which was developing its plan for demonopolization and possible privatization. Up-to-now, Iru CHP Plant has remained as a cost center of Eesti Energia but is planned to be established as a separate daughter company (profit center) in the near future. Establishment of Iru as a separate profit center would allow for more transparency in its operations and pricing.

Parnu DH Company Restructuring: The DH Company was transferred to municipal ownership in October 1992. Under the Project, technical assistance and training has been provided for improvements in company management procedures and accounting systems. The company has improved efficiency by reducing its personnel from about 160 persons in 1994 to about 100 in 1999. The company has been particularly active in marketing and has obtained 40 new customers which has allowed heat demand to remain relatively stable during the project period. Part of Parnu's success in gaining new customers is due to the fact that gas networks have not been extended to the city. During 1999, a part of the Parnu DH system, which had been spun off from the main company AS Parnu Soojus already in 1992, was successfully privatized through a 100% sale to a Swedish investor. Parnu City Council has recently decided to privatize AS Parnu Soojus and has retained an investment bank to advise in the privatization. The privatization is expected to be completed during 2000.

Tartu DH Company Restructuring: In Tartu, as per discussions between the City, the Government and the Bank, the restructuring of the DH companies was initiated prior to project start-up. In 1994, the entire network was consolidated under ME Tartu Soojus, a 100%-municipality owned company, which would handle all customer relations, including contracts tariffs, metering and billing, and in 1995, all contracts with customers had been reviewed by city legal staff and legal advisors. Heat was produced in six separate production plants, of which five were fully-owned by the city and one partly-owned. The consolidation of networks was undertaken to facilitate flexibility in heat purchases and to allow Tartu to levy a uniform tariff for retail heat sales in the city. Consulting services were provided under the Project for a new management information and accounting system, which was linked to a new Chart of Accounts and a written Accounting Manual prepared by the Tartu management with local Coopers & Lybrand Staff.

Later in 1997, this organization was changed, and three enterprises were created: (a) AS Tartu Keskkatlamaja, including Ropka system, Turu central boiler house and Turu-Luunja network (later became Turu-Luunja-Ropka network); (b) AS Tamme Soojus, including the separate, small Tuglase, Aardla and Tulbi boiler houses with associated networks; and (c) AS Anne Soojus, including Luunja boiler house and Luunja Village and greenhouses network. AS Anne Soojus was a major producer of bulk heat for the Turu-Luunja network, the main network of the city. This organization led to difficulties to optimize the heat production, as the gas-fired Turu boilers were competing with the local-fuel Luunja boilers for base load. Under the current arrangements, with different owners of the heat sources in the Turu-Luunja-Ropka network and with dispatch controlled by Tartu Keskkatlamaja (one of the competitors to the local fuel boilers), it is unlikely that an optimal operation of the system can be achieved. The City of Tartu decided to combine the DH assets in the Turu-Luunja-Ropka network for privatization under one owner as the best

way to optimize the operation of the system. The Bank team supported this decision.

Since then, AS Tamme Soojus has been sold in 1999 to a French investor. Of the shares of AS Anne Soojus, 50% are municipal-owned, 30% are owned by Luunja County, and 20% were owned by Tartu Joujaam, a private enterprise. During 1999, these 20% of shares were sold to a Finnish DH company. The remaining parts of the DH system operated by AS Tartu Keskkatlamaja, comprising the main network, the Turu and Ropka boiler houses, and AS Anne Soojus are to be privatized to a single investor in summer 2000.

Outright privatization has become an ultimate target of the Government and the project municipalities during the end of the project period. The restructuring and institutional support provided under the Project have been helpful in preparing the DH companies for privatization. Both in Tartu and in Parnu, as mentioned above, parts of the DH systems have already been privatized and further privatization of these systems is scheduled for 2000. Tallinn is also preparing the way toward system privatization.

4.2 Outputs by components:

Component A: Small Boiler Conversion/Replacement (Estimated Cost at Appraisal: US$ 12.8 million; Actual Cost: US$ 7.4 million)

The small boiler program assisted small municipalities and villages throughout Estonia to improve the economics and security of their DH systems by helping them to convert or replace obsolete existing boilers, to allow firing of lower cost local peat- or wood-based fuels rather than expensive imported fuels (mainly oil and coal). Thus, the program was designed to complement the DH rehabilitation program for the three largest Estonian cities (Tallinn, Tartu, Parnu). The program envisaged to include funding for about 70 boilers with an aggregate capacity of 145 MW, drawing from the large pool of about 1,500 boilers throughout the country. Participation would focus on publicly-owned (municipal/state) rather than privately-owned boilers. About 60% of the funding was earmarked for boiler conversion, with boiler sizes up to about 10 MW, and the remaining 40% for replacement of boilers (with a capacity of 0.5 to 3 MW). Municipalities had to show a strong commitment to their projects and had to submit firm plans regarding supply and costs of local fuels.

The component was organized almost like a credit-line for small boiler conversion/replacement, with the State Energy Department of the Ministry of Economy acting to obtain consulting services for the evaluation of the feasibility studies needed for an assessment of projects, and the Ministry of Finance providing for loan funds from the Project to be made available. Danish technical assistance was supporting the Ministry of Economy in its decision-making process and helped prepare technical specifications and tender documents for procurement according to World Bank guidelines. The component was advertised throughout Estonia, and municipalities were encouraged to submit project proposals. In October 1993, a first batch of 40 proposals was received and 34 projects were selected for detailed feasibility studies. By June 1994, 15 of the initial batch of projects were approved in Estonia and were endorsed by the World Bank in July 1994 for proceeding towards implementation. In the meantime, another batch of over 30 projects had been submitted by other municipalities. By mid-1995, almost 100 projects had already been registered, with feasibility studies completed or in hand, estimated to cost a total of over EEK 150 million (US$ 12.5 million), with almost 30 having been found feasible and about 15 being implemented or prepared for implementation, amounting to EEK 17 million (US$1.4 million). Thus, the process had a good start. In the cases of the less economic small boiler projects, had grants been available to help "monetize" resulting CO_2 reductions and local pollution reduction, some further projects might have

become economically viable as well.

Procurement for the Sida and Bank-funded component was handled centrally. Initially, bidders complained about the costs of preparing detailed tenders, which turned out rather high, particularly in the case of boiler conversions. Thus, many projects originally designed as boiler conversions were subsequently changed to boiler replacements. The heavy procurement procedures were reported to add significantly to the costs of relatively small components. Not surprising, some municipalities, with their positive feasibility study in hand, decided to obtain local financing on their own rather than to wait for the subsequent process. The procurement procedure was therefore simplified in consultation with the Bank The issue was also addressed by the team of the Ministry of Economy, by engaging in visits to the project sites prior to committing to the feasibility studies. It was also found early during implementation that many municipalities were already carrying out boiler conversions on their own, and that there was a much larger scope for boiler replacement than originally thought. In late 1995 and early 1996 the Bank agreed to the request of the Ministry of Economy to reduce the size of the conversion part of the component, as they felt the progress with regard to boiler conversion was too slow and, in any case, economically questionable. The component for boiler replacements was, however, left at its original level and proceeded well.

By end-1999, the component had supported implementation of 11 projects for conversion of boilers with a cost of US$ 1.8 million and 25 projects for replacement of boilers with a cost of $ 5.6 million. By the conclusion of the loan, the 36 projects had been completed successfully and were operational. The municipalities involved have greatly appreciated the investments, which have been very beneficial in terms of cost reductions and environmental improvements. Moreover, the increase of fuel oil prices in late 1999/early 2000 has significantly improved the economics of the small boiler conversion/replacement projects. Today, the component is considered better than "Satisfactory."

Component B: District Heating Rehabilitation in Tallinn, Tartu and Parnu

The DH rehabilitation component comprised sub-components in Tallinn, Tartu and Parnu, the three largest cities in Estonia. The components were designed to "enhance network life, improve systems operation, produce savings in the use of fuels and improve environmental performance." This was to be achieved by: (a) boiler conversion or replacement (partly), (b) replacement or modernization of substations, including heat meters, (c) replacement of obsolete parts of the network, including installation of preinsulated pipes, modern valves, variable speed pumps and pressure and flow control systems, (d) improvement of the water treatment systems, as well as (e) technical assistance to design system improvements and supervise their implementation. Generally, implementation of the sub-components and resulting outputs were satisfactory, with some mixed performance.

Component B1: Tallinn DH Rehabilitation (Estimated Cost at Appraisal: US$ 22.5 million; Actual Cost: US$ 20.4 million)

The Tallinn DH system comprised three major networks with five large boiler houses and the Iru CHP Plant, belonging to Eesti Energia, the national power company. At the time of appraisal, the system consisted of 12 hot-water boilers, with a capacity of 100 MW and 4 steam boilers, with a capacity of 8 tons each, basically gas- or fuel-oil fired, three large, separate networks comprising 444 km of pipes and 50 km of local heat networks, substations and water treatment systems.

The key objectives of the component were fuel cost reductions through improved energy efficiency to be achieved by: (a) installation of boiler controls and O_2 analyzers, (b) improvements in consumer installations through introduction of modern large and small substations, including heat meters, variable speed pumps, as well as controls; (c) connection of the eastern and central networks to allow for Iru CHP Plant to flexibly supply the central network with heat as well; (d) rehabilitation and replacement of corroded pipelines, improvement of ventilation and drainage of ducts, and improvement of water treatment; and (e) reduction of water leakages through replacement of corroded pipelines. Concomitant reduction of air emissions to meet environmental standards were also among the key objectives. The completion of this component was achieved in December 1999.

The substation improvement was the largest investment component estimated to cost almost US$ 14 million, equivalent to about 60% of the total cost of the component. Due to the lower cost of substations than estimated at appraisal, it was possible to implement a larger number of substations and also to extend them to other parts of the city than originally planned. This sub-component was successfully completed during 1998 and has greatly contributed to improved efficiency of the system, to reduction of water losses and to savings at the building level through more accurate control of heat.

The component for *boiler controls* and the *network improvements* of about 10 km (out of a total network of 490 km) further helped to improve system efficiency. The water consumption of 160.9 m3/h in 1990/91 had been reduced to a level of about 100 m3/h at the time of appraisal, largely due to the declining demand for heat, but also through early systems improvements funded by the company and EBRD. Due to the investments under the Project, and notably the change of the system to a partially closed system, and also due to network repairs and pipe replacements, make-up water requirements were reduced further to a level of 14.2 m3/h in 1998/99. Thus, water consumption has declined to less than 15% since appraisal, and even less than 9% since 1990/91.

The connection of the eastern and central networks now allows the DH company a much greater flexibility to either purchase heat from Iru CHP Plant or to produce it in its own boilers. Prior to completion of the network connection, bulk heat was purchased from Iru to serve the eastern network at a higher bulk tariff than the DH Company's own heat production costs. After completion, bulk heat can be purchased not only for the eastern network but also for the central network serving the city center. The bulk heat tariff for the incremental purchases from Iru to serve the central network has been lowered by 13% for 2000. Given the improvements in the central control of the system and also in the management information system, the company can now better optimize its operations.

Given the efficiency improvements, reduction of water losses and environmental improvements, overall the component is judged "Highly Satisfactory." The component has been considered an excellent demonstration project which has been visited by many DH companies from Russia, Ukraine, Lithuania, Bulgaria and other countries.

Component B2: Tartu DH Rehabilitation (Estimated Cost at Appraisal: US$ 14.3 million; Actual Cost: US$ 13.7 million)

The Tartu DH system in 1993 comprised one major network and five smaller network islands, with six large boiler houses with a total capacity of 500 MW, fired by oil or gas (among them Turu, Luunja and Ropka Boiler Houses, covering 82% of total capacity). In addition, there were 27 small boiler houses fired by coal, oil and/or gas, DH networks comprising about 85 km of pipes, substations and water treatment

systems.

This project component included: (a) installation of new or rebuilt substations, regulators and heat meters; (b) modernization of the network through installation of new pipe and a pipeline connection between Ropka and the main DH network, Turu-Luunja; (c) improvements to water treatment facilities at several boiler plants; and (d) conversion from gas or oil-firing to local fuels (peat or wood) of five boilers (two at Luunja and three at Ropka) to achieve almost 50% of fuel substitution in the system. Funding for earlier rehabilitation of substations was provided from EBRD. The investment components were essentially completed by May 1998, with the exception of the pipeline connection.

The installation of substations had to await the completion of the first batch of 228 substations funded under an EBRD loan. Originally 640 substations were to be replaced. By end-1999, 564 substations were completed, including the 228 funded by EBRD, 202 funded by Sida, 96 funded by consumers and 38 funded by the DH Company, with 44 substations remaining to be rebuilt in the Ropka area. These remaining substations in the Ropka area should be rebuilt in order to allow the full utilization of the connection pipeline between Ropka and Turu/Luunja networks.

Modernization of the network was achieved through: (a) installation of 6.6 km of modern preinsulated pipe, including joints, fitting and valves, and 0.6 km of steel pipe, insulated during installation, representing about 92% of the appraisal estimate of 7.8 km of pipes; and (b) installation of about 3 km of additional new pipes funded by Tartu DH Company. It is estimated that the life of the network has been extended by about 10 years as compared to the pre-project status, in part due to the modernization and in part due to the improved water quality.

Water losses have been reduced significantly due to the project investments. Due to the investments to introduce indirect domestic hot water utilization in areas where domestic hot water had previously been taken directly from the DH networks, completed in July 1996, make-up water requirements for this reason were reduced from 560,000 m3 in 1992 to zero in 1997 and thereafter. Due to the savings resulting from further investments in network leaks, a further reduction of make-up water was achieved from 740,000 m3 in 1992 to 134,000 m3 in 1999. Thus, total water consumption has declined by almost 90% between 1992 and 1999. Moreover, investments in water treatment facilities at several boiler houses has further helped to extend the life of the network through reduction of corrosion.

The boiler conversion component originally foresaw conversion of five boilers in the Luunja and Ropka boiler plant, but was reduced to four boilers with roughly the same capacity, essentially due to high bid prices. The contracts for the conversions were already concluded in September 1994 (i.e., four months after Board presentation) and were basically completed in autumn 1995 with satisfactory performance tests run in late 1995 and early 1996.

The conversions, complete with solid fuel storage and handling systems, installation of fluidized bed technology (requiring a "de-rating" of boilers from 40 MW to 18 MW capacity), and related ash-removal and cooling systems, allowed to burn sod peat or milled peat, wood chips, saw dust or bark in the converted facilities. This, together with use of wood or peat-based fuel use in some of the smaller boilers of Tartu, helped replace the equivalent of about 27 million m3 of gas or 24,000 tons of oil, leading to savings at present prices of about US$ 0.75 million per year. Of the total fuel input of 530 GWh in Tartu during 1999, 48% has been in the form of peat and wood-based fuels, thereby meeting the appraisal estimate, which envisaged slightly less than 50% of total fuel input in the form of local fuels, as compared with zero peat and wood fuel use in 1993. Initially peat represented about half the local fuel consumption during 1996 and 1997 but by 1999 it represented only about 20% with wood-based fuels representing the larger

portion. Unfortunately, the local fuel boilers are now being utilized at only about 50-60% of their available capacity and could still contribute to a greater extent to fuel cost and environmental savings.

The converted boilers and indeed the entire Tartu DH system faced a serious threat during late 1995 and 1996 when Tartu Gas started an offensive to maintain its gas market. Municipal decision makers and City Council were led to believe that the conversions were not feasible and sustainable and that the project's viability has been "rigged" to "appear economic." At the same time, DH consumers were being lured to disconnect from DH and utilize gas in individual boilers. As the City Council believed that the economics of the boiler conversions were below expectations, "no investments in further DH rehabilitation would be permitted, until updated economic calculations demonstrated the viability of the investments." Indeed, the Bank staff were accused of deliberately providing a misleading, overly-optimistic assessment of economic viability, and a full assessment was requested, which was provided during a May 1996 mid-term review. The renewed demonstration of the soundness of the Tartu investments coupled with a change in the City administration after 1996 Fall elections allowed continued implementation of the component, although now with a significant delay. The pipeline connection that was to allow the lower cost base-load heat from Ropka to replace heat produced in the old gas-fired Turu boilers was dropped. The City decided later in 1998 to undertake, with its own funds, that connection, which was not completed until October 1999.

Today, all concerned officials in the central and local government as well as in the Tartu DH companies agree that the project investments are economically sound and well justified, but that present operating conditions are not adequate for sustainability, as the different parties have not yet agreed on a sound course of action. The solution would include: (a) acknowledging that the old gas-fired Turu boiler house should be operated as a peak load installation and the converted boilers as base load; (b) improving the heat tariff policies to allow for more transparent pricing through the separation of production, transmission and distribution and introduction of two-tier tariffs with fixed and variable components; and (c) improving the financial and operational information to allow for decisions to be based on rational criteria.

Overall the Tartu District Heating Rehabilitation Component is judged "Satisfactory" in its final outcome, but was considered "Unsatisfactory" during several years. As an example of the seriousness of the matter at the time, the Estonian Parliament pronounced in 1997 that the city of Tartu behaved irresponsibly, suggesting that its assets were not used effectively.

Component B3: Parnu DH Rehabilitation (Estimated Cost: US$ 5 million at Appraisal; Actual Cost: US$ 5.5 million)

The Parnu System consisted of 9 larger and 14 small boilers and 40 km of network. The investment component comprised: (a) conversion from fuel-oil firing to local fuels (peat or wood) of two boilers to achieve almost 60% of energy substitution in the system and fuel cost reductions, (b) installation of substations, regulators and heat meters; (c) modernization of the network through installation of modern preinsulated pipe, variable speed pumps and complete monitoring and control system; and (d) improvement of water treatment facilities at several boiler plants. Funding for earlier rehabilitation of substations was provided by EBRD. The investments were completed largely in 1997.

The conversion of two boilers originally envisaged in the feasibility study and appraisal report was abandoned in favor of *complete boiler replacement.* The fact that the offered cost of replacing the boilers was about the same as the estimated cost for conversion allowed the City to decide in favor of new boilers. The cost of the conversions was high because they were technically more difficult in the confines of the limited space of the existing boiler house. The new boilers have a capacity of 7.5 MW each and were

commissioned in March and April/May 1996, respectively. The boilers have been in continuous operation ever since.

Through the predominant use of wood, wood chips, peat and peat briquettes, the oil consumption by Parnu DH company has come down continuously from 100% in 1992 to about 51% in 1997, then has crept up to 57% in 1999. This is above the proposed target which foresaw an oil use of about 42% by 1999. The key reasons for a lower than forecast peat and wood utilization were the relatively low oil prices in 1998 and 1999 and some difficulties of Parnu DH company to secure the needed quantities of peat and wood on a regular and sustained basis. However, the difficulties in securing local fuels have now been resolved, as there is keen competition in the local fuels market. As oil prices have strongly recovered since the latter part of 1999, the DH Company now plans to further increase the use of wood and peat-based fuels and to expand the storage facility constructed under the Project by another 1,200 m3 of new capacity. Estimated savings of the fuel substitution in 1999 amounted to about EEK 2.1 million (US$ 0.15 million), but had already been as high as about EEK 4.3 million (US$ 0.31 million) in 1997.

The DH Company has also invested in the shutdown of small boilers and connection of these areas to the DH network, with only 7 small boiler houses remaining in 1997.

The installation of substations was successfully implemented with a total of 222 new units installed and equipped with new controls and heat meters as compared to 200 originally planned. All units were connected to a new central monitoring and control system. Compared to the original simplified design, more components were installed, on average, per substation than originally envisaged. By 1999, the DH system comprised 293 substations (all modernized), with 45 funded by EBRD, 222 by EIB and the rest by owners. The centralized management of these substations allows an optimal running of the network and quick adaptation to temperature changes.

Modernization of the network: Under the project, about 4.5 km were rebuilt by using preinsulated pipes, including a river crossing. This represents only 11% of the total network but is critical to its continued life. It is estimated that this investment, together with the installation of over 150 network ball valves and network variable speed pumps, has reduced maintenance in the network, decreased heat and water losses, as well as extended the network's life by 10 years.

Water losses have been reduced significantly due to the investments. Due to the savings resulting from network modernization and substation renovation as well as from introduction of indirect domestic hot water utilization, make-up water was reduced from about 8-10 m3/hour in 1991 to about 0.5 m3/hour in 1999, i.e., by over 90%. Thus, total water consumption has declined to a level of about 400 m3/month. Moreover, investment in water treatment facilities at several boiler houses has further helped to extend the life of the network through reduction of corrosion. The selected water treatment investments included reverse osmosis technology, for which the river water was not pure enough and therefore required pretreatment of the water, which was not originally envisaged. Whereas the investment was completed in 1996, the contractual dispute over the incompatibility of the equipment with the available water supply has been ongoing. In 2000, with the help of a Danish grant, equivalent to about US$ 1 million, the water component is to be completed with the installation of the water pretreatment equipment.

Overall the Parnu District Heating Rehabilitation Component is judged "Highly Satisfactory." The company referred to it as an "Optimal Project Scope" at the time of appraisal. The company has plans to build a renewable energy resource-based CHP plant to further improve efficiency.

Component C: Improvement of Iru/Tallinn CHP Plant (Estimated Cost at Appraisal: US $ 5 million; Actual Cost: US$ 8.7 million)

The key objective of the Iru CHP Plant component was to improve its performance and efficiency. The partial renovation of Iru CHP Plant consisted of: (a) renovation of an air preheater of the CHP blocks; (b) rehabilitation of instrumentation and control systems of boilers; (c) installation of modern water treatment equipment and provision of side stream filters of the DH water; and (d) supply and installation of variable speed pumps. A gas pipeline to the plant had been completed in 1993, and the plant was able to benefit from increased flexibility in fuel use. During implementation, it was recognized that the stack would require replacement, which was added to the project scope. The new stack has contributed to improvement of environmental conditions. Moreover, due to the improved draught of the new stack, a flue gas exhauster was no longer needed, resulting in power savings for the plant operations. The addition of stack is the main reason why the component cost increased. The component was completed and operational by end-1997.

The benefits from the implementation of the component are an improved reliability of the installed equipment, better efficiency of process control and automation, and savings obtained through a the decrease in maintenance costs and reduction of specific fuel consumption for heat and power production. The plant has also improved efficiency through reduction of personnel from 270 persons in 1993 to 230 presently.

A project component rating of "Satisfactory" was maintained throughout the supervision of the project, but the final outcome should be judged "Highly Satisfactory." Iru CHP Plant was particularly pleased with the renovation of the air preheater of block 2 under the Project and has subsequently used its own resources to undertake a similar renovation at the other block. Eesti Energia also expressed satisfaction with the learning which the international procurement process introduced under the project. Such a process is now routinely used by Eesti Energia.

Component D: Institutional Support Program for Project Agencies (Estimated Cost at Appraisal: US$ 3.6 million; Actual Cost: US$ 3.9 million)

The Institutional Support Program was designed to provide assistance to government ministries, municipalities, project DH companies and Iru CHP Plant, in the form of studies, implementation support, formal and on-the-job training, as well as technical assistance in procurement, project supervision and monitoring. The Estonian State Energy Department, reporting to the Ministry of Economy, received support in procurement and disbursement services, in developing feasibility studies for small boiler projects, and assistance in developing the legal and regulatory framework. The DH companies received substantial training, both on-the-job and through study tours of foreign DH companies. The municipalities received assistance in restructuring their DH operations and support in implementing recommendations for effective management and operations of the systems. This has greatly contributed to strengthening the companies operationally and financially and has helped to prepare them for privatization. This component is judged "Satisfactory" or better.

4.3 Net Present Value/Economic rate of return:

The Project has had significant economic benefits in all its components. The key benefits have been reduced fuel costs and import requirements, improved efficiency in DH systems and improvement of environmental conditions in the affected areas. The economic rates of return (ERRs) at appraisal did not consider environmental benefits. Thus, the weighted ERR for the Project amounted to 24.4% at appraisal as compared to 22.5% today, the difference being largely due to the relative deterioration of the terms of trade

between oil and renewables. However, when one considers environmental benefits, the weighted average ERR increases to 58.5%. The assumptions underlying the ERRs of project components as well as the weighted average ERRs for the total project, with and without environmental benefits, are elaborated in Annex 3.

Table 1: Summary Economic Rates of Return

Component	Appraisal	ICR	ICR
		Without environmental benefits	With environmental benefits
Small boiler conversion	29.2%	10.5%	20.5%
Small boiler replacement	9.8%	31.2%	45.6%
Tallinn DH rehabilitation	22.8%	24.0%	
Tartu DH rehabilitation	28.5%	27.9%	101.3%
Parnu DH rehabilitation	27.8%	12.1%	87.4%
Iru power plant improvement	18.1%	16.7%	
Weighted ERR	24.4%	22.5%	58.5%

Note: The environmental benefits have been estimated based on international cost emission benchmarks.

The project components have contributed to reducing energy imports thereby improving Estonia's trade balance. Through this Project and other efforts, the share of indigenous wood, wood chips and waste, and peat has increased from 3.5% in 1003 to 11% in 1998 of Estonia's primary energy resources.

Establishment of a market for wood fuel is having a positive impact on the economic situation and development of the Estonian forestry sector. Use of wood fuels in heating is an important market for wood and other tree biomass which is not required by the forestry industry, thereby improving the economy in the forestry sector.

Also, the small boiler program has contributed to the development of Estonian manufacturers of energy equipment and installation companies. Some of these companies are competing for and winning contracts under other similar DH rehabilitation projects in neighboring countries of the region.

The Project has further contributed to the creation of permanent jobs in rural areas related to the harvesting, transport and disposal of local fuels. It has been estimated that the local fuel harvesting and transport business has created 200 jobs supporting Tartu's local fuel consumption. When the jobs created for Parnu and other small municipalities are considered, a significant number of jobs have been created overall under the Project.

4.4 Financial rate of return:

A FRR calculation for this Project was not made at the time of appraisal; therefore an FRR was not calculated at completion.

Financial Performance of DH Companies: The financial performance of DH companies generally improved during the project period, with all companies showing profits on operations by the end of the Project, with the exception of several of the Tartu DH companies. As a result, all DH companies are repaying the loans from the World Bank, Sweden and EIB according to schedule, with the exception of Tartu where only a part of the World Bank loan has been repaid to the Ministry of Finance which has been repaying the loan out of its reserve funds. If the privatization of the DH system in Tartu is successful, the proceeds from the privatization are expected to be utilized to repay all loans in full, including the overdue amounts.

Loan Repayment Performance of Small Boiler Projects: The loan repayment performance of the 36 completed small boiler projects is relatively good, with 21 projects paid in full and on schedule as of end-June 1999, with the balance of 15 projects experiencing some delays. Three of the 15 projects (Muhu, Vonnu and Vana Antsla) are judged as problematic due mainly to the economic difficulties in these areas. The Ministry of Finance has been following up on repayments and it is expected that some cities will reschedule their loan repayments. Payment performance has been related to the general economic situation or budgetary problems and is not related to the performance of the small boiler projects.

Heat Tariffs: Heat tariffs increased during the early years of project implementation but have remained relatively stable during the latter years due largely to the efficiency gains achieved under the Project. In Tallinn, heat tariffs have not increased since July 1998 and have been EEK 349/MWh for both household and industrial consumers. Similarly, in Tartu, heat tariffs have not increased for the past three years and have been EEK 334/MWh for consumers without substation improvements and EEK 354/MWh for consumers with substation improvements. Furthermore, in Parnu, heat tariffs are now currently EEK 370/MWh for consumers without substation improvements and EEK 380/MWh for consumers with substation improvements. In all cities, cross-subsidies have been reduced, with industrial consumers paying the same tariffs as residential consumers. Of the 41 heating systems which are members of the Estonian District Heating Association where tariffs range from about EEK 250/MWh to EEK 430/MWh, Tartu's heat tariff has been ranked in the top 10 lowest heat tariffs in Estonia. Considering that the top 5 lowest tariffs are in heating systems based on oil shale-produced heat, Tartu's performance is judged very good. Tallinn and Parnu's performance in stabilizing heat tariffs is also judged very good.

4.5 Institutional development impact:

The Project has had a major impact on the DH sector throughout Estonia. Under the ***DH rehabilitation component***, the three major cities (Tallinn, Tartu and Parnu) received substantial investment support and technical assistance to help improve the competitiveness of their district heating enterprises with alternative heat sources and to improve their operations, management and financial situation. This has helped the cities and their enterprises to prepare for privatization, which is already well underway. In the case of Tallinn, ***the Iru CHP Plant improvement component*** helped to achieve more efficient heat and power production. Eesti Energy, the owner of Iru CHP Plant is also planning to introduce a profit center approach towards the Iru CHP plant to be able to have transparent financial data and allow for optimal utilization of the plant. Under ***the small boiler conversion and replacement component***, over one hundred cities received substantial technical assistance to prepare feasibility studies for project preparation and assessment. Whereas only 36 projects were executed under the Project, many other municipalities have been enabled by this action to attract funding to implement their projects as well. For the Government, this Project also has demonstrated the need for improved sector regulation. The Energy Law of June 29, 1999 reflected these lessons and introduced a regulatory framework in line with the EU acquis communautaire. Regulatory responsibility was transferred from the municipalities to an Energy Market Inspectorate by the Energy

Law. The ***institutional development component*** has been instrumental in bringing about these achievements by providing sector studies, assisting in implementation as well as by helping to improve the management procedures and information systems in many of the companies. In this regard, the Project could be judged "Highly Satisfactory."

5. Major Factors Affecting Implementation and Outcome

5.1 Factors outside the control of government or implementing agency:

Foreign Energy Supply: Shortly after renewed independence of Estonia in 1991, the imports of gas and oil from Russia in the winter of 1992/93 were curtailed or delayed a number of times. This caused much concern among the new Government and the population of Estonia and led to a strategy of energy resource diversification. Indeed, the strategy to rely more on indigenous resources, such as peat and wood, was reinforced at the time and led to the idea of conversion/replacement of DH boilers to accommodate these local fuels, which became a core objective of the Project. As this was, at the same time, a strategy which would help improve the economics of DH systems, reduce local pollution and even contribute to reducing greenhouse gas emissions, the Bank was keen to support this strategy, and was therefore also able to attract other donors to participate in the funding of the Project and related technical assistance (EIB, BITS/Sida, EU, Danish and other bilateral support). The policy of utilization of local fuels and diversification of fuel supplies continues today as a priority of the Government.

International Energy Prices: Estonia made great efforts immediately after its renewed independence, to bring energy prices, particularly those of imported fuels (oil, gas, coal), to international levels in the domestic market. This initially had a serious impact on the heating sector, where prices had been extremely low previously, and inefficiencies and waste had been rampant. As this affected the majority of the population, the country implemented social support schemes very early on. This helped dampen the effect of the international prices on the poor consumers and reduced the danger of rapidly accumulating arrears, which would have translated into huge receivables and possible eventual bankruptcy of the newly municipal-owned companies.

Nevertheless, passing through international fuel prices into DH tariffs also exposed the country to the gyrations of international fuel supply and demand. Thus, the huge drop in oil prices in 1998/99 had a significant impact on the operations of heat producers who had switched to local fuels. While many DH companies increased the use of oil during this period, one DH company, namely Parnu, significantly increased the use of oil again in non-replaced boilers at the expense of local fuels. The reversal of the international prices in late 1999, however, has already caused a switch back to the cheaper local fuels.

5.2 Factors generally subject to government control:

Regulation of Heat Tariffs: The Government had already in 1992 moved to passing the costs of primary energy imports (gas, oil, coal), which had reached prices near world market levels, through to customers in the form of heat tariff increases. In recognition of the resulting very high proportion of families' incomes to be spent on heating only, the Government also provided for a social support scheme, which supported the very poor and vulnerable groups in meeting their energy bills. However, in 1994, it became apparent to the municipalities, now in charge of pricing, that further increases would be necessary. The Project acknowledged that there was a risk of heat tariff increases not being implemented, and moreover, because of political and social considerations, tariffs covering residential heat might be kept too low and cross-subsidized by higher than justified industrial tariffs. Cross-subsidization of heat tariffs turned out to be the case in all major cities but had particularly severe consequences in Tartu which lost many industrial customers as a result, further precipitating the decline in demand.

Ensuring Fair Competition: There were clear indications during project implementation that the well organized, gas supply company was not going to stand by idly watching its market share erode due to conversion from gas to local or other fuels. Indeed, in Tallinn and especially in Tartu (Parnu is not connected to the gas supply), aggressive marketing schemes were put into place to attract customers away from DH. These proposals involved low-cost financing of gas connections and needed heating installations, as well as offers for low-cost gas supply contracts during a period of two years. In addition, during a substantial part of the project period, gas prices were not differentiated for large and small consumers or based on the actual costs of supply, which led to unfair competition of individual gas boilers with DH.

During most of the project implementation period, a country-wide regulatory framework was not in place, but rather regulation of DH was the responsibility of municipalities. It would have been in the interest of municipalities to develop heat master plans, designating areas of the municipalities in which either DH or gas would be maintained/developed, in order to protect the assets from being undermined by predatory pricing practices, but this did not take place.

Towards the end of the Project during 1999, a new country-wide regulator, the Energy Market Inspectorate, was established in accordance with the Energy Law. Certain officials have claimed that the Energy Market Inspectorate has not required DH enterprises to separate the costs of heat production, transmission and distribution to allow for greater transparency in tariff setting. Separation of such costs would be expected to more clearly demonstrate the benefits of utilizing the full capacity of Tartu's Luunja and Ropka boilers based on local fuels. A two-tier tariff which would make the fixed and variable costs transparent, and which was being advocated by the Bank staff, would further help to clear the situation, thereby allowing to find a viable solution for the overall system operation. It is recommended that the Energy Market Inspectorate be more proactive in deciding on how the competition between DH and gas should be regulated in Estonia, so that a long-term optimum can be achieved.

5.3 Factors generally subject to implementing agency control:

System Development and Operation: The problems in Tartu illustrate the need for the owners, i.e., municipalities, of DH systems to base their judgments on clear information about economic and financial performance, so that requirements for system development can be evaluated and justified and operations can be optimized over the entire system. The intense and emotional dispute which arose in Tartu over the use of local fuels in competition with gas led to a distortion of rational economics. The belated network connection in Tartu now clearly shows that this investment was an important prerogative for the competitive operation of the system. Basing judgments on economic information would help to demonstrate that the gas-fired boiler in Tartu should be run according to its best economic benefits, i.e. as a peak-load boiler which can be easily switched on and off as the outside temperature in winter would require, and not as the base-load boiler, since base load from boilers run on cheaper wood and peat fuels helps to reduce operating costs. A rational approach to systems operations would also lead to a reduction of personnel at the gas-fired boiler house and to introduction of an automatic call on the boiler depending on the changing heat demand of the system, which is now possible as a result of the project investments, with all the substations continuously monitoring demand and centralizing the information at the central controls.

Ensuring Sufficient Local Fuel Supplies: At the time of project appraisal, there was a risk that the level of local fuel supplies might not be sufficient to operate the boilers on a sustained basis. Whereas the consultant studies had indicated sufficient stands of forests and regular harvesting for sustainable supply of wood products, as well as sufficient peat supplies over periods far exceeding the project life, locally at a

given municipality, the supply might not be adequate. In order to minimize this risk, prior to project commencement, municipalities which planned to convert their boilers to use local fuels would be required to enter into contracts for supply of at least 60% of the local fuel requirements for two years. Indeed, under the small boiler conversion/replacement program, some communities were not able, initially, to provide such contractual arrangements. In those communities and large cities where two-year supply contracts were executed, this has proved to be a useful risk-reducing arrangement, as it has helped to build the market for local fuels, assuring suppliers and DH companies alike that the required investments on both sides would be utilized as planned. As a result, the market for the local fuels started to develop rather rapidly, with satisfactory regulatory arrangements by the forestry and environmental authorities to assure sustainable and environmentally acceptable exploitation arrangements for wood and peat. Very soon, keen competition came about and prices have remained relatively stable for these fuels, almost in line with the relatively stable prices for gas. Even for the relatively large cities of Tartu and Parnu, the supply of peat and wood has stabilized and is considered sustainable over the future life of the Project. In several markets of local fuels, waste products, formerly representing an environmental problem have been turned into a steady stream of competitive fuel supply (e.g. saw-dust, bark).

5.4 Costs and financing:

The total cost of the project was estimated at EEK 870.7 million, equivalent to US$ 64.5 million, at appraisal. A loan of US$38.4 million from the World Bank would cover 60% of the project costs, with the balance to be covered by a loan from Sweden in the amount of US$ 10.0 million, a loan from the EIB in the amount of US$ 4.4 million (ECU 5 million), grants from donors in the amount of US$ 3.8 million equivalent, and contributions from the participating project agencies in the amount of US$ 7.9 million.

The cost estimates and financing plan as estimated at appraisal and at project completion are included in Annex 2 "Project Costs and Financing." In the end, the final project cost and sources of financing differed only slightly from the original estimates. The final project cost was US$ 59.8 million or about 7% less than the original estimate. The key factors which had an impact on the costs as estimated at appraisal included the following: (a) the cost of consumer substation rehabilitation and heat meters proved to be considerably less expensive due to competitive bidding and the large quantities per package (US$ 10.9 million as compared to the estimate of US$ 17.7 million); (b) the size of the small boiler conversion/replacement program was significantly reduced (from US$ 12.8 million to US$ 7.4 million) due to reductions in the scope of the conversion program; and (c) the savings realized were utilized to finance the construction of a new stack at Iru CHP Plant and additional quantities of DH equipment included in the project description.

The key factors which resulted in differences in the final financing plan as compared to the original plan included the following: (a) the requirements for both the Bank and Swedish loans were reduced when the small boiler conversion program was scaled down; (b) the requirement for the Swedish loan was further reduced when the then Tartu city management decided to stop further investments in the DH system; and (c) EIB provided additional financing in the amount of about US$ 2.2 million for substation and heat metering investments under the Tallinn DH rehabilitation component which had been foreseen to be financed by the Bank. As a result, US$ 2.08 million equivalent of the Bank loan will be canceled shortly, with US$ 36.32 million equivalent disbursed. Similarly, US$ 3.38 million of the Swedish loan was canceled, with US$ 6.62 million disbursed.

6. Sustainability

6.1 Rationale for sustainability rating:

A continuous supply of local fuels, such as saw dust, bark, wood and wood chips as well as peat, is essential for the sustainability of the project components involving conversion to these fuels (Tartu, Parnu, small boilers in other municipalities). Adequate regulations in forestry management and by environmental authorities regulating peat extraction help to assure the required supplies of local fuels. Indeed, the growth of identified peat resources exceeds the growth of peat use. Similarly, the growing market in wood-based fuels has identified many sources previously considered as waste. Thus, there is further scope for local fuel-substitution, and a number of investors are currently considering to introduce small CHP installations based on renewable energy resources to further improve energy efficiency, while helping to reduce greenhouse gas emissions and thereby helping to mitigate against climate change.

Furthermore, the investments under the Project led to efficiency gains and cost savings which improved the financial viability of DH companies and improved their attractiveness for privatization, which is now underway. Improved efficiency and lowered costs have also led to the improved competitiveness of DH companies viz-a-viz alternative heating options (individual gas heating, oil heating), making them more attractive targets for privatization. Moreover, improvement of DH systems has helped to improve environmental performance, which in turn has assisted companies to meet environmental standards. This is not only important in the local context for improved living conditions but once again increases the chances for privatization.

In addition, consultant support, training and technical assistance for management system improvements helped DH companies to improve management, technical operations and general housekeeping, allowing companies to further reduce costs as a result of improvements in system optimization. The improved management systems have allowed a better understanding of companies' strengths and weakness. In turn, managers have started to address the weaknesses and build on their strengths.

Privatization of the DH companies is already under way. With a proper regulatory regime in place and the municipalities in process of withdrawing from ownership of the DH systems, the ground is being prepared for a competitive development of the heat market including newly-privatized DH companies as well as companies offering alternative heating options.

Regarding the special case of Tartu, if the political and emotional problems in the Tartu DH system are overcome, Tartu could perform well and reap the full benefits from the project components, which would help to make the DH system and companies sustainable. It is hoped that introduction of the proposed measures as well as the ongoing privatization will eventually lead to this situation.

Apart from the Tartu case, the Project would have been rated "Highly Satisfactory." However, given the still pending problems in Tartu, which are expected to be overcome shortly, the project's sustainability is rated "Satisfactory."

6.2 Transition arrangement to regular operations:

One can consider the corporatized companies to represent "regular operations," provided a sound regulatory framework, including a strong regulatory agency is in place. An important step in this direction was the early commercialization of DH companies and their transfer to municipal ownership in 1993. Corporatization and selected restructuring of DH companies took place during project implementation. A more advanced step, privatization, is already under way or being considered for DH companies in the larger cities. Iru CHP Plant is expected to remain under the ownership of Eesti Energia but is planned to be established as a separate daughter company (i.e. profit center) in the near future, allowing for a more transparent operation.

Whereas there is scope for further improvement of the Energy Market Inspectorate, as the case of Tartu illustrates, the fact that this independent agency can be called upon to address outstanding issues is a major improvement to the prior situation of regulation by the municipalities which is subject to local politics. Two-tier DH tariffs distinguishing between fixed and variable costs remains to be introduced to improve transparency of pricing in the sector.

The improvements to the "enabling environment," i.e., the development of a new legal framework for energy, including DH, the setting-up of a regulatory framework and agency for the sector, in parallel with project implementation and in part supported by it, have been milestones during the transition. After the sustained functioning of such a system for a number of years, Estonia may consider moving to a self-regulating system for DH, with oversight by public service commissions representing consumer interests, as is the case in a number of Scandinavian countries.

7. Bank and Borrower Performance

Bank

7.1 Lending:

The Bank team was well equipped with early experiences from the implementation of the DH project in Poland and with a number of professional feasibility studies on the Estonian energy and heating sector. The comprehensive focus of the Bank team on the DH sector throughout Estonia was considered helpful by the central Government and municipalities alike as it allowed for addressing issues of the institutional, legal, regulatory and tariff-setting nature, as well as specific issues of municipalities, while affording a "learning from each other" mode throughout the country.

The insistence of the Bank team to scale down overly-optimistic demand forecasts of the consultants was helpful and took into account the efficiency improvements on the supply side expected to result from the project investments. However, even the reduction of demand forecasts was not sufficient to capture the subsequently evolving reality of further declining demand due to: (a) efficiency improvements on the demand side (which became possible and necessary due to installations of meters under the project and rising energy tariffs), and (b) the decline in the number of industrial customers due to a misguided policy of cross-subsidization at the expense of industrial customers. The Bank team had warned about this latter development, advocating instead a two-tier tariff and elimination of cross-subsidies. Another aspect which had not been foreseen in the demand forecasts, to the extent necessary, was the aggressive fight of the competing gas supplier to maintain or recapture market share as well as the lack of marketing efforts of DH companies to maintain or increase their share of customers, especially in Tartu, until the latter stages of project implementation.

The Bank team was particularly effective in making needed arrangements to transfer knowledge to the sector with regard to developing a sector strategy, setting up a legal and regulatory framework, developing management systems, technical and technology improvements, and procurement arrangements.

7.2 Supervision:

General: The fact that the Bank team did not change significantly over time and continued to be managed by the same task manager was very beneficial for the Project and its implementation. The Estonian side expressed its particular appreciation for the continued guidance by the competent and able task manager. Moreover, the Bank's Tallinn Branch Office was very helpful to support the dialogue, arrange for missions and meetings and ably follow-up on specific issues.

Implementation Support: The Project was closely supervised from Washington and during two supervision missions per year, on average, totaling 11 missions over the life of the Project. These missions addressed performance to-date and outstanding issues as well as planning for next steps. The missions made it a special point to meet with representatives of the central Government (Ministries of Finance and Economy), with Mayors and City Council representatives as well as management and staff of DH companies. Concise and comprehensive mission reports about progress performance, issues encountered and further planning were a hallmark of this Project.

Guidance Regarding Energy Sector Strategy, Legal and Regulatory Framework: The Bank team was supportive in the development of a sound sector strategy and legal and regulatory framework which would help the sector to develop under a decentralized market-oriented environment. This was achieved by provision of technical assistance early in the Project as well as through an ongoing dialogue about issues and problems encountered during supervision missions. The experiences in other former centrally planned economies were readily shared allowing Estonia to make "educated" decisions.

Guidance Regarding Tariff Policies: Bank staff were not very successful in convincing municipalities and DH companies to refrain from cross-subsidizing residential customers through inflated industrial tariffs. This had to be appreciated by the negative experience of losing significant numbers of industrial customers, before this misguided policy was abolished. The Bank team was also not able to convince the municipalities and DH companies to introduce two-tier tariff systems. This may, however, materialize after privatization.

Invitation to Share Knowledge With Other Countries: From the beginning, the Project was led by the motto: "learning from each other." This motto was even expanded across the borders of Estonia. Thus, the Bank team invited delegations from other countries (e.g. Poland) to make presentations about their experience in DH restructuring and modernization. Similarly, Estonian specialists were sent for training to other countries such as Denmark, Sweden and Finland to learn about the state-of-the-art systems and technology. The Bank team also arranged for Estonian managers and experts to make presentations about their own lessons learned to groups of visitors from other countries contemplating undertaking DH rehabilitation projects (e.g. Bulgaria, Lithuania and Ukraine). The Estonian counterparts met recently expressed their sincere appreciation for these efforts.

Mid-term review: As a result of the accusations during 1996 by the then Mayor of Tartu concerning the economics of the Tartu component, the Bank team used the mid-term review of the Project to reassess the economic and financial merits of the Tartu DH rehabilitation component. This was done with the help of independent Bank staff and others, participating in the mission and all discussions. The resulting report demonstrated the soundness of the project concept, scope and implementation to-date, especially regarding the conversion of four boilers to use of local fuels. During a recent visit, the Estonian counterparts at all levels confirmed that this mission had cleared the confusion resulting from a fight of two opposing parties. They termed the mission report of June 1996 as "very professional and objective" and were particularly appreciative of the fact that the Bank had remained a rational and objective advisor in spite of the gravity of the accusations. Whereas the situation started to be partially remedied only about a year later, and is still not fully resolved, the consistency of the Bank's position and the soundness of advice was recognized by all parties involved.

7.3 Overall Bank performance:

In the light of above experiences, the performance of the Bank team is rated as better than "Satisfactory."

Borrower

7.4 Preparation:

General: The DH sector of Estonia, during Soviet times had been administered centrally out of Moscow (Ministry of Energy). After re-independence there was an eagerness to decentralize DH systems to the municipal level. Moreover, the winter of 1992/93 had brought hardships to the population as a result of delayed or interrupted shipments of oil and gas from Russia. Thus, a decentralized sector which would

diversify into use of local fuels such as peat, wood and wood wastes was considered essential towards the sustained well-being of the population. This explains the eagerness and drive of local officials to proceed quickly with a comprehensive DH project which would help address the facets of institutional arrangements, legal and regulatory underpinnings, technical investments, fuel substitution and improvements of operations.

Project Preparation Performance: The strong motivation at all levels of Estonian counterparts helped to set common goals for the Project and its components, fostered a tight timetable and a quick and effective preparation. As a result, the most complex and difficult procurement item (large boiler conversions) already led to contract signatures a few months after Bank Loan signature and even before Bank Loan effectiveness.

The motto of "learning from each other" was all pervasive and the Estonian counterparts went out of their way to provide information, "swallow" difficult lessons (e.g. the Bank's procurement rules were considered, at least initially, as complex and difficult, but their application was seen as a long-term advantage) and to promote accepted agendas.

7.5 Government implementation performance:

General: Sharing experiences continued throughout project implementation, with excellent cooperation provided by all parties involved (apart from the temporary Tartu issues). Implementation proceeded according to established timetables for most of the components, and the majority of project investments had already been completed by end-1997. Thereafter, the learning curve with the new equipment was steep, and the Estonian counterparts were keen to learn from consulting services provided as well. On the other hand, the process of developing a sound legal and regulatory framework was protracted in the newly-established democracy and only led to a progressive law and independent regulatory authority during 1999.

Implementation: The Ministry of Finance administered the on-lending of the Bank, Sida and EIB loans and also supervised the implementation of the small boiler component, in close cooperation with the Ministry of Economy which managed a small Project Implementation Unit (PIU) supported by international consultants. Within the small boiler component, ultimate beneficiaries sometimes considered that procurement was too cumbersome and slow, being handled centrally out of Tallinn. Some project agencies even stated that a direct relationship between the Bank and the DH company would have been preferable (as was the case in the Poland DH Project). Whereas the Bank normally also prefers a direct relationship with the Borrower, considering the size of the project components and particularly that of the small boiler component, this would not have been practical from the Bank's point of view.

When the option to convert the Bank's currency pool Loan to a single currency loan in Deutsch Marks (DEM) was provided, many sub-borrowers considered that the Ministry of Finance was not sufficiently helpful to convert all sub-loans to DEM-denominated loans in order to minimize foreign exchange risk.

In the case of the political turmoil of Tartu during 1996, the Government had a particularly difficult task. Even Parliament became involved and in 1997 reprimanded the City that it was not utilizing its assets in economic ways. Not surprisingly, even today, some City officials feel that the Government was not sufficiently supportive of the Tartu component.

On the other hand, the Government has consistently acted as a facilitator for the smooth implementation of the Project.

7.6 Implementing Agency:

The PIU for the small boiler program did a good job to coordinate the original preparatory work, evaluate projects and provide assistance to the individual municipalities. Thus, in spite of the grumbling of a few, the majority of participating municipalities was satisfied with the support received.

The Tallinn and Parnu DH Companies, and the management of the Iru CHP Plant, were keen and eager to implement their respective project components and managed them well. Their cooperation in all respects was outstanding. All enterprises were highly motivated, and this combined with the support they received from the respective municipalities and consultants, as well as Eesti Energia in the case of Iru CHP Plant, led to smooth project implementation.

The Tartu component, on the other hand, is an example of a project component being held up, delayed and benefits diminished, when a fight over local fuels made decision makers lose sight of the overall benefits of the Project. Thus, at times, the performance of the Tartu City authorities and the DH companies' management was unsatisfactory. The situation has much improved by now, but further improvements are still required for the investments and the DH system to develop their full economic potential.

7.7 Overall Borrower performance:

In the light of above experiences, the performance of the Borrower and project agencies is rated as better than "Satisfactory".

8. Lessons Learned

General: The Estonia District Heating Rehabilitation Project has been a large and complex project with many different components. It was demand-driven throughout Estonia, i.e. the Estonian Government, Eesti Energia, municipalities and DH companies wanted and supported the Project. Thus, it showed a strong level of ownership by the Borrower and project beneficiaries. Moreover, it came at the right time, addressing high priority issues shortly after re-independence. Nevertheless, apart from the normal implementation difficulties and problems encountered in any such complex project, there were a number of valuable lessons. These concern: (a) demand forecasts; (b) tariff policies; and (c) competition with gas. In addition, there a a number of further lessons which are highlighted below.

Demand Forecasts: Like many of the first projects of the early 1990's in the DH sectors of former centrally planned economies, the demand forecasts of this Project were overly-optimistic. This has been a common problem in other public utility sectors as well, for example, in water supply and waste water treatment projects. In the case of DH, it was anticipated that consumers would want a "normal" level of indoor heating (18-20°C) if it were available, because DH was being rationed due to the inability to secure or pay for necessary fuel supplies, and thus demand was projected to grow. However, the projected demand growth did not materialize. Demand for DH remained, at best, stable in Parnu but declined further in Tallinn and Tartu. The introduction of cost covering tariffs, combined with the possibility to measure and regulate consumption at the building level, led to a reaction among customers to save energy instead. Subsequent investments into insulation and energy efficiency measures further depressed demand. In addition, a number of industrial consumers disconnected from DH due to uncompetitive tariffs. However, even with the unforeseen decline in demand which affected the economics of the project components to some extent and the financial position of DH companies, there were still major benefits resulting from the investments and the DH tariffs that have had to be charged have remained competitive.

Future DH projects should scrutinize demand projections and the factors which affect demand very carefully. In cities where DH is facing unfair competition from alternative heating options, consideration should be given to specifying areas where DH is the required heating option until the factors leading to the unfair competition are removed, in order to preserve DH demand. Cross-subsidies should be removed or reduced as early as possible in order to improve DH competitiveness and thereby maintain existing large industrial consumers. Greater efforts to identify new DH consumers should also be undertaken. The project design should consider how small, isolated heating systems can be connected to the larger, more efficient DH system as well as whether parts of the DH system are uneconomic and should be closed down to allow for alternative heating options. Demand forecast analysis should also consider the results of social assessments which help to forecast consumers' reactions and responses to possible tariff increases and the ability to measure and regulate heat consumption.

Tariff Policies: Appropriate tariff policies play an important role in maintaining DH consumers and thus the viability of DH systems. It has been shown through this Project, as well as elsewhere, that establishing DH tariffs above costs for one group of customers, such as industries, in order to cross-subsidize another group, such as residents, will lead to the loss of the customers from the group paying higher than the competitive tariffs. As the DH system is capital intensive and thus has relatively high fixed costs, a decline in demand increases the portion of fixed costs which the remaining customers have to carry and can lead to its loss in competitiveness. Two-tier tariff policies allow for the transparent pricing of DH based on fixed and variable costs and thus allow DH companies to charge for actual costs of supply, rather than tariffs

based on estimates of costs made at the beginning of the heating season which may be either too high or too low. Therefore, two-tier tariffs are beneficial to both DH producers and consumers. Also, gas prices, if not properly differentiated to reflect the actual costs of supply to the various categories of consumers, such as large and small consumers, can also result in unfair competition with DH. Therefore, transparency of tariffs and maintaining competitiveness with other heat providers should be a prime goal of DH tariff policy.

Competition With Gas: When designing DH projects, it is highly important to properly assess risks associated with the potential for competition from gas, or other alternatives, to DH. It is unfortunate that the competing gas company in Tartu managed to convince the then Mayor in 1996 about the attractiveness of gas and the "erroneous project concept to use local fuels." The problem is still not fully solved, and the loss to the consumers has been substantial. This development has had an impact not only on the project investments which have been delayed but also has affected consumers' attitudes towards DH. As a result of the controversy, the decline in demand, as compared to the growth projections, was most pronounced in the case of Tartu. The political risk of an administration change which would "disown" a project is difficult to mitigate against. A course of action and particular remedies which the City and the DH companies can take to improve the situation have been elaborated and are now being considered and pursued, including privatization of the DH system, but some of the losses, such as the lost consumers, may never be regained.

Other lessons:

Project "ownership" by the Borrower and project beneficiaries is key to the successful implementation of a Project. The positive experience with the project agencies involved in Tallinn, Parnu and Iru CHP Plant as well as in the small boiler program illustrates the point, and Tartu shows what can happen if the situation changes.

The beneficial impact resulting from the continuity of a competent Bank team working consistently on project preparation and implementation should be recognized. Even during the difficult mid-term review of the Tartu component, the Bank's insistence on an open-minded rational assessment by independent Bank staff and consultants helped to demonstrate the merits of the Project and the credibility of the Bank team once more.

When the Bank's Procurement Guidelines are considered to be difficult and cumbersome, it is important to take corrective action as quickly as possible. Complaints arose in the use of the Bank's suggested and newly-evolving bidding documents for the Supply and Installation of Plant that were to be utilized for the small boiler conversion/replacement projects and that were generally very small in nature, each less than US$ 1 million in value. As a result of the early unsuccessful attempts to utilize the sample bidding document, the Bank agreed and assisted the Ministry of Economy to develop a simplified bidding document more appropriate for smaller projects. After simplification, the bidding process for small boiler projects proceeded smoothly. Other project agencies genuinely appreciated the experience they gained from a competitive procurement process and from use of the Bank's procedures and documents in particular. The result was that project agencies have abandoned their less effective earlier procurement practices in favor of competitive bidding.

Addressing the sector strategy and legal, regulatory and institutional issues was a major success of this Project and demonstrates the benefits of a comprehensive and holistic approach to the Bank's project lending. During project implementation, work proceeded on all these fronts so that now the sector is ready for "normal operations" and privatization.

The motto of "learning from each other" is worthwhile in such a comprehensive project and extremely effective. Going beyond national boundaries has played an important role in helping the Estonian counterparts to absorb knowledge and to pass on the results of their learning experience as well.

9. Partner Comments

(a) Borrower/implementing agency:

General: During a recent mission, representatives of central and local Government and the DH companies were provided with copies of key parts of the draft ICR, as well as a list of specific questions about their project components, objectives, scope, implementation performance and results achieved. They have provided verbal and written feedback which has been incorporated into the final ICR. The written comments are available on electronic file.

Some specific comments deserve explicit recognition as follows:

Regarding the use of local, renewable energy resources, a representative of the Ministry of Economy emphasized that the increasing use of wood-based fuels is beneficial not only with regard to the DH companies' financial performance but also with regard to the global environment. The CO_2 emissions are considered at zero level for wood-based fuels. Thus, the development away from peat and towards a greater use of wood-based fuels which could be observed in Tartu is a very desirable development. The management of both Tartu as well as Parnu DH companies emphasized that, prior to 1995, the market for renewables was practically non-existent. In addition, the use of wood waste (bark, saw dust) has further helped to stabilize the prices for wood-based fuels. Thus, a new industry has developed and is bound to stay.

Regarding lessons learned, the Tartu DH Company has written: "We got a lot of experience in several fields (technical, economic, environmental); we got much good and useful information and knowledge about new and modern technologies from several other companies, several institutions and several people (experts). And the DH system gained more trust on the side of the consumers." This has also been emphasized by Tallinn and Parnu DH companies as well.

The Tartu DH Company further emphasized: "The price of part of the loan has become quite high: (in 1994 the US$ was at EEK 12, in March 2000 it is at EEK 17). We asked the Government to transfer (convert) the loan to Deutsch Marks, but did not get a reaction." Converting the Bank's Loan to Deutsch Marks was possible under the Bank policy for loan products which was introduced during project implementation.

Regarding the performance of the Government, the City and the Bank, the Tartu DH Company has written: "The Government did not perform at all...., The city performed quite normally, sometimes better, sometimes worse. The Bank performed very correctly, civilized, and with understanding to our problems. It was a very good cooperation. Lot's of thanks to the task manager."

The Iru CHP Plant management has written: "The Iru rehabilitation was definitely right in its objectives, project scope, as well as right for the interests of the Tallinn District Heating Company. The Project objectives were achieved and the technical level was good." Similar statements were made by all companies visited (Tallinn, Tartu and Parnu DH companies and a small boiler plant converted to wood-based fuel use (Adavere)).

(b) Cofinanciers:

The Project had two major co-financiers providing investment funding and a number of smaller contributions from the EU and bilateral sources to provide technical assistance and institutional support within and outside the immediate project scope, but in any case related to the Project. The EIB co-financed one entire component, namely the Parnu DH rehabilitation and contributed to the Tallinn DH rehabilitation component. EIB completed the Parnu component during 1998 with a project completion report which is on file in the Bank. Sida funded a considerable portion of the small boiler program and the Tartu component.

Sida has prepared the following comments: "Sida has very much appreciated the cooperation with the World Bank in this Project, and the possibility to plan and later review its components together with the World Bank in well organized joint missions. The management of the Project from the World Bank's side has been highly professional, and Sida gained much experience from this cooperation. As a matter of fact, this Project, being a pilot lending operation for Sida, has contributed to the development of a new Sida strategy for energy assistance in Eastern Europe, emphasizing rehabilitation of existing assets and energy efficiency improvements."

(c) Other partners (NGOs/private sector):

10. Additional Information

Additional information is in the Project Files and in the Annexes to this Report.

Annex 1. Key Performance Indicators/Log Frame Matrix

SMALL BOILER CONVERSION/REPLACEMENT PROGRAM:

	Dec 1995		Dec 1996		Dec 1997		Dec 1998		Dec 1999	
	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target
Project Completion Degree: Capacity of Projects completed during the period (MW):										
Conversions	4.8	4.7	0	3.5	0.8	3.5	0	0		0
Replacements	6.1	6.1	2.65	2.8	1.7	0.6	5.85	8.6		2.95
Performance: Heat produced using Domestic fuels (GWh):										
Conversions	1.2	1.2	6.1	11.7	13.6	15.4	14.6	22.1		22.1
Replacements	1.8	1.8	20.6	20.7	23.2	23.5	36.5	35.6		46.6
Value of saved fossil fuels (EEK million/Period:										
Conversions	0.22	0.22	1.11	2.12	2.56	2.80	3.45	4.01		4.01
Replacements	0.33	0.33	3.75	3.76	4.36	4.28	8.61	6.48		8.47
Net savings in fuel costs (EEK million/period):										
Conversions	0.12	0.12	0.59	1.12	1.37	1.48	2.37	2.12		2.12
Replacements	0.18	0.18	2.09	2.10	2.34	2.38	5.91	3.61		4.72
Reduction of emissions (tons/period)										
SO2	16.6	16.6	148	180	204	216	285	294		351
CO2	1,080	1,080	9,958	11,65	13,248	14,02	18,521	19,081		22,870
NOx	2.6	2.6	22.8	6	31.5	4	43.7	42		49
				28		33				

TARTU DH REHABILITATION PROGRAM:

	Dec 1995		Dec 1996		Dec 1997		Dec 1998		Dec 1999	
	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target
Project Completion Degree										
% of substation completed	5	15	90	40	100	70	100	100	100	100
% of heat meters, completed	5	15	90	40	100	70	100	100	100	100
% of remaining items completed	30	30	50	55	100	80	100	100	100	100
% of boiler conversions completed	90	100	100	100	100	100	100	100	100	100
Performance:										
Luunja boiler conversions:										
Heat production (GWh/year)	34	203	140	228	154	228	145	228	127	228
Local fuel price (EEK/MWh)	45	48	50	53	56	57	64	62	79	66
Gas price (EEK/MWh)*	145	140	125	142	141	146	131	150	153	155
Performance:										
Ropka boiler conversions:										
Heat production (GWh/year)	47	83	60	83	63	120	60	120	55	120
Local fuel price (EEK/MWh)	76	73-80	81	80-87	86	86-95	85	92-103	85	97-110
Gas price (EEK/MWh)	144	140	122	142	142	146	131	150	111	155
Make-up water added to the DH system (tons/day)	2000	2400	893	800	550	600	622	500	367	500

IRU POWER PLANT IMPROVEMENT PROGRAM:

	Dec 1995		Dec 1996		Dec 1997		Dec 1998		Dec 1999	
Seasonal overall plant efficiency (%)	87	85	87.5	85	87.5	85	87.5	85	87.5	85
CHP #2 plant efficiency after renovation of air preheater (%)	-	-	-	81	82.5	81	82.5	81	82.5	81
Make up water quality	Below Standard	Below Standard	Meets Standard	Meets Standard	Meets Standard	Meets Standard	Meets Standard	Meets Standard	Meets Standard	Meets Standard
Circulating water chemical analysis	Below Standard	Below Standard	Below Standard	Meets Standard	Below Standard	Meets Standard	Meets Standard	Meets Standard	Meets Standard	Meets Standard

TALLINN DH REHABILITATION PROGRAM:

	Dec 1995		Dec 1996		Dec 1997		Dec 1998			Dec 1999
Project Completion Degree:										
% of substation completed	5	15	85	85	90	100	100	100	100	100
% of heat meters completed	5	15	85	85	90	100	95	100	100	100
% of remaining items completed	0	0	50	50	95	100	95	100	100	100
Performance:										
Kadaka seasonal overall plant efficiency (%)	86.2	85	N/A	88	87.5	88	87.5	88	88	88
Make-up water added to the DH system (1,000) tons/year)	830	830	658	210	320	170	225	150	150	150
Circulation water chemical analysis	Below Standard	Below Standard	Below Standard	Below Standard	Below Standard	Meets Standard	Meets Standard	Meets Standard	Meets Standard	Meets Standard

Annex 2. Project Costs and Financing

Project Cost by Component (in US$ million equivalent)

Project Cost By Component	Appraisal Estimate US$ million	Actual/Latest Estimate US$ million	Percentage of Appraisal
Small Boiler Conversion and Replacement	9.78	7.37	75
District Heat Rehabilitation Program	32.32	39.65	110
Iru Power Plant Improvement	4.71	8.87	188
Design and Supervision (Note)	3.57		
Institutional Support Program	3.16	3.87	122
Total Baseline Cost	53.54	59.76	
Physical Contingencies	5.35		
Price Contingencies	5.61		
Total Project Costs	64.50	59.76	
Total Financing Required	64.50	59.76	

Note: The actual design and supervision costs are included in the costs of the District Heating Rehabilitation Project Actual/Latest Estimate.

Project Costs by Procurement Arrangements (Appraisal Estimate) (US$ million equivalent)

Expenditure Category	Procurement Method[1] ICB	NCB	Other[2]	N.B.F.	Total Cost
1. Works	13.40	0.00	6.14	7.58	27.12
	(12.50)	(0.00)	(4.45)	(0.00)	(16.95)
2. Goods	20.03	0.00	1.42	15.93	37.38
	(20.03)	(0.00)	(1.42)	(0.00)	(21.45)
3. Services	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
4. Bank Guidelines	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Total	33.43	0.00	7.56	23.51	64.50
	(32.53)	(0.00)	(5.87)	(0.00)	(38.40)

Project Costs by Procurement Arrangements (Actual/Latest Estimate) (US$ million equivalent)

Expenditure Category	Procurement Method[1]				Total Cost
	ICB	NCB	Other[2]	N.B.F.	
1. Works	21.25	2.91	3.69	6.98	34.83
	(15.41)	(2.47)	(3.12)	(0.00)	(21.00)
2. Goods	13.95	0.00	2.88	4.24	21.07
	(13.31)	(0.00)	(2.01)	(0.00)	(15.32)
3. Services	0.00	0.00	0.00	3.87	3.87
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
4. Bank Guidelines	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Total	35.20	2.91	6.57	15.09	59.77
	(28.72)	(2.47)	(5.13)	(0.00)	(36.32)

[1] Figures in parenthesis are the amounts to be financed by the Bank Loan. All costs include contingencies.

[2] Includes civil works and goods to be procured through limited international bidding, international shopping and national shopping.

Project Financing by Component (in US$ million equivalent)

	Appraisal Estimate			Actual/Latest Estimate			Percentage of Appraisal		
	Bank	Govt.	CoF.	Bank	Govt.	CoF.	Bank	Govt.	CoF.
Small Boiler Conversion/ Replacement Program	7.90	0.78	3.20	5.86	0.29	1.21	74.2	37.2	37.8
District Heating Rehabilitation Program	25.30	2.76	11.20	22.82	3.90	12.92	90.2	141.3	115.4
Iru CHP Plant Improvement	5.20	0.52		7.64	1.23		146.9	236.5	0.0
Design and Supervision		3.84					0.0	0.0	0.0
Institutional Support Program			3.80			3.87	0.0	0.0	101.8
Total	38.40	7.90	18.20	36.32	5.43	18.01	94.6	68.7	99.0

Note: Govt. refers to the contributions from project agencies.

Annex 3: Economic Costs and Benefits

Economic Re-Evaluation

The Project has had significant economic benefits in all its components. The key benefits have been reduced fuel costs and import requirements, improved efficiency in DH systems and improvement of environmental conditions in the affected areas. The economic rates of return (ERRs) at appraisal did not consider environmental benefits. Thus, the weighted ERR for the Project amounted to 24.4% at appraisal as compared to 22.5% today, the difference being largely due to the relative deterioration of the terms of trade between oil and renewables. However, when one considers environmental benefits, the weighted average ERR increases to 58.5%.

Table 1: Summary Economic Rates of Return

Component	Appraisal	ICR	ICR
		Without environmental benefits	With environmental benefits
Small boiler conversion	29.2%	10.5%	20.5%
Small boiler replacement	9.8%	31.2%	45.6%
Tallinn DH rehabilitation	22.8%	24.0%	
Tartu DH rehabilitation	28.5%	27.9%	101.3%
Parnu DH rehabilitation	27.8%	12.1%	87.4%
Iru CHP Plant improvement	18.1%	16.7%	
Weighted ERR	24.4%	22.5%	58.5%

Note: The environmental benefits have been based on international cost emission benchmarks.

Sustainability is a strong economic feature of this Project. The increased efficiency, the use of lower cost indigenous fuels as compared to imported fuels, and the environmental benefits provide a high likelihood that its major benefits will be sustained over the life of the project components.

Boiler Conversions

The Small Boiler Conversion Program followed in general the planned time implementation schedule but was reduced in scope. Changes in the relative prices between oil and renewables reduced the project's expected returns. At appraisal, the ERR for this component was estimated at 29.2%, while presently the ERR is re-evaluated at 10.5%.

The key expected benefits were fuel cost savings. However, expectations regarding oil prices became more conservative immediately after 1995, following weak international oil price trends. Weak oil prices up to 1999 were mainly due to excess supply conditions of oil in world markets, the Asian economic crisis and several mild winters in Europe. Mazut, the main fossil fuel used in Estonian DH plants, is a heavy fuel oil with high

sulfur content. Mazut has been constantly cheap, with prices, especially in summertime, ranging below 1,000 EEK (about US$ 65-70) per ton. On the other hand, prices for renewables have been relatively constant after 1995, reducing the relative price differences (see Table 2 below).

Table 2: Fuel Prices (US$/MWh)

Prices	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Oil	11.4	10.4	9.1	9.3	8.1	10.6	9.0	8.0	7.6	7.3	7.0
Peat and Wood	7.0	5.8	5.0	5.3	5.2	5.7	5.4	5.2	5.2	5.2	5.2
Difference	4.4	4.6	4.1	4.0	2.9	4.9	3.6	2.8	2.4	2.1	1.8

Sources: Parnu Soojus Ltd., International Energy Agency and World Bank Forecasts, April 2000.

A significant benefit which was not considered in the original calculation of the ERR was the reduction in the emissions of harmful gases. When one considers these figures and the environmental fees levied in Estonia, the ERR is slightly raised to 11.3%. However, if one uses international cost emission benchmarks, such as those used in Poland and the rest of Europe, instead of the conservative environmental fees, the ERR is raised to 20.5%.

Boiler Replacements

The Small Boiler Replacement Program has also followed the original time implementation schedule but with an increased scope. As with the conversion program, the key expected benefits were fuel cost savings. However, the deterioration of the relative prices between oil and renewables were more than compensated by a decline in investment costs per unit. At appraisal, the ERR was estimated at 9.8%, while presently the ERR is re-evaluated at 31.2%.

As with the conversion program, environmental benefits were not considered in the original estimate of the ERR. Once these benefits are included, the ERR increases to 32.2%. However, if one uses international cost emission benchmarks instead of the environmental fees, the ERR is raised to 45.6%.

The Small Boiler Conversion and Replacement Program has contributed to the development of Estonian manufacturers of energy equipment, as well as significantly developed local Estonian installation companies. According to local experts, the quality of the equipment and services has increased significantly since the program commenced. The program has also increased the demand for wood waste and peat, contributing to the development of a market for domestic fuels as well as to the improvement of forestry sector by demanding wood of little, if any, industrial value.

Tallinn DH Rehabilitation

The works under this project component were generally completed on time and cost. Economic benefits refer to: (a) reductions in heat demand from better regulation and controls in substations; (b) heat cost reductions from Iru CHP Plant due to installation of Laagna heat exchanger and pumping station; (c) less heat and water losses; (d) lower fuel and electricity requirements; (e) less maintenance and repair works; (f) savings in water treatment costs, and (g) improvements in reliability of heat supply. The changes in oil prices affected the project's returns but were compensated by higher estimation of other benefits. At appraisal, the ERR was estimated at 22.8%, while presently the ERR is re-evaluated at 24.0%.

Tartu DH Rehabilitation

The appraisal estimate of the ERR for this component was 29%. Although a separate estimate was not calculated for the boiler house at Luunja, a Bank team estimated it at mid-term in 1996 to be 27%. The key benefits were the savings form the conversion of various base-load boilers to use the lower-cost indigenous fuels, including improved boiler efficiency from the improvement in combustion controls. Other benefits were: (a) reductions in heat demand from better regulation and controls in the substations; (b) savings in operating and maintenance costs after improvements of the water treatment system and longer lifetime; and (c) reduction of heat and water losses in the network through the replacement of sections of the pipeline, at times which are under groundwater level, and through ventilation of concrete culverts. Presently, although the expected savings in fuel costs have been lower than expected, the component continues to remain attractive with an ERR of 27.9%.

The benefit value of the reduction of harmful emissions to the atmosphere was not considered at appraisal in the estimate of the ERR. When this environmental benefits are considered, the ERR is raised to 30.6%. However, if one uses international cost emission figures instead of the conservative environmental fees, the ERR is raised to 101.3%.

The original estimated ERR assumed optimal operation of the boiler houses to take advantage of the lower cost indigenous fuels, but this has not been the case. The boiler houses at Luunja and Ropka have not been operated at full capacity. Thus, if the use of the wood and peat boilers were increased up to their full level of capacity utilization, there would be additional savings to the project. When these additional savings are considered, the ERR is further raised to 41.7% without environmental benefits and 111.0% with environmental benefits based on international cost emission benchmarks.

Parnu DH Rehabilitation

The appraisal estimate of the ERR for the Parnu DH rehabilitation component was in the range of 28%. The economic benefits for this component are comparable to Tartu's and largely based on fuel costs savings as a result of the conversion of various base-load boilers to use the local fuels. Presently, although the expected savings in fuel costs have been lower than expected, the component continues to remain attractive with an ERR of 12.1 %.

As with Tartu, the environmental benefits from the reduction of harmful gases were not considered in the original calculation of the ERR. Once these benefits are taken into account, the ERR is raised to 22.7%. However, if one uses international cost emission figures instead of the conservative environmental fees for Estonia, the ERR is raised to 87.4%.

Iru Improvements

The appraisal estimate of the ERR for Iru Power Plant was 18%. Benefits included: (a) fuel cost savings; (b) operating and maintenance savings; (c) lower costs of chemicals and other inputs from the introduction of a modern water treatment system; and (d) extended lifetime. Costs and benefits were considered over the average life of the investments of 15 years. On this basis, the ERR for the Iru Power Plant is re-evaluated presently at 16.7%.

Annex 4. Bank Inputs

(a) Missions:

Stage of Project Cycle	No. of Persons and Specialty (e.g. 2 Economists, 1 FMS, etc.)		Performance Rating	
Month/Year	Count	Specialty	Implementation Progress	Development Objective
Identification/Preparation				
05/92	*1*	Financial Analyst		
	1	Engineer		
11/92	*1*	Financial Analyst		
	3	Engineers		
	1	Economist		
11/93	*2*	Financial Analysts		
	3	Engineers		
	2	Economists		
Appraisal/Negotiation				
11/93	*2*	Financial Analysts		
	3	Engineers		
	2	Economist		
01/94	*1*	Financial Analyst		
	2	Financial Analyst		
	2	Economist		
Supervision				
07/94	*1*	Financial Analyst	S	S
09/94	*1*	Financial Analyst	S	S
	3	Economists		
	2	Engineers		
11/94	*1*	Financial Analyst	S	S
	1	Economist		
05/95	*1*	Financial Analyst	S	S
	2	Economist		
09/95	*1*	Financial Analyst	S	S
	2	Economists		
02/96	*1*	Financial Analyst	S	S
	1	Economist		
	1	Engineer		
11/96	*1*	Financial Analyst	S	S
	1	Engineer		
06/97	*1*	Financial Analyst	S	S
	1	Engineer		
11/97	*1*	Financial Analyst	S	S
	1	Engineer		
05/98	*1*	Financial Analyst	S	S
	1	Engineer		
05/99	*1*	Financial Analyst	S	S
	1	Engineer		
ICR				
01/2000	*1*	Financial Analyst	S	S
	1	Engineer		

(b) Staff:

Stage of Project Cycle	Actual/Latest Estimate	
	No. Staff weeks	US$ (,000)
Identification/Preparation	-	-
Appraisal/Negotiation	NA	234,000 (incl. Identification)
Supervision	NA	390,000
ICR	NA	45,000
Total	NA	669,000

Note: Costs for Identification/Preparation and Appraisal/Negotiation are presented together. The SAP R/3 system provides a consolidated cost for Project Preparation.

Annex 5. Ratings for Achievement of Objectives/Outputs of Components

(H=High, SU=Substantial, M=Modest, N=Negligible, NA=Not Applicable)

	Rating
☒ *Macro policies*	○ *H* ● *SU* ○ *M* ○ *N* ○ *NA*
☒ *Sector Policies*	● *H* ○ *SU* ○ *M* ○ *N* ○ *NA*
☒ *Physical*	● *H* ○ *SU* ○ *M* ○ *N* ○ *NA*
☒ *Financial*	○ *H* ● *SU* ○ *M* ○ *N* ○ *NA*
☒ *Institutional Development*	● *H* ○ *SU* ○ *M* ○ *N* ○ *NA*
☒ *Environmental*	● *H* ○ *SU* ○ *M* ○ *N* ○ *NA*
Social	
☐ *Poverty Reduction*	
☐ *Gender*	
☐ *Other (Please specify)*	
☒ *Private sector development*	○ *H* ● *SU* ○ *M* ○ *N* ○ *NA*
☒ *Public sector management*	○ *H* ● *SU* ○ *M* ○ *N* ○ *NA*
☐ *Other (Please specify)*	

Annex 6. Ratings of Bank and Borrower Performance

(HS=Highly Satisfactory, S=Satisfactory, U=Unsatisfactory, HU=Highly Unsatisfactory)

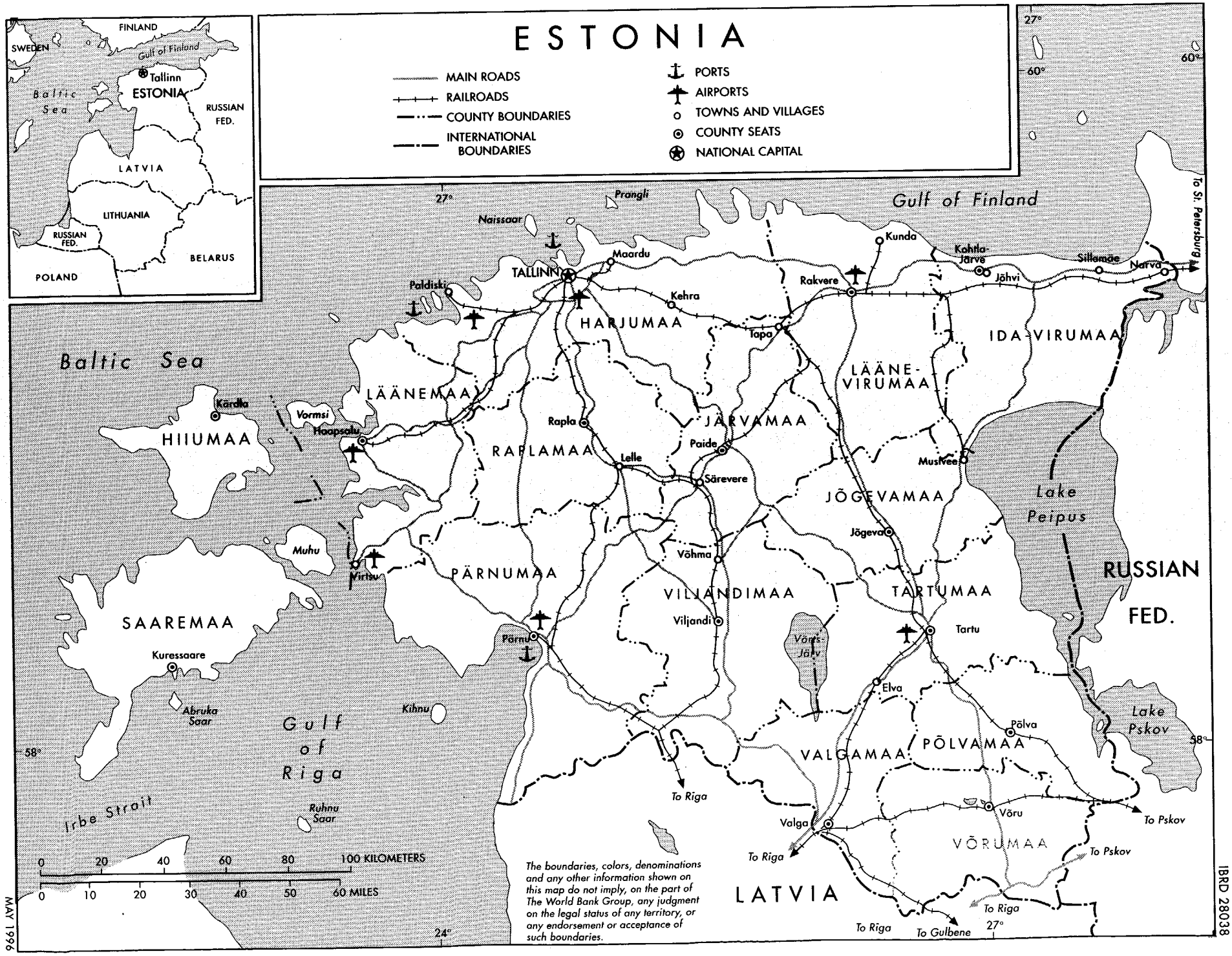
6.1 Bank performance	*Rating*
☒ *Lending*	○ *HS* ● *S* ○ *U* ○ *HU*
☒ *Supervision*	○ *HS* ● *S* ○ *U* ○ *HU*
☒ *Overall*	○ *HS* ● *S* ○ *U* ○ *HU*

6.2 Borrower performance	*Rating*
☒ *Preparation*	● *HS* ○ *S* ○ *U* ○ *HU*
☒ *Government implementation performance*	○ *HS* ● *S* ○ *U* ○ *HU*
☒ *Implementation agency performance*	○ *HS* ● *S* ○ *U* ○ *HU*
☒ *Overall*	○ *HS* ● *S* ○ *U* ○ *HU*

Annex 7. List of Supporting Documents

1. Semi-Annual Progress Reports
2. Performance Indicators
3. Annual Audit Reports
4. Economic Re-evaluation

MAP SECTION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RAILROADS
COUNTY BOUNDARIES
INTERNATIONAL BOUNDARIES
PORTS
AIRPORTS
TOWNS AND VILLAGES
COUNTY SEATS
NATIONAL CAPITAL
FINLAND
SWEDEN
Gulf of Finland
Tallinn
ESTONIA
Baltic Sea
RUSSIAN FED.
LATVIA
LITHUANIA
RUSSIAN FED.
BELARUS
POLAND
Gulf of Finland
Baltic Sea
Prangli
Naissaar
TALLINN
Maardu
Paldiski
Kehra
HARJUMAA
Kunda
Kahtla-Järve
Sillamäe
Narva
Jõhvi
Rakvere
Tapa
IDA-VIRUMAA
LÄÄNE-VIRUMAA
To St. Petersburg
LÄÄNEMAA
Kärdla
Vormsi
Haapsalu
HIIUMAA
Rapla
JÄRVAMAA
RAPLAMAA
Paide
Lelle
Särevere
Mustvee
JÕGEVAMAA
Jõgeva
Lake Peipus
Muhu
Võhma
Virtsu
PÄRNUMAA
VILJANDIMAA
TARTUMAA
RUSSIAN FED.
SAAREMAA
Viljandi
Pärnu
Tartu
Kuressaare
Võrts-Järv
Elva
Abruka Saar
Kihnu
Gulf of Riga
Lake Pskov
Põlva
VALGAMAA
PÕLVAMAA
To Riga
Irbe Strait
Ruhnu Saar
Võru
To Pskov
Valga
VÕRUMAA
To Riga
To Pskov
LATVIA
To Riga
To Riga
To Gulbene
0 20 40 60 80 100 KILOMETERS
0 10 20 30 40 50 60 MILES
27°
60°
58°
24°
The boundaries, colors, denominations and any other information shown on this map do not imply, on the part of The World Bank Group, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.
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