



1. Project Data:		Date Posted : 11/06/2003	
PROJ ID: P036011		Appraisal	Actual
Project Name: Klaipeda Geothermal	Project Costs (US\$M)	18.02	17.55
Country: Lithuania	Loan/Credit (US\$M)	5.9	5.9
Sector(s): Board: EMT - District heating and energy efficiency services (100%)	Cofinancing (US\$M)	9.52	9.84
L/C Number: L4013			
	Board Approval (FY)		96
Partners involved : GEF, Danish Ministry of Environment, EU-Phare	Closing Date	07/31/1999	12/30/2002

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2. Project Objectives and Components

a. Objectives

The project had three objectives :

- 1) To demonstrate the feasibility and value of using low temperature geothermal water as a renewable indigenous energy resource for use in district heating systems .
- 2) To reduce emission of greenhouse gases (GHG) and sulfur dioxide (SO2) by replacing gas and heavy fuel oil (HFO) with a sulfur content of 3.5 percent.
- 3) To promote sustainable management and the development of environmentally sound and non -polluting geothermal resources both in a national and regional perspective .

b. Components

The project had two main components:

- 1) **Investment component (\$15.40 million at appraisal; \$ 14.61 million, actual)**. Includes investments in production and injection wells, above ground facilities, and piping for the entire extraction and distribution system .
- 2) **Technical Assistance and Training (\$2.62 million at appraisal; \$ 2.94 million, actual)**. Includes design of the equipment for extraction and transfer of geothermal energy to the district heating systems, preparation of a detailed drilling program, management support to EG, training of local personnel, and supervision of project implementation .

c. Comments on Project Cost, Financing and Dates

Total project cost was \$17.55 million (including interest during construction) compared to the appraised estimate of \$18.02 million. The Bank and the GEF provided a total of \$12.02 million, compared to the appraised estimate of \$12.8 million (Bank loan of \$5.9 and GEF grant of \$ 6.9 million). The Danish Ministry of Environment provided a grant of \$2.94 million, compared to the appraised estimate of \$2.5 million. An additional grant from the Danish Ministry of Environment of \$.3 million funded the clean-up of the plant. The EU-Phare grant of \$.12 million did not materialize. The project's closing date was extended four times and closed on December 30, 2002.

3. Achievement of Relevant Objectives:

1) **To demonstrate the feasibility and value of using low temperature geothermal water** . *This objective was only achieved to a modest extent.* The technical, financial, and economic feasibility of geothermal district heating was not demonstrated. Although the plant was completed in 2001, its technical feasibility has not been demonstrated because of the still unresolved gypsum deposits problem . While a technical solution has been proposed, it has not yet been implemented and evaluated . Even if the technical problem can be resolved, the project's ERR of 4.7 percent is not competitive with projects using natural gas . The use of HFO as comparator is not justified because more economical natural gas and wood waste are available as alternative primary fuels . The project's financial internal rate of return (FIRR) under a variety of assumptions never exceeds 7.76 percent, which is not financially attractive . However, given the demonstration nature of this project, the findings of this demonstration experience are of value and need to be recognized.

2) **To reduce emission of greenhouse gases (GHG) and sulfur dioxide (SO2).** *This objective was partially achieved.*

Based on a projected supply of 270,000 MWh annually, reduction in fuel consumption at Klaipeda Energija (KE) is about 14.5 M m3 of natural gas or about 13,170 tons of mazut. However, since the plant is operating at partial capacity because of technical problems, the benefits from CO2 and SO2 reductions are delayed until the plant is operating at full capacity.

3) To promote sustainable management and development of environmentally sound and non-polluting geothermal sources both in a national and regional perspective. *This objective was not achieved.* Although the Ministry of Environment has expressed strong interest for additional geothermal plants in Lithuania, no new geothermal plant is being planned.

4. Significant Outcomes/Impacts:

- EG staff and management have acquired the knowledge and skills to prepare, supervise and manage a geothermal plant.
- A Direct Heating Law was enacted in July 1, 2003. The Law will promote the development and use of renewable energy sources, and will obligate KE to buy heat generated by Geoterma at a price based on KE's actual heat production cost.

5. Significant Shortcomings (including non-compliance with safeguard policies):

- Although calculations were included in the annex, the SAR did not make it sufficiently clear that the project, with an ERR of 4.6 percent (against the natural gas alternative), was not expected to be economically justified, even inclusive of global environmental benefits
- Serious technical design problems had severely delayed the completion and full operation of the project. Design issues resulting from insufficient analysis of geothermal heat, changes in environmental law and in the utilization of Klaipedos Energija's (KE) Eastern Boiler House pumps, led to changes in the plant's design mid-way through implementation and in delays in completing the plant. During operation, additional technical problems due to gypsum crystallization in injection wells and pumps resulted in below capacity utilization of the plant.
- Demand forecast for overall heat needs of Klaipeda was overestimated. Experts failed to anticipate that heat consumption would drop when customers were required to pay for heat, which led to overcapacity in heat supply.
- Enterprise Geoterma (EG) is operating at a loss. Delays in production due to a variety of technical problems and lower than expected demand contributed to EG's poor financial position. KE's refusal to honor the take or pay contract (ToP) in part because of overall lower demand for heat and the delayed certification of the plant as a reliable supplier of heat contributed to EG's financial losses.
KE is purchasing only 25 MW during the summer season, instead of the 40 MW that EG can supply, at a price of LTL 46/MWh instead of the agreed price of LTL 54/MWh.

6. Ratings:	ICR	OED Review	Reason for Disagreement /Comments
Outcome:	Satisfactory	Moderately Unsatisfactory	The feasibility of using geothermal water for district heating, which was the main objective of the project, has not been demonstrated. Although mitigating measures are underway to resolve the problem of gypsum crystallization, the effectiveness of these measures is yet to be tested and the technical soundness of the project is not guaranteed until certified by Lithuania's State Commission. Furthermore, with an ex-post ERR of 4.7 percent, inclusive of global environmental benefits, the project is not competitive with natural gas. However, the demonstration benefit of the project has some value that is acknowledged
Institutional Dev.:	Substantial	Substantial	
Sustainability:	Likely	Non-evaluable	The sustainability of the project is contingent on the resolution of the plant's technical problem, which at this time is yet unresolved.
Bank Performance:	Satisfactory	Satisfactory	As noted in the ICR, persistent technical problems could have been avoided if there was thorough supervision at critical stages in the design preparation and project implementation. On the other

			hand, the Bank tried to find creative ways to make the project work.
Borrower Perf .:	Satisfactory	Satisfactory	
Quality of ICR :		Satisfactory	

NOTE: ICR rating values flagged with '*' don't comply with OP/BP 13.55, but are listed for completeness.

7. Lessons of Broad Applicability:

- The Bank and the Borrower should ensure extensive oversight over design and implementation to minimize technical problems, especially in pioneering and demonstration type of projects .
- Enforcing contractual arrangements is likely to be difficult when ownership of public utilities changes hands, and in the absence of laws that govern legal obligations between contracting parties, whether they are public or private entities.

8. Assessment Recommended? Yes No

Why? To ascertain whether the technical and financial issues have been resolved . Should be audited along with the Power Rehab. project.

9. Comments on Quality of ICR:

The quality of the ICR is (marginally) Satisfactory overall. The ICR is comprehensive and covers relevant issues . But weaknesses include: (i) key performance indicators should have been provided in Annex 1; (ii) disconnect between ERR and FIRR results, which do not demonstrate the feasibility of the demonstration plant, and the satisfactory outcome rating; (iii) inconsistent SAR figures for ERR compared to natural gas (ERR was 4.6 percent in the SAR, but was cited as 6.6 percent in the ICR); and (iv) inconsistent project closing date (the ICR cited April 30, 2002 while the Memorandum of the President noted July 31, 1999. This Evaluation Summary used the latter date .