GEF IEO Terminal Evaluation Review form (retrofitting of APR2004 cohort)

This form is for retrofitting of the TERs prepared for APR2004. While several topics covered in this form had already been covered in the earlier form, this revised form adds several other performance and impact related concerns.

1. Project Data

Summary project data			
GEF project ID		106	
GEF Agency project ID		P035758; P036011 (IEG Review #)	
GEF Replenishment Phase		GEF-1	
Lead GEF Agency (include all for joint projects)		World Bank	
Project name		Klaipeda Geothermal Demonstration Project	
Country/Countries		Lithuania	
Region		ECA	
Focal area		Climate Change	
Operational Program or Strategic Priorities/Objectives		OP6 – Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs	
Executing agencies involved		Enterprise Geoterma (EG) – private firm at one time a branch of the Lithuania State Power system	
NGOs/CBOs involvement		Not involved	
Private sector involvement		Lead executing agency	
CEO Endorsement (FSP) /Approval date (MSP)		November, 1995	
Effectiveness date / project start		October 30, 1996	
Expected date of project completion (at start)		July 31, 1999	
Actual date of project completion		December, 2002	
Project Financing			
		At Endorsement (US $M)	**At Completion (US $M)**
Project Preparation Grant	GEF funding	-	-
	Co-financing	-	-
GEF Project Grant		6.9	6.9
Co-financing	IA/EA own		
	Government		
	Other*		
Total GEF funding		6.9	6.9
Total Co-financing		11.12	10.75
Total project funding (GEF grant(s) + co-financing)		18.02	17.65
Terminal evaluation/review information			
TE completion date		June 2003	
TE submission date			
Author of TE			
Original GEF IEO TER (2004) preparer		Baastel	
Original GEF IEO TER (2004) reviewer		Siv Tokle	
Revised TER (2014) completion date			
Revised TER (2014) prepared by		Joshua Schneck	
TER GEF IEO peer review (2014)		Neeraj Negi	

*Includes contributions mobilized for the project from other multilateral agencies, bilateral development, cooperation agencies, NGOs, the private sector, and beneficiaries.

2. Summary of Project Ratings

Criteria	Final PIR	IA Terminal Evaluation	IA Evaluation Office Review	GEF EO Review
Project Outcomes	S	S	MU	MS
Sustainability of Outcomes	N/R	L	NR	ML
M&E Design	N/R	N/R	N/R	MU
M&E Implementation	S	N/R	N/R	MS
Quality of Implementation	N/R	S	S	MS
Quality of Execution	S	S	S	MS
Quality of the Terminal Evaluation Report	-	-	S	MS

3. Project Objectives

3.1 Global Environmental Objectives of the project:

The Global Environmental Objective, as described in the Project Document, is to reduce emissions of GHGs and sulfur dioxide that contribute to climate change, by displacing heavy fossil fuel oil used for district heating in Lithuania. Estimated annual emission reductions of CO2 are 47,800 tons if natural gas is replaced and 51,940 tons if heavy fuel oil is replaced. HFP substitution would also result in an estimated reduction of 1,160 tons of SO2 per year.

3.2 Development Objectives of the project:

As stated in the Project Document, the project's Development Objectives are as follows:

- To provide a mechanism for the GEF to test the feasibility and value of using low temperature geothermal water as a renewable, indigenous energy resource in district heating systems;
- To reduce emissions of GHGs and sulfur dioxide, along with associated particulate matter and nitrous oxide emissions, by replacing gas and heavy oil used for district heating; and
- To promote sustainable management and development of environmentally sound and non-polluting geothermal resources both in a national and regional perspective.

Other benefits include achieving savings in foreign currency exchange used to import fossil fuels for heating purposes.

3.3 Were there any **changes** in the Global Environmental Objectives, Development Objectives, or other activities during implementation?

There were **no** changes to the GEO or DOs throughout implementation. However the scope, type and number of activities were revised a number of times in order to solve the emerging technical problems that occurred during the implementation of the project, and in order to increase the geothermal heat generation capacity of the plant, thus ensuring EG's status as a reliable heat supplier (ICR, pg. 5).

4. GEF EO assessment of Outcomes and Sustainability

Please refer to the GEF Terminal Evaluation Review Guidelines for detail on the criteria for ratings.

Relevance can receive either a Satisfactory or Unsatisfactory rating. For Effectiveness and Cost efficiency, a six point rating scale is used (Highly Satisfactory to Highly Unsatisfactory), or Unable to Assess. Sustainability ratings are assessed on a four-point scale: Likely=no or negligible risk; Moderately Likely=low risk; Moderately Unlikely=substantial risks; Unlikely=high risk. In assessing a Sustainability rating please note if, and to what degree, sustainability of project outcomes is threatened by financial, sociopolitical, institutional/governance, or environmental factors.

Please justify ratings in the space below each box.

4.1 **Relevance**	Rating: **Satisfactory**

The project was relevant to both the GEF and National priorities at the time of approval. Consistent with OP6 – Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs – the project provides a mechanism for the GEF to test the feasibility of a RE technology as a means for reducing GHG emissions, thus furthering the overall objective of reducing the threat of harmful climate change. As stated in the PD, "The project is eligible for GEF funding as it conforms to the Guidance for programming GEF Resources in 1995 in that: (a) it is sustainable (as in, it supports a sustainable resource – geothermal energy); (b) it is a national priority in the National Energy Strategy; (c) it provides the means of abating GHG at a cost below US $25 per ton carbon; (d) it includes an essential transfer of technology; and (e) it would develop an indigenous and renewable energy resource" (PD, pg iv). For the Lithuanian government, the project's alignment with national priorities can be seen in the text of the 1992 GOL National Energy Strategy, which states as a priority goal "...the development of indigenous and renewable energy sources in order to increase Lithuania's energy independence and security of heat supply" (ICR, pg 3).

4.2 **Effectiveness**	Rating: **Moderately Satisfactory**

Project effectiveness is rated as moderately satisfactory, as not all objectives were fully achieved, but overall, the project has been successful in piloting a relatively new renewable energy technology, with reasonable prospects for broader adoption. Achievements and challenges under the three stated project objectives are as follows:

1. *To demonstrate the feasibility and value of using low temperature geothermal water in district heating* – This objective was achieved to a modest extent. Numerous technical difficulties plagued the project throughout implementation. These included water temperatures lower than originally expected; unexpected low hydrological flow potential at the first drilled injection well, necessitating the need to drill an additional well and associated piping; need to install steam boilers to run in-plant equipment during the summer after the district heating owner KE decided to stop running their Easter Boiler House due to the low demand for heat; and most significantly, the clogging up of injection wells from gypsum crystals – clean-up of which is ongoing at the time of the ICR. The ability to successfully address the crystallization problem is

critical to the long-term success of the project. At the point of project completion, the plant had only been able to operate at full capacity for a short period in November 2002 – demonstrating that in principle, it is able to extract heat at the expected level from the geothermal water (ICR, pg 8). Nevertheless, the ICR states that the technical problem of crystallization is expected to be resolved by mid-2003, at a cost of $300,000 (financed by a grant from the Danish EPA), through the use of an inhibitor substance injected into the wells (ICR, pg 17).

2. *To reduce emission of GHGs and SO2 and particulate matter* – this objective has been partially achieved. ICR states that under expected operational conditions, the plant will reduce 33,500 tons of CO2 (if natural gas is replaced which seems more reasonable than heavy heating oil which is more expensive) (ICR, pg 8). This is about 70% of the original target. This is dependent upon the plant overcoming the technical challenge of crystallization, described above. It should also be noted that part of the challenge in maximizing GHG reductions stems from both legal wrangling with KE (owner of the distribution network and purchaser of heat from EG (geothermal plant)) over whether KE has to honor previous contract, and an overestimation of the demand for heat, following conversion to a market economy where customers are now required to pay for heat. If EG plant were able to operate at full capacity, the GHG targets would be achieved. There is the possibility that EG will be able to maximize its output in the future, as additional customers are secured and the legal wrangling with KE is resolved, but at the time of the ICR, these developments have not happened.
3. *To promote sustainable management and development of environmentally sound and non-polluting geothermal resources both in a national and regional perspective* – achievement of this objective is somewhat speculative. The ICR states that the project successfully transferred knowledge and skills on how to run a geothermal plant, and that this knowledge can now be used in Lithuania by EG to expand geothermal resources and thereby increase Lithuania's energy security and reduce its environmental footprint (ICR, pg 14). Furthermore, the ICR states that the project has had a direct impact on the Draft Law on Heating, now under review by Parliament. The law includes provisions that promote the used and development of renewable energy resources, and specifically proposes that district heating companies be obliged to buy available heat produced by renewable energy resources. However, the law has yet to be adopted, and no new geothermal plants were being planned at the time of the ICR.

4.3 **Efficiency**	Rating: **Moderately Satisfactory**

The project experienced substantial technical difficulties requiring modification of some project activities. The project's closing date was extended four times, with final closure occurring 2.5 years later than expected. The ICR states that slow initial preparation of bidding documents for well drilling were major reasons for the delay (ICR, pg 16). Moreover, the technical assistance provided through a consultative company, responsible for key components of the project's design, did not live up to expectations (ICR, pg 21). Despite these challenges, the project managed to be completed within budget. The cost of the absorption heat pumps was substantially lower than expected: ~$5 million

lower. These savings made it possible to address the cost overruns due to technical difficulties experienced during the course of the project (ICR, pg 17). On balance these led to a minor net saving at the project level. While the project is currently not competitive with heat produced from natural gas, the environmental benefits (and full damages/risks of continued use of fossil fuels, including natural gas) of geothermal need to be fully considered in making any such appraisal as to the net benefits of geothermal. These include the GEF's interest in promoting viable means for reducing GHG emissions. Furthermore, increased mandates on the use of renewables should further improve the economic competitiveness of geothermal (ICR, pg 18).

4.4 **Sustainability**	Rating: **Moderately Likely**

Sustainability is rated as moderately likely, as there are moderate risks to the sustainability of project outcomes, but on balance, these appear to be manageable. ICR states the "capacity to address technical issues is likely given management and staff experience gained through training and operation of the plant and new, additional financing obtained from DEPA" (ICR, pg 17). Sustainability is assessed along the following four dimensions:

a) *Environmental sustainability* – (**L**) there are no material threats to the sustainability of project outcomes related to environmental concerns.

b) *Financial sustainability – **(ML)*** The overall assessment on financial sustainability of project outcomes is based on balancing a number of factors – some which suggest that the project will not be sustainable over the long-term and others that suggest it will. At the time of the ICR, there were ongoing legal wrangling over whether or not KE, the owner of the distribution network, needs to honor the contact with EG it inherited from the previous owner. The contract stipulates a higher price for EG's heat than KE has so far been willing to pay. At the moment, the outcome of this dispute is not certain and difficult to predict. On the other hand, ICR states that the new Heat Law that the GOL is in the process of passing should help EG in obtaining a higher price for its heat and create additional demand for renewable energy (ICR, pg 18). ICR states that EG has been able to sign a contract to directly supply one company in the Free Economic Zone (FEZ) with heat (at a considerably higher price than what it gets from KE). There are prospects for additional customers going forward. Finally, the price of fossil fuels, always difficult to predict, will have a significant bearing on the sustainability of renewables including geothermal, throughout Lithuania.

c) *Institutional sustainability (**ML**)* – ICR states that project was successful in transferring knowledge and skills on how to run a geothermal plant, and that this knowledge can now be used by EG to expand geothermal operations. The technical challenges, which not yet fully resolved, appear to be manageable.

d) *Socio-Political sustainability* (**L**) – While there are concerns over the lack of alignment of interests of KE, the owner of the distribution network, and EG, over time, these appear to be less of a factor given the likelihood of an increased mandate to purchase renewably-sourced heat and the ability of EG to find additional direct customers. Moreover, ICR states that support

for the project is strong at the national level (ICR, pg 10). This is evidenced by the draft Heating laws provisions for renewables, and, as the ICR states "MOE has recently expressed a strong interest for further geothermal plants in Lithuania (ICR, pg 10).

5. Processes and factors affecting attainment of project outcomes

5.1 Co-financing. To what extent was the reported co-financing essential to the achievement of GEF objectives? If there was a difference in the level of expected co-financing and actual co-financing, then what were the reasons for it? Did the extent of materialization of co-financing affect project's outcomes and/or sustainability? If so, in what ways and through what causal linkages?

Expected and materialized co-financing were very close. A further grant of $0.3 from the DEPA was used to finance resolution of the gypsum crystallization problem, which is important the sustainability of the project. An EU-Phare grant of $0.12 did not materialize, although no information on why is provided in the ICR. Differences in actual co-financing were due to differences in the actual cost of project components, and not to any failure on the part of co-financiers to deliver on their expected contributions.

5.2 Project extensions and/or delays. If there were delays in project implementation and completion, then what were the reasons for it? Did the delay affect the project's outcomes and/or sustainability? If so, in what ways and through what causal linkages?

Project was extended for 2.5 years largely to give time in dealing with the technical challenges of the project. ICR attributes many of these delays to the consultancy company charged with providing technical assistance. The support "did not live up to expectations" and has caused considerable delay in implementation, as well as delays in rectifying design problems. ICR states that "it is very clear that these delays resulted in financial losses for EG, and contributed to the reluctance by the State Commission to certify the geothermal plant (ICR, pg 21).

5.3 Country ownership. Assess the extent to which country ownership has affected project outcomes and sustainability? Describe the ways in which it affected outcomes and sustainability, highlighting the causal links:

Country ownership at the national level appears to be strong, and is evidenced in the language of the draft Heat Law, that makes specific provisions for the expanded use of renewables, including geothermal power. Such support is critical for ensuring the long-term financial viability of geothermal power in Lithuania.

6. Assessment of project's Monitoring and Evaluation system

Ratings are assessed on a six point scale: Highly Satisfactory=no shortcomings in this M&E component; Satisfactory=minor shortcomings in this M&E component; Moderately Satisfactory=moderate shortcomings in this M&E component; Moderately

Unsatisfactory=significant shortcomings in this M&E component; Unsatisfactory=major shortcomings in this M&E component; Highly Unsatisfactory=there were no project M&E systems.

Please justify ratings in the space below each box.

6.1 **M&E Design at entry**	Rating: **Moderately Unsatisfactory**

Design of the project's M&E system is rated as moderately unsatisfactory, as there are significant shortcomings in design. KPIs, shown in Annex 7 in the PD are vague, and there are no targets or clear scheduling on when progress on M&E indicators is expected to be collected and reported on, beyond a general requirement to submit semi-annual progress reports on each project component (PD, pg 23). It's also not clear from the PD how M&E findings are to be used in adaptive management. It's conceivable that a more well thought out M&E plan would have identified at an earlier point in time issues with the quality of the water that led to the crystallization problem, as well as problems in the placement of the return well that necessitated drilling a second well. Moreover, ICR notes that the injection wells were not properly cleaned during commissioning of the plant and quality of the cleaning was not tested leading to a shut-down of the plant. A more detailed M&E plan – one calling for just this kind of testing and verification - might have identified this issue before it became a more significant problem.

6.2 **M&E Implementation**	Rating: **Moderately Satisfactory**

There is little evidence provided in the ICR that the project's M&E findings were used for adaptive management. Moreover, ICR notes that more intensive supervision and technical assistance by the Danish consultant during implementation could have reduced some of the project delays and solved technical problems sooner. That said, the project management did respond to all of the technical challenges that were experienced by the project, conducted a MTR, submitted required PIRs and the ICR, and in general, appear to have monitored some of the key KPIs (fuel usage, water temperature, sales of heat energy, CO2 emission reductions attributed to pilot runs of geothermal plant – calculated on basis of displaced fossil fuel use) throughout the project. M&E implementation is therefore rated as moderately satisfactory on balance.

7. Assessment of project implementation and execution

Quality of Implementation includes the quality of project design, as well as the quality of supervision and assistance provided by implementing agency(s) to execution agencies throughout project implementation. Quality of Execution covers the effectiveness of the executing agency(s) in performing its roles and responsibilities. In both instances, the focus is upon factors that are largely within the control of the respective implementing and executing agency(s). A six point rating scale is used (Highly Satisfactory to Highly Unsatisfactory), or Unable to Assess.

Please justify ratings in the space below each box.

7.1 **Quality of Project Implementation**	Rating: **Moderately Satisfactory**

ICR rates Bank supervision as satisfactory. This review downgrades the implementation rating slightly to moderately satisfactory, largely on the basis of a weak M&E design and lack of more thorough supervision that, had it been stronger, might have led to earlier detection of problems experienced (any yet not unanticipated) by the project. At the same time, as the ICR reports, preparation and supervision were closely coordinated with the co-financier, enabling emerging problems to be resolved satisfactorily (ICR, pg 20). Supervision missions were undertaken regularly to Klaipeda every 6 months and continuous implementation support was provided by the Bank. The Bank also exercised flexibility with respect to the project, approving 4 extensions in the project's closing date, that allowed EG to address technical and legal challenges and achieve project objectives to the extent possible.

7.2 **Quality of Project Execution**	Rating: **Moderately Satisfactory**

Execution of some aspects of the project, in particular, those undertaken by EG, appear to have been done well. That is, EG was able to manage construction of the plant, deal with problems as they were encountered, and achieve much of the project's objectives while managing to stay within the project's budget. The ICR does fault the Danish consultancy company for incompetence that contributed to the project's delays and financial losses for EG. Responsibility for the choice and output of this consultancy company is not clear from the ICR.

8. Assessment of Project Impacts

8.1 Environmental Change. Describe the changes in environmental stress and environmental status that occurred by the end of the project. Include both quantitative and qualitative changes documented, sources of information for these changes, and how project activities contributed to or hindered these changes. Also include how contextual factors have contributed to or hindered these changes.

While there are estimates for a reduction in GHGs and particulate matter to be achieved if and only the project succeeds in addressing technical problems related to crystallization – these had not been achieved to any appreciable level at the point of project completion. As stated above, technical, legal, and demand challenges have worked to prevent this project from fully delivering its expected environmental benefits. Moreover, the ICR does not provide any accounting of particulate matter reductions that would be achieved under alternative scenarios.

8.2 Socioeconomic change. Describe any changes in human well-being (income, education, health, community relationships, etc.) that occurred by the end of the project. Include both quantitative and qualitative changes documented, sources of information for these changes, and how project activities contributed to or hindered these changes. Also include how contextual factors have contributed to or hindered these changes.

ICR does not report any change in socioeconomic well-being that occurred due to the project. It's conceivable that some reductions in the cost of imported fuel have been achieved, but as to their precise amounts, any accounting here is speculative.

8.3 Capacity and governance changes. Describe notable changes in capacities and governance that can lead to large-scale action (both mass and legislative) bringing about positive environmental change. "Capacities" include awareness, knowledge, skills, infrastructure, and environmental monitoring systems, among others. "Governance" refers to decision-making processes, structures and systems, including access to and use of information, and thus would include laws, administrative bodies, trust-building and conflict resolution processes, information-sharing systems, etc. Indicate how project activities contributed to/ hindered these changes, as well as how contextual factors have influenced these changes.

> a) Capacities – ICR reports that the project was successful in transferring the knowledge and skills needed on how to run a geothermal plant to EG – the Lithuanian company responsible for the plant. The knowledge gained from the project can now be used in Lithuania by EG to expand geothermal energy operations in the future where economically feasible. The GOL will also now have resources on which to draw, should it with to pursue the further development of geothermal resources to increase Lithuania's energy security (ICR, pg. 14).
>
> b) Governance – As stated in the ICR, the project has had a direct impact on the draft law on Heating, now under review by the Parliament. The law is worded in such a way that it promotes the use and development of renewable energy resources. Furthermore, it specifically proposes that the district heating companies be obliged to buy heat produced from renewable sources ICR, pg 14).

8.4 Unintended impacts. Describe any impacts not targeted by the project, whether positive or negative, affecting either ecological or social aspects. Indicate the factors that contributed to these unintended impacts occurring.

The project had not unintended impacts, according to the ICR.

8.5 Adoption of GEF initiatives at scale. Identify any initiatives (e.g. technologies, approaches, financing instruments, implementing bodies, legal frameworks, information systems) that have been mainstreamed, replicated and/or scaled up by government and other stakeholders by project end. Include the extent to which this broader adoption has taken place, e.g. if plans and resources have been established but no actual adoption has taken place, or if market change and large-scale environmental benefits have begun to occur. Indicate how project activities and other contextual factors contributed to these taking place. If broader adoption has not taken place as expected, indicate which factors (both project-related and contextual) have hindered this from happening.

The ICR states that the project has “established a framework” for the demonstrations of the potential for adopting environmentally sustainable provision of energy in Lithuania. However, at the point of project completion no broader adoption had taken place. The TE reports that a draft law on Heating- which calls for the expanded use of renewables in Lithuania - was influenced by this project. However, the law had not been approved, and the degree to which this project contributed to any language appears to be largely speculative.

9. Lessons and recommendations

9.1 Briefly describe the key lessons, good practices, or approaches mentioned in the terminal evaluation report that could have application for other GEF projects.

According to the ICR, the project generated the following key lessons:

- Project has demonstrated the possibility of using low temperature geothermal energy in Lithuania and elsewhere it is available;
- Opportunities for using geothermal energy for other purposes, including health care, medicine, tourism;

9.2 Briefly describe the recommendations given in the terminal evaluation.

- More careful analysis of demand forecasts for energy in projects of this nature is needed, as overall heat needs of Klaipeda were overestimated following conversion to a market economy;
- In the event of a future geothermal project, it is highly recommended that the plant be part of the district heating company (distribution company) in order to optimized benefits;
- It could be debated if a turn-key (payment on results) approach would have been better in terms of more clearly defining responsibilities during the implementation phase. Clearly, a higher cost would have been the result, but given the lost time and revenues experienced for nearly two years, it appears that such a contract would have been more costs effective. The risk of failure then would have clearly rested with the supplier.

10. Quality of the Terminal Evaluation Report

A six point rating scale is used for each sub-criteria and overall rating of the terminal evaluation report (Highly Satisfactory to Highly Unsatisfactory)

Criteria	GEF EO comments	Rating
To what extent does the report contain an assessment of relevant outcomes and impacts of the project and the achievement of the objectives?	ICR contains an adequate assessment of relevant outcomes and potential impacts of the projects, and achievement of objectives. However, these are not always supported with appropriate performance indicators.	**MS**
To what extent is the report internally consistent, the evidence presented complete and convincing, and ratings well substantiated?	Report is largely complete, however ratings are not always well substantiated or consistent with the text. This includes the overall ratings (ICR states MS in the text and puts S in the ratings table; ICR states execution of TA component of the project is Unsatisfactory, yet awards an S rating for Execution; rating on Bank supervision is S and yet ICR identifies that more thorough supervision could have identified/prevented some of the projects problems).	**MS**
To what extent does the report properly assess project sustainability and/or project exit strategy?	ICR provides a fairly detailed account of the threats to project sustainability. It may have provided more value had it also documented experiences of other plants in addressing the crystallization problem, which it states as being manageable.	**S**
To what extent are the lessons learned supported by the evidence presented and are they comprehensive?	Lessons are well supported, concise. Could have used a bit more on the project's M&E failings and how improvements in this regard could strengthen future projects.	**MS**
Does the report include the actual project costs (total and per activity) and actual co-financing used?	Yes, report includes actual project costs and co-financing. There is no breakdown of money spent under the TA and Training component however.	**MS**
Assess the quality of the report's evaluation of project M&E systems:	ICR does not adequately discuss or report on the project's M&E and in fact leaves Log frame Matrix of KPIs in Annex 1 blank	**MU**
Overall TE Rating		**MS**

Overall TE rating: 0.3* (4+4) + 0.1 * (5+4+4+3) = 4

11. Note any additional sources of information used in the preparation of the terminal evaluation report (excluding PIRs, TEs, and PADs).