

Terminal Evaluation Review form, GEF Evaluation Office, APR 2014

1. Project Data

Summary project data			
GEF project ID		381	
GEF Agency project ID		508	
GEF Replenishment Phase		Pilot Phase	
Lead GEF Agency (include all for joint projects)		UNDP	
Project name		Biomass Integrated Gasification/Gas Turbine Project	
Country/Countries		Brazil	
Region		LAC	
Focal area		Climate Change	
Operational Program or Strategic Priorities/Objectives		OP7: Reducing the long-term costs of low greenhouse gas-emitting energy technologies	
Executing agencies involved		Ministry of Science and Technology	
NGOs/CBOs involvement		Not involved	
Private sector involvement		Secondary executing agents	
CEO Endorsement (FSP) /Approval date (MSP)			
Effectiveness date / project start		April 1992	
Expected date of project completion (at start)		April 1995	
Actual date of project completion		October 1997	
Project Financing			
		At Endorsement (US \$M)	At Completion (US \$M)
Project Preparation Grant	GEF funding		
	Co-financing		
GEF Project Grant		8.115	8.113
Co-financing	IA own		
	Government		
	Other multi- /bi-laterals		
	Private sector		
	NGOs/CSOs		
Total GEF funding		8.115	8.113
Total Co-financing			
Total project funding (GEF grant(s) + co-financing)		8.115	8.113
Terminal evaluation/review information			
TE completion date		—	
TE submission date		—	
Author of TE		?	
TER completion date		September 2014	
TER prepared by		Joshua Schneck	
TER peer review by (if GEF EO review)		Neeraj Negi	

2. Summary of Project Ratings

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

3. Project Objectives

3.1 Global Environmental Objectives of the project:

The long-term Global Environmental Objective of this project, as stated in the Project Document (PD), is to reduce net emissions of greenhouse gas emissions (GHGs) that contribute to climate change by displacing fossil-fuel energy sources with biomass sources of energy. The initial focus of the project is on the Brazilian energy sector, but it is expected that if the project technology is successful, many other countries would present favorable conditions for replication. It is noted that this project is an intermediate, Phase II, component of a three-phase project, and no GHG reductions are expected to occur by the time project activities are complete.

3.2 Development Objectives of the project:

The Development Objectives of the project, as stated in the PD, are *“to establish a globally replicable prototype unit on a commercial scale for the cogeneration of electricity based on the gasification of wood chips or sugarcane bagasse. No native forests will be used in fulfilling this objective.”* The PD also states that in addition to this key objective, *“the project will serve as the basis for developing a broad action plan to substitute biomass, mainly wood chips and sugarcane bagasse, for fossil fuels, initially in Brazil, and later in other countries.”* Finally, the PD also states that successful implementation of the project’s technology offers the potential for high rural employment.

Phase II is designed to resolve key engineering, business, economic and financial questions, resulting in the preparation of design documents for the establishment of a commercial demonstration plant. Actual construction of the gasifier/turbine demonstration plant is to occur in Phase III.

The PD defines the following four immediate objectives, with associated outputs, that this Phase II project is expected to achieve:

1. Development and testing of gas turbines suitable for biomass gasification and gas cleaning equipment;
2. Development and specification of the basic engineering and process work for the gasification plants;
3. Selection of the site for building the pilot plant and development of the necessary environmental assessment studies;

4. Elaboration of a plan for developing Phase III, including the development of pre-investment economic studies, proposal of institutional and organizational arrangements, elaboration of contract proposals for fuel supply and energy sales, and joint-venture agreements.

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

No.

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
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The project is relevant to both Brazil and the GEF. For Brazil, alignment with project objectives is seen in the Brazilian power sector Environmental Master Plan, in effect at the time of project approval, and that specifically calls for undertaking a large number of environmental studies and impact evaluations on ways to supply and generate power in an environmentally benign and socially responsible way (PD, pg 3). The PD states that the Biomass Integrated Gasification and Gas Turbine power generation technology being pursued by this project holds great potential for the Brazilian power sector for several reasons including: (1) approaching limits to further electrical generation capacity through exploitation of hydrological resources; (2) abundance of locally-sourced biomass in Brazil; (3) expected growth in demand for electricity (PD, pg 9). In addition, the project is expected to ultimately generate rural employment opportunities.

For the GEF, the project is consistent with Operational Program 7, which seeks to reduce the long-term costs of low greenhouse gas-emitting energy technologies. Energy produced from biomass is potentially carbon-neutral over the complete lifecycle, depending upon the way in which biomass is sourced (i.e., whether or not harvested biomass is continuously replanted in an environmentally sustainable manner) (PD, pg 6). The feasibility of this technology was favorably assessed in a Phase I component of this project.

4.2 Effectiveness	Rating: Satisfactory
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The project was largely successful in achieving most of the expected outcomes, with some project components - environmental impact study and study of issues related to connectivity to the electric system – pushed to a Phase III project, for which proposal documents were developed as anticipated.

Progress is further detailed along the four immediate objectives defined in the PD:

1. *Development and testing of gas turbines suitable for biomass gasification and gas cleaning equipment* – These activities were performed by General Electric company, and were successfully completed according to the TE. Work including customization of a gas turbine model originally intended for natural gas usage, but reconfigured for biogas which has a lower caloric heat value. The prototype turbine was tested at GE’s facilities using fuel synthesized from both TPS and BIOFLOW (the two companies contracted to design biomass gasification systems) (TE, pg 67). There are some concerns that impurities in the biomass gas will necessitate shorter service intervals for the equipment, thus raising the costs of operating this technology. However, the TE does not elaborate on how serious a concern this is.
2. *Development and specification of the basic engineering and process work for the gasification plants* - According to the TE, these objectives were satisfactorily achieved, with the choice of atmospheric gasification technology (and supplier – TPS) over pressurized gasification technology made mid-way through the project, as envisioned, and based on an assessment of the demonstrated strengths of each approach (TE, pg 60).
3. *Selection of the site for building the pilot plant and development of the necessary environmental assessment studies* – Activities under this objective experienced some shortcomings. According to the TE, an initial site was chosen following studies by JPE (contracted consulting company), however, the site had to be abandoned after failure to successfully conclude a fuel supply contract with the land holder. A new site was chosen, at the Lagoa Bonita farm. According to the TE, the delay resulting from the need to find another site meant that the environmental and connectivity studies, while currently underway, will not be concluded until a Phase III project has begun (TE, pg 110).
4. *Elaboration of a plan for developing Phase III, including the development of pre-investment economic studies, proposal of institutional and organizational arrangements, elaboration of contract proposals for fuel supply and energy sales, and joint-venture agreements.* A detailed proposal for developing a Phase III project was developed, as called for in the PD. Some elements of a Phase III project need additional work. These include completion of the Energy Sale contract, which requires further negotiation with stakeholders but that is, according to the TE, largely complete (TE, pg 11). In addition, while fuel supply negotiations at the first proposed plant site were not successfully concluded, the ultimate site chosen includes areas for establishing a plantation for subsequent fuel supply (TE, pg 82). Thus, the TE finds that this objective has been successfully achieved.

4.3 Efficiency	Rating: Moderately Satisfactory
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While the TE finds most of the contracted activities were successfully completed on time and as anticipated by the PD, some project components experienced delays and challenges that prevented some project activities, namely the environmental impact study and study of issues related to connectivity to the electric system, from being completed by the end of this Phase II project. TE notes minor delays in the work of developing gasification technology, but spending more time on the activities was important for achieving consistency of results, and did not ultimately affect the project (TE, pg 90). More significant were the delays caused by the need to find a second site for a pilot plant, after negotiations for a wood supply contract could not be successfully concluded. The TE does not elaborate on whether or not challenges at the first sight could have been anticipated in the PD, or were the result of actions taken by project management. However, the end result of these delays is that two important project components – the environmental impact study and study of connectivity issues – have been pushed forward to a Phase III project. TE states that both of these studies have already begun.

4.4 Sustainability	Rating: Moderately Likely
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TE notes that planning for Phase III of this project has been successfully concluded, and that prospects for sustainability of project outcomes are therefore likely. Uncertainties concern the need for environmental and connectivity studies to be successfully carried out, and the fact that a subsequent project is not guaranteed. The intermediate nature of project outputs, which consists of engineering studies and technological prototypes which, although tested in laboratories, have yet to prove their commercial worth, means that sustainability of project outcomes will clearly require additional funding and follow-up. Overall project sustainability is rated as moderately likely, based on the TE finding that there are good prospects for a follow-on project, with Phase III planning concluded and a consortium of project proponents already in place to continue the work assuming project funding and approval can be secured.

The TE does not discuss sustainability of project outcomes in sufficient detail to allow for ratings along sub-dimensions of project sustainability (environmental, socio-political, institutional, financial).

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?

The project was designed to be entirely financed by a GEF grant, although a preliminary Phase I project was financed by other stakeholders (the Rockefeller foundation). Likewise, Phase III, upon which the sustainability of project outcomes is largely dependent, is to be financed by other stakeholders,

including the World Bank and Shell. TE states that the World Bank allocated around \$0.48 million to the project for preparation of Phase III, however, this funding is not shown as having contributed to any project activities that were reported on in the TE. The additional project expenditures, over and above the \$7.7 million project budget, were financed by the GEF.

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?

As noted above, the project experienced delays caused by the need to find a second site for a pilot plant, after negotiations for a wood supply contract could not be successfully concluded. The TE does not elaborate on whether or not challenges at the first site could have been anticipated in the PD, or were the result of actions taken by project management. However, the end result of these delays is that two important project components – the environmental impact study and study of connectivity issues – have been pushed forward to a Phase III project. TE states that both of these studies have already begun.

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:

TE does not discuss the issue of country ownership or provide sufficient information relevant for undertaking an analysis on the topic.

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
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The project was designed without a detailed or robust M&E system. The PD only states that the project will be subject to tripartite review at least once every twelve months, and that project performance reports will be prepared prior to each review meeting, and that a terminal evaluation report will be prepared at the conclusion of project activities. No indicators or targets are defined in the PD, other than the very general target for the size of the pilot plant’s generating capacity. To a large degree, the project appears to rely upon the expertise and reputation of the contacted companies (GE, TPS, and others), to manage the M&E of contracted work components themselves. Some additional targets may

have been included in the pre-feasibility outputs that emerged from Phase I of this three-phase project, but the PD and TE do not discuss these outputs in any detail.

6.2 M&E Implementation	Rating: U/A
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The TE does not discuss Quality of M&E implementation in sufficient detail to provide a rating.

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: U/A
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The TE does not discuss Quality of Project Implementation in sufficient detail to provide a rating.

7.2 Quality of Project Execution	Rating: U/A
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The TE does not discuss Quality of Project Execution in sufficient detail to provide a rating.

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.

No changes in environmental status are reported to have occurred as a result of this project.

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.

No changes in human well-being are reported to have occurred as a result of this project. This project was an intermediate stage project in a three-phase project, whose effects on human well-being were not expected to come until completion of the three-phase project.

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 – The project generated increased knowledge about using biomass as a substrate for generating biogas, as well as how to generate electricity using biogas. The capacity of private sector stakeholders involved in the project (GE, Shell), as well as the Brazilian Ministry of Science and Technology are the stakeholders who are reported to have benefited from the project’s knowledge building activities.

b) Governance – No changes in governance are reported to have occurred as a result of the project.

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.

No unintended impacts are reported to have occurred as a result of the project.

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.

No adoption of GEF initiatives at scale is reported to have occurred as a result of this project. This project was an intermediate phase in a three-phase intervention, whose impacts were not expected to come until completion of the third phase.

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.

The TE provides only the following lesson:

- The choice and analysis of the plant site required a greater than planned effort, because of the need to change the site originally chose and, consequently, of the change in strategy resulting in a change in the fuel supply.

9.2 Briefly describe the recommendations given in the terminal evaluation.

The TE does not provide any recommendations.

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?	TE does a good job at describing the extent to which project activities were carried out, but provides very little assessment on the relevant outcomes of project activities, the quality of project activities, and the degree to which project outcomes match expectations.	MU
To what extent is the report internally consistent, the evidence presented complete and convincing, and ratings well substantiated?	TE does not provide any ratings. TE does not provide sufficient assessment of project activities and project management operations. While TE does present a detailed account of the project activities that took place, there is little to no detail on the project's management operations, and evidence to support the project's sustainability assessment is not given (see below).	U
To what extent does the report properly assess project sustainability and/or project exit strategy?	TE does detail the extent to which groundwork has been laid for a Phase III project. However, TE's optimistic assessment of the potential for biomass energy to take off in Brazil and elsewhere is not supported by any evidence presented in the TE.	MU
To what extent are the lessons learned supported by the evidence presented and are they comprehensive?	TE does not provide any lessons or recommendations other than to state what was known before the project began – that success of this technology will depend upon economic conditions. No insights are provided from project experiences, either successful or unsuccessful ones.	U
Does the report include the actual project costs (total and per activity) and actual co-financing used?	TE does provide a breakdown of project costs by activity. However, TE does not explain why actual project expenditures were higher than anticipated. In addition, TE states that the WB contributed around \$0.5 million to for preparation of Phase III project, but no accounting of this funding is provided in the TE, even though this output overlaps with this project's expected outputs.	MS
Assess the quality of the report's evaluation of project M&E systems:	TE does not discuss project M&E at all.	HU
Overall TE Rating		MU

Overall TE rating: $(0.3 * (3+2)) + (0.1 * (3+2+4+1)) = 1.5 + 1 = 2.5$

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