

Mozambique: Rehabilitation of switching stations in 3 towns

Ex post evaluation report

OECD sector	23040 - Electricity transmission and distribution	
BMZ project ID	1995 65 656	
Programme-executing agency	Electricidade de Moçambique (EDM)	
Consultant	Lahmeyer International GmbH Bad Vilbel	
Year of ex post evaluation	2006	
	Project appraisal (planned)	Ex post evaluation (actual)
Start of implementation	02/1996	10/2001
Period of implementation	36 months	63 months
Investment costs	EUR 5.42 million	EUR 9.03 million
Counterpart contribution	EUR 0 million	EUR 0 million
Financing, of which Financial Cooperation (FC) funds	EUR 5.42 million	EUR 7.72 million
Other institutions/donors involved	n.a.	n.a.
Performance rating	2	
• Significance/relevance	2	
• Effectiveness	2	
• Efficiency	3	

Brief description, overall objective and project objectives with indicators

The project comprised the general overhaul of three 33/11 kV switching stations in the towns of Nacala, Monapo und Xai-Xai. The measures consisted in the renewal of the individual switching stations, which included the protective structures and control equipment and the switching station buildings (in Xai-Xai), with the aim of preventing the risk of long-term power cuts in these towns, as well as consulting services. As a result of considerable damage caused by the flood disaster of 2000, the reconstruction of the switching station and parts of the power grid in Xai-Xai were added to the project.

The overall project objective was to provide a reliable supply of electrical energy in the three towns as a fundamental prerequisite for maintaining and expanding their commercial and industrial development. This was to be achieved by feeding electricity into the distribution network without interruption (project objective).

The indicator for the achievement of the overall objective at the time of project appraisal was formulated as "fewer than 12 unscheduled power cuts a year for a total of less than 12 hours per year from 1998". The indicator formulated at the time of project appraisal for the achievement of the project objective of "enabling failure-free supply of electricity into the distribution grids" was "reliable operation of the switching stations with 99.5% availability".

The total cost of the project including the renewed rehabilitation of the switching station at Xai-Xai amounted to around EUR 9 million. This matched the cost estimate of EUR 9 million quoted in the "progress report with proposed increase" of 20 September 2000. The costs were covered by the

increased financial contribution of EUR 7.7 million (originally EUR 5.4 million) and by the compensation of EUR 1.5 million paid by the insurance company of the contractor (ABB) for the damage caused by the flood disaster. The residual funds of EUR 200,000 were transferred to FC projects in support of EDM.

Project design / major deviations from the original project planning and their main causes

The project-executing agency was Electricidade de Moçambique (EDM). The financial situation of EDM improved significantly against the situation prevailing at the time of project appraisal, not least because it met the conditions set by the donors at the time for the legal separation of EDM from the general state administration and its conversion into a public law corporation, debt relief and tariff adjustments. This supported a process of institutional and financial restructuring agreed with the World Bank and the main donor countries which has enabled EDM to generate profits since 2002 and has made it one of the most economically successful electricity supply companies of the region. The upper management level of EDM is qualified and agile; what it still lacks, however, is a qualified middle management. This is sufficiently offset, on the other hand, by the presence of the Swedish long-term consultant Swedpower.

The project comprised the general overhaul of the three 33/11 kV switching plants in Nacala, Monapo and Xai-Xai, including protective structures and control equipment, captive power equipment, construction works and consulting services.

The scope of the project was considerably expanded against the project measures initially identified at the time of appraisal because it was increased to include not only the new switching station but also parts of the transmission and distribution network as a consequence of the flood disaster in Xai-Xai in February - April 2002.

The result of the project measures was defined as functioning 33/11 kV switching equipment capable of transmitting the electricity fed into the grid directly or indirectly from the Cahora Bassa hydropower plant to the towns of Xai-Xai, Monapo und Nacala and that can safely and selectively eliminate any network malfunctions. The project design is still generally appropriate.

Key results of the impact analysis and performance rating

The objective of the project was to enable failure-free supply of electricity into the distribution grids. The overall project objective was to provide a reliable supply of electrical energy in the three towns as a fundamental prerequisite for maintaining and expanding their commercial and industrial development.

The indicator for the achievement of the overall objective at the time of project appraisal was formulated as "fewer than 12 unscheduled power cuts a year for a total of less than 12 hours per year from 1998". This objective was reasonably achieved. From today's point of view we would assign this indicator to the level of the project objectives. We would now consider "raising productive power consumption at the three locations by an average of at least 6% per annum" to be an appropriate indicator for the overall objective. This indicator was reasonably fulfilled. In the towns of Nacala and Monapo, the increase of productive power consumption in the years 1997-2004 averaged 6.5% per annum, and in Xai-Xai it was as high as 7.5% per annum.

The indicator formulated at the time of project appraisal for the achievement of the project objective of "enabling failure-free supply of electricity into the distribution grids" was "reliable operation of the switching stations with 99.5% availability". This objective was very well achieved, with rates of 99.65% and 99.9%, respectively. The fulfilment of the two project objective indicators (reliable operation of the switching plants, few unscheduled power cuts) must be interpreted in the sense that they represent a prerequisite for the electricity to reach the consumers through the supply grid and the consumers to actually be able to use it.

The project has made a substantial contribution to stabilising power supply in the project locations. It matches the objectives and priorities of German development cooperation with Mozambique in the energy sector and reflects the energy sector priorities of the Mozambican government.

In the appraisal of the project as a commercial unit, the unit power production costs were not calculated because the investment in the switching station represented a replacement investment to

which there was no alternative from the operational point of view for ensuring reliable supply for the affected locations. Even from today's perspective the statement made at the time that the power supply production costs would rise in consequence of the depreciations increasing as a result of the investment but that these costs would ultimately lead to a cost recovery that would be higher than without the investment because of the revenue-enhancing demand increase by an average of 50% at the three locations in connection with the tariff increases introduced and the improvement of collection efficiency to 94% so far, was plausible. We therefore rate the project as beneficial at the micro-economic level.

In summary, the operational appraisal criteria, which were not fulfilled for any of the major efficiency criteria at a time of appraisal, were fulfilled at the time of the ex post evaluation - as was expected at the time of the appraisal - with the exception of the grid losses (production efficiency). The grid losses were 23%, just above the maximum level set at 20%, but showed a downward trend.

As no alternatives to the investment were assumed at the time of the appraisal as mentioned above, the power production unit costs were not calculated under the overall economic analysis either. On the basis of the developments mentioned previously and given the positive sector development (overall economic cost recovery ratio of 90%, operational appraisal criteria largely fulfilled), we also rate the project as beneficial from an overall economic aspect.

The immediate employment impacts of the project were limited to the short-term employment of local construction workers. The project contributed indirectly to maintaining jobs in industry and trade that would have been at risk had the power supply deficit been greater. In addition, as was expected at the time of project appraisal, new businesses settled in the three locations, including a cotton processing factory and a cashew nut processing plant as well as other food-processing firms in the grid supplied from Monapo, a cement factory and a corrugated sheet-metal factory in Nacala, while in Xai-Xai only the tourism infrastructure was expanded. However, it is not possible to quantify the income and employment effects created by the projects. The project was designed to contribute to development in general.

The project does not have any lasting adverse impacts on the environment. It indirectly promotes the increase of productive power consumption, which is a desired impact from the point of view of development policy. The indirect environmental impacts are minor because electricity is supplied from the existing Cahora Bassa hydropower plant. The project was not geared towards protecting the environment or natural resources.

Women and men have equal access to the electrical energy provided. The programme objectives did not target gender equality. It did not have the potential to contribute to gender equality.

The project did not pursue the goal of improving participatory development or good governance.

From today's perspective, the risks to the sustainable technical success of the project are rather low given the low-maintenance technology employed. There is merely a risk that the recommendations for the management of operations in Xai-Xai may not be followed, possibly affecting the sustainability of the distribution networks downstream of the affected switching plants. The possibility of sabotage attacks on transmission lines, which led to interruptions in the supply of electricity particularly during the civil war in the 1980s, was identified as a risk during project appraisal. This risk is still considered acute. Unless the FRELIMO, which has been ruling the country alone since independence in 1975, finally allows the opposition to participate in the country's economic growth by transferring part of the governmental tasks to it at least at a regional level, frustration over the exclusion could lead to renewed acts of sabotage.

Based on a combined assessment of all impacts and risks described above, we have arrived at the following rating of the developmental efficacy of the project:

Effectiveness

The objective of the project was to enable failure-free supply of electricity into the distribution grids. On the basis of the logbooks of operations it was only possible to perform a limited assessment of the chosen indicator of "reliable operation of the switching plants with an availability of 99.5%" since all power supply interruptions in the upstream and downstream transmission and distribution lines were documented under the heading of "plant failure". In an isolated assessment of unscheduled power cuts in individual strings, in most of which the switching station was in operation as a whole, however, the documented interruptions were between 0.1% and 0.35% per annum. Measured against this indicator, the project objective was overachieved. Against the indicator of "fewer than 12 unscheduled

power interruptions for a total of less than 12 hours a year from 1998", which we now assign to the project objective level as well, the achievement of the project objective was satisfactory. The fulfilment of the indicator was satisfactory in the stations at Monapo und Nacala. In the Xai-Xai station the indicator was achieved only to an adequate extent. In this plant, power interruptions totalled 31 hours a year at least in individual strings, namely in the lines that were not rehabilitated, while the overall plant continued in operation, however. Here the indicator is inadequate because the function of the switching station is not decisive for the distribution of electricity without functioning lines. Overall, we rate the effectiveness as satisfactory (sub-rating: 2).

Relevance/significance

The overall project objective was to provide a reliable supply of electrical energy in the three towns as a fundamental prerequisite for maintaining and expanding their commercial and industrial development. Today we would consider "raising productive power consumption at the three project locations by an average of at least 6% per annum" to be an appropriate indicator for the overall objective. This indicator was reasonably fulfilled. In the towns of Nacala and Monapo, the increase of productive power consumption in the years 1997-2004 averaged 6.5% per annum, and in Xai-Xai it was as high as 7.5% per annum. Overall, we classify the project's developmental relevance and significance as satisfactory (sub-rating 2).

Efficiency

Given the satisfactory productive power consumption value achieved in proportion to the consumption increase recorded for all three locations overall (68%), we rate the allocation efficiency as satisfactory. At the locations of Monapo und Nacala in the north, the increase in productive power consumption was 7.5 times higher than that of power used for consumptive purposes while in Xai-Xai the increase of power for consumptive uses was nearly 20% higher than that of productive power consumed. In recent years EDM has been increasingly installing pre-payment meters in order to contain the problem of power theft, however with limited success thus far. More consistent measures for reducing the very high losses of 23%, particularly internal controls, however, are a necessary element of a cost-efficient electricity sector expansion strategy. In light of this we consider the production efficiency to be slightly insufficient. In summary it can be said that the operational appraisal criteria were fulfilled at the time of the ex post evaluation with the exception of production efficiency. Overall, we rate the efficiency as sufficient (sub-rating: 3).

In consideration of the sub-criteria mentioned above, we rate the developmental efficacy of the project as satisfactory overall (rating 2). Despite the very good effectiveness and high relevance of the project, the inadequate fulfilment of the efficiency criteria, particularly at Xai-Xai, significantly affected the overall assessment. Nevertheless, it must be emphasised that the executing agency has achieved an extremely positive development overall given the reforms it has implemented in the period under review.

General conclusions and recommendations

The promotion of electricity projects under FC should strictly focus on the operational appraisal criteria for the energy sector. A qualification must be made to this recommendation in that a violation of the operational appraisal criteria at the time of appraisal - as happened in the case at hand - may be acceptable if the government pursues a convincing and binding reform strategy which realistically suggests that these criteria will be met within a measurable period of time and if the project contributes to implementing these reforms.

Assessment criteria

Developmentally successful: Ratings 1 to 3	
Rating 1	Very high or high degree of developmental effectiveness
Rating 2	Satisfactory developmental effectiveness
Rating 3	Overall sufficient degree of developmental effectiveness
Developmental failures: Ratings 4 to 6	
Rating 4	Overall slightly insufficient degree of developmental effectiveness
Rating 5	Clearly insufficient degree of developmental effectiveness
Rating 6	The project is a total failure

Criteria for the Evaluation of Project Success

The evaluation of the "developmental efficacy" of a project and its classification during the ex-post evaluation into one of the various levels of success described in more detail below concentrate on the following fundamental questions:

- Are the **project objectives** reached to a sufficient degree (aspect of project **effectiveness**)?
- Does the project generate sufficient **significant developmental effects** (project **relevance** and **significance** measured by the achievement of the overall development-policy objective defined beforehand and its effects in political, institutional, socio-economic and socio-cultural as well as ecological terms)?
- Are the **funds/expenses** that were and are being employed/incurred to reach the objectives **appropriate** and how can the project's microeconomic and macroeconomic impact be measured (aspect of **efficiency** of the project conception)?
- To the extent that undesired (**side**) **effects** occur, are these tolerable?

We do not treat **sustainability**, a key aspect to consider for project evaluation, as a separate category of evaluation but instead as a cross-cutting element of all four fundamental questions on project success. A project is sustainable if the project-executing agency and/or the target group are able to continue to use the project facilities that have been built for a period of time that is, overall, adequate in economic terms, or to carry on with the project activities on their own and generate positive results after the financial, organisational and/or technical support has come to an end.