

Bolivia: Electrification Larecaja

Ex-post evaluation

OECD sector	23040/Electricity transmission and distribution	
BMZ project ID	1993 65 263	
Project-executing agency	Empresa Nacional de Electricidad S.A. (ENDE)	
Consultant	DECON	
Year of ex-post evaluation		
	Project appraisal (planned)	Ex-post evaluation (actual)
Start of implementation	3. Q 2 1993	3. Q 2 1993
Period of implementation	36 months	60 months
Investment costs	EUR 21.37 million	EUR 18.71 million
Counterpart contribution	EUR 6.03 million	EUR 3.48 million
Financing, of which Financial Cooperation (FC) funds	EUR 15.33 million	EUR 15.23 million
Other institutions/donors involved	None	None
Performance rating	5	
• Significance / relevance	5	
• Effectiveness	5	
• Efficiency	5	

Brief Description, Overall Objective and Project Objectives with Indicators

The project comprised the construction of a 117 km long 115 kV transmission line from Chuspipata, the point of entry to the Bolivian integrated system, to Guanay, switchyards and sub-stations in Chuspipata, and Guanay, and the installation of 316 km of medium-voltage and 106 km of low-voltage overhead lines. The project facilities were designed to provide power to more than 50 villages in the lowland provinces of Larecaja, Nor Yungas and Sur Yungas of the Departamento La Paz.

The objective of the project was to provide reliable electrical energy and power to meet the existing demand, especially that of the commercial sector in the project area. The overall objective was to enable an economically efficient utilisation of electricity to support economic growth in the project region and the structural adjustment process in Bolivia.

The following indicators were defined to measure achievement of the project objectives:

- down times and power cuts of less than 100 hours per year; frequency of shut-downs of less than 50 per year;
- capacity utilisation of the transmission line and the transformers of at least 40% and 60%, respectively, in the year 2000;

- tariffs for end users not exceeding the specific expenditure incurred by power consumers prior to entry into operation of the financed facilities;
- tariffs for end users equalling at least 90% of the dynamic production costs.

The following indicators were defined to measure achievement of the overall objectives:

- power utilised for productive purposes of more than 80% of total demand;
- tariffs for end users equalling at least the level of long run marginal costs.

Project Design / Principal Deviations from the original Project Planning and their main Causes

The project measures essentially corresponded with the planning established at the time of project appraisal. The procurement of modern meters with magnetic cards was subsequently added to the scope of the project to facilitate tariff collection.

Delays during the implementation amounted to 24 months against the original planning. They were mostly due to the fact that the assembly of the distribution networks obviously exceeded the capabilities of the enterprise contracted for this work. The contracts concluded with this enterprise had to be rescinded and the remaining work assigned to other firms.

The actual cost was 13% lower than estimated. Savings resulted from the lower cost of constructing the lines and from the higher exchange rate of the Deutschmark against the US dollar.

At the time of project appraisal the plan was that ENDE operate the transmission facilities (115 kV overhead lines and sub-stations) and that a distribution company, Empresa de Distribución Eléctrica Larecaja (EDEL), be established specifically for the distribution of electricity in the Larecaja region. Following a far-reaching sector reform in the mid-1990s, however, ENDE was broken down into various companies, most of which were privatised. The transmission grid was taken over by the Spanish enterprise Transportadora de Electricidad (TDE) which now operates the financed transmission facilities. EDEL was established as a subsidiary of ENDE in 1998 as planned and has since been operating the distribution system of Larecaja. Privatisation has not yet materialised because the enterprise's low turnover does not make it appear profitable for the private sector.

Key Results of the Impact Analysis and Performance Rating

Already at the time of the final inspection (June 2000) it became apparent that the quantitative goals of the project could not be achieved. The main cause was that a number of mining operations in the Larecaja region became unprofitable because of the low gold price and had to suspend their operations as a consequence. Thus, the main demand source that was crucial to the project rationale was lost.

World economic developments pushed the gold price up by around 430% between 1978 and 1980 to as much as USD 700 per ounce. During this period gold production seemed lucrative even at marginal sites. However, by the mid-1980s the gold price fell to around USD 320, recovering to around USD 450 in 1988. At the time of project appraisal in 1993 it had arrived at a level of around USD 340 after falling for four years. In 2001 it reached a 20-year low of around USD 260. Gold currently stands at USD 320 (all figures per troy ounce). Analysts have very different views on the further price development. What was crucial for the gold mines in the

Larecaja region to abandon production apparently was not so much the price trend of the 1990s but its strong decline in the 1980s. The fact is that there were already signs of limitations on production in the mining sector at the time of the project appraisal.

The assumption was that overall demand for electrical energy in the Larecaja region would be 72.3 GWh in the year 2000 and 81.5 GWh in 2005. In 1999, however, electricity sales amounted to only 4.7 GWh. In 2003 a total of 7.6 GWh was sold. The average growth in electricity sales between 1999, the first full year of operation, and 2003 was around 17% per annum. Although this is a high amount which will probably decline noticeably in the future, only around 22.6 GWh would be sold in the year 2010 if demand were to continue to grow at the same rate. Therefore, in retrospect the demand forecast at the time of appraisal turned out to be much too high. The high growth in consumption also needs to be seen against the background of a tariff that is below cost-recovery level (see below), which leads to an artificial demand increase.

At project appraisal the assumption was that only 7% of total demand would come from private households (meaning consumptive demand). In 1999 consumptive demand in absolute figures was much lower than assumed but accounted for 34% of total demand. In the year 2003 as well, demand from private households was much lower than assumed but still accounted for 33% of total demand. The projected demand by manufacturing and mining was supposed to be 58.6 GWh or 81% of total consumption in the year 2000. In the year 2003 the actual figure was 2.5 GWh, or 33%. These figures reveal that the expectations for the region's economic development were not fulfilled.

The low demand for electrical energy results in low capacity utilisation of the financed equipment. Maximum load demand in 2003 was 1.14 MW at the Caranavi sub-station and 1.03 MW at the Guanay sub-station. So transformer capacity utilisation is very low. The 5 MVA transformer of the Caranavi sub-station was utilised at a maximum capacity of 23% and the 2 x 10 MVA transformers of the Guanay sub-station at not more than 5%. Accordingly, average capacity utilisation is lower. The load factor (average load/peak load) of the overall system is around 46%. The peak load for the overall system is around 2 MW and is reached around 7:30pm; this too is an indicator that consumptive demand is playing a much greater role than originally planned. Altogether the load remained far below the indicator established for the achievement of the project objective.

According to the current breakdown statistics of EDEL, there were 227 shutdowns due to distribution problems and 28 shutdowns due to transmission problems in 2003. Down times amounted to a total of 49 hours. Every customer was cut off an average of 116 times a year. Thus the availability indicator for the achievement of the project objective was reached in terms of total duration but not in terms of frequency of shutdowns. In comparison with the situation of 1999 the frequency of shutdowns per customary has increased noticeably, but in return the total duration of shutdowns has declined considerably. Electricity losses were 3.6% on the 115 kilovolt line and 9.5% in the distribution network in 2003. These figures can be regarded as still acceptable. However, distribution losses in 2003 were 21% higher than in the previous period, which is a very strong rise.

Average revenues of EDEL in 2003 were around 0.65 BOB (0.09 USD) per KWh. At project appraisal the users of the existing isolated networks paid between USD 0.18 and 0.29 per kilowatt hour. This means the intention of the project to make electrical energy available at more affordable rates than at the time of appraisal is fulfilled. However, the profit-and-loss account of EDEL shows that the enterprise cannot even meet its operating costs with the tariff revenues, let alone pay off the system. Revenues of around BOB 5 million contrasted with operating expenditure of around BOB 8.6 million in 2003. EDEL has reported considerable losses every year since it was founded. EDEL now has a very unsound financial structure. Only half of its

short-term liabilities of around BOB 13 million are covered by short-term accounts receivable. So far the enterprise has escaped insolvency only by accumulating massive debt at its parent company ENDE. At its current turnover the system in Larecaja cannot be operated efficiently and therefore cannot be privatised either. The cost recovery indicator for the achievement of the project objective was clearly not fulfilled so that we have refrained from making a detailed recalculation of the dynamic production costs. However, these costs are much higher than assumed at the time of project appraisal because the turnover in terms of volume accounts for only 10% of the estimate contained in the calculation at the time.

With regard to the indicators for the achievement of the overall objective the share of power consumption for productive purposes is 66%, clearly below the 80% that was planned. More serious than this, however, is that consumption altogether is far below the forecast level.

New calculations of the long-run marginal cost of power supply are not available. According to the final inspection, they were USD 0.14 in 2000 (USD 0.16 at the exchange rate then applicable). As the long-run marginal cost is most likely to have risen since then, it is clear that given the average revenue of EDEL of EUR 0.07 per kilowatt hour the economic cost recovery indicator has clearly not been fulfilled either.

The conditions of the sectoral framework have changed greatly since the time of project appraisal. ENDE was broken down vertically and horizontally and the new companies were largely sold to private enterprises. Unprofitable enterprises like EDEL cannot be privatised and therefore remain public, where they cause quasi-fiscal deficits.

At the time of project appraisal the only risks that were seen for the achievement of the objectives consisted in unforeseeable developments in Bolivia's internal situation. Although the political situation is largely unstable and much of the political conflict centres around energy policy, this risk was not relevant to the success of the project. The decline in mining activity in the region was not identified as a risk.

Given the very low achievement of the project objectives and the low degree of utilisation of the financed facilities the **effectiveness** of the project must be rated **clearly insufficient** (sub-rating: 5).

In hindsight, the project rationale of contributing to the economic development of the region of Larecaja through its electrification proved to be unrealistic. The further decline in the price of gold and, concomitantly, the breakdown of the mining sector as the most important electricity consumer have made any consideration on expanding production with the aid of affordable energy superfluous. This is also expressed in an unsatisfactory achievement of the overall objective. Overall, the **significance** and **relevance** of the project are also **clearly sufficient**.

At this time it is impossible to operate the financed installations profitably. EDEL is making considerable losses year after year. Privatisation is currently out of the question. Tariff increases would have only a limited impact because they would probably lead to a considerable decline in demand. Therefore, the **efficiency** of the project is also **clearly insufficient**.

From this it follows that the **developmental effectiveness** of the project must be rated **clearly insufficient**.

General Conclusions applicable to other Projects

If the success of a project depends essentially on the demand from a single branch of industry (in this case the mining of gold), this dependence results in a corresponding risk to the dependability of the demand forecast. This applies all the more if the price of the product is extremely volatile, as is the case for gold. The long-term economic viability of the industry therefore should be subjected to an in-depth analysis in the project appraisal.

Legend

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 effectiveness" 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.