

Ex Post-Evaluation Brief Kenya: Olkaria II Geothermal Power Station



Programme/Client	Olkaria II Geothermal Power Station (BMZ No 1997 65 975)	
Programme executing agency	Kenya Electricity Generating Company (KenGen)	
Year of sample/ex post evaluation report: 2011*/2011		
	Appraisal (planned)	Ex post-evaluation (actual)
Investment costs (total)	USD 193 million	USD 206 million
Counterpart contribution (company)	USD 56 million	USD 59 million
Funding, of which budget funds (BMZ)	USD 14.5 million (EUR 12.8 million)	USD 12.3 million (EUR 11.9 million)

* random sample

Project description: The project comprised cofinancing for the “Olkaria II” geothermal power station, including a transformer substation at the power plant site, a high-voltage power line to Nairobi, and its connection to the grid at the North Nairobi and Dandora substations. The project location is the Olkaria geothermal field at Lake Naivasha, some 90 km north-west of Nairobi in the Great Rift Valley. For the most part, construction proceeded as planned; however, through design changes in the course of the project, it proved possible to increase the power station’s capacity from the planned 64 MW (gross) to 70 MW (2 x 35 MW). Furthermore, the high volumes of steam available in the Olkaria geothermal field enabled a third turbine to be installed at Olkaria II, with an additional output of 35 MW; this was undertaken outside the scope of the German Financial Cooperation (FC) project. Changes in the design of the substation were correspondingly required.

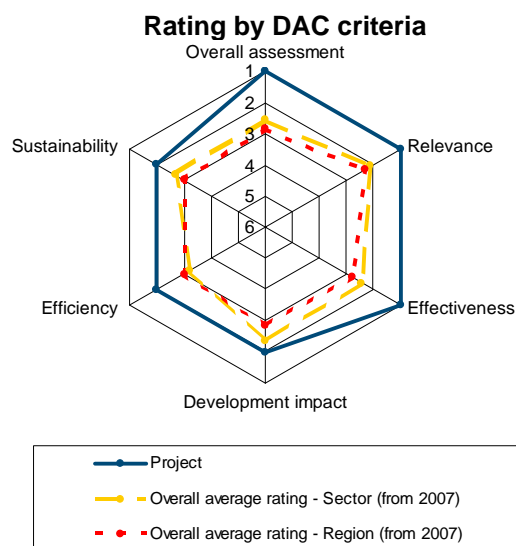
Objectives: The overall objective of this project was to promote social and economic development through electricity generation and avoid CO₂ emissions, thereby contributing to global climate protection. The overall objective of furthering social and economic development is to be considered fulfilled if the specific project objectives (see below) are satisfied; the indicator adopted for the climate objective was the annual quantity of CO₂ emissions avoided.

The project objective was the reliable, efficient and environmentally sound provision of 64 MW (gross) of electrical generation capacity and the production of up to 470 GWh/a of electricity, together with its efficient use by consumers on the grid. The indicators for achievement of the project objectives are: 1) 64 MW of generating capacity and 420 GWh/a of electricity production (corresponding to 90% of attainable net output) within two years of commissioning; 2) at commissioning, tariff prices to attain an average cost recovery of at least 85% of the long-run marginal costs for the sector; and 3) grid losses to have fallen below 16% by the time of commissioning.

Target group: The project beneficiaries are businesses and private households connected to the grid.

Overall rating: 1

This final rating, and the sub-ratings awarded for individual criteria, are explained below. Due to its high levels of effectiveness and sustainable developmental impact in a field of technology which is of increasing relevance for the Kenyan electricity sector, the project was rated as “very good”.



EVALUATION SUMMARY

The project accords with the strategies of the BMZ (German Federal Ministry for Economic Cooperation and Development) and of the partner country, and is part of a field of technology with increasing relevance for the Kenyan electricity sector. It addresses a major obstacle to development in Kenya. Through its contribution to a reliable electricity supply in that country and to climate protection, the project displays a high degree of sustainable developmental impact. In general the project was implemented efficiently; project objectives were achieved and even surpassed, demonstrating a high degree of effectiveness. Taken altogether, the project has attained an overall rating of “very good”. **Overall rating: 1**

Relevance: With its aim of a reliable, efficient and environmentally sound electricity supply, the project addresses a major obstacle to development in Kenya. Despite significant progress in recent years, Kenya still has a low electrification rate and an inadequate electricity supply, while the demand for electricity continues to rise. Due to Kenya’s heavy dependency on hydropower for electricity generation, this situation intensifies during times of drought. For Kenya, geothermal power is an indigenous resource and a climate-friendly, environmentally sound technology that is both cost-effective and reliable. Against a background of global efforts in climate protection, it therefore holds particular significance for the Kenyan energy sector’s plans for future expansion. At project appraisal, the project conformed with the developmental priorities of German Development Cooperation (DC) and of the Government of Kenya. Even though energy no longer constitutes a priority area of German DC with Kenya, today the project still complies with the BMZ’s overall concept for the sector, “Sustainable Energy for Development”. The Kenyan government views the electricity sector as an important catalyst for reducing poverty, achieving economic growth targets and creating employment. Donor coordination during project implementation was good, in keeping with donor collaboration in this sector in general. Funding gaps which emerged during the course of project were successfully closed, showing the importance of donor coordination and dialogue for effective project implementation. Financing constraints were overcome, mostly through a reallocation of funds by the cofinancing donors; however, this was not achieved without causing some delay. This illustrates the importance that was attached in project implementation to the security of funding. German Financial Cooperation (FC) was able to make a contribution here, albeit a relatively small one. FC involvement in geothermal energy in Kenya, which began with budget financing for the Olkaria II geothermal power station, has expanded progressively since, and has been extended to include additional financing products (Sub-Rating: 1).

Effectiveness: The project objective - the reliable, efficient and environmentally sound provision of 64 MW (gross) of electricity generation capacity and the production of up to 470 GWh/a of electricity - was surpassed. According to the final follow-up report, changes to the power station design allowed steam to be extracted in greater volumes than had originally been anticipated. As a result, actual levels achieved two years after commissioning were around 70 MW (2 x 35 MW) of generating capacity and 560 GWh/a of electricity

production. The project objective indicators - achieving 64 MW (2 x 32 MW) of generating capacity and 420 GWh/a of electricity production two years after commissioning - were thus not only attained but exceeded. Furthermore, the high volumes of steam available in the Olkaria II geothermal field enabled a third turbine to be installed at the power station, with a capacity of 35 MW. This was financed by the World Bank, the European Investment Bank and Agence Française de Développement. In its third financial year (2010/ 2011), the generating capacity and electrical output of Olkaria II (including the third turbine's contribution, on a proportionate annual basis) stood at around 105 MW and 850 GWh/a respectively. At the time of this ex post evaluation, the indicators set for the project objectives (in relation to cost recovery at average prices and grid losses across the electricity sector) were either substantially achieved (grid losses of 16.2%) or surpassed (cost recovery of approx. 107%). Sub-Rating: 1

Efficiency: In terms of results achieved in relation to funds deployed, the project is considered efficient overall. Although costs for individual elements were higher than those originally planned, specific investment costs for the project are acceptable, and the quality of the equipment supplied is rated as appropriate. However, with regard to production efficiency at the project level, it must be noted that the two-year delay in power station commissioning had negative financial consequences for the power station and network operators; the belated improvement in the electricity supply arguably also came an economic cost to electricity users in the country. The project formed part of a cost-effective plan for expanding power stations within the Kenyan grid; production efficiency at the system level has therefore been assumed. The Kenyan electricity sector also meets the reference values for production efficiency currently specified in the performance indicators used for FC projects in electricity generation (the "operational assessment criteria"). Moreover, sectoral reforms have led to increases in efficiency, thereby significantly improving the allocative efficiency of electricity supply since project appraisal. Average tariff charges have been raised over the years to reach cost recovery, in contrast to the situation at the time of that appraisal. Despite these positive developments, the government's plans for significant expansion will again present the relevant players with financial challenges in the future. With regard to efficiency in terms of climate protection effects, it is worth emphasising that geothermal energy, being an emission-free technology, is one of the most cost-effective technologies for electricity generation in Kenya (Sub-Rating: 2).

Overarching developmental impact: In terms of overarching developmental impact, the key achievements of this project are the contributions it has made both to a reliable electricity supply in Kenya and to climate protection. Having avoided an estimated 450,000 t per year of CO₂ emissions, the climate protection objective is judged to have been attained, even though no threshold value was defined at project appraisal. Based on having satisfied the project objectives, the targeted contribution to social and economic development is similarly viewed as having been achieved. The high proportion of consumers using electricity for production highlights the importance of the electricity sector's role in economic growth and employment in Kenya, and it is reasonable to assume that the project

has indirectly had a positive impact on poverty. Furthermore, as the third geothermal power station to be commissioned in the Great Rift Valley, Olkaria II can be credited with having had a positive structural impact on the development of this field of technology in Kenya, and having made an important contribution to building Kenyan know-how in the geothermal energy domain. Other developing countries are also benefiting from this knowledge, through interaction with KenGen (Sub-Rating: 2).

Sustainability: During the production process, hot water (brine) is separated out from the water/ steam mixture. Re-injecting this hot water into the geothermal field has allowed a stable supply of steam for electricity generation purposes since the power station was commissioned. On the basis of progress to date, there are no grounds to expect any deterioration in steam availability in the medium term either. By and large, the plant has run smoothly since it was commissioned, and the amount of maintenance and repairs undertaken has been adequate. Together with the grid operator's experience, the professionalism of the project executing agency's management provides grounds to expect that the power station will continue to be sustainably run in the future.

The emission of poisonous hydrogen sulphide (H₂S) and the power station's location in a protected natural area both pose particular risks to the environment. To date, however, there has been little evidence of any negative effects on the local population or the flora and fauna in the nature reserve caused by power station operations, nor any noticeable adverse environmental impacts from H₂S emissions (Sub-Rating: 2).

Notes on the methods used to evaluate project success (project rating)

Projects (and programmes) are evaluated on a six-point scale, the criteria being relevance, effectiveness, efficiency and overarching developmental impact. The ratings are also used to arrive at a final assessment of a project's overall developmental efficacy. The scale is as follows:

1	Very good result that clearly exceeds expectations
2	Good result, fully in line with expectations and without any significant shortcomings
3	Satisfactory result – project falls short of expectations but the positive results dominate
4	Unsatisfactory result – significantly below expectations, with negative results dominating despite discernible positive results
5	Clearly inadequate result – despite some positive partial results, the negative results clearly dominate
6	The project has no impact or the situation has actually deteriorated

Ratings 1-3 denote a positive or successful assessment while ratings 4-6 denote a not positive or unsuccessful assessment

Sustainability is evaluated according to the following four-point scale:

Sustainability level 1 (very good sustainability) The developmental efficacy of the project (positive to date) is very likely to continue undiminished or even increase.

Sustainability level 2 (good sustainability): The developmental efficacy of the project (positive to date) is very likely to decline only minimally but remain positive overall. (This is what can normally be expected).

Sustainability level 3 (satisfactory sustainability): The developmental efficacy of the project (positive to date) is very likely to decline significantly but remain positive overall. This rating is also assigned if the sustainability of a project is considered inadequate up to the time of the ex post evaluation but is very likely to evolve positively so that the project will ultimately achieve positive developmental efficacy.

Sustainability level 4 (inadequate sustainability): The developmental efficacy of the project is inadequate up to the time of the ex post evaluation and is very unlikely to improve. This rating is also assigned if the sustainability that has been positively evaluated to date is very likely to deteriorate severely and no longer meet the level 3 criteria.

The overall rating on the six-point scale is compiled from a weighting of all five individual criteria as appropriate to the project in question. Ratings 1-3 of the overall rating denote a "successful" project while ratings 4-6 denote an "unsuccessful" project. It should be noted that a project can generally be considered developmentally "successful" only if the achievement of the project objective ("effectiveness"), the impact on the overall objective ("overarching developmental impact") and the sustainability are rated at least "satisfactory" (rating 3).