

Egypt: Rehabilitation of transformer stations II

Ex-post evaluation report

OECD sector	23040 / Electricity transmission and distribution	
BMZ project ID	1994 65 022	
Project-executing agency	Egyptian Electricity Holding Company (EEHC)	
Consultant	Lahmeyer International	
Year of ex-post evaluation	2008	
	Project appraisal (planned)	Ex-post evaluation (actual)
Start of implementation	3 rd quarter 1994	2 nd quarter 1995
Period of implementation	45 months	72 and 87 months respectively
Investment costs	EUR 58.8 million	EUR 66.6 million
Counterpart contribution	EUR 3.2 million	EUR 11.0 million
Financing, of which FC funds	EUR 55.6 million	EUR 55.6 million
Other institutions/donors involved	<>	<>
Performance (overall rating)	4	
• Relevance	3	
• Effectiveness	2	
• Efficiency	4	
• Overarching developmental impact	3	
• Sustainability	2	

Brief description, overall objective and project objectives with indicators

The project included the supply, fitting and entry into operation of circuit-breakers, transformers and other electrotechnical equipment in order to rehabilitate the two transformer stations Heliopolis and Wadi Hoff with the aim of contributing to ensure a reliable and efficient electricity supply in the greater Cairo region. The two transformer stations are linked to the Egyptian integrated electricity grid by means of high tension lines. The overall objective was to contribute to ensure the reliable and efficient electricity supply in the Egyptian integrated grid. The target group were the users in the respective supply areas.

Indicators for the overall objective were the following: 1) upon entry into operation, tariffs cover more than 80% of total long-term macroeconomic marginal costs and 2) the number and duration of shut-offs in the supply areas do not exceed 10 hrs. per year. The indicators for the project objective were the following: 1) not more than one power failure per station and year and 2) a transformer capacity utilization of more than 60%. Primary target group of the project were the users in the supply areas. Due to the circular distribution line not only customers in the direct supply area around the transformer stations of Wadi Hoff (major industrial customers) and Heliopolis (commercial customers and consumers) benefit from the transformer station, but also all customers in the greater Cairo region.

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

By means of the turn-key installation of the two 220/66/11 - 6.6 kV switchboard plants in Heliopolis near the Cairo airport and in Wadi Hoff at the southern border of the city, two old transformer stations could be replaced that had reached the end of their service life and could no longer meet the higher requirements in case of a short-circuit.

The new plants were taken into service in September 2000 (Heliopolis) and in April 2002 (Wadi Hoff). All components and installations of the transformer stations were well maintained and their operational safety ensured at the time of ex-post evaluation. The Egyptian Electricity Transmission Company (EETC), a subsidiary of the EEHC, is in charge of the transformer stations' operation and maintenance. It has considerable experience in the field of power transmission and distribution and is capable of financing and carrying out maintenance works, ordinary gas works, cleaning activities and error detection independently.

Key results of the impact analysis and performance rating

At the time of ex-post evaluation, the project objective indicators were fully reached or surpassed: 1) There were no power failures in the stations over the past 12 months and 2) utilization amounts to 80-85% on annual average and to 100% at peak times.

With regard to reaching the overall objective, the following may be noted: 1) The macroeconomic long-term cost-cover ratio on the basis of world shadow prices is currently estimated at 41%. This is clearly below the minimum requirement level of KfW's operational assessment criteria, which is set at 65%. At the time of project appraisal, a macroeconomic cost-cover ratio of 70% was projected. 2) According to the information supplied by the distribution companies and interviewed consumers (cement factory in Wadi Hoff, households in Heliopolis), there were hardly any interruptions in the electricity supply over the past 12 months. Only on the occasion of repair works there were very short shut-offs, which were minimized by means of bridge connections. The integrated grid, which is connected with Libya and Jordan, is highly reliable in its supply.

It must be stated here that – at a high level of supply reliability – the minimum requirement with regard to macroeconomic cost-coverage was far from achieved. Moreover, there has been a considerable deterioration since the project appraisal. As early as at the time of project appraisal it was asserted that the low macroeconomic cost-cover ratio could affect the project's developmental success, because it requires high subsidies from the national budget. Besides, low tariffs trigger off a strong increase in energy demand, which would increase the need for financial resources in the sector and lead to additional environmental damage.

At the time of project appraisal, no micro- or macroeconomic examination of these system components (transformer stations) was carried out. There was no alternative to this investment, which was necessary to replace an old installation. From a microeconomic perspective, the investment not only served to stabilize the transmission performance (no performance increase, replacement only), but to reduce transmission losses. However, it would require too much effort to quantify the transformer stations' contribution to savings in the entire system. In the entire transmission system, grid losses were reduced from 6% to 4% altogether since the time of project appraisal. The transformer stations have a very good utilization rate of 85% on average. There have been no system failures in the past 12 months. From a microeconomic perspective, we assess the project as beneficial, because considerable savings in production costs were possible by reducing grid losses (2% correspond to approx. EUR 34 million in annual production costs in 2005/2006). Moreover, the technology used in these transformer stations offers the advantage of a longer service life and lower operation and maintenance costs.

The macroeconomic assessment is negative, due to the low cost-cover ratio of long-term marginal costs (41%). Given the strong increase of world market prices for oil and natural gas, a continued negative trend in the macroeconomic cost-cover ratio is likely, and it is to be expected that in the future, even higher subsidies will be required in the electricity supply. According to the figures provided by the EEHC, the required subsidies amounted to approx. EUR 415 million in the economic year of 2005/2006. From a macroeconomic perspective we therefore assess the project as negative.

The project's direct impact on the labour market is limited to the short-term employment of local construction workers. Altogether, the number of employees of the national energy utility has tripled since the assessment, but this must be considered also as an employment measure and cannot merely be attributed to the extension of the system. For the evaluation of the project's direct impact on employment and combating poverty, it would be necessary to measure the quantity of newly created jobs in the greater Cairo region over the past decade due to additional electricity supply. Given the lack of specific data, this is possible to a very limited extent only. Assuming that the share of productive energy consumption makes up 62% of total consumption increase, it is evident that a reliable power supply over the past decade mainly served to promote the Egyptian economy and to create new jobs, indirectly combating poverty.

To sum up, the project's developmental effect is assessed as follows:

The project had a general developmental orientation. Favouring the increase in electricity consumption and thus in CO₂ production of the thermal power stations will indirectly affect the environment. The project itself does not directly cause any serious environmental damage. The ordinary protection measures have been observed (security systems, oil sumps, accident prevention). The project did not have any potential to foster a cultural change with regard to the relationship between men and women in Egypt. Its objectives were not intended to promote participatory development / good governance.

Relevance: The core problem was identified correctly, and by renewing the transformer stations a major bottleneck for the electricity supply could be removed. The chain of impact, e.g. contributing to the creation of jobs by means of an improved power supply, is valid without modification. The project corresponded to the Egyptian government's priorities in energy policy and to the objectives of German Development Cooperation. However, some deficits were evident regarding the alignment of the various donors involved in the sector, particularly in view of the harmonisation and implementation of a common position. Summing up, we assess the project's relevance as sufficient (sub-rating 3).

Effectiveness: At the time of ex-post evaluation, the project objective indicators were entirely fulfilled or even surpassed. In the past 12 months there were no power failures in the stations, and the transformer utilization amounts to 80-85% on annual average and to 100% at peak times. Operation- and maintenance-wise, the technology selected for the project was more cost-effective than conventional technology. The transformer stations are well utilized and contribute to a more efficient transmission performance (reduction of transmission losses by 2-3% since project appraisal). It was not necessary to give recommendations to the project-executing agency with regard to the operation of the stations at final inspection. We give the operation situation an altogether good rating. There are no major risks for the proper technical operation. Project objective achievement and current operation situation are therefore satisfactory (sub-rating: 2).

Efficiency: With an availability (time-wise) of the thermal power stations measured at 90% and total system losses of 16%, production efficiency of the Egyptian electricity sector is sufficient, but the macroeconomic cost-cover ratio through tariffs (allocation efficiency) is insufficient. It fell from 70% at the time of project appraisal to 41% now. It is true that the Egyptian cabinet has agreed on considerable increases in tariffs over the next five years, but these will probably not be sufficient to achieve macroeconomic cost-coverage, given the prices for natural gas and oil on the world market. It is not to be expected that the present government will increase tariffs drastically enough to considerably reduce the subsidies required by the electricity sector over the next years, although this sector could in fact be economically viable. The Egyptian authorities consciously accept the macroeconomic distortions caused by the insufficient allocation efficiency, and provide sufficient subsidies for the operation of the stations. From an Egyptian point of view, electricity is an important means to ensure basic services for the public. This explanation serves to justify the public subsidies. All in all, there are only low risks with regard to the project's sustainability, because the sector reforms make good progress, except for the tariff policy (sub-rating: 4).

Overarching developmental impact:

To assess the overarching developmental impact in the electricity sector today, the principle of the MDG1 pro-poor growth is taken into account. Ensuring sustainable economic growth and employment are the Egyptian government's predominant objectives. With some care, it can

reasonably be stated that electricity supply in Egypt over the past decade (in spite of subsidised electricity for households and therefore higher tariffs for trade and commerce) mainly aimed at promoting the economy, creating new jobs and indirectly combating poverty. This claim is validated by the fact that over 60% of the additional electrical energy has been used for production purposes. The integrated grid linking Egypt to Libya and Jordan provides highly reliable power supply, which is a precious location factor for the young free trade zones. Taking into consideration all of the aforesaid facts, we rate the overarching developmental impact of the project as sufficient (sub-rating: 3).

However, the commitment was not justified from a sector perspective because of the utterly insufficient macroeconomic allocation efficiency (misallocation of investment due to highly subsidised electricity prices). For years it has been one condition in the sector dialogue with KfW and BMZ to improve the macroeconomic cost-cover ratio. Due to the unwillingness of the Egyptian government to political reform, German FC was finally limited to projects aiming at global environment and climate protection, e.g. wind parks. Moreover, in the sector dialogue with the Egyptian government, donors negotiated individually on their own behalf, instead of jointly as a donor party. Unlike 15 years ago, investment measures today would be accompanied by a reinforced and intensified co-ordination of the donors as a complementary measure to minimize risks. This was also confirmed by other financing partners in the energy sector at the time of ex-post evaluation.

Sustainability: The fact that the transformer stations are well maintained allows to draw the conclusion that there are no risks with regard to operational sustainability and the plants will be properly maintained and operated for the duration of their service life of 25-30 years. The installations' security systems and the national load distributor prevent overload-related problems. However, it is to be feared that there will be bottlenecks in transmission because of electricity exports and the extension of power plants. Further investments are required (e.g. high tension lines, extension of transformer stations), but their funding is not yet ensured. With regard to the individual project, no particular risks for the continuity of the project's impact are discernable. The transformer stations contribute to a reliable and productive power supply in the greater Cairo region. With the exception of pricing policy, the sector reforms have been introduced, but the speed of their implementation must increase drastically (sub-rating: 2).

Due to the absolutely insufficient macroeconomic cost-cover ratio (allocation efficiency), we give the project an overall performance rating of 4 (unsatisfactory), in spite of the clearly positive results in relevance, effectiveness, overarching developmental impact and sustainability. The main reason for this rating is the fact that the Egyptian government has afforded to pay considerable amounts of subsidies for electricity consumption in a blanket coverage way for decades, but continues to have international donors pay for new investments and reinvestments. The low tariffs contribute to the strong rise in energy demand and thus increase the need for financial resources in the sector and lead to additional environmental damage.

General conclusions and recommendations

As a general conclusion it may be pointed out that the macroeconomic success of projects in the energy sector directly depends on the respective government's willingness to reform and on the necessary tariff increases. It was a decision consistent with German development policy and exemplary for other projects and countries that the German side ceased to finance traditional projects in power supply in Egypt. This decision does not affect projects promoting global environment and climate protection, like wind parks.

However, the political dialogue should continue despite this withdrawal. In order to do so, the donor community should formalize and intensify the sector dialogue with the Egyptian government, in which the EU in particular – with the support of a bilateral European donor if required – should play a stronger role, including the co-ordination of the donors. The German side could then concentrate on the sub-sector dialogue in the field of renewable energies.

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

Projects are evaluated on a six-point scale, the criteria being relevance, effectiveness (outcome), “overarching developmental impact” and efficiency. 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 rating that clearly exceeds expectations
- 2 Good rating fully in line with expectations and without any significant shortcomings
- 3 Satisfactory rating – project falls short of expectations but the positive results dominate
- 4 Unsatisfactory rating – significantly below expectations, with negative results dominating despite discernible positive results
- 5 Clearly inadequate rating – despite some positive partial results the negative results clearly dominate
- 6 The project has no positive results or the situation has actually deteriorated

A rating of 1 to 3 is a positive assessment and indicates a successful project while a rating of 4 to 6 is a negative assessment and indicates a project which has no sufficiently positive results.

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 an improvement is very unlikely. 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. A rating of 1 to 3 indicates a “successful” project while a rating of 4 to 6 indicates an “unsuccessful” project. In using (with a project-specific weighting) the five key factors to form an overall rating, it should be noted that a project can generally only be considered developmentally “successful” if the achievement of the project objective (“effectiveness”), the impact on the overall objective (“overarching developmental impact”) and the sustainability are considered at least “satisfactory” (rating 3).