

Ex post evaluation – Georgia and Armenia

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Sector: Electrical transmission/distribution (CRS Code 23040)
Programme/Project: A) Regional power grid I, 2003 66 708, EUR 10.0 million (Geo)*, B) Electricity transmission Armenia-Georgia, 2003 66 054, EUR 4.7 million (Arm)**
Implementing agency: Georgian State Electrosystem JSC - GSE (Georgia)
 High Voltage Electrical Networks CJSC - HVEN (Armenia)



Ex post evaluation report: 2015

		Projects A+B (Planned)	Projects A+B (Actual)	Project C (Planned)	Project C (Actual)
Investment costs (total)	EUR million	16.45	17.75	11.16	10.16
Counterpart contribution	EUR million	1.75	3.05	2.45	1.45
Funding	EUR million	14.70	14.70	8.71	8.71
of which BMZ budget funds	EUR million	14.70	14.70	8.31	8.31

*) Random sample 2014; **) Projects in the 2015 random sample

Summary: The interrelated measures of the three projects largely comprise rehabilitation work in the three substations of Gardabani (Georgia, projects A and C) and Alaverdi (Armenia, project B) as well as smaller measures in other substations and the co-financing of a management contract (project C) through which Georgian electricity provider GSE was supported by an Irish advisory company.

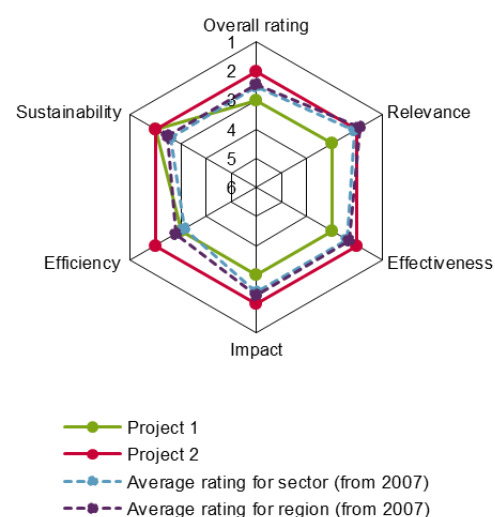
Objectives: The project was designed to bring about an improvement in cross-border electricity trading between Armenia and Georgia – as part of the BMZ's Caucasus initiative – and achieve a reliable supply of electric power in the economic zone of Tbilisi and in the northern regions of Armenia (projects A and B). Project C was designed to stabilise the Georgian electricity transmission grid and improve GSE's performance capacity. All three of the projects pursue the ultimate objective of contributing towards economic development in Armenia and Georgia. Furthermore, projects A and B – as part of the Caucasus initiative – were to help resolve conflicts and prevent crises by tightening economic ties, while project C was to support the continuation of reforms in Georgia (the restructuring of electricity transmission in the energy sector).

Target group: The target group was all consumers in the part of Tbilisi connected to the Armenian grid (project A), all consumers supplied by the transmission line (project B) and all consumers connected to the distribution grid, particularly in production sectors of the Tbilisi economic zone (project C).

Overall rating: Projects A and B: 3; Project C: 2

Rationale: All three projects focus on a significant bottleneck (inadequate production and high distribution losses) in the supply to the population and economic development in Georgia. When projects A and B were completed, the generation of electricity in Georgia rose to such an extent that there was no longer any need for imports. On the contrary, the lines even delivered small volumes of electric power to Armenia. This also reduced the originally high relevance of the project. But all the rehabilitated installations support the supply of power to the intended target groups, albeit from different sources. Project C fulfilled all expectations. The rehabilitated substation continues to play a significant role in Georgia's electricity supply. The continued financing of an existing advisory contract for GSE was crucial in its ongoing development. Positive project impacts were achieved thanks to the successful sectoral reforms and the reliable sustainability expected means this is likely to continue.

Highlights: Reversed use of the transmission line compared to what was planned at the project appraisal.



Rating according to DAC criteria

Overall rating: 3 for projects A and B (transmission line) and 2 for project C (sectoral programme)

General conditions and classification of the programme

The projects tie in with existing investment and non-investment, FC-financed rehabilitation programmes in the area of power transmission. They also support the regional electricity network expansion project as part of the BMZ's Caucasus Initiative, which is aimed at achieving an efficient and sustainable energy supply in the countries based on cross-border collaboration. After intensive dialogue with the Georgian and Armenian government as well as other donors, measures are well integrated into the regional sectoral strategies of the governments and development partners.

Relevance

The power sector in Georgia and particularly the transmission of power represented significant bottlenecks at the time of the project appraisals in 2003 and 2004 to supplying the population and boosting the country's economic development. This was due to insufficient production and high distribution losses. In 2004 for instance, net imports of 1.2 billion kWh were required alongside production of 6.9 billion kWh. The transmission losses ranged between 7 % and 8 % owing to malfunctioning facilities (transformer substations, etc.). The region of Tbilisi was particularly affected by these electricity shortages. Parts of the city were therefore supplied with electricity from Armenia using an isolated operation framework (2004: 475.4 million kWh). The approach of importing electricity to Tbilisi from Armenia by rehabilitating the transformer substations on the Armenian and Georgian sides and using the existing 220 kV power line was highly relevant during the project appraisal.

The relevance of the transmission lines between Georgia and Armenia, the use of which was facilitated by the rehabilitation of transformer substations at both ends of the line in Georgia and Armenia (projects A and B), must be analysed differently. The rehabilitation measures complied with Georgia's and Armenia's national strategies. From today's perspective we have to admit though that the relevance of the transmission line for power supply in Georgia fell significantly below the expectations determined during the appraisal, owing to the sharp reduction in importance (particularly after the absence of electricity imports). When the project was completed Georgia had sufficient power at its disposal as a result of the higher production (10.1 billion kWh) and the unchanged demand (8.7 billion kWh). Electricity imports from Armenia were not necessary. On the contrary, electricity was exported to Armenia to a limited extent (2013: 73.2 million kWh). During an emergency in 2014 when the Georgian network collapsed, Armenian electricity was imported for a day. The transmission line served as an emergency power supply. This power line is the only 220 kV connection between Armenia and Georgia, and therefore still plays a central role despite the reduced power trading between the two countries. However, the decreasing importance of the power line is also shown by the fact that the conductor cables of the line have not been replaced, which would be necessary to increase the performance of the line in a sustainable fashion. For technical reasons – Armenia's and Georgia's grids can only operate in isolated mode via the transmission line, not synchronised – the project was limited in contributing to sustainable power trading. These aspects are reflected in the evaluation of effectiveness and the overall developmental impacts too.

According to dialogue partners in Georgia as well as Armenia, electricity trading between the countries of this region is still considered to be of high political importance. This is also consistent with policies of the BMZ to promote trans-regional initiatives in this region (Caucasus Initiative, Schwarzmeer Energieverbund (Black Sea Transmission Network)). Georgia would like to position itself as an "energy hub" for the region based on its central geographical location. Armenia sees the connection to Georgia as an important strategic measure that can benefit other areas (e.g. gas supply), especially because of its isolated location (no connection to the north (Azerbaijan) or to the south (Turkey)). However, no coordinated policy regarding electricity trading has yet been established. At the moment, both countries expect potential export revenue. The collective opinion is that regional electricity trade (Russia, Iran, Azerbaijan, Turkey, Armenia

and Georgia) would be lucrative and advance the development of the countries. For the planned power trading between Armenia and Georgia, however, a 400 kV line is required and planned.

The 220 kV line could become more important with the FC transmission project "Kaukasus Energieverbundnetz" (Caucasus Energy Transmission Network) in particular, where a high voltage direct current close coupler connects the Armenian and Georgian systems. This way, both networks can operate synchronously. The back-to-back station would be provided with electricity via a project line until the proposed 400 kV line is built. However, it cannot be ruled out that the 400 kV line will be built in addition to the high voltage direct current close coupler, especially since an increase in voltage to 400 kV would otherwise be necessary in Marneuli, thereby increasing the cost of the project. In this case the 220 kV line would have the same function as a reserve line.

No particular relevance is attributed to conflict-resolving effects. There are no particular conflicts between Georgia and Armenia on the one hand, while an existing relationship is maintained by the rehabilitation of the line on the other.

Both projects are cautiously assessed as level 3 as a result of their importance for the power supply in the respective parts of the countries.

Project C, sectoral programme electricity supply, started working on a key bottleneck (see above). The Gardabani transformer substation is one of four 500 kv transformer substations of GSE. Its rehabilitation was consistent with the partner's priorities and well integrated into the donor strategy.

The transformer substation is also significant for Georgia's power network from today's perspective, and continuing the financing of the consulting contract between GSE and an Irish company (management contract) was potentially a very important contributing factor for the further development of the executing agency too. The project is assessed at level 2.

The importance of the energy sector for Georgia is reflected in the variety of active donors, including German DC which plays an important role. Other key donors are the European Bank for Reconstruction and Development (EBRD), the European Investment Bank (EIB), the International Finance Corporation (IFC) and the Austrian Development Bank (OeEB). The donors cooperate in various ways with each other. Besides FC, the most important donors in Armenia regarding investment are the World Bank/IFC and the EBRD. They cooperate consistently here as well.

In conclusion, all three projects tackled substantial bottlenecks in Georgia's development and in principle were all able to contribute to the solutions for these problems, to varying extents. The results chains of the projects to improve power trading and the availability of electricity by rehabilitating power infrastructure and therefore contribute to economic development were thoroughly plausible. The requirement to contribute to reducing conflicts between Georgia and Armenia was very high too and is only connected to the projects indirectly.

Relevance rating: 3 for projects A and B; 2 for project C

Effectiveness

The objectives of projects A and B (transmission line) were the improvement in cross-border electricity trade between Georgia and Armenia as well as the secure (and more cost-effective) supply of electricity in the economic area of Tbilisi (projects A and B) and in the northern regions of Armenia (project B). The project objectives are appropriate.

The indicators are essentially suitable too. However, some might need interpretation: Do they relate to faults in the lines or in the rehabilitated switching stations? They were certainly different for the Armenian and Georgian parts of the line, partly in terms of targets and partly with benchmarks. The target level was adjusted and unified in the EPE with due consideration of the electricity trading volume of 2012 and possible declines caused by higher power production in Georgia. The technical measuring unit of megavolt amperes (MVA) was used as the benchmark for the transmission capacity in the project. A permanent capacity of 250 MVA requires the replacement of conductor cables on the transmission lines between Georgia and Armenia.

Project A indicators	Status PA	Ex post evaluation
(1) Shutdowns caused by faults in rehabilitated power transmission plants of no more than 3 hours per year (project A).	Not indicated for the old plant.	Not fulfilled; 2012: 17 shutdowns, 2013: 4, 2014 so far: 7.3 hours p.a. were exceeded in total. Reason: the line is permanently kept under voltage from Gardabani (Georgia). This operating condition results in higher susceptibility to faults.
(2) Transmission of at least 300 GWh p.a. to Georgia at a permanently secured transmission capacity of 250 MVA.	212 GWh (2003) at a useable capacity of 180 MW (60% of nominal capacity).	Not fulfilled, 73.2 GWh (2013) in the other direction based on a largely unchanged performance capacity between 150 MW and 170 MW.
(3) All-year availability of expanded transmission capacity as a reserve.	Available capacity of 180 MW (60 % of nominal capacity).	Largely unfulfilled as the capacity is not expanded; reserve capacity remains unchanged.

The indicators for project A are not fulfilled. However, a substantial objective of the measure (reliable power supply for the economic area of Tbilisi) is secured. Rehabilitated transformer substations play an important role in this. Since this objective is fulfilled, the effectiveness for project A is still assessed at level 3, despite the missed indicators.

Project B indicators	Status PA	Ex-post evaluation
(1) Shutdowns caused by faults with the transmission lines of no more than 3 hours per year (project B).	17 hours.	Fulfilled, only one shutdown since rehabilitation.
(2) Transmission of at least 300 GWh p.a. to Georgia at a permanently secured transmission capacity of 250 MVA.	212 (2003), no capacity information for the line, probably 250 MVA.	Largely unfulfilled, 73.2 GWh (2013) in the other direction with a generally unchanged performance capacity of 250 MW.
(3) Transmission of at least 40 GWh in the course of the year in the northern supply area of Armenia	No data for the time of the PA. In 2006: 30 GWh.	Exceeded, transmission between 130 GWh and 168 GWh p.a. in the years 2010 - 2013.

The most important indicator of project B), transmission performance, is not fulfilled due to the lower power transmission, all other indicators are exceeded. The effectiveness of the project – particularly in respect of supply in the northern areas of Armenia – is assessed at level 3.

The objective of project C (sectoral programme electricity supply) was to stabilise power transmission in Georgia and ensure a better power supply, particularly in the economic area of Tbilisi. A second goal was to continue restructuring the electricity transmission sector. Both objectives complied with the project.

The 1st indicator is appropriate. The 2nd indicator was originally very output-oriented and was adjusted.

Project C indicators	Status PA	Ex-post evaluation
(1) Shutdowns caused by faults in the rehabilitated 500 kV substation total no more than 2 hours per year.	No data.	Fulfilled, no shutdowns.
(2) Reduction of power losses to approximately 2%.	6%-8%.	Fulfilled, 2%.

The indicators are fulfilled. Project C has contributed to stabilising power transmission in Georgia; the restructuring process was continued and a substantial improvement in professionalism was achieved. As a result, transmission losses hover around 2%.

The attainment of the programme objectives defined at the project appraisal can be summarised as follows:

Effectiveness rating: 3 for projects A and B; 2 for project C

Efficiency

The project focused on critical weaknesses of the power network by improving the transmission system. In Georgia a well-functioning, efficient transmission network is considered a precondition for the targeted private-sector investments in the production area. The increased production performance in recent years thanks to the new construction and rehabilitation of power plants was derived from low electricity losses of 2%. As a result, the project made an efficient contribution to improving the population's power supply. Additionally, tariffs are the reason that transmission systems in Georgia and Armenia mostly cover costs. Tariffs for end consumers range between 6.8 and 8.5 EURct/kWh depending on consumption and region. These are determined by the regulation authority GENERC and are based on a multi-stage model, which includes a higher unit price for higher consumption. In Armenia the final consumption tariff, which is determined by the regulation authority PSRC, hovers around 7.5 EURct/kWh (daily tariff).

Even though tariffs were determined by formally independent authorities in both countries, they are still influenced by political conditions. As a consequence of unrest and campaign promises, tariffs were temporarily cut in both countries. The operational assessment criteria for power supply projects (high micro and macroeconomic cost coverage; low transmission and distribution losses; high operating availability of the plants; low costs in avoiding carbon dioxide emissions) are mostly fulfilled nowadays, but this was not the case at the project appraisal.

The three projects were implemented in a very coherent manner, partly at the same time and with the same suppliers. Efficiency gains were derived from this close connection between the projects.

After an international tender, the implementation of project A was handed over to a general contractor. Some of the measures were carried out by GSE with their own staff. Delays in the implementation had no major impact as no power was transferred through the line between 2007 and 2008. In addition, the expected income level as of the project appraisal was only partly achieved due to the low amount of power transmitted. The project is assessed at level 3.

The rehabilitation measures of project B were necessary because of obsolete and unreliable facilities. At the project appraisal an internal rate of return of 11% was calculated based on the expected exports of electricity to Georgia. This will not materialise due to the significantly lower transmitted amounts (2013: 73.2 GWh instead of 200 GWh). However, income from supplying the northern regions was not taken into account at the time. The former calculation was reconstructed and a rate of return between 0% and 4% was computed – depending on the development of electricity trading – including the benefits from supplying the northern regions. The project is assessed at level 3.

The costs of the rehabilitation measures of project C can be regarded as appropriate. Changes regarding certain details and implementation delays led to a total delay of almost three years in total (2.7 years, acceptance end of 2010 instead of Q1 2006). Allocation efficiency was considered positive as the substations are important for the entire power grid, and a positive contribution was made to the macroeconomic efficiency of power supply in Georgia by reducing shutdowns and power losses. Therefore the project is assessed at level 2.

Efficiency rating: 3 for projects A and B (transmission line) and 2 for project C

Impact

The overall objective of all three projects was to contribute to the economic development of Armenia and Georgia. Furthermore, as part of the BMZ's Caucasus Initiative projects A and B were to help resolve conflicts and prevent crises by tightening economic ties, while project C was to support the continuation of reforms in Georgia (the restructuring of electricity transmission in the energy sector). Separate indicators were not defined; by fulfilling the project objective indicators the overall objectives were to be considered fulfilled as well. For lack of data no indicators were set ex post at the impact level. The measures focused on the substantial development problems. It can be assumed that without improved power transmission, economic development would probably not have been possible on this scale (Georgia: GDP growth 2010: 6.3 %; 2011: 7.2 %, 2012: 6.1 %). Data on the development of particularly power intensive industries is not available. However, the transmission line was not as important as expected for the electricity supply in Georgia due to the low quantity transmitted.

Further financing was important for the future development of the management contractor GSE. The restructuring in the Georgian power sector was continued. Nevertheless, some important measures have not been implemented (including tariff increases for GSE, debt relief for GSE).

The contributions to intensifying economic ties, reducing conflicts and preventing crises are limited. Less power was traded than expected. Normal coordination meetings between actors in the power sectors of Armenia and Georgia do take place, but they also existed before, just like the power line.

Impact rating: 3 for projects A and B and 2 for project C

Sustainability

Largely as a result of successful sectoral reforms in Georgia and Armenia, the project exerted positive effects. Signs of a continuation of the reform process dominate. However, tariffs for GSE in Georgia have remained unchanged since 2007. The investments made in the 500 kV network in the past couple of years (including the Black Sea Transmission Network) are a huge burden on GSE, and associated incomes currently remain far below expectations. In 2013 financing costs of GEL 61.4 million (of which GEL 53.9 million was currency losses) exceeded the income of GEL 61.3 million (approximately EUR 30 million). By financing new projects, GSE is exposed to additional currency risks. The situation was similar for HVEN in Armenia, which also made losses in 2013.

From a technical point of view there are no doubts about the capability of the project-executing agency to sustain the investments as required. There are currently also enough funds available for maintenance.

From today's perspective, we assume that sectoral reforms (amongst others pricing, legislative adjustments to EU regulations) will be continued and that the executing agencies will be granted sufficient tariffs in the medium term in light of their importance.

Sustainability rating: 3 for all projects

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:

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

Rating levels 1-3 denote a positive assessment or successful project while rating levels 4-6 denote a negative 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. Rating levels 1-3 of the overall rating denote a "successful" project while rating levels 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" (level 3).