

Mongolia: Emergency Long-Distance Heating in Choibalsan

Ex-post Evaluation

OECD sector	23063/Coal-fired power plants	
BMZ project number(s)	1) Fixed-asset investment 1997 66 031 2) Personnel support AF 98 190	
Project executing agency	Eastern Energy System, Joint Stock Company, Dornod Province	
Consultant	1) K.A.B.-Kraftwerks- und Anlagenbau Berlin (power station and plant construction company) 2) Stadtwerke Leipzig (Leipzig utility corporation)	
Year of ex-post evaluation	2006	
	Project appraisal (planned)	Ex-post evaluation (actual)
Start of implementation	01/98	01/98
Period of implementation	24 months	63 months
Investment costs:		
Fixed-asset investment	1) EUR 8.7 million	EUR 11.9 million
Personnel support	2) EUR 0.8 million	EUR 0.8 million
Counterpart contribution	1) EUR 1.0 million	EUR 1.2 million
Finance, of which FC funds	1) EUR 7.7 million 2) EUR 0.8 million	EUR 10.7 million EUR 0.8 million
Other institutions/donors involved	-	-
Performance rating	3	
Significance/Relevance	3	
Effectiveness	2	
Efficiency	3	

Brief Description, Overall Objective and Project Objectives with Indicators

The Choibalsan thermal power station supplies the residents and industry at the East Mongolian provincial capital of the same name with electricity, thermal energy and hot water. It operates off-grid so survival in the region and future economic development in Choibalsan depend on its secure operation. Due to the possible threat to life posed by power station outage, the project was planned as an emergency aid measure, although it was not formally classified as such. In the course of implementation, two turbines and three boilers were rehabilitated from project funds (and another from own funds). Foreign currency costs for fixed-asset investments and consultancy services were financed with FC funds amounting to EUR 10.7 million. The project was supplemented by a training measure costing EUR 0.82 million.

The overall objective of the project was to make a contribution to making the city of Choibalsan habitable in order to maintain economic development in the area served by the power station. At project appraisal, it was decided that the overall objective should be deemed to be met in tandem with the project objective. In hindsight, this procedure is no longer appropriate so that we can adduce the stabilization of the total population figure along with sustained economic activity

in the city as a proxy indicator. The project objective was the maintenance or restoration of thermal and electric power generation by the power station for at least five years. The indicator set for five years specified three operational boilers with a time availability of 60% and steam capacity of 80% and a time availability of 60% for the repaired turbines. The project executing agency was the Eastern Energy System, Dornod Province.

Project Design/Major Deviations from Original Planning and Main Causes

In the Choibalsan power station, 3 out of 6 boilers were reinstalled and the ancillary plant (firing system, mills, soot blowers, live steam and feedwater systems and district heating preheater) was replaced or overhauled. The rehabilitation of a fourth boiler by the project executing agency was financed through supplementary investments from FC funds. Two turbines including the ancillary plants were rehabilitated and the facilities for water treatment, oil supply, electrical and control technology, telecommunications and fire extinguishers were completely rebuilt or overhauled. An ash pond was emptied and the ash deposited in a special dump. The technical measures proper were supplemented by measures for training and upgrading power station operatives and for changes to organisation and management.

Key Results of Impact Analysis and Performance Rating

As of project completion, the power station is again in a condition to ensure reliable operation. The conservative indicator targets set at project appraisal for the time availabilities for boilers and turbines have been well exceeded. The efficiency figures for power production and distribution have improved considerably: own offtake has been reduced from 32% to 25% and distribution losses from 44% to almost 17%. Of particular note here are non-technical losses that have dropped from 30% to 5.1% (and as low as 2.1% in the first six months of 2006). Collection efficiency has also improved dramatically to 98.5% (as compared with 70% in 1998). Today, altogether 69% of gross power production actually earns income as compared with 16% at project appraisal. Besides improving production efficiency through rehabilitation, the consultant (from the Leipzig utility) with his training programme and a World Bank project for rehabilitating the power and district heating grid (particularly the non-technical losses) ought to have made a considerable contribution to this.

Extensive further training measures were also carried out in the training centre for power station operatives in Ulan Bator under GTZ guidance. The measure carried out by the Leipzig city utility was very successful. Worth stressing in particular is the pay-by-performance system and the above-mentioned enormous reductions in non-technical losses and own offtake of the power station. Despite the comparatively high turnover locally, about 80% of the trained persons are still engaged at the power station.

Due to the lack of connection to the central grid, low demand for current in comparison with installed capacity in summer and winter and the high variation in seasonal demand for heat, the power station can, however, only be operated at low capacity utilization, amounting to 17% a year only in power generation or 25% accounting for secured capacity. Already 33 GWh of electricity is now sold, an increase of 26% on 2003. (In 2006, it would amount to as much 43 GWh if projected over the year.) Heat generation increased by 5% in the same period. If other mines can actually be connected for a capacity of 20 MW as reportedly applied for, power consumption could almost triple. The connection to the central grid planned for 2007/08 would then coincide with the renewed need to address the issue of the lifespan of the unrehabilitated parts of the system. It would have made sense beyond the emergency aid remit of the project to sound out the option of a connection during project implementation, with a view to feasibility and cost-effectiveness at least.

For political reasons, it has been difficult so far to charge cost-effective rates and readiness to do this would seem to have diminished since the change of government in 2002. The last rise in tariffs in 2002 had to be partly rescinded after protests by lobby groups and the population. On the other hand, no subsidies have been paid from the central budget since 2004. In comparison

with the tariffs of the Choibalsan power station rates are on average 9 Tg/kWh or 0.6 cents/kWh higher than charged for the central grid, but no longer any higher than the other grids in the country. It can recover regular operating costs. The share of electricity for production has risen primarily due to the connection of further users (see below) from 34% (2002) to presently 49% and higher.

One problem, which is not uncommon for a coal power station, is its mutual dependence on the coalmine. After the privatization of the mine, prices were raised by an initial 15% and meanwhile another 28%. This problem has been discussed with the competent ministries in Ulan Bator. On the other hand, the price trend of coal is acceptable in a deregulated market and in times of rising prices for energy, particularly since they are well below the world market average despite modest quality. It should be possible to pass on at least some of the higher energy costs in the tariffs.

After the rehabilitation of the power station (initial impacts already making themselves felt in 2000), economic activities started to revive in Choibalsan, small shops began to open and a meat and a flour factory, that had been downsized to a minimum, stepped up operations again. In a survey, residents spontaneously responded that the power station's almost trouble-free operation today had gone a long way to returning life to normal. A zinc and feldspar mine have set up operations near the city in recent years and a Canadian company is in the process of opening a uranium mine. The BBC now runs the long defunct transmission facilities nearby as a separate station. Tourists and travelling businessmen from nearby China visit the city more frequently.

The power station's deterioration and ultimate stoppage and the danger of an economic collapse of the region was identified correctly as the core problem. It was right to assess the situation as an emergency since many people had already started to migrate, posing a severe threat to the region. At the same time, the previous continuous deterioration due to lack of incentives and the real decline in electricity rates since project appraisal were contributory factors to the situation at sectoral level. In hindsight, it is clear that the latter issues could not have been addressed in a joint project with the technical problems on site. A concerted approach amongst donors would, however, have been helpful.

The technical plan of implementation along emergency aid lines provided an excellent solution to the problems. The power station has recorded operating figures well above the expected targets, losses have been reduced by a considerable margin and the collection rate has already been exemplary for more than three years. Cost efficiency and capacity utilization, which were not accounted for at project appraisal owing to the emergency aid mandate, have not been as satisfactory, although the power station still recovers operating costs thanks to loss reductions and the improved collection rate. In hindsight, the design should have gone beyond emergency aid to complete the connection to the central grid earlier or at least sound out the feasibility of a phased extension.

The project and overall objectives have been attained, although at project appraisal they were defined more cautiously due to the unclear technical conditions at the outset, i.e. the Soviet technology and the need for rehabilitation with unforeseeable compatibility problems. After successful project implementation (and above all the successful training of management and personnel), we may now safely assume that the lifespan will far exceed initial expectations, provided the maintenance is adequate. However, the most important point in objectives achievement that would also have been an obvious indicator is that no outages have occurred in winter and very few in summer. The overall objective of contributing to making the city of Choibalsan more habitable was certainly worded too cautiously since the rehabilitation made a considerable contribution at the least.

As to the environmental impacts of the project, the remaining ash and dust emission can be deemed acceptable considering the small amount of prior environmental pollution and the low power station capacity. Altogether, these were considerably reduced in comparison with ongoing operations without the project thanks to increased plant efficiency. The project afforded no scope for contributing to gender equality. Men and women alike benefit from secure electricity and heat supply. The project did not have any direct bearing on poverty as the urban population

in the country belonged to the better situated classes, although they were saved from a life-threatening situation. It was therefore only geared to achieving a general developmental impact.

Summarizing, we assess the developmental efficacy of the project as follows:

The risks cited on final inspection were (1) the price trend for coal, (2) turnover of well-trained personnel, (3) the economic development of the region and (4) lack of national funds/foreign currency for spare parts. The situation can now be summarized as follows: The price trend for coal (1) must be accepted in a deregulated market and in times of rising prices for energy; in addition, calculations show that even a relatively marked rise in coal prices exerts relatively little influence on costs per kWh. The personnel situation (2) poses a problem but is not really critical and regional economic development (3) is currently quite satisfactory. So far, there has been a lack of political will to adjust tariffs to full costs and as a consequence the (4) supply of spare parts still poses a risk for lack of liquid funds. What needs answering here is the issue of rising energy costs: If coal prices are deregulated, a privatized power station should be allowed to pass this cost increase on in its tariffs. We conveyed this recommendation to the project executing agency at the final discussion.

The core problem of the deterioration, disruption and ultimate shutdown of the power station and the threat of economic collapse in the region was correctly identified and solved satisfactorily by the measures taken (relevance). It was right to gauge the situation as an emergency due to the need to build on existing capacity, which was designed for 40-50,000 soldiers plus approx. 40,000 inhabitants from the Soviet era and consisted in part of Soviet components that were no longer available. It was difficult to assess their compatibility with other systems. The expectations of the technical solutions were worded cautiously due to uncertainty about their sustainability. Even the more fitting target indicator (major contribution instead of just contribution) has been met satisfactorily (no breakdown in heat supply in the winter months). At the same time, despite previous FC activity in the sector at another location, the project did not grasp the opportunities for enhancing significance through grid connection or sectoral reforms. Despite these reservations, we assess the relevance/significance of the project as sufficient altogether (Subrating 3).

Under the project, the objectives (time availability of the boilers and turbines as well as turbine steam capacity) have been met in full and even surpassed in comparison with the cautiously defined target at project appraisal. In hindsight, however, this has created capacities that far exceed needs so that considering both factors, we attest the project satisfactory effectiveness overall (Subrating 2).

Cost ineffectiveness still detracts from this, though. Regrettably, the excellent outcomes in collection efficiency have been primarily offset by the failure to raise tariffs or the actual real drop in electricity rates. The low capacity utilization rate for both power and heat production (even in winter) as well as the failure to grasp the opportunities for improving the results through grid connection must count as deficits. The resultant waste of resources and cost ineffectiveness detract from allocative efficiency. Thanks to the good outcomes in time availability, reduction of system losses and progress in collection efficiency, production efficiency merits a much better assessment. Altogether, the efficiency of the project is gauged as sufficient (Subrating 3).

Weighing up the above factors, the project overall merits a rating of 3 - sufficient developmental efficacy.

General Conclusions

Where a project is carried out to avert a life-threatening danger as emergency aid at a location with extreme climatic conditions, the necessary framework to assure sustainable efficacy should nevertheless be analysed in the implementation phase as far as possible. In the present case, a warning was made of the imminent collapse of the district heating system and plans to rehabilitate the system with the support of a donor organization mentioned during the implementation phase. After a long delay, the World Bank is currently implementing this project. Between 1998 and 2005, however, there was a serious danger that a collapse of the district heating system at

temperatures of as low as -40° might completely thwart project success. In similar cases (parallel to implementing emergency or relief projects), the structural causes of the problems should be analysed together with the partner government (and possibly with other donors in task-sharing) and measures introduced to help prevent another emergency.

In transition countries, persistent attention should be paid to tariff and sectoral reform in the partner country at least as part of donor dialogue to make sure that the need for rehabilitation does not recur for lack of revenue.

Assigning consultants for the practical operation of technical plant has proved very useful in this case. Where possible, more use should be made in particular of the creative approaches (e.g. pay-by-performance) introduced here by a consultancy firm that did not stem from the conventional development consultancy sector.

Abbreviations

FC	Financial Cooperation
PA	Project appraisal
Tg	Mongolian Tugrik

Assessment criteria

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

Performance evaluation criteria

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:

- Have the **project objectives** been achieved to a sufficient degree (project **effectiveness**)?
- Does the programme generate sufficient significant **developmental effects** (project **relevance** and **significance** measured in terms of the achievement of the overall developmental 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 appropriate** with a view to achieving the objectives and how can the programme's microeconomic and macroeconomic impact be measured (**efficiency** of the programme design)?
- To the extent that undesired (**side**) **effects** occur, can these be tolerated?

We do not treat **sustainability**, a key aspect to consider when a project is evaluated, as a separate evaluation category, but rather as an element common to all four fundamental questions on project success. A programme is sustainable if the programme executing agency and/or the target group are able to continue to use the programme 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, organizational and/or technical support has come to an end.