

India: Rehabilitation and Expansion of Neyveli I Mine and Lignite Power Station

Ex-post evaluation report

OECD sector	Coal-fired power plants/23063/Coal/32261	
BMZ project number	1) 1995 65 680 (rehabilitation) 2) 1996 65 685 (expansion)	
Project executing agency	Neyveli Lignite Corporation Ltd.	
Consultant	VEAG, Vetschau; Rheinbraun GmbH	
Year of ex-post evaluation	2007	
	Project appraisal (planned)	Ex-post evaluation (actual)
Start of implementation	1) 4th quarter 1994 2) 4th quarter 1995	1) 4th quarter 1994 2) 4th quarter 1995
Period of implementation	1) EUR 165.30 million 2) EUR 966.34 million	1) EUR 89.35 million 2) EUR 755.27 million
Investment costs	1) EUR 132.07 million 2) EUR 774.60 million	1) EUR 63.34 million 2) EUR 566.17 million
Counterpart contribution	1) EUR 33.23 million 2) EUR 191.84 million	1) EUR 26.01 million 2) EUR 189.10 million
Finance, of which FC funds	1) EUR 165.30 million 2) EUR 966.34 million	1) EUR 89.35 million 2) EUR 755.27 million
Other institutions/Donors involved	None	None
Performance rating	1) 2	2) 2
• Relevance	1) 2	2) 2
• Effectiveness	1) 2	2) 2
• Efficiency	1) 3	2) 3
• Impact	1) 2	2) 2
• Sustainability	1) 2	2) 2

Brief Description, Overall Objective and Project Objectives with Indicators

The project, Rehabilitation of Neyveli I Mine and Lignite Power Station, comprised the renewal of the heavy mining and loading equipment of the power station's own lignite mine, the general overhaul/lifetime extension of 7 out of the power station's 9 blocks (600 MW) and retrofitting all boiler plants with electrostatic filters. In the project, Neyveli I Expansion, annual pit production capacity was raised from 6.5 million to 10.5 million tonnes and the TPS 1 power station extended with two 210 MW blocks. The project executing agency for both projects was the Neyveli Lignite Corporation Ltd. (NLC).

The overall objective of the rehabilitation project was to contribute to macroeconomically efficient and cost-effective power supply in India, while reducing environmental pollution. The indicators for overall objective achievement were: (i) Generating costs at Neyveli are under average for the Southern Region. (ii) The share of productive electricity utilization remains above 80%. (iii) The dust emissions from each boiler are less than 150 mg/Nm³ (Indian threshold).

The project objective was to assure capacity and energy supply at the previous scale for another 15 years by restoring nominal capacity and the availability of plant and equipment. The indicators for this were defined as follows: One year after completion of the rehabilitation works - (i) available capacity of 590 MW; (ii) annual grid feed-in of 3,600 GWh; (iii) assured annual production of 6.5 million tonnes of lignite and approx. 33 million m³ of mining debris.

The overall objective of the extension project was to make a contribution to the long-term elimination of infrastructure deficits in industrial and agricultural development in South India. The indicators were: (i) Average tariffs in the Southern grid meet at least 65% of the average macroeconomic costs 5 years after signing the loan agreement at the latest and at least 75% of the average macroeconomic costs 3 years after power station commissioning at the latest. (ii) Transmission and distribution losses in the Southern grid are kept to 20%. (iii) At least 80% of the energy supplied is put to productive use after power station commissioning.

The project objective was to make a contribution to reducing the power capacity deficit in the South Indian grid. The measure of project objective achievement was to be a grid feed-in of at least 2,250 GWh as of the second year after power station commissioning.

Project Design/Major Deviations from Original Planning and Main Causes

The projects were implemented without any major changes to the original conceptual design. Some considerable delays occurred in implementation, though. The layout of the power station plants was appropriate for dealing with the problems and was in keeping with the conditions then prevailing. Under today's conditions of keener competition amongst power producers and higher environmental standards for thermal power stations, however, more efficient and cleaner technologies would have been selected.

Key Results of Impact Analysis and Performance Rating

The direct environmental impacts of the projects do not infringe the specifications or regulations of the Indian environmental authorities and legislation. Numerous measuring stations and monitoring facilities control air and water quality around the coalmines and power stations. Exhausted coal deposits are refilled and recultivated. The compensation and resettlement of the families living in the proximity of the coalmines was satisfactory overall. The projects afforded no scope for gender equality. They were not aligned with participatory development/good governance. We attest them a general development approach. In a summary evaluation, we assess the developmental efficacy of the project as follows:

Relevance: The rehabilitation and expansion of the lignite mine and the TPS 1 power station have contributed to alleviating power supply shortages and infrastructure deficits for improving regional economic development. Sustainable economic growth is a primary development-policy goal of the partner country and BMZ as a prerequisite for raising employment and income and improving the conditions of life, particularly for the poorer sections of the population. The correctly identified core development problem of supplying secure and affordable power to meet demand, however, poses a long-term challenge, calling for additional efforts to ensure that sufficient infrastructure is also available for future economic progress. Overall, we assess the relevance of both projects as good (**Subrating: 2**).

Effectiveness: All project objective indicators for the rehabilitation project were met to a satisfactory degree. The available capacity of the rehabilitated TPS 1 power station has so far amounted to an average 570 MW. After rehabilitation, power station capacity utilization rose again to over 75% and average annual current feed-in exceeded the target of 3,600 GWh. The annual output of Pit 1 has exceeded 6.5 million tonnes throughout, with annual mining debris amounting to more than 33 million m³. The available production figures and the condition of the facilities indicate that the project will ensure the extension of the power station's operating life by 15 years and an annual net electricity production of 3,600 GWh. The objective of the extension project has been clearly attained. At an annual net power generation of about 2,900 GWh, the feed-in result of the new power station blocks was considerably higher than the minimum project objective indicator target of 2,250 GWh as of the 2nd year of operation. The power station has recorded a capacity utilization rate of almost 87% and has been available for 91.4% of the time over the last three years. Altogether, all project objective indicators have been met to an acceptable degree. On the whole, we assess the effectiveness of both projects as good (**Subrating 2**).

Efficiency: The prime electricity costs and the feed tariffs of the rehabilitated and new blocks approved by the regulatory authority are competitive and ensure the economic viability of the projects. A speedier implementation of the projects would, however, have saved on resources and raised the macroeconomic benefit of the measures. As to energy efficiency in hindsight, the extension project in particular forfeited the additional macroeconomic benefit of applying an environmentally cleaner technology, but the higher costs entailed would have jeopardized the microeconomic profitability of the measures at the time of project planning and would not therefore have been accepted by the Indian side. Fortunately, the situation has now changed. In response to the increased importance attached to environmental aspects, the NLC and other power producers apply lower-pollution technologies in new projects on their own. The criterion of allocative efficiency in the South Indian grid as defined in the FC operational appraisal criteria has been met in acceptable measure. The ratio of consumptive electricity to the rise in use has ranged well below 40% since the project appraisals and the tariff approval policy of the regulatory authorities evidently aims at cost recovery, so cost-effective rates can be expected in the whole South Indian grid over the short to medium term. On account of the persistently high grid losses, however, the criterion of production efficiency has only been satisfied to a limited degree. Altogether, we judge the efficiency of the projects as sufficient (**Subrating 3**).

Impact: As to the overall objective indicators for the rehabilitation project, the average electricity generating costs of the NLC power stations are below average for the Southern Region. The share of productive electricity utilization in the Southern Region has declined to 76.6% from 80%, below the target, but this was unrealistic in hindsight. Ranging between 60 mg/m³ and 80 mg/m³, dust emissions from the power station boilers remain far below the Indian threshold of 150 mg/m³.

With respect to the overall objective indicators for the extension project, the critical values defined at project appraisal were based on partly distorted initial data and were unrealistic at individual points. Taking the microeconomic average costs as a benchmark, the cost-recovery criterion has now been met, since more than 80% of the operational costs of the suppliers (including depreciation) are covered by average revenue from rates charged to end-users. At project appraisal, the actual grid losses hidden behind agricultural electricity consumption were much higher than 20%, probably even more than 30%. The present decline in losses to 22% must therefore rate as a success, even if this figure falls short of the target indicator. The fraction of consumptive electricity has increased in the Southern grid to just over 23%, exceeding the indicator of 20%. However, there are no indications that the increase in the ratio of consumptive current has been detrimental to the development of industry and agriculture. While the all-Indian real net domestic product between 2000 and 2006 rose on annual average by 6.30%, the South

Indian Union states with their comparatively efficient power sector in particular recorded above-average growth rates (Kerala: 6.76%; Andhra Pradesh: 6.58%; Karnataka: 6.40%). The slight increase in the otherwise relatively small share of consumptive electricity is therefore more a sign of growing prosperity than an indicator of a bottleneck in productive electricity utilization. The overall objectives of both projects have been reached. The projects have contributed to remedying infrastructure deficits, enabling faster growth in industry and agriculture and increased prosperity in the region. The standard of living indicators (poverty, education, medical care) have also improved in the Southern Region, partly well exceeding the Indian averages. Altogether, we assess the developmental impact of the projects as good (**Subrating 2**).

Sustainability: The sustainability of both projects is assured. The rehabilitated and newly installed plant and equipment are in good condition and guarantee reliable operation. No financial or technical risks are discernible for the executing agency. The regulatory framework of the power sector does not pose any notable dangers for the sustainability of the projects, either. The pace of power sector reforms differs in the individual Union states, but on the whole they are plausible and progressing along the right lines. The regulatory authority responsible for the executing agency has so far taken balanced tariff approval decisions that have permitted the NLC to earn cost-effective revenue and adequate return on investment capital. We therefore judge the sustainability of both projects to be good (**Subrating 2**).

Weighing up the above subcriteria, we assess the **developmental efficacy of both projects as good overall (Rating 2)**.

General Conclusions

The split-interest instrument and the endowment of special finance facilities sustained by split-interest counterpart funds should be aligned with the market, be adaptable and stand in realistic relation to the feasibility of project objective achievement.

In response to the changed framework in the Indian power sector, German FC should abide more closely by efficiency and environmental criteria when promoting projects in electricity generation and give precedence in particular to state-of-the art technologies that still encounter market barriers in India.

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).