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**IMPLEMENTATION COMPLETION REPORT**

**INDIA**

**MAHARASHTRA POWER PROJECT  
(LOAN 3096-IN)**

**June 24, 1999**

**Energy Sector Unit  
South Asia Region**

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**INDIA**

**MAHARASHTRA POWER PROJECT**

**LOAN 3096-IN**

**IMPLEMENTATION COMPLETION REPORT**

**PREFACE**

This is the Implementation Completion Report (ICR) for the Maharashtra Power Project in India, for which Loan 3096-IN in the amount of US\$ 400 million equivalent was approved on June 15, 1989, and made effective on December 14, 1989. The Borrower was India, acting by its President. The Implementing Agencies for the project were the Irrigation Department of the Government of Maharashtra (GOMID) and the Maharashtra State Electricity Board (MSEB). The project comprised a hydroelectric generation component, distribution components, and technical assistance to MSEB.

The **physical components** of the project were implemented as planned, although the implementation of the main component, the 1,000 MW fourth stage of the Koyna hydroelectric scheme was delayed because of procurement difficulties, and worse than expected geological conditions. However, the underlying **developmental objectives**, including improving Maharashtra's retail power tariff structure; strengthening the sector's finances; and introducing institutional improvements, have not been achieved. A full account of how the state's power sector has deteriorated in the 1990s is contained in the Implementation Completion Report (Report No. 19236 ) for the Second Maharashtra Power Project (Loan 3498-IN)<sup>1</sup>. Loan 3096-IN closed on December 31, 1998, after two one-year extensions. Final disbursements took place on March 23, 1999, when the loan amount was fully utilized.

This ICR was prepared by Anthony E. Sparkes (Task Leader), South Asia Energy Sector Unit (SASEG), Sameer Shukla (Financial Analyst), and I. U. B. Reddy (Social Development Officer), and reviewed by Kari Nyman, India Energy Team Leader, Energy Sector Unit, South Asia Region. Preparation of this ICR began during a Bank ICR mission in December 1998, and was finalized during a follow-up mission in February 1999. It is based on material in the project file and site-specific information collected during the ICR mission. The implementing agencies, GOMID and MSEB, contributed to the preparation of this ICR by providing technical data, the details of the final costs of the project, and financial records and projections. GOMID's and MSEB's evaluation of their implementation of the project components are given in Appendix A1 and A2 of this ICR.

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<sup>1</sup> Because of non-compliance with several of the financial covenants related to Loan 3498-IN (approved June 25, 1992), and because Government of Maharashtra failed to pass on to MSEB part of the proceeds of Loan 3498-IN, the Bank suspended disbursements as of October 22, 1996. Although most of these covenants were later complied with, MSEB's receivables position did not improve, and remains to-date at about 4 months instead of the 2.5 months covenanted. Thus the suspension remained in place, and US\$237.7 million was canceled, effective June 30, 1998, when the loan account closed.

**INDIA**

**MAHARASHTRA POWER PROJECT - LOAN 3096-IN**

**IMPLEMENTATION COMPLETION REPORT**

**EVALUATION SUMMARY**

**Introduction**

1. In 1988 demand for electricity in Maharashtra had risen to about 5,400 MW, and most of this was being supplied by thermal (coal) plants, with only a small portion being supplied by hydro-generated electricity. Because of this high thermal share, a substantial portion of peak demand was being met mainly with thermal plant, which for the Western Region<sup>2</sup> was expensive and difficult to operate with appropriate flexibility to follow the varying peak load, which hydro power can usually more easily accommodate. To correct the imbalance, between thermal and hydroelectric sources, the long term expansion plan for the Western Region, of which Maharashtra is a part, included the installation of a number of peaking hydro plants, including the Koyna Phase IV scheme. This scheme, to increase peak supplies by 1,000 MW, was least cost, minimized the displacement of population and had minimal environmental impacts because no new reservoir was needed and the scheme would be built by the Government of Maharashtra's Irrigation Department (GOMID) almost entirely underground (Part I, paragraphs 6, 7 and 8).

**Project objectives**

2. The project's stated objective were to improve the power supply and operating efficiency of the Western Region and to improve the retail power tariff structure of Maharashtra State Electricity Board (MSEB), strengthen MSEB's financial position, and introduce institutional improvements (Part I, paragraphs 9 and 10).

**Implementation Experience and Results**

3. *Implementation.* (Part I, paragraphs 11, 13, 14 and 15). The Koyna IV power plant has been constructed, commissioning began in March 1999, and the scheme will be fully commissioned by December 1999, which constitutes a delay of four years compared to the appraisal schedule (Part I, paragraphs 17, 18 and 19). All transmission and distribution components were completed by MSEB in 1996, and have been in operation since then, resulting in operational and efficiency improvements for MSEB and its consumers.

4. *Developmental outcome.* (Part I, paragraphs 16, 25, 32 and 33). The underlying developmental objective, to strengthen the power sector in Maharashtra, has not been achieved. The sector deteriorated in the 1990s<sup>3</sup>. MSEB financial position is precarious and its future outlook is alarming, to the extent of threatening increasingly to constrain state finances and economic development in Maharashtra.

5. *Project costs, savings, cancellations and closing date:* (Part I, paragraphs 20 and 21). Following the use of international competitive bidding procedures, most of the contracts were awarded to Indian

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<sup>2</sup> The Western Region electricity network serves Maharashtra, Gujarat and Madhya Pradesh.

<sup>3</sup> An account of this deterioration is described in detail in the Implementation Completion Report (Bank Report No. 19236) for the Second Maharashtra Power Project (Loan 3498-IN).

companies. This factor and the substantial devaluation of the Rupee during the project implementation period resulted in the project costs (US\$656 million), in dollar terms, being much less than the appraisal estimates (US\$1,079 million). US\$46 million was canceled from the loan account in 1992 because it was expected that the cost of the transmission component would be lower than expected. In 1996, the Bank cancelled US\$16.67 million from the loan, when it concluded that MSEB had mis-procured overhead line conductor to this value, following an MSEB exercise with two bidders, in which the bid prices were the subject of negotiations. The closing date for the loan account was extended twice from December 31, 1996 to December 31, 1998. This conformed to the policy of the South Asia Region that closing dates are only extended under unusual circumstances beyond the control of the beneficiary or borrower - in this case because of delays at start-up (Part I, paragraph 17) and delays during construction (Part I, paragraph 19), which were beyond the control of the beneficiary.

6. *Rate of Return:* (Part I, paragraphs 22 and 23). The main component of the project, Koyna IV, cost less than estimated to construct, and is the least cost solution to supplying system peak demand. The financial benefits of the scheme will begin to accrue to Maharashtra when the *frequency-linked pool rate* comes into effect, which is expected soon. This will encourage regional interchanges of electricity and will lead to great economic advantages to India. Koyna's additional 1,000 MW of peak capacity will be utilized both in Maharashtra and in other regions, especially the south of India, where capacity (MW) shortfalls will persist for the next several years.

7. *Sustainability:* (Part I, paragraphs 25 and 26). Well qualified MSEB operations and maintenance staff will ensure that the physical achievements of the project, the Koyna IV plant and the transmission lines, will be sustained for the planned lives of the components of thirty to forty years. However, MSEB's general financial position continues to deteriorate; it remains a burden on the State's finances. The position is unlikely to improve until Maharashtra enters into a program of reform, along the lines of the recommendations of the Rajadhyaksha Committee, which GOM commissioned to advise it - recommendations which the Bank has endorsed - to create a power sector which will attract investments from private sources, in the amounts needed, so that the power sector can expand at the rate required to support Maharashtra economic development.

### **Summary of Findings, Future Operations, Key Lessons Learned**

8. *Bank Performance:* (Part I, paragraphs 27, 28 and 29) Bank staff made major contributions to help prepare MSEB's portion of the project, and later in its support to GOMID in the implementation phase. However, the main component, Koyna IV, was not sufficiently well prepared when the loan was approved. An implementing team in GOMID had not been established and bidding documents had not been prepared. Also there were deficiencies regarding the resettlement and rehabilitation of the people affected by the project, which were eventually identified and appropriately addressed, but only several years after project start-up.

9. *Borrower Performance:* MSEB completed its components on time and below cost. However, compliance by Maharashtra and by MSEB with several superceding covenants of the Second Maharashtra Power Project loan (3498-IN) was unsatisfactory. Interference by the Government of Maharashtra (GOM) in the operations of MSEB resulted in MSEB being unable to perform as a commercial utility. In contravention of the covenants, which required that GOM ensure that MSEB operates along commercial lines, GOM did not allow MSEB to charge appropriate tariffs and insisted (and insists) that MSEB provide low and heavily subsidized tariffs to agriculture users and to the Mula Pravara Cooperative Society, which in turn meant placing a huge burden on industrial consumers.

10. Inadequate and untimely tariff increases caused severe strain on MSEB's finances. MSEB was also restricted from taking much needed actions to recover dues from non-paying consumers. This led to an ever increasing burden of receivables, most of which, because of its age, has now become an uncollectable bad debt. In addition, GOM issued directives to MSEB to provide and maintain additional

electricity supplies to agricultural users, leading to shortages for other paying categories of consumers. Besides weakening MSEB financially, this operational interference by GOM has over the years led to a lack of accountability in MSEB, and a slackening of commercial discipline.

11. GOMID successfully incorporated several examples of very modern technology in the Koyna IV scheme, and these are detailed in Part I, paragraphs 30 and 31.

12. *Assessment of Outcome and Future Operations:* (Part I, paragraphs 32-35) The results of the project are mixed. The transmission and distribution components were completed ahead of time and under budget, and the main component, the Phase IV extension of Koyna, will be completed late in FY1999 also under budget. However, the underlying developmental outcome to strengthen MSEB was only marginally successful. In response to requests for financial support to its power sector, the Bank has advised Maharashtra that its current reform proposals, which mainly consist of establishing a tariff commission instead of a power sector regulatory commission, and a trial of privatization for a small portion of its network, fall far short of its own adviser's (the *Rajadhyaksha Committee*) recommendation, and the Bank's expectations. Thus Bank support in the Maharashtra state power sector is currently not possible.

13. *Key Lessons Learned:* (Part I, paragraphs 36-38) The project did not produce the operational and financial improvements in Maharashtra power sector, and as such it confirmed the position that has been taken by the South Asia Region. Beginning in the mid-1980s, the Bank had attempted to improve the performance of SEBs by direct involvement at the state level. This approach was generally unsuccessful and the revitalization of institutionally and financially weak SEBs did not turn out to be feasible. Projects failed to meet expectations beyond the physical construction of facilities, as was the case with the subject project. The Bank was forced to take such strong measures as suspending disbursement (including the Second Maharashtra Power Project) and subsequently canceling loans. It has become clear that a sustainable solution to the sector's problems requires a focus on restructuring the state power sector rather than revitalizing the state electricity boards (SEBs) as attempted in the past. This restructuring includes, *inter alia*, the unbundling of monopoly utilities, corporatization, establishment of independent regulatory commission, tariff reforms, and privatization of distribution. This lesson has been applied in the on-going power sector reform projects in Orissa, Haryana and Andhra Pradesh.

14. *Project preparation:* Inadequate project preparation prior to loan approval, resulted in the Koyna IV component taking four years longer than forecast at appraisal. Projects must be carefully and adequately prepared, including the evaluation of risks that might cause delays, with an implementation team in place prior to loan approval, with bidding documents prepared and preferably issued and bids received. These are pre-requisites if projects are to move smoothly from the preparation to the implementation phase, and with minimum delays to project completion.

15. *Resettlement and rehabilitation:* It is difficult, and time and resource consuming to fix resettlement problems during project implementation. In the case of this project, only through continual Bank staff involvement were the issues eventually resolved, many years after they should have been. Failure could well have been the result. Detailed and careful attention to the issues must be part of early project preparation. Also the resettlement and rehabilitation plans need to be prepared by the institution which will be responsible for carrying out the rehabilitation.

## INDIA - MAHARASHTRA POWER PROJECT - LOAN 3096-IN

### IMPLEMENTATION COMPLETION REPORT

#### PART I. PROJECT IMPLEMENTATION ASSESSMENT

##### A. PROJECT OBJECTIVES

1. **Background** Despite the progress India had made in expanding its generating capacity from 32,000 MW in 1981 to 54,000 MW in 1988, supply shortages persisted in 1988, which were equivalent to about 20% of maximum power demand and 10% of electrical energy supplied. Also the quality and reliability of the supplied electricity was mostly unsatisfactory. Therefore, to meet a higher proportion of the demand, improve the quality of supply, and to further extend rural electrification, the Government of India (GOI) planned in 1988 to install an additional 80,000 MW of capacity by the turn of the century, with power sector investments for generation, transmission and distribution costing about US\$150 billion. Some of these investments were expected to be made in the further development of India's hydroelectric potential, which has an estimated capacity of about 100,000 MW.

2. By 1988 only 16,000 MW of this hydro-potential had been developed with only a further 4,700 MW under construction. The pace of India's hydroelectric investments had been slow in the previous decade, and at the time of project appraisal GOI was striving to increase the role of hydroelectric schemes in regional least-cost power developments. Progress in developing hydro-schemes, which are generally capital intensive, had been slow because of (a) inadequate financial resources in states with the greatest hydro potential, (b) lengthy disputes over water rights and environmental issues, and (c) the limited technical resources available for the preparation of large hydroelectric projects.

3. Some system efficiency improvements were made in the 1980s to address the unsatisfactory state of the power sector, including increased utilization of generating plant and reductions in fuel consumption. In 1980 plant load factors averaged 42%, and about 800 tons of coal were required to produce one million units of electricity. By 1988 these figures were estimated to have improved to 52% and 720 tons respectively. Tariff structures had also been improved and increased, and in the 1980s tariffs rose in real terms by an average of 5% per annum. However, although tariffs to industrial and commercial consumers had been increased to about 80% of marginal costs, the tariffs charged to agriculture were very low and heavily subsidized.

4. Even with these general improvements, India's power utilities were (and remain) for the most part relatively inefficient. Key constraints included the divided responsibility between GOI and the States for power development, political interference in the operations of the State Electricity Boards (SEBs), and weaknesses in the financial structure of the sector. These had undermined financial performance, and had held down resource mobilization. Thus India's power systems were (and still are) delivering to consumers less power of a poorer quality, and at a higher cost than they should be able to. The costs to the Indian economy of shortages and poor quality supplies were magnified by inefficiencies in end-use

of electricity, caused mainly by insufficient commercial incentives in many markets and by subsidized power prices to low voltage consumers, particularly agriculture. The National Thermal Power Corporation (NTPC) was (and remains) the one notable exception in this picture. By 1988, a ten year old NTPC was already providing about 12% of the SEBs' bulk electricity supplies, and had emerged as an efficient utility, making a return of about 17% on its assets (most of which were less than five years old).

5. In the late 1980s, GOI continued with its initiative to reduce the power sector inefficiencies, and to minimize their repercussions on future sector development. In an attempt to improve the financial strength of the SEBs, GOI amended the Electricity (Supply) Act to require them to earn a 3% rate of return on net assets at historic cost, after meeting operating expenses, taxes, depreciation and interest. GOI also accelerated development of the relatively efficient central utilities, particularly NTPC. GOI also formed the Power Finance Corporation (PFC) to mobilize additional resources for SEBs willing to make needed institutional reforms.

By the end of the 1980s GOI had recognized that central and state government funding of the power sector investment programs would be insufficient, and that the central and state government-owned utilities would have to rely increasingly on their own internal resources and in particular on investments from the private sector. In 1991 GOI opened the power sector to enable private investments to be made in generation by modifying the law so that electricity production was removed from the list of activities reserved for the public sector. The 1948 Act was amended, so that many of the regulatory disincentives to private investment in the power sector were lifted. In particular these changes provided for ownership of generating companies by the private sector, and for private generating companies and captive plants to sell power to the SEBs. Foreign companies were also allowed to implement power projects. In October 1991, GOI established a Board to promote, accelerate and clear private investment proposals in power projects.

6. In 1989, when the **Maharashtra Power Project** was appraised, private utilities were making only marginal contributions to public electricity supply. Two of India's four private utilities were in Maharashtra, where a significant expansion of private involvement in power supply was expected over the following few years. Government of Maharashtra (GOM) was already actively seeking proposals from the private sector for projects to be constructed during the Eighth Plan.

7. Demand for electricity in Maharashtra, with a population of 75 million, was growing at a rate of about 9% per year. In 1981 the State's demand, constrained by deficiencies in supply capacity, stood at 2,990 MW, and by 1988, with increasing deficiencies in supply, the demand had risen to about 5,400 MW. This demand was mainly being met by the generating plants owned or leased and operated by the Maharashtra State Electricity Board (MSEB), by the plant owned by the two private utilities, and by imports from NTPC. Most of these were thermal (coal) plants. Because of this high thermal share, the peak demand in the Western Region was being partially met with expensive-to-run thermal plant. This inefficiency was further compounded by the added substantial cost of additional maintenance for the coal-

fired units, caused by thermally cycling them to match the peak load shape, with a rapidity for which they were not designed.

8. To correct this thermal/hydro imbalance, the long-term expansion plan for the Western Region included the installation of a number of peaking hydro plants. The plan included the Koyna Phase IV scheme, which was to more than double the capacity of the existing hydroelectric site from 880 MW to 1,880 MW<sup>4</sup>. This proposal was least cost, minimized the displacement of population and had minimal environmental impacts, because no new reservoir was needed and all of the above-ground infrastructure, except for a new transmission line, was already in place, serving the existing phases of the scheme. The development of Phase IV of the scheme would increase Koyna's capacity to generate at peak hours with water currently stored and used to generate electricity at times when spare capacity, mainly thermal, existed elsewhere. Shifting Koyna to higher peak load duty would result in existing thermal units operating at a higher load factor, and would increase their energy generation by about 1,390 GWh per year.

9. The project's stated objective was thus to improve the power supply and operating efficiency in MSEB's and the Western Region's power systems through: (a) expanding regional peaking capacity at least cost; (b) improving utilization of existing generating capacity; (c) appropriately strengthening and upgrading MSEB's transmission and distribution systems; (d) recommending ways to improve load dispatch in the Western Region and rationalize bulk power regional trading; (e) improving MSEB's retail power tariff structure; (f) strengthening MSEB's finances; and (g) introducing institutional improvements to MSEB.

10. The project, as part of Maharashtra's least cost power development program, included: (a) the construction of the fourth stage of the Koyna hydroelectric power plant (4 x 250 MW); (b) detailed inspection of the existing Koyna dam, repairs as needed, upgrading of instrumentation, and review of emergency plans as required; (c) supply and erection of equipment and materials for MSEB's five-year transmission and distribution investment program, and strengthening of MSEB's capabilities for planning of distribution systems; (d) implementation of plans to strengthen MSEB's finances, management, and operations including: (i) financial performance targets and corresponding actions; (ii) setting up of corporate planning, operational performance monitoring, and management accounting systems; (iii) streamlining internal procedures; and (iv) accelerating development of data processing and internal audit systems; (e) consultancy and training services, including services of a Panel of Experts to advise on matters related to the Koyna IV scheme and the existing dam; and (f) computer hardware and software required to implement parts (a) to (e) of the project.

## B. ACHIEVEMENT OF OBJECTIVES

11. As described below, the **physical components of the project** (expanding regional peaking capacity at least cost; improving utilization of existing generating capacity; and appropriately strengthening and upgrading MSEB's transmission and distribution systems)

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<sup>4</sup> The Koyna scheme is described in further detail in the Annex to this ICR.



were all completed on time, except for the Koyna IV extension, which was the subject of a four year delay. They were completed at costs below the appraisal estimate. The stated objectives of the project, to improve power supply and operating efficiency in MSEB's and the Western Region's power systems might thus be judged to have been achieved. However, this would be a superficial and erroneous conclusion, because, despite achieving the implementation of the physical components, the Maharashtra power sector is in an even worse financial shape than it was in when the loan was approved in 1989.

12. In essence, the **underlying developmental objectives**, including improving Maharashtra's retail power tariff structure; strengthening the sector's finances; and introducing institutional improvements, have not been achieved. A full account of how the sector has deteriorated in the 1990s is contained in the Implementation Completion Report (Bank Report No. 19236) for the Second Maharashtra Power Project (Loan 3498-IN)<sup>5</sup>. Although MSEB continues to be technically and managerially one of the better performing Indian SEBs, its financial position is precarious and its future outlook is alarming, to the extent of threatening increasingly to constrain state finances and economic development in Maharashtra. The makings of a state financial crisis, emanating from the deleterious impacts of its power sector are very much evident (paragraph 16).

### **Implementation of Physical Components**

13. **Objective (a) expanding regional peaking capacity at least cost.** This objective has been met with the construction of the fourth stage of the Koyna hydroelectric power plant, including the supply and installation of its four 250 MW turbine generators. The commissioning of the first of these was complete in May 1999, and commissioning of all four units will be completed by December 1999. This constitutes a delay of about four years compared to the schedule envisaged at appraisal. The causes for this delay are detailed in paragraphs 17, 18 and 19.

14. **Objective (b) improving utilization of existing generating capacity.** This objective has been accomplished, because as the four Koyna units become available to the system, they and the other hydroelectric units at Koyna will contribute electrical power to the peak demand, and will enable coal-fired units to be used more expeditiously with lower operating and maintenance costs. Also, consultants were employed to carry out detailed inspections of the existing Koyna dam, and provide advice, which GOMID has acted upon. The necessary repairs have been performed to the dam and these have stopped the leakages, which though not at an unusual high rate for a dam of this kind, had been increasing steadily over the last twenty or so years. The Panel of Experts, which was established to oversee the construction of Phase IV and advise on the dam repairs, has expressed satisfaction at the greatly reduced rate of leakage.

15. **Objective (c) appropriately strengthening and upgrading MSEB's transmission and distribution systems.** MSEB utilized proceeds of the loan to help procure, via International Competitive Bidding (ICB) procedures, materials which have been erected in the construction of 49 schemes to extend and reinforce its transmission system. These

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<sup>5</sup> See also Footnote to Preface

included the building of 1,194 kilometers of transmission lines at 400 kV, 220 kV and 132 kV, and the construction of substation additions amounting to 4,122 MVA.

### **Achievement of Developmental Objectives**

16. The project failed to achieve the developmental objectives set out at the time of appraisal, namely improving Maharashtra's retail power tariff structure; strengthening the sector's finances; and introducing institutional improvements<sup>6</sup>. The project was one of several by which the Bank attempted, in the 1980s, to improve the performance of SEBs by direct involvement at the state level. As with the other projects, this approach was unsuccessful, even with MSEB, one of the better performing SEBs, and the revitalization of an already institutionally and financially weak utility turned out not to be feasible. It has since become clear that a sustainable solution to the sector's problems cannot be achieved by revitalizing the SEB, as attempted in this project, but rather requires a focus on addressing the root causes of the crisis:- the politicization of decisions, non-technical losses due to theft, lack of a commercial culture, which can be achieved only through structuring the state power sector. This restructuring includes, *inter alia*, the unbundling of monopoly utilities, corporatization, establishment of independent regulatory commission, tariff reforms, and privatization of distribution.

### **C. MAJOR FACTORS AFFECTING THE PROJECT**

17. *Project preparation* The main component of the project, Koyna IV, was the subject of major delays at start-up. The project was submitted for Board approval without the prerequisites that are now expected of the borrower/beneficiary at project entry. The loan became effective in December 1989. But it was not until April 1990 that a working group was set up in GOMID to handle the project.

18. *Procurement (see also paragraph 21)* Bidding document had therefore not been prepared, and only following a protracted exercise<sup>7</sup> between GOMID and the Bank, were the civil works bid documents approved by the Bank in April 1991. Despite the SAR stating that because of their size the turbine generators were unprecedented in India, the bidding documents for the procurement of these were also not available prior to loan effectiveness. The civil works and the turbines in a project of this nature are inextricably inter-linked. The SAR implementation schedule envisaged that the civil works contract and the turbine generator contracts would be effected in September 1990, i.e. nine months after loan effectiveness. This was an impossible target. Civil works contracts were eventually effected in March 1992, eighteen months later than envisaged in the appraisal schedule.

19. The exercise to evaluate the turbine generator contract bids was especially complex, requiring lengthy discussions in the Bank, and with GOMID and the Central Electricity

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<sup>6</sup> Details of the studies, which were to be financed under the loan, how they were carried out, and their impacts, are provided in Table 7, page 15, of this ICR.

<sup>7</sup> The exercise included exchanges between the Bank and GOMID and GOI over the period November 1987 to April 1991, when the bid documents were eventually issued.

Authority (CEA), and the employment by the Bank of consultants to advise it on special aspects of the ICB bids. This exercise was unprecedented, and has been described by the Bank's Procurement Policy and Services Group as the most complex bid evaluation the Bank has been involved in. It took ten months to resolve. As a result of the combination of these procurement complexities, an already tight implementation schedule was delayed in its start-up by two and half years compared with the schedule envisaged at the time of appraisal. The implementation of the underground works were delayed by worst than expected rock conditions, which, contrary to the original design plan, required the tunnel to be lined with reinforced concrete.

20. *Costs.* Project cost estimates were prepared at appraisal on the basis of international prices of various plant components. The final cost of the project is summarized in Table 8A. The cost of the Koyna IV component was about US\$ 331million equivalent compared with US\$ 455 million estimated at appraisal in 1989. The cost of the transmission and distribution components was about US\$ 325million equivalent compared with US\$ 624 million estimated at appraisal. This greatly reduced cost for the transmission component was mainly because MSEB's generation program during the project period was not as extensive as envisaged, and several evacuation transmission lines were thus omitted from its development activities. A major factor contributing to the reductions in costs of both the Koyna and transmission components relates to the devaluation of the rupee<sup>8</sup>, linked to the fact that most of contracts, especially those for the supply of materials for the transmission lines, were awarded, following international competitive bidding, to Indian suppliers, who were well able to match the appropriate standards of the specifications, which GOMID and MSEB had included in the bidding documents. The turbine generators were supplied by European manufacturers.

21. *Cancellations, and Closing Date.* In May 1992, US\$46 million was canceled from the loan account at the request of MSEB and India's Department of Economic Affairs (DEA) because it was expected that the cost of the transmission component would be lower than expected (paragraph 20). In October 1996, the Bank cancelled US\$16.67 million from the loan proceeds, following a lengthy investigation, when it declared that MSEB had misprocured overhead line conductor to this value, following an MSEB exercise with two bidders in which the bid prices were the subject of negotiations. In response to GOMID and DEA requests, the closing date for the loan account was extended twice from December 31, 1996 to December 31, 1998. This conformed to the policy of the South Asia Region that closing dates are only extended under unusual circumstances beyond the control of the beneficiary or borrower. In this case it was agreed that the loan closing date be extended to allow access to the remaining funds because the delays at start-up (paragraph 17) and during construction (paragraph 19) were beyond GOMID's control.

22. *Rate of Return.* It was recognized at the time of appraisal that the benefits of the Koyna IV project would relate to the additional value of concentrating the station's generation into periods when system demands are highest. The benefits of Koyna IV would be to move 1,390 GWh of generation from off-peak to peak periods and to provide an additional 47 GWh from efficiency improvements. It was also recognized that there would

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<sup>8</sup> At appraisal in 1989, the exchange rate was Rs. 15 per US\$. By loan closure the rate had changed to about Rs. 40 per US\$)

be no financial benefit to the concentration of generation into peak periods until the retail tariffs in the Western Region distinguished between the costs of supplying energy during peak and off-peak periods, and that there was a likelihood that two-part tariffs would be introduced for large consumers in the following few years. For Maharashtra, this was to be one of the principal objectives of the ongoing pricing study. The financial benefit of Koyna IV would then be the difference between peak and off-peak revenues on Koyna's off-peak generation which would be concentrated into peak periods. Despite the study conclusions that Maharashtra should invoke time-of-day tariffs, GOM has declined so far to allow MSEB to apply these for its consumers.

23. However, the Koyna IV scheme, with a cost-to-completion considerably less, in dollar terms, than estimated, was the least cost solution to Maharashtra's and the Western Region's peak demand needs. India will soon employ an inter-regional electricity trading system, which is expected to bring a significant improvement in grid discipline, through a *frequency-linked pool rate*. This will provide opportunities for inter-regional trading, when adequate interconnections are developed so that power can be transmitted from one region to another. Koyna will be able to contribute to meeting the peak demand in the Western Region, and even be able to help with meeting peak demand in the Southern Region to where an import/export interconnector has recently been constructed, and where power is in short supply 24-hours a day. Therefore, besides its immediate economic advantages, Koyna will soon be able reap the financial benefits for MSEB and Maharashtra.

24. *Financial management* At the time that the Bank suspended India's right to access the funds of the loan of the Second Maharashtra Power Project, MSEB and GOM were not in compliance with a number of covenants. MSEB was not in compliance with the accounts receivables covenant and the rate of return covenant, and also GOM had failed to pass on the proceeds of the Bank loan to MSEB. While these defaults were to a large extent the outcome of traditionally poor financial management practices in both MSEB as well as GOM, they were also symptomatic of the malaise affecting most states, i.e. that of a lack of commercial accountability in the state governments as well as in the SEBs resulting from years of political interference in most aspects of the operational, administrative and financial functioning of the power sector.

#### **D. PROJECT SUSTAINABILITY**

25. The **physical achievements** of the project are highly likely to be sustained. The Koyna IV power plant will remain in the ownership of GOM, but will be leased to MSEB for future operation and maintenance. It will be operated to help meet the system peak load for about four hours per day with a load factor of about 17%. MSEB has trained sufficient, and suitably qualified, staff at the other Koyna power stations and hydroplants throughout the state, and these will operate and maintain the Koyna IV plant to MSEB's high standards. Operational plans to ensure the sustainability of the Koyna IV scheme and the transmission and distribution components of the project have been discussed and agreed with MSEB's management. These include the provision of spares for the first few years of Koyna IV's life, and through the annual budget of adequate funds for the appropriate maintenance and operation of the Koyna IV and transmission plant and equipment.

26. The marginal improvements in MSEB's financial position brought about in 1996, following the threat to suspend disbursements from Loan 3498-IN and the suspension itself, have been sustained. GOM has not since issued instructions to MSEB with regard to any particular consumer groups; and a tariff increase of 13%, mainly falling on industrial consumers, was allowed in 1998. However, MSEB's position continues to be weak, and dependant on Government subsidies. Thus the sector is unlikely to be able to attract investments in the amounts needed for electricity developments to support Maharashtra's economic development. It is doubtful if the position will improve unless Maharashtra enters into a program of reform, as recommended by its consultants.

### **E. BANK PERFORMANCE**

27. *Identification and appraisal* Bank staff performance was good in that it helped MSEB identify and prepare the components of transmission and distribution, and prepared pertinent terms of reference for the recommended studies. However, Bank's involvement in the preparation of the Koyna IV component of the project was unsatisfactory. Technical specifications were not ready at the time of loan approval, and the pre-qualification of the civil works contractors was left to be performed in the initial stages of implementation. This resulted in substantial delays in project start-up and completion (see paragraph 17 and 18 above). However, staff involvement at negotiations was correct when it insisted that GOMID strengthen its technical staff, because GOM was reluctant to hire foreign specialists. It was also appropriate that the Bank recommended that GOMID should appoint a Dam Safety Panel, which contributed substantially in resolving several difficult technical problems with clarity and speed.

28. *Resettlement and rehabilitation* There were deficiencies in the resettlement and rehabilitation preparation for the project, though fortunately the scale of resettlement was small (see Appendix C). At the outset, in 1989, there was no resettlement plan, but only a number of commitments from GOM to eventually provide resettlement information. A technical specialist visited the field in 1992, and discovered that 530 families would be affected, primarily by land acquisition. Subsequently in the latter years of the project's implementation, the quality of supervision improved, the problems were properly studied by Maharashtra's Department of Forestry and Revenues, by using the services of an independent consultant. Bank staff then helped in a lengthy exercise, including linking the extensions of the loan closing date with the implementation of retrofit economic rehabilitation plan in the form of house improvement grants, financial assistance for starting income generation activities, and upgrading and creating basic civic amenities in the affected villages. As a result, the overall living standards of affected persons have improved. The economic rehabilitation program prepared in response to Bank's supervision mission's recommendation is under implementation, and GOM has assured the Bank that it will complete the implementation by June 1999, and that adequate funds have been earmarked for this purpose. GOM will be providing the Bank with a report in July 1999 which confirms the completion of the program, and details the final actions taken.

29. *Supervision* Bank supervision performed professionally in addressing delicate procurement problems (including cases of misprocurement), thereby avoiding further delays to project implementation. The Bank successfully maintained a good working relationship with GOI, GOMID and MSEB, and provided advice on the use of modern technologies

(paragraph 29), financial and managerial issues, and advised GOM on how it should reform the power sector. Complex procurement issues, including numerous complaints from bidders in the ICB process were handled expeditiously. A mid term review of this project and the Second Maharashtra Power Project (Loan 3498-IN) took place in February 1996, which confirmed the Bank's concerns over MSEB's weak financial position, and eventually led to the suspension of Loan 3498-IN, in an attempt to ensure that the concerns regarding MSEB's weak financial position were addressed.

## **F. BORROWER PERFORMANCE**

30. GOMID prepared a least-cost, economical and sustainable project, utilizing the experience it had acquired in designing and building several hydroelectric schemes and many irrigation dams and waterways in the state. GOMID is to be commended for its employment of several new technologies in the Koyna IV scheme. The scheme utilizes 400 kV gas-insulated (SF6) switchgear, which is installed in an underground cavern. It also includes the use of the world's first commercial installation of 400 kV gas-insulated cabling (about 7 km - 14 phase runs, each with a length of 500 meters). This runs from the underground generator transformers to the small (½ hectare) take-off yard at the commencement of the transmission line, which is the only evidence above ground that the 1,000 MW scheme exists.

31. The scheme has been constructed entirely underground, including the power house, the transformer and switchgear halls and, notably, the water intake structures. In excavating the intakes, which entrain the water from the existing reservoir into the head race tunnel, GOMID performed the first underwater lake tap in India. This environmentally protective exercise, which was performed without lowering the level of the water in the reservoir, is a forerunner to several exercises, which will need to be performed in India, as it follows a least cost plan of development, in devoting more of its existing hydro-sites to supplying peak demand, and creating new pumped storage schemes at existing reservoirs. In preparation for the Koyna IV exercise, staff of GOMID witnessed lake taps performed in Europe, and technical experts from Sweden and the United States were employed to advise on the complex drilling operation and the placement of explosives.

32. Compliance by Maharashtra and by MSEB with several superceding covenants of the loan for the Second Maharashtra Power Project was unsatisfactory. Interference by the Government of Maharashtra (GOM) in the operations of MSEB resulted in MSEB being unable to perform as a commercial utility. In contravention of the covenants, which required that GOM ensure that MSEB operates along commercial lines, GOM did not allow MSEB to charge appropriate tariffs and insisted (and insists) that MSEB provide low and heavily subsidized tariffs to agriculture users, which places a huge burden on industrial consumers, especially when the favored consumer groups fail to pay. Inadequate and untimely tariff increases caused severe strain on MSEB's finances. MSEB was also restricted from taking much needed actions to recover dues from non-paying consumers leading to an ever increasing burden of receivables, most of which, because of its age, has now become an uncollectable bad debt. In addition, GOM issued directives to MSEB to provide and maintain additional electricity supplies to agricultural users, leading to shortages for other paying categories of consumers. Besides weakening MSEB financially, this operational interference by GOM has over the years led to a lack of accountability in MSEB, and a slackening of commercial discipline.

## G. ASSESSMENT OF PROJECT OUTCOME

33. The results of the project are mixed. The transmission and distribution components were completed ahead of time and under budget. The main component, the Phase IV extension of Koyna, will be completed late in FY1999, and the resulting benefits will transpire (paragraph 23). But, the underlying developmental outcome to strengthen MSEB was only marginally successful and is unlikely to be sustained (paragraph 16). However, this project and the Second Maharashtra Power Project served to ensure that Maharashtra studied the need to restructure its power sector, but seemingly it has decided that it is not necessary yet.

## H. FUTURE OPERATIONS

34. **Maharashtra** has inquired as to whether the Bank would be able to support with a new loan or other instrument, its plans to further develop its hydroelectric potential, in particular a pumped storage scheme at Koyna (Phase V). The Bank has responded that it would welcome the chance to support Maharashtra power sector, including hydroelectric developments, **but** only if the sector enters a reform mode, consistent with the recommendations of its consultants – recommendations which the Bank endorses. The consultants have recommended, inter alia, that MSEB be corporatized and remain responsible only for generation and transmission; that distribution be privatized; that tariffs be rationalized to limit cross-subsidies and to properly reflect the cost of supply; that all consumers be metered; a power sector reform bill enacted; and a power sector regulatory commission established. The Bank has advised Maharashtra that its current reform proposals, which mainly consist of establishing a tariff commission instead of a power sector regulatory commission, and a trial of privatization for a small portion of its network, fall far short of its consultant's recommendation and the Bank's expectations, so that Bank support in the Maharashtra state power sector is currently not possible.

35. **MSEB** is one of the better performing SEBs, yet its financial position is precarious and its future outlook is alarming, threatening to increasingly constrain state finances and economic development in Maharashtra. The makings of a deep crisis are very much evident. The scope for continuing and increasing Government subsidy support mainly on the basis of adjustments such as debt to equity conversions, and loan and equity write-offs, is being exhausted. The Government's own financial position does not allow large cash subsidies. The Bank has urged the Government to start addressing this looming power and fiscal crisis before it becomes an acute reality. Maharashtra Government could examine the experience of Andhra Pradesh in this respect. The Andhra Pradesh Government has recently launched a comprehensive program of reforms in the power sector, but only after APSEB's situation had reached crisis proportions. MSEB is headed in a similar direction, and MSEB's burden on the Government is rising. It would be much easier to launch and implement a comprehensive power sector reform program now, rather than 3-5 years down the line when options are limited and implementing them has become much more difficult.

## I. KEY LESSONS LEARNED

36. *Reform in the power sector* Beginning in the mid-1980s, the Bank had attempted to improve the performance of SEBs by direct involvement at the state level. This approach was generally unsuccessful and the revitalization of institutionally and financially weak SEBs did not turn out to be feasible. Projects failed to meet expectations beyond the physical construction of facilities, as was the case with the subject project, where the objectives of operational and financial improvements did not result. The Bank was forced in several instances to take such strong measures as suspending disbursements (including the Second Maharashtra Power Project) and subsequently canceling loans. It has become clear that a sustainable solution to the sector's problems requires a focus on restructuring the state power sector rather than revitalizing the SEBs as attempted in the past. This restructuring includes, *inter alia*, the unbundling of monopoly utilities, corporatization, establishment of independent regulatory commission, tariff reforms, and privatization of distribution. This lesson has been applied in the on-going power sector reform projects in Orissa, Haryana and Andhra Pradesh.

37. *Project preparation* Projects must be properly prepared, with an implementation team in place prior to loan approval, with bidding documents prepared and preferably issued and bids received, if projects with accurate estimates of costs, are to move smoothly from preparation to implementation. The implementation of Koyna IV took two to three years longer than planned because the project was not adequately prepared at the time of loan approval, resulting *inter alia* in higher costs, and charges, which could have been lower, on un-disbursed portions of the loan.

38. *Resettlement and rehabilitation* It is difficult and time consuming to fix resettlement problems during project implementation. Early, detailed and careful attention to the issues must be part of project preparation, and the details need to be prepared by the institution which will be responsible for the rehabilitation. In the case of the Maharashtra Power Project, the institution responsible, the Forestry and Revenue Department, only became active in the exercise several years after the project took off.



## PART II: STATISTICAL TABLES

Table 1: Summary of Assessments

A. Achievement of Objectives	Substantial	Partial	Negligible	Not applicable
Macroeconomic policies				✓
Sector policies			✓	
Financial objectives			✓	
Institutional development			✓	
Physical objectives	✓			
Poverty reduction		✓		
Gender issues				✓
Other social objectives		✓		
Environmental objectives	✓			
Public sector management			✓	
Private sector development			✓	
Other				
	Likely	Unlikely	Uncertain	
B. Project Sustainability	✓			
C. Bank performance	Highly Satisfactory	Satisfactory	Deficient	
Identification		✓		
Preparation assistance			✓	
Appraisal			✓	
Supervision		✓		
D. Borrower performance	Highly Satisfactory	Satisfactory	Marginally satisfactory	Deficient
Preparation (physical elements)		✓		
Implementation (physical elements)		✓		
Covenant compliance				✓
Operation (physical elements)		✓		
	Highly satisfactory	Satisfactory	Unsatisfactory	Highly unsatisfactory
E. Assessment of outcome			✓	

Table 2: Related Bank Loans/Credits

Loan/Credit Title	Purpose	Year of Approval	Status
<b>IBRD Loans</b>			
<b>Preceding Operations</b>			
Ramagundam Thermal	3x200 MW	January 1979	Complete
Farakka Thermal	3x200 MW	June 1980	Complete
Second Ramagundam Thermal	3x500 MW	December 1981	Complete
Central Power Transmission	400kV+220kV transmission	May 1983	Complete
Second Farakka Thermal	2x500 MW	June 1984	Complete
Rihand Power Transmission	500kV HVDC+400kV AC tr.	May 1985	Complete
Combined Cycle Power	413 MW (Anta)	April 1986	Complete
Capital Power Supply	4x210 MW (Dadri)	June 1987	Complete
Talcher Thermal	2x500 MW	June 1987	Complete
Chandrapur (Maharashtra)	2x500 MW	May 1985	Complete
Nathpa Jhakri	6x250 MW	January 1989	Under construction
Second Maharashtra Power	1x500 MW (Chandrapur Unit 7); ±500 kV HVDC line	June 1992	Complete
<b>Following Operations</b>			
Orissa Power Sector Restructuring	T and D	May 1996	Under implementation
Haryana Power APL 1	T and D	January 1998	Under implementation
Andhra Pradesh APL 1	T and D	February 1999	Under implementation
<b>Total IBRD Loans:</b>	<b>14</b>		
<b>IDA Credits</b>			
<b>Preceding Operations</b>			
Singrauli Thermal	3x200 MW	April 1977	Complete
Ramagundam Thermal	3x200 MW	January 1979	Complete
Korba Thermal	3x200 MW	April 1970	Complete
Second Singrauli Thermal	2x500 MW	May 1980	Complete
Farakka Thermal	3x200 MW	June 1980	Complete
Second Korba Thermal	3x200 MW	July 1981	Complete
<b>Total IDA Credits:</b>	<b>6</b>		

Table 3: Project Timetable

Steps in project cycle	Date planned	Date actual
Identification	08/87	08/87
Preparation	10/88	10/88
Appraisal	01/89	01/89
Negotiations	05/89	05/15/89
Board presentation	06/89	06/15/89
Signing	09/89	09/11/89
Effectiveness	11/89	12/14/89
Project completion (physical elements)	12/95	12/99
Loan closing	12/31/97	12/31/98

**Table 4: Loan Disbursements: Cumulative Estimated and Actual**

Bank Fiscal Years	FY90	FY91	FY92	FY93	FY94	FY95	FY96	FY97	FY98
Appraisal estimate (US\$ million)	39.6	111.0	186.0	261.6	344.0	378.8	393.9	400.0	
Actual (US\$ million)	19.9	23.3	41.2	93.6	144.3	175.7	252.3	296.8	337.3*
Actual as % of estimate (%)	50	20	22	36	42	46	64	74	
Date of final disbursement									03/23/99

\* US\$62.67 million was cancelled from the loan (see text, paragraph 21)

**Table 5: Key Indicators for Project Implementation**  
**Construction and Commissioning**

Plant Component	Contract effected		Completion		Commercial operation begins	
	SAR	Actual	SAR	Actual	SAR	Actual
Koyna civils	08/90	10/92	3/94	4/99	-	-
Koyna E and M	08/90	1/95*	12/95	12/99**	3/95	4/99

\* Although the main contract for the supply and erection of the 4x250 MW turbogenerators was signed on May 26, 1994, it did not become effective until January 1995, when GOMID had established an LOC in favor of contractor, as per conditions of contract.

\*\* First unit commissioned in April 1999. Fourth unit expected to be commissioned before end of December 1999.

**Table 6: Key System Indicators**

	1991/2	1992/3	1993/4	1994/5	1995/6	1996/7	1997/8
State system annual load factor %	73.2	75.4	72.0	75.9	77.9	78.0	nya
MSEB thermal plant availability factor %	77.4	77.7	79.8	81.9	83.8	85.2	84.2
Reserve margin MW	Nil						
MSEB coal consumption (kg/kWh)	0.770	0.800	0.800	0.798	0.804	0.788	0.800
Number of system collapses 1/	3	1	1	-	7	3	1
MSEB installed capacity (MW)	7,503	7,503	7,593	7,725	7,725	7,725	8,281
MSEB annual generation (GWh)	31,360	31,030	34,110	38,210	39,390	41,020	41,630
MSEB annual sales (GWh)		30,960	34,560	37,760	41,620	42,700	nya
Total losses %	15.7	15.3	15.2	15.3	15.4	15.3	nya
MSEB average tariff income p/kWh	107	136	150	161	169	199	213
MSEB income from sales Rs. crores	3,285	4,306	5,202	6,081	7,034	8,498	9,888
MSEB rate of return %	3.0	5.2	4.8	4.7	4.8	4.5	4.5
Self financing ratio	11.6	27.5	11.2	38.3	36.0	53.6	44.9
Receivables (days)	138	137	139	134	128	112	107
Collections to billing ratio	n/a	n/a	93.2	94.3	94.4	92.5	91.6
Payables (days)	140	153	57	58	54	54	52
Debt service ratio	0.97	1.20	1.18	1.41	1.55	1.39	nya
No. of consumers (million)	8.84	9.27	9.75	10.27	10.87	11.42	nya
No. employees (regular)	107,450	111,514	111,514	111,514	110,662	110,874	110,681
Consumers/employee	82.2	83.1	87.4	92.1	98.3	103.0	nya
Employee/MW installed	14.3	14.9	14.7	14.4	14.3	14.4	13.4
Transmission 11 kV & above (km)	177,000	-	-	-	208,887	214,593	nya
Distribution below 11 kV (km)	317,000	-	-	-	396,113	397,348	nya
Transmission s/s capacity (MVA)	43,000	-	-	-	43,542	46,163	nya

1/ System collapses will likely reduce in number with commissioning in 1999 of  $\pm 500$  kV HVDC line, between Chandrapur and Bombay, which was financed under 3498-IN

**Table 7: Studies Included in the Project****Recommendations on ways to improve load dispatch in the Western Region and rationalize bulk power regional trading.**

It was agreed in 1991, that this study should not be performed under the project, and that the Power Sector Review being carried out by the Bank (ESMAP) superceded it. The ESMAP work resulted in the Bank Report No. 9786-IN, *INDIA – Long Term Issues in the Power Sector*. The Report advised that: (a) huge savings could be derived for India by improved coordination through regional inter-trading, and by the implementation of two-part tariffs for the supply to NTPC of generation, and that such improvements would also bring about improvements to the environment as a result of reduced emissions and reduced ash production; (b) the enormous sector investment program would need considerable support from the private sector if it were to succeed; (c) increasing tariffs would provide substantial economic benefits, and that raising them to the level of LRMC would produce saving to the Indian economy of Rs. 400 billion to 2000; (d) substantial saving both in capital investments and annual costs could be made through improved end-user efficiency.

**Improving MSEB's retail power tariff structure.**

This study was performed, and one of its main conclusions was that MSEB should employ time-of-day tariffs, to minimize investments and to maximize the use of its existing sources of generation. However, GOM has not allowed MSEB to use these (see text at paragraph 22 and 23)

**Strengthening MSEB's finances.**

In 1994, using its own funds, Maharashtra engaged international consultants to advise it on how to strengthen the position of MSEB, with a view to making changes in the sector to this effect. But the recommendations of the consultants were not heeded, and MSEB's condition failed to improve.

**Introducing institutional improvements to MSEB.**

Consultants were employed by MSEB, and as a result of their advice, MSEB, inter alia, established a Corporate Planning Unit, re-organized and improved its data processing procedures, established an Operations and Maintenance Unit and System to monitor the operational performance of its generation and transmission and distribution systems, strengthened its internal audit procedures, and established the Environmental Protection Cell. MSEB is currently proceeding with a Board-wide computerization plan including the establishment of Board-wide and local area networks.

**Table 8A: Project Costs**

	<i>Appraisal estimate (US\$ million) a/</i>	<i>Actual (US\$ million)</i>
Koyna IV civil works	149.6	127.5
Koyna IV electrical and mechanical equipment	262.6	189.3
Koyna IV engineering and administration	42.5	14.2
<b>Koyna IV total</b>	<b>454.7</b>	<b>331.0</b>
MSEB transmission	508.4	229.0
MSEB distribution	113.1	95.9
MSEB institutional development	2.5	0.5
<b>MSEB components total</b>	<b>624.0</b>	<b>325.4</b>
<b>Total Project Cost (US\$ m)</b>	<b>1,078.7</b>	<b>656.4</b>
<b>Interest during construction</b>	<b>265.0</b>	<b>b/</b>
<b>Total financing required</b>	<b>1,343.8</b>	

a/ Included physical and price contingencies

b/ Detail not provided by GOM or MSEB.

**Table 8B: Project Financing**

<i>Source</i>	<b>Appraisal Estimate (US\$m)</b>			<b>Actual (US\$m)</b>		
	<i>Local</i>	<i>Foreign</i>	<i>Total</i>	<i>Local</i>	<i>Foreign</i>	<i>Total</i>
IBRD	-	400	400	-	336.6	336.6
Co-financiers d/	-	150	150	-	-	-
MSEB/GOM	471	58	529	285.2	34.6	319.8
<b>Total c/</b>	<b>471</b>	<b>608</b>	<b>1,079</b>	<b>285.2</b>	<b>371.2</b>	<b>656.4</b>

c/ Comparisons exclude IDC – see footnote b/ above.

d/ It was envisaged at appraisal that co-financiers would need to be identified. This became un-necessary because bids were much lower than expected, and further funding was not required.

**Table 9: Analysis of Economic Costs and Benefits**

No post completion quantitative analysis of financial benefits and the project return was performed, for the reasons provide in the text at paragraphs 22 and 23.

**Table 10a: Status of Legal Covenants (dated September 11, 1989) of Loan 3096-IN**

<i>Loan Agreement</i>	<i>Description of Covenant</i>	<i>Covenant Status</i>
4.01	GOI/GOMID: Special Account and SOE to be audited annually within 9 months of FY end.	Complied with
4.01	GOI/GOM: Project accounts to be audited within 9 months of FY end.	Complied with
Schedule 2.10 c	GOI to cause MSEB to furnish resettlement plan for persons displaced or to be displaced by the construction of any substation under the project.	Complied with
<i>Project Agreement</i>	<i>Description of Covenant</i>	<i>Covenant Status</i>
Schedule 2.6	GOI to furnish to the Bank report on all persons to be displaced by Koyna IV by Dec. 31, 1989, and to compensate eligible persons in accordance with provisions of MPDP 1976.	Complied with. Compensation – see Appendix C. Paragraph 6.

**Table 10b: Status of superceding Legal Covenants (dated July 8, 1992) of Loan 3498-IN**

<i>Loan Agreement</i>	<i>Description of Covenant</i>	<i>Covenant Status</i>
2.02 (b)	GOI to open and maintain a Special Deposit Account in dollars with the Reserve Bank of India.	Complied with
3.04	GOI to take actions to ensure adequate coal supplies for the efficient operation of the project's power plant.	Complied with
4.01 (b) (ii)	GOM shall, jointly with the Bank, carry out a mid-term review in the 3rd year of the project to assess overall progress of the project.	Performed in February 1996
<i>Project Agreement</i>	<i>Description of Covenant</i>	<i>Covenant Status</i>
2.02	GOM/MSEB on-lending arrangement	Complied with
4.01 (b) (ii)	GOM: Project account to be audited and audit report to be furnished to the Bank no later than 9 months after FY end	Complied with
4.04	MSEB to make necessary financial arrangements for the acquisition and installation of HVDC terminals required under Part A(ii) of the project	Complied with
Schedule 2.2	GOM shall (a) establish a commission to review institutional arrangements in the power sector in Maharashtra, and (b) not later than Dec. 31, 1993, discuss the findings and recommendations of the said commission with the Bank.	(a) complied with in 1994 (b) complied with in 1996
Schedule 2.3	GOM shall, jointly with the Bank, carry out a mid-term review in the 3rd year of the project to assess overall progress of the project	Performed in February 1996
Schedule 2.3	MSEB to furnish to the Bank no later than March 31 of each year, a work plan, including the list of distribution lines and substations to be constructed under the project in the following year	Complied with
Schedule 2.5	MSEB to implement various environmental mitigatory measures at Chandrapur, including inter alia, the implementation of a waste water treatment & management scheme, the installation of a dust suppression acquisition and maintenance of various monitoring equipment.	Complied with
3.01 (iii)	MSEB to take out insurance against risks in such amounts as will be consistent with appropriate practices.	Complied with
3.02 (i)	Ln 3498-IN: MSEB to reduce commercial receivables (less any disputed amounts) to less than 2.5 months of revenue.	Not complied with
3.02 (ii)	MSEB to reduce commercial payables to less than 2.0 months of consumption of fuel and consumables, plus purchase of power.	Complied with
4.02 (c)	MSEB to furnish to the Bank, certified financial statements within 9 months of FY end, and auditor's report within 12 months.	Complied with
4.03 (a) (i)	MSEB to generate funds from internal sources (excluding GOM subsidies) equivalent to not less than 20% in FY93 and FY94, and 25% from FY95 onwards, of the annual average of its capital expenditure incurred, or expected to be incurred, for the previous, current and following fiscal year.	Complied with
4.03 (a) (ii)	MSEB to earn a return on net fixed assets of no less than 4.5% from FY93 onwards.	Complied with
4.04	MSEB to ensure that Debt Service Coverage is at least 1.0 in FY90/91 and 1.2 thereafter	Complied with
Schedule 2.1	MSEB to furnish to the Bank, no later than Dec. 31 of each year, annual revisions to the 5-year revolving capital investment and associated financing plan of MSEB	Complied with

**Table - 11: Compliance with Operational Manual Statements**

Statement number and title	Comments on lack of compliance
All Bank policies were complied with, with the exception of OP/BP 10.02. The main component of the (First) Maharashtra Power project was executed by GOMID, which typically follows government accounting systems which are cash-based single entry systems. GOMID opened a separate budget head to capture project-related expenditures. However, no separate project accounts were compiled by GOMID. The financial management of GOMID, like that of any other government department, leaves much to be desired. Any future project that the Bank might help finance will need to address this issue well in advance of loan negotiations.	

**Table 12: Bank Resources: Staff Inputs**

	Weeks	US\$ ('000)
Through Appraisal	87.1	193.6
Appraisal-Board	59.3	153.5
Board-Effectiveness/Supervision	219.7	605.0
Completion	13.5	31.5
<b>TOTAL</b>	<b>379.6</b>	<b>983.6</b>

**Table 13: Bank Resources: Missions**

Stage of Project Cycle	month/yr	No. of Persons	Days in field	Specialization (see key below)		
Identification	08/87	3	7	PO, E, SOO		
Preparation	11/87	6	4	SOO, Econ, E, PO, E, DC		
Preparation	05/88	5	5	SOO, E, FA, Econ, E		
Preparation	10/88	6	15	SOO, FA, FA, E, Econ, PO		
Appraisal	01/89	9	14	FA, E, E, ENV, Econ, MS, Econ, FA, FA		
To effectiveness	09/89	1	5	E		
Stage of Project Cycle	month/yr	No. of Persons	Days in field	Specialization	Performance Rating	
					Implementation	Development
Supervision 1	02/90	6	5	FA, E, E, E, A, Econ	1	S
Supervision 2	11/90	2	5	E, ENV	1	S
Supervision 3	02/91	2	5	E, E, FA	1	S
Supervision 4	08/91	1	5	FA	1	S
Supervision 5	10/92	7	8	E, E, E, E, FA, FA, MS	1	S
Supervision 5	07/93	2	5	FA, FA	1	S
Supervision 6	07/94	3	5	E, E, SOC	2	S
Supervision 7	11/94	1	5	E	2	S
Supervision 8	12/94	3	5	E, E, FA	2	S
Supervision 9	12/95	3	7	E, E, FA	2	S
Supervision 10*	03/96	6	8	E, SOC, E, FA, FA, ENV	1	S
Supervision 11	06/96	2	5	E, SOC	1	S
Supervision 12	12/96	3	5	E, E, FA	1	S
Supervision 13	06/97	1	5	E	1	S
Supervision 14	01/98	2	5	E, SOC	1	S
Supervision 15	06/98	3	6	E, E, SOC	1	S
ICR review mssn	12/98	4	5	E, FA, SOC	1	U

Key:- PO - Project officer; SOO - Senior Operations Officer; DC - Division Chief; FA - Financial analyst; E - Engineer; MS - Management specialist; Econ - Economist; IT - Information technology specialist; ES - Energy specialist; SOC - Sociologist; ENV - Environmental protection specialist; A - Anthropologist; S - Satisfactory; U - Unsatisfactory

\* - Mid-term review

The Koyna Phase IV Concept

1. The proposal was to more than double the power capacity of the Koyna site with the fourth stage development in parallel to the existing first and second stages. These draw water from Lake Shivajisagar, the reservoir behind the existing Koyna Dam. These waters have since the 1960s been serving Phases I, II and III, via diversionary tunnels through India's continental divide, the mountains of the Western Ghats, westwards to the Arabian Sea instead of eastwards to the Bay of Bengal. The Koyna Dam is located 56 km west of Karad, and the power station site is located 25 km from Chiplun, which is on the coastal road from Bombay to Goa. The dam is therefore situated about 350 km south of Bombay. Because of its location at the top of the steep scarp and its orientation parallel to it, the catchment area receives a very high rainfall averaging about 6,000 mm (about 20 feet) per year. About eighty percent of this rain-flow occurs during the monsoon season which extends over the period from June to October.
2. The existing Stage I and Stage II developments at Koyna consist of an intake on Lake Shivajisagar, supplying water via twin headrace tunnels and inclined shafts to an underground powerhouse, in which are installed eight Pelton-type generating units with a total installed capacity of 560 MW. From the powerhouse a tailrace tunnel leads to Lake Kolkewadi which is the forebay of Koyna Stage III which provides a further 320 MW of generating capacity. The Stage I and II units were commissioned over the period 1962 to 1967, while Stage III units were commissioned in 1975-76. Stages I, II and III thus had a combined capacity of 880 MW.
3. The Stage IV development parallels the existing Stages I and II, also developing the full 521 meter head between Lake Shivajisagar and Lake Kolkewadi. However the routing of the new power conduits have been more direct than those of the previous development, which had to accommodate implementation in stages. Koyna Stage IV involves the installation of four additional 250 MW units driven by Francis type turbines, in a new underground powerhouse. No additional flows have been diverted, and no extra water is utilized. The combination of the Stage IV development along with the existing plant provides more than twice as much capacity (1,880 MW) at the times of the system peak, but with approximately the same energy output as previously (a small increase in energy is realized due the improved efficiency of the new turbines and generators).



**Project review from the borrower's perspective  
(Contribution by GOMID on KHEP STAGE-IV Component)**

**1.0 Introduction:**

The World Bank granted a loan of US \$ 400 million in September 1989 to GOI for the Maharashtra Power Project IBRD loan 3096 IN. It had two components (A) Koyna-IV for US \$ 230 million and (B) MSEB for US \$ 170 million. The loan closing date was initially 31<sup>st</sup> December 1996 and was extended in two stages viz., (i) up to 31<sup>st</sup> December 1997 and (ii) up to 31<sup>st</sup> December 1998. This portion of Appendix A deals with the implementation of the Koyna-IV component.

**2.0 Project objectives:** The objectives of the Maharashtra Power project were to improve power supply in the western region of India and the operating efficiency of the Board.

The Project consisted of two parts, Part(A) pertained to Govt. of Maharashtra and Part(B) was with MSEB. As the present report is only for GOMID i.e. Part-A only, the project objectives as detailed in Project Agreement were as under:

1. The construction of the fourth stage of the Koyna hydro Electric Power plant (Koyna IV) comprising: (i) intake structure in the existing Koyna reservoir; (ii) a 4.5 km long head race tunnel; (iii) a 1,000 Mw (4 x 250 Mw) underground power station and ancillary structures; (iv) a 2.1 km long tail race tunnel; (v) a 1 km long approach tunnel for access to the power plant; and (vi) the associated 400 kV switchyard.
2. The carrying out of detailed inspection of the existing Koyna dam and repairs, upgrading of instrumentation and review of emergency plans as required.
3. The utilisation of specialists services and carrying out of training, including the review of the Project by a Panel of Experts.  
These works were executed in accordance with guidelines of World Bank.

**Project design** – The project covered definite target of commissioning of 4 x 250 MW machines by having close monitoring. There was definite package-wise procurement schedule. Thus, the design of project was framed in an objective methodical manner.

**3.0 Project Implementation Procedure Adopted:**

The Project Agreement Schedule 1 covered details of (i) procurement of goods and work & (ii) employment consultant's services. The contract documents for executing works and employment of the consultants were framed in accordance for procurement under IBRD loan. These documents were vetted by World Bank mission from time to time to ensure that the works get executed in accordance with World

Bank guidelines. The timely vetting by the World Bank mission provided opportunities to GOM officers to have interaction with latest procurement procedures for execution of project of this magnitude . It is necessary to state here that world Bank missions had scrutinized drawings, technical specifications. The World Bank emphasized on exhaustive pre-qualification exercise which enabled participation of competent bidders in the procurement process. Some works for equipment and civil works estimated to cost the equivalent of US \$ 2,00,000 and US \$ 5,00,000 were executed by resorting to local competitive bidding procedure.

- (a) GOM have taken review of technical aspects of Koyna-IV from time to time accordance with the help of POE. The Panel of experts consisted of 5 members, One Chairman, 2 Civil and 2 E&M members. The GOM had set up a Steering Committee under the Chairmanship of Hon. Chief Secretary for closely watching progress of works and resolving difficulties. This is the measure adopted by GOM, though not specified by World Bank, for successful completion of project.
- (b) To review the present condition of existing Koyna Dam, determine the scope of (i) additional investigations, (ii) repairs to Koyna Dam, Dam Review Panel was constituted. . This Dam Review panel consisted of experts of international reputation. Dynamic analysis of Dam based on maximum credible earthquake, studies of Hydrology with Peak Maximum Flood and under water epoxy grouting treatment from upstream face dam block to joints were carried out. The D.R.P. expressed that condition of Koyna Dam is safe.
- (c) GOM had revised the organizational structure for implementation of the project Independent offices viz., Chief Engineer, Koyna Design Circle, Pune, Koyna Construction Circle, Satara ; Koyna (E&M) Designs Circle, Koyna E&M Construction Circle, Satara were created. The appointed staff members were having background knowledge of implementation of Hydro Electric Project.
- (d) GOM furnished a plan of economic rehabilitation of persons whether landowning or Landless affected by construction of Koyna-IV and compensated eligible persons in accordance with the provisions of the Maharashtra Project Displaced persons Act 1976.
- (e) After obtaining necessary forest clearance under Forest (conservation) Act 1980, the project constructed access road to the surge tank for Koyna-IV.
- (f) GOMID established a thorough reporting system to World Bank and monitored progress of work by using computerized monitoring system.

**3.2 Operational experience:** The World Bank reviewed progress of work through several missions. The World Bank mission used to inspect physically progress of works, discussed with project officers both of department and contractors and suggested areas where specific attention of implementation authorities is required. The monthly progress reports which were very punctually submitted to the world

Bank helped world Bank to take an overall stock about progress of work. A very heartening feature of Mission visits was their professional approach. This fetched good results particularly in respect of following elements:

- a) Epoxy grouting treatment from upstream face of Dam to monolith block joints for control of leakage in the Koyna Dam. This reduced leakage which was more than 7,000 liters per minute (lpm) to less than 1,500 lpm Treatment was given to heavily leaking block joints (more than 200 lpm).
- b) Fixation of contracts for civil works critically monitored by World Bank. The World Bank scrutinized drawings for civil works of water conductor system of Koyna-IV. The World Bank readily accepted the separation of supply of steel plates 1 (ICB-3) for Pressure Shaft lining, floating independent package for Design and supply of Hydraulic Hoist and gates.
- c) The Department officers could get access to the latest developments in Geo-technical field through visit of GOMID Engineers to Norway, Canada. M/s. Golder Associates the technical consultants had reviewed proposed support treatment for caverns and tunnels in 1992. They provided geo-technical training, geo-technical advice and design review. Thus, the support treatment of Koyna-IV water conductor water system provided is in tune with latest development in this field.
- d) The World Bank helped GOMID in respect of following E&M works.
  - i) Selection of proper and efficient Francis Turbine of such a high head and large capacity from the global offers received was a very crucial job. The World Bank held meeting at Washington (1993) and had discussions with various bidder, SGI Consultants, GOMID Officers and advised proper selection.
  - ii) Very safe and proper selection of alternative of Gas Insulated Switchgear (GIS) as compared to open air switch gear (1995).
  - iii) Selection of 400 KVA XLPE cable in comparison to GITB (1996).
- e) The World Bank helped in making payments for foreign contractors by following direct payment procedure.
- f) The periodic review progress by World Bank missions brought out following important points.
- g) (i)The delay in fixation of contracts for E&M main equipment (In May 1995) and the inherent interface with civil works in respect of erection of units made it obligatory to revise key dates for completion of various elements of civil works and grant of corresponding extension in contract period for civil works.

(ii) The World Bank upheld the proposal of having underwater lake tap for connecting water conductor of Koyna Stage-IV to Koyna lake. Initially, it was proposed to deplete the lake and have final lake blast from top. This has helped in having transfer of technology to India for using lake tapping method for generation of power wherever pen stocks are not embedded in body of the dam.

(iii) The World Bank's insistence for economic rehabilitation provided new insight to the issue. Reviews of rehabilitation works by World Bank mission was important in accelerating actions. The environmental aspects were also duly taken care of.

- h) As per covenant, the accounts were maintained in accordance with sound accounting system. All records, invoices bills etc. evidencing expenditure were retained. The Accountant General had carried out audit inspections and issued certificates. The adherence to proper accounting system enabled GOM Officers to have full-fledged updated figures of component-wise utilisation of loan figures.

#### **4.0 Relationship between Borrower and World Bank.**

- 4.1 The relationship between Borrower and Bank were very cordial and the suggestions of Bank missions were implemented for successful completion of Project. It may be mentioned here that in an underground project of this magnitude and having such a wide time span, slippage in progress of works has to be taken as an inevitable feature. The requirement of extra time in civil part were mainly; because of (i) the occurrence of breccia instead of good basalt. This called for extra time for excavation and subsequent R.C.C. lining for HRT, Head Surge. (ii) requirement of having pilot excavation for pressure shaft by using boretec machine and subsequent laying of rails etc. The inclination of 58 degree instead of so far adopted 45 degree for pressure shafts called for adoption of stringent safety measures and consequent extra requirement of time for pressure shaft lining. (iii) execution of additional works such as cooling water tank, discharge header tunnel in power house.
- 4.2 The deployment of latest type of equipment for e.g. (i) Francis Turbines of compact size with runner removal passage, (ii) G.I.S. forces on Transformer Hall slab etc. called for use of latest software. The tolerance limits such as deflection due to forces are very small. Availability of POE, whose reports were reviewed by World Bank time to time, helped in effectively solving problems.
- 4.3 The clause of imposition of liquidated damages for non completion of elements in time proved to be a very stringent provision. The World Bank mission realised this and objectively viewed the difficulties and concluded that the reasons for delay beyond control of contractors. This unavoidable delay was subsequently ratified by GOM by granting extension in time limits to the civil contractors.
- 4.4 The approach of World Bank missions about the issues faced by GOM was practical and objective and the World Bank was satisfied that sincere efforts

are being made for completion of project. The World Bank granted extension twice. Thus, though by the time extended loan limit of 31<sup>st</sup> December 1998, no machine was spun, their completion was very much in view (i) first machine (Unit No.4) was mechanically spun on the 31<sup>st</sup> March 1999 and (ii) the other units are in advance stage to get complete by year 2000. It may be recalled here that Task manager, at the time of final lake blast 13<sup>th</sup> March 1999 sent a letter which said 'our Koyna Project'. This is speaking example of healthy relationship between borrower and client.

## 5.0 Financial Aspects:

5.1 SAR Provisions: The total estimated cost of the project of appraisal stage 1989) was estimated to be as under (c.f. Page No.34 of SAR).

Sr. No.	Particulars	Local Rs. Million	Foreign Rs. Million	Total Rs. Million	Local US Million	Foreign US Million	Total US Million
1	Civil works	945.8	602.2	1548.0	65.8	40.3	106.1
2	Equipment	897.8	1817.2	2715.0	62.5	123.5	186.0
3	Consulting services	32.8	4.2	37.0	0.3	2.2	2.5
4	Engineering and Administration	405.0	0.0	405.0	27.7	0.0	27.7
	<b>Total</b>	<b>2281.4</b>	<b>2423.6</b>	<b>4705.0</b>	<b>156.3</b>	<b>166.0</b>	<b>322.0</b>

The total cost including physical contingencies was estimated as under (c.f. SAR Page No.108 and 109).

Particulars.	Total (Rs.Million)	Break down of total cost (Rs. Million)			
<b>CIVIL</b>	2338.9	56.8	91.4	1.4	149.6
Equipment	4315.8	175.5	44.4	42.5	262.6
Consulting services	56.4	3.1	0.4	0.0	3.5
Engineering and Administration	608.9	0.0	38.0	0.0	38.0
Land for construction	14.9	0.0	1.0	0.0	1.0
<b>Total:</b>	<b>7334.8</b>	<b>235.5</b>	<b>175.3</b>	<b>44.0</b>	<b>454.8</b>

(The rate of exchange at Appraisal Stage : Rs.15 = 1 US \$).

Expenditure incurred up to January, 1999 end are as under.

	Rs.Million	U.S.Dollar Million.
Civil Works	4440.300	137.280
E&M Works	6990.325	193.734
Total:	11430.625	331.014

It may be mentioned here that there will be some expenditure in year 1999-2000 and beyond towards completion of remaining works of KHEP STAGE-IV. It would be to the extent of Rs.300 Million for Civil works (U.S.Dollar 8 Million) and for Electrical works, it would be Rs.1,200 Million (U.S.Dollar 32 Million).

### **Lessons learned**

The pre-qualification exercise for deciding eligible contractors, finalisation of technical specifications was a time consuming job sufficient progress in respect of finalisation of technical specifications is required to be made before posing a project for external assistance. A clause to provide for a Dispute Resolution Board would have been useful.

The provision of imposition of liquidated damages is very stringent to be implemented . Some lenient provisions are necessary for making contractors to work as per guidance of Department especially in respect of achieving interface dates.

Very intimate relations between (i) Borrower and client, (ii) wings of execution civil and electrical are essential for having constructive approach in successful completion of underground Hydro Electric Project of this magnitude.

### **Conclusion**

Execution of the KHEP STAGE-IV can be considered as a successful story in the history of externally aided projects. This was possible; because of close monitoring of progress of project by Panel of Experts; Steering Committee; dedicated staff; World Bank missions, and healthy relations between executing agencies.

**Project review from the borrower's perspective  
(Contribution by MSEB on Transmission and Distribution Components)**

**A. Preface**

This is MSEB's perspective part of the Implementation Completion Report (ICR) for first Maharashtra Power Project covered under financing of IBRD Loan 3096-IN for an amount equivalent of US\$ 400 million. The loan proposal was appraised in 1989, contract agreement for which was signed on 11<sup>th</sup> September 1989, and it became effective on 14th December 1989. The scheduled loan closing date was 31st December 1996.

First Maharashtra Power Project has been an important and ambitious project having multiple targets for the executing agencies (Govt. of Maharashtra (GOM) and Maharashtra State Electricity Board (MSEB)). As it appears in the proceeding paras., the basic physical objectives were to improve power supply and operating efficiency in MSEB and in the Western Regional Power System.

The contents of this part of the ICR were prepared during January 1999-March 1999 and include references from documents including Staff Appraisal Report (SAR) for Loan 3096-IN, Loan and Project Agreements, aide memoires, site reports and inputs received from concerned groups of MSEB involved with the implementation of this project.

**B. Project Objectives**

This project objective was to improve power supply and operating efficiency in MSEB and in the Western Region Power systems through: (a) expanding regional peaking capacity at least cost; (b) improving utilisation of existing generating capacity; (c) strengthening and upgrading MSEB's transmission and distribution systems; (d) recommending ways to improve load despatch in the Western Region and rationalize bulk power regional trading; (e) improving MSEB's retail power tariff structure; (f) strengthening MSEB's finances; and (g) introducing institutional improvements in MSEB. Out of the above items (a) and (b) were implemented by GOM through construction of Koyna Stage-IV, whereas others were within the scope of MSEB. However, item (d) was subsequently deleted due to utilization of funds meant for the consultancy part by GOM.

IBRD Loan 3096-IN of US\$ 400 M consists of US\$230 M for Koyna Stage IV (implemented by Govt. of Maharashtra) and US\$170 M for transmission lines associated with evacuation of Koyna Stage IV as well as various transmission schemes (implemented by MSEB).

This Implementation Completion Report is furnished for MSEB's scope of work included in the project. The project description for MSEB Component can be further elaborated/described as under:

- (a) The acquisition and installation of equipment and materials for the Board's transmission and distribution investment programme.

- (b) The construction of 400kV transmission lines to connect Koyna IV to the existing transmission system of Maharashtra.
- (c) The implementation of a plan to strengthen the Board's operations and finances and for managerial development including setting up of performance monitoring system, management accounting, streamlining internal procedures and accelerating development of data processing systems.
- (d) The utilization of specialists' services and carrying out training.

### **C. Achievement of Objectives**

- (i) The first and prime-most object (of supply and erection of equipment and material for MSEB's five-year transmission and distribution investment programme) has been successfully achieved by way of commissioning all the 49 Extra High Voltage (EHV) schemes utilising the equipment procured against the loan. The total loan amount of US\$107.33M was utilised before closing date of the loan which was 31<sup>st</sup> December, 1996.
- (ii) The construction of 400 kV transmission lines to connect Koyna Stage IV Power Station to transmission system of Maharashtra has also been achieved by commissioning 400 kV Koyna - Karad D/C Line (via New Koyna substation) and 400 kV Koyna IV Lonikand D/C line well in advance of commissioning of Koyna Stage IV Power Station.
- (iii) M/s. Worley International Ltd. were appointed by MSEB for availing the consultancy services in respect of Planning of distribution network. The software and hardware required for the purpose was also acquired. Further sample distribution reinforcement schemes were also prepared for two districts. The methodology suggested by the consultant is being adopted for distribution system planning.

### **D. Project Cost Estimate**

#### **1. Transmission Project**

The estimated project cost (during loan appraisal) was Rs.9,570 Million. The revised up-to-date cost works out to Rs.10,235.2 Millions (US\$324.92 Million). The up-to-date cost includes Rs.684.30 million which is the cost for evacuation of power from Koyna Stage IV by 400kV lines.

In December 1989, the World Bank sanctioned a loan of US\$400 Million under this Loan No.3096-IN. It consisted of US\$230 Million for Koyna Stage IV and US\$170 Million for transmission lines associated with evacuation of Koyna Stage IV Power Station as well as various other transmission schemes.

MSEB surrendered US\$62.67 Million worth loan due to devaluation of Indian Rupee. Thus for transmission projects the balance loan amount was US\$107.33 Million.



2. Consultancy Services

The initial estimates of consultancy services were Rs.30.00 Million (US\$2.10 Million). However the revised scope of consultant's services worked out to Rs.15.624 Millions (US\$0.496 M).

**E) Implementation Schedule**

1. The transmission schemes covered in the Maharashtra Power Project-I were commissioned as scheduled and their commissioning dates are indicated in Annexure-1.

2. Consultancy Services

The works of all the consultancy services undertaken by the consultants have been completed, as per the scheduled time frame.

MSEB secured consultants' services of M/s. Worley International Limited, New Zealand, in December 1994.

The consultant has submitted the inception report in the month of March 1995 which included:

- (a) Network analysis
- (b) Design review
- (c) Operational view
- (d) Data Base development
- (e) Skill Transfer
- (f) Implementation
- (g) Reporting

The consultant has submitted the following:

- (i) Design Review Report in the month of July 1995;
- (ii) Master plan for the implementation of Network Information Management System in the month December 1995. They have also supplied Power System Simulator (PSSU) Software required for Distribution Network Analysis;
- (iii) Design Report for District of Solapur and Parbhani in January 1996; and
- (iv) Final Report (preliminary) and final report in the month of March 1996 and May 1996 respectively.

The Consultants have also trained MSEB engineers in India as well as in New Zealand.

## **F. Design Features**

### **1. Transmission Project**

MSEB has already acquired sufficient experience of installation and commissioning of EHV transmission lines and substations including procurement of materials. All the technical specifications of supply packages were prepared, tenders floated, bids received and evaluated and contracts were awarded by MSEB's Project Design Office at Mumbai headed by the Chief Engineer (Trans. Planning). Similarly, the project implementation was executed, by MSEB's Chief Engineer, 400kV Construction Zone, Nagpur for 400kV schemes and Chief Engineer EHV Construction Zone, Pune for other Transmission Scheme. MSEB has adequate and experienced inhouse staff for operation and maintenance (O&M) activities of EHV Lines and Substations.

## **G. Lessons Learnt**

### **1. Transmission Project**

In case of procurement of Bersimis conductor, the World Bank's approach regarding validity of the offers, resulted in some delay. It may be noted that the bidders do not have any reason to go on extending validity of their offers unless asked for. Therefore World Bank's action of declaring procurement of part quantity of conductor as misprocurement could have been avoided. (This has resulted into loan amount being slashed down from US\$124 Millions to US\$107.33 Millions).

### **2. Consultancy Services**

MSEB's association with M/s. Worley, International Ltd. has been of immense benefit.

Several specific lessons can be drawn from the project that has both operational and strategic implications for similar projects likely to be implemented in future.

- (i) A sound financial health is key element to the success of stability.
- (ii) The procurement cycle right from starting of the issue of bid documents to the stage of the award of the contract simplified and shortened.

## **H. Performance of Co-financiers**

There was no co-financier for this project.

## **I. Borrower's Performance**

MSEB's performance as far as execution of project components covered under Maharashtra Power Project was satisfactory. All 49 Nos. Transmission Schemes have been commissioned.

The works of consultancy services have been undertaken as per schedule and to the satisfaction of MSEB.

#### **K. Evaluation of Bank's Performance**

The Bank has adequately assisted MSEB in upbringing the physical tasks of Maharashtra Power Project-1. Bank provided number of visits of supervisory/review missions. These efforts of World Bank have undoubtedly contributed towards MSEB's attempts for timely realisation of project objectives.

The World Bank was consistently involved right from the project preparation to the project completion. The relations between MSEB and the Bank officials were quite cordial. Frequent reviews undertaken by the Bank missions throughout the tenure of the project have helped MSEB in a way to appreciate and adopt broader sectoral concerns in their operations. The performance of the Bank from the project preparation through the project completion stage was satisfactory. The involvement of Bank's delegates during their supervisory/review missions and through correspondence and communication has always been appreciable and has contributed enough while implementing this project.

However, Bank can render more realistic functions by way of giving due considerations for the conditions prevailing in a country like India where sometimes some things are in contrast and not comparable/compatible to the conditions/environments as experienced and viewed by the Bank.

#### **L. Plan adopted for Operation and Maintenance Phase of the Project**

The transmission lines and substations covered under the project were commissioned as scheduled. These lines and substations after commissioning were handed over to the respective superintending engineers, EHV O&M Circles located at Nagpur/Chandrapur/Amravati/ Parli/ Nashik/Pune/Karad/Panvel/Kalwa. O&M of EHV Lines and Substations is a day to day business of MSEB and no special performance indicators are required to be used to monitor the operational and developmental impact of the schemes covered under this project

The overall transmission system of MSEB is quite healthy.

#### **M. List of Enclosures**

- |  |          |
|--|----------|
| (i) Name of the scheme and date of commissioning   | Annex.1  |
| (ii) Updated project cost summary and Finance Plan | Annex II |

**APPENDIX A2**  
**ANNEX I**

Sr. No.	Name of the Scheme	Date of completion of the scheme
1.	Augmentation of transformer capacity at Chandrapur substation 1x315 MVA, 400/220kV	Nov. 94
2.	Augmentation of transformer capacity at 400kV Koradi substation 1x315 MVA, 400/220kV	8.4.94
3.	Erection of 400kV Babhleshwar-Dhule D/C line and establishment of 400kV S/S at Dhule	24.11.95
4.	LILO on existing 400kV Babhleshwar-Kalwa line at Padghe (3 Kms)	9.6.94
5.	LILO on existing 400kV Lonikand-Kalwa line at Padghe (93 Kms)	28.3.97
6.	Stringing of 2 <sup>nd</sup> CKt. on 400kV Babhleshwar-Kawla D/C tap to 400kV Padghe S/S (46 Kms)	May 96
7.	400kV Koyna-Karad D/C line (80 Kms)	Jan. 99
8.	400kV Koyna-Lonikand D/C Line (180 Kms)	Feb.98
9.	Establishment of 400kV Kharghar S/S	26.3.99
10.	Establishment of 220kV Malharpeth S/S	17.3.92
11.	Establishment of 220kV S/S at Chandrapur MIDC	26.3.93
12.	Establishment of 220kV Barshi S/S	13.12.91
13.	Establishment of 220kV Jejuri S/S	18.11.92
14.	Establishment of 220kV Alephata S/S	18.3.93
15.	Establishment of 220 kV Loteparashuram S/S	31.3.92
16.	Establishment of 220kV Badnera S/S	22.3.94
17.	Establishment of 220kV Jeur S/S	11.11.92
18.	Establishment of 220kV Baramati S/S	12.12.93
19.	Establishment of 220kV Ichalkaranji S/S	7.9.95
20.	Establishment of 220kV Boisar S/S	22.3.96
21.	Establishment of 220kV Murud S/S	30.1.93
22.	a) Establishment of 220kV Malegaon S/S	8.12.95
	b) Establishment of 220kV Kharepatan S/S	3.6.95
23.	220kV D/C line between Uran & Kharghar	10.8.98
24.	Establishment of 220kV Nerul S/S	31.3.95
25.	Establishment of 220kV Peth S/S	28.3.96
26.	Establishment of 220kV Halkarni S/S	23.12.96
27.	Establishment of 220kV Kanhan S/S	27.10.96

28.	Establishment of 132kV Palghar S/S	18.2.95
29.	Establishment of 110kV Kavathe-Mahankal S/S	30.3.94
30.	Establishment of 220kV Kurkumbh S/S	20.10.93
31.	Establishment of 132kV Kothrud S/S	31.3.93
32.	110kV Dudhganga-Radhanagari line (15 Km)	3.4.95
33.	Establishment of 132kV Shirolu S/S	8.3.93
34.	Establishment of 132kV Dindori S/S	24.1.94
35.	Establishment of 132kV Kharadi S/S	21.12.96
36.	Establishment of 220kV Vita S/S	20.12.96
37.	Establishment of 132kV Dusarbid S/S	18.8.93
38.	Establishment of 132kV Kardha S.S	4.1.94
39.	Establishment of 132kV Shirala S/S	23/10/96
40.	Establishment of 132kV Mangalvedha S/S	31.3.98
41.	Establishment of 132kV Taloda S/S	2.9.92
42.	Establishment of 132kV Bhoom S/S	12.6.92
43.	Establishment of 132kV Shevgaon S/S	6.9.94
44.	Establishment of 110kV Diaganchi S/S	30.3.95
45.	Establishment of 132kV Takii S/S	21.1.93
46.	Establishment of 132kV Yaola S/S	27.3.97
47.	Establishment of 132kV Warwatbalkal S/S	19.3.94
48.	Establishment of 132kV Buldhana S/S	7.10.93
49.	Establishment of 132kV Ajgaon S/S	23.3.95

**PROJECT COST SUMMARY**

Exchange Rate: Rs. 31.5 per US\$

MSEB Investment	Rs. (in Millions)			US\$ (in Millions)		
	Local	Foreign	Total	Local	Foreign	Total
<b>TRANSMISSION</b>						
(a) Equipment & Material for Transmission	6064.92	66.30	6131.22	192.55	2.10	194.65
(b) Erection of lines & S/S	613.12	-	613.12	19.46	-	19.46
(c) Engineering & Administration	468.86	-	468.86	14.88		14.88
<b>DISTRIBUTION</b>						
(a) Equipment & Material for Transmission	2567.00		2567.00	81.49		81.49
(b) Erection of lines & S/S	256.70		256.70	8.15		8.15
(c) Engineering & Administration	198.30		198.30	6.29		6.29
CONSULTING SERVICES**		15.62	15.62		0.50	0.50
<b>TOTAL (I + II)</b>	<b>10168.90</b>	<b>66.30</b>	<b>10235.20</b>	<b>322.82</b>	<b>2.10</b>	<b>324.92</b>

\*\*Portion from unallocated loan amount.

- Note: 1) Item I (b) includes local contracts financed by WB (10.23M) and MSEB  
2) Item II (b) includes local contracts financed by MSEB.

**FINANCE PLAN**

Exchange Rate: Rs. 31.5 per US\$

Funding Source	Rs. (in Millions)			US\$ (in Millions)		
	Local	Foreign	Total	Local	Foreign	Total
MSEB	6854.31	-	6854.31	217.59	-	217.59
IBRD	3314.59	66.30	3380.89	105.23	2.10	107.33
<b>TOTAL</b>	<b>10168.90</b>	<b>66.30</b>	<b>10235.20</b>	<b>322.82</b>	<b>2.10</b>	<b>324.92</b>

Against total loan amount of 124 M US\$, two packages for Bersimis conductor worth 16.67 M US\$ could not be finalised and hence this amount is reduced to 107.330 M US\$.

### Environmental Impact Issues<sup>9</sup>

1. **Koyna scheme** The environmental impact of the fourth phase of development of the Koyna hydroelectric scheme was judged at appraisal to be negligible because no new reservoir was required and all the works were to be underground<sup>10</sup>, except for the small (½ hectare) pothead yard where the 400 kV cables are brought up to ground level and connected to the commencement of the transmission line. The scheme has been built as envisaged. In order to minimize any adverse effect of the construction operations on the environment, GOMID undertook to restore all construction-affected areas to an environmentally sound condition by adequate afforestation, and re-afforestation, in the event that any trees had to be felled, and appropriate treatment to minimize the visual effects of quarries and excavated rock dumping areas. These requirements were built into the civil works contracts, which had been approved by the Bank, and which included specifications for environmental treatment and bill of quantity items.

2. GOMID will ensure that this work is carried out to the high standards already evident on the portions of the Koyna site, which are associated with Phases I, II and III of the development. GOMID has formed an eleven member-strong Environmental Administrative Committee for Koyna Stage IV, which will advise on the work of landscaping, afforestation, etc. It consists of nine members drawn from the Central Water Commission (New Delhi), Nagpur's Branch, the Directorate of Geodetic Survey Department, (Satara office), the Forest Department, Karad, the Social Welfare Department, the Public Health Department. Two other members are the Retired Deputy Director, Horticulture Department, Ratnagiri and the Editor of the Koyna Express, Koynanagar. The work of landscaping, afforestation etc. in the project area will be carried out through the Forest Department. The Forest Department has prepared and submitted an estimate for afforestation, landscaping, muck area development etc. This has been approved by GOM, and funds have been reserved appropriately. GOMID has a dedicated site staff, who will ensure completion of the implementation of the work as described. However, SAR is budgeting resources for a short follow-up mission to the site in late FY2000, when the status of the work will be reviewed.

3. **Transmission and distribution component.** This component consisted of about 1,000 km of transmission lines at voltages of 132 kV to 400 kV. These lines needed about 7,000 hectares of land for right-of-way for which MSEB was required to obtain clearance of the Ministry of Revenue and Forests, GOM, and of the Ministry of Environment and Forest, GOI. As covenanted, MSEB furnished the Bank, with evidence that such clearances had been obtained for all the transmission lines prior to their erection. At appraisal it was noted that MSEB had to deal with issues involving environmental protection on a number of fronts, and that because these activities were dispersed throughout different units in MSEB, there

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<sup>9</sup> EA Category rating "C".

<sup>10</sup> The construction of the intake to bring water from the existing Koyna reservoir into the Stage IV head race tunnel was performed entirely underground (see text, paragraph 30).

was no systematic and coordinated approach. It was thus agreed that MSEB would establish an Environmental and Forest Affairs Unit.

4. MSEB improved on this agreed approach. A technical assistance component to strengthen MSEB's environmental capabilities, including the employment of international consulting expertise, was financed under loan 3498-IN for Chandrapur Unit 7. The consultant began work in September, 1994, and the study and training was completed in 1996. MSEB has since taken a pro-active approach to the environmental management activities included in the technical assistance, and has implementing these actions at all its thermal power stations, not just at Chandrapur. MSEB has established an Environmental Protection Cell (EPC), whose efforts to-date have included various environmental impacts studies, and where appropriate the implementation of the results. These have included coal quality impacts on power station financial and environmental performance, comparison of upstream and downstream environmental controls, alternative boiler technologies and an optimization analysis of coal washer usage and location.

5. Several environmental management activities have been initiated by the EPC, including: water management systems redesign and construction for "zero discharge" of effluent; air emissions control improvements; ash utilization studies and pilot projects; occupational health and safety audits, risk ratings and occupational assessments; institution of a safety audit and safety rating system; environmental audits; environmental data base; dispersion modeling; disaster management plans; energy conservation for pollution.

6. MSEB has adopted an **Environment Health Safety Policy**, inter alia, with the objective to achieve zero water discharges from its several thermal power stations by the year 2000. The various effluents at the power stations are collected and after treatment the water is recovered and recycled for appropriate re-use. Wet ash is collected in compartmentalized lagoons, settled, and the clear water is available for recycling and reuse. At Chandrapur (capacity 2,400 MW), the objective is close to being reached, and in the year 1998/9, 11 million cubic meters of water were recovered from the ash slurry, which is the amount of water required for 250 MW of annual generation.

7. To prevent fly-ash from being wind-blown, MSEB has planted over 2 million trees on about 1,000 hectares of thermal power station grounds.



## **Land Acquisition and Resettlement and Rehabilitation Issues**

### **Background**

1. This Appendix relates to the analysis of land acquisition and resettlement elements of the project and its implementation achievement as on the loan closing date of December 31, 1998.

### **Koyna IV – Resettlement and Rehabilitation**

2. Construction of the Koyna IV power plant necessitated the acquisition of 571 hectares of land from 530 land-owners residing in five villages of Satara and Ratnagiri districts in Maharashtra. Of these affected persons, six families also lost their houses. The land was used for construction of approach roads, power house, switch yard, muck yard, contractors colony, etc. The families were compensated for loss of lands, houses and other assets in accordance with the “Maharashtra Project Displaced Persons Act”. In response to Bank’s supervision mission’s recommendations in 1992, GOM carried out a socioeconomic survey to assess the living standards of those affected families. The objective of the survey was establish data about the living standards of the affected persons, and to determine the type of additional assistance required to improve the living standards in the case of those who were still living below minimum living standards. Against this background, this Appendix to the Implementation Completion Report (ICR) was prepared to assess the implementation progress of R&R activities including the implementation of economic rehabilitation program.

### **Summary of Implementation Performance**

3. In order to assess the performance of the borrower for satisfactory completion of R&R program, an overall progress on different activities was assessed as on loan closing date of December 31, 1998. By that date the GOM had completed the payment of compensation to affected persons and resettled the 6 displaced families as mentioned in paragraph 6 of the Project Agreement between IBRD and State of Maharashtra, dated September 11, 1989. The economic rehabilitation program prepared in response to Bank's supervision mission’s recommendation is under implementation, and GOM has assured the Bank that it will complete the implementation by June 1999, and that adequate funds have been earmarked for this purpose. The key activities that have been successfully completed by the loan closing date include: (a) payment of compensation for loss of land and other assets; (b) relocation of six displaced families in the near-by area by offering alternative house plots; (c) offering employment in the project to 31 percent of 181 targeted persons; (d) extension of assistance to 97 percent of 110 targeted familiars to start income generation activities; (e) offering assistance to 70 percent of 388 targeted families for improvement and upgrading of houses; and, (f) upgrading and improvement of various civic amenities in three affected villages. The summary of R&R activates are shown in Table 1.

**Table 1: Status of Resettlement Activities**

No	Activity	Target	Achievement	Remarks
1	Enumeration	Through consultants and district administration	Completed	A list of 443 families was prepared
2	Payment of compensation for loss of land and other assets	530	• 530 (100%)	
3	Physical relocation	6	• 6 (100%)	
4	Assistance for house upgrading	388 households	<ul style="list-style-type: none"> <li>• 262 were given part assistance (67%)</li> <li>• 8 have completed the upgrading (2%)</li> </ul>	The balance works are expected to be completed by June 30, 1999
5	Income generation Activities (Below the poverty line)	110	107 (97%)	The remaining three families will receive assistance by January 31, 1999
6.	Employment in the project	181	56 (31%)	
6	Civic amenities		<ul style="list-style-type: none"> <li>• Internal roads</li> <li>• Community toilets</li> <li>• Upgrading of water supply schemes</li> <li>• Open drains</li> <li>• Upgrading of community centers</li> <li>• Upgrading of school buildings</li> </ul>	The construction of civic amenities are at various stages of completion and expected to be completed by March 31, 1999

4. **Payment of Compensation and Relocation:** At the time of appraisal, it was envisaged that R&R included payment of compensation for loss of assets and the provision of alternative house sites to those who were physically displaced. In addition, the provision of employment opportunities in the project, subject to availability and suitability was also envisaged. The project authorities have confirmed that all persons who had lost lands and houses have been paid compensation, and those six displaced families were provided alternative sites and that they had completed the construction of alternative houses. As regards employment, 31 percent of 181 identified persons were offered employment, and the remainder were supposed to be provided as and when the vacancies arise. However, due to ban on new recruitment by GOM, other families could not be provided employment subsequently.

#### **Economic Rehabilitation Action Plan**

5. Socio-economic survey was carried out by GOM with the assistance of local consultants in 1995-96, to assess the living standards of affected persons and to identify the type of assistance required for those who are still living below minimum living standards. In

order to extend the assistance, GOM brought out a Government Resolution (GR) dated December 9, 1997 detailing the economic rehabilitation assistance. This reflects the commitment of GOM to extend assistance to those who are living below minimum living standards. The type of economic rehabilitation assistance include: (a) housing assistance (Rs.15,000 for agricultural families and Rs.10,000 for non-agricultural families) to those PAPs who are living in kuccha and semi-puce houses in order to upgrade or undertake the repairs of their houses; (b) assistance (up to Rs.55,000) for creation or upgrading of irrigation facilities to those landed PAPs who do not have adequate irrigation facilities; (c) assistance upto Rs.18,000 to landless PAPs living below the poverty line to start income generation activities with a view to raise their living standards; and, (d) construction or upgrading the basic civic amenities in the affected villages as per "Maharashtra Project Affected Persons Act".

6. The implementation of the Economic Rehabilitation Program was commenced only during middle of 1998 and is at various stages of implementation at the time of loan closing date (Table 2).

**Table 2: Summary of Implementation of Economic Rehabilitation Program**

Details	Target as per Implementation Plan	Achievement as on December 31, 1998	Balance as on December 31, 1998	Likely date of completing Target
<b>I Housing Upgrading</b>	388	262 (67%)	26	30-June-99
(a) No. PAPs to be given assistance	388	262 (67%)	26	
(b) No. PAPs who have started repairs	388	8 (2%)	280	
(c) No. of PAPs completed repairs	3.66	1.71	1.95	
(d) Total (Rs.million)				
<b>II. Income Generation Activities</b>				Jan-31-99
(a) No. of PAPs to be given assistance	110	107 (97%)	3	
(b) Total Cost (Rs. Million)	2.03	2.03 (100%)	---	
<b>III. Civic Amenities</b>				31-Mar-99
(a) Total Cost (Rs. Million)	4.75	1.00	3.75	

7. (a) **Assistance to improve the housing conditions:** Based on the existing housing conditions, 388 families were identified for extending the assistance. A large number of families (262) were released first installment and the reports and upgrading are in progress. Only 8 households have completed the repairs or upgrading to their houses. It was expected that these activities will be completed by June 30, 1999.

8. (b) **Assistance to improve or upgrade irrigation facilities:** This component was yet to be started at the time of the loan closing date. The project officials informed that digging of wells or lift irrigation schemes are not suitable in this area. The lift irrigation scheme was found to be not feasible from the point of view of recurring expenditure on maintenance. The project officials in consultation with the PAPs are exploring various other options to provide assistance to upgrade their irrigation facilities. Alternatively, the option of providing assistance to start self employment activities in lieu of irrigation facilities is being looked into.

9. (c) **Income generation activities:** All those landless families living below the poverty line were given assistance to start self employment activities. Out of 110 families identified under this program, 107 families have been offered assistance to start the income generation activities. The assistance mostly include for dairy, goat/sheep rearing, tailoring and setting up of a shop. This program was implemented with the assistance of a local NGO- Shramjivi Janata Sahayyak Mandal. The details of different type of activities funded under Economic Rehabilitation Program is provided in Table 3.

**Table 3: Details of Income Generation Activities**

No	Type of Activity	No. of beneficiaries
1	Dairy	72
2	Goat/sheep rearing	13
3.	Grocery shop	3
4	Tailoring	10
5	Others*	10
	<b>Total</b>	<b>107</b>

\* others include: restaurant, dry fish shop, welding, photo studio, etc.

10. (d) **Improvement of Civic amenities:** The implementation of civic amenities is at various stages. The improvement of facilities was undertaken in three affected villages- Vasti, Dicholi and Manainagar. The facilities undertaken include: internal roads, cross drainage works, open sewers, community toilets, upgrading of water schemes, upgrading of primary schools, etc. The estimated cost of implementing civil amenities has been estimated at Rs.4.75 million. The details of physical and financial progress for various activities is shown in Table 4. It is expected that all civic amenities will be completed by March 31, 1999.

**Table 4: Details of Progress on Implementation of Civic Amenities**

	Details	Target as per Implementation Plan	Achieved at December 31, 1998	Balance on December 31, 1998	Likely date of completing of targets
1	<b>Masonry Gutters (open sewers)</b> (a) Physical (meters) (b) Financial (Rs.million)	1200 0.65	350 (35%) 0.15 (23%)	850 0.50	31-Mar-99
2	<b>New Internal Road</b> (a) Physical (Meters) (b) Financial (Rs. Million)	40 0.15	--- ----	40 0.15	31-Mar-99
3	<b>Strengthening of Roads</b> (a) Physical (Meters) (b) Financial ( Rs. Million)	2350 0.76	---- 0.29 (38%)	2350 0.47	28-Feb-99
4	<b>Retaining Wall</b> (a) Physical ( Cubic meter) (b) Financial ( Rs. Million)	768 0.73	545 (71%) 0.51 70%)	223 0.22	28-Feb-99
5	<b>Cross Drainage Works</b> (a) Physical (Numbers) (b) Financial (Rs. Million)	14 0.31	2 (14%) 0.05 (16%)	12 0.26	28-Feb-99
6	<b>Asphalting of Internal roads</b> (a) Physical (Meters) (b) Financial (Rs. Million)	2095 0.68	---- -----	2095 0.68	31-Mar-99
7	<b>Community toilets</b> (a) Physical (Numbers) (b) Financial (Rs. Million)	13 0.38	---- ----	13 0.38	31-Mar-99
8	<b>Upgrading of Water Supply Scheme</b> (a) Physical (Number) (b) Financial ( Rs. Million)	3 0.69	--- ----	3 0.69	28-Feb-99
9.	<b>Repair/construction of Community Center</b> (a) Physical ( Number) (b) Financial (Rs. Million)	2 0.30	--- ----	2 0.30	31-Mar-99
10	<b>Upgrading of Primary School</b> (a) Physical (Number) (b) Financial ( Rs. Million)	1 0.10	---- ----	1 0.10	31-Mar-99
	<b>Total</b> (a) Physical (b) financial (Rs. Million)	4.75	1.00	3.75	31-Mar-99

11. **Action Program for Completing Balance Activities** : The R&R activities agreed under the project include payment of compensation for loss of lands and other assets and providing alternative house sites to those who had displaced from their houses. The payment of compensation and providing alternative sites to those displaced by the project have been completed. GOM has agreed during the supervision of the project to formulate and implement a Economic Rehabilitation Program to those PAPs who are still living below minimum living standards. This plan is currently under implementation and the following activities were outstanding as on loan closing date (December 31, 1999):- (a) payment of first and second installment to 126 households and second installment to 254 households for house upgrading or improvement; (b) finalization and implementation of assistance to improve or upgrade the irrigation facilities; (c) assistance to three households to start income generation activities; and, (d) completion of on-going and proposed civic amenities in the affected villages.

12. The GOM had committed to complete the implementation of economic rehabilitation program by June 30, 1999 and the required funds were made available by the irrigation department to the rehabilitation division who are responsible for implementation of rehabilitation component.

### **Transmission and Distribution Components – Resettlement and Rehabilitation**

13. The exact sites of the proposed sub-stations and transmission routes had not been identified at the time of appraisal and the likely number of persons, if any, that might be affected was also not known. However provisions were made in the project cost estimates for payment of compensation for acquisition of any private lands should the need for compensation arise. All affected persons were to be paid compensation and extended resettlement provisions in accordance with the *Maharashtra Project Affected Persons Act*.

14. There are very few cumulative adverse impacts due to implementation of transmission and distribution components because of the nature of the activities. This is primarily because the amount of land required for sub-stations was small (330 meters by 300 meters), and for the transmission routes no land needed to be acquired, because the owners of the land where the lines passes through will continue to have the right to cultivate the lands even after the erection of the towers and the overhead lines. However, wherever the land owners suffered damages to their standing crops or fruit-bearing trees or any other proprieties, they were paid cash compensation for the damages suffered by them. Under the project the total length of transmission lines erected is about 1,000 km, and none of the persons were adversely affected due to these activities. A few people suffered damages to their standing crops and fruit-bearing trees, when erection during the growing season was inevitable, and they were paid agreed compensation for the losses.

15. In general, sub-stations were sited on vacant government land in order to avoid as much as possible land acquisition or other adverse impacts. However in these cases, the lands were either acquired under the Land Acquisition Act, or through direct negotiations. Where the lands were acquired under the Land Acquisition Act, through the Revenue Department of the Maharashtra State Government, the compensation was paid in accordance with that Act. Since the land owners lost only very small portions of their total land holdings, none of them were severely affected. Specifically 41 substations were constructed on a total of 208 hectares (Government owned 78 hectares and the rest was acquired from private owners). 125 persons were affected, and they were all paid compensation. The total compensation paid out was Rs. 33,850,777. No-one was displaced, and therefore no resettlement or rehabilitation measures had to be taken.

### Financial Overview

1. **MSEB's Financial Position at Project Appraisal.** At appraisal, in FY1989, MSEB was performing well technically, but there were already signs of financial difficulties looming in the future. MSEB sold about 25 billion units at an average rate of 78 Paise/kWh, which was not sufficient to enable MSEB to cover its costs. Subsidies of about Rs. 2 billion helped MSEB post a small net profit, but were not enough for MSEB to earn the statutory rate of return of 3% (net income over net fixed assets).
2. At appraisal, in FY1989, MSEB was unable to cover its debt service obligations despite the subsidy, having a DSCR of 0.9. It was also unable to generate enough internal resources to contribute towards financing its capital expenditure. As a result, capital expenditure was financed entirely out of long term loans from GOM and other sources. MSEB's receivables position from sale of power was already unsatisfactory, and in FY1989, stood at 3.8 months of sales. Maharashtra had agreed at negotiations to ensure that starting FY1990, MSEB would maintain its receivables at less than 2.5 months of sales, and earn an annual return of 3.0% on its historical net fixed assets in operation, increasing to 3.5% from FY1992 and then to 4% from FY 1994 onwards. Return on net fixed assets continued to remain below the covenanted level till FY1992.
3. **MSEB's Current Financial Position at Project Completion.** MSEB performed better than other state electricity boards during the project period, but its financial position has deteriorated. In FY1996, FY1997 and FY1998, MSEB needed significant amounts of subsidy to achieve a 4.5% return on its net fixed assets. In FY 96, while MSEB booked a subsidy from GOM of Rs. 6.3 billion it actually received much less (only about Rs. 3.8 billion by adjustment against interest and lease rent due to GOM), leading to a return on net fixed assets of about 1.3%. Even if the write-off of Rs. 1.65 billion is excluded, the return would have been 3.4%. While MSEB's operating revenues did not enable compliance with the DSCR covenant of 1.0 in FY1991 or 1.2 in FY1992, since FY1993, MSEB has been in compliance with the covenant. Payables on account of fuel and power purchase have reduced from 2.3 months in FY1989 to 1.5 months in FY1998 (though payables increased to 4.6 months in FY1992). MSEB has consistently met the commercial accounts payables covenant of 2.0 months since FY1994.
4. MSEB's performance on receivables has not been creditable, demonstrating an inability to function commercially, although it has contained its receivables at slightly above 4 months of sales (mainly through write-offs of uncollectable dues) over the project duration. While MSEB's collection (excluding write-offs) of current bills has improved from 90% in FY1992 to 94% in FY1998, it has been unable to recover dues from specific categories of consumers such as the Mula Pravara Society. Despite the Bank's recommendations, MSEB has not been able to write off the large amounts which are due from the Society and other consumers, even though MSEB itself considers these to be uncollectable. As is evident from the table below, the majority of receivables (as a proportion of sales to the respective categories) are from the Mula Pravara society and agriculture. The other significant contributor to the defaults is the category of public bodies (government departments), accounts which are directly or indirectly controlled by the government.

Analysis of Receivables for Sale of Power (For the year ended March 31, 1998)									
	Sales	Receivables for sale of power <sup>a/</sup>						Total	Receivables (mths)
(Rs. Million)		< 2 mths	2-6 mths	6-12 mths	1-2 years	2-3 years	>3 years		
Domestic	8107	568	722	438	366	298	426	2817	4
Commercial	4902	326	337	256	190	164	224	1496	4
Industrial	51986	634	895	700	2029	1386	2409	8052	2
Agriculture	3301	284	1519	1442	1120	1003	1106	6473	24
Mula Pravara	58	0	0	0	0	0	3108	3108	641
Public bodies	6536	590	523	496	195	228	1051	3083	6
Others	16765	0	0	0	27	654	19	700	1
Total	91656	2401	3996	3332	3926	3732	8342	25729	3

a/ : The totals do not match the audited figures since these numbers do not include some accounts

5. MSEB is a clear case of a good utility being constrained by the priorities of the state government. An example of this is the fact that MSEB's request for a tariff increase of 13%, effective April 1998, was delayed until September because of elections in the state. Similarly, although MSEB's receivables from certain categories of consumers have been increasing, GOM has frequently issued orders restricting MSEB from taking corrective or punitive action against them. MSEB's dependence on GOM for tariff increases, belatedly allowed, has resulted in a tariff structure which penalizes commerce and industry too highly for their use of bulk-generated electrical energy.

6. Due to Maharashtra's unwillingness to allow increases in the tariffs for agricultural consumers, commercial and industrial consumers have experienced repeated tariff increases, and this has resulted in large cross-subsidization. The consumer category which includes large industrial users, currently pays about Rs. 3.7/kWh, while agricultural consumers on average pay only about Rs. 0.25/kWh, compared to an average MSEB cost of supply of about Rs. 2.31/kWh. As a result, and to avoid paying the industrial tariff, industries are increasingly depending on captive generation at uneconomic costs, i.e. above MSEB's costs of production; and the position will worsen further (see next paragraph), when tariffs again have to be increased.

7. While MSEB has been able to raise the requisite level of finances to meet its planned capital expenditures, the situation is expected to deteriorate in the next few years. When the expensive private power comes on stream, MSEB's finances will be badly impacted, and the situation will worsen because MSEB will have to frequently back down its own low-cost generation in order to fulfil the contractual obligations which MSEB has entered into with the independent power producers. MSEB's ability to generate sufficient internal resources to contribute meaningfully towards capital expenditure will be impaired severely, and MSEB will increasingly have to depend on borrowings to finance its investment plan, and perhaps even for operating and working capital needs.

8. The ability of the Maharashtra power sector to avoid this scenario, and indeed, its very financial viability, hinges (a) on it having the requisite operational and managerial autonomy, along with an incentive system which encourages reduction of inefficiencies, to enable it to operate effectively as a commercially oriented utility, and (b) on it being allowed tariffs



which increasingly (even if gradually, in some cases) move towards recovering cost of supply from each category of consumers. It is unlikely that these will happen in the absence of comprehensive reforms which distance the sector from the state government, which enables independent regulation and which brings in commercially-oriented, private ownership and management in distribution.

India										
Second Maharashtra Power Project (LN 3096-IN)										
MSEB's Financial Performance - FY 89 to FY 98 (see Table next page, for support data)										
Financial Year ending	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98
March 31										
<b>Covenants</b>										
Return on Net Fixed Assets										
Covenant	0.0%	3.0%	3.0%	3.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
Actual	1.4%	0.5%	2.6%	3.0%	5.2%	4.8%	4.7%	1.3%	4.5%	4.5%
Receivables (months)										
Covenant	-	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Actual	3.8	3.8	4.0	4.5	4.6	4.6	4.4	4.2	3.7	4.0
Payables - fuel, power (months)										
Covenant	0.0	3.5	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Actual	2.3	2.5	2.2	4.6	5.0	1.9	1.7	1.6	1.8	1.5
DSCR										
Covenant	-	-	1.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Actual	0.9	0.9	0.9	1.0	1.2	1.2	1.4	1.5	1.4	1.3
SFR (excluding subsidies)										
Covenant	0	0	0	0	20.0%	20.0%	25.0%	25.0%	25.0%	25.0%
Actual	-46.3%	-19.4%	-8.4%	11.6%	27.4%	11.2%	38.3%	-2.3%	40.1%	-7.0%

India																	
Second Maharashtra Power Project (LN 3096-IN)																	
MSEB's Financial Performance - FY 89 to FY 98																	
Actual performance vis-à-vis SAR forecasts																	
(Values in Rs. million)																	
Financial Year ended March 31	FY 89		FY 90		FY 91		FY 92		FY 93		FY 94		FY 95		FY 96	FY 97	FY 98
	Act	SAR estimate	Act	SAR estimate	Act	SAR estimate	Act	SAR estimate	Act	SAR estimate	Act	SAR estimate	Act	SAR estimate	Act	Act	Act
Sales (GWh)	24,981	25,698	26,972	29,501	28,414	32,625	30,472	35,640	31,454	37,744	34,562	37,787	37,763	41,038	41,619	42,698	43,894
Average Revenue (Rs/kWh)	0.78	0.75	0.82	0.78	1.02	0.83	1.08	0.90	1.37	1.00	1.51	1.11	1.61	1.22	1.69	1.99	2.09
Operating Income	2,984	3,684	3,271	4,090	5,035	5,084	6,719	6,434	9,258	7,634	10,164	9,268	10,226	11,568	10,840	11,095	12,264
Net Income	395	1,372	143	1,338	855	1,710	1,253	2,096	2,721	2,368	2,889	3,259	3,208	4,287	3,496	3,466	3,423
Internal Sources	4,862	5,423	6,714	6,332	9,507	7,729	10,805	9,778	15,643	11,551	17,938	13,394	19,362	17,065	18,092	24,828	22,520
Borrowings	10,166	5,985	9,084	8,405	12,310	12,326	8,348	13,629	9,103	15,012	8,033	19,260	11,364	22,662	7,652	13,825	24,700
Total Sources	15,028	11,408	15,798	14,737	21,816	20,055	19,153	23,407	24,746	26,563	25,971	32,654	30,726	39,727	25,744	38,653	47,220
Capital Expenditure	8,680	8,064	10,517	10,420	12,228	14,321	12,680	15,697	13,736	17,126	11,784	22,406	15,145	26,786	15,448	19,931	20,431
Working Capital Changes	1,611	(521)	(63)	(443)	1,939	135	(2,533)	585	449	830	1,841	209	3,404	1,248	(2,214)	3,820	10,092
Debt Service	4,737	3,865	5,342	4,761	7,650	5,599	9,007	7,125	10,562	8,606	12,344	10,040	12,178	11,693	12,510	14,902	16,697
Total Applications	15,028	11,408	15,797	14,738	21,817	20,055	19,154	23,407	24,747	26,562	25,969	32,655	30,727	39,727	25,744	38,653	47,220
Current Assets	13,902	12,111	16,125	12,901	18,392	14,291	22,771	16,198	29,383	18,473	28,628	20,005	33,775	23,196	44,214	41,797	54,779
Less Current Liabilities	17,104	10,679	20,516	11,913	22,539	13,168	30,551	14,490	38,335	15,935	37,766	17,259	34,834	19,201	44,239	42,158	47,596
	(3,201)	1,432	(4,392)	988	(4,147)	1,123	(7,780)	1,708	(8,952)	2,538	(9,138)	2,746	(1,059)	3,995	(26)	(361)	7,183
Net Fixed Assets	52,571	51,819	61,637	60,510	72,153	72,720	82,909	85,768	93,164	99,761	100,698	118,578	108,930	140,991	115,969	126,794	141,513
Total Assets	49,369	53,251	57,246	61,498	68,006	73,843	75,129	87,476	84,212	102,299	91,561	121,324	107,871	144,986	115,944	126,433	148,696
Debt	44,502	47,829	51,372	54,224	60,211	64,326	65,019	75,167	70,096	86,839	73,060	102,069	64,478	120,319	66,964	73,516	90,361
Equity	4,868	5,421	5,877	7,273	7,797	9,517	10,111	12,309	14,115	15,460	18,502	19,255	43,394	24,660	48,980	52,918	58,336
Total Debt + Equity	49,369	53,250	57,249	61,497	68,009	73,843	75,130	87,476	84,211	102,299	91,562	121,324	107,872	144,979	115,944	126,434	148,696
<b>Ratios:</b>																	
Rate of Return (GoI)	1.4%	2.9%	0.5%	2.9%	2.6%	3.0%	3.0%	3.5%	5.2%	3.5%	4.8%	4.0%	4.7%	4.0%	1.3%	4.5%	4.5%
Rate of Return (Before Interest)	10.7%	10.1%	10.9%	9.6%	15.1%	9.3%	16.2%	9.4%	17.8%	10.0%	16.9%	10.5%	15.1%	10.2%	13.9%	14.4%	16.1%
NICG as % of Capital Expenditure	-46.3%	32.9%	-19.4%	11.0%	-8.4%	8.1%	11.6%	11.1%	27.4%	12.9%	11.2%	19.0%	38.3%	21.4%	-2.3%	40.1%	-7.0%
Debt Service Coverage	0.9	1.3	0.9	1.2	0.9	1.3	1.0	1.3	1.2	1.3	1.2	1.3	1.4	1.4	1.5	1.4	1.3
Current Ratio	0.8	1.1	0.8	1.1	0.8	1.1	0.7	1.1	0.8	1.2	0.8	1.2	1.0	1.2	1.0	1.0	1.2
Debt as % of Debt+Equity	0.90	0.90	0.90	0.88	0.89	0.87	0.87	0.86	0.83	0.85	0.80	0.84	0.60	0.83	0.58	0.58	0.61