

Validation Report
October 2018

India: MFF-Madhya Pradesh Power Sector Investment Program (Tranche 5)

Reference Number: PVR-555
Project Number: 32298-063
Loan Number: 2520

Independent
Evaluation 

Raising development impact through evaluation

ABBREVIATIONS

ADB	– Asian Development Bank
DISCOM-C	– Madhya Pradesh Madhya Kshetra Vidyut Vitaran Company Limited
DISCOM-E	– Madhya Pradesh Poorv Kshetra Vidyut Vitaran Company Limited
DISCOM-W	– Madhya Pradesh Paschim Kshetra Vidyut Vitaran Company Limited
DMF	– design and monitoring framework
EIRR	– economic internal rate of return
FIRR	– financial internal rate of return
FY	– fiscal year
IED	– Independent Evaluation Department
MFF	– multitranchise financing facility
MPSEB	– Madhya Pradesh State Electricity Board
PCR	– project completion report
PFR	– project financing request
RRP	– report and recommendation of the President
SERF	– shadow exchange rate factor
WACC	– weighted average cost of capital

WEIGHTS AND MESURES

km	– kilometer
kV	– kilovolt
kVA	– kilovolt-ampere
kVAR	– kilovolt-ampere reactive

NOTE

In this report, “\$” refers to United States dollars.

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PROJECT BASIC DATA

Project Number	32298-063	PCR Circulation Date	12 July 2017	
Loan Number	2520	PCR Validation Date	Oct 2018	
Project Name	Madhya Pradesh Power Sector Investment Program (Tranche 5)			
Sector and subsector	Energy	Electricity transmission and distribution		
Strategic agenda	Environment Sustainable Growth Inclusive Economic Growth			
Safeguard categories	Environment		B	
	Involuntary Resettlement		C	
	Indigenous Peoples		C	
Country	India		Approved (\$ million)	Actual (\$ million)
ADB Financing (\$ million)	ADF: 0.00	Total Project Costs	270.20	163.80
	OCR: 166.00	Loan/Grant	166.00	134.02
		Borrower	0.00	0.00
		Beneficiaries	0.00	0.00
		Others	104.20	29.79
Cofinancier		Total Cofinancing	0.00	0.00
Approval Date	13 Apr 2009	Effectiveness Date	25 Aug 2009	7 Sep 2009
Signing Date	27 May 2009	Closing Date	30 Jun 2013	22 Jul 2015
Project Officers	A. Jeffries H. Kobayashi J. Banerjee	Location ADB headquarters ADB headquarters India Resident Mission	From Mar 2011 Nov 2011 Jan 2012	To Nov 2011 Jan 2012 Jul 2017
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ADB = Asian Development Bank, ADF = Asian Development Fund, IED = Independent Evaluation Department, IESP = Sector and Project Division, OCR = ordinary capital resources, PCR = project completion report.

Note: Total project costs may not sum precisely because of rounding.

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I. PROJECT DESCRIPTION

A. Rationale

1. During early 2000s, the state of Madhya Pradesh faced formidable difficulties in providing energy supplies needed to spur its poverty reduction and economic development. According to the report and recommendation of the President (RRP), transmission capacity in Madhya Pradesh was inadequate as investment in the transmission network did not match increasing demand.¹ The distribution system could not provide reliable supply to consumers, which suffered from severe capacity shortages with distribution losses of about 40%–45% in many areas.

2. Madhya Pradesh State Electricity Board (MPSEB) also had financial and operational challenges. Its critical financial position was due to inadequate tariffs, non-remunerative investments in rural electrification schemes, delays in tariff subsidies, and high commercial and technical losses in the transmission and distribution networks. To meet cash flow requirements, MPSEB defaulted on payment obligations to its suppliers and lenders, reduced capital investments, and pursued less than optimal repair and maintenance practices. Following the unbundling of MPSEB in 2002, the Madhya Pradesh government undertook financial restructuring of the sector that included injecting equity and taking over loan arrears and rural electrification loans. However, shortfalls in sector revenues were expected to continue in the medium term because of high distribution losses. Thus, targeted loss-reduction investments were critical to bring the cost of supply in line with average retail tariffs and to achieve sector profitability and eventual financial sustainability.

3. The Asian Development Bank's (ADB) country strategy and program for India in 2003–2006 focused on clean energy development in the energy sector, including run-of-the-river hydropower projects, other forms of renewable energy, rural electrification, and energy efficiency improvements.² Subsequent updates to the 2003–2006 strategy and program outlined six priorities of ADB's power sector assistance: (i) reforming the power sector, (ii) promoting higher efficiency and low-carbon power sources, (iii) expanding and optimizing transmission and distribution systems, (iv) strengthening institutions to implement reforms required by the 2003 Electricity Act, (v) promoting private sector participation, and (vi) encouraging energy conservation and ensuring environmental and social sustainability.³ Moreover, the government of India's *Integrated Energy Policy* of 2006 provided for the implementation of technologies that maximized energy efficiency, demand-side management, reduced greenhouse gas emissions, and conservation.⁴ The policy also incorporated power sector reforms to control technical and commercial losses from state transmission and distribution utilities.

4. At the request of India's government, ADB prepared a road map and a multitranche program loan to address these deficiencies, the first such intervention in the country's power sector. The multitranche financing facility (MFF) modality was well suited for the investment program. To address operational inefficiencies, such as system availability, technical losses, and system reliability, that remained after completion of earlier tranches 1 to 4, Madhya Pradesh

¹ ADB. 2007. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranche Financing Facility to India for the Madhya Pradesh Power Sector Investment Program*. Manila.

² ADB. 2003. *Country Strategy and Program: India, 2003–2006*. Manila.

³ ADB. 2004. *Country Strategy and Program Update (2004–2006): India*. Manila; ADB. 2005. *Country Strategy and Program Update (2005–2007): India*. Manila.

⁴ Planning Commission, Government of India. 2006. *Integrated Energy Policy: Report of the Expert Committee*. New Delhi.

Power Sector Investment Program (Tranche 5) was formulated. The project completion report (PCR) described the progress made under tranche 5 and is the subject of this validation.⁵

B. Expected Impacts, Outcomes, and Outputs

5. The design and monitoring frameworks (DMFs) in the RRP and the PCR indicated that the expected impacts of the investment program in Madhya Pradesh were contributions in sustaining economic growth and social development and in meeting energy demand growth. The DMF in the MFF's RRP indicated six expected outcomes of the investment program, of which the third outcome—distribution enhancement (reduction in system losses and improved supply quality and reliability)—was directly associated with the project to be financed by tranche 5. Other outcomes of tranche 5 were to help improve voltage profiles; reduce distribution system losses; reduce power outages by replacing aging transformers and capacitors; address non-technical losses by increasing metering, billing, and collection; and improve financial operations by strengthening corporate operations, transparency, and human resource development.

6. Tranche 5 project outputs included:

- (i) Part A for Madhya Pradesh Madhya Kshetra Vidyut Vitaran Company Limited (DISCOM-C):
 - (a) construction of high-voltage distribution systems in four distribution circles;
 - (b) renovation and modernization of approximately 580 33/11 kilovolt (kV) transformer substations; and
 - (c) installation of meters and facilities for automatic remote meter reading for approximately 71,000 customers;
- (ii) Part B for Madhya Pradesh Poorv Kshetra Vidyut Vitaran Company Limited (DISCOM-E):
 - (a) construction of high-voltage distribution systems in 8 distribution divisions, including the conversion of about 7,579 kilometers (km) lines from low- to high-voltage; and
 - (b) construction of approximately 1,250 km of 11 kV lines to separate agricultural and village feeders;
- (iii) Part C for Madhya Pradesh Paschim Kshetra Vidyut Vitaran Company Limited (DISCOM-W):
 - (a) augmentation, renovation, and modernization of about 50 33/11 kV transformer substations;
 - (b) construction of 15 new 33/11 kV substations;
 - (c) the installation of approximately 290 capacitor banks in 33/11 kV substations;
 - (d) construction of new 33/11 kV lines;
 - (e) augmentation of approximately 400 km of existing 11 kV lines and construction of approximately 1,700 km of new 11 kV lines; and
 - (f) enhancement of information technology systems through both the introduction of a supervisory control and data acquisition system in priority 33/11 kV substations and distribution transformer metering.

⁵ ADB. 2017. *Completion Report: Madhya Pradesh Power Sector Investment Program (Tranche 5) in India*. Manila.

C. Provision of Inputs

7. The MFF program specified that all physical subprojects were scheduled to be completed by end of 2013, with the last project financing request (PFR) submitted by 31 December 2010. The loan agreement for tranche 5 stated that withdrawals from the loan account would be completed by 30 June 2013, with loan closure at the end of 2013. However, the loan closing date was extended twice from 30 June 2013 to 22 July 2015. The implementation period was longer than estimated for two reasons. First, the procurement packages were based on a design–build model that required contractors to finalize preliminary designs to confirm the length of new and upgraded lines and revise the equipment requirements. This took about a year and was not accounted for when the project schedule was developed. Second, the early termination of 12 contracts due to the contractors' poor performance led to distribution companies completing the remaining works.

8. The total cost at appraisal was estimated at \$270.2 million, comprising \$166 million in foreign currency and \$104.2 million in local currency. Actual project costs totaled \$163.8 million, comprising \$134 million in foreign currency and \$29.8 million in local currency costs. DISCOM-C utilized \$49.9 million of its \$50 million loan allocation, DISCOM-E utilized \$49.3 million of its \$63 million allocation, and DISCOM-W used \$34.9 million of its \$53 million allocation. The unutilized loan funds were due to (i) lower bidding prices, (ii) devaluation of the Indian rupee (₹) from the date that the PFR was prepared, (iii) Ministry of Finance exemption of the excise duty for contracts under the ADB loan, (iv) lower costs resulting from optimization, and (v) implementation of the remaining part of the terminated contracts using distribution companies' own resources (footnote 5).

9. ADB provided \$166 million loan from its ordinary capital resources with a 25-year term, including a grace period of 5 years, an interest rate determined in accordance with ADB's London interbank offered rate-based lending facility, and an annual commitment charge of 0.35%. The loan was relented to the government of Madhya Pradesh at the same terms and conditions and then onlent to the distribution companies with one additional percentage point to the interest rate. The distribution companies also accessed loans from the Power Finance Corporation, Rural Electrification Corporation, and the state government to cover local currency costs. Local currency costs decreased significantly, from \$104.3 million estimated in the PFR to \$29.8 million. The unutilized loan funds comprised (i) \$32.9 million equivalent in equipment installation costs, as this was included under the internationally competitive bid contracts; (ii) \$18.6 million equivalent in unallocated costs for price contingencies; and (iii) \$22.9 million in interest during construction and commitment fees that were paid directly by the borrower.

10. At appraisal, it was assessed that the distribution companies had the required technical design, procurement, construction management, financial, and administrative institutional capacity to implement the project and that a project implementation consultant was not required. However, the distribution companies recruited and funded independent safeguard consultants to handle environmental and social management, and related monitoring and reporting. The distribution companies also recruited services of third-party inspectors to conduct technical monitoring and testing of project equipment and materials.

D. Implementation Arrangements

11. Implementation arrangements were as envisaged at appraisal. The distribution companies were the executing agencies and, under the direction of their respective managing directors, had overall responsibility for project implementation. A dedicated project management unit in each

distribution company, led by a senior chief engineer and staffed by experienced technical, project construction management, and administrative staff, provided overall day-to-day project coordination. To ensure ADB procurement guidelines were complied with, procurement units within the distribution companies handled the design and procurement of all contract packages. Executive engineers for each distribution circle were placed in charge of civil works, such as mechanical and electrical equipment installation, power pole erection, equipment testing, and distribution works commissioning. Due diligence with respect to financial matters was overseen by the chief financial officer of each distribution company. Project progress was documented through quarterly progress reports.

12. Out of 33 loan covenants, 30 were complied with, one partly complied with, and two were not complied with. No covenants were modified, suspended, or waived during implementation. DISCOM-C partly complied with the 95% full collection efficiency at 92.6% due to slow collection of arrears from agricultural connections. The current collection efficiency is expected to improve as the new distribution system increases power supply to irrigation pumps, increasing agricultural output, and therefore the income of farmers who are incentivized to pay for reliable power supply. The two loan covenants not complied with were for debt service coverage and self-financing ratios. The delay in meeting these covenants did not impact project execution or the ongoing operation of project-supplied facilities. The PCR stated that the distribution companies continued to pursue systemic physical distribution system improvements, management reforms, human resource training, strengthening of billing and collection, and better cash flow management, and compliance is expected by the end of 2018.

II. EVALUATION OF PERFORMANCE AND RATINGS

A. Relevance of Design and Formulation

13. The PCR rated the project relevant. Reforms in the Madhya Pradesh power sector under the project were aligned with India's policy and legislative framework. The project was designed "to synergize with India's Five-Year Plan and align with ADB's corporate and country partnership strategies, both of which focused on infrastructure projects in key sectors that aimed to alleviate poverty through economic growth." The MFF program was implemented concurrently with several other initiatives to improve the state's electrical distribution systems, including (i) Rajeev Gandhi Scheme for Electrification of Villages, (ii) Restructured Accelerated Power Development Reform Program, (iii) Feeder Separation Program, and (iv) ongoing programs of each distribution company. The distribution companies indicated that the MFF approach helped address priorities in their districts. The MFF modality was therefore appropriate.

14. The project incorporated technical optimization to improve the design based on actual conditions, such as global positioning system surveys. The surveys helped to reduce the length of conversion of distribution lines and fine-tune actual equipment and materials. Distribution companies prepared the project based on estimated conditions, with actual output adjusted to subsequent detailed surveys. This made it possible to target most-urgently required work and for project execution. It also saved resources and strengthened the project's strategic direction and relevance. Validation holds a similar view that the project is relevant.

B. Effectiveness in Achieving Project Outcomes and Outputs

15. The PCR rated the project effective because outcomes and outputs were achieved. According to the DMF in the PCR, the expected outcome was a reduction in electric distribution system losses, improved reliability of power supply, increased system capacity, and improved

customer connectivity. Performance indicators included (i) meeting loss targets for the distribution companies as determined by Madhya Pradesh Electricity Regulatory Commission in its tariff determination for the year starting on 1 April 2009; (ii) reducing the average number and average duration of interruptions; and (iii) reducing customer complaints about supply quality. The DMF indicated that loss targets were partially met. DISCOM-C was able to reduce losses from 41.6% in fiscal year (FY) 2009 to 25.1% in FY2016, higher than the 23.5% target in 2011. DISCOM-E reduced losses from 37.2% in FY2009 to 22.5% in FY2016, exceeding the 31% target; while DISCOM-W's reduction was from 35.5% in FY2009 to 22.5% in FY2016, exceeding the 24% target.⁶

16. The number of power interruptions (trips) per year per feeder were (i) reduced from 12 trips per year per feeder in FY2009 to 8 in FY2016 for DISCOM-C; (ii) reduced from 11 trips in FY2009 to 6.5 in FY2016 for DISCOM-E; and (iii) reduced from 10.15 trips in FY2009 to 6.76 in FY2016 for DISCOM-W. The average duration of interruptions declined by 25% for 11 kV feeders and by 51% for 33 kV feeders. Power supply reliability improved: 10 hours per day in rural areas and 24 hours per day in urban areas, along with fewer interruptions, improved voltage, and fewer power surges. Customer complaints about the power supply quality was cut by half. Both outputs for reduced interruptions and complaints were not defined in the DMF at appraisal with the same indicators and baselines. Only the PCR provided this information and could not be verified elsewhere.

17. In terms of outputs, DISCOM-C's output targets were almost fully met and, in some cases, actual outputs were lower because of system optimization after appraisal:

- (i) 1,165 km of low-voltage lines converted to 11 kV lines;
- (ii) 3,028 km of new 11 kV lines constructed (93% of targets);
- (iii) 8,460 11/0.4 kV, 25 kilovolt-ampere (kVA), and 1,477 11/0.4 kV, 16 kVA distribution transformers installed (83% of targets);
- (iv) 21,500 single-phase meters and 153 three-phase meters installed,⁷ along with 549 33kV and 1,106 11 kV vacuum circuit breakers; and
- (v) 443 33/11 kV substation renovated.

18. For DISCOM-E, output targets were fully met:

- (i) 5,300 km of low-voltage lines converted to 11 kV lines;
- (ii) 750 km of new 11 kV lines constructed;
- (iii) 1,500 km of 11 kV lines upgraded;
- (iv) 1,797 km of low-voltage lines converted to low-voltage underground cable circuits; and
- (v) 11,200 11/0.4 kV, 25 kVA, and 13,700 11/0.4 kV, 16 kVA distribution transformers installed.

19. For DISCOM-W, output targets were also fully met:

- (i) 1,250 km of 11 kV lines and 250 km of single-phase, three-wire, low-voltage lines constructed;
- (ii) 1,100 11/0.4 kV distribution transformers installed;
- (iii) 47 33/11 kV transformers augmented from 3.15 MVA to 5 MVA;
- (iv) 10 33/11 kV transformers augmented from 5 MVA to 8 MVA;

⁶ The DMF at appraisal reports a 2009 baseline loss for DISCOM-C of 37.25%, for DISCOM-E of 38.23 and for DISCOM-W of 33.76%.

⁷ The remaining meters were installed under other ongoing projects that purchased such meters in bulk for lower price.

- (v) 10 new 33 kV line bays at 132/33 kV substations and 10 new 33kV line bays at 33/11 kV substations constructed;
- (vi) 44 33/11 kV substations renovated and modernized;
- (vii) 48 33kV and 50 11 kV vacuum circuit breakers installed;
- (viii) new 15 33/11 kV, 3.15 MVA substations with interconnecting 33 kV and 11 kV lines constructed;
- (ix) 136 capacitor banks of 1.2 megavolt-ampere reactive (kVAR) at 11kV, 150 capacitor banks of 600 kVAR at 11 kV, and other 1,200 kVAR and 600 kVAR capacitor banks to meet the system requirements were installed;
- (x) 1,600 km of new 11 kV lines were constructed and 362 km of 11 kV lines were upgraded;
- (xi) for separation of agricultural from village feeders, 1,439 km of 11 kV lines and 88 11 kV vacuum circuit breakers line bays were constructed and 1,050 11/0.4 kV, 25 kVA distribution transformers were installed;
- (xii) supervisory control and data acquisition systems were installed in 92 newly constructed 33/11 kV substations and 12,000 distribution transformer meters were installed; and
- (xiii) the remaining 11,000 distribution transformers were installed under other schemes.

20. The distribution companies made significant progress in billing and collection efficiencies. As of 2016, DISCOM-C achieved 92.6% collection rate. While this was slightly below the target of 95%, the distribution company was continuing to collect arrears from smaller farmers who struggle with payments in the non-crop seasons. The other two distribution companies surpassed targets; DISCOM-E achieved a 100% collection rate and DISCOM-W achieved 96.2%.

21. Tranche 5 project was categorized B for environment, C for involuntary resettlement, and C for indigenous peoples' safeguards. The project complied with India's environment, social, health, and safety laws and regulations. The environmental management plan was implemented and ADB's *Safeguard Policy Statement* (2009) complied with over the life of the project. Work involved existing distribution systems located along existing road alignments and rights-of-way. New substations were constructed on unoccupied government land. No complaints were received from the public regarding the project's environmental, resettlement, and indigenous people aspects, and there were no reported safety issues. There was no technical assistance associated with the project, and no adverse environmental impacts were noted in these reports during the pre-construction and construction phases.⁸ Validation rates the project effective.

C. Efficiency of Resource Use

22. The PCR rated the project efficient in achieving project outcome and outputs. The project was implemented under budget but required a 2-year extension to complete all of the works. The project faced no institutional, technical, environmental, or social risks. The economic internal rate of return (EIRR) for the project was calculated at 25.3%, slightly lower than the appraisal estimate of 27.2% and higher than the hurdle rate of 12%. A sensitivity analysis of the main parameters that could affect project efficiency (increased operating and maintenance cost, reduced value of saved energy losses, and reduced incremental consumption) indicated that the combined impact of these risks would only reduce the EIRR to 19.6%.

⁸ ADB (Independent Evaluation Department). 2017. Project Safeguard Assessment: Madhya Pradesh Power Sector Investment Program (Tranche 5) in India. 15 December (internal).

23. Validation has the following comments on the methodology used in estimating the EIRR. It is not clear why the PCR chose 2015 as base year for the calculation. The PCR was prepared in 2017 and, therefore, 2017 prices should have been used. The shadow exchange rate factor (SERF) should have been updated using 2012–2016 data. The SERF based on data from the early 2000s is out of date. Table A9.1 in Appendix 9 of the PCR did not indicate what costs were tradable and did not discuss the valuation of land acquired for the project. A more serious issue is the economic capital costs provided in Table A9.1 that shows economic capital costs lower in value than financial capital costs. Since SERF is greater than unity and is applied to the tradable cost components of capital cost, economic capital costs should be higher than the financial capital costs. This implies that the EIRR is overestimated.

24. Paragraph 6 of Appendix 9 stated that reduction in non-technical losses was an economic benefit. This is partially correct because non-technical losses, such as theft, have an economic benefit for those that do not pay for the electricity, as long as the use of that electricity has economic benefits and it is not left to waste (e.g., lights on during the day because it is not paid anyway). The PCR attributed 50% of the non-technical losses to waste and 50% to economic output, and therefore half of technical losses were included as economic benefits for the project. However, the percentage attributed was not substantiated. Paragraph 7 also incorrectly stated that “peak loss reduction was assumed to result in incremental output up to and including 2015, and non-incremental output thereafter.” Valuation of project benefits is independent of future investment in generation capacity and economic benefits of the project should remain incremental over the period of analysis, less the non-incremental benefits identified in the last sentence of paragraph 11, which should be valued in terms of resource cost savings over the period of analysis. For incremental project output, the PCR should have made more effort to value economic benefits in terms of willingness to pay or consumers’ surplus, rather than just the tariff.

25. The PCR did not assess process efficiency. There was a 2-year delay for which the loan was extended, because of preliminary design requirements for contractors and early termination of 12 contracts due to poor performance. However, the project was executed with a budget 40% lower than estimated, due to efficient procurement. The economic benefits of the project are likely substantial and the EIRR is likely higher than the 12% hurdle rate, given the substantial supply efficiency of the distribution companies. Therefore, validation holds a similar view as the PCR and rates the project efficient.

D. Preliminary Assessment of Sustainability

26. The PCR rated the project likely sustainable. The financial internal rate of return (FIRR) of the project components was estimated at 13.5%, substantially higher than the project’s estimated weighted average cost of capital (WACC) of 1%. The re-evaluated FIRR was slightly lower than that calculated at appraisal, which was 16%. The PCR stated that the lower FIRR is primarily a consequence of the distribution companies’ lower actual equity contribution. This assertion is wrong as the capital structure of the project (debt equity ratio) is independent of the project’s FIRR. The PCR reported that the distribution companies’ financial performance and position improved due to the project. The PCR stated that ongoing institutional training and capacity building, strengthening of billing and collection procedures, and expected tariff increases will continue to improve the distribution companies’ financial performance, as well as the sustainability of the power systems.

27. Validation has the following comments on the methodology used in estimating the FIRR. Appendix 9 stated that the rate allowed for operating and maintenance costs is 2.5% of capital

cost, while Appendix 10 stated it is 2.3%. This seems to be inconsistent. The financial benefit that the distribution companies gained from the project is the incremental revenue they received from reduction of technical and non-technical losses. This revenue is based on the tariff the DISCOMs charge, which in turn is proportional to the level of investment of the previous years. Also, while the residual value was included in the FIRR calculation as the asset life would be longer than 25 years, it is not indicated if that value is net of disposal or major maintenance costs.

28. It is not clear why WACC was calculated on a pre-tax basis when ADB guidelines require that WACC be calculated post-tax. Paragraph 7 of Appendix 10 stated there was no equity financing. However, paragraph 33 of the main text indicated that there was equity financing. This also seems to be inconsistent. Table A10.3 showed the real cost of the ADB loan as zero and an inflation rate of 5.4%.

29. The PCR provided no assessment of the financial performance of the three distribution companies. Although the FIRR may be higher than WACC, the financial soundness of the distribution companies, which seems more critical to the project's sustainability, is unknown. While no detailed information is provided regarding financial performance of these companies, it appears that given the substantial loss reduction achieved by the project, and that the FIRR is higher than the WACC, the project is considered likely sustainable.

III. OTHER PERFORMANCE ASSESSMENTS

A. Preliminary Assessment of Development Impact

30. The PCR rated the project's overall impact satisfactory, and reported that the enhanced distribution capacity and reliability facilitated (i) higher productivity in terms of agricultural outputs; and (ii) decreased energy charges and lower maintenance costs with regard to electric appliances, irrigation pumps, and equipment, thereby, improving the economic opportunities of farmers, industrial and commercial users, and domestic consumers. Due to lower losses, the improved electricity supply contributed significantly to increased agricultural production, with some farmers increasing annual crop rotations from one to two or from two to three, as an improved power supply enables more irrigation during the dry season. As a result, agricultural production and incomes increased substantially. The implementation of the project provided opportunities for job creation, income growth, and local infrastructure improvement, thus contributing to poverty reduction and sustainable development in both agricultural and village or urban project areas. The improved electricity services achieved through the program have also contributed, among other factors, to the increase in the state per capita income from ₹25,278 in FY2008 to ₹37,180 in FY2012.

31. The PCR provided no evidence to the impacts claimed above, and most importantly it did not link them to the impact indicators defined in the DMF, namely (i) gross state product (GSP) grew by at least 6% annually in 2008–2012, and (ii) energy deficit reduced from 13% in 2007 to 0% in 2012. However, the project contribution to strengthen distribution networks, reduced losses, and increased efficiency of the distribution sector, the validation concludes that the project has contributed to the development impacts of increased economic growth and reduced energy deficits, albeit it is not possible to measure them against the indicators. Also, the project implementation process strengthened the distribution companies' institutional capacity, as well as the managerial and operational competence of managers and staff. Therefore, validation rates impact as satisfactory.

B. Performance of the Borrower and Executing Agency

32. The PCR rated the overall performance of the borrower and executing agency as satisfactory. All international competitively bid project contracts were procured, constructed, and commissioned successfully before the extended loan completion date and under budget. Although some loan funds were not utilized due to conditions beyond the distribution companies' control, the outputs estimated at appraisal were generally achieved. The distribution companies demonstrated their ability to formulate, appraise, and arrange counterpart financing; and engineer, procure, and construct a variety of technically complex electrical distribution projects. However, the companies over-estimated the local currency costs because they were unfamiliar with turnkey contracts. They also failed to use more than \$10 million in loan funds that was available from 12 terminated contracts. Nevertheless, they successfully completed the remaining works with their own resources or through other locally funded ongoing contracts. Validation concurs that the overall performance of the borrower and executing agency was satisfactory.

C. Performance of the Asian Development Bank and Cofinanciers

33. The PCR rated the overall performance of ADB satisfactory. ADB monitored the project's progress through 10 periodic review missions (4 were fielded from ADB headquarters in Manila and the remaining 6 were fielded from the resident mission). The project's implementation support was difficult when the project was administered from the headquarters in Manila during the first 2 years of implementation. However, ADB administration was strengthened with the transfer of the project to the resident mission, where procurement capacity of the distribution company staff was enhanced through procurement and contract management clinics. ADB also provided useful and proactive day-to-day advice on procurement, project management, and safeguards capacity building, especially with regard to the environmental monitoring procedures. ADB held safeguards monitoring workshops both in the field and in the resident mission. ADB accorded timely approvals that made it possible to achieve the revised project milestones and smoothed project execution. ADB, the executing agency, and government officials also conducted annual tripartite meetings with senior distribution company managers and project staff.

34. Validation notes that project schedule defined in project preparation did not account for the time required by contractors to carry out preliminary designs during the procurement process. This gap of about a year resulted in procurement delays that should have been accounted for in an appropriate project schedule.

35. IED's Project Safeguard Assessment concluded that there was no evidence that ADB staff directly supervised the environmental and safeguards elements of the project (footnote 8). The Assessment noted that "there were no feedback reports identified from ADB addressing information contained in the annual monitoring reports (AMRs), and ADB did not recommend that the borrower submit more comprehensive AMRs with data especially during the construction phase." This seems to be ADB's only shortcoming, so validation concurs that the overall performance of ADB was satisfactory.

IV. OVERALL ASSESSMENT, LESSONS, AND RECOMMENDATIONS

A. Overall Assessment and Ratings

36. The PCR rated the project successful because it was relevant, effective, efficient and likely sustainable. The table on the next page provides the PCR's and validation's ratings. The project was fully aligned with the government's development strategy and ADB's sector policy and

resulted in the outcome envisaged at appraisal. The project was efficient and helped the distribution companies become more sustainable by improving the operation of the distribution systems and strengthening human resources. Revenues increased due to the installation of consumer meters, including remote meters for major power consumers, better billing and collection procedures, and better financial management of the distribution companies. Validation concurs with the PCR's overall rating.

Overall Ratings

Validation Criteria	PCR	IED Review	Reason for Disagreement and/or Comments
Relevance	Relevant	Relevant	
Effectiveness	Effective	Effective	
Efficiency	Efficient	Efficient	
Sustainability	Likely sustainable	Likely sustainable	
Overall Assessment	Successful	Successful	
Preliminary assessment of impact	Satisfactory	Satisfactory	
Borrower and executing agency	Satisfactory	Satisfactory	
Performance of ADB	Satisfactory	Satisfactory	
Quality of PCR		Satisfactory	

ADB = Asian Development Bank, IED = Independent Evaluation Department, PCR = project completion report.

B. Lessons

37. The PCR identified the following lessons. From a **project perspective**, the program shows the benefit of the MFF approach where successive tranches help to train and build the experience of the implementing agencies. However, the PCR also suggested building flexibility into the MFF structure by reducing the number of tranches to increase the scope and loan amounts for later tranches to reduce administrative costs and for earlier project completion. Also, it is highlighted that unexpected delays in project implementation were a result from international competitive bidding, which is a common among ADB-assisted projects. However, this validation cautions that international competitive bidding is not a cause of delay per se, but project preparation should consider time buffers and assess procurement processes appropriately in advance. The PCR also highlighted the greater effectiveness and efficiency of administering the project from the resident mission and suggested tightening bid evaluation criteria for bidders' technical experience to avoid the selection of bidders with insufficient capacity or qualification and reduce early termination of contracts due to underperformance.

38. Regarding **results framework and methodology level lessons**, this validation suggests that since one of the MFF outcomes was for better financial performance of the distribution companies, ADB should emphasize more on the monitoring of financial performance over the 5 or more years of project implementation. Improvement in the physical infrastructure of the power systems should go hand-in-hand with improvements in the financial soundness of these companies. Corrective measures to financial performance should be during implementation when ADB has the most leverage.

C. Recommendations for Follow-Up

39. The PCR suggested one recommendation, that ADB considers supporting more power distribution projects designed to maximize efficiency by reducing distribution system technical

losses and metering programs to reduce non-technical losses. Validation concurs and has no other recommendations to offer.

V. OTHER CONSIDERATIONS AND FOLLOW-UP

A. Monitoring and Reporting

40. Loan covenants required that the borrower ensure that a project performance monitoring system is established within 3 months of the effective date by the distribution companies. The PCR indicated that this covenant was complied with. However, the PCR did not assess the project performance monitoring and evaluation system.

B. Comments on Project Completion Report Quality

41. The PCR was succinct and assessed all the evaluation criteria. However, the PCR did not assess process efficiency and time delays. It was also missing a comprehensive assessment of the financial performance of the three distribution companies, which is an important aspect of the sustainability of the project. While there were some shortcomings in assessing the development impacts and the project sustainability, the validation rates the quality of the PCR satisfactory.

C. Data Sources for Validation

42. Data sources included the RRP, PCR, mission reports, and IED's safeguard assessment report.

D. Recommendation for Independent Evaluation Department Follow-Up

43. The PCR recommended preparation of the project performance evaluation report in 2019–2020. Validation suggests that a project performance evaluation report be prepared for the whole MFF when the project completion report for the last tranche is completed.