

**Validation Report**  
June 2022

# India: Madhya Pradesh Energy Efficiency Improvement Investment Program - Tranche 1

Reference Number: PVR-895  
Project Numbers: 43467-014 and 43467-015  
Loan Numbers: 2764



*Raising development impact through evaluation*

## ABBREVIATIONS

ADB	–	Asian Development Bank
AT&C	–	aggregate technical and commercial (loss)
DISCOM	–	power distribution company
DISCOM-C	–	Madhya Pradesh Madhya Kshetra Vidyut Vitaran Company Limited
DISCOM-E	–	Madhya Pradesh Poorva 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
GAP	–	gender action plan
GoMP	–	Government of Madhya Pradesh
HVDS	–	high-voltage distribution system
ICB	–	international competitive bidding
km	–	kilometer
kV	–	kilovolt
kWh	–	kilowatt-hour
MFF	–	multitranches financing facility
MPERC	–	Madhya Pradesh Electricity Regulatory Commission
O&M	–	operation and maintenance
PCR	–	project completion report
SHG	–	self-help group
TA	–	technical assistance

## NOTES

- (i) The fiscal year (FY) of the Government of India ends on 31 March. “FY” before a calendar year denotes the year in which the fiscal year ends, e.g., FY2015 ends on 31 March 2015.
- (ii) In this report, “\$” refers to United States dollars.

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## PROJECT BASIC DATA

Project numbers	43467-014 and 43467-015	PCR circulation date	23 Dec 2021	
Grant and loan numbers	2764	PCR validation date	Jun 2022	
Program name	Madhya Pradesh Energy Efficiency Improvement Investment Program – Tranche 1			
Sector and subsector	Energy	Electricity transmission and distribution		
Strategic agendas	Environmentally sustainable growth Inclusive economic growth			
Safeguard categories	Environment		B	
	Involuntary resettlement		B	
	Indigenous peoples		C	
Country	India		Approved (\$ million)	Actual (\$ million)
ADB financing (\$ million)	ADF: 0.00	Total project costs <sup>a</sup>	292.66	222.89
	OCR: 200.00	Loan	200.00	146.07
		Borrower <sup>b</sup>	50.00	14.40
		Beneficiaries		
		Others <sup>c</sup>	42.66	62.42
Approval date	15 Jul 2011	Effectiveness date	17 Nov 2011	19 Oct 2011
Signing date	17 Aug 2011	Loan closing date Financial closing date	28 Feb 2015 —	28 Feb 2020 12 Oct 2020
Project officers	H. Kobayashi T.R. Limbu A. Yusupov J. Banerjee	Location ADB headquarters INRM INRM INRM	From Jul 2011 Feb 2012 Sep 2013 May 2014	To Feb 2012 Sep 2013 Apr 2014 Oct 2020
IED review Director Team leader	N. Subramaniam, IESP A. Guha, Evaluation Specialist, IESP <sup>d</sup>			

— = no approved financial closing date, ADB = Asian Development Bank, ADF = Asian Development Fund, IED = Independent Evaluation Department, IESP = Sector and Project Division, INRM = India Resident Mission, PCR = project completion report.

<sup>a</sup> Numbers may not sum precisely because of rounding.

<sup>b</sup> Financed by the Government of Madhya Pradesh.

<sup>c</sup> Financed by distribution companies.

<sup>d</sup> Team members: B. Nguyen (quality reviewer), F. De Guzman (Senior Evaluation Officer), A. Terway and T. Hanson (consultants).

## I. PROJECT DESCRIPTION

### A. Rationale

1. India's rural Madhya Pradesh needed adequate and reliable electricity supply to support its economic growth, where 70% of the state population lived. The rural power distribution network

supplied electricity to agriculture pumps, small business establishments, and residences. Power supply issues beset the rural areas, specifically on overused subsidized electricity meant for agriculture and unauthorized use of illegal and unmetered connections that caused under-recovery of electricity supply cost. The consequent poor health of the power distribution companies (DISCOMs) resulted in delayed maintenance and upgrade of rural distribution network which, in turn, lowered supply reliability and increased technical losses. To manage the aggregate technical and commercial (AT&C) losses, DISCOMs curtailed hours of supply to rural consumers. However, this aggravated the billing and collection problems and further constrained economic growth.

2. A multitranche financing facility (MFF) was prepared in 2011 for the Madhya Pradesh Energy Efficiency Investment Program that comprised two tranches.<sup>1</sup> It followed the 2001 sector development program and 2007 investment program that supported the restructuring of the state's power sector and investments for strengthening the rural electricity distribution systems.<sup>2</sup> The MFF modality was used for a time-slice of ongoing medium-term power sector improvement initiatives of the three DISCOMs in Madhya Pradesh.<sup>3</sup> The DISCOMs concurrently implemented two central government programs—the Asian Development Bank's (ADB) investment program and their own maintenance and refurbishment programs.<sup>4</sup> The MFF's two tranches were flexible to fill investment gaps remaining from these other ongoing programs.

3. Tranche 1 aimed to (i) install power supply feeders for irrigation pumps and rural residences; (ii) expand high voltage distribution system (HVDS) and aerial bundle conductors; (iii) provide new power connections; (iv) install energy meters for distribution transformers and feeders; (v) prepare distribution asset maps; and (vi) undertake network analysis models to improve power supply to rural households. Of the state's 50 districts, the MFF identified 32 districts for investments and 16 of these were included in tranche 1.

## **B. Expected Impact, Outcome, and Outputs**

4. The envisaged impact of the MFF and tranche 1 was continuous and higher quality supply of electricity to Madhya Pradesh's rural households. The expected outcome was improved operational efficiency of electricity distribution in the state's rural areas. Based on tranche 1's design and monitoring framework (DMF), 1.4 million households would benefit.<sup>5</sup>

5. Tranche 1 had four target outputs: (i) separated feeders for agricultural pumps and households, and installed HVDS; (ii) installed meters, new service connections, and improved supply quality; (iii) improved access to business development services for women-headed microenterprises; and (iv) built capacity of women self-help groups (SHGs) to provide energy-

<sup>1</sup> ADB. 2011. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranche Financing Facility to India for the Madhya Pradesh Energy Efficiency Improvement Investment Program*. Manila.

<sup>2</sup> ADB. 2001. *Report and Recommendation of the President to the Board of Directors: Proposed Loans to India for the Madhya Pradesh Power Sector Development Program*. Manila; and 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.

<sup>3</sup> These DISCOMs were Madhya Pradesh Madhya Kshetra Vidyut Vitaran Company Limited (DISCOM-C), Madhya Pradesh Paschim Kshetra Vidyut Vitaran Company Limited (DISCOM-W), and Madhya Pradesh Poorv Kshetra Vidyut Vitaran Company Limited (DISCOM-E).

<sup>4</sup> Initiated both in 2008, Rajiv Gandhi Grameen Vidyutikaran Yojna provided 1.8 million additional new household connections in Madhya Pradesh and Restructured Accelerated Power Development Reform Program reduced AT&C losses, including implementation of HVDS in urban areas.

<sup>5</sup> Footnote 1, *Framework Financing Agreement and Periodic Financing Request for Project 1* (accessible from the list of linked documents).

related microenterprise development services. Outputs 3 and 4 were implemented under an associated technical assistance (TA).

### C. Provision of Inputs

6. Tranche 1 was approved in July 2011 and became effective in October 2011, about 2 months after the loan agreement signing. The agreed loan closing date was February 2015, 40 months after loan effectiveness. However, it was extended twice in June 2014 and December 2017, and was financially closed in October 2020. According to the project completion report (PCR), the delay in project implementation was mainly due to 10 large contracts (about \$85 million) that had to be terminated and new vendors selected after rebidding.<sup>6</sup> Payments under the turnkey contracts were linked to construction milestones and not on progress payments based on inputs provided every month. Some inexperienced contractors were unable to arrange working capital from local banks that had accumulated large nonperforming assets of the power sector. The cash flow problems slowed project implementation and led to the contractors' bankruptcy. The actual availability of loan proceeds was less than 10 years as allowed in the MFF policy.

7. Tranche 1's estimated total cost was \$292.66 million, while the actual total cost was \$222.89 million, with an underrun of \$69.77 million. The main reasons for the significant cost underrun were the use of international competitive bidding (ICB) procedure that attracted competitive bids for the ADB-financed contract packages, and the rupee devaluation that lowered the foreign exchange needed for local currency denominated contracts.<sup>7</sup> Some ICB contracts were also terminated before completion of all works, with the DISCOMS completing the remaining work. The implementation delays increased financial charges from \$4.89 million (1.7% of estimated project cost) to \$14.40 million (6.5% of actual project cost). The financing plan at appraisal envisaged a \$200 million ADB loan, DISCOMS' \$42.66 million contribution, and Government of Madhya Pradesh's (GoMP) \$50 million allocation. DISCOMS and GoMP met all contingencies (\$40.9 million) and financing charges (\$4.89 million). At completion, DISCOMS' contribution was for the base cost, while GoMP provided for the financing charges. There was a minor reduction in ADB's share of tranche financing from 68.3% to 65.5%.

8. Tranche 1 was categorized B for both environment and involuntary resettlement. Environmental due diligence indicated that the tranche's components would have temporary minor impacts during construction that could be readily mitigated. Construction of new distribution lines would not require private land acquisition and with minor, temporary impact on standing crops. This tranche was categorized C for indigenous peoples. Construction activities would not threaten existing sociocultural systems of indigenous peoples and no tribal land would be acquired.

9. Tranche 1 included targeted activities to enhance women's benefits from the improved rural power supply. A gender action plan (GAP) was developed to implement outputs 3 and 4. The tranche was classified as effective gender mainstreaming. Gender analysis indicated a large gap in literacy levels of women (44.4%) and men (73.5%), while access to various forms of media was low for both women (47%) and men (31%). Only 9% of women had bank accounts and only 1% of women had taken a loan from microcredit programs, against the 4% national average. Women in project areas also operated about 30% of the home-based microenterprises. Focus group discussions revealed the perception among women that improved power supply would

<sup>6</sup> ADB. 2021. *Completion Report: Madhya Pradesh Energy Efficiency Improvement Investment Program—Tranche 1 in India*. Manila.

<sup>7</sup> At appraisal \$1.00 = Rs44.46 and at project completion \$1.00 = Rs73.00.

lower production cost, encourage purchase of electrical equipment and expansion of businesses, and enable women to start new businesses.

10. To help implement the GAP, a \$1.1 million associated transactional TA was approved for Enhancing Energy-Based Livelihoods for Women Micro-Entrepreneurs, with ADB extending \$1 million from the TA Special Fund and \$100,000 from the Government of India.<sup>8</sup> The ADB's TA amount used was \$917,875 and implemented from December 2011 to September 2017 with four extensions of TA closing date. The expected TA impact was improved women's socioeconomic status in the state's 32 project districts. The envisaged outcome was enhanced access energy-based livelihood opportunities for women. The activities were aligned to tranche 1's outputs 3 and 4. The TA was rated relevant, effective, efficient, most likely sustainable, and overall successful.

## **D. Implementation Arrangements**

11. Tranche 1's implementation arrangement was envisaged to have three DISCOMs as executing agencies. Each DISCOM established a project management unit with a chief engineer as head and adequate technical staff experienced in construction management, contract administration, progress monitoring and reporting, and day-to-day coordination. The DISCOMs had significant experience in planning, designing, and implementing externally financed projects. They supervised implementation of community activities and institutional capacity building that enabled continued implementation, monitoring, and reporting of gender-disaggregated results. Madhya Pradesh Electricity Regulatory Commission (MPERC) also monitored the project's outputs. ADB closely monitored the performance and financial management of DISCOMs through regular site visits, review of financial and progress records, and participation in Ministry of Finance-chaired annual tripartite review missions.

12. At appraisal, it was determined that project implementation consultant was not required as the DISCOMs had the adequate capacity. Independent safeguard consultants were engaged to regularly monitor and report safeguard activities. The DISCOMs engaged third-party inspectors for pre-dispatch inspection of equipment. The GAP consultant helped achieve outputs 3 and 4.

13. There were 29 loan and 24 project agreement covenants. The covenants covered various aspects such as implementation arrangements, counterpart funds, subproject selection criteria, safeguard and GAP implementation, among other things. These were mostly met, except for the loss reduction covenant since only DISCOM-W partially met the target that MPERC set. Two financial performance covenants were not complied. These required the DISCOMs to achieve full recovery of power supply cost and maintain a debt service coverage ratio of 1:2. Another covenant for the submission of a project completion report was not complied with as the DISCOM staff were engaged in other competing assignments.

## **II. EVALUATION OF PERFORMANCE AND RATINGS**

### **A. Relevance of Design and Formulation**

14. The PCR rated tranche 1 highly relevant. The DMF was aligned with India's development priorities and ADB's country and energy sector strategies. The design included transformative effect on women entrepreneur and pioneered asset mapping to effectively operate rural power supply for agriculture and households. Inclusive growth and development were national

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<sup>8</sup> Footnote 6, Appendix 12. All TAs attached to a loan are classified as a transaction TAs.

government's policy priorities, which translated as parity in the quality of electricity supply in urban and rural areas. ADB's India Country Partnership Strategy, 2009–2012 focused on infrastructure development in less developed states, capacity building, and inclusive growth.<sup>9</sup>

15. At completion, the tranche remained aligned with the operational priorities of ADB's Strategy 2030 and India's Thirteenth Five Year Plan, 2017–2022.<sup>10</sup> The results chain was logical. Quantities of outputs were modified to reflect the results of surveys that contractors conducted prior to preparation of detailed design of subprojects. The separation of feeders for agricultural pumps and non-agriculture consumers enabled 24-hour supply to rural households and small businesses, and new connections were extended to thousands of consumers. Illegal tapping of power supply was prevented with the use of HVDS and arial bundle conductors that lowered commercial losses. Women entrepreneurs were trained and SHGs were strengthened. These enabled them to engage in traditionally men-led businesses and reinforced their leadership capacities. Asset mapping and new energy meters for rural feeders allowed the DISCOMs to monitor power consumption, particularly for agricultural pumps that were billed based on horsepower capacity.<sup>11</sup> The implementation arrangement ensured delivery of results. The tranche did not overlap with the initiatives of other development partners. This validation assesses tranche 1 highly relevant considering the sound results chain, suitable design, transformative effect on women empowerment, and introduction of asset mapping for improved operation of rural power supply.

## **B. Effectiveness in Achieving Project Outcome and Outputs**

16. The PCR rated tranche 1 effective. The newly installed equipment was operating as designed, and being maintained, as required. The distribution system's efficiency has been improving, and non-technical loss has been reduced through customer education and use of data derived from the expanded energy meters. Safeguards had no outstanding issues while GAP activities had been adequately implemented. The DMF targets were mostly achieved.

17. Of the five outcome indicators, four were achieved.<sup>12</sup> In the 16 districts where tranche 1 was implemented, segregated feeders provided power supply for irrigation pumps for at least 8 hours a day and 100% metering and volumetric tariff was implemented for rural households.<sup>13</sup> Distribution losses also were reduced from 46% in 2010 to 32% in 2019. The number of women-headed microenterprises increased by 51,024 from 116,368 in 2012 to 167,392 in 2019, exceeding the 20,000 target. However, the outcome target on DISCOMs was not achieved since they were reporting negative operating margins in 2019.

<sup>9</sup> ADB. 2009. *India Country Partnership Strategy 2009–2012 Abridged Version*. Manila.

<sup>10</sup> ADB. 2018. *Strategy 2030 for Achieving a Prosperous, Inclusive, Resilient, and Sustainable Asia and the Pacific*. Manila; and Government of India. *Thirteenth Five Year Plan, 2017–2022*. Delhi.

<sup>11</sup> Earlier, errant consumers used higher capacity irrigation pumps than what they declared to the DISCOMs. Access to the remote locations was difficult, thus, physical inspection of individual pumps entailed a high cost. Feeder-level energy meters eased inspections as a variation in consumption indicated the approximate location of an errant consumer. The unnecessary use of high-capacity pumps also depleted subterranean water sources and consequently threatened future crop yields.

<sup>12</sup> The DMF stated that the supply improvement and output targets had to be achieved by 2013 or 2014. However, in June 2014 and December 2017, ADB recognized that implementation was delayed and approved two extensions of loan closing dates to 28 February 2020. Accordingly, this validation of the achievements of outcome and output targets was based on the duly revised project completion date.

<sup>13</sup> To enable volumetric tariff for irrigation pumps, the installation of energy meters for irrigation feeders in six districts was supported under other schemes of the government.

18. The DMF identified 12 indicators with quantifiable targets for tranche 1's four outputs. The PCR summarized that 10 of these targets were achieved or substantially achieved, and the remaining 2 targets were partially achieved.<sup>14</sup>

19. On output 1, achieved targets included the addition of 20,885 kilometers (km) of new 11 kilovolts (kV) (109% of targeted 19,100 km); and the addition of 22,888 units of new 25 kilovolt-ampere, 11/0.4 kV distribution transformers (88% of targeted 26,000 units). Partially achieved targets included the upgrade of 326 km of low voltage 0.4 kV lines to 11 kV (9% of targeted 3,600 km) and the upgrade of 8,596 km of 0.4 kV lines to arial bundle conductor (53% of targeted 16,100 km).<sup>15</sup> The PCR included 10 additional targets under output 1, such as the hardware needed for implementation of 11 kV lines (e.g., bays, switches, and poles) and upgrade of 0.4 kV network. It was unclear if the hardware was for additional lines or related to the quantity of new 11 kV lines reported in the first indicator. The scope was increased to (i) install 1,981 km of 0.4 kV lines; (ii) replace 1,511 km of arial bundle conductor; and (iii) shift the location of 1,267 units and rehabilitate 2,531 units of 11/0.4 kV distribution transformers. These additions partly offset the partial achievement of the fourth indicator. On the whole, this validation considers output 1 as partially achieved.

20. On output 2, the PCR recorded the quantities of new service connections and energy meters installed under the tranche. However, the DISCOMs extended more new connections and installed energy meters under other government initiatives that enabled bulk purchase for a more efficient procurement. This validation accepts the clarification as it was reasonable to avail opportunities of large lot size for efficient procurement. The achieved targets included (i) 358,084 new service connection extended from loan proceeds and balance 326,552 connections (target was 684,636) from other government programs; (ii) 103,617 energy meters installed or replaced from loan proceeds and balance 54,558 energy meters from other government programs; and (iii) asset maps prepared, and energy audits carried out in all three DISCOMs.

21. On output 3, achieved targets included (i) 44% increase (target was 10%) in the number of women-headed, start-up energy-based microenterprises, compared to the 2011 base from 116,368 in 2012 to 167,392 in 2019; (ii) 20,729 women entrepreneurs trained to avail opportunities in energy-based businesses (104% of targeted 20,000); and (iii) 506 women trained as gender and energy trainers and on spreading awareness of energy conservation aspects (101% of targeted 500). On output 4, the achieved targets included 517 women trained to provide business development services (103% of targeted 500 women) and a project performance monitoring system template developed and adopted for monitoring social and gender impacts of the tranche.

22. The project had satisfactory safeguard screening, categorization, implementation, monitoring, and reporting. The environment management plan identified the actions and responsibilities for monitoring and reporting needed for compliance with ADB's safeguards and India's requirements. Scientists of GoMP's Department of Environment prepared semi-annual reports indicating that the environment management plan was properly implemented. While a resettlement plan was prepared at appraisal, involuntary resettlement was completely avoided by selecting the route of 11 kV and 0.4 kV distribution lines. The initial environmental examination and periodical safeguard reports were disclosed on ADB's website.

<sup>14</sup> ADB. 2016. *Guidelines for the Evaluation of Public Sector Operations*. Manila. A target was achieved if the quantity was 80% or more of the target.

<sup>15</sup> A footnote in the PCR had clarified that much of the planned upgrade of 0.4 kV lines was considered unnecessary after the detailed field survey. However, the actual quantity of upgrade was not mentioned.



23. All GAP activities were appropriately implemented and systematically reported. ADB published a gender-equality results case study that showcased gender-related benefits.<sup>16</sup> The project's new connections benefited 99% of women-headed households with increased access to electricity. Project staff and service providers gained more understanding on gender equity issues. Their awareness of energy use and opportunities for energy-based microenterprises had increased. Women's involvement increased in decision-making and men participated more in household chores. ADB and DISCOMs built capacity for mainstreaming social inclusion, gender equity, and women's empowerment in energy sector projects. This validation assesses tranche 1 effective based on the achievement of outcome and output targets, no outstanding safeguards issues, and the GAP's positive results.

### C. Efficiency of Resource Use

24. The PCR rated tranche 1 efficient. The economic internal rate of return (EIRR) was reevaluated at 23.1%, compared to 20.6% at appraisal. The reevaluation framework was same as that used at appraisal. Since the DISCOMs did not provide a breakdown of power consumption along the newly installed distribution feeders, the economic analysis was based on unverified assumptions like those used at appraisal. The actual tranche costs less taxes were expressed in 2020 terms. Traded inputs were adjusted using a shadow exchange rate factor of 1.04 and non-traded inputs were valued at the domestic price. Considering India's high unemployment, unskilled labor cost was adjusted using a shadow wage rate factor of 0.75. The operation and maintenance (O&M) cost was assumed at 3% of capital cost, and consumer's cost of new connection was assumed at \$75 per connection. The additional power consumption involved higher environmental cost of carbon dioxide emission from coal-based power generation and was valued at \$36.30 per ton. The incremental economic benefit from electricity consumption was at the average recovery rate of Rs5.30 per kilowatt-hour (kWh). Non-incremental benefit was the resource cost saving because of the avoided use of kerosene for lighting, i.e., the difference between cost of kerosene-based lighting (Rs41.53/kWh in 2020) and the variable cost of power generation from old coal-fired power generation (Rs 2.89/kWh in 2018). The distribution losses decreased from 32% in 2011 to 21% in 2020, which resulted in resource cost saving.

25. The process efficiency for tranche 1 was reasonable. The implementation period was 267% of the appraisal estimate. Accordingly, the reevaluation spread the costs over the actual implementation period and delayed the benefits for the 10 packages with contractual issues. There was no cost overrun. This validation reviewed the economic analysis approach appended to the PCR and the reevaluated EIRR calculation worksheets. The power generation and transmission cost were not included in the economic cost. It was difficult to accurately determine the tranche-related additional power supply and loss reduction, although a better reflection of the completed tranche's economic impact was needed. Instead of the high-level assumptions of household consumption (61 kWh/month for rural household) and DISCOM-wide distribution losses reduction (11%), a more reasonable estimate was possible using actual data from new feeder-level energy meters of some representative sample feeders of each DISCOM and then extrapolating the results for the whole tranche. The willingness-to-pay had not been determined. Instead, the incremental benefit was linked to the average tariff recovery; thus, the consumer surplus was ignored in the tranche benefit. In the without-project case, a value of Rs41.53/kWh for lighting appeared high as it translated to an unrealistic expenditure of over Rs2,500 per month for an average rural household. As part of this validation, the spreadsheet used for the economic analysis in the PCR was adjusted to include the variable cost of power (Rs2.89/kWh) and

<sup>16</sup> ADB. 2018. *Gender Equality Results Case Study: India – Enhancing Energy-Based Livelihood for Women Micro-Enterprises*. Manila.

consumer surplus that was assumed to be 25% of average recovery (Rs1.09/kWh). The revised EIRR with these changes was estimated to be 18.8%. This validation assesses tranche 1 efficient.

#### **D. Preliminary Assessment of Sustainability**

26. The PCR rated tranche 1 likely sustainable. The financial internal rate of return (FIRR) was reevaluated at 5.9% and the weighted average cost of capital at 4.1%. At appraisal, the FIRR estimated at 15.4% was considered unrealistic as the DISCOMs were regulated utilities and MPERC would require them to pass on the benefit to the consumers. The FIRR of the three DISCOMs were reevaluated separately and as aggregate. The revenue was estimated using the approach of MPERC for determining aggregate revenue requirement in tariff orders—(i) it comprised a return on equity of 16%; (ii) O&M cost was 3% of the actual tranche cost; (iii) interest charges applicable to the ADB loan based on a projected London interbank offered rate of 0.45% beyond 2020; (iv) depreciation based on asset life of 40 years; (v) saving in power purchase cost because of lower distribution losses; and (vi) adjustments for projected foreign exchange rates. The DISCOMs were well managed, and the O&M practices were sound. Over the period 2011–2020, new investments helped to reduce losses, and increase the number of metered connections by 77% and the sale per customer by 30%. The PCR did not include a review of the DISCOMs' financial projection; hence, a quantitative analysis and key financial ratios were not available.

27. This validation finds the financial analysis weak as it did not relate to the actual revenue and operating costs. The spreadsheets presented the revenue in real term, while some operating costs were mentioned in nominal terms that distorted the FIRR value.<sup>17</sup> The DISCOMs generally had a persisting high level of AT&C losses. DISCOM-W met the AT&C target set in the tariff notification in fiscal year (FY) 2019 and it exceeded again in FY2020. In FY2019, the AT&C loss of DISCOM-C was 37.5% against the target of 17.0%, and DISCOM-E's loss was 27.1% against target of 16.0%, which would imply an under-recovery of supply costs by over 10%. However, documents shared after the PCR indicated that the ADB-supported distribution circles showed improvements in AT&C losses over the project period. The AT&C losses in these supported distribution circles were generally lower than the average for the respective DISCOMs. On balance, this validation assesses tranche 1 likely sustainable. However, a quantitative analysis showing improvement in AT&C loss reduction over the project period and clearer attribution to ADB support would have further bolstered the tranche's sustainability rating.

### **III. OTHER PERFORMANCE ASSESSMENTS**

#### **A. Preliminary Assessment of Development Impact**

28. The PCR rated the development impact of tranche 1 satisfactory. The increased rural power supply contributed to improved quality of life for 1.4 million households (about 5 million people). All villages in 10 districts received 24-hour power supply. Feeder separation helped to increase agriculture output and reduce maintenance cost of irrigation pumps and electrical

<sup>17</sup> During this validation, ADB South Asia Department commented that notwithstanding the fact that incremental revenue and operating costs attributable to the project are not observable, the regulatory regime in place in Madhya Pradesh means that DISCOMs' effective incremental revenue is not simply the product of incremental sales and tariff. This is because the regulatory regime includes mechanisms to pass through certain costs and share benefits between customers and the business. Beyond a given multi-year tariff regulatory control period, all benefits are effectively returned to customers. The DISCOM earns the regulated return on equity of 16% (or lower, if the regulator finds that the DISCOM's investment is inefficient). Actual incremental revenue is, therefore, a function of incremental equity invested, as modelled.

equipment. The GAP implementation improved the condition of women and children. The DMF identified three impact indicators with targets. The target of 24-hour power supply was for all 16 villages in Madhya Pradesh. However, the PCR did not mention the hours of brownout in the 6 other districts that were included in the target.

29. A GoMP 2019 report mentioned that all 51,929 villages in Madhya Pradesh had been electrified and power connection extended to all 9.7 million rural households.<sup>18</sup> The quarterly report of Madhya Pradesh transmission company stated that the power demand was fully met during the quarter July–September 2021.<sup>19</sup> These reports implied that the village-level power supply was secure, barring outages due to routine maintenance works. According to a consulting firm’s unpublished report, women were spending 30% less time on household tasks in 2016 against the target of 20%.<sup>20</sup> The target of 25% increase in children’s study time was not achieved. Based on the improved power supply in the rural areas and the successful GAP implementation, this validation assesses the development impact of tranche 1 satisfactory.

## **B. Performance of the Borrower and Executing Agency**

30. The PCR rated the performance of the borrower (Government of India) and executing agencies (three DISCOMs) satisfactory. The DISCOMs awarded 56 contracts using ICB procedure. They demonstrated their capacity in planning, designing, and implementing externally financed projects. The contractors carried out detailed engineering of tranche components after field survey and agreed adjustment of scope of work. The PCR noted that inputs of an experienced contracts expert may have removed some weak bids submitted by vendors having less experience or tight financial condition, and this had resulted in the delay and rebid of 10 contracts. Counterpart funds were provided in a timely manner. Some packages were not fully completed at contract closing; thus, the DISCOMs completed the works using in-house staff, own funds, and other local contracts. The DISCOMs supervised the implementation of community-based activities under the GAP, and the institutional capacity building resulted in continued implementation, monitoring, and sex-disaggregated results reporting of gender components. This validation assesses the performance of the borrower and executing agencies satisfactory.

## **C. Performance of the Asian Development Bank**

31. The PCR rated ADB’s performance satisfactory. ADB fielded 21 loan review and special project administration missions comprising 164 person-days over a period of 94 months (October 2011 to August 2019).<sup>21</sup> It conducted procurement and contract management clinics for capacity building of DISCOMs’ staff. The approvals and disbursements were timely. Implementation progress and corrective measures were discussed during review missions and annual tripartite meetings with a Ministry of Finance official and DISCOMs’ senior staff. This validation notes that the report and recommendation of the President had identified a high risk of inadequate distribution loss reduction, and two related covenants required the DISCOMs to operate on full cost recovery basis in accordance with regulatory provisions and maintain a minimum debt service coverage ratio of at least 1:2. The review missions could have included discussions on

<sup>18</sup> Deen Dayal Upadhyaya Gram Jyoti Yojna. 2019. *SDDUGJY & Saubhagya: Status of Rural Electrification in Madhya Pradesh*. New Delhi.

<sup>19</sup> [Madhya Pradesh Power Transmission Company Limited](#) (accessed 1 April 2022).

<sup>20</sup> In 2017, Price Waterhouse Coopers submitted an unpublished report to ADB titled “Impact Assessment of TA–7831 Enhancing Energy-based livelihood for Women Entrepreneur.”

<sup>21</sup> Several review missions generally discussed implementation progress under three ongoing loans for Madhya Pradesh power sector.

action plans for achieving the AT&C loss targets set in tariff orders. On the whole, this validation assesses ADB's performance satisfactory.

#### IV. OVERALL ASSESSMENT, LESSONS, AND RECOMMENDATIONS

##### A. Overall Assessment and Ratings

32. Overall, the PCR rated tranche 1 successful. It was highly relevant due to its transformative effect on women entrepreneurs and the introduction of asset mapping for rural power supply. It was effective, efficient, and likely sustainable. This validation assesses the tranche highly relevant, effective, efficient, and likely sustainable. Overall, this validation assesses the tranche successful.

##### Overall Ratings

Validation Criteria	PCR	IED Review	Reason for Disagreement and/or Comments
Relevance	Highly relevant	Highly relevant	
Effectiveness	Effective	Effective	
Efficiency	Efficient	Efficient	
Sustainability	Likely sustainable	Likely sustainable	
<b>Overall Assessment</b>	<b>Successful</b>	<b>Successful</b>	
Preliminary assessment of impact	Satisfactory	Satisfactory	
Borrower and executing agency	Satisfactory	Satisfactory	
Performance of ADB	Satisfactory	Satisfactory	
Quality of PCR		Satisfactory	Para. 37.

ADB = Asian Development Bank, IED = Independent Evaluation Department, PCR = project completion report.  
Source: ADB (IED).

##### B. Lessons

33. The PCR derived three lessons: (i) long-term support provided through MFFs to the same agencies can strengthen staff capacity as seen in smooth project implementation and the DISCOMs becoming self-sustaining; (ii) benefits of quality power supply in rural areas are better shared if combined with awareness-raising on gender equity and on safe and efficient use of electricity, skills training on starting energy-based enterprise, and provision of business development services; and (iii) resident mission staff's involvement can improve project implementation support, and more participation at appraisal stage would help fine-tune estimates and provide better understanding of the investment program.

34. This validation supports these lessons and offers additional two project-level lessons.

- (i) The MFF modality can allow DISCOMs to tailor the tranche subprojects according to the distribution networks' priorities and complement other rural development programs being implemented at the time. Most upgrade of 0.4 kV feeders to 11 kV feeders, about half the aerial bundle conductors and new connections, and a third of the meters were implemented under other ongoing programs.

- (ii) More attention during project implementation can help manage risks identified during the investment program preparation. The reduction of distribution losses needed periodic monitoring and reporting against time-bound AT&C loss reduction action plans for feeders, districts, and circles; and the corrective actions needed to be based on the data from distribution network energy meters installed and asset maps prepared in the tranche.<sup>22</sup>

### **C. Recommendations for Follow-Up**

35. The PCR recommended that the DISCOMs needed to continue the efficient operation of the power distribution network. The MFF introduced the gender-responsive approach for rural electrification. However, business development services needed to continue over the next few years to overcome deep-rooted social and cultural constraints.

## **V. OTHER CONSIDERATIONS AND FOLLOW-UP**

### **A. Monitoring and Reporting**

36. The three DISCOMs monitored the tranche implementation progress in their respective regions and submitted periodic progress reports. ADB reviewed the monthly progress reports and participated in the annual tripartite review meetings. Audited project and annual financial reports were submitted although some were delayed by a few weeks. Independent experts monitored implementation of environmental aspects, environmental reports were disclosed, and the quality was satisfactory. The DISCOMs did not prepare a completion report.

### **B. Comments on Project Completion Report Quality**

37. The PCR provided a comprehensive summary of project implementation, and the appendixes were consistent with the main text and included an in-depth discussion of GAP implementation and DISCOM-wise breakdown of project costs. It discussed salient implementation aspects, including the rebidding of 10 contract packages that resulted in very significant implementation delay. The output section summarized the works related to feeder separation and upgrade of low-voltage network that were essential to reduce distribution losses, although it did not explicitly mention the conversion to HVDS. There was a shortcoming in the sustainability criteria's evaluation—the FIRR calculations used normative tariffs instead of actual increase in sales and lacked a review of financial projections of the DISCOMs that could inform how the AT&C loss reduction risk was being managed. On the whole, this validation assesses the quality of the PCR satisfactory.

### **C. Data Sources for Validation**

38. Data sources for this validation included the report and recommendation of the President, the PCR, loan review mission reports, and information available on the internet web pages of MPERC, Madhya Pradesh transmission company, and the Ministry of Power.

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<sup>22</sup> Benchmarking and sharing experiences of better-performing DISCOMs would strengthen AT&C reduction plans. According to the Ranking and Ninth Annual Integrated Rating: State Distribution Utilities (footnote 19), the AT&C losses in three Gujarat DISCOMS was 6.2%–11.3%, in the Punjab DISCOM was 14.2%, and in one Haryana DISCOM was 16.4%.

**D. Recommendation for Independent Evaluation Department Follow-Up**

39. A follow up or preparation of project performance evaluation report would not be necessary for tranche 1.