

**Validation Report**  
October 2018

# India: Power Grid Transmission (Sector) Project

Reference Number: PVR-556  
Project Number: 38492-013  
Loan Number: 2152



*Raising development impact through evaluation*

## ABBREVIATIONS

ADB	– Asian Development Bank
DMF	– design and monitoring framework
EIRR	– economic internal rate of return
EMR	– environmental monitoring report
FIRR	– financial internal rate of return
FSC	– fixed series compensation
IDC	– interest during construction
IED	– Independent Evaluation Department
NTDP	– National Transmission Development Plan
O&M	– operations and maintenance
PCR	– project completion report
POWERGRID	– Power Grid Corporation of India Limited
ROW	– right-of-way
RRP	– report and recommendation of the President
SMR	– social monitoring report
T&D	– transmission and distribution

## WEIGHTS AND MEASURES

cct-km	– circuit kilometer
GW	– gigawatt
MVA	– mega volt ampere

## NOTE

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

<b>Director General</b>	Marvin Taylor-Dormond, Independent Evaluation Department (IED)
<b>Deputy Director General</b>	Veronique Salze-Lozac’h, IED
<b>Director</b>	Nathan Subramaniam, Sector and Project Division (IESP), IED
<b>Team leader</b>	Alfredo Baño-Leal, Evaluation Specialist, IESP

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### PROJECT BASIC DATA

Project Number	38492-013	PCR Circulation Date	19 July 2017	
Loan Number	2152	PCR Validation Date	Oct 2018	
Project Name	India: Power Grid Transmission (Sector) Project			
Sector and Subsector	Energy	Electricity transmission and distribution		
Strategic Agenda	Environmentally Sustainable Growth			
Safeguard Categories	Environment		B	
	Involuntary Resettlement		—	
	Indigenous Peoples		—	
Country	India		Approved (\$ million)	Actual (\$ million)
ADB Financing (\$ million)	ADF: 0.00	Total Project Costs	568.00	602.20
	OCR: 400.00	Loan	400.00	400.00
		Borrower	168.00	202.20
		Beneficiaries		
		Others		
Cofinancier		Total Cofinancing		
Approval Date	21 Dec 2004	Effectiveness Date	1 Feb 2006	10 Jan 2006
Signing Date	03 Nov 2005	Closing Date	31 Dec 2009	5 Oct 2012
Project Officers	C. N. Chong P. B. Song A. Guha K. Vallabha Rao	Location ADB headquarters ADB headquarters ADB headquarters India Resident Mission	From Aug 2004 Feb 2006 Oct 2009 Jan 2010	To Feb 2006 Sep 2009 Jan 2010 Jul 2017
IED Review Director Team	N. Subramaniam, IESP A. Baño-Leal, Evaluation Specialist, IESP*			

– = not applicable, 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.

\*Team members: F. De Guzman (Senior Evaluation Officer); and C. Gertig, J. Eerikainen, and R. Brockman (Consultants).

## I. PROJECT DESCRIPTION

### A. Rationale

1. The government of India in 2004—the year of loan appraisal—set the target of installing an additional 100 gigawatts (GW) of generating capacity to provide access to electricity for all households by 2012.<sup>1</sup> At that time, India was experiencing load shedding and quality problems because of the limited power transmission capacity.<sup>2</sup>

2. The country's power system has five interconnected regions—northern, north eastern, eastern, western, and southern—with interconnections to neighboring states. State electricity boards are under the administrative control of the respective state ministry or department of power, and account for approximately 80% of commercial electricity sales. The Electricity Act of 2003 has also enabled open transmission access and the development of a power trading market, both demanding a robust and reliable transmission grid.<sup>3</sup>

3. The government approved the National Transmission Development Plan (NTDP) with required investments amounting to \$12.6 billion by 2012. The plan aimed to alleviate existing transmission shortages and deploy additional generation capacity. The Asian Development Bank (ADB) approved the \$400 million loan in 2004 for the Power Grid Transmission (Sector) Project to support the implementation of the NTDP. This loan, in accordance with ADB's country strategy and program for India, financed the procurement and construction of transmission infrastructure. It also helped the Power Grid Corporation of India Limited (POWERGRID)<sup>4</sup> strengthen and develop India's national transmission grid.<sup>5</sup> POWERGRID also cofinanced the project. These improvements in the power sector would promote increased private sector participation through open access to the national transmission grid. The private sector though has been cautious in investing in transmission because of the weak regulatory framework.

### B. Expected Impacts, Outcomes, and Outputs

4. The design and monitoring framework (DMF) indicated that the project's expected impact was adequate and reliable power supply to meet the demands for electricity in India. The project's outcome was the national transmission grid strengthened and expanded with transmission bottlenecks removed and power losses reduced.

5. The project outputs were three core subprojects originally included in the DMF and seven candidate subprojects added in the revised DMF:

- (i) Core subprojects
  - (a) Tamil Nadu grid I strengthened,
  - (b) Tamil Nadu grid II strengthened,
  - (c) Tamil Nadu, Andhra Pradesh, and Union Territory of Pondicherry grid strengthened; and

<sup>1</sup> ADB. 2017. *Completion Report: Power Grid Transmission (Sector) Project in India*. Manila.

<sup>2</sup> ADB. 2004. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to India for the Power Grid Transmission (Sector) Project*. Manila.

<sup>3</sup> Ministry of Law and Justice of India. 2003. *The Electricity Act of 2003*. New Delhi.

<sup>4</sup> POWERGRID is one India's central power utilities and is responsible for the inter-state transmission of electricity and the development of national grid. It is state-owned and transmits about 50% of the total power generated in India on its network.

<sup>5</sup> India's national transmission grid has 765-kilovolt (kV) and 400 kV transmission lines and substations.

(ii) Seven candidate subprojects added in 2005–2007 after the project’s appraisal and ADB approval:

- (a) Kerala I grid strengthened,
- (b) Kerala II grid strengthened,
- (c) Northern region system’s scheme V strengthened,
- (d) Transmission capacity enhanced in the northern region’s east–west corridor,
- (e) Western region’s scheme VII strengthened,
- (f) Bulk conductors and insulators procured, and
- (g) Additional bulk conductors procured.

6. To be selected under the sector loan, subprojects should (i) be technically feasible, (ii) be part of POWERGRID’s NTDP, (iii) not include transmission lines emanating from power generating stations, (iv) not be classified as category A under ADB’s Environment Policy 2002, and (v) the state electricity board or other beneficiary of a subproject should have a satisfactory payment record with POWERGRID—accounts receivable of 3 months or less.

### **C. Provision of Inputs**

7. The project was approved on 21 December 2004 and the loan became effective on 10 January 2006, slightly earlier than the original date of 1 February 2006. The project period was extended twice and the loan closed on 5 October 2012, about 33 months after the target date of 31 December 2009. The project completion report (PCR) indicated that the reasons for the two extensions and revision of the loan closing dates were delays in the tendering and execution of the supply contracts for most subprojects (Table 4 and Appendix 8 of the PCR). The difficulty in securing forest clearance permits and right-of-way (ROW) issues led to significant delays for some subprojects. Due to resulting ROW court trials, the works on one transmission project were stalled in 2010, with ROW issues resolved in 2016 and new contracts signed in 2017.

8. The \$400 million ADB loan was fully disbursed by 2012. Guaranteed by India’s government, POWERGRID was the loan borrower and also assumed the foreign exchange risk. Project costs were initially appraised in October 2004 at \$568.0 million but were revised in September 2007 to \$653.2 million to include candidate subprojects requested by POWERGRID. At appraisal the borrower was to finance \$168.0 million, but this increased to \$253.2 to cover the additional subprojects—ADB’s loan remained at \$400 million. The actual project cost was \$602.2 million, lower than the revised estimate due to cost savings through international competitive bidding. Interest during construction (IDC) was originally estimated at \$15.0 million but was increased to \$39.3 million. It was lower at \$30.1 million upon completion.

9. The sector modality was deemed suitable since it enabled POWERGRID to utilize the loan proceeds according to their development plans, priorities, and technical requirements.

10. The project was environmental category B. No involuntary resettlement or indigenous peoples’ categorization was given in the project data sheet. During project execution, no external consultants were used.

### **D. Implementation Arrangements**

11. POWERGRID was the executing agency and was responsible for planning, design and procurement, and implementing all subprojects. A project management unit was set up within

company. There was no change in the implementation arrangements throughout the project. The director (projects) of POWERGRID was responsible for project implementation and was assisted by the corporate monitoring group. Engineering and contracting activities for all packages and liaison with ADB was undertaken in the corporate headquarters under the company's executive director (corporate planning). Supervision of construction for each subproject was delegated to the executive directors of the concerned regions, assisted by the planning, engineering, finance, and personnel departments of the regional offices.

12. POWERGRID carried out the technical feasibility studies for each subproject, prepared a resettlement plan, conducted an initial environmental examination, formulated an indigenous peoples' development plan, and submitted subproject appraisal reports to ADB. Project monitoring was conducted by having a master network schedule for each subproject that was integrated with separate work schedules for each contract package to ensure contractors' activities were aligned with the master network schedule. Progress reviews were executed at local, regional, and corporate levels. The regional executive directors held weekly and monthly review meetings, while POWERGRID's corporate management reviewed the implementation progress quarterly. After commissioning, POWERGRID was able to undertake operations and maintenance (O&M) of the subprojects. Neither technical assistance nor other consulting services were used during project execution.

13. Loan effectiveness was not subject to special or additional conditions other than legal opinions. There were 58 project specific covenants, and none of these was modified, suspended, or waived during project implementation. The PCR indicated that POWERGRID complied with all of them. Nevertheless, this validation notes the following noncompliances:

- (i) Loan Agreement Schedule 4, paragraph 9 (a) states, "POWERGRID shall implement subprojects in accordance with requirements of Guarantor's applicable laws, ADB's involuntary Resettlement Policy, 1995. For each subproject the Borrower shall: make available land and rights-of way required, in a timely manner". Although it should be made sure that ADB's safeguard policies are met as well as Guarantor's laws, delays of over 10 years cannot be considered as 'in a timely manner' (Subproject 4).
- (ii) Loan Agreement Article IV, Section 4.03 (a) states, "In the carrying out of the Project, the Borrower shall employ competent and qualified contractors acceptable to ADB and to an extent and upon terms and conditions satisfactory to ADB and the Borrower." The PCR (Appendix 8), however, portrayed significant deviations between actual project implementation and planned work schedules. Although conditions are subjective, such deviations should not be satisfactory to ADB.

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

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

14. The PCR rated the project relevant. At the time of appraisal, the project was aligned with ADB's country strategy and program for India that supported infrastructure projects aimed at increasing economic growth.<sup>6</sup> It was aligned with the energy sector strategy that targeted the expansion of the electricity transmission and distribution (T&D) systems, strengthening of

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<sup>6</sup> ADB. 2003. *Country Strategy and Program: India, 2003–2006*. Manila; and ADB. 2004. *Country Strategy and Program Update: India, 2005–2007*. Manila.

infrastructure, and the expansion of availability and access to energy by reducing losses, among other targets.<sup>7</sup> These were also formulated in ADB's country partnership strategy for India<sup>8</sup> and the government's 11th five-year plan objectives.<sup>9</sup> The project also continued former ADB operations that supported the national grid expansion and reforms in the energy sector, such as the Power Transmission Improvement (Sector) Project. The project was also aligned with the NTDP in strengthening and expanding the transmission lines and associated substations. The government's objective at appraisal was to improve energy efficiency in the power sector by removing transmission bottlenecks, enabling the market entry of independent power producers, and establishing a power market requiring smooth power flow throughout the national grid.

15. Project design deficiencies impacted implementation and delayed the completion of subprojects. This validation finds that potential ROW issues and the lessons from delivery timelines of past transmission projects, and a more thorough inquiry into the dependencies of the project outputs with generation asset development, were not appropriately assessed during project preparation. Implementation contracts should have not started before all ROW were secured. Implementation timelines were not realistic for subprojects of this type and magnitude in India.

16. The sector loan modality enabled POWERGRID the flexible allocation of funds according to the power sector master plan and priority needs. The modality also enabled the change of subprojects as required. The PCR indicated the project was designed in close coordination with POWERGRID, the Central Electricity Authority (CEA), the Ministry of Power, and the Department of Economic Affairs.

17. Despite lessons learned from former projects implemented by POWERGRID (e.g., the need for ADB to be flexible in India, land acquisition to be carried out expeditiously, contracts to be properly packaged, and loan covenants to be appropriate),<sup>10</sup> there were significant delays between anticipated tendering and implementation time frames, and project execution. This validation suggests that the constraints for the timely achievement of the results were not adequately considered, since subproject timing and loan disbursements were not aligned with the deployment of generation assets as part of the broader NTDP development. These issues caused delays during implementation and increased IDC. The lessons also from previous tendering and implementation time frames of the executing agency and the ROW issues should have been taken into account in project design and planning.

18. The design issues led to two project extensions from December 2009 to December 2010 and then to March 2012, to allow for full loan disbursement. However, the last subproject contract for the 150-kilometer 400 kV double-circuit Edamon–Muvattupuzha transmission line of the grid strengthening for Kerala I subproject was retendered only in 2017 (over 10 years after loan effectiveness) and is currently under implementation. These issues are assessed as project design deficiencies that support this validation's rating of less than relevant.

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<sup>7</sup> ADB. 2009. *Energy Policy*. Manila.

<sup>8</sup> ADB. 2013. *Country Partnership Strategy: India, 2013–2017*. Manila.

<sup>9</sup> Government of India, Planning Commission. 2006. *Towards Faster and More Inclusive Growth: An Approach to the 11th Five Year Plan*. Delhi.

<sup>10</sup> ADB (South Asia Department). 2004. Management Review Meeting: Power Grid Transmission (Sector) Project of India. Minutes of meeting 4 October (internal).

## B. Effectiveness in Achieving Project Outcomes and Outputs

19. The PCR rated the project effective in achieving its outcome and outputs. The outcome indicator of increasing the grid availability at 99.0% or greater was achieved—the reported accomplishment at the end of the project was 99.6% availability. However, the reduction of T&D losses from 30% in 2004 to 20% in 2012 was not achieved, as it was reduced only to 28.5% at project completion in 2012, and to 22% in 2017. The PCR indicated that T&D losses are estimated to be achieved by 2019. This validation considers that the targeted outcome indicator of T&D losses was too ambitious during project formulation, as the major factor for the losses—pilferage of electricity through unauthorized connections and tampering of meters<sup>11</sup>—could not be reasonably addressed by the project outputs. A specific target of energy losses in the transmission system would have been a more suitable outcome.

20. Table 1 shows the accomplishment of the project outputs, including the core subprojects and candidate subprojects that were added later.

**Table 1: Output deliveries**

#	Outputs Planned	Output Delivery
<b>Core subprojects</b>		
1	820 circuit kilometer (cct-km) of transmission and 1,260 mega volt ampere (MVA) of substation capacity in Tamil Nadu	Only 535 cct-km (65%) and 630 MVA (50%); completed in October 2009
2	436 cct-km of transmission and 1,260 MVA of substation capacity in Tamil Nadu	Only 382 cct-km (88%); all 1,260 MVA installed; completed in July 2010
3	98 cct-km of 400 kV transmission and 1,260 MVA of substation capacity in Tamil Nadu, Andhra Pradesh, and Union Territory of Pondicherry	Only 54 cct-km (55%); all 1,260 MVA installed; completed in July 2010
<b>Candidate subprojects</b>		
4	620 cct-km of transmission capacity in Kerala	Still under execution; partly completed in March 2010
5	160 cct-km of transmission and 630 MVA of substation capacity plus the extension of substation bays at one location in Kerala	Fully delivered and completed in November 2011
6	1,332 cct-km of transmission capacity plus the extension of substation bays at three locations in the northern region	1,188 cct-km (89%), plus substations completed in March 2010
7	Two units of 30% fixed series compensation (FSC) and two units of 45% FSC in the northern region	Fully delivered, completed in March 2010
8	Two 125 mega volt ampere (reactive) MVAR bus bar reactors in the western region	Fully delivered, completed in October 2010
9	2,349 km of Aluminium-conductor-steel-reinforced (ACSR) Moose conductors, 87,161 120 kilo-newton (kN) insulators and 134,761 160 kN insulators	Fully delivered, completed in March 2009
10	3,150 km of ACSR Lapwing conductors	Fully delivered, completed in March 2010

Source: Project Completion Report.

<sup>11</sup> Footnote 2, para. 4.



21. While deviating in various project outputs against the initial established targets, it is clear that the final results were sufficient to serve the intended purpose of strengthening the transmission grids in the respective regions, and that the initial targets were revised toward the final result in course of the detailed engineering of the project (footnote 11 of the PCR). Reductions in scope due to changes in engineering design in some project outputs were compensated by additional subproject outputs that were procured with the same total budget, therefore adding value without increasing the overall cost.

22. This project was considered as gender neutral and a gender action plan was unnecessary. An initial environmental examination and environmental management and monitoring plan was prepared for the project. Experts from the Environmental and Social Monitoring Department monitored the implementation of the plan's provisions and were commissioned by POWERGRID to submit semiannual reports to the company and ADB. ADB also monitored the environmental compliance of POWERGRID and its contractors during implementation. The environmental monitoring reports (EMRs) confirmed that such monitoring was implemented appropriately during project implementation. Resettlement was planned and a rapid action plan was prepared. The social monitoring report (SMR) indicated that the rapid action plan was adequately implemented and monitored.<sup>12</sup> Most of the outputs were implemented fully and subprojects were added beyond the original project scope. The operating assets provided vital interconnections, helped remove bottlenecks in the transmission network, expanded and strengthened the grid, and reduced related losses. The project partially achieved its outcome targets and the shortcoming in one outcome target was due to deficiencies in project design. Based on the above, this validation rates the project effective.

### **C. Efficiency of Resource Use**

23. The PCR rated the project efficient because it was implemented within the approved budget and the extended time frame. Loan disbursements occurred generally in line with the planned schedule (Appendix 7). However, significant procurement and implementation delays of most subprojects led to the late operation of the assets and increased IDC to \$30.1 million at completion, twice the amount estimated at appraisal. The PCR mentioned that these delays were the result of the slow implementation of generation assets and because of ROW issues.

24. The implementation of subprojects 2, 4, 5, and 6 took longer than expected because of delays in government approvals for forest clearances following a Supreme Court order.<sup>13</sup> The PCR noted that the emergence of ROW issues for subproject 4 interrupted the transmission line construction works after 18 km out of 150 km were completed. Demands for higher compensation were resolved until August 2016 and led to retendering of the remaining works and a delay in completion to March 2017. This subproject was responsible for the highest cost overruns of \$43 million against the revised estimate, and the contract is currently under execution. For subproject 5, ROW issues led to a stay order from the High Court of Kerala, causing delays and requiring the rebidding of the works.

25. At project completion, significant delays of 2–3 years had occurred in subprojects 1, 2, 3, and 5, with one part of subproject 4 still under implementation. These delays resulted from the implementation delays of associated generation assets under the NTDP, ROW issues settled in

<sup>12</sup> ADB (Independent Evaluation Department). 2018. Project Safeguard Assessment: Power Grid Transmission (Sector) Project in India. 20 February (internal).

<sup>13</sup> ADB (South Asia Department). 2007. Review Mission to India: Power Grid Transmission (Sector) Project. Back-to-office report. 23 July (internal).

court, and delays in tendering because of the heavy workload of POWERGRID in 2005 and 2006.<sup>14</sup>

26. This validation notes that ROW should have been secured by POWERGRID in a timely manner as required by the loan agreement. Also, the delays in subproject implementation could be justified by the postponement in generation asset implementation as indicated in the PCR. The loan agreement (Schedule 4, para. 3 of the PCR) stated that the subprojects should not include transmission lines emanating from generation assets, and therefore dependent on their construction. The PCR justification was not substantiated by the mission memoranda and associated aide memoires.

27. Subproject cost savings of \$21 million were outweighed by increases of \$75.8 million, leading to \$54.8 million of contingencies being used. Actual project costs stayed within the approved revised budget of \$653.2 million. Although the final IDC was significantly higher than the estimate at the time of the loan agreement, the final IDC was within the revised estimate of \$39.3 million.

28. The project's economic internal rate of return (EIRR) computed at appraisal was 30.5%, while at completion it was estimated at 19.7%. Sensitivity analysis of three downside scenarios and the combination of them showed that the EIRR would remain above the hurdle rate of 12.0%. The PCR stated that the difference in the EIRR was because of the use of different investment amounts: (i) using the overall NTDP investment of \$12.6 billion at appraisal, in para. 58 of the report and recommendation of the President (RRP); whereas (ii) using only ADB-financed assets at completion. It remains unclear why the different bases for EIRR calculations were chosen at project appraisal and completion, since it inhibits comparability.

29. The determination of the EIRR at completion was based on the virtual cash flow derived from the total amount of energy transferred through the newly created transmission network. The energy transferred through each transmission asset is hard-coded in the analysis spreadsheet and adjusted with correction factors. This validation cannot verify these estimates and it recommends to check their validity. The economic benefit from energy transmission was calculated as the difference between the average electricity tariff of 4.9 Indian rupees (₹) per kilowatt-hour, a 2017 estimate from the Energy and Resources Institute (TERI), and the willingness to pay (WTP) of ₹7.2 per kilowatt-hour based on the national government's 2017 estimates. Net benefit was derived by deducting transmission losses, capital, and O&M costs of the assets. Despite the lack of formatting and documentation of the economic analysis spreadsheet, the assessment appears reasonable, except for the shortcomings mentioned in Section 5B of this validation.

30. Because of the high and robust EIRRs, and despite the delays in some subprojects (described in Section II.A above), this validation rates the project efficient.

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

31. The PCR rated the project as likely sustainable since the subproject design and technology was considered state-of-the-art. POWERGRID has long standing experience of the O&M of T&D infrastructure, and it was confirmed in the PCR to have adequately qualified in-house personnel to undertake the task. POWERGRID has executed commercial contracts with

<sup>14</sup> ADB (South Asia Department). 2006. Review Mission to India: Power Grid Transmission (Sector) Project. Back-to-office report. 25 September (internal).

concerned distribution companies and holds a letter of credit for more than 100% of monthly bills to cover potential defaults. According to government forecasts, energy demand will be adequate for the evacuation of power from existing stations, and for its transfer from regions with an energy surplus to those with a deficit.

32. The financial internal rate of return (FIRR) analysis suggested that the project is financially viable and the use of high-quality components is expected to mitigate against unexpected remedial expenditures. The FIRR at appraisal was calculated for the entire NTDP investment at 7.9%, higher than the weighted average cost of capital (WACC) of 4.5%. At completion, using a base computation for only ADB-financed assets, the FIRR was computed to be 5.6% against the revised WACC of 3.1%. A sensitivity analysis was only carried out by the PCR related to the EIRR, not the FIRR. It remains unclear why different bases for FIRR calculation were used at appraisal and completion. The FIRR calculation was based on revenue streams established for each of the project outputs. These were hard-coded into the financial analysis spreadsheet and could not be checked. Capital and O&M costs were deducted to derive net cash flow. The FIRR calculation methodology appeared reasonable, although not all values could be verified because their lack of documentation in the financial analysis spreadsheet. Also in the FIRR calculation, revenues and total costs did not seem to subtract to net cash flow (Appendix 11 of the PCR). Compared to the calculation spreadsheet provided, there were discrepancies in the revenue column of Appendix 11, while the calculation spreadsheet contained consistent values.<sup>15</sup>

33. The social monitoring report confirmed that all affected people were adequately compensated and that project execution was carried out without pilferage.<sup>16</sup> The transmission infrastructure is crucial to enabling the implementation of the power trading market and the connection of the additional generation capacity that is expected to increase in line with energy demand. Disruption of the continued profitable utilization of project outputs is unlikely, and POWERGRID confirmed that it currently works toward outcome targets beyond those established in the DMF. This validation rates the project as likely sustainable similar with the PCR.

### III. OTHER PERFORMANCE ASSESSMENTS

#### A. Preliminary Assessment of Development Impact

34. The expected indicators to measure the project's impact were (i) additional deployment of 100 GW of generation capacity and (ii) increase in rural electrification from 31% to 100%. Although the added generation capacity was nearly achieved (97% of the target), the percentage of rural households having access to electricity was not—those with access only increased to 67% by 2012.

35. The deployment of transmission assets as project outputs could not contribute directly to the target of increasing the countries generation capacity. However, the PCR indicated that the connection of various generation assets was possible because of the project and, therefore, a contribution toward the ambitious 100 GW target was achieved. The increase of rural electrification through the transmission assets of the project was only indirectly possible. The project outputs were mainly interconnector lines, while increased rural electrification would occur mainly through the electricity distribution network. However, given the project outputs of added

<sup>15</sup> ADB (South Asia Department). 2017. Project Costs Revenues, O&M WACC: Power Grid Transmission (Sector) Project. Spreadsheet (internal).

<sup>16</sup> Power Grid Corporation of India Limited. 2012. *Social Monitoring Report: Power Grid Transmission (Sector) Project in India* (prepared for ADB).

capacity transfers to underdeveloped regions, there would be an indirect contribution toward increased electrification through the additional power capacity distributed to rural areas.

36. The new transmission assets of the project may contribute to the reduction of losses since these used the latest technology. However, most of the T&D losses are from electricity theft and no impact on this could be leveraged via the project. An increase in grid availability could be achieved, as the project outputs increased transmission capacity, avoided overstrained grids, and also helped to connect additional generation capacity, this way reducing the risk of blackouts. The project also provided new transmission infrastructure interconnector lines that would help to provide redundancy in transmission capacity should other lines fail. There is no apparent correlation between the outcome targets and the impact targets.

37. The PCR rating for project impact was not stated. No environmental or social targets were included in the DMF. The PCR elaborated that the environmental impact was well anticipated and managed throughout project execution, and that POWERGRID minimized impacts on ecologically sensitive areas, unstable areas, human settlements, developed areas, and places of archeological, historical, and cultural importance. None of the infrastructure was implemented in sanctuaries, biosphere reserves, nor protected areas, but some 20.6 km of forest was crossed, requiring the use of 94.5 hectares (ha) of forestland and tree felling. The forest department was compensated and replacement trees were planted. Equipment procurement and installation considered their environmental impacts. The EMR did not flag any adverse environmental impacts and POWERGRID confirmed that no related complaints were received.<sup>17</sup> However, review missions noted that environmental safeguards supervision and implementation could have been more systematic and structured but no major environmental issue was witnessed.<sup>18</sup> This validation considers the environmental impact as negligible because compensation was paid, and rainwater harvesting, use of solar energy, and groundwater reuse all showed that the environmental contributions of the project were exceeded.

38. The project was gender neutral. It acquired 68.8 ha of land, 6.8 ha of which was from government and the remainder from private sector. The transmission line routes were planned by POWERGRID to minimize negative social impacts. Notifications were issued, stakeholder consultations were undertaken, and 200 affected persons were compensated during the land acquisition process in line with the agreed entitlement matrix. Some 17,553 people received compensation for loss of crops and damage to trees. Complaints were adequately dealt with and POWERGRID will fully compensate those who were granted additional compensation by the courts. POWERGRID also invested in community development works, such as the construction of roads, health facilities, community centers, water tanks, school buildings, and others, in consultation with the local population, thus improving project acceptance. The SMR showed that the overall living standards of the affected residents improved during project execution. This validation rates the social impact satisfactory, but recommends monitoring of the outstanding compensation granted by court orders to be paid by POWERGRID.

39. No institutional impact was directly targeted thus, the project impact was rated negligible. However, the project enabled the connection of some renewable energy generating plants and facilitated the implementation of a power trading market. This validation rates the impact of the project satisfactory.

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<sup>17</sup> Power Grid Corporation of India Limited. 2012. *Environmental Monitoring Report: Power Grid Transmission (Sector) Project in India* (prepared for ADB).

<sup>18</sup> ADB (South Asia Department). 2010. Review Mission to India: Power Grid Transmission (Sector) Project. Back-to-office report. 21 December (internal).

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

40. The PCR rated the performance of POWERGRID, as the executing agency and borrower, satisfactory. This was justified since the project was completed and the subprojects are being well operated and maintained. The increase of transmission grid availability to 99.6% was an achievement in line with one of the intended outcome targets. The PCR also found that POWERGRID demonstrated its capacity to formulate and appraise projects satisfactorily.

41. This validation differs in the assessment. The outcome target of T&D loss reduction from 30% in 2004 to 20% in 2012 was not achieved. Substantial delays in tendering and project implementation impacted the majority of the subprojects. More due diligence in the definition of project impact and outcome targets, and output schedules at formulation would have helped to establish realistic expectations. This was raised in a Staff Review Committee meeting.<sup>19</sup> The PCR emphasized that significant delays in most subprojects were caused by lack of synchronicity between generation asset and transmission asset implementation, which this validation considers should have been foreseen at formulation stage and would have needed to be flagged as a major risk for delay at appraisal.

42. Another major cause of the delays in subproject implementation was the ROW problems that executing agency POWERGRID contractually obliged to resolve in the loan agreement. This did not happen in subproject 4, which is still under implementation and has a 10-year delay. The minutes of the September 2006 review mission (footnote 14) indicated that the inadequacy of staff resources caused delays in 2005–2006 relative to the workload of the executing agency. Subproject 8 involved the delayed implementation of fixed series compensation (FSC) due to approval procedures for substation shutdowns (para. 28 of the PCR)—a procedural issue that should have been known by the executing agency at project formulation. Despite delays in project execution, the executing agency disbursed the sector loan in line with the original disbursement plan, leading to an increase in IDC (5% of final project cost) that was twice the amount estimated at loan signing. Subproject appraisal was contractually required to be finalized not later than 31 December 2005, but additional subprojects were approved up to 2007 (para. 3 and Appendix 2 of the PCR), indicating delayed submission.

43. The establishment of the grievance redress committees was delayed beyond the 3-month contractual time frame, and compliance with subproject work schedules, as required by the loan agreement, was not adhered to for most subprojects. The review mission fielded in 2010 from October to December found that environmental safeguard supervision was partly deficient. The semiannual EMR of August 2011 was also deficient because it only contained a collection of letters. The review mission of September 2006 (footnote 14) also attested the borrower's poor compliance with covenants. Accordingly, this validation finds that POWERGRID as the executing agency performed less than satisfactory.

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

44. The PCR rated ADB's performance as satisfactory based on adequate project progress monitoring, the fielding of missions, and appropriate reporting. ADB provided valuable advice and approved actions in a timely manner. Project administration was transferred to the ADB India Resident Mission in January 2010, which improved project administration and monitoring. The PCR also suggested corrective measures in project execution on various occasions.

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<sup>19</sup> ADB (South Asia Department). 2004. Staff Review Committee Meeting: Power Grid Transmission (Sector) Project in India. Minutes of Meeting. 2 November (internal).

45. This validation finds that project progress monitoring was carried out, and missions were fielded at regular intervals with formal documentation, follow-up, and clear indications of actions reported afterwards. Project documentation was elaborated adequately, but deliverables of the executing agency, such as the EMR for 2011, could have been checked better and the deficiencies identified.

46. Project design deficiencies, however, impacted substantially the project implementation and delayed the completion of subprojects for a few years. This validation considers a more diligent assessment of potential ROW issues at appraisal and the lessons from delivery timelines of previous transmission projects in India, as well as a more thorough inquiry into the dependencies of the project outputs with generation asset development. ADB could have advised POWERGRID not to start implementing contracts and disbursing funds before all ROWs were secured. Project implementation timelines were too ambitious for subprojects of this type and magnitude in India.

47. Due to the flaws in project design and assessment or critical issues, as well as a late submission of the PCR (5 years after loan closing date), this validation rates ADB performance as less than satisfactory.

#### **D. Others**

48. This validation notes that the costs resulting from the delays incurred during procurement may have been reduced if contract awards had been postponed until all ROW issues were identified and resolved, and the generation asset implementation was sufficiently advanced. For subproject 4, it is unclear how the implementation contract was executed for 18 km before the ROW issue was encountered. Delays in tendering seem to have incurred mainly because of the lack of executing agency's resources as mentioned in the SMR (footnote 16).

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

#### **A. Overall Assessment and Ratings**

49. This validation rates the project successful, supporting the findings of the PCR. Table 2 summarizes the individual ratings for each validation criteria.

**Table 2: Overall Ratings**

<b>Validation Criteria</b>	<b>PCR</b>	<b>IED Review</b>	<b>Reason for Disagreement and/or Comments</b>
Relevance	Relevant	Less than Relevant	The shortcomings at project design contributed to substantial implementation delays
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	
Borrower and executing agency	Satisfactory	Less than satisfactory	ROW issues and limited assessment of inter-dependencies to associated generation assets

Validation Criteria	PCR	IED Review	Reason for Disagreement and/or Comments
Performance of ADB	Satisfactory	Less than satisfactory	Project design deficiencies contributed to substantial delays
Quality of PCR		Satisfactory	

ADB = Asian Development Bank, IED = Independent Evaluation Department, PCR = project completion report, ROW = right-of-way.

Source: ADB Independent Evaluation Department.

## B. Lessons

50. **At country level**, this validation considers that the main causes of project delays were ROW issues, and executing agency's resource constraints and its management. It appears that disputes with affected people caused significant delays in subproject implementation and they had to be settled in the courts. These issues led to delayed revenues, additional work for the executing agency staff, and increased IDC. It is essential that future disputes should be settled outside the courts through more adequate consultation and negotiation with those affected. The executing agency should also emphasize that consulting and negotiating more with affected persons will be beneficial for future projects.

51. **At sector level**, the PCR stated that delayed generation asset implementation resulted in delays in the commissioning of most subprojects, suggesting a dependency of the transmission infrastructure on the generation assets. This dependency was intended to be avoided in the loan agreement and more related delays were flagged in the RRP (para. 15) from preceding sector projects in India, with mitigation measures recommended to be implemented in this project. Future subprojects must take account of their dependency and interrelationship with other investments.

52. **At project level**, procurement should only take place after all ROW issues have been resolved and dependencies with other developments cleared. A supplementary technical assistance could have helped to identify and solve these issues, together with better execution of the executing agency, supervision by ADB, and a more thorough due diligence at project design.

53. **Results framework and methodology level** lessons stem from the shortcomings of the overly ambitious impact and outcome targets. The target that 100% of rural households would have access to electricity, and the installation of an additional 100 GW of generation capacity, both by 2012, were not only unrealistic, but also not directly related to the project outputs. The second outcome target—reducing the T&D losses by 33%—should have referred to transmission losses only, since they contribute to only 4% of the overall grid losses according to the project data sheet.

54. The EIRRs and FIRRs were not recomputed on the same basis as used at appraisal, hence, they are not comparable. Data estimates used for the analyses, such as annual energy transferred through the transmission assets, were hard-coded in the analysis sheets and could not be verified. The lack of references and unsubstantiated hard-coded data in the spreadsheets of economic and financial analyses hindered evaluation of the analyses. These issues restricted additional analysis of the results and should be avoided in future projects.

## C. Recommendations for Follow-Up

55. The project outputs were specifically not supposed to be used to connect generation assets (as per loan agreement), but the PCR argued that delays in transmission infrastructure

deployment were caused by delays in associated generation infrastructure. This causality contradicts the loan agreement and should be clarified.

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

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

56. The PCR indicated that various court orders for compensation for the losses incurred by affected persons are still pending payment by POWERGRID. It is recommended that ADB monitors progress, and that POWERGRID settles these claims in a timely manner (see footnotes 25 and 27 of the PCR).

57. Successful completion of subproject 4—grid strengthening for Kerala I—is still pending in part, and it is recommended that the project team monitors this subproject, verifies, and reports that the outputs are delivered, and safeguard aspects are adequately handled.

58. The project data sheet in the ADB website shows a different outcome target of reducing the transmission losses to below 4%. This inconsistency should be corrected.

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

59. Although there are minor deficiencies in the PCR as follows, its quality is rated satisfactory:

- (i) Discrepancy in PCR of \$0.2 million in appraisal estimate between Tables II.C.1 and II.C.3.
- (ii) Rating of development impacts in the PCR is measured as likely sustainable instead of satisfactory or not.
- (iii) Economic and financial analyses spreadsheet is not well documented and hard to follow.
- (iv) Table A11.3 suggests that the transmission and distribution loss variation is a downside scenario, but the resulting EIRR increases.
- (v) The quantity of subprojects throughout the PCR differs between 7, 8, 9, and 10, obstructing comparability between scope and cost items (cf. Tables C.3, C.4, Section II.B and E, and Appendix 11 paragraph 5).
- (vi) Appendix 2 is missing the September 2007 loan revision, while the November and October 2005 events are in the wrong order.
- (vii) Inconsistencies in the procurement for subprojects 9 and 10; unclear whether they were only procured as stated in Sections II.E.8 and 9, or erected and commissioned under this project as mentioned in Table C.4.
- (viii) Reference to project impact on communities in para. 44 should be paras. 47–50 instead of paras. 34–49.

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

60. These included mission reports, PCR, RRP, minutes of the management review and staff review meetings, EMRs, SMR and IED's project safeguard assessment.

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

61. No further follow-up from IED is required.