



# Report and Recommendation of the President to the Board of Directors

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Project Number: 49214-002  
March 2017

## Proposed Loan and Administration of Loan Power Grid Corporation of India Limited Solar Transmission Sector Project (Guaranteed by India)

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Asian Development Bank

## CURRENCY EQUIVALENTS

(as of 15 February 2017)

Currency unit	–	Indian rupee (₹)
₹1.00	=	\$0.0150
\$1.00	=	₹66.8350

## ABBREVIATIONS

ADB	–	Asian Development Bank
CPTD	–	compensation plan for temporary damages
CSR	–	corporate social responsibility
CSS	–	country safeguard system
CTF	–	Clean Technology Fund
ESPP	–	Environment and Social Policy and Procedures
GW	–	gigawatt
IEAR	–	initial environmental assessment report
MW	–	megawatt
OCR	–	ordinary capital resources
PAM	–	project administration manual
POWERGRID	–	Power Grid Corporation of India Limited

## NOTES

- (i) The financial year (FY) of Power Grid Corporation of India Limited ends on 31 March. “FY” before a calendar year denotes the year in which the financial year ends, e.g., FY2016 ends on 31 March 2016.
- (ii) In this report, “\$” refers to US dollars.

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## PROJECT AT A GLANCE

<b>1. Basic Data</b>		<b>Project Number:</b> 49214-002	
<b>Project Name</b>	Solar Transmission Sector Project	<b>Department /Division</b>	SARD/SAEN
<b>Country</b>	India	<b>Executing Agency</b>	Power Grid Corporation of India Limited
<b>Borrower</b>	Power Grid Corporation of India, Limited		
<b>2. Sector</b>		<b>ADB Financing (\$ million)</b>	
✓ <b>Energy</b>	Electricity transmission and distribution		175.00
		<b>Total</b>	<b>175.00</b>
<b>3. Strategic Agenda</b>		<b>Climate Change Information</b>	
<b>Subcomponents</b>			
Inclusive economic growth (IEG)	Pillar 1: Economic opportunities, including jobs, created and expanded	Mitigation (\$ million)	175.00
Environmentally sustainable growth (ESG)	Eco-efficiency	CO <sub>2</sub> reduction (tons per annum)	7,060,273 <sup>a</sup>
	Global and regional transboundary environmental concerns	Climate Change impact on the Project	Medium
<b>4. Drivers of Change</b>		<b>Gender Equity and Mainstreaming</b>	
<b>Components</b>			
Governance and capacity development (GCD)	Client relations, network, and partnership development to partnership driver of change	Some gender elements (SGE)	✓
Knowledge solutions (KNS)	Institutional development		
	Application and use of new knowledge solutions in key operational areas		
Partnerships (PAR)	Knowledge sharing activities		
	International finance institutions (IFI)		
Private sector development (PSD)	Official cofinancing		
	Public sector goods and services essential for private sector development		
<b>5. Poverty and SDG Targeting</b>		<b>Location Impact</b>	
Geographic Targeting	No	Nation-wide	High
Household Targeting	No		
SDG Targeting	Yes		
SDG Goals	SDG9, SDG13		
<b>6. Risk Categorization:</b>	Complex		
<b>7. Safeguard Categorization</b>	<b>Environment: B</b>	<b>Involuntary Resettlement: B</b>	<b>Indigenous Peoples: C</b>
<b>8. Financing</b>			
<b>Modality and Sources</b>		<b>Amount (\$ million)</b>	
<b>ADB</b>		<b>175.00</b>	
Sovereign Sector loan (Regular Loan): Ordinary capital resources		175.00	
<b>Cofinancing</b>		<b>50.00</b>	
Loan - Clean Technology Fund		50.00	
<b>Counterpart</b>		<b>225.00</b>	
POWERGRID (other sources)		90.00	
POWERGRID equity (internal sources)		135.00	
<b>Total</b>		<b>450.00</b>	
<b>9. Effective Development Cooperation</b>			
Use of country procurement systems	Yes <sup>b</sup>		
Use of country public financial management systems	Yes		

<sup>a</sup> 7,060,273 tons of CO<sub>2</sub> reduction are indirect benefit of this project, which will be brought by renewable energy to be connected to the project.

<sup>b</sup> This will be applied for subsequent subprojects at the agency level upon the project's approval.

## I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on a proposed loan to Power Grid Corporation of India Limited (POWERGRID), to be guaranteed by India, for the Solar Transmission Sector Project. The report also describes the proposed administration of a loan to be provided by the Clean Technology Fund (CTF) for the Solar Transmission Sector Project,<sup>1</sup> and if the Board approves the proposed loan, I, acting under the authority delegated to me by the Board, approve the administration of the loan.<sup>2</sup>

2. The project will finance high-voltage transmission systems to evacuate electricity generated by new mega solar parks to the interstate grid, and improve the reliability of the national grid system. The project will be based on the sector loan approach, and will include subprojects in various locations throughout India. It will also use the country safeguard and procurement systems at the agency level.

## II. THE PROJECT

### A. Rationale

3. **Sector background.** India is experiencing both base load and peak power deficits. The lack of a reliable electricity supply is constraining India's economic growth and making it difficult for around 311 million people to access electricity.<sup>3</sup> Despite such constraints, the demand for electricity is continually increasing in step with sustained industrialization, an expanded consumer market, and enhanced economic development.<sup>4</sup> Demand for power is projected to more than double from about 300 gigawatts (GW) in 2016 to over 700 GW by 2030.<sup>5</sup> It will be challenging to meet such capacity addition through a conventional power supply approach. India's power system is dominated by thermal generation from coal-fired plants, and fossil fuels have created several problems, including domestic production shortages, volatile prices due to increased imports, and adverse climate impacts. To ensure sustainable energy security, the government has updated its strategy to provide future additional generating capacity through an energy mix, and has increased its renewable energy target for 2022.<sup>6</sup> At the Conference of Parties 21 in Paris in 2015, the government further committed to increase its cumulative power capacity from non-fossil fuel-based energy resources to 40% by 2030.<sup>7</sup>

4. **National solar mission.** This ambitious target is based on a greater use of solar and wind power. In 2015, the Jawarharlal Nehru National Solar Mission's target for 2022 was revised from 20 GW (its aim in 2010) to 100 GW, comprising an installed capacity of 40 GW from rooftop solar projects, and 60 GW from utility-scale projects. In support of rooftop solar deployment, the government has been encouraging states to enact model net-metering regulations, and enabling financing through commercial banks to facilitate market growth in this

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<sup>1</sup> Financed by the CTF, a funding window of the Climate Investment Funds that provides middle-income and developing countries with resources to scale up the demonstration, deployment, and transfer of low-carbon, clean technologies.

<sup>2</sup> The design and monitoring framework is in Appendix 1.

<sup>3</sup> World Bank. 2015. *Power for All: Electricity Access Challenge in India*. Washington, DC.

<sup>4</sup> India's per capita electricity consumption is about one-third of the global average.

<sup>5</sup> International Energy Agency. 2015. *India Energy Outlook: World Energy Outlook Special Report*. Paris.

<sup>6</sup> As of June 2016, the country's total grid-connected renewable energy capacity accounted for around 44 GW of India's total installed power generation capacity of 305 GW. Installed renewable energy sources comprise wind (27.2 GW), solar (7.8 GW), biomass (4.8 GW), and small hydropower (4.3 GW).

<sup>7</sup> The government ratified the Paris Agreement on climate change on 2 October 2016.

sector.<sup>8</sup> Utility-scale solar projects are supported through various incentives, including capital subsidies, customs concessions, and accelerated depreciation. Of the targeted 100 GW, 20 GW of installed solar capacity will be realized through 34 solar parks known as the Ultra Mega Solar Power Projects.<sup>9</sup> The policy and regulatory framework assumes that the private sector will play a major role in solar power generation, while the public sector will be responsible for the associated transmission facilities for grid integration, including offtake arrangements.

5. **Solar park development.** The solar parks scheme seeks to address the time and expense involved in obtaining suitable land in remote areas, providing accessibility, and promoting clearances for each project, all of which have been identified as key development barriers to solar expansion in India. Solar parks provide solar power developers (independent power producers and/or investors) with access to a site with all necessary government clearances, basic infrastructure such as transmission systems, water access, road connectivity, and communication networks, for a leasing fee. As well as accelerating the development of solar power, these projects are also anticipated to yield lower tariffs due to economies of scale resulting from the development of large plots of land that can host several solar park projects.<sup>10</sup> The government is providing capital subsidies through solar park development to lower investment costs for solar power producers and, ultimately, lower solar power purchase tariffs. States with sufficient institutional capacity are developing the parks through state utilities, while others are forming joint ventures between the government-owned Solar Energy Corporation of India, state utilities, and/or private parties for solar park development.<sup>11</sup>

6. **Solar park transmission.** The transmission line expansion associated with the solar parks is being carried out by either the state transmission companies or the central transmission utility, POWERGRID.<sup>12</sup> The transmission infrastructure required to increase the penetration of solar energy remains the responsibility of the public sector. Despite the recent decrease in project costs, solar power remains more expensive than conventional power in India and imposes an additional cost burden to integrate the associated variable power generation into the grid. The government has thus declared transmission expansions connecting solar parks to be part of the interstate transmission system, with costs socialized across the entire network. This will ensure that connection costs do not further increase tariffs for solar power developers.<sup>13</sup> The use of Asian Development Bank (ADB) resources, including the CTF, to finance this transmission expansion will substantially reduce the cost of connecting the solar parks to the

<sup>8</sup> Asian Development Bank (ADB). 2016. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranche Financing Facility and Administration of Loan and Technical Assistance Grant to Punjab National Bank for the Solar Rooftop Investment Program (Guaranteed by India)*. Manila. The program includes CTF cofinancing.

<sup>9</sup> Each solar park will have a generation capacity of 500 megawatts (MW) or more.

<sup>10</sup> The solar power developers can be selected in the bids. The 2016 solar project auctions for the solar park in Bhadla, Rajasthan, indicated a bid tariff of ₹4.00 per kilowatt-hour, a decrease of one-third from the pioneering feed-in-tariff of ₹12.54 per kilowatt-hour that was set out for solar power in Gujarat in 2010.

<sup>11</sup> As some state distribution utilities are financially distressed, central entities such as the Solar Energy Corporation of India and National Thermal Power Corporation are involved in offtake arrangements between solar power developers and selective offtake utilities. To incentivize competitive solar power tariffs in the bid selections, the government also provides operational subsidies for developers in the solar parks that sell solar power to state distribution utilities.

<sup>12</sup> When at least 50% of the power produced at a park will be consumed within the host state, the state transmission company may choose to build the transmission network. POWERGRID may be asked to expand the transmission lines for the remaining parks.

<sup>13</sup> In January 2016, the National Tariff Policy was amended to include (i) no interstate transmission charges on solar power, and (ii) a renewable power obligation to purchase 8% of the distribution utilities' electricity consumption, particularly from solar energy, by March 2022. POWERGRID is allowed to charge solar power-related transmission costs on other grid users in the form of cross-subsidization.

existing transmission network, ultimately minimizing the transmission charges paid by grid users and end-customers.

7. **ADB interventions.** ADB was one of the first institutions to develop the solar parks' transmission systems for state utilities in Gujarat and Rajasthan.<sup>14</sup> While various donors and multilateral development banks are widely involved in renewable energy development projects, the CTF has been allocated to ADB and the World Bank to support solar rooftop projects, solar parks, and the associated transmission infrastructure.<sup>15</sup>

8. Since 1995, ADB has provided POWERGRID with eight sovereign-guaranteed loans and two nonsovereign loans to strengthen its national transmission system. The projects have a good implementation history and satisfactory ratings. In 2015, ADB provided loans for the Green Energy Corridor and Grid Strengthening Project,<sup>16</sup> which was based on the National Smart Grid Mission to connect renewable resource-rich areas to the long-distance interregional grid through high-voltage, direct-current technology. This follow-on project for interstate transmission for solar parks is consistent with ADB's country partnership strategy for India, 2013–2017.<sup>17</sup> POWERGRID remains responsible for planning, developing, and operating the high-voltage interstate and interregional power transmission network. It has a sound implementation record in upgrading and strengthening the national transmission network system, and its operational performance is consistently good.

9. **Project design.** The government asked ADB to provide continued support for the interstate transmission system for solar parks, because it aims to scale up the country's installed solar capacity drastically but in a phased manner. A series of solar parks have been identified, but their development and preparation processes differ.<sup>18</sup> The sector lending approach is therefore considered suitable as it will enable POWERGRID to expand transmission lines to individual solar parks according to the planned commissioning of solar parks, based on their readiness. This approach is warranted based on the government's development plan, policies, and strategies, as well as POWERGRID's implementation capacity.

10. **Adoption of the agency's safeguard and procurement systems.** As a special feature, the project will use POWERGRID's safeguard and procurement systems, which have been assessed and deemed satisfactory to ADB, along with agreed action plans, to comply fully with ADB's safeguard and procurement requirements (paras. 21–22). The adoption of the agency's systems is expected to improve operational flexibility and autonomy, and reduce transaction costs and the time required for the safeguard and procurement processes of subsequent subprojects, in conjunction with the sector loan approach.

11. **Value added by ADB assistance.** By supporting the construction of interstate transmission systems for the Ultra Mega Solar Power Projects, the project will provide a means of exporting excess solar energy from states with surplus power to power-deficit states and

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<sup>14</sup> ADB. 2011. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to India for the Gujarat Solar Power Transmission Project*. Manila; and ADB. 2013. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranches Financing Facility and Administration of Loans and Technical Assistance Grant to India for the Rajasthan Renewable Energy Transmission Investment Program*. Manila.

<sup>15</sup> Development Coordination (accessible from the list of linked documents in Appendix 2).

<sup>16</sup> ADB. 2015. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to Power Grid Corporation of India Limited for the Green Energy Corridor and Grid Strengthening Project (Guaranteed by India)*. Manila.

<sup>17</sup> ADB. 2013. *Country Partnership Strategy: India, 2013–2017*. Manila.

<sup>18</sup> Land availability, site preparation, and the provision of access to the transmission grid all vary based on the specific site's current land usage, existing infrastructure, and distance from the existing transmission network.



those seeking to meet their renewable purchase obligation requirements.<sup>19</sup> As such, the project will directly support the continued expansion of solar energy in India, and will also strengthen the integrated interstate and interregional grid. It will thus enable power trading across larger geographical areas, which is considered a prerequisite to deploy high penetrations of variable renewable energy effectively. The resultant power output profiles will differ greatly from India's current generation mix, which is dominated by thermal plants, and substantiate India's contribution to climate mitigation.

## **B. Impact and Outcome**

12. The impact will be increased share of clean energy in the power mix; increased overall efficiency of the power system; and enhanced energy security in India. The outcome will be expanded supply of clean power to the national transmission system.

## **C. Outputs**

13. The project's outputs will be (i) the improved capacity of the interstate transmission network, particularly to transmit the increased supply of electricity generated from the new solar parks to the national grid; and (ii) POWERGRID's improved autonomous management of its safeguard and procurement systems, based on its own policies and procedures satisfactory to ADB.

14. The sector lending approach sets out the following selection criteria for ADB-financed subprojects:

- (i) The subproject shall be technically feasible for grid improvement and expansion, including to areas where solar parks are being developed.
- (ii) The subproject shall be financially and economically viable.
- (iii) The subproject shall not have environmentally or socially significant impacts warranting an ADB safeguard *category A*.

15. Based on these criteria, ADB and POWERGRID have jointly appraised two transmission systems subprojects: (i) transmission grid systems to support the evacuation of 2,500 megawatts (MW) of power from solar parks in Bhadla, Rajasthan; and (ii) transmission grid systems to support the evacuation of 700 MW of power from a solar park in Banaskantha, Gujarat.<sup>20</sup> Subsequent subprojects must satisfy the above criteria and will be reviewed based on their readiness. POWERGRID will include at least two more subprojects: (i) a grid system to support the evacuation of 1,000 MW of power from a solar park in Tumkur, Karnataka (phase 2); and (ii) the upgrading of an existing high-voltage, direct-current system between Rihand and Dadri in Uttar Pradesh to improve the stability of the transmission grid. These subprojects will help improve the grid system's efficiency and increase solar power generation by 4.2 GW, contributing to saving 7,060,273 tons of carbon dioxide emissions per year. Each subproject will include equipment and its related work for the interstate transmission lines and grid substations.

## **D. Investment and Financing Plans**

16. The project is estimated to cost \$450 million (Table 1).

<sup>19</sup> India's tariff policy (amended in 2016) requires that utilities purchase 8% of their power from solar energy by 2022 (an increase from the previous target of 3%), prohibits interstate transmission charges for renewable energy, and promotes the development of ancillary services to facilitate the high penetration of renewable energy on the grid.

<sup>20</sup> At Bhadla, relevant solar park developers include the Government of Rajasthan, the Infrastructure Leasing and Financial Services, Adani, and Essel. The developer at Banaskantha is the Gujarat Power Corporation.

**Table 1: Project Investment Plan**

		(\$ million)
Item		Amount <sup>a</sup>
<b>A.</b>	<b>Base Cost<sup>a</sup></b>	
	1. Bhadla subproject (Rajasthan)	199.0
	2. Banaskantha subproject (Gujarat)	27.4
	3. Tumkur subproject (Karnataka)	82.9
	4. Rihand–Dadri subproject (Uttar Pradesh)	76.7
	<b>Subtotal (A)</b>	<b>386.0</b>
<b>B.</b>	<b>Contingencies<sup>b</sup></b>	<b>43.0</b>
<b>C.</b>	<b>Financing Charges During Implementation<sup>c</sup></b>	<b>21.0</b>
	<b>Total (A+B+C)</b>	<b>450.0</b>

<sup>a</sup> In 2016 prices. Includes \$32 million equivalent in estimated taxes and duties to be financed from Power Grid Corporation of India Limited resources.

<sup>b</sup> Includes both physical and price contingencies and foreign exchange variation. Physical contingencies computed at 3% for substations and equipment, civil works, and environmental and social safeguards. Price contingencies computed at 1.5% on foreign exchange costs and 5.5% on local currency costs; includes provision for potential exchange rate fluctuation under the assumption of a purchasing power parity exchange rate.

<sup>c</sup> Includes interest and commitment charges. Interest during construction for the Asian Development Bank (ADB) sovereign loan is computed at the 5-year forward London interbank offered rate (LIBOR) plus a spread of 0.5%, and a sovereign guarantee fee (payable by POWERGRID to the Government of India) of 1.2%. Commitment charges for an ADB ordinary capital resources loan are 0.15% per year to be charged on the undisbursed loan amount. Interest during construction for the ADB Clean Technology Fund loan has been computed at an interest rate of 0.25%, a multilateral development bank's fee of 0.18%, and a sovereign guarantee fee (payable by POWERGRID to the government) of 1.2%. Applicable rates for additional debt funds are included.

Sources: POWERGRID and Asian Development Bank estimates.

17. To support the project cost of \$450 million, POWERGRID is expected to make an equity contribution of \$135 million equivalent (30% of the project cost) from its internally generated resources accruing from existing operations, as regulated by the tariff norms of the Central Electricity Regulatory Commission. ADB will support the project funding of \$225 million through (i) the ADB sovereign-guaranteed loan of \$175 million from ordinary capital resources (OCR), and (ii) the loan cofinancing equivalent to \$50 million from the CTF to be administered by ADB. The remaining project cost will be financed from proceeds from POWERGRID's regular bond issues and other corporate loan financing. The financing plan is in Table 2.

**Table 2: Financing Plan**

Source	Amount (\$ million)	Share of Total (%)
Asian Development Bank		
Ordinary capital resources (regular loan)	175.0	38.9
Clean Technology Fund <sup>a</sup> (loan)	50.0	11.1
POWERGRID (other sources) <sup>b</sup>	90.0	20.0
POWERGRID equity (internal sources)	135.0	30.0
<b>Total</b>	<b>450.0</b>	<b>100.0</b>

POWERGRID = Power Grid Corporation of India Limited.

<sup>a</sup> Administered by the Asian Development Bank.

<sup>b</sup> Expected to be POWERGRID's regular domestic bond issuance and other corporate loan financing.

Source: Asian Development Bank estimates.

18. ADB will provide OCR and CTF loans directly to POWERGRID, with a separate guarantee agreement with the government. Financing from ADB's OCR will have a 20-year term, including a grace period of 5 years; an annual interest rate determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility; a commitment charge of 0.15% per year; and such other terms and conditions set forth in the draft loan and guarantee agreements. Based on the straight-line method, the average maturity is 12.75 years. The CTF

loan financing will come with a 40-year term,<sup>21</sup> including a grace period of 10 years; an annual interest rate of 0.25%; a multilateral development bank fee of 0.18% per year; and such other terms and conditions set forth in the draft loan and guarantee agreements. POWERGRID will bear the foreign exchange risk under these loans and will mobilize the remaining financing, including its equity contributions and debt, from domestic bonds and other corporate loan financing.

19. The project's contribution to climate mitigation amounts to \$450 million. Of this, 50% will be financed by ADB (\$175 million) and CTF (\$50 million).

## E. Implementation Arrangements

20. The implementation arrangements are summarized in Table 3 and described in detail in the project administration manual (PAM).<sup>22</sup>

**Table 3: Implementation Arrangements**

Aspects	Arrangements		
Implementation period	January 2017–December 2021		
Estimated completion date	31 December 2021 (loan closing date: 31 May 2022)		
Management			
(i) Oversight body	Coordination committee, POWERGRID		
(ii) Executing agency	POWERGRID		
(iii) Key implementing agency	POWERGRID		
(iv) Implementation unit	POWERGRID's regional offices		
Procurement	International competitive bidding	13 contracts	\$327 million
	Direct contracting	3 contracts	
Advance contracting and retroactive financing	Advance contracting for eligible expenditures incurred for civil works, equipment, and materials; and for retroactive financing of eligible expenditures incurred not more than 12 months before the loan agreement signing and up to 20% of the loan amount.		
Disbursement	The loan proceeds will be disbursed in accordance with ADB's <i>Loan Disbursement Handbook</i> (2015, as amended from time to time) and detailed arrangements agreed between POWERGRID and ADB.		

ADB = Asian Development Bank, POWERGRID = Power Grid Corporation of India Limited.

Sources: Asian Development Bank and POWERGRID estimates.

21. **Implementation and procurement.** POWERGRID has set up a program management unit. The project will be completed by 2021 (over a 5-year period). POWERGRID has conducted advance procurement action with retroactive financing requirements for advance subprojects based on ADB's Procurement Guidelines (2015, as amended from time to time).<sup>23</sup> During project appraisal, ADB conducted a detailed assessment of POWERGRID's agency procurement system and practices.<sup>24</sup> The assessment found that POWERGRID's procurement system generally meets the principles of ADB's procurement policy, and the procurement risk rating is *low* given POWERGRID's sound track record over 20 years in ADB-financed

<sup>21</sup> The principal repayment per year will be based on 2% during the first 10 years, and 4% for the remaining 20 years.

<sup>22</sup> Project Administration Manual (accessible from the list of linked documents in Appendix 2).

<sup>23</sup> ADB's member country procurement eligibility restrictions were applied for the advance procurement action while CTF cofinancing was still uncertain. Since confirming the CTF cofinancing, universal procurement has been applied to the remaining packages under the project, since ADB administers the cofinancing resources from the CTF commingled with OCR. Universal procurement is also in line with POWERGRID's member country eligibility requirements. The subsequent subproject in Uttar Pradesh will include bid packages procured through direct contracting. This is because the high-voltage, direct-current system will be replaced with new equipment from the original supplier to ensure technical compatibility with existing equipment.

<sup>24</sup> Agency Procurement Assessment (accessible from the list of linked documents in Appendix 2).

procurement. It is proposed that POWERGRID's procurement system be adopted for this project on a pilot basis to procure any remaining packages with an estimated contract value of \$40 million or less. ADB will not exercise oversight through the usual post or prior review of such procurement, constituting an exception to ADB's Procurement Guidelines.<sup>25</sup> To ensure that any such procurement is conducted in a manner consistent with ADB's Procurement Guidelines' principles and procurement practices acceptable to ADB, POWERGRID will also follow the action plan for procurement set out in the PAM.<sup>26</sup>

22. **Safeguards.** ADB has approved the use of country safeguard systems (CSS) for POWERGRID for any future projects,<sup>27</sup> based on an equivalence and acceptability assessment of POWERGRID's Environment and Social Policy and Procedures (ESPP).<sup>28</sup> Since POWERGRID agreed to implement an action plan to address some minor gaps that will ensure full acceptability and equivalence with ADB's Safeguard Policy Statement (2009), all subprojects will be prepared in compliance with the ESPP and the action plan included in the PAM.<sup>29</sup>

23. **Subproject processing.** For each subsequent subproject under the sector loan, POWERGRID will be asked to follow certain procedures, including (i) carrying out a technical feasibility study; (ii) undertaking financial and economic analyses; (iii) preparing an initial environmental assessment report (IEAR) analogous to an initial environmental examination, including an environmental management plan; (iv) preparing a compensation plan for temporary damages (CPTD) analogous to a resettlement plan; and (v) preparing an indigenous peoples plan, if necessary. POWERGRID will submit appraisal reports for these procedures to ADB, which will consider and approve each subproject before financing it. ADB will not consider any subproject that does not satisfy all of the eligibility criteria or where the above procedures have not been followed.

### III. DUE DILIGENCE

#### A. Technical

24. POWERGRID has carried out detailed technical studies by using the latest available power system analysis software, and has confirmed that the proposed transmission system's transfer capacity is adequate to evacuate the electricity from the planned solar parks.

<sup>25</sup> ADB's Procurement Guidelines require prior or post reviews of contract packages. Instead, ADB will spot-check bid documents, bid evaluations, and contract awards annually (at least) and as part of a midterm audit to verify that the procurement was undertaken in the manner agreed with ADB.

<sup>26</sup> Project Administration Manual (accessible from the list of linked documents in Appendix 2). The action plan details additional requirements to satisfy minor gaps between ADB's Procurement Guidelines and POWERGRID's Works and Procurement Policy and Procedures. These include the submission of a procurement plan and bid invitations to ADB, interest-free advance payments, dispute resolution provision, international arbitration for foreign bidders, anticorruption measures, and the exclusion of e-reverse auction. While the project's procurement plan has no contracts valued at more than \$40 million (ADB's threshold of international competitive bidding for India's works and plant), the procurement of any such package will follow ADB's Procurement Guidelines.

<sup>27</sup> ADB. 2017. *Power Grid Corporation of India, Limited. Agency Level Use of Country Safeguard System*. Manila. The assessment concluded that POWERGRID has a good track record, and has systems in place that effectively manage environmental and social risks.

<sup>28</sup> In 1998, POWERGRID developed the ESPP as a comprehensive environmental and social management system. This was revised in 2009 to integrate guidance and best practices from the World Bank. Since then, the World Bank has used the ESPP under its use of country systems pilot program for environmental and social safeguards.

<sup>29</sup> Project Administration Manual (accessible from the list of linked documents in Appendix 2). The action plan has been agreed with POWERGRID as a result of the ESPP's equivalence and acceptance assessments. The actions are mainly related to improved monitoring, disclosure, consultation, and grievance redress; gender focus; appropriate cumulative impact and strategic environmental assessments; specific costs in environmental management plans; and indigenous peoples' benefits and participation.

POWERGRID will also install a state-of-the-art substation automation system that will enable the operators to take necessary actions to manage intermittent renewable energy sources. All of the identified subprojects are based on well-proven technology and fall within POWERGRID's implementation capability.

## **B. Economic and Financial**

25. The subproject-level model makes detailed cost estimates for specific project-funded assets, and financial revenues generated from, and costs incurred related to, these assets. The financial viability of the two subprojects was examined in advance. The subprojects' financial internal rates of return, which were calculated in real terms, compare favorably with the estimated weighted average cost of capital value in real terms. This substantiates the subprojects' financial viability with full cost recovery.<sup>30</sup>

26. Electricity from the solar parks would displace coal-fired generation from existing plants (a resource cost saving) in states with renewable energy shortfalls. In light of these benefits, and consistent with other ADB economic analyses of renewable energy transmission, the subprojects' economic internal rates of return are expected to exceed the threshold of economic viability established by ADB.<sup>31</sup> The appraised subprojects are thus assessed as financially viable and economically sustainable.

27. Given the cost-plus nature of the tariff-setting process, which provides an assured post-tax return on equity, POWERGRID's financial position remains healthy and robust. Both Standard & Poor's and Fitch Ratings have assigned a rating of *BBB-* with a stable outlook consistent with the government's sovereign rating. POWERGRID's revenue from operations doubled in the 5 years preceding FY2016. POWERGRID achieved a 14% post-tax return on equity and a debt service coverage ratio of 2.0 in FY2016, and it is also projected to sustain a sound financial position. The company maintains adequate financial management capacity based on its *navratna* (jewel) status, where the government allows it a degree of managerial and financial autonomy, despite its majority-government ownership.

## **C. Governance**

28. POWERGRID is governed by corporate governance principles and systems as per India's Securities and Exchange Board Regulations, 2015. It has disclosed quarterly corporate governance reports with certificates to ensure corporate fairness, transparency, and accountability. The corporate governance structure specifies the distribution of rights and responsibilities among different stakeholders, including a number of committees and independent directors. POWERGRID's operations fall under the regulation of the Central Electricity Regulatory Commission, which provides robust, tariff-based remuneration for its transmission services. POWERGRID also has an advanced accounting system using computerization that ensures confidentiality and integrity at various levels, and its financial management risks are low.

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<sup>30</sup> Financial Analysis (accessible from the list of linked documents in Appendix 2). The financial internal rate of return of the Bhadla subproject is 4.90% (higher than its weighted average cost of capital of 3.92%), and that of the Banaskantha subproject is 4.83% (higher than its weighted average cost of capital of 3.91%).

<sup>31</sup> Economic Analysis (accessible from the list of linked documents in Appendix 2). The economic internal rate of return of the Bhadla subproject is 19.22%, and that of the Banaskantha subproject is 18.50%.

29. ADB's Anticorruption Policy (1998, as amended to date) was explained to and discussed with the government and POWERGRID. The specific policy requirements and supplementary measures are described in the PAM.

#### **D. Poverty and Social**

30. POWERGRID's committee for corporate social responsibility (CSR) has provided local communities with various activities relating to rural development, skills development, health, education, and the environment, as appropriate.<sup>32</sup> The project is designed to include (i) compensation for the loss of crops and trees and land damage based on market value, (ii) additional assistance for affected vulnerable households under CSR,<sup>33</sup> and (iii) gender mainstreaming training programs for POWERGRID and its contractors.<sup>34</sup>

#### **E. Safeguards**

31. The overall project is classified *category B* for the environment, *category B* for involuntary resettlement, and *category C* for indigenous peoples. The subprojects will have no significant safeguard impacts. Two advance subprojects have already been appraised, and environmental and social assessments have been completed on the basis of CSS. Each subproject's environmental and social impacts have been adequately assessed in the IEAR and CPTD, and these documents meet the requirements of both the ESPP and the action plan for safeguards in the PAM.<sup>35</sup> The environmental impacts of the transmission lines were minimized during the route-selection process, and the alignments do not pass through any forests. No acquisition of private land for the subprojects is foreseen.<sup>36</sup> Impacts during the construction of the lines will be temporary and will primarily consist of the loss of crops and trees, for which affected persons will be compensated.<sup>37</sup> POWERGRID has a good track record and its staff are experienced in monitoring the environmental and social risks of subprojects and conducting the necessary consultations and disclosure. Any subsequent subprojects will be assessed in accordance with the requirements of the ESPP and the action plan in the PAM, which will be treated as safeguard frameworks and guidelines to prepare the IEAR and CPTD. Project implementation will be monitored continuously in keeping with ADB requirements.<sup>38</sup>

#### **F. Risks and Mitigating Measures**

32. Major risks and mitigating measures are summarized in Table 4 and described in detail in the risk assessment and risk management plan.<sup>39</sup> The risks are manageable, and appropriate mitigation measures are incorporated. Integrated benefits are expected to outweigh the costs.

<sup>32</sup> POWERGRID spent more than \$18 million equivalent on CSR activities in 2015–2016.

<sup>33</sup> The ESPP's definition of vulnerable households includes scheduled tribes, scheduled castes, households headed by women, and people with disabilities as certified by state governments. These will be prioritized under CSR activities.

<sup>34</sup> The programs will be implemented after training manuals are prepared for POWERGRID and the contractors covering equal pay for men and women, the prevention of sexually transmitted infections, and the construction of site facilities suitable for women workers.

<sup>35</sup> As a result, these safeguard documents also fully meet ADB's Safeguard Policy Statement requirements.

<sup>36</sup> The land has been acquired or is being transferred from state governments and a state utility to POWERGRID.

<sup>37</sup> With regard to transmission lines, a small square area (0.8–1.96 square meters) is requested for each tower.

<sup>38</sup> The use of CSS will not change ADB's monitoring disclosure requirements or the role and function of ADB's accountability mechanism.

<sup>39</sup> Risk Assessment and Risk Management Plan (accessible from the list of linked documents in Appendix 2).

**Table 4: Summary of Risks and Mitigating Measures**

<b>Risks</b>	<b>Mitigating Measures</b>
Completion delays due to procurement and safeguards	Delays in the completion of transmission projects are typically due to the time required for procurement, private land acquisition, and rights-of-way. These risk factors are mitigated for the project. Most of the bids have been advertised and some have already been awarded through advance procurement action. For the subproject sites, POWERGRID has confirmed that no private land will be acquired, and the impacts of transmission towers and lines are limited to the loss of crops and trees, which will be addressed through compensation. Any subsequent subprojects will be implemented through POWERGRID's procurement and safeguard systems, as well as their action plans and loan and guarantee agreements, and will be monitored by ADB. No safeguard <i>category A</i> subprojects will be considered under the sector loan.
Counterparty defaults	POWERGRID is protected against any immediate failures stemming from solar park development or power offtaking under commercial agreements. Specific securities are included in the form of performance bonds from solar park developers, and letters of credit from offtakers. In case of any offtaker defaults beyond these securities, the regulations allow POWERGRID to recover its losses from other non-defaulting customers by sharing any increased transmission charges on a pro rata basis.
Regulatory changes	POWERGRID's regulatory risk is minimal due to the regulator's good track record and the National Tariff Policy provisions, which specify a full cost pass-through to ensure the project's full cost recovery. The sector regulator has historically supported POWERGRID as the central transmission utility and national transmission licensee, with the tariff structure and key tariff components remaining largely unchanged.

ADB = Asian Development Bank, POWERGRID = Power Grid Corporation of India Limited.

Source: Asian Development Bank.

#### **IV. ASSURANCES**

33. The government and POWERGRID have assured ADB that implementation of the project shall conform to all applicable ADB policies, including those concerning anticorruption measures, safeguards, gender, procurement, consulting services, and disbursement, except as ADB may agree otherwise, as described in detail in the PAM and loan documents.

34. The government and POWERGRID have agreed with ADB on certain covenants for the project, which are set forth in the draft loan and guarantee agreements.

#### **V. RECOMMENDATION**

35. I am satisfied that the proposed loan would comply with the Articles of Agreement of the Asian Development Bank (ADB) and recommend that the Board approve

- (i) the loan of \$175,000,000 to Power Grid Corporation of India Limited, to be guaranteed by India, for the Solar Transmission Sector Project, from ADB's ordinary capital resources, in regular terms, with interest to be determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility; for a term of 20 years, including a grace period of 5 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft loan and guarantee agreements presented to the Board; and
- (ii) the use of Power Grid Corporation of India Limited's agency procurement systems, as described in para. 21.

Takehiko Nakao  
President

7 March 2017

## DESIGN AND MONITORING FRAMEWORK

<b>Impacts the Project is Aligned with</b>			
Share of clean energy in the power mix increased, overall efficiency of the power system increased, and energy security in India enhanced (Jawaharlal Nehru National Solar Mission <sup>a</sup> and India's Intended Nationally Determined Contribution to the United Nations Framework Convention on Climate Change <sup>b</sup> )			
<b>Results Chain</b>	<b>Performance Indicators with Targets and Baselines</b>	<b>Data Sources and Reporting</b>	<b>Risks</b>
<p><b>Outcome</b></p> <p>Supply of clean power to the national transmission system expanded</p>	<p>By 2022:</p> <p>a. Grid-connected solar power increased by 4.2 GW through public and private investment (2016 baseline: 7.8 GW)</p> <p>b. An additional 7,060,273 tons equivalent of carbon dioxide emissions avoided per year through solar parks and their transmission systems</p>	<p>a. Ministry of New and Renewable Energy annual report</p> <p>b. POWERGRID monitoring report</p>	<p>Natural hazards cause the failure of the solar parks</p> <p>Regulatory changes will impair full cost recovery tariff mechanisms</p>
<p><b>Outputs</b></p> <p>1. Capacity of the interstate transmission network improved</p>	<p>By 2021:</p> <p>1a. 201 km of transmission systems (765 kV and 400 kV) constructed to help evacuate 2,500 MW of power from solar parks in Bhadla, Rajasthan (2016 baseline: 0)</p> <p>1b. 95 km of transmission systems (400 kV) constructed to help evacuate 700 MW of power from solar parks in Banaskantha, Gujarat (2016 baseline: 0)</p> <p>1c. 195 km of transmission systems (400 kV) constructed to help evacuate 1,000 MW of power from solar parks in Tumkur, Karnataka (2016 baseline: 0)</p> <p>1d. HVDC terminals (500 kV) between Rihand and Dadri rehabilitated to provide an efficient power supply with a capacity of 1,500 MW</p>	<p>1a–d. POWERGRID project progress report</p>	<p>Rights-of-way issues cause delays</p> <p>Increases in the bid prices of equipment and materials exceed contingency and inflation forecasts</p>



Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting	Risks
2. POWERGRID's autonomous management of safeguard and procurement systems improved	<p>2a. POWERGRID's Environment and Social Policy and Procedures adopted by ADB, and additional actions implemented by POWERGRID from 2016 onward</p> <p>2b. POWERGRID's Works and Procurement Policy and Procedures adopted by ADB, and additional actions implemented by POWERGRID from 2017 onward</p>	2a–b. POWERGRID project progress report	
<p><b>Key Activities with Milestones</b></p> <p><b>1. Capacity of the interstate transmission network improved</b></p> <p>1.1 Install 765 kV and 400 kV transmission systems to connect solar parks in Bhadla, Rajasthan</p> <p>1.1.1 Prepare bid documents (Q1–Q2 2016)</p> <p>1.1.2 Award contracts for goods, works, and services (Q3–Q4 2016)</p> <p>1.1.3 Construct assets (Q4 2016–Q1 2019)</p> <p>1.1.4 Make assets operational (Q1 2019)</p> <p>1.2 Install 400 kV transmission systems to connect solar parks in Banaskantha, Gujarat</p> <p>1.2.1 Prepare bid documents (Q2 2016–Q1 2017)</p> <p>1.2.2 Award contracts for goods, works, and services (Q1–Q2 2017)</p> <p>1.2.3 Construct assets (Q2 2017–Q1 2019)</p> <p>1.2.4 Make assets operational (Q1 2019)</p> <p>1.3 Install 400 kV transmission systems to connect solar parks at Tumkur, Karnataka</p> <p>1.3.1 Prepare bid documents (Q3 2016–Q1 2017)</p> <p>1.3.2 Award contracts for goods, works, and services (Q4 2016–Q2 2017)</p> <p>1.3.3 Construct assets (Q2 2017–Q1 2019)</p> <p>1.3.4 Make assets operational (Q1 2019)</p> <p>1.4 Refurbish and/or replace equipment at the Rihand and Dadri HVDC terminals</p> <p>1.4.1 Prepare bid documents (Q1–Q2 2017)</p> <p>1.4.2 Award contracts for goods, works, and services (Q3 2017–Q1 2018)</p> <p>1.4.3 Construct assets (Q2 2018–Q4 2021)</p> <p>1.4.4 Make assets operational (Q1 2022)</p> <p><b>2. POWERGRID's autonomous management of safeguard and procurement systems improved</b></p> <p>2.1 Assess POWERGRID's agency procurement and safeguard system (Q3–Q4 2016)</p> <p>2.2 Adopt POWERGRID's agency safeguard system on the basis of ADB approval (Q1 2017)</p> <p>2.3 Adopt POWERGRID's agency procurement system on the basis of ADB approval (Q1 2017)</p> <p>2.4 Provide ADB safeguard training programs for POWERGRID (Q1 2017)<sup>c</sup></p> <p>2.5 Monitor POWERGRID's agency procurement and safeguard system implementation (Q1 2017–Q2 2022)</p>			

**Inputs**

ADB: \$175 million (ordinary capital resources, regular loan)  
 Clean Technology Fund: \$50 million (loan)  
 POWERGRID: \$135 million (equity from internal sources) and \$90 million (other sources)<sup>d</sup>

**Assumptions for Partner Financing**

Not applicable

ADB = Asian Development Bank, GW = gigawatt, HVDC = high-voltage direct current, km = kilometer, kV = kilovolt, MW = megawatt, POWERGRID = Power Grid Corporation of India Limited.

<sup>a</sup> Government of India, Ministry of New and Renewable Energy. 2010. *Jawaharlal Nehru National Solar Mission*. New Delhi. Targets increased as reported in the 2015 government press release.

<sup>b</sup> Government of India, Ministry of Environment and Forests. 2015. *India Intended Nationally Determined Contribution: Working Towards Climate Justice*. New Delhi.

<sup>c</sup> The following ongoing technical assistance projects are expected to provide and support safeguard training programs: ADB. 2013. *Technical Assistance for Improving Safeguard Policy Applications in South Asia Developing Member Countries*. Manila; and ADB. 2010. *Technical Assistance for Strengthening and Use of Country Safeguard Systems*. Manila.

<sup>d</sup> Expected to be POWERGRID's domestic bond issuance and/or parallel financing from the commercial banking sector and/or other financial institutions.

Source: Asian Development Bank.

### **LIST OF LINKED DOCUMENTS**

<http://www.adb.org/Documents/RRPs/?id=49214-002-3>

1. Loan Agreement: Ordinary Operations
2. Loan Agreement: ADB Clean Technology Fund
3. Guarantee Agreement: Ordinary Operations and ADB Clean Technology Fund
4. Sector Assessment (Summary): Energy
5. Project Administration Manual
6. Contribution to the ADB Results Framework
7. Development Coordination
8. Financial Analysis
9. Economic Analysis
10. Country Economic Indicators
11. Summary Poverty Reduction and Social Strategy
12. Initial Environmental Assessment Report: Bhadla (Rajasthan)
13. Initial Environmental Assessment Report: Banaskantha (Gujarat)
14. Compensation Plan for Temporary Damages: Bhadla (Rajasthan)
15. Compensation Plan for Temporary Damages: Banaskantha (Gujarat)
16. Risk Assessment and Risk Management Plan

### **Supplementary Documents**

17. Climate Change Assessment
18. Solar Park Development and Business Structure
19. Agency Procurement Assessment