



Report and Recommendation of the President to the Board of Directors

Project Number: 44426-018
November 2015

Proposed Loan Power Grid Corporation of India Limited Green Energy Corridor and Grid Strengthening Project (India)

This is an abbreviated version of the document approved by ADB's Board of Director's that excludes information that is subject to exceptions to disclosure set forth in ADB's Public Communication Policy 2011.

Asian Development Bank

CURRENCY EQUIVALENTS

(as of 5 October 2015)

Currency unit	–	Indian rupee/s (Re/Rs)
Re1.00	=	\$0.0153374939
\$1.00	=	Rs65.1997

ABBREVIATIONS

ADB	–	Asian Development Bank
GW	–	gigawatt
HVDC	–	high-voltage direct current
km	–	kilometer
kV	–	kilovolt
MNRE	–	Ministry of New and Renewable Energy
NSO	–	nonsovereign operations
POWERGRID	–	Power Grid Corporation of India Limited

NOTES

- (i) The fiscal year (FY) of the Government of India ends on 31 March. “FY” before a calendar year denotes the year in which the fiscal year ends, e.g., FY2015 begins 1 April 2014 and ends on 31 March 2015.
- (ii) In this report, “\$” refers to US dollars.

Vice-President	D. Gupta, Private Sector and Cofinancing Operations
Director General	T. Freeland, Private Sector Operations Department (PSOD)
Director	M. Barrow, Officer-in-Charge (OIC), Infrastructure Finance Division 1, PSOD
Team leader	S. Tang, Senior Investment Specialist, PSOD
Team members	C. Chan, Guarantees and Syndications Specialist, PSOD
	K. Enomoto, Energy Specialist, South Asia Department (SARD)
	L. George, Energy Specialist, SARD
	J. Ghimire, Senior Counsel, Office of the General Counsel
	Y. Jang, Social Development Specialist, SARD
	A. Jeffries, Principal Energy Specialist, SARD
	A. Kumar, Investment Officer, PSOD
	B. Liu, Investment Specialist, PSOD
	B. Raemaekers, Principal Guarantees and Syndications Specialist, PSOD
	V. Ramasubramanian, Safeguards Specialist, PSOD
	S. Sasaki, Senior Safeguards Specialist, PSOD
	S. Shah, Principal Investment Specialist, PSOD
	Y. Zhou, Environment Specialist, SARD
Peer reviewer	A. Wanniachchi, Senior Energy Specialist, Southeast Asia Department

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PROJECT AT A GLANCE

1. Basic Data		Project Number: 44426-018	
Project Name	Green Energy Corridor and Grid Strengthening Project	Department /Division	PSOD/PSIF1
Country	India		
2. Sector		ADB Financing (\$ million)	
✓ Energy	Electricity transmission and distribution		500.00
		Total	500.00
3. Strategic Agenda		Climate Change Information	
Inclusive economic growth (IEG)	Pillar 1: Economic opportunities, including jobs, created and expanded	Climate Change impact on the Project	Low
Environmentally sustainable growth (ESG)	Eco-efficiency Natural resources conservation Urban environmental improvement		
4. Drivers of Change		Gender Equity and Mainstreaming	
Partnerships (PAR)	Commercial cofinancing Private Sector	No gender elements (NGE)	✓
Private sector development (PSD)	Promotion of private sector investment Public sector goods and services essential for private sector development		
5. Poverty Targeting		Location Impact	
Project directly targets poverty	No	Nation-wide	High
6. Nonsovereign Operation Risk Rating			
Obligor Name		Implied Project Rating	Final Project Rating
POWER GRID CORPORATION OF INDIA LIMITED		NSO5	NSO5
7. Safeguard Categorization		Environment: B	Involuntary Resettlement: B
			Indigenous Peoples: C
8. Financing			
Modality and Sources		Amount (\$ million)	
ADB		500.00	
Nonsovereign LIBOR Based Loan: Ordinary capital resources		500.00	
B-Loans		0.00	
None		0.00	
Official Cofinancing^a		0.00	
None		0.00	
Others^b		2,081.30	
POWERGRID (Other Sources)		806.90	
POWERGRID Equity (Internal Sources)		774.40	
Ordinary Capital Resources (Sovereign Guaranteed Loan-ADB)		500.00	
Total		2,581.30	

^a Concessional financing from external sources.

^b Derived by deducting ADB financing, B Loans and Official Cofinancing from Project Total Cost.

I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on a proposed loan of up to \$500 million, without a sovereign guarantee, to Power Grid Corporation of India Limited (POWERGRID) for the Green Energy Corridor and Grid Strengthening Project in India.¹ A separate report and recommendation for a loan of up to \$500 million, with a sovereign guarantee, is being proposed concurrently.²

2. The project will finance power transmission system upgrades in India, including (i) a portion of the Government of India's Green Energy Corridor initiative to facilitate the transfer of power from renewable energy-rich areas to other parts of the country, through 765 kilovolt (kV) and 400 kV high voltage transmission lines and an associated 765/400kV substation and equipment; and (ii) four high voltage direct current (HVDC) terminals (two at 800 kV and two at 320 kV) to increase interregional connectivity between India's western and southern regional power grids.³

II. THE PROJECT

A. Rationale

3. India suffers from an unreliable power supply that inhibits its economic growth potential by constraining commercial activities. About 300 million citizens have no access to electricity, while some areas face daily power outages because of supply shortages and transmission bottlenecks.⁴ The government is scaling up investments in the generation, transmission, and distribution subsectors to address these issues. India is also promoting increased use of clean renewable energy, universal electricity access, and energy self-sufficiency by supplementing conventional power-generation sources (oil, gas, and coal). This includes ambitious renewable energy targets in the electricity-generation mix. As of 31 July 2015, India had an installed generating capacity of 275.9 GW, of which 36.5 GW was renewable energy.⁵ In 2015, the Ministry of New and Renewable Energy (MNRE) announced state-level renewable energy-capacity targets for 2022 with a national aggregate of 175 GW. About 90% will come from solar and wind sources.⁶

4. **Green Energy Corridor initiative.** In 2012, MNRE and the Forum of Regulators⁷ commissioned POWERGRID to conduct a green energy corridor study to identify nationwide transmission investments required to accommodate the additional renewable energy-generation capacity.⁸ Almost 60% of this renewable energy capacity is located in six states—Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Rajasthan, and Tamil Nadu. To facilitate the transfer of power from these renewable energy-rich states to others, as well as address the absorption

¹ The design and monitoring framework is in Appendix 1.

² Asian Development Bank (ADB). 2015. *Power Grid Corporation of India Limited. Green Energy Corridor and Grid Strengthening Project (Guaranteed by India). Project Number 44426-016*. Manila.

³ Asian Development Bank (ADB). 2013. *Technical Assistance to India for National Green Corridor Investment Project*. Manila.

⁴ Government of India, Planning Commission. 2013. *Twelfth Five Year Plan, 2012–2017*. New Delhi.

⁵ Government of India, Central Electricity Authority. 2015. *All India Installed Capacity (In MW) of Power Stations (As of 31 July 2015)*. New Delhi. Note: MW = megawatts.

⁶ Government of India, MNRE. 2015. *Tentative State-wise break-up of Renewable Power target to be achieved by year 2022*. New Delhi.

⁷ The Forum of Regulators, established in 2005, consists of the Central Electricity Regulatory Authority chairperson and the chairpersons from all state-level regulatory authorities.

⁸ POWERGRID. 2012. *Report on Green Energy Corridors—Transmission Plan for Envisaged Renewable Capacity*. Gurgaon.

of power and the intermittency and timing differences of renewable energy, POWERGRID identified \$7 billion in investments to be undertaken in phases, starting under the Twelfth Five Year Plan. These include (i) intrastate transmission investments of about \$3.6 billion within renewable energy-rich states and (ii) phased interstate investments of more than \$3.4 billion to enable power flows across states over long distances.

5. **Expanded interregional connectivity.** India's national transmission grid is divided into five regions.⁹ Synchronous interconnectivity previously existed only between the northern, eastern, western, and northeastern regions. On 31 December 2013, POWERGRID commissioned an interconnection between the southern and western regions, which enabled synchronous operation of an interconnected national power grid. This not only augmented the interregional power transfer capacity of southern states, but also relieved congestion in some transmission corridors. Southern states, including Andhra Pradesh, Karnataka, and Tamil Nadu, have been particularly troubled by power shortages. A more resilient regional and interregional grid is essential in facilitating power transfers among states and regions. Furthermore, daily peak power demand does not occur simultaneously in all regions. One state or region may have a power surplus while another faces a deficit. Hence, an integrated national grid facilitates (i) power transfers from areas with a surplus to those with a deficit, (ii) optimization of the power system by integrating the electricity market and encouraging power trading, and (iii) competitive electricity prices and improved power supply mix through greater use of renewable energy. Interregional power transfer capacity as of 31 December 2014 was 46.5 GW and is envisaged to increase to 72.3 GW by 2017.¹⁰

6. **Borrower.** POWERGRID, India's national power transmission company, is responsible for planning, developing, and operating the high-voltage interstate and interregional power transmission network.¹¹ POWERGRID operates about 90% of the country's interstate and interregional transmission networks—consisting of 117,679 circuit kilometers (km) of transmission lines and 197 transmission substations with a transformation capacity of about 239,424 megavolt-amperes as of 31 July 2015—and provides nondiscriminatory open access to its transmission system for any licensed utility or generating company.¹² POWERGRID has a sound implementation record in upgrading and strengthening the national high-voltage transmission network, with consistently good operational performance as evidenced by transmission network availability of above 99% for the past 5 years.

7. **Project design.** POWERGRID's immediate investment plans consist of the Green Energy Corridor initiative's interstate portions, including a high-capacity transmission corridor connecting major renewable energy pockets from Gujarat in the western region through Rajasthan to Punjab state in the northern region. This project will fund a portion of these interstate investments, consisting of two 765 kV alternating current transmission lines, one 400 kV alternating current transmission line, and one 765/400 kV substation in Rajasthan state connecting to a 765/400 kV substation in Punjab state, including a real-time system for measuring and monitoring power flows. Other portions of the initiative are funded by German development cooperation through KfW for €500 million (about \$556 million equivalent) that will be recognized through a memorandum of understanding as parallel collaborative cofinancing.¹³

⁹ The five regions are the northern, eastern, southern, western, and northeastern regions.

¹⁰ Government of India, Ministry of Power. *Creation of a National Grid*. New Delhi. (<http://powermin.nic.in/transmission-0>)

¹¹ As of 30 June 2015, the Government of India owned 57.9% of POWERGRID, which makes the company majority state-owned and therefore a public sector undertaking.

¹² POWERGRID. *Our Network*.

http://www.powergridindia.com/_layouts/PowerGrid/User/ContentPage.aspx?PId=80&LangID=English.

¹³ Development Coordination (accessible from the list of linked documents in Appendix 2).

A separate project component will further increase interregional transmission capacity between the western and the southern regional grids as part of a high-priority HVDC transmission link, since the southern region has an 11.3% overall deficit and a 19.8% peak power deficit, while the western region is in surplus. The envisaged southern region generation-capacity additions are not sufficient, and increased transmission capacity is therefore required. This component consists of two 800 kV HVDC terminals—one in Chhattisgarh (western region) and the other in Tamil Nadu (southern region)—and two 320 kV HVDC terminals connecting Kerala and Tamil Nadu. This will expand western–southern interconnectivity from 10 GW to 16 GW between Chhattisgarh and Tamil Nadu, and the portion between Tamil Nadu and Kerala will have 2 GW capacity. The adoption of HVDC transmission technology improves power transfer efficiency and reduces transmission losses over long distances. It is thus a least-cost solution and low-carbon investment option well suited for high-capacity interregional power transfers.

8. **Alignment with ADB strategy and operations.** Asian Development Bank (ADB) support for the Green Energy Corridor initiative and financing transmission networks to increase interregional power flows is consistent with ADB’s Strategy 2020 and Energy Policy¹⁴ which advocate the promotion of renewable energy, increased energy efficiency, improved energy security, and facilitation of the country’s transition to a low-carbon economy. It is also consistent with India country partnership strategy, 2013–2017¹⁵ which supports (i) clean and renewable energy expansion; (ii) enhanced energy efficiency; (iii) promotion of advanced high-voltage transmission technology, including HVDC transmission lines to increase transmission efficiency; and (iv) grid integration of renewable energy.

9. Since 1995, the ADB has provided POWERGRID seven sovereign-guaranteed loans and one nonsovereign operation (NSO) loan to strengthen its transmission system nationally. The projects have a good implementation history and high ratings. Among these, ADB provided two loan facilities in 2011 consisting of an NSO loan and a sovereign-guaranteed loan in a single financing package.¹⁶ The NSO loan represented POWERGRID’s first transaction without sovereign support, and helped POWERGRID diversify its financing sources.

B. Value Added by ADB Assistance

10. Renewable energy-based power generation is still more expensive than conventional coal-fired power generation in India and poses an additional cost burden due to its power intermittency. The government’s intervention through the Electricity Act, 2003, the National Action Plan on Climate Change, and the Jawaharlal Nehru National Solar Mission has created the necessary legal and regulatory frameworks and incentives to attract private investments into the sector, thereby capturing the environmental benefits of renewable energy projects. However, the public sector is responsible for ensuring timely investments in transmission networks to allow for increased renewable energy penetration. In this context, POWERGRID’s near-term funding needs for the interstate green energy corridor exceed \$3.4 billion, whereas enhanced overall interregional connectivity—critical not just for renewable energy but for bulk power evacuation and power sector optimization—will require a further \$10 billion.¹⁷ The previous ADB sovereign and NSO loans helped POWERGRID diversify its funding sources.

¹⁴ ADB. 2008. *Strategy 2020: The Long-Term Strategic Framework of the Asian Development Bank, 2008–2020*. Manila; and ADB. 2009. *Energy Policy*. Manila.

¹⁵ ADB. 2013. *Country Partnership Strategy: India, 2013–2017*. Manila.

¹⁶ ADB. 2011. *Report and Recommendation of the President to the Board of Directors: Proposed Loans for the National Grid Improvement Project in India*. Manila. The NSO loan (Loan 2788-IND) had a principal outstanding balance of \$94 million as of 31 July 2015.

¹⁷ Government of India, Ministry of Power. 2015. *Transmission Overview*. New Delhi. <http://powermin.nic.in/overview-1>

POWERGRID will continue to access all available sources, including domestic and international banks, capital markets, and multilateral and other development financial institutions, including ADB, to fund its capital investment plans. To maintain affordability, POWERGRID must match its funding sources' tenors more closely to the transmission assets it constructs, owns, and operates, which have 35-year cost recovery periods inherent in transmission tariff regulations.

11. ADB's assistance thus plays an important role in financing India's power transmission components that are critical in achieving the government's renewable energy targets, as well as increasing overall interregional interconnection capacity. Without this, (i) significant additional generation capacity cannot be transferred, (ii) renewable and conventional energy project bankability becomes a challenge, (iii) power trading will not expand, and (iv) continued increases in access to affordable power will not materialize. The proposed loans are attractive to POWERGRID because (i) the sovereign loan provides long-term, low-cost financing that helps keep transmission tariffs at reasonable levels, while the additional financing provided by the NSO loan at attractive terms also includes a long tenor; (ii) ADB's presence on both the sovereign and NSO side provides comfort to potential commercial cofinanciers and risk participants; and (iii) ADB has the ability to deliver multisource financing and hybrid solutions to companies like POWERGRID by accessing the combined knowledge and experience of its regional, country, and private sector operations.

C. Impact and Outcome

12. The impact will be increased overall efficiency of the Indian power system, expanded access to electricity, increased private investment in renewable energy, and enhanced energy security in India. The outcome will be improved and more reliable transmission system capacity in the northern, western, and southern regions of India.

D. Outputs

13. These will be achieved by 2020 through the following outputs:
- (i) Green energy corridor system expansion in the northern region:
 - (a) 765 kV double circuit transmission line from Ajmer to Bikaner (263 km);
 - (b) 765 kV double circuit transmission line from Bikaner to Moga (366 km);
 - (c) 400 kV double circuit (Quad) transmission line from Bikaner (new substation) to Bikaner (existing substation) (26 km);
 - (d) 765/400 kV substation with 2x1500 megavolt-ampere transformers at Bikaner;
 - (e) extensions of the existing Ajmer and Moga substations by adding two line bays to each; and
 - (f) real-time measurement and monitoring equipment.
 - (ii) Transmission interconnection capacity expansion between the western and southern regions:
 - (a) 800 kV HVDC terminal stations at Raigarh in Chhattisgarh and Pugalur in Tamil Nadu; and
 - (b) 320 kV voltage source converter HVDC terminal stations at Pugalur in Tamil Nadu; and North Trichur in Kerala.

E. Investment and Financing Plans

14. The project is estimated to cost \$2,581.3 million (Table 1).

Table 1: Project Investment Plan
(\$ million)

Item	Amount
A. Base Cost^a	
1. Green energy corridor (ADB-funded portion of interstate)	624.0
2. Western–southern HVDC interconnection terminals	1,578.9
Subtotal (A)	2,202.8
B. Contingencies^b	165.9
C. Financing Charges During Implementation^c	212.6
Total (A+B+C)	2,581.3

Note: Numbers may not sum precisely due to rounding.

ADB = Asian Development Bank, HVDC = high-voltage direct current.

^a In mid-2015 prices. Includes taxes and duties of \$44.1 million, which are eligible for financing from ADB resources.

^b Physical contingencies computed at 3% for substations and equipment, and 15% for transmission lines. 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.

^c Includes interest and commitment charges.

Sources: Power Grid Corporation of India Limited and ADB estimates.

15. **Nonsovereign operations loan.** POWERGRID has requested a commercial NSO loan for up to \$500 million without a sovereign guarantee, and with a maturity of 15 years including a 4-year grace period. The NSO loan will carry an interest rate, commitment fee, and front-end fee to be determined by ADB's Investment Committee. The NSO loan will be supported by POWERGRID's corporate credit, and is to be secured by a floating charge on POWERGRID's corporate assets, details of which will be agreed during loan negotiations. ADB is exploring risk transfer arrangements for the NSO loan. ADB may also assist POWERGRID with arranging a parallel NSO cofinancing loan, the terms and conditions of which the cofinancing lender(s) and POWERGRID will agree upon.

16. **Sovereign guaranteed loan.** POWERGRID has also requested a sovereign guaranteed loan of \$500 million from ADB's ordinary capital resources to help finance the project. The loan is being presented for approval separately and will be made directly to POWERGRID. Both the sovereign guaranteed loan and the NSO loan will include taxes and duties for the investment components.¹⁸

Table 2: Financing Plan

Source	Amount (\$ million)	Share of Total (%)
Asian Development Bank: Nonsovereign operations loan	500.0	19.4
Asian Development Bank: Sovereign loan	500.0	19.4
POWERGRID (other sources) ^a	806.9	31.2
POWERGRID equity (internal sources)	774.4	30.0
Total	2,581.3	100.0

POWERGRID = Power Grid Corporation of India Limited.

Note: Numbers may not sum precisely due to rounding.

^a Expected to be POWERGRID's domestic bond issuance, parallel financing from the commercial banking sector, the nonsovereign operations parallel loan, financing from other financial institutions, or combinations thereof.

Source: Asian Development Bank estimates.

¹⁸ This includes taxes and duties of \$44.1 million to be financed from government resources by cash contribution and ADB. The amount of taxes and duties to be financed by ADB (i) is within the reasonable threshold identified in the India country partnership strategy, (ii) does not represent an excessive share of the investment plan, (iii) applies only to ADB-financed expenditures, and (iv) is considered material and relevant to the project's success.

- F. Confidential information deleted.
- 17. Confidential information deleted.
- 18. Confidential information deleted.

III. DUE DILIGENCE

A. Technical

19. POWERGRID has in-house planning capabilities, including computer-aided facilities for transmission system planning, design, operation, and maintenance. POWERGRID's green energy corridor study (footnote 8) identified the required investments and estimated capital expenditure to ensure adequate capacity and system reliability to meet India's demand growth. The Ministry of New and Renewable Energy, the Forum of Regulators, and the Central Electricity Authority reviewed data from state transmission utilities and the Central Electricity Regulatory Commission. The study also included power demand projections taken from the 18th Electric Power Survey (2013) of the Central Electricity Authority.

20. The 800 kV HVDC transmission system is state-of-the-art, commercially proven technology, and is the most cost-effective means of transmitting bulk power over long distances. For high-capacity, point-to-point transmission, HVDC is economically preferable for system lengths exceeding 700–800 km. The project will enhance energy efficiency by reducing transmission losses to about 3% below levels of typical conventional alternating current transmission systems. Screening for climate risks was conducted, and risks were assessed as low. Such risks are considered in the project design.

B. Economic and Financial

21. The project's financial internal rate of return, calculated on a real basis, is 5.76%—higher than the weighted average cost of capital of 3.66%—and remains as such in the various adverse sensitivity scenarios.¹⁹ Its economic internal rate of return is estimated to be 16.60%,²⁰ higher than the social discount rate of 10%. The project is thus financially viable and economically sustainable.

22. The government has awarded POWERGRID "Navratna" status, which gives public sector undertakings a degree of managerial and financial autonomy despite their majority-government ownership.²¹ POWERGRID maintains an international long-term issue credit rating of BBB– (Outlook: Stable) from both Standard & Poor's and FitchRatings, and enjoys the highest domestic credit rating of AAA.²² Based on the cost-plus nature of the tariff-setting process coupled with its operating efficiency, POWERGRID has increased revenues and net profits consistently, maintaining a robust financial position with stable cash flows to cover its costs, capital investment, and debt payments. Over the past 3 years, it achieved a post-tax return on net worth of more than 10.0% and an average debt service coverage ratio of 1.5

¹⁹ Financial Analysis (accessible from the list of linked documents in Appendix 2). The nominal financial internal rate of return is 10.72%, higher than the nominal weighted average cost of capital of 7.78%.

²⁰ Economic Analysis (accessible from the list of linked documents in Appendix 2).

²¹ Navratna-status public sector undertakings may invest up to the lesser of (i) Rs10 billion or (ii) 15% of net worth on a single project or 30% of net worth in a single year, without having to seek the government's permission.

²² Since 2001, POWERGRID's domestic bonds have been rated AAA by the Credit Rating Information Services of India Limited and AAA by the Investment Information and Credit Rating Agency of India Limited. Since 2008, Credit Analysis and Research has also given these bonds an AAA rating.

times. In FY2015, the return on net worth rose to 13.1%²³ and the debt service coverage ratio improved to 2.0 times.²⁴ POWERGRID's debt-to-equity ratio has remained at about 70:30. Although POWERGRID has an aggressive investment plan and a large need for additional borrowings, financial projections show it has a sound financial position even under stress scenarios.

C. Governance

23. As a publicly listed company, POWERGRID is subject to several strong governance measures imposed by India's Securities and Exchange Board, which enhance accountability, transparency, and predictability of its financial governance through information disclosure to shareholders, investment professionals, and the public. POWERGRID has an advanced accounting system using computerization with confidentiality and integrity at various levels. The financial management risk is thus low. Confidential information deleted.

D. Poverty and Social

24. The power sector is a key driver of India's economic growth and development. Access to reliable, stable, and adequate electricity supply increases agricultural, industrial, and commercial productivity, and enhances economic growth. Economic growth helps reduce poverty and improve quality of life, particularly for the most vulnerable segments of society. The project will avoid or minimize negative impacts on affected people.²⁵ Social design features include (i) compensation for loss of crops and trees at market value, (ii) additional assistance for affected vulnerable households, and (iii) equal opportunities to access employment and equal pay for men and women under civil works contracts.

E. Safeguards

25. The project is classified as category B for environment, category B for involuntary resettlement, and category C for indigenous people. In accordance with ADB's Safeguard Policy Statement (2009), the project's potential environmental and social impacts and risks have been identified. Measures to avoid, mitigate, and compensate for adverse environmental impacts are incorporated in the initial environmental examination, which includes the environmental management plan.²⁶ Environmental impacts of transmission lines can be minimized by careful route selection. One of the lines passes through about 0.7 km of degraded forest land. Compensatory afforestation required by the government to offset this impact is budgeted. Private land will be required for the HVDC terminal in Pugalur, Tamil Nadu, and is being acquired on a willing-buyer, willing-seller basis and through negotiated settlement.²⁷ The remaining substations are on government or POWERGRID-owned land. Due diligence has confirmed there are no encroachers or informal settlers and that the land is free of claims and disputes. For the transmission towers and lines, impacts are temporary and will occur during

²³ POWERGRID. 2015. *FY2014–2015 Press and Analysts Meet Announcement*. Mumbai.

²⁴ POWERGRID. 2015. *Audited Annual Financial Results for the year ended 31 March 2015*. Gurgaon.

²⁵ Summary Poverty Reduction and Social Strategy (accessible from the list of linked documents in Appendix 2).

²⁶ Initial Environmental Examination (accessible from the list of linked documents in Appendix 2).

²⁷ The private land is being acquired through negotiated settlement between willing buyer and willing seller, such that there is no expropriation required. The negotiation is being done through meaningful consultation with affected persons and POWERGRID's committee dealing with the land purchase, and will aim to offer a fair price. POWERGRID will ensure any negotiations with affected persons are transparent, and an appropriate expert will validate the transaction. POWERGRID will document the processes of negotiation, such as the consultation processes, policies, and laws applicable to such transactions and third-party validation, and will submit to ADB after the completion of negotiations and payment.

construction in loss of crops and trees, which will be compensated. Measures to avoid, mitigate, and compensate for adverse impacts are incorporated in a compensation plan for temporary damages, analogous to ADB's resettlement plan.²⁸ This contains basic elements of a resettlement plan, as required by ADB's Safeguard Policy Statement for category B projects, and is based on the principles of the Safeguard Policy Statement; the Indian Telegraph Act 1885; and the Electricity Act, 2003. POWERGRID has the commitment and ability to manage the social and environmental risks.²⁹ Information disclosure to and consultations with affected people will be conducted following ADB requirements.

26. POWERGRID will comply with national labor laws and, pursuant to ADB's Social Protection Strategy³⁰, will take measures to comply with the internationally recognized core labor standards. The borrower will report regularly to ADB on (i) its (and its contractors') compliance with such laws and (ii) the measures taken. Information disclosure and consultation with affected people will be conducted in accordance with ADB requirements.

F. Anticorruption Policy

27. POWERGRID was advised of ADB's policy of implementing best international practice relating to combating corruption, money laundering, and the financing of terrorism. ADB will ensure that the investment documentation includes appropriate provisions prohibiting corruption, money laundering, and the financing of terrorism, and remedies for ADB in the event of noncompliance.

G. Risks and Mitigating Measures

28. Major risks and mitigating measures are shown in Table 4 and further described in the risk assessment and risk management plan.³¹ The risks are manageable, and appropriate mitigation measures are incorporated. Integrated benefits are expected to outweigh the costs. Confidential information deleted.

29. Confidential information deleted.

30. Confidential information deleted.

IV. ASSURANCES AND CONDITIONS

31. Consistent with the Agreement Establishing the Asian Development Bank (the Charter),³² ADB is proceeding with the proposed NSO assistance after having established that the Government of India has no objection to the proposed assistance to POWERGRID. ADB will enter into suitable finance documentation, in form and substance satisfactory to ADB, following approval of the proposed assistance by the Board of Directors.

V. RECOMMENDATION

²⁸ Compensation Plan for Temporary Damages Plan (accessible from the list of linked documents in Appendix 2).

²⁹ POWERGRID developed a comprehensive environmental and social management system in 1998 and revised it in 2009. This integrated guidance and best practices from the World Bank through a multi-stakeholder and participatory consultation process.

³⁰ ADB. 2001. *Social Protection Strategy 2001*. Manila.

³¹ Risk Assessment and Risk Management Plan (accessible from the list of linked documents in Appendix 2).

³² ADB. 1966. *Agreement Establishing the Asian Development Bank*. Manila.

32. 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 the loan of up to \$500,000,000 to the Power Grid Corporation of India Limited, without a sovereign guarantee, for the Green Energy Corridor and Grid Strengthening Project, from ADB's ordinary capital resources; for a term of 15 years, including a grace period of 4 years; and such other terms and conditions as are substantially in accordance with those set forth in this report, and as may be reported to the Board

Confidential information deleted.

Takehiko Nakao
President

16 November 2015

DESIGN AND MONITORING FRAMEWORK

Impacts the Project is Aligned with

Increased overall efficiency of the Indian power system, expanded access to electricity, increased private investment in renewable energy, and enhanced energy security in India. (Electricity for All, Twelfth Five Year Plan)^a

Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting	Risks
<p>Outcome</p> <p>Improved and more reliable transmission system capacity in the northern, western, and southern regions of India</p>	<p>By 2020:</p> <p>Additional 3,000 MVA of transmission capacity installed to accommodate renewable energy flows via Bikaner, Rajasthan in the northern region. (2015 baseline = 0)^b</p> <p>Interregional capacity between Chhattisgarh in the western and Pugalur in the southern region increased by 6,000 MW. (2015 western–southern baseline: 5,720 MW)^b</p>	<p>National Load Dispatch Center and Power System Operation Corporation annual reports</p>	<p>Expected growth in renewable energy-generation capacity does not match the increase in transmission capacity.</p>
<p>Outputs</p> <p>1. Green energy corridor transmission system expanded in the northern region</p>	<p>By 2020:</p> <p>1a. About 629 km of 765 kV double circuit transmission lines constructed. (2015 baseline: 0)^b This consists of about 263 km line from Ajmer to Bikaner and about 366 km line from Bikaner to Moga.</p> <p>1b. About 26 km of 400 kV double circuit (Quad) transmission line from Bikaner (new substation) to Bikaner (existing substation) constructed. (2015 baseline: 0)^b</p> <p>1c. 765/400 kV substation with 2x1,500 MVA transformers at Bikaner constructed. (2015 baseline: 0)^b</p> <p>1d. Existing Ajmer and Moga substations extended by additional two line bays each. (baseline: 0 extensions)</p> <p>1e. Real-time measurement and monitoring equipment installed. (2015 baseline: 0)</p>	<p>POWERGRID annual reports</p>	<p>Rights-of-way issues cause delays.</p> <p>Completion of associated transmission lines (external to the project) is delayed.</p> <p>Increases in the prices of equipment and materials exceed contingency and inflation forecasts.</p>
<p>2. Transmission interconnection capacity between the western and southern regional grids expanded</p>	<p>By 2020:</p> <p>2a. Two 800 kV HVDC terminal stations constructed in Raigarh, Chhattisgarh, and Pugalur, Tamil Nadu. (2015 baseline = 0)^b</p>	<p>POWERGRID annual reports</p>	

Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting	Risks
	2b. Two 320 kV voltage source converter HVDC terminal stations constructed in Pugalur, Tamil Nadu and Trichur, Kerala. (2015 baseline = 0) ^b		
<p>Key Activities with Milestones</p> <p>1. Green energy corridor transmission system expanded in the northern region</p> <p>1.1 Identify and technically appraise subprojects (Q1–Q3 2015) [G/CD] 1.2 Prepare engineering designs (Q1–Q3 2015) 1.3 Conduct financial and economic assessment (Q3 2015) 1.4 Prepare bid documents (Q1–Q4 2015) 1.5 Award contracts for goods, works, and services (Q3 2015–Q1 2016) 1.6 Construct assets (Q1 2016–Q4 2020) 1.7 Make assets operational (Q4 2018–Q4 2020)</p> <p>2. Transmission interconnection capacity between the western and southern regional grids expanded</p> <p>2.1 Identify and technically appraise subprojects (Q1–Q3 2015) [G/CD] 2.2 Prepare engineering designs (Q1–Q3 2015) 2.3 Conduct financial and economic assessment (Q3 2015) 2.4 Prepare bid documents (Q1–Q3 2015) 2.5 Award contracts for goods, works, and services (Q3 2015–Q1 2016) 2.6 Construct assets (Q4 2015–Q4 2020) 2.7 Make assets operational (Q4 2018–Q4 2020)</p>			
<p>Inputs</p> <p>ADB (nonsovereign operations): \$500.0 million (loan) ADB (sovereign): \$500.0 million (loan) POWERGRID (other sources):^c \$806.9 million POWERGRID equity (internal sources): \$774.4 million</p>			
<p>Assumptions for Partner Financing:</p> <p>POWERGRID raises the requisite debt funding from other sources for the project.</p> <p>Parallel, related investments that are aligned with the project outcome, and further contribute to the impact include: German development cooperation through KfW is providing €500 million (about \$556 equivalent) parallel cofinancing for the Green Energy Corridor Initiative's component that includes transmission lines and substations connecting Gujarat with Rajasthan up to a new substation in Ajmer, Rajasthan.</p>			

ADB = Asian Development Bank, G/CD = governance and capacity development, HVDC = high voltage direct current, km = kilometer, kV = kilovolt, MVA = megavolt-ampere, MW = megawatt, POWERGRID = Power Grid Corporation of India Limited.

^a Government of India, Planning Commission. 2013. *Twelfth Five Year Plan, 2012–2017*. New Delhi.

^b As of 31 July 2015, POWERGRID owns and operates about 117,679 circuit km of high-voltage transmission lines and 197 substations with transformation capacity of about 239,424 MVA, and total interregional power transfer capacity is 47,450 MW. Source: http://www.powergridindia.com/_layouts/PowerGrid/User/ContentPage.aspx?Pid=150&LangID=English.

^c Expected to be POWERGRID's domestic bond issuance and/or parallel financing from the commercial banking sector and/or other financial institutions.

Source: ADB.