

Semi-Annual Environment Safeguard Monitoring Report

Loan Number : 2415-IND & 2510-IND
Reporting Period : Oct. 2015 to Mar. 2016

Power Grid Development Investment Program (Tranche 1 & 2)

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ABBREVIATIONS

ADB	–	Asian Development Bank
APs	–	Affected Persons
CTU	–	Central Transmission Utility
EA	–	Executing Agency
EIA	–	Environment Impact Assessment
ESPP	–	Environment and Social Policy & Procedures
EMF	–	Electro Magnetic Fields
EMP	–	Environmental Management Plan
GO	–	Government Order
GOI	–	Government of India
GRM	–	Grievances Redressal Mechanism
GRC	–	Grievance Redressal Committee
IEE	–	Initial Environmental Examination
km	–	Kilometers
MoEF	–	Ministry of Environment and Forests
POWERGRID	–	Power Grid Corporation of India Ltd.
PMU	–	Project Management Unit
RoW	–	Right of Way
RAP	–	Rehabilitation Action Plan
S/s	–	Substation
NER	–	North Eastern Region
NR	–	Northern Region

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SECTION 1: INTRODUCTION

The power generation sources are unevenly distributed and often located far away from the load centers. The generation capacity addition will require development of an adequate intra and inter-states transmission system to ensure reliable and secured delivery of power from generation plants to end users. The North-eastern region mainly Arunachal Pradesh & Sikkim of India and Bhutan are endowed with large hydro potential. The generation addition of about 35,000 MW in Arunachal Pradesh and 15,000 MW in Sikkim & Bhutan is expected in future. Considering the low growth of power demand of NER including Sikkim and Bhutan, it is estimated that power to the order of about 42,000-45,000 MW would be surplus in these areas whereas the generation addition scenarios of the Northern Region (NR) and the Western Region (WR) indicate that these regions would remain in a serious deficit situation during 11th Plan and beyond. Therefore, surplus power from the above generation sources would have to be transmitted to the load centers of NR and WR over long distance through the narrow corridor in north of West Bengal. To optimally utilize the transmission corridor of the Chicken neck area and the difficult terrain of NER, it is necessary to plan evacuation system of major projects in NER and Bhutan in a comprehensive manner keeping in view the future generation expansion.

POWERGRID studied different transmission options i.e. high voltage HVDC and 765kV AC transmission system for transmission of surplus power from NER/ Sikkim/ Bhutan to NR/WR, and concluded that hybrid system of ± 800 kV HVDC with 400kV AC system is the most optimal one and would need to be installed and commissioned in stages matching with the timeframe for development of hydro power generation projects. Generation addition, out of above potential in NER, as presently planned from Lower Subansiri ($8 \times 250 \text{ MW} = 2000 \text{ MW}$) and Kameng ($4 \times 150 \text{ MW} = 600 \text{ MW}$) Hydro Electric Projects in Arunachal Pradesh/Assam is expected to come up by XI Plan, beneficiaries being mainly NER, NR & WR. Evacuation of power from these Hydro Electric Projects has been envisaged with 400kV D/C Transmission systems at Biswanath Chariyali in Assam where 220/400/765kV HVAC power pooling point & ± 800 kV HVDC Terminal is proposed. Transfer of bulk power from this Terminal Station (Biswanath Chariyali) has been proposed through ± 800 kV HVDC Transmission line to Agra in Uttar Pradesh in Northern Grid for further dispersal to National Grid.

To meet the funding requirement of the proposed ± 800 kV High Voltage Direct Current (HVDC) Northern-Northern/Western Interconnector project, ADB has approved a Multi Tranche Financing Facility of \$ 400 million & \$ 124 million under Loan No. 2415-IND, Power Grid Development Investment Programme (Tranche 1) and under Loan No. 2510-IND, Power Grid Development Investment Programme (Tranche 2) respectively. The loan for Tranche -1 was signed on 28th March 2008 and closed on 30th June 2015 whereas loan for Tranche - 2 was signed on 27th March 2009 and became effective from 18th May 2009 and closed on 31th December 2015.

1.1 OVERALL PROJECT DESCRIPTION

The Power Grid Development Investment Project (Tranche 1 & 2) covered under Loan No. 2415-IND and Loan No. 2510-IND include establishment of ± 800 kV HVDC Northern-Northern/Western Interconnector for transmission of power from North Eastern Region (NER) to NR and WR. The project involves construction about 1800 km ± 800 kV HVDC transmission system from Biswanath Chariyali (Assam) to Agra (Uttar Pradesh) including 800 kV converting and inverting stations at both ends. The detail scope of the

project covered under above subject loan includes establishment of the following transmission facilities:

- i) ±800 kV, 6000 MW HVDC Bipole line from Biswanath Chariali – Agra - 1812 km
- ii) Earth electrode line at Biswanath Chariali end - 75 km
- iii) Earth electrode line at Agra end - 148 km

(Note:- Substation facilities for this project are excluded from above two loans scope)

1.2 PROJECT OBJECTIVES

The main objective is to strengthen and enhance the economy and efficiency of intra- and inter-regional through establishment of a high capacity transmission system to evacuate bulk surplus power from NER. The Program will not only improve transmission reliability and security in this region but also provide uninterrupted power supply to energy deficit Northern and Western Region

1.3 ENVIRONMENTAL CATEGORY

As per the Asian Development Bank's (ADB) classification of project on the basis of potential environmental impacts, the Power Grid Development Investment Programme (Tranche 1 & 2) is classified as Environmental Category 'B'.

1.4 ENVIRONMENTAL PERFORMANCE INDICATOR

The following parameters considered as key indicators for this project need to be monitored to evaluate the environmental performance.

1. Selection of optimum route which has least environment impact on environment and also avoid protected area/ecological sensitive area/ historical or cultural monuments;
2. Compliance to all applicable statutory requirements;
3. Compliance with Environment Management Plan.

1.5 OVERALL PROJECT PROGRESS, AGREED MILESTONES & IMPLEMENTATION SCHEDULES

Name of Project	Project Details	Progress as on Mar.' 2016	Completion Schedule
± 800 kV HVDC Northeastern - Northern/Western Interconnector	Transmission System <ul style="list-style-type: none"> • ± 800 kV, 6000 MW HVDC Bi-pole Transmission Line from Biswanath Chariyali (Assam) to Agra (Uttar Pradesh) - 1812 km • Earth electrode line at Biswanath Chariali end - 75 km • Earth electrode line at Agra end - 148 km 	Construction of transmission line in all sections of ± 800 kV Biswanath Chariyali-Agra completed on 31 st Oct.'2015.	Construction of transmission line in all sections of ± 800 kV Biswanath Chariyali-Agra completed on 31 st Oct.'2015.

SECTION 2 : COMPLIANCE STATUS WITH APPLICABLE STATUTORY ENVIRONMENTAL REQUIREMENTS:

S. No.	Legal Requirements Act/Rules/Guidelines	Applicable Attributes	POWERGRID's Compliance Status
1.	Environment (Protection) Act, 1986	All developmental projects listed in Schedule of EIA Notification, 2006 needs to get prior environmental clearance. However, environment clearance is required if transmission projects is located in specified area of Aravalli range (Alwar district in Rajasthan and Gurgaon & Mewat districts in Haryana) as per notification dated 7 th May 1992 under the EP Act, 1986	Power transmission projects are not listed in schedule of the EIA Notification 2006. Therefore, prior environmental clearances are not required for the subprojects. The proposed transmission project doesn't pass through specified area of Aravalli range. Therefore, environmental clearance under the said notification is not required.
2.	Forest (Conservation) Act, 1980	This Act is applicable whenever a transmission line traverses through forest area. Prior approval from Ministry of Environment & Forests (MoEF), Govt. of India has to be obtained before construction of line in forest areas	The project involves a total of 14.8 km (53.716 ha.) of forest land along the 2035 km transmission system including earth electrode lines. Forest are mostly protected forest along road & canal crossing. Forest Clearance/Working permission has been obtained for all sections of 800 kV HVDC Agra-Biswanath Chariali Line. For Earth Electrode line at Agra end, POWERGRID has submitted forest diversion proposals to obtain clearance from MoEF which is under approval. The State wise details of forest involved and status of forest clearance are presented below in Table-1.
3	Batteries (Management and Handling) Rules, 2001	As per the Rule, Bulk consumers shall have the responsibility to dispose all used batteries to dealers, manufacturer, registered recycler, reconditioners or at the designated collection centres only. Half-yearly return (Form-8) for the same is to be submitted to the concerned State Pollution Control Board.	Since projects are under implementation phase, no used batteries have been replaced so far.
4	Hazardous Wastes (Management, Handling and Transboundary Movement) Amendment Rules, 2008	As per Rules, used mineral oil (Schedule I, category – 5.1) is categorized as hazardous waste and require proper handling, storage and disposed only to authorised disposal facility (registered recyclers/ reprocessors). Half-yearly return (Form -13) for the same is to be submitted to the concerned State	Transformer oil is changed only after 10-15 years of operation Since projects are under implementation phase, oil change/ replacement is not envisaged at present.

S. No.	Legal Requirements Act/Rules/Guidelines	Applicable Attributes	POWERGRID's Compliance Status
		Pollution Control Board.	
5	Ozone Depleting Substances (Regulation and Control) Rules, 2000	Controls and regulations specified on manufacturing, import, export, and use of CFC compound.	Necessary provisions have been made in contract document for restricting the use CFC compound.

Table – 1 : Details of State-wise Forest Involvement and Forest Clearance Status

Sl. No.	Transmission line section	Forest stretch involved (in km)	Forest area involved (in Ha.)	Name of the State(s)	Status
1.	Earth Electrode line at Biswanath Chariyali end	10.27	22.55	Assam	In-principle and Final clearance from Ministry of Environment Forests and Climate Change (MoEF & CC) obtained on 17.11.09 and 26.10.12 respectively.
2.	+800 kV HVDC bipole Biswanath Chariyali – Bongaigaon	00	00	Assam	No forest involved
3.	+800 kV HVDC bipole Bongaigaon-Islampur (including chicken neck area)	00	00	Assam, West Bengal	No forest involved
4.	+800 kV HVDC bipole Islampur – Gorakhpur	2.41	16.63	Bihar	<u>Muzaffarpur, Saharsa Chapra, Samastipur & Darbhanga divisions (4.2642 ha.):</u> In-principle and Final clearance obtained on 12.10.12 and 25.09.14 respectively. <u>Purnia, Saharsa, Kishanganj & Araria divisions (7.2816 ha.):</u> In-principle and final clearance issued on 29.01.14 and 22.12.15 respectively. <u>Chapra, Siwan, & Gopalganj divisions (5.09 ha.):</u> In-principle and Final clearance issued on 15.07.15 and 30.10.15 respectively.
		0.03	0.207	Uttar Pradesh	In-principle and final clearance issued by RMoEF, Lucknow on 30.09.13 and 17.09.15 respectively.
5.	+800 kV HVDC bipole Gorakhpur – Lucknow	0.27	1.89	Uttar Pradesh	<u>Gorakhpur (0.22 Ha.):</u> In-principle clearance obtained from RMoEF, Lucknow on 15.12.14. Working permission obtained on 07.09.15. <u>Basti (0.22 Ha.):</u> In-principle and final clearance obtained from RMoEF, Lucknow on 24.09.10 and 11.05.11

					respectively. <u>Faizabad (1.45 Ha.):</u> In-principle clearance obtained from RMoEF, Lucknow on 15.12.14. Working permission issued on 29.10.15.
6.	<u>±800 kV HVDC bipole Lucknow - Agra</u>	1.79	12.36	Uttar Pradesh	<u>Kanpur, Lucknow, Unnao and Barabanki divisions (3.91 Ha.):</u> In-Principle and Final approval obtained on 24.10.11 and 08.08.12 respectively. <u>Agra (0.47Ha.), Etawah (1.41Ha.) & Firozabad (6.57Ha.) divisions:</u> In-principle clearance issued by RMoEF, Lucknow on 31.10.13. Working permission for Auraiya, Etawah issued on 08.09.15 and for Agra and Firozabad issued on 18.09.15 and 28.09.15 respectively.
7.	Earth Electrode line at Agra end (#)	0.036	0.0792	Uttar Pradesh	Proposal pertaining to forest along road/ canal crossing submitted to DFO, Agra on 06.08.14. Online uploading of proposal completed and submitted to CF, Agra on 27.12.14. NO raised certain queries. Reply of the same submitted to NO, Lucknow by DFO on 16.04.15. NO has asked to submit hard copy of proposal to DFO and DM office. Copies submitted. DFO has raised queries on 14.08.15 which were clarified and proposal was forwarded to NO on 31.03.16. NO has raised some queries on 20.04.16 which have been replied on 23.06.16.
Total		14.806	53.716		

Note: As per MoEF guideline dated 08.08.2014 allowing work in forest area after deposition of funds and issuance of working clearance. The construction work in forest area is not affected for want of Stage-II/Final forest clearance from MoEF.

(#) Work in Earth Electrode line at Agra end is under progress. Work in protected forest (along road/canal crossing) shall be carried out only after obtaining Forest Clearance /Working Permission.

SECTION 3 : COMPLIANCE STATUS WITH MAJOR LOAN COVENANTS

POWERGRID has complied with various environmental safeguards as agreed in the loan covenants. The point wise compliance status is presented in the table below

Project Specific Covenants	Reference	Status of Compliance
A. Environment		
<p>The Borrower shall ensure that each of the projects under the Facility, and all Project facilities are assessed, designed, implemented, constructed, operated, maintained, and monitored in accordance with all applicable environmental laws and regulations of the Guarantor, relevant States, ADB's Environment Policy (2002).</p>	<p>LA, Sch. 5, para 4.</p>	<p>Being complied</p>
<p>EMP and the mitigation measures included therein, as specified in the IEE, EIAs, and EARF, as applicable, are properly and promptly implemented;</p> <p>EMP and mitigation measures included therein are updated at the engineering design stage and incorporated into the bidding documents and civil works / supply contracts;</p> <p>Any adverse impact on the environment that may arise from project implementation activities is promptly mitigated or minimized in accordance with the EMP;</p> <p>Any major accidents, including any safety breaches, violation of environmental standards, and corrective measures taken thereto, are reported forthwith to ADB;</p> <p>At least semiannual reports on the implementation of the EMP are submitted to ADB, and ADB is allowed to conduct annual environmental reviews</p> <p>Reports and information are provided to ADB on request to enable it to verify that the goods and services, if any, financed out of the proceeds of the loan have been produced in a responsible manner with a view to resource efficiency, waste minimization, and other environmental considerations</p>	<p>LA, Sch. 5, para. 5</p>	<p>Being complied</p> <p>Complied</p> <p>Complied. All measures listed in EMP implemented.</p> <p>No such incident reported till date.</p> <p>Complied</p> <p>Complied</p>
<p>The Project and/or Project facilities are not located within national parks, wild and planted forest, and wildlife sanctuaries, unless prior environmental clearances are obtained from the relevant government agencies</p> <p>Monuments of cultural or historical importance are avoided.</p>	<p>LA, Sch. 5, para. 6</p>	<p>N.A.</p> <p>No such protected area (National Parks, Wildlife Sanctuaries etc) are involved in the transmission line route alignment.</p> <p>Complied. Careful route alignment has avoided all such areas.</p>

SECTION: 4 COMPLIANCE STATUS & MONITORING PLAN AS STIPULATED IN EMP, IEER AND AS AGREED WITH ADB

The project is being implemented as per approved EMP, IEE and in accordance with applicable laws and ADB's Policies. POWERGRID has Initial Environmental Examination (IEE) reports including Environmental Management Plan (EMP) and mitigation measures to ensure that all the anticipated impacts due to the project activities are minimized wherever possible. The EMP describes a detailed site-specific mitigation measures and monitoring plans anticipated during different stages of the proposed project i.e. pre-construction, construction, and operation & maintenance phase. A summary of monitoring requirements has also been included which identifies when and where the parameter will be monitored, how often and against what aspect. For proper implementation of EMP and other mitigation measures separate fund has been allocated in the project cost.

Monitoring the implementation of environmental mitigation measures is required to ensure that these are undertaken in accordance with the EMP, and to enable mitigation to be adapted and refined/updated as required. A summary of the environmental mitigation measures and monitoring requirements vis-à-vis compliance status by POWERGRID's is given below in **Table-2**.

Table-2: Environment Management Plan

Project activity/stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation on schedule	Compliance Status
Pre-construction							
Location of transmission towers and transmission line alignment and design	Exposure to safety related risks	Setback of dwellings to overhead line route designed in accordance with permitted level of power frequency and the regulation of supervision at sites	Tower location and line alignment selection with respect to nearest dwellings	Setback distances to nearest houses - once	POWERGRID	Part of tower siting survey and detailed alignment survey and design	Complied during survey. Route alignment criterion is part of survey contract.
Equipment specifications and design parameters	Release of chemicals and gases in receptors (air, water, land)	PCBs not used in substation transformers or other project facilities or equipment.	Transformer design	Exclusion of PCBs in transformers stated in tender specification - once	POWERGRID	Part of tender specifications for the equipment	Complied. As per technical specification PCB is not used or it should not be detectable (i.e less than 2mg/kg) as per IEC 61619 or ASTM D4059
		Processes, equipment and systems not to use chlorofluorocarbons (CFCs), including halon, and their use, if any, in existing processes and systems should be phased out and to be disposed of in a manner consistent with the requirements of the Government	Process, equipment and system design	Exclusion of CFCs stated in tender specification – once	POWERGRID	Part of tender specifications for the equipment	Complied
				Phase out schedule to be prepared in case still in use – once			
Transmission line design	Exposure to electromagnetic interference	Transmission line design to comply with the limits of electromagnetic interference from overhead power lines	Electromagnetic field strength for proposed line design	Line design compliance with relevant standards - once	POWERGRID	Part of detailed alignment survey and design	Complied. Designed as per guidelines of ICNIRP and ACGIH and checked by CPRI and M/s PTI, USA

Project activity/stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation on schedule	Compliance Status
Location of transmission towers and transmission line alignment and design	Impact on water bodies and land	Consideration of tower location at where they could be located to avoid water bodies	Tower location and line alignment selection (distance to water bodies.	Consultation with local authorities and avoiding tower foundation in water bodies	POWERGRID	Part of tower siting survey and detailed alignment survey and design	Complied during survey. Route alignment criteria is part of survey contract.
	Social inequities	Careful route selection to avoid existing settlements	Tower location and line alignment selection (distance to nearest dwellings or social institutions)	Consultation with local authorities and land owners - once	POWERGRID	Part of detailed tower siting and alignment survey and design	
		Minimise need to acquire agricultural land	Tower location and line alignment selection (distance to agricultural land)	Consultation with local authorities and land owners - once	POWERGRID	Part of detailed tower siting and alignment survey and design	
Encroachment into precious ecological areas	Loss of precious ecological values/ damage to precious species	Avoid encroachment by careful site and alignment selection	Tower location and line alignment selection (distance to nearest designated ecological protection area)	Consultation with local forest authorities to avoid/minimize forest involvement - once	POWERGRID	Part of detailed siting and alignment survey /design	Complied during survey. Route alignment criterion is part of survey contract. An area of 53.716 ha (14.8 Km) is falling within forest land in the states of Uttar Pradesh, Bihar, and Assam. However, the alignments do not encompass any National Parks/Sanctuaries or other protected / sensitive areas.
Transmission line through forestland	Deforestation and loss of biodiversity	Avoid encroachment by careful site and alignment selection	Tower location and line alignment selection	Consultation with local authorities - once	POWERGRID	Part of detailed siting and alignment	Complied. Route alignment finalised by taking consideration of

Project activity/stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation on schedule	Compliance Status
		Minimise the need by using existing towers, tall towers and RoW, wherever possible	(distance to nearest protected or reserved forest)	Consultation with local authorities and design engineers - once		survey/design	minimum impact on forest area after consultation with concerned authorities. Forest Clearance/Working permission has been obtained for all sections of 800 kV HVDC Agra-Biswanath Chariali Line. For Earth Electrode line at Agra end, Forest Clearance is under progress.
		Obtain statutory clearances from the Government	Statutory approvals from Government	Compliance with regulations – once for each subproject			
Encroachment into farmland	Loss of agricultural productivity	Use existing tower footings/towers wherever possible	Tower location & line alignment selection	Consultation with local authorities and design engineers - once	POWERGRID	Part of detailed alignment survey and design	Complied during survey which is part of survey contract. However, as per law of land no land is acquired for transmission line tower but all damages are compensated as per provision of Electricity Act, 2003 and Indian Telegraph Act, 1885.
		Avoid siting new towers on farmland wherever feasible	Tower location & line alignment selection	Consultation with local authorities and design engineers - once		Part of detailed siting and alignment survey /design	
		Farmers compensated for any permanent loss of productive land	Design of Implementation of Crop Compensation (based on affected area)	Consultation with affected parties – once in a quarter		Prior to construction phase	
		Farmers/landowners compensated for significant trees that need to be trimmed/ removed along RoW.	Design of Implementation of Tree compensation (estimated area to be trimmed)	Consultation with affected parties – once in a quarter		Prior to construction phase	

Project activity/stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation on schedule	Compliance Status
			Statutory approvals for tree trimming /removal	Compliance with regulations –once for each subproject		Part of detailed siting and alignment survey /design	Forest Clearance/Working permission has been obtained for all sections of 800 kV HVDC Agra-Biswanath Chariali Line. For Earth Electrode line at Agra end, Forest Clearance is under progress.
Interference with drainage patterns/Irrigation channels	Flooding hazards/loss of agricultural production	Appropriate siting of towers to avoid channel interference	Tower location and line alignment selection (distance to nearest flood zone)	Consultation with local authorities and design engineers - once	POWERGRID	Part of detailed alignment survey and design	Complied during survey. Route alignment criteria is part of survey contract.
Construction							
Equipment layout and installation	Noise and vibrations	Construction techniques and machinery selection seeking to minimize ground disturbance.	Construction techniques and machinery	Construction techniques and machinery creating minimal ground disturbance- once at the start of each construction phase	POWERGRID (Contractor through contract provisions as per Sec- VII, 44.7)	Construction period	Complied. Low noise producing machinery/ equipments are being used.
Physical construction	Disturbed farming activity	Construction activities on cropping land timed to avoid disturbance of field crops (within one month of harvest wherever possible).	Timing of start of construction	Crop disturbance – Post harvest as soon as possible but before next crop - once per site	POWERGRID (Contractor through contract provisions as per Sec-II, 2.5)	Construction period	Complied. Construction on farm land undertaken mostly during post harvest period. (Compensation amount paid to be given in Social Monitoring Report)

Project activity/stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation on schedule	Compliance Status
Mechanized construction	Noise, vibration and operator safety, efficient operation	Construction equipment to be well maintained	Construction equipment – estimated noise emissions	Complaints received by local authorities - every 2 weeks	POWERGRID (Contractor through contract provisions as per Sec-VIII, 44.7)	Construction period	No complaints received so far
	Noise, vibration, equipment wear and tear	Turning off plant not in use.	Construction equipment – estimated noise emissions and operating schedules	Complaints received by local authorities - every 2 weeks	POWERGRID (Contractor through contract provisions as per Sec-VIII, 44.7)	Construction period	
Construction of roads for accessibility	Increase in airborne dust particles	Existing roads and tracks used for construction and maintenance access to the line wherever possible.	Access roads, routes (length and width of new access roads to be constructed)	Use of established roads wherever possible - every 2 weeks	POWERGRID (Contractor through contract provisions as per Sec-II, 2.8)	Construction period	Most sites are easily accessible and existing road used for construction activity.
Temporary blockage of utilities	Overflows, reduced discharge	Temporary placement of fill in drains/canals not permitted.	Temporary fill placement (m ³)	Absence of fill in sensitive drainage areas - every 4 weeks	POWERGRID (Contractor through contract provisions as per Sec-II, 2.6)	Construction period	Complied with.
Site clearance	Vegetation	Marking of vegetation to be removed prior to clearance, and strict control on clearing activities to ensure minimal clearance.	Vegetation marking and clearance control (area in m ²)	Clearance strictly limited to target vegetation - every 2 weeks	POWERGRID (Contractor through contract provisions as per Sec-VIII, 43.5 & Sec. II, 2.6)	Construction period	Complied with.

Project activity/stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation on schedule	Compliance Status
Trimming/ cutting of trees within RoW	Fire hazards	Trees allowed growing up to a height within the RoW by maintaining adequate clearance between the top of tree and the conductor as per the regulations.	Species-specific tree retention as approved by statutory authorities (average and maximum tree height at maturity, in meters)	Presence of target species in RoW following vegetation clearance – once per site	POWERGRID (Contractor through contract provisions)	Construction period	Regulated felling of tree in RoW is carried out with permission of owner & revenue authority keeping required electrical clearance as per design.
	Loss of vegetation and deforestation	Trees that can survive pruning to comply should be pruned instead of cleared.	Species-specific tree retention as approved by statutory authorities	Presence of target species in RoW following vegetation clearance – once per site	POWERGRID (Contractor through contract provisions)	Construction period	Complied with
		Felled trees and other cleared or pruned vegetation to be disposed of as authorized by the statutory bodies.	Disposal of cleared vegetation as approved by the statutory authorities (area cleared in m ²)	Use or intended use of vegetation as approved by the statutory authorities – once per site	POWERGRID (Contractor through contract provisions)	Construction period	All felled trees are handed over to owner for disposal. POWERGRID has no role in storage and disposal of felled tree/wood.
Wood/ vegetation harvesting	Loss of vegetation and deforestation	Construction workers prohibited from harvesting wood in the project area during their employment, (apart from locally employed staff continuing current legal activities).	Illegal wood /vegetation harvesting (area in m ² , number of incidents reported)	Complaints by local people or other evidence of illegal harvesting - every 2 weeks	POWERGRID (Contractor through contract provisions as per Sec-II, 2.3)	Construction period	No complaints received on illegal harvesting
Surplus earthwork/ soil	Runoff to cause water pollution, solid waste disposal	Soil excavated from tower footings disposed of by placement along roadsides, or at nearby house blocks if requested by landowners.	Soil disposal locations and volume (m ³)	Acceptable soil disposal sites - every 2 weeks	POWERGRID (Contractor through contract provisions as per Sec-VIII, 43.5 & Sec-II, 2.6)	Construction period	Complied with Approx. 159 (A Type) -365 (D Type) m ³ earth is excavated at each tower location and 90-95% of this is used for refilling/resurfacing and rest is disposed off along with other debris at

Project activity/stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation on schedule	Compliance Status
							selected location.
Tower construction – disposal of surplus earthwork/fill	Waste disposal	Excess fill from tower foundation excavation disposed of next to roads or around houses, in agreement with the local community or landowner.	Location and amount (m ³) of fill disposal	Appropriate fill disposal locations - every 2 weeks	POWERGRID (Contractor through contract provisions as per Sec-II, 2.6 & Sec-VIII, 43.5)	Construction period	Complied with
Storage of chemicals and materials	Contamination of receptors (land, water, air)	Fuel and other hazardous materials securely stored above high flood level.	Location of hazardous material storage; spill reports (type of material spilled, amount (kg or m ³) and action taken to control and clean up spill)	Fuel storage in appropriate locations and receptacles - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period	Stored at designated place only.
Construction schedules	Noise nuisance to neighbouring properties	Construction activities only undertaken during the day and local communities informed of the construction schedule.	Timing of construction (noise emissions, [dB(A)])	Daytime construction only - every 2 weeks	POWERGRID (Contractor through contract provisions as per Sec-VIII, 44.7)	Construction period	Construction activity restricted to day time only
Provision of facilities for construction workers	Contamination of receptors (land, water, air)	Construction workforce facilities to include proper sanitation, water supply and waste disposal facilities.	Amenities for Workforce facilities	Presence of proper sanitation, water supply and waste disposal facilities - once each new facility	POWERGRID (Contractor through contract provisions)	Construction period	No complaints received
Encroachment into farmland	Loss of agricultural productivity	Use existing access roads wherever possible	Usage of existing utilities	Complaints received by local people /authorities - every 4 weeks	POWERGRID (Contractor through contract provisions as	Construction period	No complaints received from local peoples/ authorities
		Ensure existing irrigation facilities are maintained in working condition	Status of existing facilities				

Project activity/stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation on schedule	Compliance Status
		Protect /preserve topsoil and reinstate after construction completed	Status of facilities (earthwork in m ³)		per Sec-II, 2.8) Sec-II, 2.5 & Sec-II, 2.7		
		Repair /reinstate damaged bunds etc. after construction completed	Status of facilities (earthwork in m ³)				
	Social inequities	Compensation for temporary loss in agricultural production	Implementation of Crop compensation (amount paid, dates, etc.)	Consultation with affected parties – once in a quarter	POWERGRID	Prior to construction	Tried to minimise the loss. However, if there is any damage to tree/ crop then damages are compensated. (Compensation amount paid to be given in Social Monitoring Report)
Uncontrolled erosion/silt runoff	Soil loss, downstream siltation;	Need for access tracks minimised, use of existing roads.	Design basis and construction procedures (suspended solids in receiving waters; area re-vegetated in m ² ; amount of bunds constructed [length in meter, area in m ² , or volume in m ³])	Incorporating good design and construction management practices – once for each site	POWERGRID (Contractor through contract provisions as per Sec-II, 2.8) As per Sec-II, 2.6	Construction period	Complied with
		Limit site clearing to work areas					
		Regeneration of vegetation to stabilise works areas on completion (where applicable)					
		Avoidance of excavation in wet season					
		Water courses protected from siltation through use of bunds and sediment ponds					
Nuisance to nearby properties	Losses to neighbouring land uses/values	Contract clauses specifying careful construction practices.	Contract clauses	Incorporating good construction management practices – once for each site	POWERGRID (Contractor through contract provision as	Construction period	Complied with

Project activity/stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation on schedule	Compliance Status
		As much as possible existing access ways will be used.	Design basis and layout	Incorporating good design engineering practices – once for each site	per Sec-II, 2.8)		Complied with
		Productive land will be reinstated following completion of construction	Reinstatement of land status (area affected, m ²)	Consultation with affected parties – twice– immediately after completion of construction and after the first harvest			No complaints received
	Social inequities	Compensation will be paid for loss of production, if any.	Implementation of Tree/Crop compensation (amount paid)	Consultation with affected parties – once in a quarter	POWERGRID	Prior to construction	Compensation provided as per POWERGRID's procedure for tree/crop compensation
Health and safety	Injury and sickness of workers and members of the public	Contract provisions specifying minimum requirements for construction camps	Contract clauses (number of incidents and total lost-work days caused by injuries and sickness)	Contract clauses compliance – once every quarter	POWERGRID (Contractor through contract provisions as per Sec-II, 2.2 (v,vii,viii) and also Safety precautions in Special Contract Condition 43.2)	Construction period	Complied with. Safety awareness programme conducted for contractors/ workers regularly.
		Contractor to prepare and implement a health and safety plan.					
		Contractor to arrange for health and safety training sessions					
Inadequate construction stage monitoring	Likely to maximise damages	Training of POWERGRID environmental monitoring personnel	Training schedules	Number of programs attended by each person – once a year	POWERGRID	Routinely throughout construction period	Provided proper training and have very good environmental monitoring process. Appropriate clause incorporated in contact provision for EMP implementation. Site
		Implementation of effective environmental monitoring and reporting system using checklist of all contractual environmental requirements	Respective contract checklists and remedial actions taken thereof.	Submission of duly completed checklists of all contracts for each site - once			

Project activity/stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation on schedule	Compliance Status
		Appropriate contact clauses to ensure satisfactory implementation of contractual environmental mitigation measures.	Compliance report related to environmental aspects for the contract	Submission of duly completed compliance report for each contract - once			managers review the implementation on daily basis.
Operation and Maintenance							
Location of transmission towers and transmission line alignment and design	Exposure to safety related risks	Setback of dwellings to overhead line route designed in accordance with permitted level of power frequency and the regulation of supervision at sites.	Compliance with setback distances ("as-built" diagrams)	Setback distances to nearest houses – once in quarter	POWERGRID	During operations	Being Complied.
Inadequate provision of staff/workers health and safety during operations	Injury and sickness of staff /workers	Careful design using appropriate technologies to minimise hazards	Usage of appropriate technologies (lost work days due to illness and injuries)	Preparedness level for using these technologies in crisis – once each year	POWERGRID	Design and operation	Being Complied.
		Safety awareness raising for staff.	Training/ awareness programs and mock drills	Number of programs and percent of staff /workers covered – once each year			
		Preparation of fire emergency action plan and training given to staff on implementing emergency action plan					
Electric Shock Hazards	Injury/mortality to staff and public	Careful design using appropriate technologies to minimise hazards	Usage of appropriate technologies (number of injury incidents, lost work days)	Preparedness level for using these technologies in crisis – once a month	POWERGRID	Design and Operation	Being Complied.
		Security fences around substations	Maintenance of fences	Report on maintenance – every 2 weeks			
		Barriers to prevent climbing on/dismantling of transmission towers	Maintenance of barriers				

Project activity/stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation on schedule	Compliance Status
		Appropriate warning signs on facilities	Maintenance of warning signs				
		Electricity safety awareness raising in project areas	Training/awareness programs and mock drills for all concerned parties	Number of programs and percent of total persons covered – once each year			
Equipment specifications and design parameters	Release of chemicals and gases in receptors (air, water, land)	Processes, equipment and systems using chlorofluorocarbons (CFCs), including halon, should be phased out and to be disposed of in a manner consistent with the requirements of the Government.	Process, equipment and system design	Phase out schedule to be prepared in case still in use – once in a quarter	POWERGRID	Operations	Being Complied.
Transmission line maintenance	Exposure to electromagnetic interference	Transmission line design to comply with the limits of electro-magnetic interference from overhead lines	Required ground clearance (meters)	Ground clearance - once	POWERGRID	Operations	Designed as per guidelines of ICNIRP and ACGIH and checked by CPRI and PTI, USA.
Noise related	Nuisance to neighbouring properties	Substations sited and designed to ensure noise will not be a nuisance.	Noise levels (dB(A))	Noise levels at boundary nearest to properties and consultation with affected parties if any - once	POWERGRID	Operations	Being Complied.

SECTION: 5 APPROACH AND METHODOLOGY ENGAGED FOR ENVIRONMENT MONITORING OF THE PROJECT

Environmental monitoring is a continuous process throughout the Project life cycle starting from site selection to construction and maintenance state. A Project Management Unit (PMU) has been set up headed by Executive Director (Corporate Planning) at headquarters to coordinate and implement all environment and social issues with the assistance of functional department like Environment & Social Management Deptt., Engineering etc. Apart from site managers review the progress on daily basis and regular project review meetings held at least on monthly basis, chaired by the Executive Director of the region wherein the environmental and social aspects of the projects are discussed and remedial measures taken wherever required. The exceptions of these meetings will be submitted to the Directors and Chairman and Managing Director (CMD).

POWERGRID has a separate monitoring department which carry out real time monitoring of all parameters of project implementation including the environment and social issues. Such issues are discussed in detail during every quarter in the Project Review Meeting (PRM) Chaired by Director (Project). CMD also takes periodic review of project implementation. A summarized environmental monitoring plan with implementation schedule at different stage of subprojects implementation is presented in the table below

Environmental Monitoring Tasks	Implementation Responsibility	Implementation Schedule
Pre-Construction Phase		
Monitor contractor’s detailed alignment survey to ensure relevant environmental mitigation measures in EMP have been included.	POWERGRID with assistance of project implementation unit	Prior to POWERGRID approval of contractor’s detailed alignment survey.
Construction Phase		
Regular monitoring and reporting of contractor’s compliance with contractual environmental mitigation measures.	POWERGRID with assistance of project implementation unit	Continuous as per IEER and EMP throughout construction period.
Operation and Maintenance Phase		
Observations during routine maintenance inspections of substations and transmission lines RoWs. Inspections will include monitoring implementation status of mitigation measures specified in EMP.	POWERGRID	As per POWERGRID inspection schedules and EMP provisions.

SECTION: 6 MONITORING OF ENVIRONMENTAL RECEPTORS/ ATTRIBUTES

It is evident that environmental impacts associated with power transmission project are not far reaching as these developmental activities are non polluting in nature and do not involve any disposal of solid waste, effluents and hazardous substances on land, air and water. Although, there are some localized impacts on natural resources like forest whenever transmission line passes through forest area, however, it can be avoided or minimized through careful route and site selection.

By adopting careful route selection by using modern technique like GPS, GIS, remote sensing etc. the total forest involvement was restricted to only 14.8 km (0.73%) which is insignificant compared to total line length of 2035 km transmission system. Besides this environmental sensitive or protected area like national parks, sanctuaries, eco-sensitive zones, tiger reserves and biosphere reserves etc were completely avoided. Hence, impact on wildlife and its habitat is not anticipated.

The project doesn't have much anticipated impact on environmental attributes like air, water, soil etc. and are mostly concentrated to construction stage. Air quality impact is restricted to the construction phase only as no emissions to air during ordinary operations transmission lines. Impacts on air quality due to airborne dust in the vicinity of the work sites (at points along the route of the transmission line where towers are located) mainly result from excavation and construction activities and tail gases from construction equipments and vehicles. Since all the proposed alignments are accessible, no construction of access roads is envisaged thereby avoiding any airborne dust pollution in the vicinity. The construction activities are small scale and of a temporary nature. Moreover, the activities are not localized to any residential area and are widely dispersed that provide adequate buffering to air environment. Therefore, impacts on air quality from construction activities are considered to be insignificant. No liquid effluent is generated due to project activity. However, small quantities of domestic sewage from staff quarters and construction camp is generated which is treated in local soak pits. Construction of transmission tower foundation, stringing and other activities are mostly manual in nature and use heavy equipment or blasting is not envisaged. The main noise sources during the construction phase are from equipments and transportation vehicles. However, no significant noise nuisance to local communities from construction related activities is anticipated.

SECTION: 7 ANY OTHER MONITORING OF ENVIRONMENTAL ASPECTS, IMPACTS OBSERVED DURING IMPLEMENTATION

Except the predicted impacts as mentioned in EMP, no other unanticipated impacts were observed during the implementation of the project.

SECTION: 8 DEATAILS OF GRIEVENCE REDRESS COMMITTEE AND COMPLAINT RECEIVED AND ACTION TAKEN

POWERGRID has a well establish Grievance Redressal Mechanism (GRM) inbuilt in the process itself to receive complaints and grievances to facilitate concerns of project affected persons (PAPs). In respect to Environment related issues, people intend to move directly to court of law/ National Green Tribunal as the issues are quite important to human life. We are pleased to confirm that no grievances in response to violation/ non-compliance of legal requirements related to environment issues have been received till date.

SECTION: 9 CONCLUSION

It is obvious that the subprojects activities are non-polluting in nature and don't have significant adverse impacts on environment. However, some environmental impacts are observed, mostly during construction period which have been addressed successfully by implementing the EMP. POWERGRID approach starting from selection of most optimum route before design stage, proper implementation of EMP and monitoring mechanism

throughout project life cycle supported by strong institutional arrangement has considerably nullified the adverse impacts arising out of project activities. Moreover, the instant project will help in reducing CO2 emission due to transmission of clean & green hydro power from Northern Eastern Region to Northern & Western Region by replacing thermal power generation that would have required to cater the demand. Besides this, many direct and indirect benefits of the projects like enhanced employment opportunity, improvement in infrastructure, improved business opportunity will outweigh the likely negative impacts of the project.

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