

# Semi-Annual Environmental Monitoring Report

Loan Number : 2415–IND & 2510–IND

Reporting period : January 2011 to June 2011

## 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  $\pm 800$ 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 (8x250MW=2000MW) and Kameng (4x150MW=600MW) 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 &  $\pm 800$ kV HVDC Terminal is proposed. Transfer of bulk power from this Terminal Stn. (Biswanath Chariyali) has been proposed through  $\pm 800$ 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  $\pm 800$  kV High Voltage Direct Current (HVDC) Northern-Northern/Western Interconnector project, ADB has approved a Multitranche Financing Facility of \$ 400 million & \$ 200 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 28<sup>th</sup> March 2008 and became effective from 25<sup>th</sup> June 2008. The loan closing date is on 30<sup>th</sup> June 2013 whereas loan for Tranche – 2 was signed on 27<sup>th</sup> March 2009 and became effective from 18<sup>th</sup> May 2009. The loan closing date is on 30<sup>th</sup> June 2014.

### **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  $\pm 800$  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  $\pm 800$  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)  $\pm$ 800 kV, 6000 MW HVDC Bipole line from Biswanath Chariali – Agra - 1812 km
- ii) Earth electrode line at Biswanath Chariali end - 72 km
- iii) Earth electrode line at Agra end - 80 km

**(Note:- Loan No. 2415-IND (Tranche-1) & Loan No.2510-IND (Tranche-2) include only transmission line facilities whereas Substation facilities for this project is excluded from above two loan 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 having least environment impacts.
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 June 2011	Implementation Schedule
$\pm$ 800 kV HVDC Northeastern - Northern/Western Interconnector	<b>Transmission System</b> <ul style="list-style-type: none"> <li>• <math>\pm</math> 800 kV, 6000 MW HVDC bi-pole Transmission Line from Biswanath Chariyali (Assam) to Agra (Uttar Pradesh) - 1812 km</li> <li>• Earth electrode line at Biswanath Chariali end - 72 km</li> <li>• Earth electrode line at Agra end - 80 km</li> </ul>	Out of total 4228 nos. of Tower, about 1800 nos. of foundations and 600 Nos. tower erections have been completed	30 <sup>th</sup> June 2013

**SECTION 2 : COMPLIANCE STATUS WITH APLICABLE 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 <sup>th</sup> May 1992 under the EPA, 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, 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 14.39 km (50.9 ha.) of forest land along the 1964 km transmission system including earth electrode lines. POWERGRID has submitted forest diversion proposals to obtain clearance from Ministry of Environment and Forest which are under various stage of approval. The State wise details of forest involved and status of forest clearance are presented below in <b>Table-1</b> .
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 of only in authorised disposal facility (registered recyclers/ reprosorsors). Half-yearly return (Form -13) for the same is to be submitted to the concerned State Pollution Control Board.	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.
5	Ozone Depleting Substances (Regulation and Control) Rules, 2000	Controls and regulations specified on manufacturing, import, export, and use of CFC compound.	Restricting the use of equipments containing ozone depleting substances by specifying in tender document and also phasing out all existing equipments that use ODS.

S. No.	Legal Requirements Act/Rules/Guidelines	Applicable Attributes	POWERGRID's Compliance Status
6.	The Biological Diversity Act, 2002	This act is not directly applicable to transmission projects because it deals with the conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith.	Not applicable as no transmission line under the subprojects passes through Biosphere Reserves.

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

Sl no.	Name of Line/Length	Forest stretch (in km)	Forest Stretch (in Ha.)	State	Status of Forest Clearance
1.	Earth Electrode line at Biswanath Chariyali end, 72 kms.	10.27	22.55	Assam	In-principle clearance obtained in 17 <sup>th</sup> Nov 2009 from Ministry of Environment & Forest (MoEF).  POWERGRID has deposited CA & NPV Cost and the revised compliance report has been submitted to Nodal Officer on 16.07 2011.
2.	+800 kV HVDC bipole Islampur – Gorakhpur, 575 kms.	1.76	12.146 (SF)	Bihar	Only <b>Social forestry</b> involved.  Forest Divisions involved : Saharsa, Purnea, Araria, Madhepura, Kishenganj, Darbhanga, Samastipur, Chapra, Muzaffarpur, Shiwan, Gopalganj  Presently proposal for Saharsa, Darbhanga, and Samastipur& Muzaffarpur divisions are at PCCF, Bihar.
3.	+800 kV HVDC bipole Gorakhpur – Lucknow, 190.5 kms.	0.515	3.56 (SF)	U.P.	Only <b>Social forestry</b> involved.  Forest Divisions involved: Gorakhpur, Basti & Faizabad.  Forest proposal for Gorakhpur (0.2208 Ha) is with RMoEF, Lucknow for issuance of In-principle clearance.  In principle clearance for Basti (0.2208 Ha) obtained from RMoEF, Lucknow on 24.09.2010.
4.	+800 kV HVDC bipole Lucknow –Agra, 383 kms.	1.79	12.363	U.P.	Proposal for Forest Division of Kanpur Dehat, Kanpur Nagar, Unnao, Lucknow, Barabanki have been forwarded to RMoEF,Lucknow Proposal for Forest Division of Agra,Etawah & Firozabad have been forwarded to CCF,Kanpur
5.	Earth electrode line at Agra, 65 kms.	0.06	0.28	U.P.	Forest proposal submitted to DFO, Agra on 18.07.09
<b>Total</b>		<b>14.395</b>	<b>50.8985</b>		

**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
<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, Schedule 5, para 4.</p>	<p>Complied with.</p> <p>All project facilities are being assessed, designed, implemented, and constructed in accordance with all applicable environmental laws &amp; regulations and ADB's Environment Policy, 2002.</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>Approved EMP and the mitigation measures as included in IEE are being implemented.</p> <p>Approved EMP and the mitigation measures are part of contract/bidding documents</p> <p>Will be complied with</p> <p>Will be complied with</p> <p>Being complied with. EMP &amp; Compensation Plan for Temporary Damages (CPTD) status are being submitted periodically to ADB.</p> <p>Will be complied with</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</p>	<p>LA, Sch. 5, para. 6</p>	<p>Complied with.</p> <p>The project involves only forest land i.e 14.39 km forest</p>





**TABLE – 2 : ENVIRONMENT MANAGEMENT PLAN**

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule	Compliance Status
<b>Pre-construction</b>							
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 policy 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	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	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 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 policy 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 policy is part of survey contract.
Transmission line through forestland	Deforestation and loss of biodiversity	Avoid encroachment by careful site and alignment selection	Tower location and line alignment selection (distance to nearest protected or reserved forest)	Consultation with local authorities - once	POWERGRID	Part of detailed siting and alignment survey/design	Route alignment finalised by taking consideration of minimum impact on forest area after consultation with concerned authorities. Forest Clearance from MoEF under progress
		Minimise the need by using existing towers, tall towers and RoW, wherever possible		Consultation with local authorities and design engineers - once			
		Obtain statutory clearances from the Government	Statutory approvals from Government	Compliance with regulations – once for each subproject			

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule	Compliance Status
Encroachment into farmland	Loss of agricultural productivity	Use existing tower footings/towers wherever possible	Tower location and 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 and 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	
			Statutory approvals for tree trimming /removal	Compliance with regulations – once for each subproject		Part of detailed siting and alignment survey /design	
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 policy is part of survey contract.
<b>Construction</b>							
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 with.  Low noise producing machinery/ equipments are being used

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule	Compliance Status
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	Construction on farm land undertaken mostly during post harvest period. Wherever crop loss occurs compensation paid to farm owners
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	Complied with. 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. However, some short approach road are being constructed only where there is no alternative
Temporary blockage of utilities	Overflows, reduced discharge	Temporary placement of fill in drains/canals not permitted.	Temporary fill placement (m <sup>3</sup> )	Absence of fill in sensitive drainage areas - every 4 weeks	POWERGRID (Contractor through contract provisions as	Construction period	Complied with

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule	Compliance Status
					per Sec-II, 2.6)		
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 <sup>2</sup> )	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
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 <sup>2</sup> )	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	Illegal wood /vegetation harvesting (area in m <sup>2</sup> , 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

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule	Compliance Status
		continuing current legal activities).					
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 <sup>3</sup> )	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
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 <sup>3</sup> ) 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 <sup>3</sup> ) 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

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule	Compliance Status
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 per Sec-II, 2.8 ) Sec-II, 2.5 & Sec-II, 2.7	Construction period	No complaints received from local peoples/ authorities
		Ensure existing irrigation facilities are maintained in working condition	Status of existing facilities				
		Protect /preserve topsoil and reinstate after construction completed	Status of facilities (earthwork in m <sup>3</sup> )				
		Repair /reinstate damaged bunds etc after construction completed	Status of facilities (earthwork in m <sup>3</sup> )				
	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.
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 <sup>2</sup> ; amount of bunds constructed [length in meter, area in m <sup>2</sup> , or volume in m <sup>3</sup> ])	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					



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule	Compliance Status
		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 per Sec-II, 2.8)	Construction period	Complied
		As much as possible existing access ways will be used.	Design basis and layout	Incorporating good design engineering practices – once for each site			Complied
		Productive land will be reinstated following completion of construction	Reinstatement of land status (area affected, m <sup>2</sup> )	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	Construction period	Complied
		Contractor to prepare and implement a health and safety plan.					

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule	Compliance Status
		Contractor to arrange for health and safety training sessions			also Safety precautions in Special Contract Condition 43.2)		
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	<p>Provided proper training and have very good environmental monitoring process.</p> <p>Appropriate clause incorporated in contact provision for EMP implementation. Site managers review the implementation on daily basis.</p>
		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			
		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			
<b>Operation and Maintenance</b>							
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	Will be Complied.
Oil spillage	Contamination of land/nearby water bodies	Substation transformers located within secure and	Substation bunding (Oil sump) (“as-built”	Bunding (Oil sump) capacity and permeability	POWERGRID	During operations	Will be Complied.

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule	Compliance Status
		impervious sump areas with a storage capacity of at least 100% of the capacity of oil in transformers and associated reserve tanks.	diagrams)	- once			
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	Will be 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	Will be 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				
		Appropriate warning signs on facilities	Maintenance of warning signs				

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule	Compliance Status
		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 cholorofluorocarbons (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	Complied.
Transmission line maintenance	Exposure to electromagnetic interference	Transmission line design to comply with the limits of electromagnetic interference from overhead power 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	Will be Complied.

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

Environmental monitoring is a continuous process through out 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 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

<b>Environmental Monitoring Tasks</b>	<b>Implementation Responsibility</b>	<b>Implementation Schedule</b>
<b>Pre Construction Phase</b>		
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.
<b>Construction Phase</b>		
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.
<b>Operation and Maintenance Phase</b>		
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 forest involvement was restricted to only 14.39 km (0.7% ) which is insignificant compared to total line length of 1964 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, there is no impact on wildlife and its habitat.

The proposed 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) as a result mainly of 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 subprojects.

#### **SECTION: 8 DEATAILS OF GRIEVENCE REDRESS COMMITTEE AND COMPLANINT 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). POWERGRID set up a formal Grievance Redressal Committee (GRC) whenever the project involves acquisition of private land for establishment of substation. Since the scope of subject loan doesn't include any substation package, grievances redress process for PAPs in Substation area is not covered in this report. However for transmission line, the GRM process is in built in the tree & crop compensation process where affected persons are given a chance to place their grievances after issuance of notice by revenue officials on the basis of assessment of actual damages. Grievances received towards compensation are generally addressed in open forum and in the presence of many witnesses. Process of spot verification and random checking by the district collector also provides forum for raising the grievance towards any irregularity/complaint. Apart from this POWERGRID officials also listen to the complaints of affected farmers and the same are forwarded to revenue official for doing

the needful and, if required POWERGRID takes necessary action to mitigate the concern of the affected. Certain grievances of Project Affected Person (PAP) regarding compensation and community development works were received and same has been addressed as per the norms.

## **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 anticipated, mostly during construction period which have been mitigated successfully by implementing the EMP. POWERGRID approach of project implementation involving selection of optimum route before design stage, proper implementation of EMP and monitoring mechanism through out project life cycle supported by strong institutional arrangement has considerably nullified the adverse impacts arising out of project activities. Moreover, the project will also reduces carbon footprint by transmitting the clean/green hydro power with negligible environment impact by replacing thermal generation which otherwise would have emitted 257 million tons of CO<sub>2</sub> during the 30 year lifecycle of the project. Besides this, direct or indirect beneficial impacts of the subprojects like the employment opportunity, improvement in infrastructure facilities, improved business opportunity will outweigh the negative impacts of the project.

**Signed by:**

**R.K.SRIVASTAVA  
DGM, ESMD**