

# Environmental Monitoring Report

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Semestral Report  
Project Numbers: 44426-014/44917-014  
July 2015

Period: October 2014 – March 2015

## IND: National Grid Improvement Project

Prepared by Power Grid Corporation of India Limited for the Asian Development Bank.

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(भारत सरकार का उद्यम)

POWER GRID CORPORATION OF INDIA LIMITED

(A Government of India Enterprise)



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सदम संख्या / Ref. No.

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Date: June 23, 2015

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Sub: Loan 2787-IND & 2788-IND: National Power Grid Development Investment Program - Semi-Annual Environmental Monitoring Report for the period of October, 2014 - March, 2015.

Dear Madam,

This has reference to submission of Semi-Annual Environmental Monitoring Report under ADB-VII&VIII Loan (Loan Nos. 2787-IND & 2788-IND).

As part of the compliance requirement to loan covenants of subject Loan(s) (Ln 2787: Schedule 5, para 19 and Ln 2788: Clause 17.6), Semi-Annual Environmental Monitoring Report for the period of October, 2014 - March, 2015 is attached, please.

Thanking you,

Yours faithfully,

*S. Kumar* 23.6.15

(Sathish Kumar J.)  
Dy. General Manager (CP)

Attach.: As above

Copy to:

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स्वहित एवं राष्ट्रहित में ऊर्जा बचाएं  
Save Energy for Benefit of Self and Nation

# Semi-Annual Safeguard Monitoring Report

**Loan Number : 2787-IND & 2788 -IND**

**Reporting Period : Oct.'14 to Mar'15**

## **National Grid Improvement Project**

**Prepared by : ESMD, CORPORATE CENTRE, POWERGRID**

**Implementing Agency : POWERGRID**

**Executing Agency : POWERGRID**

**Date : 19/06/2015**

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## ABBREVIATIONS

ADB	- Asian Development Bank
APs	- Affected Persons
CEA	- Central Electricity Authority
CTU	- Central Transmission Utility
EA	- Executing Agency
EIA	- Environment Impact Assessment
ESPP	- Environment and Social Policy & Procedures
ESMD	- Environment & Social Management Department
EMF	- Electro Magnetic Fields
EMP	- Environmental Management Plan
GIS	- Gas Insulated Switchgear
GO	- Government Order
GoI	- Government of India
GRM	- Grievances Redressal Mechanism
GRC	- Grievance Redressal Committee
HVDC	- High Voltage Direct Current
IEE	- Initial Environmental Examination
IPP	- Independent Power Producer
km	- Kilometers
LTOA	- Long-Term Open Access
MoEF	- Ministry of Environment and Forests
PAPs	- Project Affected Persons
POWERGRID	- Power Grid Corporation of India Ltd.
PMU	- Project Management Unit
RoW	- Right of Way
RAP	- Rehabilitation Action Plan
S/s	- Substation
WR	- Western Region
NR	- Northern Region

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## SECTION 1: INTRODUCTION

Power Grid Corporation of India Ltd. (POWERGRID), the Central Transmission Utility (CTU) of the country, is engaged in power transmission with the mandate for planning, co-ordination, supervision and control over complete Inter-State transmission system. It has been contributing significantly towards development of Indian power sector by undertaking coordinated development of power transmission network along with effective and transparent operation of regional grids and through continuous innovations in technical & managerial fields

POWERGRID has received a nos. of Long-Term Open Access (LTOA) applications from Independent Power Producer (IPP) generation projects coming up in Chhattisgarh for transfer of power to different target regions viz. Western and Northern region. It is estimated that IPP generation projects with long-term power transfer requirement of about 15000-16000 MW is coming up in Raigarh (Kotra), Champa, Raigarh (Tamnar) and Raipur generation complex in Chhattisgarh progressively in next 3-4 years. Out of the 15000-16000 MW quantum of power transfer requirement, about 5000 MW power is indicated for transfer to Northern region as the target region and balance power is to be transferred to the Western region. For evacuation and transfer of power from these generation projects, 765/400kV High Capacity Pooling stations viz. at Raigarh (Kotra), Raigarh (Tamnar), Raipur and Champa is proposed. However, considering the quantum of power transfer requirement (about 5000 MW) to Northern region, it is proposed that a new high capacity transmission corridor may be developed to effect above transfer.

Based on the discussion with IPPs and Central Electricity Authority (CEA) as well in the 29th & 30th Standing Committee meeting on Power System planning in Western region/11<sup>th</sup> meeting of WR constituents regarding LTOA application in WR, transmission system for above generation projects in Chhattisgarh with power transfer requirement to target regions was agreed. Looking at the transmission system requirement for transfer of power to Northern/Western region from generation projects coming up in Chhattisgarh, a comprehensive transmission scheme on system strengthening in Western- Northern inter-regional HVDC transmission corridor is proposed.

Presently, North-West inter-regional transmission corridors are being developed with AC technology. However, considering the long distance as well quantum of power transfer requirement to NR from IPP generation projects in Chhattisgarh, it is proposed that power from IPP generation projects in Chhattisgarh can be transferred over HVDC system. Development of such HVDC transmission corridors shall facilitate in establishing transmission corridors with hybrid technology. This shall also facilitate in meeting controlled power flow requirement, flexibility of operation as well as maintaining system parameters within limits through its control mechanism. For this  $\pm 800$ kV, 3000MW HVDC bipole between Champa Pooling Station and Kurukshetra, a major load center in NR is proposed. For power transfer from Kurukshetra onwards, a 400kV transmission corridor towards Nakodar/ Jalandhar in Punjab is proposed. It is also proposed that provision should be kept to upgrade above HVDC Bipole to 6000MW at a later date with increased power transfer requirement to Northern region.

To meet the funding requirement for the proposed project, Asian Development Bank (ADB) has accepted POWERGRID proposal to finance a loan of USD 750 million (USD 500 million as Sovereign & USD 250 million as Non-Sovereign) for implementation of HVDC Sub-Station at Champa & Kurukshetra and some package of transmission line. The funding for the remaining part will be met from POWERGRID's own Internal

Resources (IR). The loan was signed on 30<sup>th</sup> March, 2012 and became effective from 22<sup>nd</sup> October, 2012. The loan closing date is 30<sup>th</sup> June, 2017.

### 1.1 OVERALL PROJECT DESCRIPTION

The National Grid Improvement Project covered under Loan No. 2787-IND and 2788-IND involves establishment of HVDC Inter-regional transmission system between the Northern (Haryana) and Western (Chhattisgarh) regions. The detail scope of the project covered under above loans include following transmission facilities:

1. Construction of  $\pm 800$ kV HVDC Bipole between Champa (in Chhattisgarh) and Kurukshetra (in Haryana)
2. Establishment of 800kV HVDC terminals at Champa and Kurukshetra

### 1.2 PROJECT OBJECTIVES

The objective of the project is to provide transmission arrangement so as to transfer power from future IPP generation projects in the State of Chhattisgarh to Northern and Western region with reliability and security.

### 1.3 ENVIRONMENTAL CATEGORY

As per the Asian Development Bank's (ADB) classification of project on the basis of potential environmental impacts, the National Grid Improvement Project is classified as Environmental Category 'B'.

### 1.4 ENVIRONMENTAL PERFORMANCE INDICATOR:

The following parameters are 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 & COMPLETION SCHEDULES

Name of project	Project Details	Progress as on Mar.' 2015	Completion Schedule
Establishment of HVDC inter-Regional Transmission System between the Northern (Haryana) and Western (Chhattisgarh) Regions	<b>Transmission Line:</b> Construction of $\pm 800$ kV HVDC Bipole between Champa (in Chhattisgarh) and Kurukshetra (in Haryana) <b>Substation:</b> Establishment of 800kV HVDC terminals at Champa and Kurukshetra	Civil work and engineering activities are under progress.	June' 2015

**SECTION 2 : COMPLIANCE STATUS WITH APPLICABLE STATUTORY REQUIREMENTS:**

S. No.	Legal Requirements	Applicable Attributes	POWERGRID's Compliance Status
1.	Forest (Conservation) Act, 1980	This Act is applicable whenever a transmission line traverses 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 57.54 km (397.053 ha.) of forest land enroute of 1365 km of Bipole line. POWERGRID has submitted forest diversion proposals to respective States for obtaining clearance from Ministry of Environment and Forest. Details of forest clearance status are presented in Table-1.
2.	Batteries (Management and Handling) Rules, 2001	To avoid/minimize lead pollution, 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 the instant project is under implementation phase, no used batteries have been replaced so far.
3.	Hazardous Wastes (Management, Handling and Transboundary Movement) Amendment Rules, 2008	As per the notification, used mineral oil is categorized as hazardous waste and require proper handling, storage and disposed only to authorised disposal facility (registered recyclers/reprocessors). Annual return (Form -13) for the same is to be submitted to the concerned State Pollution Control Board.	Transformer oil (Used mineral oil) is changed only after 10-15 years of operation Since the instant project is under implementation phase, oil change/ replacement is not envisaged at present.
4.	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/supply of CFC compound.

**Table – 1: Details of Forest Clearance Status**

Sl. No	Transmission line section	Forest involved (in km)	Forest involved (in Ha.)	Name of the State(s)	Status
1.	Western Region-I portion of the HVDC line	28.00	193.161	Chhattisgarh	In-principle approval issued on 28th Aug.'14. State Govt. forwarded compliance report to MoEF & CC on 17 <sup>th</sup> Dec.'14 for Stage-II approval. MoEF&CC on 27 <sup>th</sup> Feb'15 asked state govt. for submission of undertakings. State Govt forwarded clarifications to MoEF&CC on 11 <sup>th</sup> Mar.'15. However, Working permission issued on 07 <sup>th</sup> Jan'15.
2.	Western Region-II portion of the	28.4	196.008	MP	Shahdol (5.813 ha), Annupur (7.667 ha.), Jabalpur (14.190 ha.), Dindori (4.558 ha.), Sagar (19.710 ha.), Chattarpur (56.73 ha.)



	HVDC line				& Damoh (87.34 ha): Forest proposal for all divisions submitted to concerned forest authorities in Aug.'13. Combined proposal of all seven divisions forwarded to CCF, Sagar on 17 <sup>th</sup> Dec.'14. CCF, Sagar forwarded proposal to Nodal Officer on 20 <sup>th</sup> Dec.'14 and subsequently forwarded to Secretary Forest on 23 <sup>rd</sup> Jan.'15. Proposal forwarded to APCCF, Bhopal on 02 <sup>nd</sup> Mar'15.
3.	Northern Region-I portion of the HVDC line	1.0	6.88	UP	Banda-Etawah Section (1.68 ha): Mahoba (0.1932 ha), Jalaun (0.4554 ha), Etawah (1.035 ha): Proposal uploaded online. Part-II Form uploaded from DFO. FRA certificate obtained. Etawah- Bulandshar Section (3.44 ha): Proposals for Etah (0.57 Ha)/ Aligarh (0.46 Ha)/ Kasganj (0.9315 ha) forwarded to CF, Aligarh and CF, Aligarh has asked for revised FRA certificate along with enclosures & same are received and submitted to NO, Lucknow. NO, Lucknow has requested to submit the revised Digital map which is awaited. Proposal for Bulandshar (0.53) and Mainpuri (0.9591 ha) forwarded to NO. NO has again raised queries in Dec'14 which are under preparation. Bulandshar-Kurukshetra Section (1.76 ha): Proposal forwarded to RMoEF, Lucknow on 05 <sup>th</sup> Jan.'15. RMoEF, Lucknow on 05 <sup>th</sup> Feb.'15 has raised few clarifications and same submitted on 13 <sup>th</sup> Mar.'15.
		0.14	1.004	Haryana	In-principle and final approval obtained on 24 <sup>th</sup> Jun.'14 and 29 <sup>th</sup> Aug.'14 respectively.
<b>Total</b>		<b>57.54</b>	<b>397.053</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
The Borrower shall ensure that the preparation, design, construction, implementation, operation and decommissioning of the Project and all Project facilities comply with (a) all applicable laws and regulations of the Guarantor and the relevant States relating to environment, health and safety; (b) the ESPP; (c) the Environmental Safeguards; and (d) all measures and requirements set forth in the IEE, the EMP, and any corrective or preventative actions set forth in the Safeguards Monitoring Report.	LA, Sch. 5, para. 12	Being complied.

The Borrower shall ensure that (a) the Project and/or Project facilities are not located within national parks, forests, and wildlife sanctuaries, unless prior environmental clearances are obtained from the relevant government agencies; (b) the monuments of cultural or historical importance are avoided; and (c) works do not commence without obtaining prior forest clearances, wherever applicable.	LA, Sch. 5, para. 13	Being complied.
In the event irrigation supplies are disrupted and affected farmers experience losses, the Borrower shall ensure that a provision is made for independent valuation of the losses and timely compensation in respect thereof.	LA, Sch. 5, para. 16	Being complied.
The Borrower shall make available necessary budgetary and human resources to fully implement the EMP, the CPTD and the RP.	LA, Sch. 5, para. 17	Complied.
The Borrower shall ensure that all bidding documents and contracts for works contain provisions that require contractors to: (a) comply with the measures relevant to the contractor set forth in the IEE, the EMP, the CPTD and the RP (to the extent they concern impacts on affected people during Construction), and any corrective or preventative actions set forth in the Safeguards Monitoring Report; (b) make available a budget for all such environmental and social measures; (c) provide the Borrower with a written notice of any unanticipated environmental, resettlement or indigenous peoples risks or impacts that arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, the CPTD and the RP; (d) adequately record the condition of roads, agricultural land and other infrastructure prior to starting to transport materials and construction; and (e) reinstate pathways, other local infrastructure, and agricultural land to at least their pre-project condition upon the completion of construction.	LA, Sch. 5, para. 18	Complied
The Borrower shall do the following: (a) submit semiannual Safeguards Monitoring Reports to ADB and disclose relevant information from such reports to affected persons promptly upon submission; (b) if any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, the CPTD and the RP, promptly inform ADB of the occurrence of such risks or impacts, with detailed description of the event and proposed corrective action plan;	LA, Sch. 5, para. 19	Being complied.  No such issues come across till date.

<p>(c) report any actual or potential breach of compliance with the measures and requirements set forth in the EMP, the CPTD and the RP promptly after becoming aware of the breach; and</p> <p>(d) in the event unexpected significant safeguard impacts are identified, promptly engage qualified and experienced external expert or agency under terms of reference intimated to ADB, to verify information produced through the Project monitoring process, and facilitate the carrying out of any verification activities by such external experts.</p>		<p>Will be complied in case of any breach. But till date no such breach reported. Will be complied if such situation warrants.</p>
<p>The Borrower shall ensure that subsequent to award of works contract, no works are commenced by the contractor unless the applicable provisions of the IEE, the EMP, the CPTD and the RP, as approved by ADB, have been complied with.</p>	<p>LA, Sch. 5, para. 20</p>	<p>Compliance ensured</p>
<p>Any changes to the location, land alignment, or environment impacts on account of detailed designs of the Project shall be subject to prior approval by ADB before commencement of works for transmission lines under the Project.</p>	<p>LA, Sch. 5, para. 22</p>	<p>No such deviation reported so far.</p>

#### **SECTION: 4 COMPLIANCE STATUS WITH ENVIRONMENT MANAGEMENT AND MONITORING PLAN STIPULATED IN IEER AND AS AGRRED WITH ADB**

The instant project is being implemented as per approved IEE and EMP and in accordance with applicable laws & ADB's Safeguard Policy Statement, 2009. POWERGRID has prepared Initial Environmental Examination (IEE) reports including Environmental Management Plan (EMP) and mitigation measures to ensure that all the anticipated environment 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 as required. A summary of the environmental mitigation measures and monitoring requirements vis-a vis to compliance status by POWERGRID's is given in **Table 2**.

TABLE – 2 : ENVIRONMENT MANAGEMENT PLAN

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement & 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 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 not 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 Govt..	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		Part of equipment and process design	Complied
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
Substation location and design	Exposure to noise	Design of plant enclosures to comply with noise regulations.	Expected noise emissions based on substation design	Compliance with regulations - once	POWERGRID	Part of detailed siting survey and design	Complied

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement & 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 or agricultural land.	Tower location and line alignment selection (distance to water and/or agricultural land)	Consultation with local authorities and land owners - once	POWERGRID	Part of tower siting survey and detailed alignment survey and design	Complied during survey. Route alignment criterion 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	
Involuntary resettlement or land acquisition	Social inequities	Compensation paid for temporary/permanent loss of productive land as per LAA and its process	RAP implementation	Consultation with affected parties – once in a quarter	POWERGRID	Prior to construction phase	Progressive social entitlement framework is part of policy and implemented in true spirit
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 - once	POWERGRID	Part of detailed siting and alignment survey /design	Complied during survey. Route alignment criterion is part of survey contract. An area of 397,053 ha (57.54 Km) is falling within forest land in the states of Madhya Pradesh, Chhattisgarh, Uttar Pradesh and Haryana. However, the alignments do not encompass any National Parks/Sanctuaries or other protected / sensitive areas.

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement & frequency	Institutional responsibility	Implementation schedule	Compliance Status
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	Complied. 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			
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/ removed)	Consultation with affected parties – once in a quarter		Part of detailed siting and alignment survey /design	
			Statutory approvals for tree trimming /removal	Compliance with regulations – once for each subproject			Forest Clearance from MoEF under Forest (Conservation) Act, 1980 is in progress

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement & frequency	Institutional responsibility	Implementation schedule	Compliance Status
Noise related	Nuisance to neighbouring properties	Substations sited and designed to ensure noise will not be a nuisance.	Noise levels	Noise levels to be specified in tender documents – once	POWERGRID	Part of detailed equipment design	Proper monitoring of noise level at regular interval (maximum noise limit is 80 (dB)A as per technical specification for transformer- Cl. 6.0.20)
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 criterion is part of survey contract.
Escape of polluting materials	Environmental pollution	Transformers designed with oil spill containment systems, and purpose-built oil, lubricant and fuel storage system, complete with spill cleanup equipment.	Equipment specifications with respect to potential pollutants	Tender document to mention specifications - once	POWERGRID	Part of detailed equipment design /drawings	Complied. Oil sump of sufficient capacity (200% by volume of oil tank in transformer) is provided for every transformer.
		Substations to include drainage and sewage disposal systems to avoid offsite land and water pollution.	Substation sewage design	Tender document to mention detailed specifications - once	POWERGRID	Part of detailed substation layout and design /drawings	Complied. Provision of soak pit is part of design where sewage line is not present.
Explosions /Fire	Hazards to life	Design of substations to include modern fire control systems/firewalls.	Substation design compliance with fire prevention and control codes	Tender document to mention detailed specifications - once	POWERGRID	Part of detailed substation layout and design /drawings	Complied. Fire fighting equipments are integral part of Substation design
		Provision of fire fighting equipment to be located close to transformers.					
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	POWERGRID (Contractor through contract provisions as per Sec- VII, 44.7)	Construction period	Complied.  Low noise producing machineries/ equipments are being used.

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement & 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	phase 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. (Compensation Amount paid shall be provided in Social Monitoring Report)
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 are used for construction activity. However, some short approach roads are being constructed only where there is no alternative.



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement & frequency	Institutional responsibility	Implementation schedule	Compliance Status
	Increased land requirement for temporary accessibility	New access ways restricted to a single carriageway width within the RoW.	Access width (meters)	Access restricted to single carriage-way width within RoW - every 2 weeks	POWERGRID (Contractor through contract provisions as per Sec-II, 2.8)	Construction period	Complied/ Being Complied
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 per Sec-II, 2.6)	Construction period	Complied/ Being Complied
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/ Being Complied
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/ Being Complied

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement & frequency	Institutional responsibility	Implementation schedule	Compliance Status
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 harvesting (area in m <sup>2</sup> , number of incidents reported)	Complaints by local people or illegal harvesting - every 2 weeks	POWERGRID (Contractor through contract provisions as per Sec-II, 2.3)	Construction period	No complaints received on illegal harvesting
		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.
Vegetation	Runoff to cause water pollution, solid waste disposal	Soil excavated from tower footings disposed of by placement along roadides, 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	Complited/Being Complited
Site clearance	Vegetation	Tree clearances for easement establishment to only involve cutting trees off at ground level or pruning as appropriate, with tree stumps and roots left in place and ground cover left undisturbed	Ground disturbance during vegetation clearance (area, m <sup>2</sup> )	Amount of ground disturbance - every 4 weeks	POWERGRID (Contractor through contract provisions)	Construction period	Regulated felling of tree in RoV is carried out with permission of owner & keeping required electrical clearance as per design. All felled trees are handed over to owner for disposal.
Tower construction –	Waste disposal	Excess fill from tower foundation excavation	Location and amount (m <sup>3</sup> ) of fill	Appropriate fill disposal	POWERGRID (Contractor provisions)	Construction period	Complited/Being Complited

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement & frequency	Institutional responsibility	Implementation schedule	Compliance Status
disposal of surplus earthwork/fill		disposed of next to roads or around houses, in agreement with the local community or landowner	disposal	locations - every 2 weeks	through contract provisions as per Sec-II, 2.6 & Sec-VIII, 43.5)		
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
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	Construction period	Being complied. 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> )				

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement & frequency	Institutional responsibility	Implementation schedule	Compliance Status
		Repair /reinstate damaged bunds etc after construction completed	Status of facilities (earthwork in m <sup>3</sup> )		& Sec-II, 2.7		
	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. (Amount shall be provided 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 <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/ Being Complied
		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 per Sec-II, 2.8)	Construction period	No complaints received
		As much as possible existing access ways will be used	Design basis and layout	Incorporating good design engineering practices– once for each site			Complied/ Being Complied

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement & frequency	Institutional responsibility	Implementation schedule	Compliance Status
		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
Inadequate siting of borrow areas	Loss of land values	Existing borrow sites will be used to source aggregates, therefore, no need to develop new sources of aggregates	Contract clauses	Incorporating good construction management practices – once for each site	POWERGRID (Contractor through contract provisions)	Construction period	Complied/ Being Complied
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 spe. contract Condition 43.2)	Construction period	Complied/ Being Complied
		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	Provides proper training and have very good environmental monitoring process.

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement & frequency	Institutional responsibility	Implementation schedule	Compliance Status
		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 clause incorporated in contract provision for EMP implementation. Site managers review the implementation on daily basis.
		Appropriate contract 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			
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	Designed as per guidelines of ICNIRP and ACGIH and checked by CPRI and M/s PTI, USA
Equipment submerged under flood	Contamination of receptors (land, water)	Equipment installed above the high flood level (HFL) by raising the foundation pad.	Substation design to account for HFL ("as-built" diagrams)	Base height as per flood design - once	POWERGRID	During operations	Safety margin of 300 mm above the HFL is part of all foundation design.
Oil spillage	Contamination of land/nearby water bodies	Substation transformers located within secure and impervious sump areas with a storage capacity of at least 100% of the capacity of oil in transformers and associated reserve tanks.	Substation bunding (Oil sump), ("as-built" diagrams)	Bunding (Oil sump) capacity and permeability - once	POWERGRID	During operations	Oil sump of sufficient capacity (200% by volume of oil tank in transformer) is provided for every transformer.

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement & frequency	Institutional responsibility	Implementation schedule	Compliance Status
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	In design and operation, standards of safety procedure followed. Proper safety training to all workers and primary safety kits/PPEs are provided in every site. Regular mock drills on fire and other occupational hazards will be organised.
		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					
		Provide adequate sanitation and water supply facilities	Provision of facilities	Complaints received from staff /workers every 2 weeks			
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 technology in crisis – once a month	POWERGRID	Design and Operation	Will be complied. Used of technology which trip the line in fraction of seconds to prevent hazards
		Security fences around substations	Maintenance of fences	Report on maintenance – every 2 weeks			Security fences will be maintained at every substation.
		Barriers to prevent climbing on/dismantling of transmission towers	Maintenance of barriers				Sufficient barriers will be maintained
		Appropriate warning signs on facilities	Maintenance of warning signs				Warning system will be maintained for alarm

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement & 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			Regular mock drills on electric and other occupational hazard will be organised
Operations and maintenance staff skills less than acceptable	Unnecessary environmental losses of various types	Adequate training in O&M to all relevant staff of substations & transmission line maintenance crews.	Training/awareness programs and mock drills for all relevant staff	Number of programs and percent of staff covered – once each year	POWERGRID	Operation	Training will be imparted regular interval
		Preparation and training in the use of O&M manuals and standard operating practices.					
Inadequate periodic environmental monitoring.	Diminished ecological and social values.	Power Grid staff to receive training in environmental monitoring of project operations and maintenance activities.	Training/awareness programs and mock drills for all relevant staff	Number of programs and percent of staff covered – once each year	POWERGRID	Operation	Training will be imparted regular interval
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 Govt.	Process, equipment and system design	Phase out schedule to be prepared in case still in use – once in a quarter	POWERGRID	Operations	Will be 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 M/s PTI, USA.
Noise related	Nuisance to neighbouring	Substations sited and designed to ensure noise will	Noise levels (dB(A))	Noise levels at boundary	POWERGRID	Operations	Will be complied



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement & frequency	Institutional responsibility	Implementation schedule	Compliance Status
	properties	not be a nuisance.		nearest to properties and consultation with affected parties if any - once			

## 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 & 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
<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 total forest involvement was restricted to 57.54 km which is only 4.2 % of total line length of 1365 km Bipole line. Besides this environmental sensitive/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 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) 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 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 discharged 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 level variation 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 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). As a regular practice, wherever fresh land acquisition is involved, a committee is formed comprising of POWERGRID officials, representatives of local authorities, PAPs, Gram Panchayat and well-reputed person to address the grievances of the affected persons. However, in the instant project for Kurukshetra terminal station, no such committee is needed since the land area of 116.47 ha. acquired is a Panchayat land and in case of Champa terminal station the private land has been acquired with negotiated settlement/consent award where PAPs have been consented for not moving to court regarding compensation issues.

In case of 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.

## **SECTION: 9 CONCLUSION**

It is may be noted from above that the subprojects activities are non-polluting in nature and don't have significant adverse impacts on environment except the involvement of 397.053 ha. (only 4.2%) of forest area enroute of transmission line. However, with the condition of raising the compensatory afforestation on double the area and measures like extended tower to reduce tree felling will go a long way in mitigating the likely loss of vegetation. Moreover, 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 throughout project life cycle supported by strong institutional arrangement has considerably nullified the adverse impacts arising out of project activities. There will be optimization of RoW resulting in reduction in land requirement due to high power carrying capacity of this line. Besides this, direct or indirect benefits of the subprojects like the employment opportunity, improvement & uninterrupted power supply, improvement in infrastructure facilities, improved business opportunity will outweigh the negative impacts of the project.



**R.K. SRIVASTAVA**

**Addl. General Manager (ESMD)**