

Environment Management Plan

Project Activity /Stage	Potential Impact	Proposed Mitigation Measures	Parameter to be Monitored	Measurement and Frequency	Institutional Responsibility	Implementation Schedule	Compliance Report
Pre construction							
Location of transmission towers and transmission line alignment and design	Exposure to safety related risks	Setback of dwelling 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 distance to nearest houses – once	POWERGRID	Part of tower siting survey and detailed alignment survey and design	Careful route alignment had ensured that no house/dwelling unit is coming in the ROW.
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 transformer stated in tender specifications –Once	POWERGRID	Part of tender specifications for the equipment	Compiled and included in tender document
		Process, equipment and system 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 requirement of the Government	Process, equipment and system design	Exclusion of CFCs stated in tender specification – Once	POWERGRID	Part of tender specifications for the equipment	Compiled and included in tender document
				Phase out schedule to be prepared in case still in use – once			
Transmission line design	Exposure to electromagnetic	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	Designs are in compliance with international standards as certified by PTI, USA, CPRI Bangalore
Location of transmission towers and transmission line alignment and design	Impact on water bodies and land	Consideration of tower location 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 and no tower is placed in water bodies.
	Social inequities	Careful route selection to avoid existing settlements	Tower location and line alignment selection (distance to nearest dwelling or social institutions)	Consultation with local authorities and land owners – ONCE	POWERGRID	Part of tower siting survey and detailed alignment survey and design	Careful route selection and provision of adequate extensions has avoided the habituated area to the extent possible.
		Minimize need to acquire agriculture land	Tower location and line alignment selection (distance to agricultural land)	Consultation with local authorities and land owners – once	POWERGRID	Part of tower siting survey and detailed alignment survey and design	No agricultural land is acquired for tower location and people are consulted at every stage.

Project Activity /Stage	Potential Impact	Proposed Mitigation Measures	Parameter to be Monitored	Measurement and Frequency	Institutional Responsibility	Implementation Schedule	Compliance Report
Encroachment into precious ecological area	Loss of precious ecological values/damages 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	Lines into precious ecological area like forest, eco sensitive area etc. was completely avoided
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	NA since there is no forest involent.
		Minimize the need by using existing towers, tall towers, and ROW, wherever possible		Consultation with local authorities and design engineers- once			NA
		Obtain statutory clearances from the Government	Statutory approvals from Government	Compliance with regulations-once for each sub project			NA
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 engineer- once	POWERGRID	Part of detailed alignment survey and design	Foundations cast during lean period to avoid damage to the crops during harvest.
		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	Due care taken to avoid the damage to the extent possible.
		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	Compensation being paid as per Indian Telegraph Act 1885 for all damages if any.
		Farmers / land owners 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		Prior to construction phase	Tree compensation paid for all damages during construction.
		Statutory approvals for tree trimming / removal	Compliance with regulations-once for each sub project	Part of detailed siting and alignment survey// design		Being complied regularly.	
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 authorities and design engineers- once	POWERGRID	Part of detailed alignment survey and design	Complied and no blocking of any water channel is anticipated.
Construction							
Equipment layout and installation	Noise and vibration	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	POWERGRID (Contractor through contract provisions)	Construction period	Complied and periodic monitoring of machinery is done.

Project Activity /Stage	Potential Impact	Proposed Mitigation Measures	Parameter to be Monitored	Measurement and Frequency	Institutional Responsibility	Implementation Schedule	Compliance Report
				construction phase			
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)	Construction period	Foundation being planned in lean period or avoided during harvest. (Exhibit-3)
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)	Construction period	Complied.
	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)	Construction period	Complied.
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)	Construction period	Existing Road used to access the line route
Temporary blockage of utilities	Over flows, reduced discharge	Temporary placement of fill in drains/canals not permitted	Temporary fill placement	Absence of fill in sensitive drainage areas – every 4 weeks	POWERGRID (Contractor through contract provisions)	Construction period	Nil
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 m2)	Clearance strictly limited to target vegetation – every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period	Included in contract provisions and being monitored regularly. An area of 400 m ² is being cleared tower foundation at each location depending on the type of tower. In rest of ROW trees that are coming in the electrical clearance zone are cleared.
				Presence of target species in ROW following vegetation clearance – once per site	POWERGRID (Contractor through contract provisions)	Construction period	Parameter is being monitored and taken care during const.
	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	.Species – specific tree retention as approved by statutory authorities (average and maximum tree height at maturity in meters)	POWERGRID (Contractor through contract provisions)	Construction period	Parameter is being monitored and taken care during const. Controlled felling coupled with other safety measures applied restrict any such incident. No such case

Project Activity /Stage	Potential Impact	Proposed Mitigation Measures	Parameter to be Monitored	Measurement and Frequency	Institutional Responsibility	Implementation Schedule	Compliance Report
			regulations				of fire has been reported till date.
Wood /vegetation harvesting	Loss of vegetation and deforestation	Construction workers prohibited from harvesting wood in the project area during their employment (apart from locally employed staff continuing current legal activities)	Illegal wood / vegetation harvesting (area in m3 number of incident reported)	Complaints by local people or other evidence of illegal harvesting every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period	Provision for providing fire wood/ fuels etc. are included in contract. All such provisions are complied by contractor and taken care during const. by the site In-charge.
Surplus earthwork / soil	Runoff to cause water pollution, solid waste disposal	Soil excavated from tower footings disposed of by placement along roadside, or at nearby house blocks if requested by landowners.	Soil disposal locations and volume (m3)	Acceptable soil disposal sites – every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period	Excavated earth is used for refilling. The top/ fertile soil is kept separately for resurfacing and other earth is used for refilling. Approx. 100-300 m ³ earth is excavated at each tower location and 90-95% of this is used for refilling/resurfacing and rest is being disposed off along with other debris at selected location with landowners request.
Tower construction- disposal of surplus earthwork/fill	Waste disposal	Excess fill from tower foundations excavation disposed of next to roads or around houses, in agreement with the local community or landowner	Location and amount (m3) of fill disposal	Appropriate fill disposal locations- every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period	--Do-- These provisions are strictly complied and recorded during construction.
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 m3) 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	Complied and condition is taken care during storage.
Construction schedule	Noise nuisance to neighboring properties	Construction activities only undertaken during the day and local communities informed of the construction schedule	Timing of construction (Noise level in dB(A)	Day time construction –every 2 Weeks	POWERGRID (Contractor through contract provisions)	Construction period	It is ensured by site In-charge that construction activities takes place during day time and villagers are informed in advance and affected villagers are even served notice in advance.

Project Activity /Stage	Potential Impact	Proposed Mitigation Measures	Parameter to be Monitored	Measurement and Frequency	Institutional Responsibility	Implementation Schedule	Compliance Report
Provision of facilities for construction workers	Contamination of receptors(land, water, air)	Construction work force facilities to include proper sanitation, water supply and waster disposal facilities.	Amenities for workforce faculties	Presence of proper sanitation, water supply and waste disposal faculties - once each new facility	POWERGRID (Contractor through contract provisions)	Construction period	Complied and included in the contract provision. Adequate sanitation facilities are provided in the labour camp.
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)	Construction period	During construction existing road are used.
		Ensure existing irrigation facilities are maintained in working condition	Status of existing facilities				No irrigation facilities is affected or blocked.
		Protect/ preserve topsoil and reinstate after construction completed	Status of facilities (earthwork in m3)				All measures to resurface the excavated area by top soil is adopted as described above.
		Repair/reinstate damaged bunds etc after construction completed	Status of facilities in m3)				Damaged bunds were repaired to normal stage
	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	Compensation towards crop damage paid to affected person.
Uncontrolled erosion / silt runoff	Soil loss, downstream siltation	Need for access tracks minimized, use of existing roads. Limit site clearing to work areas.	Design basis and construction procedure	Incorporating good design and construction management practices – once for each site	POWERGRID (Contractor through contract provisions)	Construction period	All necessary measured undertaken during construction.
		Regeneration of vegetation to stabilize works areas on completion (where applicable)					Regeneration/cultivation is allowed in the complete ROW and even in the area below tower after completion of construction activities.
		Avoidance of excavation in wet seasons					It is ensured by the site In-charge that no excavation is carried out during monsoon/rainy season.
		Water courses protected form siltation through use of bunds and sediment ponds					N.A.
Nuisance to near by properties	Losses to neighboring land uses/ values	Contract clauses specifying careful construction practices.	Contract clauses	Incorporating good construction management practices- once for each site	POWERGRID (Contractor through contract provisions)	Construction period	Complied
		As much as possible existing access ways will be used	Design basis and layout	Incorporating good design engineering practice- once for each site			Complied

Project Activity /Stage	Potential Impact	Proposed Mitigation Measures	Parameter to be Monitored	Measurement and Frequency	Institutional Responsibility	Implementation Schedule	Compliance Report
		Productivity land will be reinstated following completion of construction	Reinstatement of land status(area affected, m2)	Consultation with affected parties-twice – immediately after completion of construction and after the first harvest			Complied
	Social inequities	Compensation will be paid for loss of production, if any	Implementation of Tree/crops compensation (amount paid)	Consultation with affected parties – Once in a quarter	POWERGRID	Prior to construction	Crop and tree compensation paid to affected persons.
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 day caused by injuries and sickness)	Contract clauses compliance – once every quarter	POWERGRID (Contractor through contract provisions)	Construction period	Complied. No incident of accident/ injury reported
		Contractor to prepare and implement a health and safety plan.					All health and safety plan are in place and monitored regularly
		Contractor to arrange for health and safety training sessions					Regular briefing / training for labour is organized by contractor/POWERGRID
Inadequate construction stage monitoring	Likely to maximize damages	Training of POWERGRID environmental monitoring personnel.	Training schedule	Number of program attended by each person – once a year	POWERGRID	Routinely throughout construction period	Periodic training programs are organized for such persons.
		Implementation of effective environmental monitoring and reporting system using check list 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			Complied. Regular monitoring by site, RHQ and Corporate is organized.
		Appropriate contract clauses to ensure satisfactory implementation of contractual environmental mitigation measures	Compliance report related to environmental aspect for the contract	Submission of duly completed checklists of all contracts for each site-once			All provisions are complied and monitored regularly by Site/RHQ.
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 distance ("as built" diagram)	Setback distances to nearest houses – once in quarter	POWERGRID	During operation	Designed as per guidelines of ICNIRP and ACGIH and checked by CPRI and M/s PTI, USA
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	Substain bundign (oil sump) ("as built" diagram)	Bundign (Oil sump) capacity and permeability – once	POWERGRID	During operation	Oil sump of sufficient capacity (200% by volume of oil tank in transformer) is provided for every transformer.
Inadequate Provision of	Injury and sickens of staff /	Careful design using appropriate technologies to	Usage of appropriate technologies (lost	Preparedness level for using these	POWERGRID	Design and operation	Being Complied. In design and operation

Project Activity /Stage	Potential Impact	Proposed Mitigation Measures	Parameter to be Monitored	Measurement and Frequency	Institutional Responsibility	Implementation Schedule	Compliance Report
staff/workers health and safety during operations	workers	minimize hazards	work days due to illness and injuries)	technologies in crisis – once each year			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 are organised.
		Safety awareness raising for staff	Training / awareness program and mock drills	Number of program and percent of staff /worker 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 minimize hazards	Usage of appropriate technologies (number of injury incidents, lost work days)	Preparedness level for using these technologies in crisis – once a month	POWERGRID	Design and Operation	Being Complied.
		Security fences around substation	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				
		Electricity safety awareness raising in project areas	Training / awareness programs and mock drills for all concerned parties				
Equipment specifications and design parameters	Release of chemicals and gases in receptor(air, water, land)	Processes, equipment and systems using chlorofluorocarbons(CFCs), including halon, should be phased out and to be disposed of in a manner consistent with the requirements of the Government	Process, equipment and system design	Phase out schedule to be prepared in case still in use – once in a quarter	POWERGRID	Operations	Being Complied.
Transmission line maintenance	Exposure to electromagnetic interference	Transmission line design to comply with the limits of electromagnetic interference 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 neighboring properties	Substation sited and designed to ensure noise will not be a nuisance	Noise level (dB(A))	Noise level at boundary nearest to properties and consultation with affected parties if any – once	POWERGRID	Operations	Being Complied.