#

# SECTION- I: PROJECT DESCRIPTION

**1.1 BACKGROUND**

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. As on March’11 POWERGRID has established about 82,355 ckt kms of transmission lines at 765 kV, 400 kV, 220 kV & 132 kV EHVAC & +500 kV HVDC levels and 135 sub-stations with transformation capacity of about 93,050 MVA. This transmission network, spread over length and breadth of the country, is consistently maintained at an availability of over 99.7% through deployment of state-of-the-art Operation & Maintenance techniques at par with global standards. About 51% of total power generated in the country is wheeled through this transmission network.

POWERGRID 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.

Rajasthan has proposed generation addition of 9000 MW by the end of XII plan. With the increase in generation in Rajasthan and a large quantum of import from WR side, a large quantum of power would be required to be transferred out of the state. So the power transmission project under Northern Region System Strengthening Scheme XXV involving (i) Jaipur-Bhiwani 765 kV S/C (2nd) (ii) Bhiwani-Hissar 400kV D/C (iii) LILO of Moga-Bhiwadi 400kV D/c at Hissar has been proposed. The above transmission system is proposed to be funded by World Bank as an additional project under PSDP-V loan (Loan No. 7787-IN).

The above scheme has been discussed and agreed in 29th meeting of Standing Committee on Power System Planning in Northern Region, held on 29th Dec. 2010. The above transmission system was agreed as Northern Region System Strengthening Scheme XXV. A copy the minutes of above meeting in this regard is enclosed as **Annexure-1.** The above transmission scheme was also agreed in the 19th (Special) meeting of NRPC held on 4/01/2011.

Initial Environment Assessment Report (IEAR) for its power transmission project for (i) Jaipur-Bhiwani 765 kV S/C (2nd) (ii) Bhiwani-Hissar 400kV D/C (iii) LILO of Moga-Bhiwadi 400kV D/c at Hissar under Northern Region System Strengthening Scheme XXV proposed under The World Bank’s Additional financing for PSDP-V loan (Loan No. 7787-IN). The report describes the environmental issues/affects that might arise due to setting up proposed project in the States of Rajasthan and Haryana and various mitigation measures that will be taken care of by POWERGRID during design, construction and maintenance stages.

**1.2 PROJECT JUSTIFICATION**

For transfer of Power from IPP’s in Orissa to Northern region via Western region, Gwalior`(POWERGRID) - Jaipur(RRVPNL) - Bhiwani(POWERGRID) 765kV S/C has been proposed under “Transmission System for Phase-I Generation Projects in Orissa”. Similarly, power from Rihand-III (1000MW) is to be pooled at Vindhyachal Pooling in WR and is to be transferred via WR to NR. Gwalior -Jaipur (RRVPNL) 765 kV S/C (2nd) has been proposed for transfer of power Rihand –III power from WR to NR. Further RRVPNL is also constructing 765 kV 2xS/c from Anta Pooling point, where in power from Chabra TPS, Kalsindh, etc would be pooled, to Jaipur(RRVPNL). Rajasthan has proposed generation addition of 9000 MW by the end of XII plan.

Earlier it was envisaged that power from Gwalior would partly meet the load of Jaipur (in addition to power from Anta) and partly be transferred towards Bhiwani With increased generation addition in Rajasthan and a large quantum of import from WR side, a large quantum of power would be required to be transferred out of the state. Accordingly Jaipur-Bhiwani 765kV S/C (2nd ckt) is proposed. For transfer of Power beyond Bhiwani, Bhiwani-Hissar 400kV D/C and LILO of Bhiwadi-Moga 400kV D/C at Hissar has been proposed. The scheme would improve the power transfer beyond Jaipur in a reliable and secure manner.

**1.3 BENEFITS OF THE PROJECT**

The proposed project shall facilitate strengthening of Northern region transmission system for evacuation of power from Western region to Northern region and beyond Jaipur with greater reliability and security. Additionally, the project is likely to generate direct and indirect employment opportunities, promote industrial growth and stimulate overall development of the area.

**1.5 PROJECT OBJECTIVE**

The objective of the system is to ensure reliable evacuation of power beyond Jaipur.

**1.4 PROJECT HIGHLIGHTS**

|  |  |  |  |
| --- | --- | --- | --- |
| **a)** | Project Name | : | Northern Region System Strengthening – XXV  |
| **b)** | Location  | : | Northern Region |
| **c)** | Beneficiary States/UT  | : | Constituents of Northern Region |
| **d)** | Project Cost  | : | Rs. 534.86 Crores (including IDC)  |
| **e)** | Commissioning Schedule | : | April 2013 |

**1.6** **SCOPE OF WORK**

The complete scope of the transmission system to be implemented under the scheme is as follows:

#### Transmission Lines:

1. Jaipur (RVPN) -Bhiwani 765kV S/C (2nd) - 262 km

2. Bhiwani (PG)-Hisar 400kV D/C - 053 km

3. LILO of Moga-Bhiwadi 400kV D/C at Hissar - 002 km

**Substation (Extension):**

1. Extension of 765/400kV Bhiwani Substation

2. Extension of 400/220kV Hissar Substation

3. Extension of 65/400kV Jaipur (RRVPNL) Substation

 A power map showing the transmission grid of Northern region highlighting the above scope of works has been placed as **Exhibit-1.**

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# SECTION II: BASELINE DATA

 **2.0 DESCRIPTION OF ENVIRONMENT**

The proposed transmission system project involving three different transmission lines and associated substations extension are located in the states of Rajasthan & Haryana.

(i) Jaipur-Bhiwani 765 kV S/C line has setting in the states of Rajasthan & Haryana.

(ii) Bhiwani-Hissar 400kV D/C line will pass through Harayana.

(iii)LILO of Moga-Bhiwadi 400 kV D/C at Hissar will pass through the state of Haryana. It does **not involve any forest area.**

The base line data on general conditions as well as Environmental details in brief of above referred states are described below.

**2.1 RAJASTHAN**

[Rajasthan](http://www.mapsofindia.com/maps/rajasthan), situated at the northwestern part of India is the biggest state in the country of India and lies between 23°30' and 30° 11' North latitude and 69° 29' and 78° 17' East longitude. Rajasthan is bordered by Pakistan in the west and northwest, the states of [Punjab](http://www.mapsofindia.com/maps/punjab/index.html), [Uttar Pradesh](http://www.mapsofindia.com/maps/uttarpradesh/index.html) and [Haryana](http://www.mapsofindia.com/maps/haryana/index.html) in the north and northeast. The state of [Madhya Pradesh](http://www.mapsofindia.com/maps/madhyapradesh/index.html) lies in the southeast and Gujarat in the southwest.

The physiography of Rajasthan is product of long years of erosional and depositional process. The present landform and drainage systems have been greatly influenced and determined by the geological formation and structures.  Physiographically it has been divided in to following 4 regions:

1. The Western Desert
2. The Aravalli Range and Hilly Region
3. The Eastern Plains
4. South-eastern Plateau (The Hadoti Plateau)

The **land use pattern** of the state is given in following table:

|  |  |  |
| --- | --- | --- |
| **Land use** | **Area in 000 ha** | **Percentage (%)** |
| Total geographical area | 34224 |  |
| Reporting area for land utilization | 34265 | 100.00 |
| Forests | 2698 | 7.87 |
| Not available for cultivation | 4262 | 12.44 |
| Permanent Pasture & Grazing land | 1706 | 4.98 |
| Land under misc. tree crops & groves | 20 | 0.06 |
| Cultivable waste land | 4611 | 13.46 |
| Fallow land other than current fallows | 2265 | 6.61 |
| Current fallows | 1939 | 5.66 |
| Net area Sown | 16764 | 48.92 |
| ***Source: Land Use Statistics, Ministry of Agriculture, GOI, 2006*** |

**2.1.1 Population**

Details of population as per 2011 census are as follows:

|  |  |
| --- | --- |
| Total population | 68,621,012 |
| Male population | 3,56,20,086 |
| Female population | 3,30,00,926 |
| Rural population  | 51,540,236 |
| Urban population | 17,080,776 |
| Sex ratio (female/1000male) | 926 |
| Literacy % | 67.06 |
| Male | 80.51 |
| Female | 52.66 |
| ***Census Survey 2011*** |

**2.1.2 Climate**

The climate of the state varies from semi-arid to arid. The temperature in the state ranges from 25°C to 50°C.

**2.1.3 Rainfall**

The annual rainfall in the state differs from place to place significantly. The western deserts accumulate about 100 mm (about 4 inch) annually, while the southeastern part of the state receives 650 mm (26 inch) annually, most of which falls from July through September during the monsoon season. The average rainfall ranges from 480 mm to 750 mm being as low as 150 mm in arid region and 1000 mm in the south-eastern plateau.

**2.1.4 Soil**

The main type of soils available in Rajasthan are mostly sandy, saline, alkaline and chalky (calcareous). Clay, loamy, black lava soil and nitrogenous soils are also found. The hilly tracts of the Aravali are characterized by the black, lava soils.

**2.1.5 Mineral Resources**

Rajasthan has the second largest mineral reserves in the country. The state produces 42 varieties of major minerals and 23 varieties of minor minerals.Main minerals found in the state are:Wollastonite, Gypsum - 94%, Soap Stone - 87%, Asbestos - 89%, Fluorite - 96%, Feldspar - 70%, Ball Clay - 71%, Rock Phosphate - 75% of all India production.

It is the second largest producer of glass and ceramic raw materials and leading producer of feldspar.Also a store-house of 70% of the country's non-ferrous metallic minerals.  Rajasthan produces 90% of the country's copper and zinc. Barytes, Calcite, Clay,Dolomite,Emerald,Feldspar,Fluorite,Garnet,Gypsum,Potash,Rock-Phosphate,Silica Sand, Siliceous Earth, Soapstone, Wollastonite, lime stone, Lignite, Cu, Pb, Zinc & Mica and dimensional and decorative stone including sandstone, slate, marble, phyllite and granite are found in Rajasthan. Large reservoir of mineral oil (Petroleum) have been found in Jaisalmer district of the state.

**2.1.6 Water Resources**

In the west, Rajasthan is relatively dry and infertile; this area includes some of the Thar Desert, also known as the Great Indian Desert. In the southwestern part of the state, the land is wetter, hilly, and more fertile. Major rivers of the state are the Mahi, the Chambal and the Anas. Having much arid land, Rajasthan needs extensive irrigation. It receives water from Punjab rivers and also from the Western Yamuna (Haryana) and Agra canals (Uttar Pradesh) and from the Sabarmati and Narmada Sagar projects to the south. There are thousands of tanks (village ponds or lakes), but they suffer from drought and silt. Rajasthan shares the Bhakra Nangal project with the Punjab and the Chambal Valley project with Madhya Pradesh; both are used to supply water for irrigation and for drinking purposes. The Rajasthan Canal, renamed as Indra Gandhi Canal in the mid-1980s carries water from the Beas and Sutlej rivers in Punjab for about 400 miles to irrigate desert land in northwestern and western Rajasthan.

**2.1.7 Ecological Resources**

**Recorded forest area**

The recorded forest area of the State is 32,639 sq km, which constitutes 9.54% of its geographical area. Reserved Forests constitutes 38.16%, Protected Forests constitutes 53.36% and Unclassed Forest 8.48% of its total forest area (**Map-1).**

**Protected Areas**

The State has 5 National Parks, 25 Wildlife Sanctuaries covering an area of 9,326 km sq. which constitures 2.7% of its geographical area. Rajasthan has 2 Tiger Reserves namely, Ranthambore and Sariska. Keoladeo Ghana National Park, Bharatpur is of international importance for its rich avifauna and for migratory birds. It is one of the heritage sites of the world and also one of the Ramaser sites. Sambhar lake has also been designated under the Ramasar Convention.

The proposed transmission line i.e Jaipur-Bhiwani 765 kV S/C (2nd) & Bhiwani-Hissar 400 kV D/C will not pass through the protected areas mentioned above.

**Forest Cover**

The forest cover in the State, based on interpretation of satellite data of Oct-Dec 2006, is 16,036 sq. km., which is 4.69% of the state’s geographical area. In terms of forest canopy density classes, the state has 72 sq. km. very dense forest, 4,450 sq. km moderately dense forest and 11,514 sq. km open forest.

**Forest Types**

The State has 17 forest types which belong to 2 forest types groups viz, Tropical dry Decidous and Tropical Thorn Forests.

Out of 3 transmission lines under the project, only Jaipur-Bhiwani 765 kV S/C (2nd) transmission line shall pass through 3 districts of Rajasthan. The details of forest resources available in these three said districts are listed in the table below:

|  |  |  |  |
| --- | --- | --- | --- |
| **District** | **Geographic area****(Sq. Km.)** | **2007 Assessment ( Sq.Km.)** | **% of****Forest Cover** |
| **Very dense forest** | **Mod. dense forest** | **Open forest** | **Total** |
| Jaipur | 14,069 | 13 | 114 | 504 | 631 | 4.49 |
| Sikar | 7,732 | 0 | 32 | 160 | 192 | 2.48 |
| Jhunjhunu | 5,928 | 0 | 24 | 169 | 193 | 3.26 |
| ***Source: Forest Survey Report 2009*** |

5 km of Jaipur-Bhiwani 765 kV S/C (2nd) line will pass through Protected forest in Rajasthan.

**2.1.8 Human and Economic Development:**

Rajasthan, the 2nd largest state of country, has geographic area of 342,239 sq. km, which is 10.4% of the country’s geographic area. The total population of state is 56.46 million, constituting 5.5% of country’s population, of which 76.6% is rural and 23.4% is urban. The average population density is 166 persons per km sq,

Rajasthan's economy is mainly agricultural; millet, wheat, maize (corn), and cotton are grown. Though parts of the state are extremely dry, and are covered by the Thar Desert, the total cultivable area in the state is 27,465 thousand hectares, and the sown area, 20,167 thousand hectares. Tourism is also an important part of the economy.
Primarily an agricultural and pastoral economy, Rajasthan have good mineral resources. Rajasthan accounts for India's entire output of zinc concentrates, emeralds and garnets, 94% of it's gypsum, 76% of silver ore, 84% of asbestos, 68% of feldspar and 12% mica. It has rich salt deposits at Sambhar and elsewhere and copper mines at Khetri and Dariba. The white marble is mined at Makarana near Jodhpur. The main industries are textiles, the manufacture of rugs and woolen goods, vegetable oils and dyes. Heavy industries include the construction of railway rolling stock, copper and zinc smelting. The chemical industry also produces caustic soda, calcium carbide and sulphuric acid, fertiliser, pesticides and insecticides. The principal industrial complexes are at Jaipur, Kota, Udaipur and Bhilwara.Majority of the electricity requirements of the state are met through generation from its own generation plants. Balance requirement is met through import from Central Generation Plants. Rajasthan is well connected by rail, air and roads.

Rajasthan handicrafts are famous all over the world. Marble work, woolen carpets, jewellery, embroidery, articles of leather, pottery and brass embossing.

**2.2 HARYANA**

Haryana has a geographic area of 44,212 sq.km.. It lies between latitude 27˚ 39’ and 30˚55’N and longitude 74˚27’ and 77˚36’E. **Physiographically** the state is divided into two natural zones:

1. The Shiwalik and the Aravalli hills
2. The Indo-Gangetic plains.

The Yamuna and Ghagger rivers are the lifeline of the state. The land use pattern of the state is given below:

|  |  |  |
| --- | --- | --- |
| **Land use** | **Area in ‘000 ha** | **Percentage** |
| Total geographical area | 4,421 |  |
| Reporting area for land utilization | 4,372 | 100.00 |
| Forests | 39 | 0.89 |
| Not available for cultivation | 524 | 11.99 |
| Permanent pasture and other grazing lands | 27 | 0.62 |
| Land under misc. tree crops & groves | 12 | 0.27 |
| Culturable wasteland | 65 | 1.49 |
| Fallow land other than current fallows | 8 | 0.18 |
| Current fallows | 141 | 3.23 |
| Net area sown | 3,556 | 81.34 |

 ***Source: Land use statistics, Ministry of Agriculture,GOI,2006***

 **2.2.1 Population**

 Details of population as per 2011 census are as follows:

|  |  |
| --- | --- |
| Total population | 25,353,081 |
| Male population | 13,505,130 |
| Female population | 11,847,951 |
| Rural population  | 16,531,493 |
| Urban population | 8,821,588 |
| Sex ratio (female/1000male) | 877 |
| Literacy Rate (%) | 76.64 |
| Male | 85.38 |
| Female | 66.77 |

 ***Source: Census survey 2011***

**2.2.2 Climate**

The climate of Haryana varies too much. It is cold in winter. In the beginning of summer the climate is dry, but when rains set in it is moist in the extreme

**2.2.3 Rainfall**

The rainfall varies from 213 mm in south-west to 1,400 mm in the north-east.

**2.2.4 Temperature**

The annual mean temperature varies between 22.5˚C to 25˚C.

**2.2.5 Soil**

Predominant soil found in project area is sandy soil.

**2.2.6 Mineral Resources**

The main minerals of Haryana are slate stone, lime stone, gypsum, china clay, marble, sulphur.

**2.2.7 Water Resources**

Haryana has no perennial rivers. The only river which flows through Haryana is the Ghaggar, which passes through the northern fringes of the state. Haryana is a beneficiary of the multi-purpose project on Setluj with Beas, where it shares benefit with Punjab and Rajasthan.Major irrigation projects are Western Yamuna Canal, Bhakra Canal System and Gurgaon Canal. The state has completed Jui Loharu and Sewani lift irrigation schemes. Jawaharlal Nehru irrigation scheme, the biggest of its kind shall be completed soon.

**2.2.8 Ecological Resources**

The recorded forest area of the State is 1,599 sq. km. which is only 3.53% of geographical area . Reserved Forests constitute 15.97%, Protected Forest 74.28%, and Unclassed Forest 9.75% of the total forest area. Most of the roadside plantations in the State have been notified as Protected Forests (**Map-2).** Three types of forest are recorded in the State.

* Tropical Dry Deciduous in the eastern part
* Tropical Moist Deciduous in the Shiwalik region
* Tropical Thorn Forests in the western part of the state.

**Protected Areas**

Two National Park and 8 Wildlife Sanctuaries in Haryana cover an area of 303.92 sq. km. which constitutes 0.69% of the geographic area.

The proposed transmission lines (i) Jaipur-Bhiwani 765 kV S/C (2nd) (ii) Bhiwani-Hissar 400kV D/C & (iii) LILO of Moga-Bhiwadi 400 kV D/C at Hissar will **not pass through these mentioned area.**

Jaipur-Bhiwani 765 kV S/C (2nd) transmission line will pass through Bhiwani district of Haryana and Bhiwani-Hissar 400kV D/C transmission line will pass through two districts of Haryana viz, Bhiwani and Hissar.

The detail of forest resources available in the above districts are given in table below.

|  |  |  |  |
| --- | --- | --- | --- |
| **District** | **Geographic area****(Sq. Km.)** | **2007 Assessment ( Sq.Km.)** | **% of G.A** |
| **Very dense forest** | **Mod.****dense forest** | **Open forest** | **Total** |
| Bhiwani | 4,778 | 0 | 14 | 133 | 147 | 3.08 |
| Hissar | 3,983 | 0 | 13 | 29 | 42 | 1.05 |
| ***Source: Forest Survey Report 2009*** |

**Bhiwani-Hissar 400kV D/C line will pass through 0.765 km of Protected forest in Haryana. However,** Jaipur- Bhiwani 765 kV S/C (2nd) & LILO of Moga-Bhiwadi 400 kV D/C at Hissar **will not pass through forest area in Haryana.**

**2.2.9 Human and Economic Development**

Haryana lies in north-west part of country. It has geographic area is 1.3% of country geographic area. The population of state is 21.08 million (2.1% of country population) of which rural population is 71% and urban population is 29%. There is no tribal population in the state and its average population density is 477 persons per sq. Km.

Haryana has become India’s fastest growing state, offering its citizens the third highest per capita income.

Agricultural development in Haryana has been tremendous. The production of food grains (121 lakh tones), sugarcane (gur), oilseeds and cotton has risen to great levels. Haryana was the 1st state to introduce crop insurance cover. Per capita per day availability of milk is 579 grams against the Indian average of 180 grams.

The major industries are cement, sugar, paper, cotton, textiles, glassware, brassware, cycles, tractors (largest production in the country), motorcycles, timepieces, automobile tyres and tubes, sanitary ware, television sets, steel tubes, hand tools, cotton yarn, refrigerators, vanaspati, ghee and canvas shoes. Haryana produces the largest number of tractors in the country. A factory of the Hindustan Machine Tools producing tractors is located at Pinjore. Gurgaon is a fast growing industrial hub where Maruti Udyog is the central piece. There are 79,678 small scale industrial units in the state, in addition to 1,023 large and medium industries.

Haryana is well known for its handloom products. Panipat has earned the reputation of being the "weaver's city" of India for its exquisite hand- tufted woolen carpets and colorful handloom products.

# SECTION III: POLICY, LEGAL AND REGULATORY FRAMEWORK

**3.0** POWERGRID’s activities by their inherent nature and flexibility have negligible impacts on environmental and social attributes. Indian laws relating to environmental and social issues have strengthened in the last decade both due to local needs and international commitments. POWERGRID undertakes its activities within the purview of Indian laws keeping in mind appropriate international obligations and directives and guidelines with respect to environmental and social considerations of Funding Agencies.

***3.1* ENVIRONMENTAL :**

*3.1.1* Constitutional Provisions :

Subsequent to the first United Nations Conference on Human Environment at Stockholm in June, 1972, which emphasized the need to preserve and protect the natural environment, the Constitution of India was amended through the historical 42nd Amendment Act, 1976 by inserting Article 48-A and 51-A (g) for protection and promotion of the environment under the Directive Principles of State Policy and the Fundamental Duties respectively. The amendment, *inter alia* provide:

**"The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country". (New Article 48A)**

**"It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures”. (New Article 51 A(g)**

**Article 21 of the constitution provides, “no person shall be deprived of his life or personal liberty except according to procedure established by law”.**

**Article 21** is the heart of the fundamental rights and has received expanded meaning from time to time after the decision of the Supreme Court in 1978. The Article 21 guarantee fundamental right to life – a life of dignity to be lived in a proper environment, free of danger of disease and infection. The right to live in a healthy environment as part of Article 21 of the Constitution. Recently, Supreme Court has broadly and liberally interpreted the Article 21, transgressed into the area of protection of environment, and held that the protection of environment and citizen’s right to live in eco-friendly atmosphere interpreted as the basic right guaranteed under Article 21.

Thus the Indian Constitution has now two fold provision:

(a) On the one hand, it gives directive to the State for the protection and
 improvement of environment.

* 1. On the other hand the citizens owe a constitutional duty to protect improve and

 natural environment.

***3.1.2* Mandatory Requirements (National) :**

* **MOP order/sanction under The Electricity Act, 2003 :**

Sanction of MOP, GOI is a mandatory requirement for taking up any new transmission project under the section 68(1) of The Electricity Act, 2003. The sanction authorize POWERGRID to plan and coordinate activities to commission the new project. Electricity act does not explicitly deal with environmental implications of activities related to power transmission. However, POWERGRID always integrates environmental protection within its project activities.

* **Forest Clearance under The Forest (Conservation) Act, 1980 :**

When transmission projects pass through forest land, clearance has to be obtained from relevant authorities under the Forest (Conservation) Act, 1980. This Act was enacted to prevent rapid deforestation and environmental degradation. State governments cannot de-reserve any forest land or authorize its use for any non-forest purposes without approval from the Central government. POWERGRID projects, when involving forest areas, undergo detailed review and approval procedures to obtain a Forest Clearance certificate from MOEF, Government of India before starting any construction activity in designated forest area.

* **Environmental Clearances under Environment (Protection) Act**,**1986:**

Since transmission line projects are environmentally clean and do not involve any disposal of solid waste, effluents and hazardous substances in land, air and water they are kept out of the purview of Environment (Protection) Act, 1986**.**  However, the recent amendment in the Environment (Protection) Act, 1986 made it necessary to obtain clearance from MoEF for power transmission projects in two districts in the Aravalis (*viz.*, Alwar in Rajasthan and Gurgaon in Haryana). The Aravali range, in these two areas, is heavily degraded, hence, any industrial activity there becomes critical. Environment Impact Notification, 1994 lays down specific project categories that require clearance from MoEF Power transmission projects are not included in this list.

* **Batteries (Management and Handling) Rules, 2001 :**

MoEF vide its notification dt. 16th May, 2001 under the section of 6, 8 and 25 of the Environment (Protection) Act, 1986 has put certain restriction on disposal of used batteries and its handling. As per the notification it is the responsibility of bulk consumer (POWERGRID) to ensure that used batteries are not disposed of, in any manner, other than by depositing with the dealer/manufacturer/registered recycler/importer/reconditioner or at the designated collection centres and to file half yearly return in prescribed form to the concerned State Pollution Control Board.

* **Hazardous Wastes (Management and Handling)Amendment Rules, 2003 :**

MoEF vide its notification dt. 20th May, 2003 under the section of 6, 8 and 25 of the Environment (Protection) Act, 1986 has put used mineral oil under the category of hazardous waste which require proper handling and disposal. As per the notification, all used oil is to be auctioned/sold to registered recyclers only and file annual return on prescribed form to the concerned State Pollution Control Board.

* **Ozone Depleting Substances (Regulation and Control) Rules, 2000 :**

MoEF vide its notification dt. 17th July, 2000 under the section of 6, 8 and 25 of the Environment (Protection) Act, 1986 has notified rules for regulation /control of Ozone Depleting SubstancesunderMontreal Protocol adopted on 16th September 1987. As per the notification certain control and regulation has been imposed on manufacturing, import, export and use of these compound. POWERGRID is following provisions of notification and is phasing out all equipment which uses these substances and planning to achieve CFC free organization in near future.

* **The Biological Diversity Act, 2002 :**

Under the United Nations Convention on Biological Diversity signed at Rio de Janeiro on the 5th day of June, 1992 of which India is also a party, MoEF has enacted the Biological Diversity Act, 2002 to provide for 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. As per the provision of act certain area which are rich in biodiversity and encompasses unique and representative ecosystems are identified and designated as Biosphere Reserve to facilitate its conservation. All restrictions applicable to protected areas like National Park & Sanctuaries are also applicable to these reserves. POWERGRID will abide by the provision of act wherever applicable and try to totally avoid these biosphere reserves while finalizing the route alignment.

* + - 1. **Funding Agencies :**

**WB** Operational Policies (OP) 4.01**/ADB’s** Safeguard Policy Statement (June 2009) **and JBIC** Environmental Guidelines**:** These outlines funding agencies policy and procedures for environmental assessment (EA) of different developmental projects. All these guidelines classified developmental projects into three categories (A-C) based on its possible environmental and social impacts though WB & ADB has another category F1 applicable only to projects involving a credit line through a financial intermediary.

Transmission line projects are categorized as category-B project having limited impact that can be further minimized through mitigative/management measures and would normally require only an environmental review. POWERGRID takes remedial measures to prevent, minimize, mitigate, or compensate for adverse impact and improve environmental performance. Environment Assessment will take account the natural environment, human health and safety, and social aspects and trans- boundary and global environmental aspects. During EA process public is also informed at every stage of project execution and their views are considered during decision-making process.

**3.1.4 Prescriptive Framework (National) :**

1. Applicable Legislations

**3.1.4 Relevant Policies :**

1. National Conservation Strategy and Policy Statement on Environment and

 Development, 1992

1. Policy statement for Abatement of pollution, 1992
2. National Environment Policy, 2006

**3.2.0 SOCIAL :**

3.2.1 Constitutional Provisions :

Constitutional provisions in regard to social safeguards are well enshrined in the preamble such as **JUSTICE,** social, economic and political; **LIBERTY** of thought, expression, belief, faith and worship; **EQUALITY** of status and of opportunity; **FRATERNITY** assuring the dignity of the individual and the unity and integrity of the Nation. Fundamental Rights and Directive Principles guarantee the right to life and liberty. Health, safety and livelihood have been interpreted as part of this larger right. Social safeguards provisions are dealt in detail in different Article such as Article-14, 15 17, 23, 24, 25, 46, 330, 332 etc. POWERGRID, through this document, ESPP, commits itself to implementing the said constitutional provision in true sprit to fulfill its environmental and social obligations and responsibilities.

**3.2.2 Mandatory Requirements (National) :**

* **National Rehabilitation and Resettlement Policy, 2007 :**

Ministry of Rural Development, Government of India has notified a National policy on R&R for PAFs in Feb’04 applicable to all developmental projects where 500 or more families enmass in plain areas or 250 or more families enmass in hilly areas are displaced due to project activity. It essentially addresses the need to provide succor to the asset less rural poor, support the rehabilitation efforts of the resources and provide a broad canvas for an effective consultation between PAFs and authorities responsible for their R&R. It has also listed R&R measures and entitlements for different category of PAFs. Though the National policy as such is not applicable to POWERGRID because transmission projects do not involve displacement of such a large numbers of families since land required for substations is quite small. However, the entitlement benefits listed in the National policy for PAFs have been adopted by POWERGRID in its “Social Entitlement Framework” that is being implemented wherever land acquisition for substations is undertaken.

* **Rights of Way and Compensation under Electricity Act,2003 :**

The act has a provision for notifying transmission company under section 164 (B) to avail benefits of eminent domain provided under the Indian Telegraph Act, 1885. MOP, GOI vide gazette notification dt 23rd Dec’03 had already notified POWERGRID under this section of said act. Therefore, for the purpose of placing of any wires, poles, etc., POWERGRID has all the powers that the telegraph authority possesses. Thus, POWERGRID can erect and construct towers without actually acquiring the land. However, all damages due to POWERGRID activity are compensated at market rate. Power transmission schemes are always planned in such a way that the power of eminent domain is exercised responsibly.

1. **Provisions under Land Acquisition Act, 1894, as amended** **in 1984 :**

When land is acquired for sub-stations, POWERGRID will follow procedures laid down under the Land Acquisition Act (LA Act), 1894. POWERGRID sub-stations have never resulted in large scale displacement or loss of livelihoods. There have been only marginal impacts due to flexibility exercised by POWERGRID in selecting sites. The LA Act specifies that in all cases of land acquisition, no award of land can be made by the government authorities unless all compensation has been paid.

* + - 1. **Funding Agencies :**

For POWERGRID, mandatory requirements *vis-à-vis* Funding Agencies are comprehensive Resettlement and Rehabilitation (R&R) guidelines and an entitlement framework as per World Bank Operational Directives 4.30 (OP-4.12) and 4.20 and ADB’s Safeguard Policy Statement, June 2009.

* ***World Bank OD 4.30* (OP-4.12)*: Involuntary Resettlement :***

This directive describes Bank Policy and procedures on involuntary resettlement as well as conditions that borrowers are expected to meet during operations involving resettlement of affected groups. It requires a entitlement framework aimed at restoration, replacement and participation of affected groups. A detailed social assessment and development of an action plan having list of measures for betterment/restoration of lost assets/income is required to be submitted to bank before start of project work. However where only a few people (e.g. about 100-200 individuals) are to be relocated at a particular location, appropriate compensation for assets, logistical support for moving and a relocation grant may be the only requirements but the principle on which compensation is to be based will remain same as for larger groups.

* ***World Bank OD 4.20: Indigenous People (IP ):***

This directive describes World Bank policies and procedures for projects that affect indigenous people. The objective is to ensure that development benefits are socially and culturally compatible and that the IPs are consulted. Thus, the Indigenous People Development Plan/Tribal Development Plan is to be prepared as a prerequisite. POWERGRID will not only incorporate the IP component whenever necessary, but will also pay attention to marginalized groups such as women, children, etc.

* **ADB** **Safeguard Policy Statement, June 2009 *:***

The SPS, June 2009 describes Bank Policy and operational procedures on three key safeguard areas viz Environmental, Involuntary resettlement and Indigenous Peoples as well as a set of specific safeguard requirements that borrowers are expected to meet during operations when addressing social and environment impacts and risks. Its objective is to ensure social and environmental sustainability of projects through avoidance, minimization, mitigation and/or compensate of adverse impacts on environment and affected peoples. It also classified project into three categories like category-A where resettlement is significant and involve physical displacement of more than 200 persons, which require a detailed resettlement plan. Category-B where resettlement is not that significant and requires a short resettlement plan. Category-C where no resettlement of peoples are foreseen and neither require neither resettlement plan nor a resettlement framework.

POWERGRID emphasizes that displacement is not an issue with transmission projects because land below tower/line is not acquired and only a small piece of land is required for substations. However, all affected persons/families shall be provided compensation and rehabilitation assistance along with other measures as per POWERGRID's social entitlement framework which is based on these directives/manuals and National R&R Policy to restore income/livelihood of all affected persons.

**3.2.4 Prescriptive Framework (National) :**

1. National and State-wide Laws and Policies Relating to Land Acquisition and Issues of R&R
	* + Madhya Pradesh Pariyojana Ke Karan Visthapit Vyakti (Punsthapan)

 Adhiniyam, 1985

* + - Maharashtra Project Affected persons Rehabilitation Act, 1986

***3.2.5*  Relevant Policies :**

1. Resettlement and Rehabilitation Policy- Coal India Ltd., May,2008
2. Resettlement and Rehabilitation Policy- NHPC Ltd., 2007
3. Policy for Rehabilitation and Resettlement of Land Owners – Land Acquisition

 Oustees – Haryana State, December, 2007;

1. The Orissa Resettlement and Rehabilitation Policy, Orissa , May, 2006;Resettlement and Rehabilitation Policy – NTPC Ltd., June,2005.

# SECTION-IV: POWERGRID APPROACH FOR ROUTE SELECTION

**4.0 ROUTE SELECTION (ASSESSMENT & MANAGEMENT PROCESS)**

At the system planning stage itself one of the factors that govern the evolution of system is the possible infringement with the forest. Wherever such infringements are substantial, different alternative options are considered. The route/ site selection criteria followed by POWERGRID is detailed below.

While identifying the transmission system for a generation project or as a part of National Power Grid, preliminary route selection is done by POWERGRID based on the Topo sheets of Survey of India and Forest Atlas (Govt. of India's Publi­cation). During route alignment all possible efforts are made to avoid the forest area involve­ment completely or to keep it to the barest minimum, whenever it becomes unavoidable due to the geography of terrain or heavy cost involved in avoiding it.

**4.1 STUDY OF ALTERNATIVES**

 **Environmental Criteria for Route Selection**

 For selection of optimum route, the following points are taken into consideration:

1. The route of the proposed transmission lines does not involve any human rehabilitation.
2. Any monument of cultural or historical importance is not affected by the route of the

 transmission line.

1. The proposed route of transmission line does not create any threat to the survival of any community with special reference to Tribal Community.
2. The proposed route of transmission line does not affect any public utility services like playgrounds, schools, other establishments etc.
3. The line route does not pass through any sanctuaries, National Park etc.
4. The line route does not infringe with area of natural resources.

In order to achieve this, POWERGRID undertakes route selection for individual transmis­sion lines in close consultation with representatives from the Ministry of Environment and Forests and the Department of Revenue. Although under National law POWERGRID has right of eminent domain to put a tower in Pvt. land (Section 63 of the Electricity Act,2003) yet alternative alignments are considered keeping in mind the above-mentioned factors during site selection*,* ***with minor alterations often added to avoid environmentally sensitive areas and settlements at execution stage.***

1. As a rule, alignments are generally cited 10-15 km away from major towns, whenever possible, to account for future urban expansion.
2. Similarly, forests are avoided to the extent possible, and when it is not possible, a route is selected in consultation with the local Divisional Forest Officer, that causes minimum damage to exist­ing forest resources.
3. Alignments are selected to avoid wet­lands and unstable areas for both financial and environmental reasons.

In addition, care is also taken to avoid National parks and sanctuaries and any other forest area rich in wild life.

Keeping above in mind the route for proposed lines have been so aligned that it takes care of above factors. As such different alternatives were studied with the help of Govt. published data like Forest atlas, Survey of India topo-maps to arrive at most optimum route which can be taken up for detailed survey and assessment of environmental & social impacts for their proper management.

**4.1a EVALUATION OF ALTERNATIVE ROUTE ALIGNMENT OF JAIPUR-BHIWANI 765 KV S/C TRANSMISSION LINE**

Three different alignments **(Map-3)** were studied with the help of published data/maps and walkover survey to arrive at most optimum route for detailed survey. The comparative details of these alternatives for the line Jaipur-Bhiwani 765 kV S/C (2nd) shown in the following table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.N.** | **Description** | **Alternative-I** | **Alternative-II** | **Alternative-III** |
| **1.** | **Route Particulars** |
| i) | Length(km) | 262 | 270 | 287 |
| ii) | Terrain | Plain | Plain | Plain |
| a | Hilly | 0.5% | 0.5% | 0.5% |
| b | Plain | 99.5% | 99.5% | 99.5% |
| **2** | **Environmental Details** |
| i) | Name of District/ District Details (through which line passes) | Jaipur, SikarJhunjhunu, Bhiwani | Jaipur, SikarJhunjhunu, Bhiwani | Jaipur, SikarJhunjhunu, Bhiwani |
| ii) | Town in alignment (nearby) | Shrimadhopur,Loharu | Khetri, Nim Ka Thana, Kaladera, Ringus | Shrimadhopur,Loharu, Surajgarh, Udaipurwati, Chirawa |
| iii) | House in R.O.W | Nil | Nil | Nil |
| iv) | Forest Involvement in Ha/Km | 32.00 Ha/5 km  | 40.00 Ha/6.25 km  | 48.00Ha/7.5 km  |
| v) | Type of forest |  |  |  |
|  | Reserved/Protected/ Mangrove/ Wild life area/ Biosphere reserve/any other environment sensitive area | Protected Forest | Protected Forest | Protected Forest |
| vi) | Density of forest | 0.1 | 0.1 | 0.1 |
| vii) | Type of Flora | Azadirachta indica, Calotropis gigantea, Acacia caesia, Aloe vera, Pheonix, Ocimum basilicum, Opuntia stricta and other Xeophytes | Azadirachta indica, Calotropis gigantea, Acacia caesia, Aloe vera, Pheonix, Ocimum basilicum, Opuntia stricta and other Xeophytes | Azadirachta indica, Calotropis gigantea, Acacia caesia, Aloe vera, Pheonix, Ocimum basilicum, Opuntia stricta and other Xeophytes |
| viii) | Type of Fauna | Camels, Crow, Fox & Domestic animals like Cattle, Sheep, Goat etc. | Camels, Crow, Fox & Domestic animals like Cattle, Sheep, Goat etc. | Camels, Crow, Fox & Domestic animals like Cattle, Sheep, Goat etc. |
| ix) | Endangered species(if any) | NIL | NIL | NIL |
| x) | Historical/ Cultural Monument | NIL | NIL | NIL |
| xi) | Any other relevant information | NIL | NIL | NIL |
| **3** | **Compensation Cost (in Rs lacs)** |
| i) | Crop (Non-Forest) | 257 | 263.75 | 279.5 |
| ii) | Forest(CA+NPV) | 362.56 | 453.2 | 543.84 |
| **4.** | **No. of Crossing (Nos.)** |
| i) | Railway line /Highway(National/ State) |  Rly- 4  NH - 2SH - 5 |  Rly.- 4  NH - 2 SH – 5 |  Rly.- 4  NH -2 SH - 5 |
| ii) | Power Line | 8  | 8  | 8  |
| iii) | River Crossing etc. | 3 | 3 | 3 |
| **5.** | **Construction Problem** | Easy approaches. Relatively less ROW problems. | Moderate ROW problems. | Relatively more line length. Moderate ROW problem. |
| **6.** | **O & M Problem** | O & M shall be relatively easier due to better approaches and plain terrain  | O & M shall be easier due to better approaches and plain terrain | O & M shall be easier due to better approaches and plain terrain |
| **7** | **Overall Remarks** | Easy accessibility, less ROW problems & minimum forest involvement.  | Easy accessibility but moderate ROW problems & forest involvement comparatively more | Easy accessibility but more line length with moderate ROW problems & high forest involvement  |

**Reasons for Selection of Final Route:**

From the above comparison of three different Alternatives, it is evident that the **Alternative-I** is the most suitable route as it involves minimum forest area, has relatively less ROW problem and also easily approachable through existing road. Hence **Alternative-I** has been found most optimum and recommended for detailed survey.

**4.1b EVALUATION OF ALTERNATIVE ROUTE ALIGNMENT OF BHIWANI-HISSAR 400 KV D/C TRANSMISSION LINE**

The different alignments **(Map-4)** were studied with the help of published data/maps and walkover survey to arrive at most optimum route for detailed survey. The comparative details of these alternatives for the line Bhiwani-Hissar 400 kV D/C shown in the following table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.N.** | **Description** | **Alternative-I** | **Alternative-II** | **Alternative-III** |
| **1.** | **Route Particulars** |
| i) | Length (km) | 52  | 53 | 54.45  |
| ii) | Terrain | Plain | Plain | Plain |
| a | Hilly | Nil | nil | nil |
| b | Plain | 100% | 100% | 100% |
| **2** | **Environmental Details** |
| i) | Name of District/ District Details (through which line passes) | Bhiwani, Hisar | Bhiwani, Hisar | Bhiwani, Hisar |
| ii) | Town in alignment (nearby) | Dhana Narsan, Dinaud, Baliyali, Jamalpur, Depal Hajampur,  | Dhana Narsan, Dinaud, Baliyali, Jamalpur, Depal Hajampur, | Dhana Narsan, Dinaud, Baliyali, Jamalpur, Depal Hajampur,  |
| iii) | House in R.O.W | NIL | NIL | NIL |
| iv) | Forest Involvement in Ha/Km | 3.62Ha/0.787 km | 3.52 Ha/0.765 km | 3.7Ha/0.804 km |
| v) | Type of forest | Protected forest (along roads, railways & Canal crossing) | Protected forest (along roads, railways & Canal crossing) | Protected forest (along roads, railways & Canal crossing) |
| vi) | Density of forest | <0.1 | 0.1-0.2 | 0.1-0.2 |
| vii) | Type of Flora | Eucalyptus, Neem, Alanthus,Muskat, Keekar, Jandi, Popular | Eucalyptus,Neem, Alanthus,Muskat, Keekar, Jandi, Popular | Eucalyptus,Neem,Alanthus,Muskat, Keekar, Jandi, Popular |
| viii) | Type of Fauna | Dog, Monkey, Cow, Lizard, Snake, Buffalo, Rabbit, Fox | Dog, Monkey, Cow, Lizard, Snake, Buffalo, Rabbit, Fox | Dog, Cow, Lizard, Snake, Buffalo, Rabbit, Fox Monkey, |
| ix) | Endangered species(if any) | NIL | NIL | NIL |
| x) | Historical/ Cultural Monument | NIL | NIL | NIL |
| xi) | Any other relevant information | NIL | NIL | NIL |
| **3** | **Compensation Cost(in Rs. lacs)** |
| i) | Crop(Non Forest)) | 51.21 | 52.23 | 53.64 |
| ii) | Forest(CA+NPV)) | 41.11 | 39.88 | 41.92 |
| **4.** | **No. of Crossing (Nos.)** |
| i) | Railway | 1 | 1 | 1 |
| ii) | Power Line | 21 | 20 | 18 |
| iii) | River Crossing etc. | NIL | NIL | NIL |
| **5.** | **Construction problem** | Relatively more ROW problem as the line route is very close to Bhiwani Town | Comparatively less ROW problems | More forest area involved as compared to Route-II & I |
| **6** | **O&M Problem** | More O& M problem as route is passing through the polluted area | Less O&M problems as route is approachable and away from the pollution sources | Less O&M problems as route is approachable |
| **7** | **Overall Remarks** | Less suitable | More suitable in comparison to alternate I & III | Less suitable |

**Reasons for Selection of Final Route :**

It may be seen from above comparison that **Alternative-II** is most optimum route as it involves minimum forest area. Although the line length of Alignment-II is slightly higher than Alternative-I, but this route is away from the pollution sources like brick, kiln etc and also the Alternative-I would have severe ROW problem due to its proximity with Bhiwani town. Hence, **Alternative-II** has been found to be most optimum and recommended for detail survey.

**4.1c EVALUATION AND ROUTE ALIGNMENT ALTERNATIVES OF LILO OF MOGA-BHIWADI 400 KV D/C AT HISSAR**

Since the total length of the proposed line is only 2 km and there is no forest involvement, route alignment alternatives study has not been done. However, during selection of the route all parameters of route selection of transmission line has been taken into consideration.

# SECTION-V: SCREENING OF POTENTIALENVIRONMENTAL

# IMPACT, EVALUATIONAND ITS MANAGEMENT

 **5.0 IMPACT DUE TO PROJECT LOCATION AND DESIGN**

Environmental impact of transmission line projects are not far reaching and are mostly localized to ROW. However, transmission line project has some affects on natural and socio-culture resources. These impacts can be minimized by careful route selection. In order to get latest information and further optimization of route modern survey techniques/tools like GIS, GPS aerial photography are also applied. Introduction of GIS and GPS in route selection result in access to updated/latest information, through satellite images and further optimization of route having minimal environmental impact. Moreover, availability of various details, constraints like topographical and geotechnical details, forest and environmental details etc. help in planning the effective mitigative measures including engineering variations depending upon the site situation/location. In the instant project these techniques are not used. All possible measures have been taken during the finalization of route alignment for the proposed transmission system but due to peculiarity of terrain and demography of the area where project is being implemented, some environmental impacts may be there. The explanations in brief with regard to specific environment review criteria based on preliminary survey are as follows:

**(i) Resettlement**

As described earlier all measures are undertaken by POWERGRID at line routing stage itself to avoid settlements such as cities, villages etc. It may be seen from the above description of proposed route alignment and also keeping in mind that no land is acquired for tower foundation as per existing law, the project does not require any resettlement of villagers.

As land for extension of proposed Substation is already available for proposed bays in the existing substations. **Hence no fresh land acquisition or R&R issues are involved for existing Substations.**

 **(ii) Land value depreciation**

Based on past experience land prices are generally expected to rise in the areas receiving power. Further, transmission lines generally pass through uninhabited area, agriculture fields and forests, where the land-use is not going to change in foreseeable future. Therefore, the value of land will not be adversely affected to a significant degree.

 **(iii)** **Historical/cultural monuments/value**

As per the POWERGRID’s policy of route selection only that route alignment is finalized which avoids all the historical and cultural monuments. As per the preliminary assessment carried out during finalization of route alignment in consultation with State revenue authorities and Archeological Survey of India (ASI), **no such monument is coming in the proposed route alignment**.

 **(iv)** **Encroachment into precious ecological areas**

As already explained all precautions have been taken to avoid routing of line through forest and ecological sensitive areas and National park/Sanctuaries. However, complete avoidance of forest area was not possible. The routes of proposed transmission line have been finalized in such a way that it affects minimum forest area in consultation with forest department. Out of total transmission line length of 317 km., about **5.765 km ( 1.82%) length shall pass through forest land consisting a total of 35.52 Ha. forest area in the states of Rajasthan and Haryana.**

Prior approval of GOI/MOEF shall be obtained for affected forest under Forest (Conservation) Act, 1980 after detail survey and finalization of route through forest area in consultation with local forest authorities. Most of the forests to be traversed by the lines are already degraded and the wildlife species present are those who have been adapted to open or disturbed habitat. Therefore with provision of Compensatory Afforestation the overall forest status will in many cases improve. **A budget provision of Rs.933.17 lakhs** has been kept in the cost estimate to meet the requirement of Compensatory Afforestation and Net Present Value (NPV). **A detail of budget estimate is enclosed as Annexure-2.**

Nonetheless, to mitigate losses to existing forests, clearing of the transmission line Right-of-way will be done under supervision of Forest Department, and some low canopy seed trees and shrubs may be kept intact if they do not interfere with tower erection and line installation. The wood will be sold by the Forest Department, who will also retain the sale proceeds. Three-meter wide strips of land under each conductor will be cleared and maintained as maintenance rows, but the remaining land will be allowed to regenerate. Lopping of trees to maintain line clearance will be done under the direction of Forest Department. POWERGRID will provide construction crews with fuel wood or alternative fuels as a precaution against collection of fuel wood from nearby forest.

 **(v) Encroachment into other valuable lands**

Impacts on agricultural land will be restricted to the con­struction phase and when large-scale maintenance measures are required. Some stretch of the line will pass through agricul­tural fields. Agricultural land will be lost at the base of the tower, which is estimated to be 0.2-1 sq. m per average farm holding **(Fig-1).**

It is estimated that for 765 kV Jaipur-Bhiwani S/C line of 262 Km a total of 786 towers shall be erected. Construction of these towers will result in loss of approx. 786 sq.m. or 0.0786 ha. of land. Similarly, for 400 kV D/C Bhiwani-Hissar D/C line (53 km) and LILO of Moga-Bhiwadi 400 kV D/C line (2 km), approx. 159 towers and 5 towers shall be required respectively. Construction of these towers will result in total loss of approx.164 sq.m. or 0.0164 ha. of land. Therefore, a total land loss estimated to be about 0.0950 Ha, which is negligible and will not adversely affect the land holding.

In areas where lines will traverse agricultural land, compen­sation will be paid to owners for any crop damage incurred as a result of construction activities. POWERGRID field staff will consult affected villagers and local revenue department and apprise them about the project and tower location, which shall be erected in the agricultural land. Revenue depart­ment, after evaluating the loss due to construction activity and productivity of land, will calculate the compensation cost and that will be paid to farmers. Agricultural activities will be allowed to continue following the construction period. If bunds or other on-farm works are disturbed during construction or maintenance, they will be restored to the owner's satisfaction following cessation of construction or maintenance activities. In the event that private trees are felled during construction or maintenance operations, compensation will be paid to the owner in an amount determined by the estimated loss of products from the tree over an eight year period (for fruit bearing trees) and for other trees compensation is finalized in consultation with local forest authorities. Agricultural lands under private ownership will be identified, and in accordance with normal POWERGRID procedures compensa­tion will be paid to the affected villagers **(Annexure-3).** Budgetary provision Rs. 311.24 lakhs is made in the cost estimate to meet these expenses.

 **(vi)** **Interference with other utilities and traffic**

As per regulations enacted by Government of India, it is mandatory for POWERGRID to seek clearance prior to construc­tion from department of Railways, Telecommunications and wherever necessary from aviation authorities that are likely to be affected by the construction of transmission lines. The transmission lines affect nearby telecommunication circuits by causing electrical interference. A standing committee -- Power Telecom Co-ordination Committee (P.T.C.C.) has been constituted by Government of India to plan and implement the mitigating measures for the induced voltage which may occur to nearby telecom circuit and suggest necessary protection measures to be adopted. The committee suggests measures like rerouting of the telecom circuits, conversion of overhead telecom circuits into cables etc. to minimize the interference.

The cost of such measures is determined by the Committee and is shared by POWERGRID and Telecom Department on the basis of prevailing norms and guidelines. Though the exact cost to mitigate the impacts of induction in neighboring telecom circuits would vary from case to case, the cost on an average works out to be Rs.50000/- per km for POWERGRID. Provision to meet these expenses has been made in the cost estimate for the same.

Wherever transmission line crosses the railways, clearance is taken from that department. In general, the system is planned and executed in such a way that adequate clearance is maintained between transmission lines on the one hand, and railways, civil aviation and defense installations on the other. Wherever the transmission lines pass by the airports the towers beyond specified height are painted in alternate orange and white stripes for easy visibility and warning lights are placed atop these towers.

 **(vii) Interference with drainage pattern**

As the transmission lines are constructed aerially and the blockage of ground surface is limited to area of tower footings, which is very small, there is little possibility of affecting drainage pattern. In the infrequent instances where the drainage is affected, flow will be trained and guided to safe zones.

 **5.1 ENVIRONMENTAL PROBLEMS DUE TO DESIGN**

 **(i) Escape of polluting materials**

The equipments installed on lines and substations are static in nature and do not generate any fumes or waste materials.

 **(ii)** **Explosion/fire hazards**

During the survey and site selection for transmission lines and sub-stations, it has been ensured that these are kept away from oil/gas pipelines and other sites with potential for creating explosions or fires.

Fires due to flashover from lines can be a more serious problem in forest. However, adequate safety measures shall be taken to avoid such incidence besides this forest authorities also incorporate measures like making fire lines to prevent spreading of fire in the affected forest area.

 **(iii) Erosion hazards due to inadequate provision for resur­facing of exposed area**

Adequate measures are taken to re-surface the area where excavation works are done. Topsoil disturbed during the development of sites will be used to restore the surface of the platform. Infertile and rocky material will be dumped at carefully selected dumping areas and used as fill for tower foundations.

 **(iv) Environmental aesthetics**

Since spacing between the towers is approx. 300-400 meters these will not affect the visual aesthetics of the localities particularly when it is ensured to route the lines as far away from the localities as possible. POWERGRID takes up plantation of trees to buffer the visual effect around its substations and to provide better living condi­tions. Wherever POWERGRID feels it appropriate, discussions will be held with local Forest Department officials to deter­mine feasibility of planting trees along roads running paral­lel to transmission lines to buffer visual effect in these areas. In addition, towers may be painted grey or green to merge with the background.

 **(v) Noise/vibration nuisances**

The equipment installed at sub-station are mostly static and are so designed that the noise level always remains within permissible limits i.e. 85 dB as per Indian standards. The noise levels reported during normal operating conditions are about 60 to 70 dB at 2 m. distance from the equipment. To contain the noise level within the permis­sible limits whenever noise level increases beyond permissi­ble limits, measures like providing sound and vibration dampers and rectification of equipment are undertaken. In addition, plantations of sound absorbing species like Casuarinas, Tamarind, and Neem are raised at the sub-stations that reduce the sound level appreciably. Actual noise levels measured at perimeters of existing Substations are 30 to 40 dB.

 **(vi)** **Blockage of wildlife passage**

The proposed lines are passing through mostly agricultural, wasteland and forest area. Area is also not a migration path of wildlife hence, possibility of disturbance to wild life area are nil/remote.

 **5.2 ENVIRONMENTAL PROBLEMS DUE TO CONSTRUCTION PHASE**

 **(i) Uncontrolled silt runoff**

The proposed projects involves only small scale excavation for tower foundations at scattered locations that are re-filled with excavated material, therefore uncontrolled silt run off is not expected.

 **(ii)** **Nuisance to nearby properties**

As already described in preceding paras, during site selec­tion due care is taken to keep the transmission line and substations away from settlements. Further, all the con­struction activities will be undertaken through the use of small mechanical devices e.g. tractors and manual labour therefore nuisance to the nearby properties if any, is not expected.

 **(iii) Interference with utilities and traffic and blockage of access way**

Access to the site will be along existing roads or village paths; minor improvements to paths may be made where neces­sary, but no major construction of roads will be necessary either during construction or as a part of maintenance proce­dures.

As and when a transmission line crosses any road/ railways line, the terminal towers are located at sufficient distance so as not to cause any hindrance to the movement of traffic. Stringing at the construction stage is carried out during lean traffic period in consultation with the concerned au­thorities and angle towers are planted to facilitate execu­tion of work in different stages.

 **(iv) Inadequate resurfacing for erosion control**

The proposed lines are to be constructed mostly in plain area where erosion problem is not anticipated. However, if due to terrain at some points transmission towers may be placed on slopes and erosion prone soils internationally accepted engineering practices will be undertaken to prevent soil erosion. This will include cutting and filling slopes wher­ever necessary. The back cut slopes and downhill slopes will be treated with revetments. As explained above adequate steps shall be taken to resurface the area after construction. Wherever sites are affected by active erosion or landslides, both biological and engineering treatment will be carried out, e.g. provision of breast walls and retaining walls, and sowing soil binding grasses around the site. Furthermore, construction is generally undertaken outside the rainy season. The proposed line is mostly passing through plain area, hence these problems are not anticipated.

 **(v)** **Inadequate disposition of borrow area**

As mentioned earlier the transmission tower foundations involve excavations on small scale basis and the excavated soil is utilized for back filling. In case of sub-stations generally the sites are selected in such a manner that the volume of cutting is equal to volume of filling avoiding borrowing of the area. Therefore, acquisition/opening of borrow area is not needed.

 **(vi)** **Protection of Worker's health/safety**

The Safety Regulations/Safety Manual published by POWERGRID and included in tender documents will guide provisions for workers’ health and safety. Various aspects such as, work and safety regulations, workmen's compensation, insur­ance are adequately covered under the General Conditions of Contract (GCC), a part of bidding documents. As a deterrent or to minimize accident during construction a provision in the contract has been added that stipulates a fine/penalty of Rs.10 lakhs for each accidental death and Rs1.0 lakh/each for any injury and is deducted from the contractor’s payment and paid to the deceased/affected family, in case of occurrence **(Annexure-4)**.

POWERGRID has a dedicated unit to oversee all health and safety aspects of its project under the Operation Service Department POWERGRID has framed guidelines/checklist for workers’ safety as its personnel are exposed to live EHV apparatus and transmission lines. These guidelines/checklist include work permits and safety precautions for work on the transmission lines both during construction and operation **(Annexure-5)** and is monitored regularly by site in-charge and corporate Operation Services. In addition training is imparted to the workers in fire fighting and safety measures. Safety tools like helmet, safety belt, gloves etc. are provided to them in accordance to the provisions of Safety Manual. First aid facilities will be made available with the labour gangs, and doctors called in from nearby towns when necessary. The number of outside (skilled) labourers will be quite small, of the order of 25-30 people per group. The remaining workforce of unskilled labour­ers will be comprised of local people. Workers are also covered by the statutory *Workmen (Compensation) Act*. Regular health checkups are conducted for construction workers. The construction sites and construction workers’ houses will be disinfected regularly if required. In order to minimize/checking of spread of socially transmitted diseases e.g. HIV/AIDS etc. POWERGRID will conduct awareness building programs on such issues for the construction workers.

 **5.3 ENVIRONMENTAL PROBLEMS RESULTING FROM OPERATION**

**(i)** **O&M Staff/Skills less than acceptable resulting in variety of adverse effects**

The O&M program in POWERGRID is normally implemented by sub-station personnel for both, the lines as well as sub-sta­tions. However in respect of the long distance transmission lines there are monitoring offices that are located at various points en-route. Monitoring measures employed include patrolling and thermo-vision scanning.

The supervisors and managers entrusted with O&M responsibili­ties are intensively trained for necessary skills and exper­tise for handling these aspects.

A monthly preventive maintenance program will be carried out to disclose problems related to cooling oil, gaskets, circuit breakers, vibration measurements, contact resistance, con­densers, air handling units, electrical panels and compres­sors. Any sign of soil erosion is also reported and recti­fied. Monitoring results are published monthly, including a report of corrective action taken and a schedule for future action.

POWERGRID is following the approved international standards and design, which are absolutely safe. Based on the studies carried out by different countries on the safety of EHV lines in reference to EMF affect POWERGRID have also carried out such studies with the help of PTI**, USA** and **CPRI, Bangalore** on their design. The studies inferred that the POWERGRID design are safe and follow the required international standard. Because of issues relating to need to ensure health and safety relating to the line such as fire safety, safe voltages on metallic parts of buildings, and safety clearances to avoid flashover, the transmission lines will not pass directly over any residential properties and as such the potential for EMF effects to occur will be further diminished. Given that it will be necessary to ensure that there are no properties in the ROW beneath and to the sides of the overhead line, automatic mitigation against EMF will be provided between the source of potentially high strengths (the transmission line) and the residential properties.

Poly Chlorinated Biphenyls (PCBs) due to its high heat capacity, low flammability and low electrical conductivity was extensively used as insulating material in capacitors and transformers. But after the finding that these PCBs are non-biodegradable and has carcinogenic tendency, its use in electrical equipments as insulating medium has been banned all over the world long back. However, it has been reported in some studies that chances of contamination of oil with PCB is possible. Keeping that in mind, POWERGRID has taken all possible steps in association with NGC, UK and setup Regional testing laboratories for testing of existing oil for PCB traces and results of this suggests that PCB contamination is not an issue with POWERGRID. The World Bank has also made following comments after a detailed study on Management of PCBs in India:

**“Power Grid was the most advanced in testing for PCBs of the organizations visited for this project. They have established a procedure for identification of the presence of PCBs in transformer oil and more detailed analysis for positive identification sample. To date no significant concentrations of PCBs have been detected. Power Grid does not appear to have any significant issues regarding PCB management and have initiated a testing program. The experience & laboratories of Power Grid could be used to provide a national PCB auditing service”.**

 **5.4 CRITICAL ENVIRONMENTAL REVIEW CRITERIA**

  **(i)** **Loss of irreplaceable resources**

The transmission projects do not involve any large scale excavation and land is lost to the extent of 0.2-1 sq m only for each foundation. As only **1.82%** of the total length of the lines in the subject projects are passing through forest area and the said forest is degraded, the problem of losing natural resources in these project are insignificant. Moreover, with the provision of raising compensatory afforestation on double the area getting affected will increase the forest cover.

 **(ii)** **Accelerated use of resources for short-term gains**

The proposed project will not be making use of any natural resources occurring in the area during construction as well as mainte­nance phases. The construction material such as tower mem­bers, cement etc shall come from factories while the excavat­ed soil shall be used for backfilling to restore the surface. Thus the project shall not cause any accelerated use of resources for short term gains.

 **(iii)** **Endangering of species**

No endangered species of flora and fauna exist in these project areas as well as no reserve forest is getting affected. Thus there is no possibility of endangering/causing extinction of any species.

**(iv)** **Promoting undesirable rural-to urban migration**

The proposed project will not cause any submergence or loss of land holdings that normally trigger migration. It also does not involve acquisition of any private land holdings. Hence, there is no possibility of any migration.

**5.5 PUBLIC CONSULTATION**

Public consultation/information is an integral part of the project implementation. Public is informed about the project at every stage of execution. During survey also POWERGRID’s site offi­cials meet people and inform them about the routing of transmission lines. During the construction, every individual, on whose land tower is erected and people affected by ROW, are consulted.

Apart from this, public consultation using different technique like Public Meeting, Small Group Meeting, informal Meeting as per **Environmental Social Policy & Procedures of POWERGRID (ESPP)** shall also be carried out during different activities of project cycle. During such consultation the public will be informed about the project in general and in particular about the following:

1. Complete project plan (i.e. its route and terminating point and substations, if any, in between);
2. POWERGRID design standards in relation to approved international standards;
3. Health impacts in relation to EMF;
4. Measures taken to avoid public utilities such as school, hospitals, etc.;
5. Other impacts associated with transmission lines and POWERGRID’s approach to minimizing and solving them;
6. Land acquisition details, proposed R&R measures and compensation packages in line with POWERGRID’s policy;
* Trees and crop compensation process.

Apart from organizing many informal group meetings in different villages, public meetings were also organized in the routes of transmission lines **(Table-5.1)**. To get the maximum participation during the Public Consultation Program, a notice was served well in advance to the villagers are enclosed as **Annexure-6(a) & Annexure-6(b)**. The details of lines and its importance were explained to the villagers. Villagers including Village panchayat representatives and POWERGRID representative participated in the programme. The photographs are enclosed as **Plate- A(1-6) and Plate B(1-4)**.The program was arranged in an interactive way and queries like crop compensation, route alignment etc. were replied. Most of the participants were small farmers and were worried about their land through which the line will pass. They were informed that POWERGRID will not acquire their land for construction of transmission lines. Only towers will be spotted in their fields where they can do farming without any fear because the tower height is very high and even tractor can pass below the tower. Moreover, there is no risk of passing current from the above line as there is foolproof system of earthing for tower. The consultation process was appreciated by the villagers. They were happy to know about the transparent policy of POWERGRID for execution of the project and promised to extend their cooperation during construction of the line. The process of such consultation and its documentation shall continue during project implementation and even during O&M stage.

**Table - 5.1**

 **Details of Public Consultation en-route of proposed Transmission Lines**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Name of Transmission Line** | **Date of meeting** | **No. of villagers attended** | **Name of Village** | **Remarks**  |
| 1. | 765 KV Jaipur-Bhiwani (S/C 2nd) | 25.09.11 | 07 | Chokidi | Village Panchayat representatives, farmers, teachers and others attended the meeting.Compensation for Crops/trees, utilization of road path were main concerns which were clarified during meeting. |
| 25.09.11 | 05 | Mawath |
| 26.09.11 | 06 | Mahela |
| 26.09.11 | 06 | Hasteda |
| 27.09.11 | 06 | Umranat |
| 27.09.11 | 04 | Sohansara |
| 2. | 400 kV D/C Bhiwani-Hissar | 01.09.11 | 09 | Dhana Narsan | Village Panchayat representatives, farmers, teachers and others attended the meeting.Compensation for Crops/trees, utilization of road path were main concern, which were clarified during meeting.  |
| 01.09.11 | 09 | Devsar |
| 01.09.11 | 11 | Dinaud |
| 01.09.11 | 10 | Biran |

 **5.6 CONCLUSION**

From the above discussion, it seems that the area is rich in physical resources. But careful route selection has minimized involvement of forest area to the extent possible but could not be completely avoided due to terrain and other physiographical reasons. Thus, routes selected for detailed survey are the most optimum alignment and involved minimum forest. Hence, based on the criteria agreed with The Bank, the project is coming under the P2 category or non sensitive. No major impact on wild life is envisaged as the forest is not the habitat of any endangered or endemic species of fauna and flora. Further construction of no new substation is involved. Hence no displacement of people and R & R issues are involved. The infrastruc­tural constraints are very real and pose a limiting factor on the development of the area. The above facts while on the one hand underline the need for implementation of the project for overall development of the area and on another hand suggest that a detailed E.I.A. may not be necessary.

# SECTION-VI: MONITORING AND ORGANISATIONAL SUPPORT STRUCTURE

**6.0**   **ENVIRONMENTAL MONITORING PROGRAM IN POWERGRID**

Monitoring is a continuous process for POWERGRID projects at all the stages be it the site selection, construction or maintenance.

The success of POWERGRID lies in its strong monitoring sys­tems. Apart from the site managers reviewing the progress on daily basis, regular project review meetings are held at least on monthly basis, which is chaired by Executive Director of the region wherein apart from construction issues the envi­ronmental aspects of the projects are discussed, and remedial measures taken wherever required. The exceptions of these meetings are submitted to the Directors and Chairman and Managing Director of the Corporation. The progress of var­ious on-going projects is also informed to the Board of Directors. Following is the organization support system for proper implementation and monitoring of Environmental & Social Management Plan. Flow chart of organization support structure is depicted in **Exhibit-2.**

**6.1 CORPORATE LEVEL**

An Environmental Management Cell at corporate level was created within POWERGRID in 1992 and subsequently upgraded to an Environment Manage­ment Department (EMD) in 1993 and in 1997 it has been further upgraded to Environment & Social Management Deptt. (ESMD) by incorporating social aspect of project. Briefly, the ESMD’s responsibilities are as follows:

1. Advising and coordinating RHQs and Site to carry out environmental and social surveys for new projects.
2. Assisting RHQs and site to finalize routes of entire power transmission line considering environmental and social factors that could arise en-route
3. Help RHQs and Site to follow-up with the state forest offices and other state departments in expediting forest clearances and the land acquisition process of various ongoing and new projects
4. Act as a focal point for interaction with the MoEF for expediting forest clearances and follow-ups with the Ministry of Power.
5. Imparts training to POWERGRID’s RHQs & Site Officials on environment and social issues and their management plan.

**6.2** **REGIONAL LEVEL**

At its Regional Office POWERGRID has an Environmental and Social Management cell (ESMC) to manage Environmental and Social issues and to coordinate between ESMD at the corporate level and the Construction Area Office (CAO) of site. The key functions envisaged for ESMC are:

1. Advising and coordinating field offices to carry out environmental and social surveys for new projects envisaged in the Corporate Investment Plan
2. Assisting the ESMD and CAOs to finalise routes of entire power transmission lines considering the environmental and social factors that could arise en-route
3. To follow-up forest clearances and land acquisition processes with state forest offices and other state departments for various ongoing and new projects
4. Acting as a focal point for interaction with the ESMD and CAOs on various environmental and social aspects.

**6.3** **SITE OFFICE**

At the Construction Area office (CAO) level, POWERGRID has made the head of the site responsible for implementing the Environmental and Social aspect of project and are termed as Environmental and Social Management Team (ESMT). Key functions of the ESMT are:

1. Conduct surveys on environmental and social aspects to finalise the route for the power transmission projects
2. Conduct surveys for the sites to being considered for land acquisition
3. Interact with the Forest Departments to make the forest proposal and follow it up for MoEF clearance.
4. Interact with Revenue Authorities for land acquisition and follow it up with Authorised Agencies for implementation of Social Management Plan (SMP).
5. Implementation of Environment Management Plan (EMP) and SMP
6. Monitoring of EMP and SMP and producing periodic reports on the same.

It may be noted that POWERGRID is well equipped to implement and monitor its environment and Social Management plans.

As regards monitoring of impacts on ecological resources particularly in Forest, Sanctuary or National Park, it is generally done by the concerned Divisional Forest Officer, Chief Wildlife Warden and their staff as a part of their normal duties. A monitoring system (done by the Forest Department) is also in place for compensatory forests established as part of the Project. A detailed **Environment Management Plan (EMP)** including monitoring plan for all possible environmental and social impact and its proper management has been drawn **(Table- 6.1)** and will be implemented during various stage of project execution. Since many provisions of EMP are to be implemented by contractor hence for proper monitoring EMP has included in the contract document.

**6.4 ENVIRONMENTAL REVIEW**

Periodic review by corporate ESMD and higher management including review by CMD POWERGRID of all environmental and social issues is under taken to ensure that EMP and other measures are implemented at site. Besides it annual review by independent Auditor under ISO: 14001 shall also be undertaken for compliance of agreed policy and management plan.

**Table- 6.1 Environment Management Plan**

| **Project activity /stage** | **Potential impact** | **Proposed mitigation measure** | **Parameter to be monitored** | **Measurement and frequency** | **Institutional responsibility** | **Implementation schedule** |
| --- | --- | --- | --- | --- | --- | --- |
| **Pre-construction** |
| Location of transmission towers and transmission line alignment and design  | Exposure to safety related risks | Setback of dwellings to overhead line route designed in accordance with permitted level of power frequency and the regulation of supervision at sites. | Tower location and line alignment selection with respect to nearest dwellings | Setback distances to nearest houses - once | POWERGRID | Part of tower siting survey and detailed alignment survey and design |
| 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 |
| 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 |
| Phase out schedule to be prepared in case still in use – once | Part of equipment and process design |
| 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 |
| 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 |
| 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 |
| 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 – once | POWERGRID | Part of detailed siting and alignment survey /design |
| 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 |
| 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 |
|  | 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 | 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 phase | POWERGRID (Contractor through contract provisions) | Construction period |
| 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 |
| 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 |
| 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 |
| 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 |
| 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 carriageway width within RoW - every 2 weeks | POWERGRID (Contractor through contract provisions) | Construction period |
| Temporary blockage of utilities | Overflows, reduced discharge | Temporary placement of fill in drains/canals not permitted. | Temporary fill placement (m3) | Absence of fill in sensitive drainage areas - every 4 weeks | POWERGRID (Contractor through contract provisions) | Construction period |
| 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 |
| 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 |
| 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 |
| 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 m2) | Use or intended use of vegetation as approved by the statutory authorities – once per site | POWERGRID (Contractor through contract provisions) | Construction period |
| 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 m2, number of incidents reported) | Complaints by local people or other evidence of illegal harvesting - every 2 weeks | POWERGRID (Contractor through contract provisions) | Construction period |
| 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 (m3) | Acceptable soil disposal sites - every 2 weeks | POWER GRID (Contractor through contract provisions) | Construction period |
| Substation construction | Loss of soil | Fill for the substation foundations obtained by creating or improving local water supply ponds or drains, with the agreement of local communities. | Borrow area siting (area of site in m2 and estimated volume in m3) | Acceptable borrow areas that provide a benefit - every 2 weeks | POWERGRID (Contractor through contract provisions) | Construction period |
| Substation construction | Water pollution | Construction activities involving significant ground disturbance (i.e. substation land forming) not undertaken during the monsoon season. | Seasonal start and finish of major earthworks  | Timing of major disturbance activities - prior to start of construction activities | POWERGRID (Contractor through contract provisions) | Construction period |
| 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, m2) | Amount of ground disturbance - every 4 weeks | POWERGRID (Contractor through contract provisions) | Construction period |
| Statutory approvals | Statutory approvals for tree clearances – once for each site | POWERGRID (Contractor through contract provisions) | Construction period |
| 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 (m3)of fill disposal | Appropriate fill disposal locations - every 2 weeks | POWERGRID (Contractor through contract provisions) | Construction period |
| 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 |
| 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) | Construction period |
| 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 |
| 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 |
| 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 m3) |
| Repair /reinstate damaged bunds etc after construction completed | Status of facilities(earthwork in m3) |
| 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 |
| 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 m2; amount of bunds constructed [length in meter, area in m2, or volume in m3]) | Incorporating good design and construction management practices – once for each site | POWERGRID (Contractor through contract provisions) | Construction period |
| 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 provisions) | Construction period |
| As much as possible existing access ways will be used. | Design basis and layout | Incorporating good design engineering practices – once for each site |
| Productive 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  |
| 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 |
| 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 |
| 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) | Construction period |
| 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 |
| 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 |
| **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 |
| 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 |
| 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. | Substatio bunding (Oil sump) (“as-built” diagrams) | Bunding (Oil sump) capacity and permeability – once | POWERGRID | During operations |
| 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 |
| 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 technologies in crisis – once a month | POWERGRID | Design and Operation |
| 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 |
| 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 |  |  |
| 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 and 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 |
| 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 |
| Equipment specifications and design parameters | Release of chemicals and gases in receptors (air, water, land) | Processes, equipment and systems using cholofluorocarbons (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 |
| 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 |
| 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 |