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SECTION- I: Project Description

1.0 INTRODUCTION:

Power Grid Corporation of India Ltd. (POWERGRID) has prepared the Initial Environment Examination Report for its power transmission (improvement) project for Balia - Bhiwadi HVDC Bi-pole transmission line proposed under World Bank PSDP-III. The report describes the environmental issues/affects that might arise due to setting up proposed project in the State of Uttar Pradesh, Haryana & Rajasthan and various mitigation measures that will be taken care of by POWERGRID during design, construction and maintenance stages.

1.1 PROJECT DESCRIPTION & BENEFITS :

The proposed system is envisaged in consultation with CEA and other beneficiary constituents for the reliable transfer of Power and distribution amongst various beneficiary states. The main objective of this line is to transfer power from Balia, one of the major pooling stations, where power will be pooled from various upcoming generation projects in Eastern Region such as Kahalgaon-II (1320 MW), Barh (1980 MW), North Karanpura (1980 MW), Maithon (1000 MW) etc. within next 4-5 years. The power from Balia pooling S/s will be drawn through HVDC link to Bhiwadi S/S to meet the deficit of other regions and Northern region, one of the major beneficiaries and would further be dispersed to Western Region via Agra-Gwalior 765 kV line and 400 kV D/C Bhiwadi-Agra line which are being established to enhance the efficiency of existing network and addition of more power to other regions.

1.2 PROJECT HIGHLIGHTS:

- Location of project: - Uttar Pradesh, Haryana & Rajasthan
- Cost of project: - US\$ 698.08 million including IDC
- Beneficiaries: - Uttar Pradesh, Haryana, Delhi, Punjab & Rajasthan Advantages
- Transfer of large Quantum of Power from Eastern Region to Northern Region
- Allow controlled power flow and provide flexibility of operation.
 - Reduce demand supply gap of Northern Region
 - Tecno-economically more feasible than 400 Kv A/C Transmission alternatives

1.3 SCOPE OF WORK:

The scope of the transmission lines and sub-stations to be implemented under the scheme is as follows:

Transmission Line: i) Balia-Bhiwadi \pm 500kV HVDC bi-pole line – 803 km.

Substation : i) HVDC Terminal for 2500 MW at Balia
ii) HVDC Terminal for 2500 MW at Bhiwadi

SECTION-II: Base Line Data

2.1 DESCRIPTION OF ENVIRONMENT:

The HVDC Transmission line of the system has setting in the states of **Uttar Pradesh, Haryana and Rajasthan**. The base line data on general conditions as well as Environmental details in brief of above referred states are described below:

2.2 Uttar Pradesh:

Physiography:Uttar Pradesh is bounded by Uttaranchal and Nepal in North; Madhya Pradesh and Chhattisgarh in south; Rajasthan, Haryana and Delhi in west and Bihar and Jharkhand in east. It lies between lat. 23° 52' and 31° 28' N and long. 77° 5' and 84° 38' E.The main rivers of the state from are the Yamuna, the Ganga, the Ramganga, the Gomati and the Ghaghara. All the rivers, except the Gomati, emerge from the Himalaya. The Yamuna and the Ganga flow from north-east to south-west in their upper mountainous courses, from north to the south in western parts of the state and thereafter from north-west to south-east joining at Allahabad and thereafter west to east as Ganga river which leaves state of Uttar Pradesh near Balia and after running through Bengal state finally merges with Sea beyond way of Bengal .

Climate: The state has a tropical climate except in the Himalayas, which has a temperate climate.

Rainfall: The average annual rainfall ranges between 1000 to 1200 mm

Temperature: The average annual temperature ranges between 22.5°C to 25°C.

Soil: Transmission line is passing through Indo-Gangetic plain area. Predominant soils in the area are of alluvial nature

Mineral Resources

The state is poor in mineral resources. The only considerable deposits are of limestone in Mirzapur districts. These are being quarried and are used largely in cement manufacture. Dolomite occurs in small quantities Varanasi and Mirzapur district and pyrophyllite and diaspore in Jhansi and Hamirpur districts, phosphorite and bauxite in Karvi tehsil of Banda district and in southern part of Varanasi district and coalfield at Singrauli in Mirzapur district.

Ecological resources:

The recorded forest area of the state is 16,826 Sq.km, which constitutes 7.0% of its geographic area. By legal status, Reserved Forest constitutes 65.84%, Protected Forest 14.41% and Un-classed Forest 19.75%. Forest map of Uttar Pradesh is enclosed as **Map-1**. The flora of the region includes all the varieties of plants,

which grow there. The plains of Uttar Pradesh have been very rich in natural vegetation that has, however, diminished due to wide-ranging needs of the people.

Only a few patches of natural forest are now found scattered here and there in the plains. The following 3 types of forest are found in Uttar Pradesh.

- **Tropical Moist Deciduous Forests:** These forests are found in the moist region of Terai. They grow in regions that record 100 to 150 cm. of rainfall annually, have an average temperature between 26° - 27° C. and have considerable degree of humidity. A special feature of the forests is that deciduous trees of uneven size grow on higher altitude regions. Lower regions have several species interspersed with Bamboo, Climbers, Cand and ever green shrubs. Main trees are Sal, Ber, Gular, Jhingal, Palas, Mahua Semal, Dhak, Amla, Jamun, etc.
- **Tropical Dry Deciduous Forests:** These forests are found in all parts of the plains, and usually in central eastern and western regions. The trees are mostly deciduous. Since sunlight reaches the ground in abundance, shrubs and grasses also grow here. Large tracts of these forests have been cleared for cultivation. Important trees are Sal, Palas, Amaltas, Bel, Anjeer etc. Neem, Peepal, Sheesham. Mango, Jamun, Babool, Imli (Trmarind) etc. grows along riverbanks and in other moist regions.
- **Tropical Thorny Forests:** These are mostly found in south-western parts of the State. Such forests are confined to the areas, which have low annual rainfall (50-70 cms), mean annual temperature between 25° C to 27° C and low humidity (less than 47%). Widely scattered thorny trees mainly, Babool, Thorny, legumes and Euphorbias are extensively found here. During rains, short grasses also grow here. The trees are generally small here forming open dry forests. Important trees of the region are Phulai, Khair, Kokke, Dhaman, Danjha, Neem, etc. Various types of resin and gum are also obtained from these trees.

Fauna: Animals depend on forest not only of food but also for habitat.. Since major portion of the land is under intensive agricultures the area is mostly devoid of wild life, however some fauna living in water and land in the air are found in the State. The proposed line is not passing through any wildlife sanctuary national park.

The lines of proposed transmission system shall pass through mainly 13 district of this state namely Ballia, Mau, Azamgarh, Jaunpur, Ferozabad, Sultanpur, Raebareli, Unnao, Kanpur, Farukhabad, Hatharas, Mainpuri, , and Aligarh, having forest cover ranging from 0.18% to 8.52%. It may be noted from the table below that most of the forest cover in the said districts is covered under open forest category i.e. the forest is degraded in nature having less than 40% canopy density, routing of lines through these forest will not cause further degradation of forest resources. The Transmission line will not pass through forest. Details of forest cover of these districts are as follows:

District	Geographic Area (Sq. Km.)	Dense forest (Sq. Km.)	Open forest (Sq. Km.)	Total (Sq. Km.)	% Forest Cover
Ballia	2,981	10	0	10	0.34
Mau	1,713	0	3	3	0.18
Azamgarh	4,234	46	0	46	1.09
Sultanpur	4,436	74	14	88	1.98
Unnao	4,558	36	2	38	0.83
Kanpur-Nagar	1,065	21	3	24	2.25
Kanpur-Dehat	5,111	188	6	194	3.80
Mainpuri	2,760	47	2	49	1.78
Aligarh	3,650	39	2	41	1.12
Firozabad	2,361	13	30	43	1.82
Farrukhabad	2,181	32	4	36	1.65
Hathras	1,840	30	0	30	1.63
Jaunpur	4,038	30	6	36	0.89
Mainpuri	2,760	47	2	49	1.78

Human and Economic development:

Uttar Pradesh: The proposed transmission line passes through plain portion of Uttar Pradesh, which is a part of Indo-Gangetic plain.

UP is the most populous state in the country accounting for 16.4 per cent of the country's population. It is also the fourth largest state in geographical area (238,566 Sq. Km.)

Economy: Uttar Pradesh is rich in human and natural assets. Most of State's farm land is in the well watered and naturally fertile U.P is the largest producer of food grains and oilseeds in the country. It leads all the states in India in the production of wheat, maize, barley, gram, sugarcane and potatoes. The state (India's sugar bowl) produces about one half of the total sugarcane output in the country.

The western region of the state is more advanced in terms of agriculture. Majority of the population depends upon farming as its main occupation. Wheat, rice, sugar cane, pulses, oil seeds and potatoes are its main products. Sugar cane is an important cash crop almost through out the state and sugar mills and other cane crushers who produce Gur and Khandsari are common throughout the state. Uttar Pradesh is an important state in so far as horticulture is concerned.

Industries:

There are different types of minerals and several industries have come up based on the minerals. There are cement plants in the Mirzapur area in the Vindhya region, a bauxite based aluminum plant in the Banda area Coal deposits are found in the Singrauli area. The industries include a large printing establishment units engaged in manufacturing of scales, locks, letter boxes, furniture, badges and belts, leather goods, scissors etc. Handloom, carpet, glass, electrical goods, electro-plating, building material industries are also found in this State.

Until recently the organized industrial sector of U.P. was confined to agro-based industries such as sugar, cotton, textiles, edible oils, paper etc.. Now electric generation, railway equipment, electrical machinery, brass industry, aluminum and cement factories have sprung up. 24 spinning mills are functioning in the state under public and private sector. The main industrial cities in U.P are Kanpur, Gaziabad, NOIDA, Varanasi, Muradabad etc. Uttar Pradesh has a lot to offer by way of handicrafts. Some of the famous handicraft items of the region are Chikan work, Zari work, wooden toys and furniture, Terracotta toys and Brass work.

2.3 HARYANA

Physiography: The south west of Haryana is dry, sandy and barren.

Haryana has a geographic area of 4.42 million ha. It lies between lat. 27° 39' and 30°55'N and long 74°27' and 77°36'E. The state is divided into two natural zones, the Shiwalik and the Aravalli hills and the Indo-Gangetic plains. The Yamuna and the Ghaggar rivers is the lifeline of the state.

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

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

Temperature: The annual mean temperature varies between 22.5⁰C to 25⁰C.

Soil: Predominant soil found in project area is sandy soil.

Mineral Resources: The main minerals of Haryana are slate stone, lime stone, gypsum China clay, Marble, Sulphur etc.

Water Resources: Haryana has no perennial rivers. The only river that 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 Satluj with Beas rivers, 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.

Ecological Resources

Haryana, an intensively cultivated state, is deficient in natural forests. The recorded forest area of the state is 1551 Sq.km., which is 3.5% of the geographic area of the state. As per legal classification, Reserved Forest constitutes 16.05%, Protected Forest 74.47% and Un-classed Forest 9.48%. Forest map of Haryana is enclosed as **Map-2**.

Forests are mainly distributed in the north-eastern and south-eastern districts of state.

There are three forest types:

- Tropical Dry Deciduous in the eastern part

- Tropical Moist Deciduous in the Shiwalik region
- Tropical Thorn Forests in the western part of the state.

The lines of proposed transmission system shall pass through mainly 2 districts of this state having forest cover ranging from 0.87% to 7.01%. The Transmission line will not pass through forest. Details of forest cover of these districts are as follows:

District	Geographic area	2001 Assessment		Total	% of Forest cover
		Dense forest	Open forest		
Faridabad	2,151	19	46	65	3.02
Gurgaon	2,766	21	173	194	7.01

Protected Areas

One National Park and 9 Wildlife Sanctuaries in Haryana cover an area of 27,975 ha which constitutes 0.63% of the geographic area.

2.4 RAJASTHAN:

Rajasthan the second largest state of the country has a geographic area of 34.22 million ha, which constitutes 10.41% of the land area of the country. It lies between lat.23°4' and 30°11'N and long.69°29' and 78°7'E. The line near Bhiwadi S/Stn. will fall in Alwar district of Rajasthan.

Physiography: 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. Aravalli Mountains like mid rib divide the state into two parts. Following major physiographical regions can be identified in the state:

- Western Sandy Plains
- The Aravali Range and Hilly Region
- The Eastern Plains
- South-eastern Rajasthan Plateau (The Hadoti Plateau)

Climate: The climate of the state varies from semi-arid to arid. The climate varies throughout Rajasthan

Rainfall: Average rainfall varies; 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.

Temperature: The temperature in the state ranges from 25⁰C to 50⁰ C.

Soil: Predominant soil in the project area is mainly sandy soils

Mineral Resources: Rajasthan has the second largest mineral reserves in the country. Rajasthan produces 42 varieties of major minerals and 23 varieties of minor minerals.

Main minerals found in Rajasthan 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, leading producer of feldspar, the second largest producer of clay and silica. It is also a storehouse of 70% of the country's non-ferrous metallic minerals, producing 90% of the country's copper and zinc. The largest copper smelter in the country is based in this State.

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.

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 the 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 the Indira Gandhi Canal in the mid-1980s for the late prime minister, carries water from the Beas and Sutlej rivers in Punjab some 400 miles to irrigate desert land in northwestern and western Rajasthan.

Ecological Resources

The total forest area is 3.17 million ha. which constitutes 9.26% of geographic area of the state. By legal status Reserved Forest constitutes 37%, Protected Forest 53% and Unclassed Forest 10%. Forest map of Rajasthan is enclosed as **Map-3**.

The following two types of forest are found in Rajasthan

- **Tropical Dry Deciduous**
- **Tropical Thorn forests.**

Forests are mostly confined in eastern and southern parts of the state. The western part of the state is devoid of forests because of prevailing hot arid conditions.

Protected Areas

There are 4 National Parks and 24 Wildlife Sanctuaries, covering an area of 0.96 million ha, which constitutes 2.80% of the geographic area of the state. Ranthambore and Sariska are the two tiger reserves located in the state. Keoladeo Ghana National

Park, Bharatpur is of international importance for its rich avifauna and for migratory Siberian crane. It is one of the Heritage and the Ramsar sites of the country. Sambar Lake is also a Ramsar site. Pinchola, a wetland of national importance, with an area of 1,000 ha. is located in Udaipur district.

The line of proposed transmission system shall pass although through Alwar district of this state having forest cover 14.43%. The Arawali hills in the district have been declared to be heavily degraded by MOEF. Hence it will attract environment clearance under Environment (Protection) Act, 1986. Details of forest cover of Alwar district are as follows:

District	Geographic area (in sq. Km.)	2001 Assessment (in sq. Km.)		Total (in sq. Km.)	% of forest cover
		Dense forest	Open forest		
Alwar	8380	436	773	1209	14.43%

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 its 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. Electricity supplies are obtained from neighbouring states and from the Chambal Valley project. There is a nuclear energy plant at Rawatbhata, near Kota. 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.

SECTION III: POLICY, LEGAL & 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 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 forestland, 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 forestland 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/re-conditioner 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 Substances under Montreal 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 that uses these substances and planning to achieve CFC free organisation 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 that 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.

3.1.2 FUNDING AGENCIES:

WB Operational Policies (OP) 4.01/ADB's Operations Manuals (OM)- F1/BP 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.

3.1.3 PRESCRIPTIVE FRAMEWORK (NATIONAL)

- Constitutional Guarantees
- Applicable Legislations

3.1.4 RELEVANT POLICIES

- National Conservation Strategy and Policy Statement on Environment and Development, 1992
- Policy statement for Abatement of pollution, 1992

3.2.0 SOCIAL

3.2.1 MANDATORY REQUIREMENTS (NATIONAL)

- **National Policy on Resettlement and Rehabilitation for Project Affected Families:** 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 en-mass in plain areas or 250 or more families en-mass 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.
- **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, the government authorities can make no award of land unless all compensation has been paid.

3.2.2 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 Operations Manual OM-F2/BP.

- **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 Operations Manual –F2/BP: *Involuntary Resettlement:***

The OP describes Bank Policy and procedures on involuntary resettlement as well as conditions that borrowers are expected to meet during operations involving resettlement. Its objective is to avoid such resettlement as far as possible if unavoidable measures like assistance to affected persons for restoration of their assets/livelihood as would have been in the absence of project. 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 resettlements of peoples are foreseen and 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.

3.2.3 **PRESCRIPTIVE FRAMEWORK (NATIONAL)**

- Constitutional Guarantees
- 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*

3.2.4 **RELEVANT POLICIES**

- The Orissa Resettlement and Rehabilitation of Project Affected Persons Policy, 1994 (water resources projects)
- Resettlement & Rehabilitation Policy – NTPC

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, GIS/GPS and Forest Atlas (Govt. of India's Publication) for alternate alignment. 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.

4.1.1 STUDY OF ALTERNATIVES

POWERGRID approach towards Route selection

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

- (i) The route of the proposed transmission lines does not involve any human rehabilitation.
- (ii) Any monument of cultural or historical importance is not affected by the route of the transmission line.
- (iii) The proposed route of transmission line does not create any threat to the survival of any community with special reference to Tribal Community.
- (iv) The proposed route of transmission line does not affect any public utility services like playgrounds, schools, other establishments etc.
- (v) The line route does not pass through any sanctuaries, National Park etc.
- (vi) 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.*

- As a rule, alignments are generally cited 10-15 km away from major towns, whenever possible, to account for future urban expansion.

- 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.
- 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 line has 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, GIS/GPS techniques (**Plate-I to III**) etc. to arrive at most optimum route which can be taken up for detailed survey and assessment of environmental & social impacts for their proper management.

4.1.2 EVALUATION OF ROUTE ALIGNMENT ALTERNATIVES OF BALIA – BHIWADI HVDC BI-POLE TRANSMISSION LINE

Three different alignments (**Map-4**) were studied to arrive at most optimum route for detailed survey. The comparative details of these three alternatives are as follows:

ENVIRONMENT AND SOCIAL DETAILS FOR TRANSMISSION LINE				
Balia-Bhiwadi 2500 MW HVDC Bi-pole				
S.No	Description	Alignment-I	Alignment-II	Alignment-III
I.	Route Particulars	Origin Mau S/s near Ballia and destination Bhiwadi S/s	Origin Mau S/s near Ballia and destination Bhiwadi S/s	Origin Mau S/s near Ballia and destination Bhiwadi S/s
I	Length (Km from satellite images) May change ± 10 Kms	734.5	740.4	743.5
II	Terrain	Normally Plain	Normally Plain	Normally Plain
		Undulated towards Bhiwadi	Undulated towards Bhiwadi	Undulated towards Bhiwadi
(a)	Hilly/Plain (Kms)	Hilly – 03 Kms	Hilly – 03 Kms	Hilly – 03 Kms
		Near RANNA P.F	Near RANNA P.F	Near RANNA P.F
	Agriculture	712.5 Km	716.4 Km	715.5 Km
	Wet	4.0 Km near rivers	6.0 Km near rivers	6 Km near rivers
	Marsy	NIL	NIL	NIL
	Estuarine	NIL	NIL	NIL
	Other Type of Land	Sodic Land in plains and Fissured rock near Bhiwadi	Sodic Land in plains and Fissured rock near Bhiwadi	Sodic Land in plains and Fissured rock near Bhiwadi
2	Environment Details			
I	Name of the District/Districts through which TL passes	Ballia, Mau, Azamgarh, Jaunpur, Ferozabad, Sultanpur, , Raebareli, Unnao, Sohana, Kanpur, Farukhabad, Hatharas, Mainpuri, , Aligarh, Alwar Faridabad, Gurgaon	Ballia, Mau, Azamgarh, Jaunpur, Ferozabad, Sultanpur, , Raebareli, Unnao, Sohana, Kanpur, Farukhabad, Hatharas, Mainpuri, Alwar, Aligarh, Faridabad, Gurgaon	Ballia, Mau, Azamgarh, Jaunpur, Ferozabad, Sultanpur, , Raebareli, Unnao, Sohana, Kanpur, Farukhabad, Hatharas, Mainpuri, Alwar, Aligarh, Faridabad, Gurgaon
III	Towns in Alignment (Near	Ghosi, Sultanpur, Bilhaur,	Sultanpur, Bilhaur,	Sultanpur, Mainpuri,

	by)	Safipuri, Raebareli, Bachcharawa, Mainpuri, Etah, Aligarh, Sikandara Rao, Distpur, Palwal, Mubarakpur	Mainpuri, Etah, Aligarh, Sikandara Rao, Dera, Kadipur	Etah, Aligarh, Sikandara Rao, Kannauj, Kadipur
IV	House within ROW	NIL	NIL	NIL
V	Forest in Km/ha.	2 Km of RAINNA P F in Aravalli hills & 3 Km of social forestry	2 Km of RAINNA P F in Aravalli hills & 3 Km of social forestry	6 Km of GAUR R F in Aravalli hills & 4.5 Km of social forestry
		10 Ha of RAINNA P F in Aravalli hills & 15 Ha of strip plantation along road, railway lines and canals	15 Ha of RAINNA P F in Aravalli hills & 17.5 Ha of strip plantation along road, railway lines and canals	30 Ha of GAUR P F in Aravalli hills & 23 Ha of strip plantation along road, railway lines and canals
(a)	Type of forest (Reserve/Protected/ Mangrove/wild life area/ Biosphere reserve / any other environment/ sensitive area)	PF As above in Sr. No. V only	PF As above in V in Sr.Noonly	PF & RF As above in Sr.No. V only
(b)	Density of Forest	Low	Low	Low
©	Type of Fauna & Flora	Mango, Neem, Jamun, Acacia, Eucalyptus etc.	Mango, Neem, Jamun, Acacia, Eucalyptus etc	Mango, Neem, Jamun, Acacia, Eucalyptus etc
(d)	Endangered species if any	NIL	NIL	NIL
(e)	Historical/Cultural monument	None	None	None
(f)	Any other relevant information	-	-	-
3.	Compensation Cost			
(I)	Crop	200 lakhs	215 lakhs	225 lakhs
(II)	Forest	125 lakhs	172.5 lakhs	265 lakhs
4	No. of crossing			
(I)	Railway	13	15	15
(II)	Transmission line (Main Power line)	10	8	9
(III)	River X'ing etc.	3 major +9 minor	3major +5minor	3major +6 minor
		Ganga Span = 1007 M	Ganga Span=1908 M	Ganga Span=1480 M
		Gomti Span=164 M	Gomti Span=223 M	Gomiti Span=254 M
		Yamuna Span=506 M	Yamuna Span=540M	Yamuna Span=617M
Vi	Construction Problem	No	No	No
VII	O&M Problem	No	No	No
VIII	Overall Remarks	Route diverted towards south due to the presence of dense settlement in Lucknow, lowland areas around Safipur & RF near Unnao, Ganga crossing on this route is most feasible and appropriate due to the presence of embankment on one side and bridge near Nanamau, Yamauna crossing has least flood plain among the three alternative routes	Route diverted towards north due to the presence of settlement in Kanpur & Lucknow. Ganga and Yamauna crossings pass through a sandy stretch in the flood plain areas.	Route diverted towards north due to the presence of settlement in Kanpur & Lucknow. Ganga and Yamauna crossing pass through a sandy stretch in flood plain areas. Route passes through Gaur Reserved Forest in the Aravalli Hills
I	Route Particulars	S/s near Ballia/ Mau and destination Bhiwadi S/s	S/s near Ballia / Mau and destination Bhiwadi S/s	S/s near Ballia /Mau and destination Bhiwadi S/s

I	Length (km. with satellite images) (May change ± 10 KMs.)	734.5	740.4	743.5
5.	Construction Problem	Less as the maximum stretch of the line is approachable.	Construction can be done with some problem as the stretches are not easily approachable and the line is passing near city/ town area. At some places garden of fruit bearing trees are encountered in the line corridor.	Line is passing near Ghosi, Sagri Pewatal Shahganj which are fast developing area. Tal area is low land area and casting of foundation will be difficult. Less developed approach roads and line at few places is passing through populated area.
6.	O&M Problem	Negligible due to existing approach roads.	Line is passing through densely populated area i.e. Maharajganj, shahganj, Phoolpur which are fast growing area.	O&M will be comparatively difficult due to less developed approach roads.
7.	Overall Remarks	Shortest route and no critical / way leave problems.	Developed area, way leave problems.	Length is more and approach roads are less.

Reasons for selection of final route: This route (**Alignment- I**) has been found most feasible, economical and environmentally least disturbing. During the joint survey conducted by PGCIL and Forest Deptt. No Reserved Forest is involved. Railway crossings are minimum. Marshy land, wildlife areas and ecologically sensitive areas have been clearly avoided. The route is approachable for construction & O/M purpose with a number of link roads. From above comparison it may be noted that this alignment has least forest area involvement and also meets the POWERGRID's criteria of route selection due to availability of better approach roads, avoidance of forest / orchard, tal (low lying) and populated area. In view of above **Alignment-I** has been recommended for detailed survey.

SECTION-V: SCREENING OF POTENTIAL ENVIRONMENTAL IMPACT, EVALUATION AND ITS MANAGEMENT

5.0 Impact Due to Project Location and Design

Environmental impacts 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, and aerial photography are also applied. Introduction of GIS and GPS in route selection results 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 geo-technical 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 also these techniques are used in preliminary survey-using GIS/GPS (Illustrated at **Plate – I to III**). The alternative routes studied through and GIS/GPS is enclosed as (**Map-4**). Although, all possible measures have been taken during the finalization of route alignment for the proposed transmission line 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.

The proposed project envisages construction of two new substations namely i) Balia (including EHVAC-765/400/220 KV & ± 500 KV HVDC) and Addl. Bhiwadi HVDC terminal and addl. Extension bays in existing one. Lands for Balia and Addl. HVDC terminal for Bhiwadi are under acquisition process. Land for extensions of bays at Bhiwadi is already available within the boundary of existing one and R & R is not involved. However, for land being acquired as mentioned above, R & R is involved for which Social assessment/RAP is to be dealt separately.

(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 this 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 ASI, no such monuments are 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 though National Park/Sanctuary or any other protective areas have been completely avoided. But the route of proposed transmission line

is so finalized that it affects minimum forest area, which has also been certified by concerned Divisional Forest Officer (DFO). It may be seen from the above-referred tables (para-4.1.2) that out of total transmission line length of about 835 Km of which about 4.8 Km (0.58% only) length shall pass through forestland consisting of 25 Ha. forest area in the states of Uttar Pradesh, Haryana and Rajasthan. Prior approval of GOI/MOEF shall be obtained for affected forest under Forest (Conservation) Act, 1980 after detail survey of the route so finalized through forest area in consultation with local forest authorities. Most of the forests to be traversed by the lines are strip plantation for road/ river/canal crossings and social forestry and already heavily 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. 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/supervision of POWERGRID & Forest Department. POWERGRID will provide construction crews with fuel wood or alternative fuels as a precaution against collection of fuel wood from nearby forest.

Transmission lines can serve as new access routes into previously inaccessible or poorly accessible forests, thereby accelerating forest and wildlife loss. In such cases, POWERGRID cannot take action itself, but local Forest Department personnel will normally assess the dangers and take appropriate action, such as establishing guard stations at the entrance to the forest. Given the already easy access and degraded conditions at the proposed project sites, this problem is not expected to be encountered. Nonetheless, POWERGRID staff will report to the Forest Department any noticeable encroachment induced by the Projects.

As already explained all precautions have been taken to avoid routing of line through reserve forest and ecological sensitive areas and National park/ Sanctuaries. In the present case only 10 Ha protected forest and 15 Ha. Strip plantation along road and canal crossing is involved for which provision of Rs. 133.40 lakh has been kept towards mitigation.

5.1 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**).

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 him about the project and tower location, which shall be erected in the agricultural land, for compensation. Revenue department, after evaluating the loss due to construction activity and productivity of land, arrives at the compensation cost, which is paid to farmer. 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 depending on the timber value. Agricultural lands under private ownership will be identified, and in accordance with normal POWERGRID procedures crop/tree compensation will be paid to the affected persons. Budgetary provision Rs.800.21 lakh is kept to meet these expenses. **FUNDING AGENCIES:**

5.2 **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.50,000/- per KM. In the instant case provision of Rs.1.39lakh has been kept for 2.79 km (affected portion) towards these expenses.

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.

5.3 **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 in case of ± 500 KV HVDC lines is approx. 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 gray 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. It is reported that 93 m³ of woodland can reduce the noise level by 8 dB. Actual noise levels measured at perimeters of existing Substations are 20 to 30 dB.

(vi) Blockage of wildlife passage

Since the line is passing through mostly agricultural, wasteland and the affected forest area is also not a migration path of wild life hence, possibility of disturbance to wild life are nil/remote.

5.2 Environmental Problems During Construction Phase

(i) Uncontrolled silt runoff

The Project 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

Since proposed line is to be constructed 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.

(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 substations 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.

(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 Erection Conditions of Contract (ECC), a part of bidding documents.

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*. POWERGRID has a dedicated unit to oversee all health and safety aspects of its project under the Operation Service Deptt. POWERGRID has framed guidelines/checklist for workers' safety as its personnel are exposed to live EHV apparatus and transmission lines. This guidelines/checklist includes work permits and safety precautions for work on the transmission lines both during construction and operation (**Annexure-2**) and is monitored regularly by site in-charge and corporate Operation Services.

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 do 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 the lines in the subject project are not passing through any forest area, the problem of losing natural resources in this project is not envisages.

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

The 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 the project area 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 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.

5.6 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:

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

Apart from organising many informal group meetings in different villages, a public meeting was also organised in the village Khanpur (Raj.) Bazarka & Chechhera (Haryana) and Manikpur (UP), Mohamadpur (UP), Kandharpur (U.P) from 11st to 24th Nov.'04. To get the maximum participation during the Public consultation Programme notices were served in advance to the villagers (**Annexure-3**). The details of line and its importance were explained to the villagers by the Deputy Manager, Bhiwadi S/Stn./Manager in-charge, Balia along with ESMD officials. About 15-20 villagers including Sarpanchs Mr. Dhani Ram of village at Khanpur/ M/s. Ramkhilwan & Suryadev of Manikpur, participated in public consultation (**Photograph sets -1 to 6**). Pamphlets in local language were circulated during the programme amongst the participants (**Annexure-4**). The programme was arranged in interactive way and queries like crop compensation etc. were replied. The villagers including Sarpanch appreciated the programme and they assured to extend their cooperation for construction of transmission project. The process of such consultation shall continue during project implementation and even during O&M stage.

5.7 CONCLUSIONS:

From the above discussion, it would seem that the area is not rich in natural resources. During route selection care has been taken to avoid involvement of any National Park/Sanctuary but involvement of Road/canal side forest could not be avoided due to terrain and other physiographical reasons. Thus, alignment of **alternative-I** route selected for detailed survey is the most optimum one and involved minimum forest. R&R issues for fresh land acquisition involved shall be dealt separately. Hence, based on the **criteria agreed with the Bank** the project is coming under the **P2 category**. 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.

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:

- Advising and coordinating RHQs and Site to carry out environmental and social surveys for new projects.
- Assisting RHQs and site to finalize routes of entire power transmission line considering environmental and social factors that could arise en-route
- 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
- Act as a focal point for interaction with the MOEF for expediting forest clearances and follow-ups with the Ministry of Power.
- 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 ESCMC are:

- Advising and coordinating field offices to carry out environmental and social surveys for new projects envisaged in the Corporate Investment Plan
- Assisting the ESMD and CAOs to finalise routes of entire power transmission lines considering the environmental and social factors that could arise en-route
- To follow-up forest clearances and land acquisition processes with state forest offices and other state departments for various ongoing and new projects
- 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:

- Conduct surveys on environmental and social aspects to finalise the route for the power transmission projects
- Conduct surveys for the sites to be considered for land acquisition
- Interact with the Forest Departments to make the forest proposal and follow it up for MOEF clearance.
- Interact with Revenue Authorities for land acquisition and follow it up with Authorised Agencies for implementation of Social Management Plan (SMP).
- Implementation of Environment Management Plan (EMP) and SMP
- 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.**

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.

