

## SECTION I: PROJECT DESCRIPTION

### 1.0 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 30th April 2015, POWERGRID has established about 1,16,117 Ckt kms of transmission lines at 765 kV, 400 kV, 220 kV & 132 KV EHVAC & +500 KV HVDC levels and 193 sub-stations with transformation capacity of about 2,33,209 MVA. This transmission network, spread over length and breadth of the country, is consistently maintained at an availability of over 99% through deployment of state-of-the-art Operation & Maintenance techniques at par with global standards. About 50% of total power generated in the country is wheeled through transmission network.

India has a peninsular geography comprising vast coast line. Majority of this coast line is lying in Southern part of India extending from eastern coast in Andhra Pradesh & Tamil Nadu to western coast in Kerala and Karnataka. As part of Government of India programme for accelerated capacity addition, a number of Ultra Mega Power Projects (UMPP) with capacity of 4000 MW each are being developed. Krishnapatnam UMPP is one of these UMPPs which is proposed to be developed at Krishnapatnam along eastern coast of Andhra Pradesh near Nellore in Southern Region. The Krishnapatnam UMPP project is a multi-regional project where beneficiaries of the project are located in more than one region. As indicated by the project developer, the allocation of power from Krishnapatnam UMPP to different beneficiaries comprise of 3200 MW to various constituents of Southern Region (viz. Andhra Pradesh - 1600 MW, Karnataka - 800 MW and Tamil Nadu - 800 MW) and 800 MW to Maharashtra in Western Region.

The present project comprises of development of Inter-regional “Transmission Highway” between Southern and Western Region and strengthening of transmission systems within Southern and Western Regions. The above scheme has been agreed by all the constituents of Southern & Western Regions in their respective Standing Committee meetings.

The **Final Environment Assessment Report (FEAR)** for System Strengthening in Southern and Western Region for Krishnapatnam UMPP has been prepared in accordance with Environmental & Social Policy and Procedures (ESPP) of the Corporation. The present report describes the environmental issues/affects that have been encountered or may arise due to setting up this project and various mitigation measures are being taken care of by POWERGRID during construction and maintenance stages.

### 1.1 OBJECTIVE OF THE PROJECT:

The main objective of this system is to :

- Enhancement of inter-regional transmission capacity to export surplus power of southern region;
- Provide strengthening of transmission system in Southern and Western for reliable transfer of power,
- Reduction in transmission losses.

## 1.2 PROJECT DESCRIPTION :

Southern Region having a vast coast line presents attractive opportunity for development of imported coal based coastal generation projects. Towards this, POWERGRID, as a nodal agency for Long Term Open Access has already received number of applications amounting to capacity addition of about 30,000 MW from generation project developers for transfer of power to various beneficiaries in Southern, Western and Northern Region. These generation projects are in various stages of development and most of them are still in process of identifying their beneficiaries. Accordingly, the firm requirement of inter-regional capacity can be arrived at only after finalization of beneficiaries by the generation project developers. However, from the target beneficiaries indicated by the generation developers, it is apparent that with the coming of large number of coastal based generation projects, Southern region is likely to be major exporter of power.

The applications for long term open Access to the Inter State Transmission System (ISTS) inter-alia also include application of M/s Coastal Andhra Power Limited who have proposed to setup 4000 MW Ultra Mega Power Project (UMPP) to be located at Krishnapatnam in Andhra Pradesh. As a part of Govt of India programme for accelerated capacity addition, a number of Ultra Mega Power Projects (UMPP) with capacity of 4000 MW each are being developed. Krishnapatnam UMPP is one of these UMPPs which is proposed to be developed at Krishnapatnam along eastern coast of Andhra Pradesh near Nellore in Southern Region.

The Krishnapatnam UMPP project is a multi-regional project where beneficiaries of the project are located in more than one region. As indicated by the project developer, the allocation of power from Krishnapatnam UMPP to different beneficiaries comprise of 3200 MW to various constituents of Southern Region (viz. Andhra Pradesh - 1600 MW, Karnataka - 800 MW and Tamil Nadu - 800 MW) and 800 MW to Maharashtra in Western Region. Based on the firm power transfer requirement of 800 MW from Krishnapatnam UMPP and the interest evinced by the generation developers coming through Long term open access process, it is prudent that high capacity transmission corridor is developed between Southern and Western region.

Accordingly, a power transmission “Highway” encompassing Kurnool & Raichur in Southern region and Sholapur & Pune in Western region has been planned. The power from Krishnapatnam UMPP and also from other generation projects materializing through long term open access route shall be transmitted to this transmission “Highway” through separate transmission schemes. As per load flow studies carried out for “System strengthening in Southern & Western Region for Krishnapatnam UMPP” scheme, there would be reduction of losses of about 220 MW in the Southern and Western grid.

## 1.3 PROJECT HIGHLIGHTS :

a)	Project Name	:	System Strengthening in Southern and Western Region for Krishnapatnam UMPP
b)	Location	:	Andhra Pradesh
c)	Beneficiary States	:	Constituents of Southern & Western Region
d)	Project Cost	:	Rs. 23661.07 million (USD 518.22 million) excluding IDC

## 1.4 PROJECT SCOPE :

### Transmission lines

1. Raichur – Solapur 765 kV S/C line - 208 km
2. LILO of existing Raichur- Gooty 400 kV Quad D/C line at Raichur- 10.5 km
3. Sholapur – Pune 765 kV S/C line - 268 km
4. Kurnool (New) – Raichur 765 kV S/C line - 92 km<sup>1</sup>
5. Pune (New) – Pune 400 kV D/C (Quad) line – 5 km<sup>1</sup>
6. LILO of Parli-Pune 400 kV D/C and Pune-Aurangabad 400kV D /C line at Pune - 48.5 km

### Substations

1. Establishment of new 765/400kV substation at Raichur with 765/400 kV 7x500 MVA single phase transformers including Bays;
2. Establishment of new 765/400kV substation at Solapur with 765/400 kV 7x500 MVA single phase transformers including Bays;
3. Extension of 765/400kV substation at Kurnool, Pune (only 7x500 MVA single phase transformers excluding Bays);
4. Extension of Gooty 400/220 kV substation – 2X63 MVAR three phase shunt reactor excluding Bays.

A power map showing the transmission grid of Western Region highlighting the above scope of works is placed as **Exhibit - I**.

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<sup>1</sup> Both the lines included in earlier scope stand deleted. New LILO Lines at Sl. No.6 have been added in place of 400 kV D/C (Quad) Pune-Pune line due to system requirements and RoW problem faced at Pune.

## SECTION II : BASELINE DATA

**2.0** The project is located in the State of Andhra Pradesh, Maharashtra and Karnataka in India. The basic details of the area under project are given below:

### **2.1 ANDHRA PRADESH :**

Andhra Pradesh has a geographic area of 27.51 million ha, which constitutes 8.37% of the total area of the country. It is situated in the tropical zone and lines between latitude 12° 40' and 19° 50' N and longitude 76° 45' and 84° 40' E.

**Physiographically** the state can be divided into 3 distinct regions viz. (i) the mountainous region having Nallamalai and Erramalai Hills of the Rayalaseema and the Eastern Ghats (ii) the plateau having an altitude of 100 m to 800m and (iii) the deltas of rivers and the sea coast. The proposed project is located in the district of Anantapur of Rayalaseema region. The general land use pattern of the state is given in **Table 2.1**.

**Table-2.1: Land use Pattern**

Land Use	Area in '000 ha	Percentage
Total geographical area	27,507	
Reporting area for land utilization	27,505	100.00
Forests	6,230	22.65
Not available for cultivation	4,827	17.55
Permanent pastures and other grazing lands	553	2.01
Land under misc.tree crops & groves	289	1.05
Culturable wasteland	614	2.23
Fallow lands other than current fallows	1,558	5.66
Current Fallows	2,273	8.26
Net area sown	11,161	40.58

*Source: Land use statistics, Ministry of Agriculture, GOI, 2011-12*

**Climate** of the state is hot and humid with temperatures ranging from 15 °C to 45° C. Annual rainfall ranges from 1,100 to 1,250 mm in the north, reducing to about 500 mm in the south. The north-eastern areas along the coastline are periodically lashed by cyclones.

The **major rivers** of the State are the Godavari, the Krishna and the Pennar, which pass through the Deccan Plateau and drain into the Bay of Bengal. Nearly 75% of the state area is covered by the river basins of the Godavari, Krishna and Pennar, and their tributaries. There are 17 smaller rivers like the Sarada, Nagavali and Musi, as well as several streams.

**Ecological Resources** Total recorded forest area in the state is 63,814 sq. km., which works out to 23.20% of its geographical area. Reserved, Protected and Unclassed Forests constitute 79.10%, 19.38% and 1.52% of the total forest area respectively (**Map-1**). The forests are the main source of supply of fodder and fuel and subsistence for the poorest sections of the people and tribal population in the interior under-developed areas of the state. The five forest types occurring in the state are Tropical Dry Deciduous, Tropical Thorn, Tropical Moist Deciduous, Tropical Dry Evergreen, and Littoral and Swamp forests. Forests are distributed mainly in the form of a wide strip in the north starting from Nizamabad district in the west to Srikakulam in the east. Besides

this, a belt runs from central to the southern part of the state in the Nallamalai hills. There are 6 National Parks and 21 Wildlife Sanctuaries covering an area of 0.14 million ha and 1.16 million ha respectively. Thus, a total of 1.30 million ha area constituting 4.73% of the geographical area of the state is under protected area network. Nagarjuna Sagar-Srisailem, the largest tiger reserve of the country with an area of 0.36 million ha is located in the state.

The project involves two districts of Andhra Pradesh i.e. Kurnool and Mehboobnagar. However, due to precaution taken during route alignment the forest area has been completely avoided. The details of forest resources available in the project area are as follows:

District	Geographic area	Area in sq. km.				% Forest cover
		Very Dense forest	Moderately Dense forest	Open forest	Total	
Kurnool	17,658	72	1488	549	2109	11.94
Mehboobnagar	18432	329	537	1076	1942	10.54

Source: India State of Forest Report 2013 by Forest Survey of India

The **economy** of Andhra is based on widely diversified farming base with a rich variety of cash crops. It is surplus in food grains, and produces over 10 m tons of rice therefore called as the granary of South. Agriculture sector accounts for around 50% of state economy and provides livelihood for 70% of the population. The major crops of the state are paddy, jawar, bazra, ragi, maize, groundnut, tobacco, cotton, castor and sugarcane etc. The district Anantapur is not rich in the Forest Wealth. The name ' Forest' in Anantapur District does not indicate any dense tree population with thick foliage of variform of pastures.

## 2.2 MAHARASHTRA:

Maharashtra, with an area of 30.77 million ha, is the third largest state of the country, constituting 9.36% of the total geographic area. It lies between latitude 15<sup>0</sup> 35' and 22<sup>0</sup> 02' N and longitude 72<sup>0</sup> 36' and 80<sup>0</sup> 54' E.

**Physiographically**, the state can be divided into five regions viz. Deccan Plateau, Central Highland, Eastern Chotanagpur Plateau, Eastern Ghat and Coastal plain. Except around Mumbai, and along the eastern limits, the State of Maharashtra presents a monotonously uniform, flat-topped skyline. This topography of the state is the outcome of its geological structure. The state area, barring the extreme eastern Vidarbha region, parts of Kolhapur and Sindhudurg, is practically co-terminus with the Deccan Traps. The general land use pattern of the State is given in **Table 2.2**.

**Table-2.2 : Land use Pattern**

Land Use	Area in '000 ha	Percentage
Total geographical area	30,771	
Reporting area for land utilization	30758	100.00
Forests	5211	16.94
Not available for cultivation	3179	10.34
Permanent pastures and other grazing lands	1244	4.04
Land under misc.tree crops & groves	250	0.81
Culturable wasteland	919	2.99
Fallow lands other than current fallows	1192	3.88

Current Fallows	1378	4.48
Net area sown	17386	56.53

Source: Land Use Statistics, Ministry of Agriculture, GOI, 2011-12

**Climate:** The state enjoys a tropical monsoon climate; the hot scorching summer from March onwards yields to the rainy monsoon in early June. The rich green cover of the monsoon season persists during the mild winter that follows through an unpleasant October transition, but turns into a dusty, barren brown as the summer sets in again.

**Rainfall:** The average annual rainfall varies between 160-200 cms. However, seasonal rains from the western sea-clouds are very heavy and the rainfall is over 400 cm. on the Sahyadrian crests. The Konkan on the windward side is also endowed with heavy rainfall, declining northwards. East of the Sahyadri, the rainfall diminishes to a meagre 70 cm. in the western plateau districts, with Solapur-Ahmednagar lying in the heart of the dry zone.

**Temperature:** The average annual temperature varies from 25-35 °C.

**Soil:** The soils of Maharashtra are residual, derived from the underlying basalts. In the semi-dry plateau, the regur (black-cotton soil) is clayey, rich in iron, but poor in nitrogen and organic matter; it is moisture-retentive. The higher plateau areas have Pather soils, which contain more gravel. In the rainy Konkan, and the Sahyadri Range, the same basalts give rise to the brick-red laterite soil.

**Mineral Resources:** The mineral-bearing zones of Maharashtra lie beyond the area of the basalts in eastern Vidarbha, southern Kolhapur and the Sindhudurg area. The Chandrapur, Gadchiroli, Bhandara and Nagpur Districts form the main mineral belt, with coal and manganese as the major minerals and iron ore and limestone as potential wealth. The Ratnagiri coast contains sizeable deposits of illmenite.

**Water Resources:** Water is the most precious natural resource of the state, greatly in the demand, and most unevenly distributed. The major rivers like the Krishna, Bhima, Godavari, Tapi-Purna and Wardha-Wainganga through its Fluvial action has further aided in the compartmentalization of the state into broad, open river valleys, alternating with plateau interfluves.

**Ecological Resources:** The recorded forest area of the state is 61,357 km<sup>2</sup> which is 19.94% of the geographical area. The Reserved Forests constitute 84.01%, Protected Forests 10.96% and Unclassed Forests 5.02% of the recorded forest area. There are six forest types in the state, viz. Tropical Semi Evergreen, Tropical Moist Deciduous, Tropical Dry Deciduous, and Tropical Thorn, Subtropical Broadleaved hill and Littoral and Swamp forests (**Map-2**). Maharashtra has 6 National Parks and 35 Wildlife Sanctuaries covering an area of 15,526 km<sup>2</sup> which constitutes 5.04% of the state's geographical area. There are three Tiger Reserves, namely, Melghat, Tadoba-Andhari and Pench covering an area of 1,660km<sup>2</sup>. A wetland of national importance Ujni is located in Sholapur district.

The lines of proposed transmission system passed through mainly two district of this state viz. Solapur and Pune having forest cover ranging from 0.31 % to 11.08%. Earlier route involved 45.17 ha. of forest land. However, with the change in location of

substation to Shikrapur, the route is so aligned that it doesn't involve any forest land. Details of forest cover of these districts are as follows:

District	Geographic area	Area in sq. km.				% Forest cover
		Very Dense forest	Moderately Dense forest	Open forest	Total	
Solapur	14,895	0	8	38	46	0.31
Pune	15,643	0	757	977	1,734	11.08

Source: India State of Forest Report 2013 by Forest Survey of India

About 70 per cent of the people in Maharashtra depend on agriculture. Agriculture contributes more than 22% of the state's income. Maharashtra is the largest producer of a number of items such as Alphonso mango, Thomson seedless grapes, Cavendish bananas, soft seeded pomegranates, sugar, cotton, oilseeds and cashew. Important cash crops are cotton, sugar cane, groundnut and tobacco. Although the state accounts for 9.2% of the total population of the country, it shares about 11% of industrial units, over 17% of labour, about 16% of investment and 23% of the value of industrial output.

Maharashtra's major industries are chemicals and allied products, textiles, electrical and non-electrical machinery and petroleum and allied products. Other important industries are pharmaceuticals, engineering goods, machine tools, steel and iron castings and plastic ware. The development of offshore oil fields at Mumbai High and the nearby basins have contributed greatly for the industrial development of the state.

## 2.3 KARNATAKA :

Karnataka is located in southwestern part of the country and lies between latitude 11°10' to 18° 25'N and longitude 74°10' to 78°35'E. It has a geographic area of 19.18 million ha constituting 5.83% of the total area of the country. It has a coastline of approximately 400 km.

**Physiographically** the State can be divided into two distinct regions viz. the 'Maland' or hilly region comprising of Western Ghats and the 'Maidan' or the plain region comprising the inland plateau of varying height. Karnataka has representatives of all types of variations in topography - high mountains, plateaus, residual hills and coastal plains. The State is enclosed by chains of mountains to its west, east and south. It consists mainly of plateau which has higher elevation of 600 to 900 metres above mean sea level. The entire landscape is undulating, broken up by mountains and deep ravines. General land use pattern of the state is given in **Table 2.3**.

**Table-2.3: Land use Pattern**

Land Use	Area in '000 ha	Percentage
Total geographical area	19,179	
Reporting area for land utilization	19,050	100.00
Forests	3,072	16.13
Not available for cultivation	2,220	11.65
Permanent pastures and other grazing lands	908	4.77
Land under misc. tree crops & groves	285	1.50
Culturable wasteland	413	2.17

Fallow lands other than current fallows	539	2.83
Current Fallows	1,672	8.78
Net area sown	9,941	52.18

Source: Land use statistics, Ministry of Agriculture, GOI, 2011-12

**Climate:** The state enjoys three main types of climates. For meteorological purposes, the state has been divided into three sub-divisions namely Coastal Karnataka, North Interior Karnataka and South Interior Karnataka. The Tropical Monsoon climate covers the entire coastal belt and adjoining areas. Southern half of the State experiences hot, seasonally dry tropical savana climate while most of the northern half experiences hot, semi-arid, tropical steppe type of climate. The climate of the State varies with the seasons.

**Soil:** The Red soil constitutes major soil type, followed by Black soil. In some area Lateritic soils, Alluvio- Colluvial Soils are also found.

**Rainfall:** The annual rainfall in the State varies from 2,000 3,200 mm in the Western Ghats and between 400-500 mm in the northern and northeastern parts. Average summer and winter temperature varies from 26°C to 35°C and 14°C to 25°C respectively.

**Temperature:** Both day and night temperatures are more or less uniform over the State, except at the coastal region and high elevated plateau. They generally decrease south-westwards over the State due to higher elevation and attain lower values at high level stations. April and May are the hottest months.

**Mineral Resources:** Karnataka is endowed with fairly rich mineral wealth distributed more or less evenly over its territory. It has one of the oldest Geological Survey Department in the country, started as far back as 1880. The State contains deposits of asbestos, bauxite, chromite, dolomite, gold, iron ore, kaolin, limestone, magnesite, manganese, ochre, quartz and silica sand. Karnataka is the sole producer of feldspar and leading producer of gold (84%), moulding sand (63%) and fuchsite quartzite (57%).

**Water Resources:** Karnataka accounts for about six per cent of the country's surface water resources of 17 lakh million cubic metres (mcum). About 40 percent of this is available in the east flowing rivers and the remaining from west flowing rivers. The major rivers of the State are Krishna, Cauvery, Godavari, North Pennar and South Pennar

**Ecological Resources:** The recorded forest area of the state is 38,284 km<sup>2</sup> which is 19.96% of its geographical area. The Reserved Forests constitute 74.94%, Protected Forests 10.27%, and Unclassed Forests 14.79% (**Map-3**). The forests are the main source of supply of fodder and fuel and subsistence for the poorest sections of the people and tribal population in the interior under-developed areas of the state. The five forest types found in the State are Tropical Wet Evergreen, Tropical Semi Evergreen, Tropical Dry Evergreen, Tropical Dry Deciduous and Tropical Thorn forests. Most of the forests in Karnataka are situated in a belt running from north to south starting from Belgaum to Mysore in the Western Ghats. Karnataka has 5 National Parks and 21 Wildlife Sanctuaries covering an area of 2472 km<sup>2</sup> and 3,879 km<sup>2</sup> respectively. Thus a total of 6,351 km<sup>2</sup> area constituting 3.31 % of the state's geographical area is under protected area network. Karnataka has two Tiger Reserves namely, Bandipur



Nagarhole (extension) and Bhadra, covering an area of 1,366 km<sup>2</sup>. A part of the famous Nilgiri Biosphere Reserve (area 5,520 km<sup>2</sup>) also lies in the state.

The lines of proposed transmission system passed through two district of this state viz. Raichur and Gulbarga having forest cover ranging from 0.35 % to 01.82%. It may be noted from the table below that the forest cover in the above said districts are generally open/degraded. However, with due precaution in the route alignment the forest area has been avoided completely.

District	Geographic area	Area in sq. km.				% Forest cover
		Very Dense forest	Moderately Dense forest	Open forest	Total	
Raichur	6,827	0	2	22	24	0.35
Gulbarga	16,224	0	87	209	296	1.82

*Source: India State of Forest Report 2013 by Forest Survey of India*

Karnataka is one of the more economically progressive states in India. Nearly 56% of the workforce in Karnataka is engaged in agriculture and related activities Karnataka is the manufacturing hub for some of the largest public sector industries in India, including HAL, NAL, BHEL, ITI, BEML and HMT, which are based in Bangalore. Since the 1980s, Karnataka has emerged as the pan-Indian leader in the field of Information Technology. Exports from IT firms exceeded Rs. 50,000 crores (\$12.5 billion) in 2006-07, accounting for nearly 38% of all IT exports from India. Karnataka also leads the nation in biotechnology. It is home to India's largest bio cluster, with 158 of the country's 320 biotechnology firms being based here. The state also accounts for 75% of India's floriculture.

## 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 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 42<sup>nd</sup> 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 51A (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 guarantees 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 the 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.
- (b) On the other hand the citizens owe a constitutional duty to protect and improve 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 projects. 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 Ministry of Environment and Forests (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 three districts in the Aravalis (*viz.*, Alwar in Rajasthan and Gurgaon & Nuh -Mewat in Haryana). The Aravali range, in these areas, is heavily degraded; hence, any industrial activity there becomes critical. Environment Impact Notification, 2006 lays down specific project categories that require clearance from MoEF, Power transmission projects are not included in this list.

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

MoEF vide its notification dt. 17<sup>th</sup> 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 16<sup>th</sup> 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.

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

MoEF vide its notification dt. 16<sup>th</sup> 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 off, in any manner, other than by depositing with the dealer/manufacturer/registered recycler/importer/re-conditioner or at the designated collection centers – and to file half yearly return in prescribed form to the concerned State Pollution Control Board.

- **The Hazardous Wastes(Management, Handling and Transboundary Movement) Rules, 2008 :**

MoEF vide its notification dt. 20<sup>th</sup> May, 1986 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.

- **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.

### 3.1.3 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 into account the natural environment, human health and safety, 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)

- Applicable Legislations

### 3.1.5 RELEVANT POLICIES

- National Conservation Strategy and Policy Statement on Environment and Development, 1992
- Policy statement for Abatement of pollution, 1992
- National Environment Policy, 2006

## 3.2 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 Articles 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 spirit to fulfill its environmental and social obligations and responsibilities.

### **3.2.2 MANDATORY REQUIREMENTS (NATIONAL)**

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

The Ministry of Rural Development, Gol, has notified “The National Rehabilitation, and Resettlement Policy” in October 2007 applicable to all development projects involving displacement of 400 or more families en masse in plain areas or 200 or more families en masse in hilly areas. It essentially addresses the rehabilitation of Project Affected Families (PAFs) and provides a broad canvas for an effective consultation between PAFs and the project authorities. 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 number 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.

- **Right of Way (RoW) 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, Gol vide gazette notification dt 23.12.2003 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, no award of land can be made by the government authorities unless all compensation has been paid.

### **3.2.3 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 (OP-4.10) and ADB’s Safeguard Policy Statement, June 2009.

- **World Bank 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 an 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 OP 4.10: 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)**

- National and State-wide Laws and Policies Relating to Land Acquisition and Issues of R&R
  - Maharashtra Project Affected persons Rehabilitation Act, 1986

### 3.2.5 RELEVANT POLICIES

- Resettlement and Rehabilitation Policy - Coal India Ltd., May,2008
- Resettlement and Rehabilitation Policy - NHPC Ltd., 2007
- Policy for Rehabilitation and Resettlement of Land Owners - Land Acquisition Oustees – Haryana State, December,2007;
- The Orissa Resettlement and Rehabilitation Policy, Orissa, May, 2006;
- Resettlement and Rehabilitation Policy – NTPC Ltd., June, 2005;

## SECTION III : MAJOR FEATURES OF FINAL ROUTE & ENVIRONMENTAL IMPACT

### 4.1 ROUTE SELECTION

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. To minimize these possible impact POWERGRID at the system planning stage itself try to avoid ecological sensitive areas like forest. Wherever such infringements are substantial, different alternative options are considered to select most viable route alignment. For further optimization of route modern survey techniques/tools like GIS, GPS aerial photography is 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 mitigate measures including engineering variations depending upon the site situation/location. The route/site selection criteria followed by POWERGRID is detailed below:

#### Environmental Criteria for 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 the right of eminent domain, 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 (refer final route map).
- 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 routes of line under this transmission system 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 etc. to arrive at most optimum route which can be taken up for detailed survey using GIS/GPS. and assessment of environmental and social impacts for their proper management. In the instant projects also these techniques have been used for studied of 3 alternatives route (**Annexure-1**).

Similarly the TOR for detailed survey using modern tool like GIS/GPS also contained parameters to avoid/reduce environmental impact while deciding the final route alignment. The major objectives for detailed survey that are part of contract are summarized below:

- (i) *The alignment of transmission line shall be most economical from the point of view of construction and maintenance.*
- (ii) ***Routing of transmission line through protected and reserved forest area should be avoided. In case it is not possible to avoid the forest or areas having large trees completely then keeping in view of the overall economy, the route should be aligned in such a way that cutting of trees is minimum.***
- (iii) ***The route should have minimum crossing of major rivers, railway lines, and national/state high ways, overhead EHP power lines and communication lines.***
- (iv) *The number of angle point shall be kept to a minimum.*
- (v) *The distance between the terminal points specified shall be kept shortest possible, consistent with the terrain that is encountered.*
- (vi) ***Marshy and low line areas, river beds and earth slip zones shall be avoided to minimum risk to the foundations.***
- (vii) *It would be preferable to utilize level ground for the alignment.*
- (viii) *Crossing of power line shall be minimal. Alignment will be kept at a minimum distance of 300 meters from power lines to avoid induction problems on the lower voltage lines.*
- (ix) *Crossings of communication lines shall be minimized and it shall be preferably at right angle, proximity and paralyses with telecom lines shall be eliminated to avoid danger of induction to them.*
- (x) ***Area subjected to flooding searches streams shall be avoided.***
- (xi) ***Restricted areas such as civil and military airfield shall be avoided. Care shall also be taken to avoid the aircraft landing approaches.***
- (xii) ***All alignment should be easily accessible both in dry and rainy seasons to enable maintenance throughout the year.***
- (xiii) ***Certain areas such as query sites, tea, tobacco and saffron fields and rich plantation, gardens and nurseries that will present the owner problems in of right of way and leave clearance during construction and maintenance should be avoided.***
- (xiv) ***Angle point should be selected such that shifting of the point within 100 m radius is possible at the time of construction of the line.***
- (xv) ***The line routing should avoid large habitation densely populated areas to the extent possible***
- (xvi) *The area requires special foundations and those prone to flooding should be avoided*

- (xvii) For examination of the alternatives and identification of the most appropriate route, besides making use of information/data/details available/extracted through survey of India topographical maps and computer aided processing of NRSA satellite imagery, the contractor shall also carry out reconnaissance/preliminary survey as may be required for the verification and collection of additional information/data/details.
- (xviii) The contractor shall submit his preliminary observation and suggestion along with various information/data/details collected and also processed satellite imagery data, topographical map data marked with alternative routes etc. The final evaluation of the alternative routes shall be conducted by the contractor in consultation with owners' representatives and optimal route alignment shall be proposed by the contractor. Digital terrain modeling using contour data from topographical maps as well as processed satellite data shall be done by the contractor for the selected route. A flythrough perspective using suitable software(s) shall be developed or further refinement of the selected route. If required site visit and field verification shall be conducted by the contractor jointly with the owners' representatives for the proposed route alignment.
- (xix) Final digitized route alignment drawing with the latest topographical and other details/features including all river railway lines, canals, roads etc. upto 8 Kms on both side of selected route alignment shall be submitted by the contractors for owners approval along with report containing other information / details as mentioned above.**

Based on above the most optimum route alignments are finalized. In the instant project also such studies have been carried out and final route alignment has been finalized and chosen for construction. The major features of transmission line covered under this project are as follows;

### **1. 765 KV S/C Raichur-Solapur Line**

The total length of line is 208 kms. Road Network is very good all along the route. The alignment is well connected with many pucca/moorum roads besides interconnection with major Distt. Roads and State Highway (SH-12,SH-20 etc.) respectively. The line corridor also involves 1 river crossing and 1 railway crossing. The nearest airport to the transmission line is Hyderabad which is 183 kms from Raichur.

Both unskilled and semi-skilled labour for construction purposes are available locally in nearby villages along the line. Local labours are quite conversant with the normal construction activity. Route alignment map is placed as **Annexure-II (A)**.

#### **Details of Forest involvement:**

The subject line does not involve any forest land.

#### **Forest Clearance:**

Since instant transmission line doesn't involve any forest land, forest clearance under Forest (Conservation) Act, 1980 is not applicable.

### **(ENVIRONMENTAL IMPACT MATRIX)**

<b>S. No.</b>	<b>PARAMETERS</b>	<b>EXTENT OF IMPACT</b>
1. A.	Total Line length - 208 km	--

S. No.	PARAMETERS	EXTENT OF IMPACT
B.	Terrain: Plain - 100% Hilly - 0%	
2.	Type of line, 765 kV S/c	---
3.	Forest land traversed (km)	Nil
4.	Forest land traversed (ha.)	Nil
5.	Forest type	NA
6.	Forest density	NA
7.	Rare/ endangered flora	Nil
8.	Rare/ endangered fauna	Nil
9.	Migrating Wildlife/ breeding ground	None
10.	National Park / sanctuaries	None
11.	Amount of wet land traversed	Nil
12.	Soil erodability	Low
13.	Historical / Cultural Monument	None
14.	Relocation of villagers	None
15.	Loss/ Hindrance to Public Utilities	Negligible, restricted to construction phase only.

## 2. 765 KV S/C Solapur-Pune

The total length of line is 268 Kms. Road Network is very good all along the route. The alignment is well connected with many pucca/moorum roads besides interconnection with major Distt. Roads and State Highway respectively. The line corridor involves crossing through SH-68, NH-9,, SH-10, SH-67, SH-60 and NH-50. The line corridor also involves 14 river crossing and 3 railway crossing. The nearest airport to the transmission line is Pune at a distance of approx. 19 km.

Both unskilled and semi-skilled labour for construction purposes are available locally in nearby villages along the line. Local labours are quite conversant with the normal construction activity. Route alignment map is placed as **Annexure-II (B)**.

### Details of Forest involvement:

The subject line doesn't involve any forest land.

### Forest Clearance:

Since instant transmission line doesn't involve any forest land, forest clearance under Forest (Conservation) Act, 1980 is not applicable.

### (ENVIRONMENTAL IMPACT MATRIX)

S. No.	PARAMETERS	EXTENT OF IMPACT
1. A.	Total Line length - 268 Km	--
B.	Terrain: - Plain : 225 km (84%) Hilly : 43 km (16%)	
2.	Type of line, 765 kV S/C	---
3.	Forest land traversed (km)	Nil <sup>2</sup>

<sup>2</sup> Earlier route involved approx. 60.41 ha. of forest land. However, due to careful selection of substation site and due diligence in route alignment of proposed line the forest area involvement was completely avoided.

S. No.	PARAMETERS	EXTENT OF IMPACT
4.	Forest land traversed (ha.)	Nil
5.	Forest type	NA
6.	Forest density	NA
7.	Rare/ endangered flora	Nil
8.	Rare/ endangered fauna	Nil
9.	Migrating Wildlife/ breeding ground	None
10.	National Park / sanctuaries	None
11.	Amount of wet land traversed	Nil
12.	Soil erodability	Low
13.	Historical / Cultural Monument	None
14.	Relocation of villagers	None
15.	Loss/ Hindrance to Public Utilities	Negligible, restricted to construction phase only.

### 3. LILO of 400 KV D/C Parli-Pune and Pune-Aurangabad at Pune & LILO of existing Raichur – Gooty 400 kV Quad D/C line at Raichur (New) substation

The proposed lines are meant to provide electricity to nearby areas connected to substation in the vicinity. These lines are shorter in line length and don't have any forest area involvement. Moreover, no major environmental and social issues are envisaged, hence no alternative has been studied for these lines which require such studies. Route alignment map of LILO of Raichur – Gooty 400 kV Quad line at Raichur and LILO of 400 KV D/C Parli-Pune & Pune-Aurangabad at Pune are placed as **Annexure-II (A)** & **Annexure-II (B)** respectively.

## SECTION V: POTENTIAL ENVIRONMENTAL IMPACT, ITS EVALUATION AND MANAGEMENT

### 5.0 IMPACT DUE TO PROJECT LOCATION

Although, all possible measures have been taken during the finalization of route alignment as described in the earlier chapter 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 possible environmental impact and measures taken to minimize the same 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 noted from the above description that final route alignments do not impact habitation. Moreover, 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 involved construction of two new substations at Raichur & Solapur and extension of three substations at Kurnool Pune and Gooty. For extension of three existing substations at Kurnool, Pune and Gooty sufficient land is already available for proposed bays and hence there was no need to acquired fresh land. However, fresh land area measuring 37.54 ha. (Private land) acquired for Raichur through consent award where as for Solapur substation a total land area of 22.24 ha.(21.14 ha. private & 1.10 ha. govt. land) acquired for construction of substation. Hence fresh land acquisition and R&R issues are only involved in the Solapur and Raichur substations. As per the provisions of ESPP, Indian Institute of Management (IIM), Bangalore and M/s Center for Management & Social Research (CMSR), Hyderabad had been entrusted with the work of detailed social assessment. Based on outcome of such assessment, Rehabilitation Action Plan (RAP) for Raichur & Solapur were prepared & submitted to World Bank in Mar'11 and Jan'12 respectively and also disclosed on POWERGRID's website. RAP implementation has been completed and various community development works proposed under RAP like construction of school building, community center, supply of computers in school etc. were undertaken for upliftment/ improvement of infrastructure of affected village.

#### (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 assessment carried out during finalization of route alignment in consultation with State Revenue Authorities and ASI, no such monuments are getting affected in the instant project.

#### (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. It is pertinent to mention that the earlier route of 765 KV S/C Solapur-Pune involved approx. 60.41 ha. of forest land. However, by careful route selection and shifting of substation location to Shikrapur, the route is so aligned that it doesn't involve any forest land. Hence, in the instant project routes of all transmission lines so finalized that all such areas have been completely avoided.

#### (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**).

In case of 765 kV S/C Raichur – Solapur & Sholapur – Pune line, a total of 1596 towers are erected which resulted in impact on land area of 0.1596 ha. Similarly in case of LILO of kV D/C Parli-Pune 400 and Pune-Aurangabad line at Pune & LILO of existing Raichur-Gooty 400 kV Quad D/C line at Raichur, a total land area 0.0111 ha & 0.0035 ha are impacted by erection 111 & 35 towers. Hence, the total land loss estimated to be about 0.1742 ha. which is negligible and not adversely affect the land holding.

However, in areas where lines traverse through agricultural land, compensation is paid to owners for any crop damage incurred as a result of construction activities. POWERGRID field staff consulted affected villagers and local revenue department and apprised them about the project and tower location, which are to 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 that is paid to farmer. Agricultural activities are allowed to continue following the construction period. If bunds or other on-farm works are disturbed during construction or maintenance, they are 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 are 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 are being identified, and in accordance with normal POWERGRID procedures compensation is paid to the affected villagers (**Annexure-III**). It is estimated that total compensation towards crops/trees shall be in the tune of Rs. 1401 Lakhs and budgetary provision for the same is made in the cost estimate to meet these expenses (**Annexure-IV**). In the instant project particular in Maharashtra, additional compensation towards land cost etc. has also been paid based on the DC order under Section 16(1) of Indian Telegraph Act, 1885.

#### (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. All necessary clearance have already been obtained or in the advance stage of processing with relevant authorities.

**(vii) Interference with drainage pattern**

As the transmission lines are constructed aurally 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. Since in the instant project most of the line is being constructed mostly in the plain area no such impact is encountered. In case of substations, all drainage channels along or inside substations is trained and connected to main or existing drainage to avoid any erosion due to uncontrolled flow of water

## **5.1 ENVIRONMENTAL PROBLEMS DUE TO DESIGN**

**(i) Escape of polluting materials**

The equipments installed on lines are static in nature and do not generate any fumes or waste materials. To avoid/minimize during construction phase a clause has been included in the contract document and is monitored regularly by the site engineers (Refer EMP).

**(ii) Explosion/fire hazards**

During the survey and site selection for transmission lines and substation, it has been ensured that these are kept away from oil/gas pipelines and other sites with potential for creating explosions or fires. Apart from this, state of art safety instruments are installed in the substations on both the ends so that line gets tripped within milliseconds in case of any fault.

**(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. Soil disturbed during the development of sites is stored separately and used to restore the surface (**Exhibit-2**). Infertile and rocky material dumped at carefully selected dumping areas and used as fill for tower foundations.

#### **(iv) Environmental aesthetics**

Since spacing between the towers in case of 765 kV & 400 kV lines is approx. 300- 400 meters and it was ensured that route of the lines are far away from the localities as possible, there is any significant affect on visual aesthetics of the localities. POWERGRID also take 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.

#### **(v) Noise/vibration nuisances**

The equipment installed at substation are mostly static and are so designed that the noise level always remains within permissible limits i.e. 85 dB(A) as per Indian standards. The noise levels reported during normal operating conditions are about 60 to 70 dB(A) 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 substations that reduce the sound level appreciably. It is reported that 93 m<sup>3</sup> of woodland can reduce the noise level by 8 dB. Actual noise levels measured at perimeters of existing Substations are 25 to 35 dB(A).

Noise during construction phase is periodically monitored and due maintenance of equipments are ensured to keep the noise level well within the prescribed limit.

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

Since the line is passing through mostly agricultural, wasteland and no forest/protected area, migration path of wild life/bird etc. are getting involved, hence possibility of disturbance to wild life is not anticipated.

## **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 as the major portion of the project area is in plain. In the hilly areas, excavation is avoided in rainy days. Hence 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 away from settlements. Further, all the construction activities are undertaken through the use of small mechanical devices e.g. tractors and manual labour therefore nuisance to the nearby properties is insignificant. The construction activities are normally undertaken in lean period/post harvesting to avoid/minimize such impact (**Exhibit-3**).

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

Access to the site along existing roads or village paths, minor improvements to paths are made where ever necessary, but no major construction of roads are required either



during construction or as a part of maintenance procedures. Using details collected using GIS and GPS during route alignment, It may be noted that access road (Metalled /Non-metalled /Cart roads) are existing to access all angle points and construction of no new road is required (taking 250 m as buffer zone which can always be accessed through head load) for these lines. Even if at some places it is found that access road is not available than existing field/path is upgraded/augmented for utilization and compensation for any damage to crop or field is paid to the owner. In many areas such improvement in the access road is highly appreciated by the local population. As explained above, special care is taken to ensure that construction activities are conducted mostly during the lean period.

As and when a transmission line crosses any road/railways line, the short span angle (DT) towers are located at a 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. Apart from this, safety precaution like barricading of work area and placement of visible signage are undertaken to avoid any unforeseen incident.

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

The proposed lines are constructed mostly in plain area where erosion problem is not anticipated. But at some points due to terrain transmission towers are placed on slopes and erosion prone soils as internationally accepted engineering practices to prevent soil erosion. This includes cutting and filling slopes wherever necessary. The back cut slopes and downhill slopes are treated with revetments. As explained above adequate steps are taken to resurface the area after construction. Wherever sites are affected by active erosion or landslides, both biological and engineering treatment are being carried out, e.g. provision of breast walls and retaining walls, and sowing soil binding grasses around the site. Further, construction is generally undertaken in dry/non-monsoon period. As the proposed lines are mostly passing through plain areas no such problems encountered.

#### **(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. As such 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 are guiding 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(**Annexure-V**).

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 include work permits and

safety precautions for work on the transmission lines both during construction and operation and is monitored regularly by Site In-charge and Corporate Operation Services (**Annexure-VI**). In addition trainings are imparted to the workers on fire fighting and safety measures (**Exhibit- 4**). Safety tools like helmet, safety belt, gloves etc. are provided to them in accordance to the provisions of Safety Manual. First aid facilities are made available with the labour gangs, and doctors called in from nearby towns when necessary. The number of outside (skilled) labourers are quite small, of the order of 25-30 people per group. The remaining workforce of unskilled labourers are 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 are disinfected regularly if required. In order to minimize/checking of spread of socially transmitted diseases e.g. HIV/AIDS etc., POWERGRID/contractor conducted awareness programs on such issues for the construction workers (**Annexure- VII**).

### 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 substation personnel for both, the lines as well as substations. 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 is being 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 are not passing directly over any residential properties and as such the potential for EMF effects to occur will be further diminished. It is also ensure that there are no properties in the ROW beneath and to the sides of the overhead line, automatic mitigation against EMF are 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. In the instant project, none of the line is passing through forest area, hence the problem of losing natural resources is not envisaged.

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

The instant project doesn't 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 being used are coming from factories while the excavated soil is used for backfilling to restore the surface. To conserve precious water resource and enhance the ground water level, provision of rain water harvesting has been made in all proposed substations. Hence it may be seen that the activities associated with implementation of subject project shall not cause any accelerated use of resources for short term gains. Thus the project is not causing 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 protected/reserve forest is getting affected. Hence, there is no possibility of endangering/causing extinction of any species.

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

The instant project doesn't involve 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 rural to urban 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) also 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 organizing many informal group meetings in different villages (**Table-5.1**) public meeting were also organized in the routes of transmission lines. To get the maximum participation during the Public consultation Program a notice was served well in advance to the villagers. The details of line and its importance were explained to the villagers. The details of public consultation along with photographs are enclosed as **Annexure-VIII**. The programmes are arranged in 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 be continued even during O&M stage.

**Table 5.1: PUBLIC CONSULTATION ENROUTE OF TRANSMISSION LINES**

S No.	Date	Village Name	Person attended
<b>1.</b>	<b>765 kV S/C Raichur-Solapur &amp; LILO of 400 kV D/C Raichur- Gooty Line</b>		
a.	16 <sup>th</sup> May 2009 Distt.- Raichur	J. Venketpura	Village Sarpanch / Panchayat Members and general/ interested resident of village
b.	27 <sup>th</sup> May 2009 Distt.- Gulbarga	Gundrevula	-Do-
c.	03 <sup>rd</sup> Dec. 2013 Distt. Raichur	Jagir Venkatapuram	-Do-
d.	04 <sup>th</sup> Dec. 2013 Distt. Solapur	Udagi	-Do-

2.	<b>765 kV S/C Solapur-Pune and LILO of 400 kV D/C Parli-Pune and 400kV D /C Pune-Aurangabad line at Pune</b>		
a.	13 <sup>th</sup> June 2009 Distt.- Pune	Kedgaon	-Do-
b.	19 <sup>th</sup> June 2009 Distt.- Pune	Jambud	-Do-
c.	20 <sup>th</sup> June 2009 Distt.- Pune	Hattur	-Do-

## 5.6 CONCLUSIONS:

From the above discussion, it would seem that the area is rich in physical resources. But careful route selection has completely avoided involvement of any forest area and protected areas. The routes selected for detailed survey are the most optimum alignment and there are no major environment and social issues involved. Hence, the project is coming under the P2 category or non sensitive as the project does not involve any forest/ protected area. 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. 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 aspects 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 enroute.
- 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). The key functions envisaged for ESCM 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 CAO to finalize 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 Site level, POWERGRID has made the head of the CAOs 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 finalize 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 Authorized 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. As no forest area is involved in the instant project such monitoring/provision shall not be applicable to proposed project. A detailed Environment Management Plan (EMP) including monitoring plan for all possible environmental and social impact and its proper management has been drawn and is being implemented at site during various stage of project execution. The updated EMP with compliance status for subject line is enclosed as **Annexure-IX**.

Apart from this, Bank's environment and social experts have also visited Solapur and Raichur site in April' 2009 & April'2015 respectively to oversee the implementation of RAP and environment management measures undertaken by POWERGRID. Some photograph of above site visits are placed as **Annexure- X**.

### 6.4 Environmental Review:

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