



## **SECTION- I: PROJECT DESCRIPTION**

### **1.1 BACKGROUND**

POWERGRID, the Central Transmission Utility (CTU) of the country is engaged in power transmission with the mandate for planning, co-ordination, supervision and control over complete inter-State transmission system. As on Mar'09, POWERGRID has established about 71,500 ckt kms of transmission lines at 765 kV, 400 kV, 220 kV & 132 kV EHVAC &  $\pm 500$  kV HVDC levels and 120 sub-stations with transformation capacity of about 79,500 MVA. This transmission network, spread over length and breadth of the country, is consistently maintained at an availability of over 99.55% through deployment of state-of-the-art Operation & Maintenance techniques at par with global standards. About 45% of total power generated in the country is wheeled through this transmission network.

POWERGRID has been contributing significantly towards development of Indian power sector by undertaking coordinated development of power transmission network along with effective and transparent operation of regional grids and through continuous innovations in technical & managerial fields.

Satluj Jal Vidyut Nigam Ltd is establishing Rampur Hydro Electric Project having 412 MW capacity in the State of Himachal Pradesh. The power from the project is likely to be consumed by the Northern region beneficiaries. The generation project is already under construction and it is expected that the project shall be commissioned during XI plan.

The transmission system for Rampur HEP was discussed and agreed during the 18th Standing Committee Meeting of Northern Region Transmission Planning held on 06/06/2005. A copy the minutes of above meeting in this regard is enclosed as **Annexure-1**.

Initial Environment Assessment Report (IEAR) for Rampur transmission project has been prepared which includes i) LILO of Nathpa Jhakri – Nalagarh 400 kV D/c line at Rampur ii) Patiala – Ludhiana 400 kV D/c & iii) LILO of Patiala –Hissar 400kV line at Kaithal under transmission system for Rampur HEP). The report describes the environmental issues/affects that might arise due to setting up proposed project in the States of Punjab and Haryana and various mitigation measures that will be taken care of by POWERGRID during design, construction and maintenance stages.

### **1.2 PROJECT JUSTIFICATION**

For evacuation of power from Rampur HEP, LILO of Nathpa Jhakri – Nalagarh 400 kV D/C line at Rampur has been considered, which would be available by that time and would have adequate margins for immediate evacuation of power from the project. Further, for dispersal of power, LILO of second circuit of Patiala –Hissar 400 kV line at Kaithal (LILO of first circuit already done) has been envisaged. In addition, Patiala – Ludhiana 400 kV D/C line is also envisaged under this project to provide requisite



strengthening in the system. Power transfer to other constituents shall be through displacement.

### 1.3 BENEFITS OF THE PROJECT

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

### 1.4 PROJECT OBJECTIVE

The objective of the project is to provide adequate transmission system for immediate evacuation of power from the Rampur generation project and further dispersal of power to the beneficiaries.

The beneficiaries are All 9 constituents of NR (Delhi, Uttar Pradesh, Uttarakhand, Haryana, Rajasthan, Punjab, Himachal Pradesh, Jammu & Kashmir, and Chandigarh).

### 1.5 PROJECT HIGHLIGHTS

a)	Project Name	:	Transmission System associated with Rampur HEP
b)	Location	:	Northern Region
c)	Beneficiary States/UT	:	Constituents of Northern Region
d)	Project Cost	:	Rs.207.90 Crores at 2nd Quarter 2008 Price Level
e)	Commissioning Schedule	:	Nov'2011

### 1.6 SCOPE OF WORK

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

#### Transmission Lines

- (i) Patiala – Ludhiana 400 kV D/C line - 78 km.
- (ii) LILO of 400 kV D/C Nathpa Jhakri – Nalagarh (Triple Snowbird) line at Rampur – 4 km.
- (iii) LILO of Patiala-Hissar 400 kV (Triple Snowbird) line at Kaithal - 33 km.



## **Substations**

- (i) Patiala 400/220 kV (POWERGRID) Substation (Extension)
- (ii) Ludhiana 400/220 kV (POWERGRID) Substation (Extension)
- (iii) Kaithal 400/220 kV (POWERGRID) Substation (Extension)

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



## SECTION II: BASELINE DATA

### 2.0 DESCRIPTION OF ENVIRONMENT

The proposed transmission project involves 3 transmission lines i.e. Patiala – Ludhiana 400 kV D/C line, LILO of 400 kV D/C Nathpa Jhakri – Nalagarh (Triple Snowbird) line at Rampur & LILO of Patiala-Hissar 400 kV line at Kaithal.

Three transmission lines and associated substations extension are located in the states of Punjab, Haryana & Himachal Pradesh.

- (i) Patiala – Ludhiana 400 kV D/C line has setting in the state of Punjab.
- (ii) LILO of Patiala-Hissar 400 kV (Triple Snowbird) line at Kaithal in the state of Haryana and Punjab.
- (iii) LILO of 400 kV D/C Nathpa Jhakri – Nalagarh (Triple Snowbird) line at Rampur has setting in the state of Himachal Pradesh.

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

### 2.1 PUNJAB

Punjab is situated in North West India and covers an area of 5.04 Million ha. constituting 1.57 % of the total geographical area of the country and population of 242.89 Lakh (2001 census) constituting 2.4% of the total population of India. Punjab is bounded on the west by Pakistan, on the north east by Himachal Pradesh and on the South by Haryana and Rajasthan. It extends between 29° 33' and 32° 31' North Latitude and 73°53' and 76°56' East Longitude.

Physiographically, the state is divided into three regions viz. Mountainous Himalayas, Sub-Mountainous Himalayas and Eastern & Western Alluvial Plain.

The land use pattern is shown in Table below:

**Table 2.1- Land Use Pattern**

Land use	Area in '000 ha	Percentage
Geographical area	5036	
Total reporting area	5033	100
Forests	305	6.06
Not available for cultivation	381	7.57
Permanent pasture and other grazing land	7	0.14
Land under misc. tree crops and groves	10	0.2
Culturable wasteland	25	0.5
Fallow land other than current fallow	4	0.08
Current fallow	4	0.08
Net Area sown	4264	84.72

*Source: Land Use Statistics, Ministry of Agriculture, GOI, 2005*



## **Climate**

The climate of Punjab is of semi arid monsoon type. This climate is transitional type between the arid climate of Rajasthan and humid climate of Himachal Pradesh. Unfortunately, the anticyclone with its high pressure does not allow the moisture laden monsoon winds to rise higher so as to condense and shower rainfall. Other characteristics of Punjab's climate are high summer temperature and evaporation. Punjab experiences extremes of temperature in winter and summer.

During May and June temperature remains high. Rainy season starts in July up to August bringing down temperatures appreciably but high temperature coupled with high humidity cause uncomfortable conditions. By the end of October, onset of winter brings down the temperature appreciably. January is the coldest month in the region. The cold waves occasionally cause the temperature to fall below freezing point and especially in sandy tracts. Heavy fog is encountered in mornings of December and January especially in and around industrial towns.

## **Rainfall**

The average annual rainfall varies from 480 mm in plains to 960 mm in the hilly region.

## **Temperature**

The highest temperatures are recorded in the month of June ranging between 42°C to 45°C. January is the coldest month when temperature ranges between 10°C and 15°C. The annual temperature ranges from 23°C to 25°C.

## **Soil**

Soils in Punjab are alluvial in character. Only in submontane tracts the alluvium consists of more sand and gravel than clay or loam. Similarly, in fringe areas of Ferozpur and Bhatinda districts soils similar to Bangar are found. In rest of Punjab the soils are purely alluvial soils and difference there is of older alluvium i.e. 'Bangar' and young alluvium i.e. 'Khadar'. The younger soils consist of more clay whereas older alluvium soils are overlain by layers of sand.

## **Mineral Resources**

Punjab has practically no mineral resources. The economy of the state is dependent mainly on agriculture and Industrial sector. However boulder gravels and sand in the river beds is mined for construction material. Beside alluvial clay is largely mined for brick making in the kilns.

## **Water Resources**

The rivers have played a very significant role in the life of Punjab and name of state is derived from 'Punj' "Aab" meaning land of five rivers. Hence any account of Punjab seems to be incomplete without reference to its rivers. In present Punjab there are three main rivers- Ravi, Beas and Sutlej.



Punjab has a distribution network of 1.45 lakh km of canals including branch canals and minor distributaries and one lakh km of field canals for irrigation purposes.

### Ecological Resources

Punjab, an intensively cultivated state, is deficient in natural forests. The forest cover of the state based on the satellite data of October-January, 2004, is 1,558 Sq. km. which constitutes 3.09 % of the geographic area. Out of these 723 sq. km constitutes moderately dense forest and 835 sq. km open forest. The recorded forest area of the state is 3,084 sq. km. which is 6.12 % of the total geographical area of the state. As per legal classification, Reserved Forest constitutes 1.43 %, Protected Forest 36.83 % and Unclassified Forest 61.7 %. Forests are mainly distributed in the north-eastern and south-eastern districts of state. Refer **Map-1** for Forest Map of Punjab.

**Patiala – Ludhiana 400 kV D/C line** shall pass through Patiala, Fatehgarh Sahib and Ludhiana & **LILO of Patiala-Hissar line at Kaithal** shall pass through Patiala & Sangrur. It will have almost negligible impact on forest cover as areas through which line is proposed to pass has forest cover ranging from 0.37% to 2.38% of the total geographical area only. Details of forest cover of these districts are as follows:

**Table 2.2**

District	Geographic area (Sq. Km.)	2005 Assessment (Sq.Km.)				% of G.A
		Very dense forest	Mod. dense forest	Open forest	Total	
<b>1. Patiala – Ludhiana 400 kV D/C line</b>						
Patiala	3654	0	26	61	87	2.38
Fatehgarh	1180	0	0	0	0	0.00
Ludhiana	3578	0	27	18	45	1.26
<b>2. LILO of Patiala-Hissar line at Kaithal</b>						
Sangrur	5108	0	5	14	19	0.37
Patiala	3654	0	26	61	87	2.38
Jind (Haryana)	The details are given in the table no. 2.4					
Kaithal(Haryana)						

**Source: Forest Survey Report 2005**

### Human and Economic Development

Punjab's economy is mainly agriculture oriented and enjoys an enviable position among states in yield per hectare, irrigation intensity, consumption of fertilizers and power etc. Punjab is an agriculturally progressive state producing over eight tones per hectare of wheat and rice with 94% of the cropped area irrigated, It uses 184 kg per hectare of chemical fertilizers and has 9.35 lakh tractors in use. Although Punjab encompasses only 1.5% of the geographical area in India, it produces 21% of wheat, 10% of rice and 8% of cotton of the total produce of these crops in India. The state has more than 50% of wheat share and 33% of rice share in central pool. Today agriculture is backbone of Punjab economy. This can be substantiated with following facts:



- i. Agriculture Income forms 26.3% of net state domestic product.
- ii. 66% of Punjab's population lives in rural areas where agriculture is main occupation.
- iii. Agriculture provides raw material to agro based industries like cotton textile, sugar mills, rice shellers, oil crushing, vanaspati mills etc.

Economic development is also dependent upon transformation from state of domination of agriculture sector to that of industrial sector. At the time of independence Punjab had only a few hundred industrial units mainly processing foodgrains, cotton spinning and brick kilns. Today, there are more than 2 lacs registered working large, medium and small scale industries employing more than 9 lacs workers. Maximum number of units and employment is in Ludhiana district. It leads in the manufacture of machine and hand tools; printing and paper cutting machinery; auto parts and electrical switch gear. The state provides more than 75% of the country's requirement for bicycles, sewing machines, hosiery and sports goods.

Roads provide basic infrastructure facilities for both agricultural and industrial sectors of the state. The state has more than 60000 km of metal roads as on date. More than 99 percent of villages in state are linked by roads. Also all the districts of state are connected with rail link. The total rail route length is approximately 4000 km.

Punjab has a 58% literacy rate and per capita income is also among highest in India. Punjab average growth rate is 10% amongst the highest in the country, reflects the progressive economy of the state. It has become a land of boundless opportunities, offering distinct advantages for investment and industry. Punjab has marked its existence on the global business mainstream, with major players from around the world forming joint ventures in the field of agri-business. The state was the first to translate agricultural technology into the "green revolution", recording highest growth rate in food production.

## 2.2 HARYANA

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

- (i) The Shiwalik and the Aravalli hills
- (ii) The Indo-Gangetic plains.

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

**Table 2.3**

Land use	Area in '000 ha	Percentage
Total geographical area	4,421	
Reporting area for land utilization	4402	100.00
Forests	115	2.61
Not available for cultivation	469	10.65
Permanent pasture and other grazing lands	34	0.77
Land under misc. tree crops & groves	7	0.16
Culturable wasteland	19	0.43
Fallow land other than current fallows	0	0.00



Current fallows	232	5.27
Net area sown	3526	80.10

Source: Land use statistics, Ministry of Agriculture, GOI, 2005

## 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 22.5°C to 25°C.

## 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 which flows through Haryana is the Ghaggar, which passes through the northern fringes of the state. Haryana is a beneficiary of the multi-purpose project on Setluj with Beas, where it shares benefit with Punjab and Rajasthan. Major irrigation projects are Western Yamuna Canal, Bhakra Canal System and Gurgaon Canal. The state has completed Jui Loharu and Sewani lift irrigation schemes. Jawaharlal Nehru irrigation scheme, the biggest of its kind shall be completed soon.

## Ecological Resources

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

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





## Protected Areas

Two National Park and 10 Wildlife Sanctuaries in Haryana cover an area of 27,362 ha. which constitutes 0.62% of the geographic area. The proposed transmission lines will not pass through these mentioned areas. Refer **Map-2** for Forest Map of Haryana.

**LILO of Patiala-Hissar line at Kaithal** transmission line will pass through Kaithal & Jind district of Haryana.

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

**Table 2.4**

District	Geographic area (Sq. Km.)	2005 Assessment ( Sq.Km.)				% of G.A
		Very dense forest	Mod. dense forest	Open forest	Total	
Kaithal	2520	0	50	27	77	3.06
Jind	1834	0	8	15	23	1.25

*Source: Forest Survey Report 2005*

## Human and Economic Development

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

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

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

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

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

## 2.3 Himachal Pradesh

### Physiography

Himachal Pradesh, with an area of 55,673 Square Kms is located in Northern part of India. It lies between latitude 30° 22' and 33° 02' N and longitude 75° 47' and 79° 54' E. The state is almost mountainous with altitudes ranging from 460 to 6600 meters above



sea level. The geographical area of state is about 1.73% of total geographic area of country and about 10.48% of the total area of Indian Himalayan region.

The state presents an intricate mosaic of mountain ranges, hills and valleys. Snow covered peaks and gushing peaks streams add to its scenic beauty. The Dhauladhar range looks in supreme majesty over the Kangra valley while the Pir Panjal, the Great Himalayan and Zaskar ranges stand guard over Chamba, Lahaul- Spiti, Kullu and Kinnaur. The mountain tops are covered with forests and meadows. There is a general increase in elevation from 'West to East' and 'South to North'.

Three physiographic divisions from North to South are:

- i. The Shiwalik or Outer Himalaya
- ii. Central Himalaya or Lesser Himalaya
- iii. The Greater Himalaya and Zaskar

The land use pattern is shown in Table below

**Table 2.5**

Land use	Area in '000 ha	Percentage
Geographical area	5567	
Total reporting area (as per village papers)	4547	100
<b>Forests</b>	<b>1097</b>	<b>24.06</b>
Not available for cultivation	1121	24.65
Permanent pasture and grazing land	1529	33.63
Land under misc. tree crops and groves	57	1.25
Culturable wasteland	124	2.73
Fallow land other than current fallow	13	0.29
Current fallow	54	1019
<b>Net Area sown</b>	<b>555</b>	<b>12.21</b>

Source: Land Use Statistics, Ministry of Agriculture, GOI, 2005

## Climate

The climatic conditions vary from hot and sub-humid tropical (450-900 metre) in the southern low tracts, warm and temperate (900-2400 metre) and cold Alpine and glacial (2400- 4800 metre) in the northern and eastern high mountain ranges. The climate in Lahual- Spiti and Kinnaur are of semi arid high land type.

## Rainfall

Himachal Pradesh receives rainfall both from south western monsoon and winter cyclonic rainfall, however most of the rainfall is received during summer period. Western disturbance also showers rainfall in winter. Beyond Kullu towards Lahaul-Spiti and Kinnaur, rainfall decreases due to rain shadow effect. Spiti is the driest area with 50 mm rainfall, being enclosed by high mountains from all sides. Dharmshala is the rainiest



place with 3400 mm rainfall. Shimla receives 1600 mm rainfall annually. Kullu receives 900mm rainfall. There is a gradual decrease in rainfall towards Mandi, Rampur, Kullu, Kalpa and Keylong. About 70% of annual rainfall is obtained during July to September about 20% from October to March and 10% from April to June. During winter snow falls down to an elevation of about 1300mm but above 4500m snow is permanent.

## **Temperature**

Highest temperature is recorded in the month of June and lowest in the month of January. Temperature remains generally above 25 °C in south western part of Una district, western Bilaspur and western part of Solan. It is between 15 °C to 25 °C in the district of Kangra, Hamirpur, Mandi and Southern Chamba. Temperature remains below 15°C in rest parts of the state. Annual range of temperature in Shimla is 15 °C. In Dharmshala it is about 18 °C while in Lahaul it is 10.4 °C.

## **Soil**

The soils of Himachal Pradesh vary according to aspect, altitude and climate. The soils are young and thin in river valleys and inclined hill slopes depth of soil is very deep. Because of rugged topography, the soil profiles are channery and have diffuse boundaries between the genetic horizon thus indicating their skeletal character. Himachal Pradesh has been classified in five types of soils in the state on the basis of climatic conditions and altitude.

- i. Low Hill Soil Zone: This zone extends up to an altitude of 1000 metres and includes areas in district of Una, Bilaspur, Hamirpur and Kangra and Sirmaur
- ii. Mid Hill Soil Zone: This zone extends up to an altitude of 1000 metres & 1500 metres above sea level and includes areas in district of Solan, Chamba, Kangra and Sirmaur
- iii. High Hill Soil Zone: This zone extends up to an altitude of 1500 metres & 2100 metres above sea level and includes areas in district of Shimla, Mandi, Kullu, Kangra, Chamba and Sirmaur
- iv. Mountainous Soil Zone: This zone extends up to an altitude of 2100 metres & 3000 metres above sea level and includes areas in district of Shimla. Soils in such areas are having organic content from 2.5 to 3.5 and are not much used for agriculture purposes but Shimla district apple orchards are grown on this soil.
- v. Dry Hill Soil Zone: This type of soil is found above 25600 metres particularly in Lahaul and Spiti, Pangl and Kinnaur where monsoon rain fall is very less.



## Mineral Resources

Important minerals found in Himachal Pradesh are lime stone, barytes, gypsum, dolomite, rock salt, magnesite, silica sand quartzite. Besides these, building material like slate, granite and sandstone are also available. Other minerals like uranium, pyrite, iron ore, copper and cobalt are also available. Coal, gold are also available but these are not explored due to heavy extraction cost.

## 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 Sutluj, Beas, Ravi, Yamuna, Chenab, and various other small rivers flow through the state.

## Ecological Resources

Different climate conditions and edaphic factors have given rise to the diversified flora. The forests of Himachal Pradesh known for their grandeur and majesty are like a green pearl in the Himalayan crown. This life supporting systems are presently under great stress due to impact of modern civilization, economic development and growth in human and cattle population.

The recorded forest area of the State is 37033 sq. km. which is 66.52% of geographical area. Reserved Forests constitute 5.12%, Protected Forest 89.23%, and Unclassed Forest 5.65% of the total forest area. There are broadly six forest types identified in Himachal Pradesh viz. Tropical Dry Deciduous forest, Sub Tropical Dry evergreen, SubTropical Pine Forest, Himalayan Moist temperate, Himalayan Dry temperate and Sub Alpine forests. Forest map of Himachal Pradesh is enclosed as **Map-3**.

**LILO of 400 kV D/C Nathpa Jhakri – Nalagarh line at Rampur** shall pass through Kullu & Shimla districts of Himanchal Pradesh.

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

District	Geographic area (Sq. Km.)	2005 Assessment ( Sq.Km.)				% of G.A
		Very dense forest	Mod. dense forest	Open forest	Total	
Kullu	5503	117	1297	527	1941	35.27
Shimla	5131	192	1576	611	2379	46.37

*Source: Forest Survey Report 2005*

## Human and Economic Development:

Himachal Pradesh was carved out of thirty big and small erstwhile princely estates in 1948. Road connectivity was very poor and main source of income of people subsistence agriculture. Hilly terrain and harsh climatic conditions restricted people to limited



cultivation. But as the time passed Himachal Pradesh experienced growth and development. New seeds and plants were introduced in the state to increase the agriculture and horticulture output. After potato and apple revolution, Upper Shimla, Kullu, Kinnaur, Lahual area of Himachal Pradesh has experienced highest level of prosperity. Solan district is pioneer in Agriculture and industrial products. Main stay of the people is agriculture but people are shifting to horticulture, Floriculture for cash crops. Today economy of the state is based on agriculture, horticulture, forests, hydel power and tourism industry. In the state, more than 90% of the total population reside in rural area and average land holding is only 1.3 hectare. It indicates that maximum farmers belong to small scale category. Agriculture contribute to around 40% of the gross domestic product. Himachal Pradesh also leads in production of medicinal herbs which are exported in huge quantity and earn good revenue. The state is also known as fruit basket of Indi.. Production of fruits per year is around 6 lakh tonnes. Apple is most important cash crop of the state which constitutes about 42% of the total area under horticultural crops.



## SECTION III: POLICY, LEGAL AND REGULATORY FRAMEWORK

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

### **3.1 ENVIRONMENTAL:**

#### **3.1.1 Constitutional Provisions :**

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

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

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

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

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

Thus the Indian Constitution has now two fold provision:

- (a) On the one hand, it gives directive to the State for the protection and improvement of environment.
- (b) On the other hand the citizens owe a constitutional duty to protect improve and natural environment.



### 3.1.2 Mandatory Requirements (National) :

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

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

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

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

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

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

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

MoEF vide its notification dt. 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 of, in any manner, other than by depositing with the dealer/manufacturer/registered recycler/importer/reconditioner or at the designated collection centres and to file half yearly return in prescribed form to the concerned State Pollution Control Board.



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

MoEF vide its notification dt. 20<sup>th</sup> 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. 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 16th September 1987. As per the notification certain control and regulation has been imposed on manufacturing, import, export and use of these compound. POWERGRID is following provisions of notification and is phasing out all equipment which uses these substances and planning to achieve CFC free organization in near future.

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

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

### **3.1.3.1 Funding Agencies :**

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

Transmission line projects are categorized as category-B project having limited impact that can be further minimized through mitigative/management measures and would normally require only an environmental review. POWERGRID takes remedial measures to prevent, minimize, mitigate, or compensate for adverse impact and improve environmental performance. Environment Assessment will take account the natural





environment, human health and safety, and social aspects and trans-boundary and global environmental aspects. During EA process public is also informed at every stage of project execution and their views are considered during decision-making process.

### **3.1.4 Prescriptive Framework (National):**

- 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
- National Environment Policy, 2006

### **3.2.0 SOCIAL:**

#### **3.2.1 Constitutional Provisions:**

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

#### **3.2.2 Mandatory Requirements (National) :**

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

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



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

The act has a provision for notifying transmission company under section 164 (B) to avail benefits of eminent domain provided under the Indian Telegraph Act, 1885. MOP, GOI vide gazette notification dt 23<sup>rd</sup> 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, no award of land can be made by the government authorities unless all compensation has been paid.

### **3.2.3.1 Funding Agencies :**

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

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

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

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

This directive describes World Bank policies and procedures for projects that affect indigenous people. The objective is to ensure that development benefits are socially and culturally compatible and that the IPs are consulted. Thus, the Indigenous People Development Plan/Tribal Development Plan is to be prepared as a prerequisite.



POWERGRID will not only incorporate the IP component whenever necessary, but will also pay attention to marginalized groups such as women, children, etc.

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

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

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

### **3.2.4 Prescriptive Framework (National) :**

- National and State-wide Laws and Policies Relating to Land Acquisition and Issues of R&R
  - Madhya Pradesh Pariyojana Ke Karan Visthapit Vyakti (Punsthapan) Adhiniyam, 1985
  - Maharashtra Project Affected persons Rehabilitation Act, 1986

### **3.2.5 Relevant Policies :**

- 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-IV: POWERGRID APPROACH FOR ROUTE SELECTION

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

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

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

### 4.1 STUDY OF ALTERNATIVES

#### Environmental Criteria for Route Selection

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

- a) The route of the proposed transmission lines does not involve any human rehabilitation.
- b) Any monument of cultural or historical importance is not affected by the route of the transmission line.
- c) The proposed route of transmission line does not create any threat to the survival of any community with special reference to Tribal Community.
- d) The proposed route of transmission line does not affect any public utility services like playgrounds, schools, other establishments etc.
- e) The line route does not pass through any sanctuaries, National Park etc.
- f) 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 lines have been so aligned that it takes care of above factors. As such different alternatives were studied with the help of Govt. published data like Forest atlas, Survey of India topo-maps to arrive at most optimum route which can be taken up for detailed survey and assessment of environmental & social impacts for their proper management.

#### 4.1a EVALUATION OF ALTERNATIVE ROUTE ALIGNMENT OF PATIALA – LUDHIANA 400 KV D/C LINE TRANSMISSION LINE

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

S.No.	Description	Alternative-I	Alternative-II	Alternative-III
1.	Route Particulars			
i)	Length(Km)	76.574 Kms	80.588 Kms	79.510 Kms
ii)	Terrain	Nil	Nil	Nil
a	Hilly	Nil	Nil	Nil
b	Plain	76.574 Kms	80.588 Kms	79.510 Kms
2	Environment Details			
i)	Name of District/District Detail (through which line passes)	Patiala, Fatehgarh Sahib, Ludhiana	Patiala, Fatehgarh Sahib, Ludhiana	Patiala, Fatehgarh Sahib, Ludhiana
ii)	Town in alignment (nearby)	Bhadso, Amlloh, Delhon	Bhadso, Amlloh, Delhon	Bhadso, Amlloh, Delhon
iii)	House in R.O.W.	Nil	Nil	Nil
iv)	Forest Involvement in Ha/kms	3.47 /0.754	4.96 /1.078	5.05 /1.097
v)	Type of forest	Social Forest along road and canal crossing	Social Forest along road and canal crossing	Social Forest along road and canal crossing
	Reserved/Protected/Mangrove/Wild life area/Biosphere reserve/any other	Nil	Nil	Nil



	environment sensitive area			
vi)	Density of forest	<0.5	<0.5	<0.5
vii)	Type of Flora	Euqipelts, Neem, Dreak, Sheesam, Arjun etc.	Euqipelts, Neem, Dreak, Sheesam, Arjun etc.	Euqipelts,Neem , Dreak, Sheesam, Arjun etc.
Viii)	Type of fauna	Crow, rabbit, fox and domestic animals like cow, sheep and goat	Crow, rabbit, fox and domestic animals like cow, sheep and goat	Crow, rabbit, fox and domestic animals like cow, sheep and goat
ix)	Endangered species( if any)	Nil	Nil	Nil
x)	Historical/Cultural Monument	Nil	Nil	Nil
xi)	Any other relevant information	Nil	Nil	Nil
3.	Compensation Cost ( in Rs lacs)			
i)	Crop (Non-Forest)	Rs 75.82	Rs.79.51	Rs.78.41
ii)	Forest (CA+NPV)	Rs.39.312	Rs.56.192	Rs.57.21
4.	No. of Crossing (Nos.)			
i)	Railway line /Highway (National/ State)	01	01	01
ii)	Power Line	07	04	07
iii)	River Crossing etc.	Nil	Nil	Nil
iv)	Canal Crossing	04	04	04
5.	Construction Problem	Easy approaches Relatively less ROW problems.	Moderate ROW problems.	Relatively more line Length. Moderate ROW problem.
6.	O&M Problem	O & M shall be relatively easier due to better approaches and plain terrain	O & M shall be easier due to better approaches and plain terrain	O & M shall be easier due to better approaches and plain terrain
7.	Overall Remarks	Easy accessibility less ROW problems & minimum forest involvement.	Easy accessibility but moderate ROW problems & forest involvement comparatively more.	Easy accessibility but more line length with moderate ROW problems & high forest involvement.

### Reasons for Selection of Final Route:

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

### 4.1b EVALUATION OF ALTERNATION ROUTE ALIGNMENT OF LILO of 400 KV PATIALA- HISAR D/C LINE AT KAITHAL



Three different alignments (**Map-5**) were studied with the help of published data/maps and walkover survey to arrive at most optimum route for detailed survey. The comparative details of these alternatives for LILO of 400 KV Patiala- Hissar D/C Line at Kaithal shown in the following tables.

1	Description	Alternative-I	Alternative-II	Alternative-III
1.	Route Particulars			
i)	Length(km)	33.419 Kms	38.67 Kms	35.14 Kms
ii)	Terrain			
a	Hilly	Nil	Nil	Nil
b	Plain	33.419 Kms	38.67 Kms	35.14 Kms
2	Environment Details			
i)	Name of District/District Detail (through which line passes)	Kaithal, Jind, Sangrur, Patiala	Kaithal, Jind, Sangrur, Patiala	Kaithal, Jind, Sangrur, Patiala
ii)	Town in alignment (nearby)	Khanouri	Khanouri	Khanouri
iii)	House in R.O.W.	Nil	Nil	Nil
iv)	Forest Involvement in Ha/Km	0.86 /0.186	0.98 / 0.213	0.92 / 0.20
v)	Type of forest	Social Forest along road and canal crossing.	Social Forest along road and canal crossing.	Social Forest along road and canal crossing.
	Reserved/Protected/Mangrove/Wild life area/Biosphere reserve/any other environment sensitive area	Nil	Nil	Nil
vi)	Density of forest			
vii)	Type of Flora	Eucalyptus, Neem, Dreak, Sheesam, Arjun etc.	Eucalyptus, Neem, Dreak, Sheesam, Arjun etc.	Eucalyptus, Neem, Dreak, Sheesam, Arjun etc.
Viii)	Type of fauna	Crow, fox, rabbit and domestic animals like cow, sheep and goat	Crow, fox, rabbit and domestic animals like cow, sheep and goat	Crow, fox, rabbit and domestic animals like cow, sheep and goat
ix)	Endangered species( if any)	Nil	Nil	Nil
x)	Historical/Cultural Monument	Nil	Nil	Nil
xi)	Any other relevant information	Nil	Nil	Nil
3.	Compensation Cost ( in Rs lakhs)			
i)	Crop (Non-Forest)	Rs.33.23	Rs.38.46	Rs.34.94
ii)	Forest (CA+NPV)	Rs. 9.74	Rs.11.10	Rs. 10.42
4.	No. of Crossing (Nos.)			
i)	Railway line /Highway (National/ State)	Railway-Nil	Railway-Nil	Railway-Nil
ii)	Power Line	03	03	03
iii)	River Crossing etc.	Nil	Nil	Nil
iv)	Canal Crossing	01	01	01
5.	Construction Problem	Easy	Relatively more	Moderate ROW



		approaches Relatively less ROW problems.	line Length. Moderate ROW problem.	problems.
6.	O&M Problem	O & M shall be relatively easier due to better approaches and plain terrain	O & M shall be easy due to better approaches and plain terrain	O & M shall be easy due to better approaches and plain terrain
7.	Overall Remarks	Easy accessibility, less ROW problems & minimum forest involvement.	Easy accessibility but more line length, moderate ROW problems & forest involvement comparatively more.	Easy accessibility but with moderate ROW problems & more forest involvement.

**Reasons for selection of final Route:**

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

**4.1c EVALUATION AND ROUTE ALIGNMENT ALTERNATIVES OF LILO of 400 kV D/C Nathpa Jhakri – Nalagarh line at Rampur**

Three different alignments (**Map-6**) were studied with the help of published data/maps and walkover survey to arrive at most optimum route for detailed survey. The comparative details of these alternatives for LILO of 400 KV Nathpa Jhakri – Nalagarh (Triple Snowbird) line at Rampur shown in the following tables

**i) ALTERNATIVE STUDY FOR LOOP IN FOR 400 KV D/C NATHPA JHAKRI – NALAGARH LINE AT RAMPUR**

S.N.	Description	Alternative-I	Alternative-II	Alternative-III
<b>1.</b>	<b>Route Particulars</b>			
i)	Length(Km)	2.681	3.249	3.447
ii)	Terrain			
a	Hilly	2.681	3.249	3.447
b	Plain	Nil	Nil	Nil
<b>2</b>	<b>Environmental Details</b>			
i)	Name of District/ District Details (through which line passes)	Dist Kullu (HP)	Dist Kullu (HP)	Dist Kullu (HP)
ii)	Town in alignment (nearby)	Rampur	Rampur	Rampur
iii)	House in R.O.W	Nil	Nil	Nil
iv)	Forest Involvement in Ha/Km	10.5068 / 2.284	12.50 / 2.71	13.69 / 2.97





v)	Type of forest			
	Reserved/Protected/ Mangrove/ Wild life area/ Biosphere reserve/any other environment sensitive area	Protected Forest	Protected Forest	Protected Forest
vi)	Density of forest	0.1	0.1	0.1
vii)	Type of Flora	Eucalyptus, Cheer	Eucalyptus, Cheer	Cheer
viii)	Type of Fauna	Crow, Fox & Domestic animals like Cattle, Sheep, Goat etc.	Crow, Fox & Domestic animals like Cattle, Sheep, Goat etc.	Crow, Fox & Domestic animals like Cattle, Sheep, Goat etc.
ix)	Endangered species(if any)	Nil	Nil	Nil
x)	Historical/ Cultural Monument	Nil	Nil	Nil
xi)	Any other relevant information	Nil	Nil	Nil
<b>3</b>	<b>Compensation Cost (in Rs lakhs)</b>			
i)	Crop (Non-Forest)	0.397	0.539	0.477
ii)	Forest(CA+NPV)	119.04	141.625	155.10
<b>4.</b>	<b>No. of Crossing (Nos.)</b>			
i)	Railway line /Highway(National/ State)	Nil	Nil	Nil
ii)	Power Line	02	03	04
iii)	River Crossing etc.			
<b>5.</b>	<b>Construction Problem</b>	Easy approaches. Relatively less ROW problems.	Moderate ROW problems.	Heavy ROW
<b>6.</b>	<b>O &amp; M Problem</b>	O & M shall be relatively easier due to better approaches and plain terrain	O & M shall be tough due to Hilly approaches	O & M shall be tough due to Hilly approaches
<b>7</b>	<b>Overall Remarks</b>	Easy accessibility, less ROW problems & minimum forest involvement.	Easy accessibility but moderate ROW problems & forest involvement comparatively more	Easy accessibility but moderate ROW problems & forest involvement comparatively more

ii) Alternative Study for Loop Out for 400 kV D/C Nathpa Jhakri – Nalagarh line at Rampur

S.N.	Description	Alternative-I	Alternative-II	Alternative-III
1.	Route Particulars			



i)	Length(Km)	1.343	1.700	1.800
ii)	Terrain			
a	Hilly	Nil	Nil	Nil
b	Plain	1.343	1.700	1.800
<b>2</b>	<b>Environmental Details</b>			
i)	Name of District/ District Details (through which line passes)	Distt Shimla (HP)	Distt Shimla (HP)	Distt Shimla (HP)
ii)	Town in alignment (nearby)	Rampur	Rampur	Rampur
iii)	House in R.O.W	Nil	Nil	Nil
iv)	Forest Involvement in Ha/Km	1.56 / 0.339	1.90 / 0.413	2.50 / 0.543
v)	Type of forest			
	Reserved/Protected/ Mangrove/ Wild life area/ Biosphere reserve/any other environment sensitive area	Protected Forest	Protected Forest	Protected Forest
vi)	Density of forest	0.1	0.1	0.1
vii)	Type of Flora	Eucalyptus, Cheer	Eucalyptus, Cheer	Eucalyptus, Cheer
viii)	Type of Fauna	Crow, Fox & Domestic animals like Cattle, Sheep, Goat etc.	Crow, Fox & Domestic animals like Cattle, Sheep, Goat etc.	Crow, Fox & Domestic animals like Cattle, Sheep, Goat etc.
ix)	Endangered species(if any)	Nil	Nil	Nil
x)	Historical/ Cultural Monument	Nil	Nil	Nil
xi)	Any other relevant information	Nil	Nil	Nil
<b>3</b>	<b>Compensation Cost (in Rs lakh)</b>			
i)	Crop (Non-Forest)	1.00	1.287	1.257
ii)	Forest(CA+NPV)	17.67	21.527	28.325
<b>4.</b>	<b>No. of Crossing (Nos.)</b>			
i)	Railway line /Highway(National/ State)	Nil	Nil	Nil
ii)	Power Line	02	03	04
iii)	River Crossing etc.			
<b>5.</b>	<b>Construction Problem</b>	Easy approaches. Relatively less ROW problems.	Moderate ROW problems.	Heavy ROW
<b>6.</b>	<b>O &amp; M Problem</b>	O & M shall be relatively easier	O & M shall be difficult due to	O & M shall be difficult due to



		due to better approaches and plain terrain	Hilly approaches	Hilly approaches
<b>7</b>	<b>Overall Remarks</b>	Easy accessibility, less ROW problems & minimum forest involvement.	Easy accessibility but moderate ROW problems & forest involvement comparatively more	Easy accessibility but moderate ROW problems & forest involvement comparatively more

**Reasons for selection of final Route:**

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



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

### 5.0 IMPACT DUE TO PROJECT LOCATION AND DESIGN

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

#### (i) Resettlement

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

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

#### (ii) Land value depreciation

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

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

As per the POWERGRID's policy of route selection only that route alignment is finalized which avoids all the historical and cultural monuments. As per the preliminary assessment carried out during finalization of route alignment in consultation with State



revenue authorities and Archeological Survey of India (ASI), **no such monument is coming in the proposed route alignment.**

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

As already explained all precautions have been taken to avoid routing of line through forest and ecological sensitive areas and National park/Sanctuaries. However, complete avoidance of forest area was not possible. The routes of proposed transmission line have been finalized in such a way that it affects minimum forest area in consultation with forest department.

**In Patiala-Ludhiana 400 KV D/C line**, out of total transmission line length of 76.574 km, about 0.75 km (0.98%) length shall pass through forest land consisting a total of 3.47 Ha. forest area in the state of Punjab.

**In LILO of 400 KV Patiala- Hissar D/C line at Kaithal**, out of total transmission line length of 33.419 km, about 0.186 km (0.55%) length shall pass through forest land consisting a total of 0.86 Ha. forest area in the state of Punjab & Haryana.

**In LILO of 400 kV D/C Nathpa Jhakri – Nalagarh line at Rampur**, out of total transmission line length of 4.02 km, about 2.62 km (65.18%) length shall pass through forest land consisting a total of 12.07 Ha. forest area in the state of Himachal Pradesh.

Prior approval of GOI/MOEF shall be obtained for affected forest under Forest (Conservation) Act, 1980 after detail survey and finalization of route through forest area in consultation with local forest authorities. Most of the forests to be traversed by the lines are already degraded and the wildlife species present are those who have been adapted to open or disturbed habitat. Therefore with provision of Compensatory Afforestation the overall forest status will in many cases improve. A budget provision of **Rs. 39.31 lakhs for 400 KV D/C Patiala-Ludhiana, Rs. 9.74 lakhs for LILO of 400 KV Patiala- Hissar D/C Line at Kaithal and Rs. 136.71 lakhs for LILO of 400 kV D/C Nathpa Jhakri – Nalagarh line at Rampur** has been kept in the cost estimate to meet the requirement of Compensatory Afforestation and Net Present Value (NPV). A detail of budget estimate is enclosed as **Annexure-2**.

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

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

Impacts on agricultural land will be restricted to the construction phase and when large-scale maintenance measures are required. Some stretch of the line will pass through



agricultural fields. Agricultural land will be lost at the base of the tower, which is estimated to be 0.2-1 sq. m per average farm holding (**Fig-1**).

It is estimated that for **400 kV Patiala-Ludhiana D/C line of 76.57 Km** a total of 192 towers will result in loss of approx. 192 sq.m. or 0.0192 ha. of land. **For LILO of 400 KV Patiala- Hissar D/C Line at Kaithal (33.419 kms)** approx 84 towers will result in total loss of approx. 84 sq.m. or 0.0084 ha. of land. **For LILO of 400 kV D/C Nathpa Jhakri – Nalagarh line at Rampur (4.024 kms)**, approx 11 towers will result in total loss of approx. 11 sq.m. or 0.0011 ha. of land. Therefore, a total land loss estimated to be about 0.0287 Ha, which is negligible and will not adversely affect the land holding.

In areas where lines will traverse agricultural land, compensation will be paid to owners for any crop damage incurred as a result of construction activities. POWERGRID field staff will consult affected villagers and local revenue department and apprise them about the project and tower location, which shall be erected in the agricultural land. Revenue department, after evaluating the loss due to construction activity and productivity of land, will calculate the compensation cost and that will be paid to farmers. Agricultural activities will be allowed to continue following the construction period. If bunds or other on-farm works are disturbed during construction or maintenance, they will be restored to the owner's satisfaction following cessation of construction or maintenance activities. In the event that private trees are felled during construction or maintenance operations, compensation will be paid to the owner in an amount determined by the estimated loss of products from the tree over an eight year period (for fruit bearing trees) and for other trees compensation is finalized in consultation with local forest authorities. Agricultural lands under private ownership will be identified, and in accordance with normal POWERGRID procedures compensation will be paid to the affected villagers (**Annexure-3**). **Budgetary provision of Rs. 75.82 lakhs for 400 KV D/C Patiala-Ludhiana, Rs. 33.23 lakhs for LILO of 400 KV Patiala- Hissar D/C Line at Kaithal and Rs. 1.40 lakhs for LILO of 400 kV D/C Nathpa Jhakri – Nalagarh line at Rampur is made in the cost estimate to meet these expenses.**

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

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

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



for POWERGRID. Provision to meet these expenses has been made in the cost estimate for the same.

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

#### **(vii) Interference with drainage pattern**

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

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

#### **(i) Escape of polluting materials**

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

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

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

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

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

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

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

Since spacing between the towers is approx. 300-400 meters these will not affect the visual aesthetics of the localities particularly when it is ensured to route the lines as far away from the localities as possible. POWERGRID takes up plantation of trees to buffer the visual effect around its substations and to provide better living conditions. Wherever



POWERGRID feels it appropriate, discussions will be held with local Forest Department officials to determine feasibility of planting trees along roads running parallel to transmission lines to buffer visual effect in these areas. In addition, towers may be painted grey or green to merge with the background.

**(v) Noise/vibration nuisances**

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

**(vi) Blockage of wildlife passage**

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

**5.2 ENVIRONMENTAL PROBLEMS DUE TO CONSTRUCTION PHASE**

**(i) Uncontrolled silt runoff**

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

**(ii) Nuisance to nearby properties**

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

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

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

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





with the concerned authorities and angle towers are planted to facilitate execution of work in different stages.

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

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

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

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

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

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

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



conducted for construction workers. The construction sites and construction workers' houses will be disinfected regularly if required. In order to minimize/checking of spread of socially transmitted diseases e.g. HIV/AIDS etc. POWERGRID will conduct awareness building programs on such issues for the construction workers.

### **5.3 ENVIRONMENTAL PROBLEMS RESULTING FROM OPERATION**

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

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

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

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

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

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



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

#### **5.4 CRITICAL ENVIRONMENTAL REVIEW CRITERIA**

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

The transmission projects do not involve any large scale excavation and land is lost to the extent of 0.2-1 sq m only for each foundation. As only **0.98% of the total length of the 400 KV D/C Patiala-Ludhiana, 0.55% of the total length of the LILO of Patiala-Hissar at Kaithal and 65.18% of the total length of the LILO of 400 kV D/C Nathpa Jhakri – Nalagarh line at Rampur** in the subject projects are passing through forest area and the said forest is degraded, the problem of losing natural resources in these project are insignificant. Moreover, with the provision of raising compensatory afforestation on double the area getting affected will increase the forest cover.

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

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

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

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

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

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

#### **5.5 PUBLIC CONSULTATION**

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



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

- 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, public meetings were also organized in the routes of transmission lines (**Table 5.1**). To get the maximum participation during the Public Consultation Program, a notice was served well in advance to the villagers are enclosed as **Annexure-6(a) & Annexure-6(b)**. The details of lines and its importance were explained to the villagers. Villagers including Village panchayat representatives and POWERGRID representative participated in the programme. The photographs are enclosed as **Plate- A (1-3) and Plate B (1-3)**.The program was arranged in an interactive way and queries like crop compensation, route alignment etc. were replied. Most of the participants were small farmers and were worried about their land through which the line will pass. They were informed that POWERGRID will not acquire their land for construction of transmission lines. Only towers will be spotted in their fields where they can do farming without any fear because the tower height is very high and even tractor can pass below the tower. Moreover, there is no risk of passing current from the above line as there is foolproof system of earthing for tower. The consultation process was appreciated by the villagers. They were happy to know about the transparent policy of POWERGRID for execution of the project and promised to extend their cooperation during construction of the line. The process of such consultation and its documentation shall continue during project implementation and even during O&M stage.

**Table - 5.1**  
**Details of Public Consultation en-route of proposed Transmission Lines**

Sl. No.	Name of Transmission Line	Date of meeting	No. of villagers attended	Name of Village	Remarks
1.	400 KV D/C	12.11.09	12	Ditupur	Village Panchayat



	Patiala-Ludhiana	11.11.09	15	Chalela	representatives, farmers, teachers and others attended the meeting. Compensation for Crops/trees, utilization of road path were main concerns which were clarified during meeting.
2.	LILO of 400 KV Patiala-Hissar at Kaithal	06.01.10	21	Atela	Village Panchayat representatives, farmers, teachers and others attended the meeting. Compensation for Crops/trees, utilization of road path were main concern, which were clarified during meeting.
		06.01.10	19	Farsh Majra	
		07.01.10	15	Galoli	

## 5.6 CONCLUSION

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



## **SECTION-VI: MONITORING AND ORGANISATIONAL SUPPORT STRUCTURE**

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

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

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

#### **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 ESMC 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 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 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 finalize the route for the power transmission projects
- Conduct surveys for the sites to being 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. A monitoring system (done by the Forest Department) is also in place for compensatory forests established as part of the Project. A detailed **Environment Management Plan (EMP)** including monitoring plan for all possible environmental and social impact and its proper management has been drawn (**Table- 6.1**) and will be implemented during various stage of project execution. Since many provisions of EMP are to be implemented by contractor hence for proper monitoring EMP has included in the contract document.

### **6.4 ENVIRONMENTAL REVIEW**

Periodic review by corporate ESMD and higher management including review by CMD POWERGRID of all environmental and social issues is under taken to ensure that EMP and other measures are implemented at site. Besides it annual review by independent



Auditor under ISO: 14001 shall also be undertaken for compliance of agreed policy and management plan.





**Table- 6.1 Environment Management Plan**

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
<b>Pre-construction</b>						
Location of transmission towers and transmission line alignment and design	Exposure to safety related risks	Setback of dwellings to overhead line route designed in accordance with permitted level of power frequency and the regulation of supervision at sites.	Tower location and line alignment selection with respect to nearest dwellings	Setback distances to nearest houses - once	POWERGRID	Part of tower siting survey and detailed alignment survey and design
Equipment specifications and design parameters	Release of chemicals and gases in receptors (air, water, land)	PCBs not used in substation transformers or other project facilities or equipment.	Transformer design	Exclusion of PCBs in transformers stated in tender specification – once	POWERGRID	Part of tender specifications for the equipment
		Processes, equipment and systems not to use chlorofluorocarbons (CFCs), including halon, and their use, if any, in existing processes and systems should be phased out and to be disposed of in a manner consistent with the requirements of the Government	Process, equipment and system design	Exclusion of CFCs stated in tender specification – once	POWERGRID	Part of tender specifications for the equipment
				Phase out schedule to be prepared in case still in use – once		
Transmission line design	Exposure to electromagnetic interference	Transmission line design to comply with the limits of electromagnetic interference from overhead power lines	Electromagnetic field strength for proposed line design	Line design compliance with relevant standards – once	POWERGRID	Part of detailed alignment survey and design



<b>Project activity /stage</b>	<b>Potential impact</b>	<b>Proposed mitigation measure</b>	<b>Parameter to be monitored</b>	<b>Measurement and frequency</b>	<b>Institutional responsibility</b>	<b>Implementation schedule</b>
Location of transmission towers and transmission line alignment and design	Impact on water bodies and land  Social inequities	Consideration of tower location at where they could be located to avoid water bodies or agricultural land.	Tower location and line alignment selection (distance to water and/or agricultural land)	Consultation with local authorities and land owners – once	POWERGRID	Part of tower siting survey and detailed alignment survey and design
		Careful route selection to avoid existing settlements	Tower location and line alignment selection (distance to nearest dwellings or social institutions)	Consultation with local authorities and land owners – once		Part of detailed tower siting and alignment survey and design
		Minimise need to acquire agricultural land	Tower location and line alignment selection (distance to agricultural land)	Consultation with local authorities and land owners – once		Part of detailed tower siting and alignment survey and design
Encroachment into precious ecological areas	Loss of precious ecological values/ damage to precious species	Avoid encroachment by careful site and alignment selection	Tower location and line alignment selection (distance to nearest designated ecological protection area)	Consultation with local forest authorities – once	POWERGRID	Part of detailed siting and alignment survey /design
Transmission line through forestland	Deforestation and loss of biodiversity	Avoid encroachment by careful site and alignment selection	Tower location and line alignment selection (distance to nearest protected or reserved forest)	Consultation with local authorities – once	POWERGRID	Part of detailed siting and alignment survey/design
		Minimise the need by using existing towers, tall towers and RoW, wherever possible		Consultation with local authorities and design engineers – once		
		Obtain statutory clearances from the Government	Statutory approvals from Government	Compliance with regulations – once for each subproject		



<b>Project activity /stage</b>	<b>Potential impact</b>	<b>Proposed mitigation measure</b>	<b>Parameter to be monitored</b>	<b>Measurement and frequency</b>	<b>Institutional responsibility</b>	<b>Implementation schedule</b>
Encroachment into farmland	Loss of agricultural productivity	Use existing tower footings/towers wherever possible	Tower location and line alignment selection	Consultation with local authorities and design engineers - once	POWERGRID	Part of detailed alignment survey and design
		Avoid siting new towers on farmland wherever feasible	Tower location and line alignment selection	Consultation with local authorities and design engineers - once		Part of detailed siting and alignment survey /design
		Farmers compensated for any permanent loss of productive land	Design of Implementation of Crop Compensation (based on affected area)	Consultation with affected parties – once in a quarter		Prior to construction phase
		Farmers/landowners compensated for significant trees that need to be trimmed/ removed along RoW.	Design of Implementation of Tree compensation (estimated area to be trimmed/removed)	Consultation with affected parties – once in a quarter		Prior to construction phase
			Statutory approvals for tree trimming /removal	Compliance with regulations – once for each subproject		Part of detailed siting and alignment survey /design
Interference with drainage patterns/Irrigation channels	Flooding hazards/loss of agricultural production	Appropriate siting of towers to avoid channel interference	Tower location and line alignment selection (distance to nearest flood zone)	Consultation with local authorities and design engineers - once	POWERGRID	Part of detailed alignment survey and design



<b>Project activity /stage</b>	<b>Potential impact</b>	<b>Proposed mitigation measure</b>	<b>Parameter to be monitored</b>	<b>Measurement and frequency</b>	<b>Institutional responsibility</b>	<b>Implementation schedule</b>
Escape of polluting materials	Environmental pollution	Transformers designed with oil spill containment systems, and purpose-built oil, lubricant and fuel storage system, complete with spill cleanup equipment.	Equipment specifications with respect to potential pollutants	Tender document to mention specifications - once	POWERGRID	Part of detailed equipment design /drawings
<b>Construction</b>						
Equipment layout and installation	Noise and vibrations	Construction techniques and machinery selection seeking to minimize ground disturbance.	Construction techniques and machinery	Construction techniques and machinery creating minimal ground disturbance - once at the start of each construction phase	POWERGRID (Contractor through contract provisions)	Construction period
Physical construction	Disturbed farming activity	Construction activities on cropping land timed to avoid disturbance of field crops (within one month of harvest wherever possible).	Timing of start of construction	Crop disturbance – Post harvest as soon as possible but before next crop - once per site	POWERGRID (Contractor through contract provisions)	Construction period
Mechanized construction	Noise, vibration and operator safety, efficient operation	Construction equipment to be well maintained.	Construction equipment – estimated noise emissions	Complaints received by local authorities - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period
	Noise, vibration, equipment wear and tear	Turning off plant not in use.	Construction equipment – estimated noise emissions and operating schedules	Complaints received by local authorities - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
Construction of roads for accessibility	Increase in airborne dust particles	Existing roads and tracks used for construction and maintenance access to the line wherever possible.	Access roads, routes (length and width of new access roads to be constructed)	Use of established roads wherever possible - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period
	Increased land requirement for temporary accessibility	New access ways restricted to a single carriageway width within the RoW.	Access width (meters)	Access restricted to single carriageway width within RoW - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period
Temporary blockage of utilities	Overflows, reduced discharge	Temporary placement of fill in drains/canals not permitted.	Temporary fill placement (m <sup>3</sup> )	Absence of fill in sensitive drainage areas - every 4 weeks	POWERGRID (Contractor through contract provisions)	Construction period
Site clearance	Vegetation	Marking of vegetation to be removed prior to clearance, and strict control on clearing activities to ensure minimal clearance.	Vegetation marking and clearance control (area in m <sup>2</sup> )	Clearance strictly limited to target vegetation - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period
Trimming/cutting of trees within RoW	Fire hazards	Trees allowed growing up to a height within the RoW by maintaining adequate clearance between the top of tree and the conductor as per the regulations.	Species-specific tree retention as approved by statutory authorities (average and maximum tree height at maturity, in meters)	Presence of target species in RoW following vegetation clearance – once per site	POWERGRID (Contractor through contract provisions)	Construction period
	Loss of vegetation and deforestation	Trees that can survive pruning to comply should be pruned instead of cleared.	Species-specific tree retention as approved by statutory authorities	Presence of target species in RoW following vegetation clearance – once per site	POWERGRID (Contractor through contract provisions)	Construction period



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
		Felled trees and other cleared or pruned vegetation to be disposed of as authorized by the statutory bodies.	Disposal of cleared vegetation as approved by the statutory authorities (area cleared in m <sup>2</sup> )	Use or intended use of vegetation as approved by the statutory authorities – once per site	POWERGRID (Contractor through contract provisions)	Construction period
Wood/vegetation harvesting	Loss of vegetation and deforestation	Construction workers prohibited from harvesting wood in the project area during their employment, (apart from locally employed staff continuing current legal activities).	Illegal wood /vegetation harvesting (area in m <sup>2</sup> , number of incidents reported)	Complaints by local people or other evidence of illegal harvesting - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period
Surplus earthwork/soil	Runoff to cause water pollution, solid waste disposal	Soil excavated from tower footings disposed of by placement along roadsides, or at nearby house blocks if requested by landowners.	Soil disposal locations and volume (m <sup>3</sup> )	Acceptable soil disposal sites - every 2 weeks	POWER GRID (Contractor through contract provisions)	Construction period
Site clearance	Vegetation	Tree clearances for easement establishment to only involve cutting trees off at ground level or pruning as appropriate, with tree stumps and roots left in place and ground cover left undisturbed.	Ground disturbance during vegetation clearance (area, m <sup>2</sup> )	Amount of ground disturbance - every 4 weeks	POWERGRID (Contractor through contract provisions)	Construction period
			Statutory approvals	Statutory approvals for tree clearances – once for each site	POWERGRID (Contractor through contract provisions)	Construction period
Tower construction – disposal of surplus earthwork/fill	Waste disposal	Excess fill from tower foundation excavation disposed of next to roads or around houses, in agreement with the local community or landowner.	Location and amount (m <sup>3</sup> ) of fill disposal	Appropriate fill disposal locations - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period
Storage of chemicals and	Contamination of receptors	Fuel and other hazardous materials securely stored	Location of hazardous material storage; spill	Fuel storage in appropriate	POWERGRID (Contractor	Construction period



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
materials	(land, water, air)	above high flood level.	reports (type of material spilled amount (kg or m <sup>3</sup> ) and action taken to control and clean up spill)	locations and receptacles - every 2 weeks	through contract provisions)	
Construction schedules	Noise nuisance to neighbouring properties	Construction activities only undertaken during the day and local communities informed of the construction schedule.	Timing of construction (noise emissions, [dB(A)])	Daytime construction only - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period
Provision of facilities for construction workers	Contamination of receptors (land, water, air)	Construction workforce facilities to include proper sanitation, water supply and waste disposal facilities.	Amenities for Workforce facilities	Presence of proper sanitation, water supply and waste disposal facilities - once each new facility	POWERGRID (Contractor through contract provisions)	Construction period
Encroachment into farmland	Loss of agricultural productivity	Use existing access roads wherever possible	Usage of existing utilities	Complaints received by local people /authorities - every 4 weeks	POWERGRID (Contractor through contract provisions)	Construction period
		Ensure existing irrigation facilities are maintained in working condition	Status of existing facilities			
		Protect /preserve topsoil and reinstate after construction completed	Status of facilities (earthwork in m <sup>3</sup> )			
		Repair /reinstate damaged bunds etc after construction completed	Status of facilities (earthwork in m <sup>3</sup> )			
	Social inequities	Compensation for temporary loss in agricultural production	Implementation of Crop compensation (amount paid, dates, etc.)	Consultation with affected parties – once in a quarter	POWERGRID	Prior to construction
Uncontrolled erosion/silt runoff	Soil loss, downstream siltation;	Need for access tracks minimised, use of existing roads.	Design basis and construction procedures (suspended solids in receiving waters;	Incorporating good design and construction management	POWERGRID (Contractor through contract provisions)	Construction period
		Limit site clearing to work areas				



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
		Regeneration of vegetation to stabilise works areas on completion (where applicable)	area re-vegetated in m <sup>2</sup> ; amount of bunds constructed [length in meter, area in m <sup>2</sup> , or volume in m <sup>3</sup> ]	practices – once for each site		
		Avoidance of excavation in wet season				
		Water courses protected from siltation through use of bunds and sediment ponds				
Nuisance to nearby properties	Losses to neighbouring land uses/values	Contract clauses specifying careful construction practices.	Contract clauses	Incorporating good construction management practices – once for each site	POWERGRID (Contractor through contract provisions)	Construction period
		As much as possible existing access ways will be used.	Design basis and layout	Incorporating good design engineering practices – once for each site		
		Productive land will be reinstated following completion of construction	Reinstatement of land status (area affected, m <sup>2</sup> )	Consultation with affected parties – twice – immediately after completion of construction and after the first harvest		
	Social inequities	Compensation will be paid for loss of production, if any.	Implementation of Tree/Crop compensation (amount paid)	Consultation with affected parties – once in a quarter	POWERGRID	Prior to construction
Inadequate siting of borrow areas	Loss of land values	Existing borrow sites will be used to source aggregates, therefore, no	Contract clauses	Incorporating good construction	POWERGRID (Contractor through	Construction period





Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
		need to develop new sources of aggregates		management practices– once for each site	contract provisions)	
Health and safety	Injury and sickness of workers and members of the public	Contract provisions specifying minimum requirements for construction camps	Contract clauses (number of incidents and total lost-work days caused by injuries and sickness)	Contract clauses compliance – once every quarter	POWERGRID (Contractor through contract provisions)	Construction period
		Contractor to prepare and implement a health and safety plan.				
		Contractor to arrange for health and safety training sessions				
Inadequate construction stage monitoring	Likely to maximise damages	Training of POWERGRID environmental monitoring personnel	Training schedules	Number of programs attended by each person – once a year	POWERGRID	Routinely throughout construction period
		Implementation of effective environmental monitoring and reporting system using checklist of all contractual environmental requirements	Respective contract checklists and remedial actions taken thereof.	Submission of duly completed checklists of all contracts for each site - once		
		Appropriate contract clauses to ensure satisfactory implementation of contractual environmental mitigation measures.	Compliance report related to environmental aspects for the contract	Submission of duly completed compliance report for each contract - once		
<b>Operation and Maintenance</b>						
Location of transmission towers and transmission line alignment and	Exposure to safety related risks	Setback of dwellings to overhead line route designed in accordance with permitted level of power frequency and the	Compliance with setback distances (“as-built” diagrams)	Setback distances to nearest houses – once in quarter	POWERGRID	During operations



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
design		regulation of supervision at sites.				
Inadequate provision of staff/workers health and safety during operations	Injury and sickness of staff /workers	Careful design using appropriate technologies to minimise hazards	Usage of appropriate technologies (lost work days due to illness and injuries)	Preparedness level for using these technologies in crisis – once each year	POWERGRID	Design and operation
		Safety awareness raising for staff.	Training/awareness programs and mock drills	Number of programs and percent of staff /workers covered – once each year		
		Preparation of fire emergency action plan and training given to staff on implementing emergency action plan				
		Provide adequate sanitation and water supply facilities	Provision of facilities	Complaints received from staff /workers every 2 weeks		
Electric Shock Hazards	Injury/mortality to staff and public	Careful design using appropriate technologies to minimise hazards	Usage of appropriate technologies (number of injury incidents, lost work days)	Preparedness level for using these technologies in crisis – once a month	POWERGRID	Design and Operation
		Barriers to prevent climbing on/dismantling of transmission towers	Maintenance of barriers	Report on maintenance – every 2 weeks		
		Appropriate warning signs on facilities	Maintenance of warning signs			
		Electricity safety awareness raising in project areas	Training /awareness programs and mock drills for all concerned parties	Number of programs and percent of total persons covered – once each year		



<b>Project activity /stage</b>	<b>Potential impact</b>	<b>Proposed mitigation measure</b>	<b>Parameter to be monitored</b>	<b>Measurement and frequency</b>	<b>Institutional responsibility</b>	<b>Implementation schedule</b>
Operations and maintenance staff skills less than acceptable	Unnecessary environmental losses of various types	Adequate training in O&M to all relevant staff of substations and transmission line maintenance crews.	Training/awareness programs and mock drills for all relevant staff	Number of programs and percent of staff covered – once each year	POWERGRID	Operation
		Preparation and training in the use of O&M manuals and standard operating practices.				
Inadequate periodic environmental monitoring.	Diminished ecological and social values.	Power Grid staff to receive training in environmental monitoring of project operations and maintenance activities.	Training/awareness programs and mock drills for all relevant staff	Number of programs and percent of staff covered – once each year	POWERGRID	Operation
Equipment specifications and design parameters	Release of chemicals and gases in receptors (air, water, land)	Processes, equipment and systems using cholofluorocarbons (CFCs), including halon, should be phased out and to be disposed of in a manner consistent with the requirements of the Government.	Process, equipment and system design	Phase out schedule to be prepared in case still in use – once in a quarter	POWERGRID	Operations
Transmission line maintenance	Exposure to electromagnetic interference	Transmission line design to comply with the limits of electromagnetic interference from overhead power lines	Required ground clearance (meters)	Ground clearance - once	POWERGRID	Operations