NATIONAL POWER TRANSMISSION CORPORATION
SOUTHERN POWER PROJECT MANAGEMENT BOARD

ENVIRONMENTAL PROTECTION COMMITMENT

TAN UYEN – THUAN AN 220KV TRANSMISSION LINE & 220KV OUTGOING FEEDER WIDEN AT THUAN AN 220KV SUBSTATION PROJECT

Ho Chi Minh city, June 2012
ENVIRONMENTAL PROTECTION COMMITMENT

TAN UYEN – THUAN AN 220KV TRANSMISSION LINE & 220KV OUTGOING FEEDER WIDEN AT THUAN AN 220KV SUBSTATION PROJECT

PROJECT OWNER
SOUTHERN POWER PROJECT MANAGEMENT BOARD
DIRECTOR

CONSULTANT
POWER ENGINEERING & CONSULTING J.S.C No.3
GENERAL DIRECTOR

Ho Chi Minh city, June 2012
SOzialist Republik Vietnam

Independence – Freedom - Happiness

To: Thuan An District People’s Committee
From: Southern Power Projects Management Board
Address: 383 Vo Van Kiet, District 1, Ho Chi Minh City

We would like to send to you the Environment Protection Commitment with details as follows:

I. BASIC INFORMATION

I.1. The Project’s name
Tan Uyen – Thuan An 220kV TL and 220kV extension bays at Thuan An 220kV SS (herein after called the Project).

I.2. Executive Organizations
- Project owner Southern Power Projects Management Board.

   General Director: Mr. Thai Tuan Tai
   Address: 32 Ngo Thoi Nhiem, District 3, Ho Chi Minh City
   Telephone: 08.22110360 Fax: 08.22210758

I.3. Project owner’s address
383 Vo Van Kiet, District 1, Ho Chi Minh City

I.4. Project owner’s director
Mr. Nguyen Tien Hai

I.5. Telephone number and Fax
Telephone: 08.22100720 Fax: 08.38361096

I.6. Project’s location:

I.6.1 Project’s location:
Tan Uyen - Thuan An 220kV TL starts from 220kV busbar of Tan Uyen 500kV SS at Tan Uyen district, passing Thanh Phuoc commune, Thai Hoa and Tan Phuoc Khanh towns in Tan Uyen district, Binh Hoa, Binh Chuan, An Phu wards at Thuan An commune, ends at 220kV busbar of Thuan An 220kV SS in Binh Duong Province.

I.6.2 Topography
The Project travels through Tan Uyen and Thuan An districts, Binh Duong Province. The topography along the Project is relative flat.
1.6.3 Geology

- **Geological conditions**

The terrain of the project is relatively flat, average elevation compared with sea level ranges from 0-3m. Route passes through mainly industrial parks and residential areas.

Through exploratory drilling surveys and experiments, the overall survey area has geological structure of the soil is mainly clay, clay loam and clay sand conditions from hard plastic to soft plastic, and semi-hard to hard.

- **Geography**

Based on the survey results in the field, and the results of laboratory experiments, sections are divided into several classes as follows:

- Topsoil is Lớp đất mặt là đất thô nhường, distributed depth from the top to 0.2-0.3m.

- Layer 1(CH-CL): clay, clay cloam, yellowish gray, whitish gray, reddish brown, soft hard to semi-hard

- Layer 2a (SC): shaly sand, yellowish brown, whitish gray, soft plastic to hard plastic.

- **The physical, earthquakes, resistivity phenomena**

  **Motivation engineering geology:**

  The terrain is relatively flat, stable and solid geological background.

  **Earthquake:**

  According to TCXDVN 375:2006 – Design of structures for earthquake resistance:

  - Tan Uyen district – Binh Duong province has peak ground acceleration is $a_{gR} = 0.0433$ (which has been converted according to the gravitational acceleration g), the corresponding level earthquake level VI (MSK-64).

  - Thuan An town – Binh Duong province has peak ground acceleration is $a_{gR} = 0.0812$ (which has been converted according to the gravitational acceleration g), the corresponding level earthquake level VII (MSK-64).

  **Electric resistivity:**

  Along the route, the electric resistivity is very low.

1.6.4 Climate

The subproject area is located in the tropics, the equatorial position influenced by the monsoon. Every year, there are two distinct seasons, the rainy season starts from May to November and the dry season starts from December to April next year. Rainy season the prevailing wind direction is northeast from the ocean blowing in large humidity bring clouds and rain. During the dry season there is cold air from the north so it is slightly cold and dry at night.

**Temperature:**

- The annual average temperature is 24°C to 28°C, the average temperature in 2012 was 26.8°C.
- Temperature changes relative stability: the average monthly temperature for many years varies from 25.3°C (Nov.) to 29.8°C (May), the maximum difference of the average monthly temperature of the year is 4.7°C.
- The highest temperature in April and May: 28.3°C - 29.8°C.
- The lowest temperature in January and November: 24.2°C - 25.3°C.

**Wind:**
- Average wind velocity/year: 1.8m/s.
- Strongest wind velocity/year: 24m/s.
- Wind pressure W0=65daN/m².

**Rainfall:**
- There are two distinct seasons: the rainy season starts from May to November, the average number of rainy days in these months is about 19 rainy days/month. Rainfall is concentrated in the June, July, August and September (46.6% compared to the year). Total rainfall in 2012 was 2,413.1mm.

**Lightning:**
- Average number of lightning strikes per year: 44.

### 1.6.5 Socio-economic characteristic

According to socio-economics during the first 6 months in 2010 of Tan Uyen district and Thuan An town, socio-economic conditions of Tan Uyen district and Thuan An town is below:

**Traffic:**
The main roads to access the project are mainly provincial road DT743 and inter-communal roads.

**Population:**

**Tan Uyen district**
Tan Uyen is a district belong to Binh Duong province, located toward the southeast province of Binh Duong. Natural area of 613.44 km², accounting for 22% of the natural area of the province. Population is approximately 169,309 persons, accounting for 11% of the provincial population. Density is 276 persons per km². Administrative organization contains 3 towns and 19 communes (Uyen Hung town, and Thai Hoa and Tan Phuoc Khanh townships).

**Thuan An town**
Thuan An is a town belong to Binh Duong province, located towards southern of Binh Duong province, a key area for industrial development, small industries - agriculture and services. Natural area of 84.26 km², accounting for 3.1% of the natural area of the province. Population is approximately 235,850 persons, accounting for 15.7% of the provincial population; density is 276 people per km². Administrative organization contains 09 wards and 01 commune.

### 1.6.6. The distance from the project to the cultural, historical works

Preliminary investigation and survey work of buildings, structures, trees and crops within the safety corridor was implemented on July, 2010 by PECC3. The results showed that there is no regional warehouse project museum, parks military,
industrial, chemical, building airports and culture, historical monuments, temples and pagodas.

1.6.7. Receiving location waste from project’s activities

- **In construction phase**
  - Waste water:
    
    Based on existing traffic conditions of the area where the transmission line area passes through, to ensure the progress, quality and convenience of the construction, the project has arranged one temporary site, to be located in the the existing Binh Hoa 220kV substation located in Binh Hoa ward, Thuan An town, Binh Duong province.

    Wastewater in the construction phase is mainly domestic wastewater of construction workers. The number of construction workers gathered at the busiest time is about 20 people, the workers will use the toilet at the existing Binh Hoa substation.

  - Solid waste
    
    Domestic waste of construction workers will be collected in containers placed in the focus areas of litter of the existing Thuan An 220kV substation. Debris is then collected into local specialized units and transported to landfills.

    The process of construction of the project will not generate hazardous waste. The waste from the construction process will be used for leveling (soil, sand, bricks, rocks, debris ...) or re-used for crap metal (iron, steel ...).

- **Operation phase**
  
  During the operation phase, transmission line will not virtually generate emissions, sewage and hazardous waste which will not affect the ambient environment.

1.7 Project’s scale

1.7.1 Technical characteristics

- Voltage level : 220kV;
- Circuit : 2;
- Starting point : 220kV busbar at Tan Uyen 500kV SS;
- Ending point : 220kV busbar at Thua n An 220kV SS;
- Length : 12.7 km;
- Steering angles : 12;
- Conductor :new 220kV section: 2 phase ACSR 500/64; renovated 220kV section: ACSR 400/51; renovated 110kV section: ACSR 400/51.
- Earthwire : one Pastel 147, one OPGW-150.
- Insulator : polyme;
- Steel tower : zinc-galvanized steel tower with hot-dip method;
- Foundation : site-precast steel reinforced concrete;
- Earthing : Φ12 round iron bar combined with pile L63x63x6–
2,000 in every tower.

1.7.2 Extension bay at Thuan An 220kV SS

Providing and installing electrical equipment and materials for bay extension (02 bays), including:
  - 3 phase 220kV circuit breaker.
  - 3 phase 220kV disconnector with a earthing blade and without earthing blade.
  - 1 phase 220kV disconnector without earthing blade.
  - 220kV current transformer.
  - 220kV voltage transformer.
  - 220kV insulator suspension strings.
  - Control and protection panel for 220kV outside line bays.
  - Extension of 220kV two-busbar system.
  - Using existing power supply.
  - Outside earthing and lighting system is additionally equipped at location of new bays.
  - Secondary electrical equipments and SCADA connected to existing system at National Power Grid Dispatch Center (A0) and Southern Power Grid Dispatch Center (A2), protection relay for the TL.

1.7.3. Route’s description

❖ Tan Uyen 500kV SS - G2: Building a new double circuit Tan Uyen - Thuan An 220kV TL
  - Length: 605 m.
  - Location: Thanh Phuoc commune, Tan Uyen district
  - Passing ponds, rice fields, orchards, crops.
  - Passing 01 houses, there are 2 houses in the ROW.

❖ G2 - G3A: Upgrading Tri An - Binh Hoa 220kV TL into four – circuit

G2 – G3:
  - Length: 3,502 m.
  - Passing Thanh Phuoc commune, Thai Hoa and Tan Phuoc Khanh towns, Tan Uyen district and Binh Chuan ward, Thuan An district.
  - Passing 13 houses, there are 33 houses in the ROW.
  - Passing 04 roads, 08 soil paths.
  - Passing 05 medium voltage TLs and 02 low voltage TLs.

G3 – G3A:
  - Length: 848.8 m.
  - Passing Binh Chuan ward, Thuan An district.
  - Passing 03 houses, there are 15 houses in the ROW.
  - Passing 04 soil paths.
- Passing Binh Hoa – Tan Uyen 110kV TL, 04 medium voltage TLs and 01 low voltage TL.

❖ **G3A - G3B: Building a new double circuit Tan Uyen - Thuan An 220kV TL**
- Length: 97.8 m.
- Passing Binh Chuan ward, Thuan An district.
- Passing 220kV Tan Đinh – Binh Hoa TL.
- Passing 01 roads.
- There are 15 houses in the ROW.

❖ **G3B - Thuan An 220kV SS: Upgrading Binh Hoa- Hoc Mon 220kV TL into four – circuit**

G3B – G4:
- Length: 7.300 m.
- Passing Binh Chuan, An Phu and Binh Hoa wards, Thuan An district.
- Passing 14 houses, there are 84 houses in the ROW.
- Passing 01 sewage drainage canal and 01 spring.
- Passing 20 roads, 02 concrete roads and 11 soil paths.
- Passing 03 110kV TLs, 8 medium voltage TLs and 7 low voltage TLs.

G4 – G5:
- Length: 94, 2 m.
- Passing Binh Hoa ward, Thuan An district.
- Passing Thu Duc – Thuan An 110kV TL.

G5 – G6:
- Length: 124 m.
- Passing Binh Hoa ward, Thuan An district.

G6 - G7:
- Length: 58,2 m.
- Passing Binh Hoa ward, Thuan An district.
- Passing crops and 01 canal.

### 1.7.4. **Total investment cost**

<table>
<thead>
<tr>
<th>No.</th>
<th>Project Cost By Component</th>
<th>Total (VND)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Construction cost</td>
<td>349,327,743,000</td>
</tr>
<tr>
<td>2</td>
<td>Equipment cost</td>
<td>43,192,082,000</td>
</tr>
<tr>
<td>3</td>
<td>Compensation cost</td>
<td>133,188,611,089</td>
</tr>
<tr>
<td>4</td>
<td>Project management cost</td>
<td>5,542,847,000</td>
</tr>
<tr>
<td>No.</td>
<td>Project Cost By Component</td>
<td>Total (VND)</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>5</td>
<td>Consultancy cost</td>
<td>16,375,884,000</td>
</tr>
<tr>
<td>6</td>
<td>Other cost</td>
<td>43,931,666,000</td>
</tr>
<tr>
<td>7</td>
<td>Reserve depreciation</td>
<td>151,482,485,000</td>
</tr>
<tr>
<td></td>
<td><strong>Total project cost</strong></td>
<td><strong>743,041,318,089</strong></td>
</tr>
</tbody>
</table>

### 1.7.5 Schedule of the Project

#### Schedule of the subproject

<table>
<thead>
<tr>
<th>Contents</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation and approval of Technical design</td>
<td>First quarter/2014</td>
</tr>
<tr>
<td>Preparation and approval of Biding document for equipments and construction</td>
<td>Third quarter/2014</td>
</tr>
<tr>
<td>Organizing and evaluating Bid</td>
<td>Fourth quarter/2014</td>
</tr>
<tr>
<td>Approval of Bid results and signing all contracts</td>
<td>First quarter/2015</td>
</tr>
<tr>
<td>Enter equipments and materials</td>
<td>Second quarter/2015</td>
</tr>
<tr>
<td>Construction and installation</td>
<td>Third quarter/2015 - Fourth quarter/2015</td>
</tr>
<tr>
<td>Commissioning</td>
<td>First quarter/2017</td>
</tr>
</tbody>
</table>

### 1.8 The Project’s demand on material and fuel

The Tan Uyen - Thuan An 220kV transmission line project is a unique project compared to other electricity transmission projects. During construction and operational phase the project does not use fuel and raw material, except for a small amount of fuel to operate the motorized column erection. This amount of fuel substantially is small and insignificant. Building materials for the line will be provided by the contractor in HCMC. Quantity of material will be moved by truck from HCMC to construction sites. This material includes wiring, electrical devices, insulators, iron and steel, steel columns, ....

#### 1.8.1 Power supply

Power supply for construction is provided by a local source or the contractor’s mobile diesel generator.

#### 1.8.2 Water supply and water demand

- Construction phase

Water used for construction is taken from water sources such as rivers, canals, existing wells in the local area where the TL passing by. However, this water must be clean, free of impurities and must meet the standards for mixing concrete. The estimated volume of water during construction is about 22.64 m³/day throughout the transmission line taken from Binh Hoa 220kV SS.
- Operation phase
  No water demand.

II. ENVIRONMENT IMPACTS

2.1 Generated waste

During the construction process, projects have some certain influence on the environment. However, the construction activities will be closely managed to restrict to a minimum the influence. Therefore, the level will not be effected. In operational processes, the project does not use organic ingredients, without active transport of materials and products; virtual waste not generated significant effect on the environment.

During operation, workers of Power Transmission Company No.4 will periodically inspect equipment, safety corridor or troubleshooting line. The number of workers is very small, the work is arranged in daytime, thus the effect of this activity on the environment is considered negligible.

2.1.1 Dust

During construction, the main construction activities which generate dust affecting the air quality of the environment: (i) dust generated from excavation activities, (ii) dust generated from transportation, unpacking materials and equipments.

The estimated volume of excavation is as follows:

<table>
<thead>
<tr>
<th>Foundation</th>
<th>Tower</th>
<th>Quantity</th>
<th>Foundation area</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Digging (m³)</td>
<td>Levelling (m³)</td>
</tr>
<tr>
<td>4T92 40-59</td>
<td>D242-69</td>
<td>2</td>
<td>265.0</td>
<td>1,294.6</td>
</tr>
<tr>
<td>MB92 25-172x202</td>
<td>D242-69</td>
<td>1</td>
<td>393.0</td>
<td>1,096.8</td>
</tr>
<tr>
<td>4T98 40-59</td>
<td>D242-72</td>
<td>4</td>
<td>284.9</td>
<td>1,383.3</td>
</tr>
<tr>
<td>MB98 25-178x208</td>
<td>D242-72</td>
<td>2</td>
<td>417.2</td>
<td>1,162.0</td>
</tr>
<tr>
<td>4T77 35-43</td>
<td>D2142-59</td>
<td>2</td>
<td>173.2</td>
<td>746.2</td>
</tr>
<tr>
<td>4T83 35-43</td>
<td>D2142-62</td>
<td>14</td>
<td>189.3</td>
<td>809.6</td>
</tr>
<tr>
<td>4T70 40-59</td>
<td>N222-34B+XP</td>
<td>1</td>
<td>197.4</td>
<td>990.8</td>
</tr>
<tr>
<td>MB70 25-150x190</td>
<td>N222-34B+XP</td>
<td>1</td>
<td>325.4</td>
<td>914.9</td>
</tr>
<tr>
<td>4T97 40-59</td>
<td>N222-43B+XP</td>
<td>1</td>
<td>280.6</td>
<td>1,363.8</td>
</tr>
<tr>
<td>4T133 45-65</td>
<td>N222-55C</td>
<td>1</td>
<td>438.9</td>
<td>1,658.3</td>
</tr>
<tr>
<td>4T156 40-59</td>
<td>N242-67A</td>
<td>1</td>
<td>513.9</td>
<td>1,221.9</td>
</tr>
<tr>
<td>MB122 30-192x232</td>
<td>N242-</td>
<td>1</td>
<td>496.0</td>
<td>1,674.5</td>
</tr>
</tbody>
</table>
### Foundation Tower

<table>
<thead>
<tr>
<th>No.</th>
<th>Foundation</th>
<th>Tower</th>
<th>Quantity</th>
<th>Foundation area</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Digging (m³)</td>
</tr>
<tr>
<td>1</td>
<td>MB154 35-239x264</td>
<td>N242-67C</td>
<td>1</td>
<td>688.0</td>
<td>2,712.9</td>
</tr>
<tr>
<td>2</td>
<td>4T177 40-53</td>
<td>N242-73DN</td>
<td>2</td>
<td>580.8</td>
<td>1,059.5</td>
</tr>
<tr>
<td>3</td>
<td>MB95 30-165x185</td>
<td>N2142-53B</td>
<td>1</td>
<td>348.7</td>
<td>1,400.1</td>
</tr>
<tr>
<td>4</td>
<td>MB93 35-193</td>
<td>N2142-53C+XP</td>
<td>1</td>
<td>417.8</td>
<td>1,689.7</td>
</tr>
<tr>
<td>5</td>
<td>MB113 30-173x203</td>
<td>N2142-59B</td>
<td>4</td>
<td>419.3</td>
<td>1,572.3</td>
</tr>
<tr>
<td>6</td>
<td>4T113 35-49</td>
<td>N2142-59DN</td>
<td>2</td>
<td>302.8</td>
<td>782.9</td>
</tr>
<tr>
<td>7</td>
<td>MB129 35-219</td>
<td>N2142-65DN</td>
<td>1</td>
<td>530.8</td>
<td>2,119.2</td>
</tr>
<tr>
<td>8</td>
<td>MB147 30-207</td>
<td>N2162-68DN</td>
<td>1</td>
<td>478.3</td>
<td>1,851.0</td>
</tr>
<tr>
<td>9</td>
<td>4T177 35-49</td>
<td>N2162-74GC</td>
<td>1</td>
<td>565.0</td>
<td>782.9</td>
</tr>
</tbody>
</table>

**Source:** PECC3, Feasibility study, 09/2010

Dust diffusion coefficient due to excavation and transportation of construction materials is presented in the following table:

**Table 2.2: Dust diffusion coefficient**

<table>
<thead>
<tr>
<th>No.</th>
<th>Source of pollution</th>
<th>Estimated diffusion coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dust generated in the process of digging, leveling, being blown up (sand dust)</td>
<td>$1 \div 10 \text{ g/m}^3$</td>
</tr>
<tr>
<td>2</td>
<td>Dust generated in the process of packing and unpacking of construction materials</td>
<td>$0.1 \div 1 \text{ g/m}^3$</td>
</tr>
<tr>
<td></td>
<td>(cement, soil, sand, ice ...), machines and equipments</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Emissions of vehicles, construction machines containing dust, CO, hydrocarbon,</td>
<td>Dust: 4.3kg/ton DO; SO$_2$: 0.1kg/ton DO; NO$_x$: 55kg/ton DO; CO: 28kg/ton DO; VOC: 12kg/ton DO</td>
</tr>
<tr>
<td></td>
<td>SO$_2$, .. (3.5 ÷ 16 ton trucks using diesel DO have S = 0.5%)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sand and soil drop in the transportation generating dust</td>
<td>$0.1 \div 1 \text{ g/m}^3$</td>
</tr>
</tbody>
</table>

**Source:** WHO’s Quick Assessment

Expected construction time is 2 years, supposing that the arm of affected area around the excavation pit is 3 times larger than the pit arm, so the affected area is 9 times larger than the area of excavation and height of diffusion is 30m. The space affected by dust is calculated as follows:

$$W_{(g/s)} = M_{(m^3)} \times (1 \div 100) \times (g/m^3 \times T1 \text{ (s)})$$
The estimated suspended concentration in 1 hour diffusion into the air during excavation (working 8 hours/day) as follows:

\[ N_{(mg/m^3)} = \frac{[W_{(g/s)} \times T2\ (s)]}{(S_{m2} \times 30m)} \]

*In which:*
- \( W \): Amount of dust
- \( M \): Volume of soil excavated
- \( T1 \): Construction time
- \( T2 \): 3,600 (s)
- \( N \): Dust concentration
- \( S \): Affected area

Dust concentration calculated in the Project area is as follows:

**Table 2.3. Dust concentration in construction phase**

<table>
<thead>
<tr>
<th>Foundation</th>
<th>Quantity</th>
<th>Foundation area</th>
<th>Total excavation volume (m³)</th>
<th>Dust concentration mg/m³</th>
<th>QCVN 05:2009/BTN MT mg/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>4T92 40-59</td>
<td>2</td>
<td>265.0</td>
<td>2,480.8</td>
<td>0.00201 - 0.201</td>
<td>0.3</td>
</tr>
<tr>
<td>MB92 25-72x202</td>
<td>1</td>
<td>393.0</td>
<td>1,932.6</td>
<td>0.00105 - 0.105</td>
<td>0.3</td>
</tr>
<tr>
<td>4T98 40-59</td>
<td>4</td>
<td>284.9</td>
<td>2,658.2</td>
<td>0.002 - 0.2</td>
<td>0.3</td>
</tr>
<tr>
<td>MB98 25-78x208</td>
<td>2</td>
<td>417.2</td>
<td>2,047.6</td>
<td>0.00105 - 0.105</td>
<td>0.3</td>
</tr>
<tr>
<td>4T77 35-43</td>
<td>2</td>
<td>173.2</td>
<td>1,444.5</td>
<td>0.00179 - 0.179</td>
<td>0.3</td>
</tr>
<tr>
<td>4T83 35-43</td>
<td>14</td>
<td>189.3</td>
<td>1,571.1</td>
<td>0.00178 - 0.178</td>
<td>0.3</td>
</tr>
<tr>
<td>4T70 40-59</td>
<td>1</td>
<td>197.4</td>
<td>1,873.2</td>
<td>0.00203 - 0.203</td>
<td>0.3</td>
</tr>
<tr>
<td>MB70 25-50x190</td>
<td>1</td>
<td>325.4</td>
<td>1,611.2</td>
<td>0.00106 - 0.106</td>
<td>0.3</td>
</tr>
<tr>
<td>4T97 40-59</td>
<td>1</td>
<td>280.6</td>
<td>2,619.3</td>
<td>0.002 - 0.2</td>
<td>0.3</td>
</tr>
<tr>
<td>4T133 45-65</td>
<td>1</td>
<td>438.9</td>
<td>3,176.3</td>
<td>0.00155 - 0.155</td>
<td>0.3</td>
</tr>
<tr>
<td>4T156 40-59</td>
<td>1</td>
<td>513.9</td>
<td>2,335.3</td>
<td>0.00097 - 0.097</td>
<td>0.3</td>
</tr>
<tr>
<td>MB122 30-192x232</td>
<td>1</td>
<td>496.0</td>
<td>2,951.8</td>
<td>0.00128 - 0.128</td>
<td>0.3</td>
</tr>
<tr>
<td>MB154 35-239x264</td>
<td>1</td>
<td>688.0</td>
<td>4,877.7</td>
<td>0.00152 - 0.152</td>
<td>0.3</td>
</tr>
<tr>
<td>4T177 40-53</td>
<td>2</td>
<td>580.8</td>
<td>2,035.3</td>
<td>0.00075 - 0.075</td>
<td>0.3</td>
</tr>
<tr>
<td>MB95 30-165x185</td>
<td>1</td>
<td>348.7</td>
<td>2,512.2</td>
<td>0.00154 - 0.154</td>
<td>0.3</td>
</tr>
<tr>
<td>MB93 35-193</td>
<td>1</td>
<td>417.8</td>
<td>3,032.3</td>
<td>0.00156 - 0.156</td>
<td>0.3</td>
</tr>
</tbody>
</table>
As shown in table 2.3, the max dust concentration in a foundation is around 0.00203 – 0.203 mg/m³, lower than which is regulated in QCVN 05:2009/BTNMT (0.3mg/m³), so that, the impacts from dust is insignificant to the surrounding environment.

2.1.2. Noise

- Construction phase

During construction, the main source of vibration is the construction machines and trucks transporting materials

Table 2.4: The noise level generated by some equipments

<table>
<thead>
<tr>
<th>No</th>
<th>Kind of equipments</th>
<th>Noise level at distance of 15m (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hooter</td>
<td>90</td>
</tr>
<tr>
<td>2</td>
<td>Compressor</td>
<td>72 – 88</td>
</tr>
<tr>
<td>3</td>
<td>Concrete mixer</td>
<td>71 – 85</td>
</tr>
<tr>
<td>4</td>
<td>Generator</td>
<td>70 – 82</td>
</tr>
<tr>
<td>5</td>
<td>Welding machine</td>
<td>80</td>
</tr>
</tbody>
</table>

Source: Assessment of sources of air, water and land pollution, WHO, 1993

The construction work is mainly done by men. Moreover, around the foundations laying agricultural land with many trees which can prevent and reduce noise. Therefore, impacts from noise are considered small and short term.

- Operation phase

No noise generated.

2.1.3. Sewage

- Construction phase

Overflow rainwater

Overflow rainwater passing through the construction area swept dirt, grease and other contaminants which can cause pollution and increase turbidity in the adjacent canal.
The Project area’s topography is relatively flat, the volume of excavated soil is not big. So, this kind of impact is considered small.

**Worker’s domestic sewage**

The number of construction workers at the site depends on the stage of construction such as excavation, concrete, equipment installation, ... approximately 20 person, the domestic sewage is around 2.4 m³/day, this amount is temporarily distributed along the TL. After construction, there will be no sewage generated.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Pollutant concentration</th>
<th>QCVN 14 : 2008/BTNMT Column A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissolving waste</td>
<td>mg/l</td>
<td>350</td>
<td>500</td>
</tr>
<tr>
<td>Solid waste</td>
<td>mg/l</td>
<td>150</td>
<td>-</td>
</tr>
<tr>
<td>Total suspended solid</td>
<td>mg/l</td>
<td>350</td>
<td>50</td>
</tr>
<tr>
<td>Deposited solid</td>
<td>mg/l</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>BOD₅</td>
<td>mg/l</td>
<td>200</td>
<td>30</td>
</tr>
<tr>
<td>DO</td>
<td>mg/l</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Total N</td>
<td>mg/l</td>
<td>50</td>
<td>-</td>
</tr>
<tr>
<td>Organic nitrogen</td>
<td>mg/l</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>N-NH₃</td>
<td>mg/l</td>
<td>30</td>
<td>-</td>
</tr>
<tr>
<td>N-NO₂</td>
<td>mg/l</td>
<td>0.05</td>
<td>-</td>
</tr>
<tr>
<td>N-NO₃</td>
<td>mg/l</td>
<td>0.2</td>
<td>30</td>
</tr>
<tr>
<td>Cl⁻</td>
<td>mg/l</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>Alkalinity</td>
<td>mgCaCO₃/l</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>Lipid</td>
<td>mg/l</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Total P</td>
<td>mg/l</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Total Coliforms</td>
<td>MPN/100ml</td>
<td>10⁷ ÷ 10¹⁰</td>
<td>3,000</td>
</tr>
</tbody>
</table>

The construction workers are mainly concentrated in the area of building foundations. It is expected there will be an installation of mobile toilets in construction sites or hiring surrounding households’ toilets to ensure sewage is not discharged directly into surface water sources in the area.

- **Operation phase**
No sewage generated.

### 2.1.4. Solid waste

*Generated during construction phase*

Workforce centralization will generate domestic waste: 0.5kg/person/day x 20 workers= 10kg/day. Main components of domestic waste includes:

- Organic compounds such as vegetables, leftovers...
- Kind of packages, food packages, cans...
- Inorganic compounds such as resin, plastic, glass...
- Metals such as food containers, ...

In construction sites, solid waste is collected and concentrated in the waste area. Periodically, the urban hygiene company will transport them to hygienic treatment places.

Construction solid waste:

- Construction solid waste includes left and split construction materials as iron, steel scrap, bricks, stone, cement,... This waste is not discharged into the environment but will be utilized to backfill (brick, stone, cement paste...) or reuse, sell (iron, steel...).

- The whole amount of the excavated soil will be utilized to backfill foundations or handover to surrounding households to reuse. Therefore, Project’s excavation process does not generate excess soil.

No solid waste generated in operation phase.

### 2.1.5. Hazardous solid waste

Hazardous solid waste includes:

- Rags, oil tank, ...

- Oil and grease from the maintenance and repair of vehicles and construction machines in the project area. The amount of waste oil generated in the project area depends on the number, oil change cycle (3-6 months depending on the activities of vehicles) and maintenance of vehicles and machines.

The Project owner signs the contract with specialized units for collecting and treating hazardous waste in accordance with regulations on hazardous waste management.

### 2.2. Other impacts

#### 2.2.1. Impacts of land acquisition

- Permanently acquired land:

<table>
<thead>
<tr>
<th>No</th>
<th>Locality</th>
<th>Agricultural land for perennial trees (m²)</th>
<th>Agricultural land for annual trees (m²)</th>
<th>Total (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Binh Duong Province</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Locality</td>
<td>Agricultural land for perennial trees (m²)</td>
<td>Agricultural land for annual trees (m²)</td>
<td>Total (m²)</td>
</tr>
<tr>
<td>----</td>
<td>-----------------</td>
<td>-------------------------------------------</td>
<td>----------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>1</td>
<td>Tan Uyen District</td>
<td>902.8</td>
<td>2,615.5</td>
<td>3,518.30</td>
</tr>
<tr>
<td>2</td>
<td>Thuan An Town</td>
<td>1,396</td>
<td>3,111</td>
<td>4,507.00</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2,299.20</td>
<td>5,726.90</td>
<td>8,026.10</td>
</tr>
</tbody>
</table>

Source: PECC3, Feasibility study, 09/2010

- Affected land in the ROW:

Table 2.7 Affected land in the ROW

<table>
<thead>
<tr>
<th>No.</th>
<th>Locality</th>
<th>Residential land (m²)</th>
<th>Agricultural land for perennial trees (m²)</th>
<th>Agricultural land for annual trees (m²)</th>
<th>Total (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Binh Duong Province</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Tan Uyen District</td>
<td>41,237.10</td>
<td>24,375.60</td>
<td>70,618.50</td>
<td>136,231.20</td>
</tr>
<tr>
<td>2</td>
<td>Thuan An Town</td>
<td>62,790.10</td>
<td>35,477.60</td>
<td>79,782.10</td>
<td>178,049.80</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>104,027.20</td>
<td>59,853.20</td>
<td>150,400.60</td>
<td>314,281.00</td>
</tr>
</tbody>
</table>

Source: PECC3, Feasibility study, 09/2010

2.2.2 Affected houses and trees in the Project area

In order to build foundation and ROW, the Project will cause some impact on trees and houses in the Project area.

According to Government’s Decree No.81/2009/ND-CP dated 12/10/2009 amending, supplementing a number of articles of the Government’s Decree No.106/2005/ND-CP dated August 17, 2005, which details and guides a number of articles of the Electricity Law regarding the safe protection of high-voltage power grid Works, upon construction or renovation of overhead electricity transmission lines stretching over population quarters, public places, industrial parks, hi-tech parks, export processing zones, important defense or security works, historical-cultural relics and scenic places already classified by the State, electricity and construction safety measures shall be intensified as follows:

The distance from the lowest point of conductor in the maximum sagging state to the ground surface must not be lower than the limit prescribed in the following table:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>110kV</th>
<th>220kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>15m</td>
<td>18m</td>
</tr>
</tbody>
</table>

Trees and crops:
The vertical distance from the average height of fully grown trees to the lowest conductor in the maximum sagging state must not be smaller:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>110kV</th>
<th>220kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance</td>
<td>3.0m</td>
<td>4.0m</td>
</tr>
</tbody>
</table>

- Rice and crops are only allowed to be planted at least 0.5m away from the foundations.

**Houses:**

Houses and works are not required to be relocated from up-to-220 kV power grid ROWs if the following conditions are fully met:

- Their roofs and surrounding walls are made of fire-proof materials;
- Their metal structures are earthed according to regulations on earthing techniques;
- They do not obstruct paths for examination, maintenance or replacement of parts of high-voltage power grid works;
- The distance from any part of houses or works to the nearest transmission cables in the maximum sagging state is not lower than the limits prescribed in the following table:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>110kV</th>
<th>220kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance</td>
<td>4.0m</td>
<td>6.0m</td>
</tr>
</tbody>
</table>

According to Circular No.03/2010/TT-BCT about earthing for houses and structures under the ROW.

Houses with metal roofs and walls are supported to be earthed in order to continue existing in the ROW. The earthing cost will be paid by the PMU/Project owner basing on the Province/City’s decisions.

**Table 2.8 Affected trees**

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
<th>Unit</th>
<th>District</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tan Uyen</td>
<td>Thuan An</td>
</tr>
<tr>
<td>1</td>
<td>Rice</td>
<td>m²</td>
<td>24,926</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Jack fruit</td>
<td>tree</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Longgan</td>
<td>tree</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Sơ ri</td>
<td>tree</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Tarmarine</td>
<td>tree</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Mango</td>
<td>tree</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>Nulgar bamboo</td>
<td>bush</td>
<td>-</td>
<td>118</td>
</tr>
<tr>
<td>No</td>
<td>Item</td>
<td>Unit</td>
<td>District</td>
<td>Total</td>
</tr>
<tr>
<td>----</td>
<td>------------</td>
<td>------</td>
<td>------------------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tan Uyen</td>
<td>Thuan An</td>
</tr>
<tr>
<td>8</td>
<td>Cashew tree</td>
<td>-</td>
<td>138</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Cajuput tree</td>
<td>5,549</td>
<td>1,272</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Eucalyptus tree</td>
<td>2,686</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Source: PECC3, Feasibility study, 09/2010

- In 220kV TL’s ROW, houses with flammable roofs and walls have to be relocated or renovated in order to stay in the ROW, houses with unflammable roofs and walls do not have to be relocated. Distance from any point of the house to conductor at maximum sagging state must be not less than 6m.

Table 2.9 Houses/structures need earthing

<table>
<thead>
<tr>
<th>No</th>
<th>Type of house</th>
<th>Tan Uyen</th>
<th>Thuan An</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Area (m²)</td>
<td>Quantit y</td>
<td>Area (m²)</td>
</tr>
<tr>
<td>1</td>
<td>Brick wall, reed roof</td>
<td>50</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Brick wall, tole roof</td>
<td>14,437</td>
<td>62</td>
<td>15,132</td>
</tr>
<tr>
<td>3</td>
<td>Brick wall, tiled roof</td>
<td>1,170</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Thatched wall, thatched roof</td>
<td>1,536</td>
<td>12</td>
<td>256</td>
</tr>
<tr>
<td>5</td>
<td>Thatched wall, tole roof</td>
<td>792</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Tole wall, tole roof</td>
<td>780</td>
<td>4</td>
<td>591</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>17,973</td>
<td>85</td>
<td>16,771</td>
</tr>
</tbody>
</table>

Source: PECC3, Feasibility study, 09/2010

2.2.3. Impact on military areas and cultural historic relics

According to the field survey, the project did not go near any military zones or historic and cultural relics.

During the construction process, if it is discovered that historic relics or archaeological remains, Project owner and contractors will report immediately to the Department of Culture and Information. The workers will be provided with the necessary knowledge about how to deal with discovery of archaeological remains.
2.2.4. Impacts of electromagnetic field on human’s health

a. Standard of electromagnetic field

According to the industry standard "The allowed electric field intensity of industrial frequency" were issued together with Decision No.183 NL/KHKT of the Ministry of Energy on 04/12/1994 time t (hours) that allows people to be directly affected by the electric field depends on the electric field strength (E) as follows:

- $E > 25\text{kV/m}$, $t = 0$
- $20 < E \leq 25 \text{kV/m}$, $t = 1/6$
- $5 \leq E \leq 20 \text{kV/m}$, $t = (50/E)-2$

b. Factors affecting the electric field strength

- The distance from the conductor to the ground.
- Diagram laying out conductor on the tower: phase distance, circuit number, laying out conductor horizontally, vertically, triangularly …
- Arrangement of the order of phases: double circuit forward phase, reverse phase.
- Cross section of conductor, number of conductor/phase.
- The number of earthwire on towers, the distance between conductors and earthwires

c. Methods and results

To calculate the electromagnetic field strength under high voltage TLs we use the electromagnetic field transient program (EMTP). The electromagnetic field strength at 1 meter height from the ground is shown in figures V1 and V2 below. In which:

- Vertical axis: Electromagnetic field strength $E (\text{kV/m})$
- Horizontal axis: horizontal distance (m) of the TL. Coordinates $X=0$ (m) at centre of the TL.
- The curve on the safe distance from the conductor to ground (Hat = 7m, 8m, 9m, 10m).
Figure 2.1: Distribution of electromagnetic field strength at 1 meter height from the ground - 220kV TL

Figure 2.2: Distribution of electromagnetic field strength at 1 meter height from the ground - 220kV TL (reversed phase)

The Project is designed with a safe distance from the conductor to ground ≥ 8m. According to the calculation results (Figure 2.1 and 2.2), the electromagnetic field strength at 1 meter height from the ground is always <5kV/m which meets the requirements of Article 6, paragraph 1 of Decree No.106/2005/ND-CP and Decree No.81/2009/ND-CP on 12/10/2009 (<5kV/m)

Table 2.10: Affected households/people

<table>
<thead>
<tr>
<th>Total number of affected households/people</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of households whose houses/structures need earthing/renovation</td>
<td>176 696</td>
</tr>
</tbody>
</table>

Source: PECC3, Feasibility study, 09/2010

2.2.5. **Impacts of subsidence and erosion...**

The geological survey is well done before design and construction. Design is reviewed and prepared based on the results of geological survey; construction is compliance with standards and technical regulations. Therefore, the possibility of subsidence incidents is very low.

2.2.6. **Impact on traffic**

The transporting, gathering of materials and equipment for construction mainly use roads and no waterways. Transportation can cause some impacts as follows:

- Increase the density of vehicles on the roads leading to Project area;
- The traffic disruption due to roads intersecting;
- The risk of causing road damage, subsidence... (when transporting heavy and over-sized equipments and machines..).
2.2.7. **Labor accidents**

The construction, operation and maintenance of transmission line can cause accidents such as falling from high towers and electric shock... if safety rules are not complied. Therefore, only workers who are well trained are allowed to do maintenance work and are trained with emergency response capabilities in the event of an accident.

2.2.8. **Impacts of Risks and Incidents**

- **The environmental risks and incidents may occur during the construction phase**

  **a. Labor accidents**

  With unique signature of power sector projects and overhead execution, labor accidents are likely to occur. This issue is given serious attention during the construction process. The risk of labor accidents occurs most often during construction related to the installation of overhead equipments and large equipments. Labor accidents can occur to construction workers in the construction site near power lines, major load machines, cranes, or the foundation pit. If construction work is well managed, safety regulations are strictly abide and workers will have been adequately equipped with high quality labor protection means, the impacts will be minimized.

  The experience of the professional construction contractor, complying with strict regulations on labor safety during construction and installation of equipment, as well as close monitoring and timely rescue can minimize loss of life and property.

  **b. Risk of explosion**

  The environmental problems in the construction phase can be hidden in the fuel depots. Leakage and fire are likely caused by problems associated with the construction activities such as soldering or electric shock which are very common in construction. So the safety measures for warehouses are paid much attention and are strictly controled.

  The construction methods do not use explosives but only digging and motor vehicles. So safety regarding fire issues is guaranteed.

  **c. The risk of impacts from the remants of war**

  Before construction, Project owner will contract with functional units to perform demining in the foundations area. Therefore, during construction and operation, the risk of accidents from the remants the war is low.

- **The environmental risks and incidents that may occur in the operation phase**

Subsidence may occur due to:

- Errors in the foundation renovation process;
- Corrosion of transformer’s foundation;
- Construction subsidence.

The geological survey is done well before design and construction. Design is reviewed and prepared based on the results of geological survey; construction is in
compliance with standards and technical regulations. Therefore, the possibility of subsidence incidents is very low.

During operation, conductors can be sagged or broken due to weather (storms can cause cord, electric shock,…) or plants around.

In case of problems, automatic relays will immediately be disconnected to the electrical system which will cause a very small impact on the surrounding area. At the same time, plants in the ROW are cleared periodically during operation and weather factors are taken care of in the detailed design stage so this kind of impact is negligible.

However, broken conductors at cross sections or near the road can impact on traffic flow, endangering people nearby.

III. MEASURES FOR MINIMIZING NEGATIVE IMPACTS

During the construction phase, the implementation of measures to minimize environmental impacts to be included in the tender documents and the contract with the contractor to ensure that mitigation measures are fully implemented and tested by the contractor and investigated by the project owner.

Due to the specific characteristics of the electricity sector so that the work does not generate wastes affecting air environment in the region.

In operational phase, the operator unit is responsible for the implementation of mitigation measures during this period.

3.1. Mitigation measures of impacts relating to waste

3.1.1. Minimizing dust in construction phase

- Means of transport, machines and equipments used must to be registered at Vietnam Register Bureau;
- The transportation of materials or equipments have to use specialized trucks which must be checked before using. Ropes have to be firm to ensure safety and compliance with safety regulations for transportation;
- All vehicles transporting materials (sand, cement, stone, …) must to be covered to prevent dust diffused into the environment;
- Watering construction site in hot, dry and windy weather is a necessary measure to limit dust.

3.1.2. Minimizing noise

- **Construction phase**
  - All construction activities are executed during daytime. In case of execution at night, the project owner has to inform and have approval from local authorities. Excavation activities, transportation of materials and equipments are executed during the daytime;
  - Using methods, equipments with low noise and vibration;
  - Limit a proper density of vehicles transporting materials to reduce noise, horns are only allowed to be used when necessary such as going in residential areas, especially areas with schools, temples, etc.

- **Operation phase**
- Check and maintain periodically transformers to ensure transformer reaches noise standards.

### 3.1.3. Sewage

- **Construction phase**
  - Organize and arrange reasonable construction work, especially the excavation which has to be executed in the dry season to minimize overflown rainwater sweeping soil, sand and oil polluting water sources;
  - It is expected to install mobile toilets for workers to ensure that domestic sewage is not discharged directly into canals. In addition, construction workers who rent houses near the project area will use local sewage collection and treatment system.

- **Operation phase**
  No sewage generated.

### 3.1.4. Solid waste

Solid waste generated during construction of the project includes construction solid waste and domestic solid waste.

- **Construction phase**
  - including construction material waste, steel scrap, brick, stone, cement... almost all of which will not be discharged into the environment but reused to level (brick, stone, cement paste...) or collected and sent back to the manufacturer for recycling or selling scrap (steel, metal...);
  - The local hygiene company will collect these wastes everyday or every 2 days and treat them as regulated.

- **Operation phase**
  No solid waste generated.

### 3.1.4. Hazardous waste

All hazardous waste will be collected in containers in a concentrated area and will be transported and treated by a local company.

The processes of collecting, storing, transporting and treating are subject to regulations on hazardous waste management in Circular 12/2011/TT - MONRE of Ministry of Natural Resources and Environment about the hazardous waste management.

### 3.2. Minimizing other impacts

#### 3.2.1. Compensation, resettlement and support

Project owner coordinates with local compensation councils to implement compensation and support policies for households affected by the project. Compensation and support framework is approved by PPC basing on the proposal of the Compensation Councils.

- **Compensation for houses/structures**: As regulated in Decree No.69/2009/ND-CP dated 13/8/2009 providing additional regulations on of land-use planning, land prices, land acquisition, compensation and support of resettlement

- **Compensation for land**: 
Article 14 – Decree No.69/2009/ND-CP

“...by the State shall be compensated with new land with the same use purpose. If no land is available for compensation, compensation equal to the value of land use rights calculated based on land prices at the time of land recovery decision will be paid. Incase land is compensated with new land or residential land or a house for resettlement, any difference in value shall be paid in cash as regulations…”

Compensation and support for land in ROW:

Besides receiving compensation directly for damages, project affected people have rights to receive allowance as regulated in Decree No.106/2005/ND-CP and Decree No.81/2009/ND-CP. Allowance and support include:

(a) Support for ground:

According to Article 6 of Decree No.106/2005/ND-CP dated 17/8/2005 stipulated: conditions for dwelling houses and projects to exits within safety corridor of to-220 kV power grid works “Their roofs, frames and surrounding walls, if made of metals, must be earthed according to regulations on earthing technique”.

(b) Support for upgrading house:

According to Article 6 of Decree No.106/2005/ND-CP dated 17/8/2005 stipulated: conditions for dwelling houses and projects to exits within safety corridor of to-220 kV power grid works “Their roofs and surrounding walls are made of fire-proof materials”.

(c) Support for land within the ROW:

According to Article 6 of Decree 81/2009/ND-CP dated 12/10/2009 stipulated:

For residential land and land of other types in the same lot of a land user within a power grid safety corridor, which is not subject to land recovery by the State, its user will be entitled to compensation or support for restricted usability of their land. The compensation or support will be made in lump sum as follows: “The residential land area entitled to compensation or support for its restricted usability is the actual/land area in the power grid safety corridor. The compensation or support level must not exceed 80% of the level of compensation for recovery of residential land, calculated on the land area lying inside the corridor.

(d) Support for houses located within the ROW.

Owners of houses and support facilities in service of daily-life activities of households and individuals, which are not required to be relocated from up-to-220 kV power grid safety corridors under Clause 4, Article 4 of this Decree, will enjoy compensations or supports for restricted usability and impacts on daily-life activities. The compensation or supports will be paid in lump sum as follows: “Specific compensation or support levels shall be set by provincial-level People’s Committees, but must not exceed 70% of the value of house or support facility section lying inside power grid safety corridors, at construction unit prices of new houses or support facilities of similar technical standards, which are promulgated by provincial-level People’s Committees”.

Compensation for trees:

Article 12 of Circular 14/2009/TT-BTNMT
1. “The amount of compensation for annual crops by harvest value of a (01) harvest. The value of an output (01) crop yields are the highest in three (03) years preceding the major crops in local time the average price of agricultural products in the same category at the same time local of land acquisition.

2. Perennials include industrial plants, fruit trees, timber trees, leaves, trees specified in Clause 1, Article 2 of Decree No.74-CP of the Government dated 25.10.1993 stipulated detail the implementation of tax laws used agricultural land, the State compensation recovered under the existing value of the garden, this value does not include the value of land use rights”.

Because the period from preparing Compensation Plan to carrying out the project may be extended, thus at the time of project implementation, prices may not match the market value or replacement cost.

Article 5 of Circular 14/2009/TT-BTNMT:

“In case land prices set by provincial-level People’s Committees are not close to actual market prices of land-use right transfer under normal conditions, provincial-level People’s Committees shall assign functional agencies to re-determine specific land prices in order to decide on appropriate land prices used for compensation calculation which are not restricted not with standing the provisions on price brackets of land of different categories”.

The detailed survey report will be carried out by the Compensation and Resettlemt Council at the start of project implementation. The evaluation unit at the start of the project implementation will be carried out by an independent monitoring agency and the Department of Finance of the province. The scope of this work will be required after the terms of reference of the independent monitoring agency.

Cost for compensation and support of the project is described in the following table:

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Preparation Resettlement plan and DMS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Initial stage (preparation of Resettlement Plan)</td>
<td>270,000,000</td>
</tr>
<tr>
<td></td>
<td>Implementation stage (DMS)</td>
<td>841,180,090</td>
</tr>
<tr>
<td></td>
<td><strong>Sub-total 1</strong></td>
<td><strong>1,111,180,090</strong></td>
</tr>
<tr>
<td>2</td>
<td>Compensation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acquisition land</td>
<td>1,029,668,500</td>
</tr>
<tr>
<td></td>
<td>Permanently affected perennial trees</td>
<td>705,601,000</td>
</tr>
<tr>
<td></td>
<td><strong>Sub-total 2</strong></td>
<td><strong>1,735,269,500</strong></td>
</tr>
<tr>
<td>3</td>
<td>Support</td>
<td></td>
</tr>
<tr>
<td></td>
<td>For earthling and upgrading</td>
<td>1,470,000,000</td>
</tr>
</tbody>
</table>

**Table 3.1 Cost for compensation and support**
<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2</td>
<td>For land within the ROW</td>
<td>84,791,482,450</td>
</tr>
<tr>
<td>3.3</td>
<td>For houses within the ROW</td>
<td>19,964,700,000</td>
</tr>
<tr>
<td></td>
<td><strong>Sub-total 3</strong></td>
<td><strong>105,464,182,450</strong></td>
</tr>
<tr>
<td>4</td>
<td>Management</td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>Management</td>
<td>100,000,000</td>
</tr>
<tr>
<td>4.2</td>
<td>Training, conference, etc</td>
<td>20,000,000</td>
</tr>
<tr>
<td></td>
<td><strong>Sub-total 4</strong></td>
<td><strong>120,000,000</strong></td>
</tr>
<tr>
<td>5</td>
<td>Independent monitoring = 2% (1+2)</td>
<td>2,181,452,641</td>
</tr>
<tr>
<td></td>
<td><strong>Sub-total 5</strong></td>
<td><strong>2,181,452,641</strong></td>
</tr>
<tr>
<td>6</td>
<td>Contingency = 20% (1+2)</td>
<td>21,814,526,408</td>
</tr>
<tr>
<td></td>
<td><strong>Sub-total 6</strong></td>
<td><strong>21,814,526,408</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Total (1+2+3+4+5+6)</strong></td>
<td><strong>133,188,611,089</strong></td>
</tr>
</tbody>
</table>

3.2.2. **Prevention of fire and erosion**

Fire prevention: Fire extinguisher, sand, or other specialized equipments.

Erosion prevention: foundations are made of site – casting concrete B15. Towers, bolts and equipment supporting are galvanized.

3.2.3. **Minimizing impacts on public transportation**

- Regulate and arrange execution schedule to avoid obstructing traffic, ...
- Avoid overloading in transporting construction materials. For oversized machines and equipments, specialized vehicles are to be used to avoid damage, roadbed subsidence.
- In case of damage or subsidence, recovery of the roads to the original state after construction.

3.2.4. **Minimizing impacts of electromagnetic fields**

To ensure absolute safety for locals and workers, the transmission line is designed and operated in accordance with the provisions of the Government’s Decree No.106/2005/ND-CP dated 17/08/2005, Decree No.81/2009/ND-CP dated 12/10/2009 and other legal documents.

In the transmission line’s ROW, houses/ structures are to be renovated and roof – earthing to ensure safety conditions. In addition, an earthing corridor is identified according to Circular No.03/2010/TT-BCT dated 22/01/2010, houses and structures in this corridor are roof earthing before the project’s operation.

The electromagnetic field intensity is checked at the start of project operation and periodically in accordance with EVN’s regulations to ensure that the electromagnetic
field strength does not exceed the current regulations.

3.2.5. **Minimizing risk of labor accidents**

At construction sites, Project owner always monitor labor safety issues. The following measures are taken:

- Machines and equipments must be checked periodically before operation.
- Workers working overhead should have a regular medical check.
- Before working overhead, it is necessary to check labor tools, harness. Tools must be light, easy to manipulate.
- Workers must be equipped with helmets and stay away from dangerous positions.
- When hoisting materials and equipment, it’s necessary to carefully check mooring ropes, cable hook. Workers must not stand in the sphere activities of crane.
- Installation of electrical equipments and materials needs to comply with the principles to protect materials and equipment from scratches and damage.
- Adjustment and testing must be conducted according to regulations for each type of equipments and materials.
- Do not work in darkness, rain, fog or strong wind.
- During the construction process, if there is any problems with technical design, the contractor has to inform the Project owner for a solution.

3.2.6. **Minimizing the risks and incidents**

**Prevention of labor accidents**

The following safety measures will be applied while erecting towers; pulling, spreading wire; and installing other devices.

- Construction procedures act in compliance with design, regulations, technical procedure on transmission line construction.
- The construction of tower foundations and the line has to comply with the design and the technical regulations.
- Checking periodically machines and equipments before operation;
- Before pulling wire across traffic roads, Project Owner will announce to relevant agencies to combine for temporary traffic flow suspension for pathways or pulling mesh and putting warning signs for major roads.
- Before working on high positions, workers have to check labor tools and safety belts. These tools should be compact, lightweight, easy to handle.
- While pulling wire across other transmission lines, it is necessary to have detail plan and notify relevant agencies to combine for temporary cut-off to ensure safety for workers and the local people.
- Before hoisting equipment, it is necessary to check carefully live wires, and hook the cable precisely. The workers are not allowed to stand under the scope of crane operation.
- Complying with the principle when installing electrical equipments and materials will avoid scratches or damage.
- Adjustment and testing must be carried out in compliance with specified regulations for each type of equipment and materials.

Construction machines and devices will be checked carefully on quantity and quality before. Besides construction leader, there is a staff on safety and environment (if necessary). This staff has responsibility to check tools, safety work equipments and guide regularly workers on safety and environmental protection during construction phase.

**Prevention subsidence, broken conductors and towers**

- Foundations and towers are designed based on results of geological survey with reference to geological documents of the project area and its surroundings.

- The Project is executed complying with technical procedures and regulations of construction.

- Periodic checks of the quality of work and timely remedy subsidence incidents.

- In case of incidents, the protective relays will automatically switch off in time and alarm system start. Then, the operator will quickly solve the problems.

**Prevention and respond to fire incidents**

- Regularly check and maintenance fire fighting facilities as well as maneuver fire fighting.

- Train and raise workers’ awareness about fire fighting.

- In case of incidents, protective relays installed in the TL will switch off automatically.

- The ROW has to meet the technical conditions according to Decree No.106/2005/ND-CP of the Government, which will not causing fire incident;

Emergency measures in case of fire incidents:

- Alarm everyone to extinguish the fire if possible.

- Report immediately to professional fire fighting force (if necessary).

- Inform the captain/vice captain of management team.

- Quickly inspect and repair the incidents.

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**IV. ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM**

**4.1. Environmental Management Program**

**4.1.1. Environmental management**

During operation phase, the department in charge of environmental issues of Power Transmission Company No.4 (PTC4) will monitor and supervise the environmental issues and submit a periodic report to the competent authorities.

**4.1.2. Organization and implementation**

Responsible for Project operation including environmental management and observation during the operational phase.

**Table 4-1 Organization and implementation**

---
<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibilities</th>
<th>Agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project owner in pre-construction and construction phases</td>
<td>Plan and implement environmental management activities in management, observation and monitoring plan</td>
<td>SPPMB</td>
</tr>
</tbody>
</table>
| Project owner in operational phase             | 1. Responsible for Project operation, included construction and implement management, observation and monitoring during the operation phase  
|                                                | 2. Report environmental information for related agencies                          | PTC4     |
| Consultant                                     | Responsible for consulting and carrying out EPC                                   | PECC3    |

### 4.1.3. Environmental treatment works

Environmental remediation works are mainly: collection and treatment wastewater systems, and construction activities, oil-contaminated wastewater, sludge settling tank on a construction site in the preparation phase and construction.

### 4.2. Environmental monitoring program

**Environmental monitoring in the operational phase**

During operation phase, the department in charge of environmental issues of Power Transmission Company No.4 (PTC4) will monitor and supervise the environmental issues and periodically report to the competent authorities.

**Object, parameter, frequency of observation and monitoring in operational phase:**

- Monitoring electromagnetic field:
  
  Electromagnetic field will be monitored according to regulations of EVN and at the point of complain.

- Other monitorings:
  
  + The ROW will be monitored once a quarter according to regulations of EVN;
  + Monitoring annual health for laborers (once per year).
  + Regularly monitor operation activities, and checking maintainance equipment of the transmission lines and safety grid.
  + Regularly monitor the alarm system.

**Estimated cost for environment monitoring in operation phase:**

Cost for electromagnetic field check when having complain:

- 02 samplings x VND500,000 = VND1,000,000

Cost for operation and maintainance of TL including ROW clearance and checking, fire prevention and fighting, labor safety,… is VND13,457,933,607/year.
III. COMMITMENT

1. Project owner commits that the construction and operation of the Project comply with current environmental rules and regulations including:

- Law on Land, 2003;
- Decree No.80/2006/ND-CP dated 09/08/2006 of the Government detailing and guiding the implementation of some articles of the Law on Environmental Protection.
- Decree No.21/2008/ND-CP dated 28/02/2008 amending and supplementing a number of articles of Decree No. 80/2006/ND-CP dated 09/08/2006.
- Circular No.12/2011/TT-MONRE dated 14/04/2011 of the Ministry of Natural Resources and Environment guiding the practice conditions and document procedures, registration and licensed, code of management hazardous waste.
- Circular No.03/2010/TT-BCT of MoIT dated 22/01/2010 stipulated some contents on protect the safety of high-voltage grid
- TCVN 3733/2002/ QĐ-BYT: Occupational health standards;
- Existing regulations of the electricity and construction branches on safety in the construction and operation of electrical equipment.

2. Project owner commits to:

- Project Owner will cooperate strictly with local authorities in order to implement well compensation and clearance processes.
- Implement measures to protect the water, soil and ground water in the Project area;
- Implement measures to minimize air pollution and noise;
- Collect and handle the solid waste;
- Operate the Project in the allowed limit of electromagnetic field;
- Implement measurement to ensure safety, prevention and respond to risks and incidents.
- Register for all waste streams as hazardous waste oily rags according to regulations for hazardous waste management under Circular No.12/2011/TT-BTNMT dated 14/4/2011 of MONRE.
- Comply with environment monitoring report.

3. Measurements to protect and minimize the impacts on environment will be attached in the construction contract and the contractors will be responsible to implement these measurements which will be supervised by the Project owner.

4. Project owner commits that during the operation of the project, Project owner will be solely responsible for the laws of S.R Vietnam if there is any violation of international conventions, environmental regulations and the occurrence of environmental problems.

SOUTHERN VIETNAM POWER
PROJECT MANAGEMENT BOARD
DIRECTOR

(signed & seal)