ELECTRICITY OF VIETNAM
POWER COMPANY No. 3

SYSTEM EFFICIENCY IMPROVEMENT,
EQUITIZATION AND RENEWABLE PROJECT

ENVIRONMENT IMPACT ASSESSMENT

FOR

REHABILITATION OF KON DAO HYDROPOWER PLANT

Prepared by:

POWER ENGINEERING CONSULTING COMPANY No. 1

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SOCIALIST REPUBLIC OF VIET NAM
ELECTRICITY OF VIET NAM
POWER ENGINEERING CONSULTING COMPANY I

Project: 44.01

REHABILITATION AND UPGRADE PROJECT
KONDAO HYDROPOWER PLANT
KONTUM PROVINCE

FEASIBILITY STUDY

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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Hanoi, 3 - 2002

GENERAL DIRECTOR
POWER ENGINEERING CONSULTING COMPANY I

LÊ Bá NHUNG
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1. INTRODUCTION

1.1. General Introduction on the Background of Power Development in the Project Area and Relevant Environmental Issues

Dak To, the district where Kon Dao Hydropower Plant is located, has a total capacity of 1.9MW. The grid has 66.3km of 22kV transmission line and 44km of 0.4kV transmission line. There are 31 substations with 2342.5 kVA of capacity in the whole district.

1.2. Relevant Organization Structure

The management and operation of the Kon Dao Hydropower Plant is belonged to a team of 16 people working in the plant: Executive Board and operating staff consists of 12 people and they work in 3 shifts and 5 groups; The Plant is directly governed by Electricity of Dak To district who is belonged to Electricity of Kon Tum, Power Company 3, Electricity of Vietnam.

1.3. Purpose of the Report

Kon Dao Hydropower Plant is an under-operation plant. It is located in Dak To District, Kon Tum Province. Based on the study on present environmental conditions, this report shall assess the environmental impact caused by the plant, propose mitigation measures for negative environmental impacts after twelve years of operation as well as when implementing the rehabilitation of Kon Dao Hydropower Plant to improve the plant's capacity.

1.4. Methodology

Kon Dao Hydropower Plant has a small reservoir (non-fully operation), which mainly use the flow from Dak Ta Kan river for power generation, so it causes little negative impact to the environment. Therefore, we use the direct observation method and interview to assess the environmental impact of Kon Tum plant from the first operation up to now (2001) and when we carry out the rehabilitation to improve the power capacity of the plant.
2. PROJECT DESCRIPTION

2.1. Project Properties

Kon Dao Hydropower Plant was designed by Gia Lai - Kon Tum Water Resource Department. The project was implemented in 1987 and came into operation in 1989.

- Reservoir:
  Reservoir is a natural earth reservoir which is expanded along a stream. Total reservoir area is 31,933m², and its storage is 38,961m³.

Salient Feature

+ Catchment Area = 230km²
+ Length of Main River = 31.5km
+ Average Width of the Catchment = 7.3km
+ Storage at FSL = 39,000 m³
+ Full Supply Level (FSL) = 77.8m (assumed elevation)
+ Minimum Operating Level = 73.8m (assumed elevation)
+ Installed Capacity = 510kW

- Penstocks:
  + Diameter of Unit 1 = 900mm
  + Diameter of Unit 2 = 1200mm

- Diversion Canal:
  373.4 m diversion canal is reinforced concrete type with an inclination of 0.002. It is designed to divert a flow of 6 m³/s.

- Spillway
  To create a reservoir with enough storage for regulation as required, the spillway should be built of rocks with reinforced concrete.
  + Crest elevation = 77.8m
  + Crest length = 61.5m

- Generator
  Generator No.1
  + Manufacturer : GANZ, Hungary, 1988
  + Capacity : P = 210kW.
  + Rated Voltage : 400V

  Generator No.2
  + Capacity : P = 360kW.
  + Rated Voltage : 400V
- **Turbine**

  **Turbine No. 1**
  
  + Type of turbine: KC42/60
  + Manufacturer: Vietnam Designing and Manufacturing Electrical Equipment Manufactory

  **Turbine No. 2**
  
  + Type of turbine: KC42/100
  + Manufacturer: Vietnam Designing and Manufacturing Electrical Equipment Manufactory

- **Main transformer**

  Step-up Switchyard includes two main step-up transformers, manufactured in Vietnam in 1989:
  
  + Transformer No.T1: 200 kVA - 0.4/22 kV
  + Transformer No.T2: 400 kVA - 0.4/22 kV

- **Switchgear and main transformer protection**
  
  + Drop-fuse is used at 22 kV side for switching and protection.
  + Mini circuit breaker is used at 0.4 kV side for switching and protection.

2.2. **Map of Project Location**

Map of project location is shown in Figure 1.1 of the annex part.

2.3. **Resettlement**

The Plant has been operating for 12 years. During construction as well as during rehabilitation and upgrade, the project does not affect any households and occupy any agriculture land areas, so it is not necessary to make the resettlement plan.
3. LEGAL BASIS, POLICIES AND ADMINISTRATIVE MANAGEMENT

3.1. Requirement from Investor to environmental issues

According to the Investor requirement, an Environmental Impact Assessment (EIA) and a Resettlement Action Plan (RAP) should be included in the Project document.

3.2. Feasibility Study Report

Feasibility Study Report was prepared by Power Engineering Consulting Company 1 in July 2001.

3.3. Agreement on Project Site

This is a rehabilitation and upgrade project, all kinds of work will be carried out inside the existing area of the plant, so it is not necessary to have this agreement, but a proposal for the rehabilitation and upgrade of the Kon Dao Hydropower Plant is needed (in the annex part).

3.4. Environmental Management System

The environmental management system in Vietnam is divided into two levels:

- Ministry of Science, Technology and Environment (MSTE) is commonly responsible for the managing of environmental protection at State level in the whole country, organizing and instructing all environmental protection activities and reviewing reports on environmental impact assessment of large projects.

- Provincial Department of Science, Technology and Environment is responsible to the provincial people's committee to carry out the managing of environmental protection at State level in the localities. This kind of project is managed by provincial level.

- Electricity of Vietnam (EVN) is the project investor responsible for the whole project including resettlement programs. EVN will supervise the establishment of specialized bodies in charge of the preparation and implementation of the project and will have to approve all decisions taken by Power Company 3, the Project Management Board (PMB).

- Power Company (PC3): Apart from responsibility to manage the producing and operating of the Kon Dao Hydropower Plant, PC3 is also in charge of Project Management Board to coordinate all activities of the Project, including resettlement planning and implementation. In addition, PC3 is responsible for explaining the scope of the project to People's Committees at various levels; providing the budget for the rehabilitation and upgrade
project; and reporting on the progress of project implementation to EVN and World Bank.

- Electricity of Kon Tum is responsible for guiding, monitoring and supervising the Environmental Impact Assessment (EIA) planning and implementation of the project; reviewing document on land acquisition and submitting to the Provincial People's Committee of Kon Tum to grant land within the province area; and monitoring, maintaining and repairing the plant periodically. Electricity of Kon Tum is responsible to PC 3.

- Electricity of Dak To District is responsible for protecting, taking over and operating the Plant after the completion of the project; supervising and monitoring to find out timely all the incidents or changes of the plant to inform Electricity of Kon Tum.

3.5. Laws on Environment

- Law on Environmental Protection approved on December 27th 1993 by the National Assembly of Socialist Republic of Vietnam and signed for issuance on June 10th 1994 by The State President of Vietnam.

- The Government Degree No.175/CP dated October 18th 1994 on Guideline for implementing the Law on Environmental Protection.


- Decision No.1806 QĐ-MTg dated December 31st 1995 by The Minister of Science, Technology and Environment on organizing and implementing the environmental impact assessment.

- Decision No.229 QĐ/TDC dated March 25th 1997 by The Minister of Science, Technology and Environment on the issuance of the environmental standard.


- World Bank 's safeguards policies, namely
  + Environmental Assessment (OP 4.01, BP 4.01, GP 4.01)
  + Pest Management (OP 4.09).
  + Safety of dams (OP 4.037)
  + Bank Procedures BP 17.50, Public disclosure of Environmental and Social operation documents.
4. DATA

4.1. Relevant Documents and Legal Basis about the Studied Area.
- Technical Design Documents
- Reports on the orientation to develop socio-economy, development projects, data of present condition about the economy and socio-culture of the studied area.

4.2. Operation Efficiency of the Plant
The main function of Kon Dao Hydropower Plant (HPP) is to generate electric power for the locality. Now, it has been connected to the national grid with annual energy productions is about 300,000-400,000 kWh from 1989 to 1994. Annual energy productions of the last years are: 794,116kWh; 1,747,441kWh; and 2,573,000kWh in 1998; 1999 and 2000 respectively.

4.3. Purposes of the Rehabilitation and Upgrade Project of Kon Dao Hydropower Plant
To implement instructions of Electricity of Vietnam in document No.1940 EVN/KH-HTQT, Power Engineering Consulting Company 1 (PECC1) has prepared the Feasibility Study Report for the Rehabilitation and Upgrade Project of Kon Dao Hydropower Plant.

- Name of the Company in charge/Contractor: Power Company No.3 (PC3) who is belonged to Electricity of Vietnam.
- Name of the Designing Company for the Project: Power Engineering Consulting Company 1 (PECC1) who is belonged to Electricity of Vietnam.
- Purposes of the Project: To improve electric power capacity supplying to the whole power system, to treat pending environmental and technical matters so that enable the Plant to reach to design capacity and further promote the efficiency of the current hydro-energy.

4.4. Present Situation of the Project Site
The whole headwork system of Kon Dao Hydropower Plant (including reservoir, main dam, canal site, penstock, power house, switchyard,
machinery building, etc.) is located in Kon Dao Commune, Dak To District, Kon Tum Province.

Water resource supplied for Kon Dao Hydropower Plant is from Dak Ta Kan river with a catchment area to the dam site of 230 km².

4.4.1. Present Situation of the Natural Environment

4.4.1.1. Location, Topography and Minerals

- **Location**
  Kon Dao Hydropower Plant on Dak Ta Kan river is located in Kon Dao Commune, Dak To District, Kon Tum Province. The catchment area to the dam site of 230 km² covering most of the natural area of Dak Ta Kan river.

- **Topography**
  The studied topography of Kon Dao Hydropower Plant located in the Westside of Truong Son Mountains is inclining lower and lower from North to South, from the divide to Dak Ta Kan River. It is complicated and diversified with a lot of low wavy hills.

- **Reservoir Area, Reservoir Banks and Diversion Canal**
  The Reservoir is small so there is no sedimentation occurring. There is no erosion nor sliding on the reservoir banks and concrete diversion canal. All the items here are working in normal condition.

- **Penstocks, Powerhouse and Switchyard**
  Penstocks are stable and anchor bolts are not eroded nor slid. Powerhouse and Switchyard are in similar situation.

- **Minerals**
  According to "Kon Tum Industrial Development Plan, 2000 - 2010" dated December, 1999 by Kon Tum Industry Department, the studied catchment has following minerals: Mineral gold in Dak Pet (Dak Glei and Dak Ha districts) far from Dak Ta Kan catchment area; high value paved masonry stones such as black gaborpixoen in Ngoc Hoi and Yachim communes (Kon Tum Town); mineral water in Kon Dao, Ngoc Lu (Dak To district).
  There is no mineral mine for industrial purpose in the project site.

4.4.1.2. Meteorology and Hydrology

Dak Ta Kan River catchment is a part of Krong Poko River. After studying the documents about meteorology and hydrology observed in the upper part and the adjacent of the catchment, we have some comments as follows:
Climate

Temperature:
The climate in the project area is a combination of the monsoon-tropical and highland climate. Krong Poko catchment has rather cold winters and hot summers. The temperatures between hottest and coldest months are 5°C, while temperatures between days and nights are 11°C in dry seasons. The hottest months in a year are March and April, while the coldest are December and January. Dak To has annual average temperature is at 22.1°C; the highest temperature is at 39.9°C, while the lowest temperature is at 3.2°C.

Air humidity:
The average annual humidity is 81%; this number varies from 80% to 90% during the wet seasons, and from 71% to 83% during the dry seasons. The annual average humidity varies from 71% to 89%; the highest value is 100% and the lowest value is 8%.

Absolute air humidity in the catchment is 23mb in the lower part, 21mb in higher part (about 700 - 800m) and below 21mb in a height above 1,000m. The maximum absolute air humidity months are July and August.

Rain:
This is the rainy area and the density of rain increases heavier and heavier from the downstream toward upstream. Average annual rainfall in the mountainous area varies from 2,800mm to 2,900mm. In the south of the catchment closed to the site area, it is about 2,000mm. Rainy season is often from May to October, rainfall in rainy seasons is about 80 - 90% of the whole year. Number of rainy days in a year is about 146; 90% of which is in seasons having south - west and west wind. Dry season is from November to April of the next year; there is little rain or no rain in this season.

Downpours often occur in the beginning and in the end of rainy seasons; average rainfall per each rain is about 10mm - 30mm, in some cases the number reaches to 100mm. Maximum daily rainfall is not much, it is about 252mm at Kon Tum gauging station (in 1970) and 166.5mm at Dak To gauging station (in 1996).

Wind:
Wind direction in the area changes according to each season, usually it occurs with frequency from 16% to 27% in East and West directions; from 4% to 7% in North and South - West directions. Wind velocity in dry season is higher than it is in rainy season; and it does not change much during months and years. From November to February of the next year, average wind velocity is 3m/s and it is higher than the one of the other months in the same year. Maximum wind velocity observed at Kon Tum gauging station in the catchment was 20m/s on April 14th 1984.
Evaporation:
Since humidity in the catchment is high, the evaporation in the catchment is not much. In dry seasons, max monthly evaporation measured in Picher is about 224.3mm (from February to April) at Dak To. From August to October, the evaporation goes down sharply to 52mm. Annual evaporation is 1081mm at Dak To.

Extreme climate factors:
+ In the studied area, dry season lasts 6 months with hot and sunny weather causing more extremely drought condition.
+ Much rain and rain with great intensity in rainy seasons causes floods with frequencies more than 10%, especially in the area below 520m height, having negative impacts on people's living and working. There are places with fog (Dak To district, for example), and there is little hoarfrost and storm in the area.

Hydrology and Water Resource

- Hydrology

River and Stream Network:
There are many streams running into Dak Ta Kan River in the studied catchment, 15 streams on the left bank along 45.8 km of river length and 27 streams on the right bank along 109.5 km of river length. River network density in the catchment is 0.81 km/km².

Hydrology:
Flood season begins in July and ends in October; dry season begins in November and ends in June next year. Transition stage from dry season to flood season is in June and from flood season to dry season is in November. Equivalent to design frequency of 1%; 1.5%; and 5% are 882 m³/s; 867 m³/s; and 692 m³/s respectively. Salient features of the flows at the project site are Qo = 9.45m³/s, Cv = 0.26, and Cs = 0.26.

Mud and Sand.
+ Suspended sediment drifting to Kon Dao reservoir is 43,255 ton/year and displaced sediment is 17,290 ton/year. Total annual sediment to Kon Dao reservoir is 60,515tons equivalent to 36,569m³/year.
+ As usual calculation, suspended sediment stagnating in Kon Dao reservoir is 3,657m³/year and displaced sediment is 5,563m³/year. Total annual sediment in Kon Dao reservoir is 9,220 m³.

- Water Resources

+ Surface water resource: Kon Dao HPP on Dak Ta Kan River has a catchment area of 230km², average annual flow of 9.45m³/s.
+ Underground water resource: Underground water resource in Kon Dao is found in pore holes, hole-seam of alluvial deposit and 1st level
bench. The variable marginal of water level depends on water levels of Dak Ta Kan River and certain seasons, it varies from 3 m to 5m. By observing some water wells in Dien Binh and Dak To districts, it is reported that the underground water level is about 3 ± 5 m below ground surface.

Underground water resource inside deluvial layer is available in the site area and it is varies depending on seasons with a marginal from 4 to 6m.

Underground water in Neogen sediment formation in Kon Tum: According to documents on water investigation in 1986 of Military Group 701, this water layer is absorbed from surface water and other adjacent formations. In general, underground water in the studied area has a weak corrosion to HCO₃.

4.4.2. Socio-economic Present Condition of The Studied Area.

4.4.2.1. Economic Present Condition.

The studied area is fully located in Dakto District. The natural area of the district is 1,377.4km², with 15 communes. The district’s population is 45,015 people (Dec. 2000). Area, population and population density of the district are shown in Table 1. There are 3 communes in the catchment area of Kon Dao: Dak To Kan, Van Lem and Kon Dao with a population of 9,920 people in an area of 263.9km², average population density of the three communes is 38 people/km².

Land area up to the year 2000 is shown in Table 1. The whole district's land area is 137,740ha, of which the area of three above communes is 26,390ha.

Agricultural growth rate of Dakto district in 1996 – 2000 was relatively stable. The agricultural overall worth production increased 3.6 billion VND per annum. Average increasing rate is 8.76%, of which cultivation is 12.3% and husbandry is 1.36%. Land area for agricultural development and for industrial trees is not more than the area of the other district in Kon Tum province.

Annual cultivating land area of the district includes 7,222 ha, of which 3,817 ha for rice crops, 541 ha for maize crops, 2,505 ha for other crops, 157 ha for industrial trees, and 202 ha for other perennial trees. Apart from that, there are 164 ha of land for vegetable.

Of the 3,159 ha land area for perennial trees, there is 2,863 ha for industrial trees and 296 ha for fruit trees.

In recent years, food production in the studied area has increased rapidly. Total production in 2000 (mainly rice and maize) was 9,445 tons, rice occupied 49.87% of the whole regional production. Food average per capita was 210kg.
### Table 1

<table>
<thead>
<tr>
<th>District/Commune</th>
<th>Population (people)</th>
<th>Pop. Den. (people/km²)</th>
<th>Land area (ha)</th>
<th>Total Of Natural Land</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Agri. Land</td>
<td>Forest Land</td>
</tr>
<tr>
<td>District</td>
<td>45,015</td>
<td>33</td>
<td>10,612</td>
<td>91,920</td>
</tr>
<tr>
<td>Dien Binh</td>
<td>5,349</td>
<td>162</td>
<td>1,768</td>
<td>228</td>
</tr>
<tr>
<td>Poko</td>
<td>2,525</td>
<td>27</td>
<td>1,307</td>
<td>1,954</td>
</tr>
<tr>
<td>Dakto Town</td>
<td>8,625</td>
<td>288</td>
<td>1,137</td>
<td>1,003</td>
</tr>
<tr>
<td>Tan Canh</td>
<td>3,149</td>
<td>61</td>
<td>1,659</td>
<td>914</td>
</tr>
<tr>
<td>Kon Dao</td>
<td>2,569</td>
<td>66</td>
<td>834</td>
<td>1,019</td>
</tr>
<tr>
<td>Ngoc Tu</td>
<td>3,377</td>
<td>19</td>
<td>993</td>
<td>12,953</td>
</tr>
<tr>
<td>Van Lem</td>
<td>3,630</td>
<td>44</td>
<td>530</td>
<td>6,274</td>
</tr>
<tr>
<td>Dak To Kan</td>
<td>3,721</td>
<td>30</td>
<td>491.7</td>
<td>10,842</td>
</tr>
<tr>
<td>Dak Xao</td>
<td>2,120</td>
<td>29</td>
<td>369.5</td>
<td>7,117</td>
</tr>
<tr>
<td>Dak Na</td>
<td>2,041</td>
<td>25</td>
<td>286.5</td>
<td>6,604</td>
</tr>
<tr>
<td>Dak Ha</td>
<td>1,667</td>
<td>18</td>
<td>266.1</td>
<td>7,773</td>
</tr>
<tr>
<td>Toumorong</td>
<td>879</td>
<td>17</td>
<td>175</td>
<td>4,847</td>
</tr>
<tr>
<td>Ngoc Yeu</td>
<td>1,832</td>
<td>7</td>
<td>235</td>
<td>16,751</td>
</tr>
<tr>
<td>Ngoc Lay</td>
<td>1,128</td>
<td>11</td>
<td>250</td>
<td>6,633</td>
</tr>
<tr>
<td>Mang Xang</td>
<td>2,403</td>
<td>26</td>
<td>310.2</td>
<td>7,008</td>
</tr>
</tbody>
</table>

The district had 698 ha of water rice with a production of 2548 tons in Winter-Spring crops, 1,784 ha of upland rice with 2,077 tons, and 1,335 ha of ten-month water rice with 3,223 tons. Production of other crops are 75.66 quintal/ha of sweet potatoes and 9.2 tons/ha of vegetables.

There are 2,863 ha of perennial industrial trees; of which 1,455 ha for coffee, 1,374 ha for rubber, and the rest area for others like tea, pepper. Land area for coffee and rubber has increased rapidly since 1996 (from 792ha to 2,829ha). Coffee production has also increased, from 40 tons in 1996 to 489 tons in 2000. Apart from that, pineapple is also a main production of the district.

Land areas of short-term industrial trees increases more slowly than it did in previous years with low value. In 2000, there were 135 ha of sugarcane with 4,106 tons and 22 ha of groundnut with 17 tons in the whole district.
Up to the year 2000, there were 203 industrial enterprises, three of them were state owned, and 200 were private owned. Number of labor force in industry sector were 336 people; of which 25 people were in state owned enterprises, 27 people were in provincial owned enterprises, 10 people were in district owned enterprises and the rest were in private sector. Production value in industry sector was 21,799 million VND, of which the number controlled by state sector was 1,475 million VND. Living standards of the local resident are still low, with capita average income of 150,000 - 200,000 VND/month.

4.4.2.2. Population, Society and Culture in the Project Area.

There are 2 main groups of people living in the district: the first is Kinh who are majority (34.6%) and the later is minority Sedang and some other minority peoples (65.4%), according to social studies.

- After many years of immigrating to Dak To district, the Kinh people have settled in crowded areas like towns, along main roads and highways.

- The minority ethnic peoples, including Sedang and several other peoples, have their own ways of living and culture. In the past, these peoples lived on shifting cultivation. Today, they have gradually settled and lived on settled and intensive cultivation. Living standard of the minority people in the district has been increased. They have started their settle living and cultivation; and they are aware of their responsibility to protect the surrounding natural environment and eco-system.

- To the end of the year 2000, the district has a population of 45,015 people, of which there are 36,390 people live in rural area and 8,625 people live in urban are. Natural population increasing rate is 2.23%; average density is 33 people/km².

- District's education: There are 13,941 pupils, of which there are 9,860 pupils (70.7%) at primary school level; 3,402 pupils (24.4%) at lower secondary school level; and 679 pupils (4.9%) at upper secondary school level; The number of teachers is 593 people. In addition, there are four kindergarten schools with 2,720 children in 111 classes (120 teachers) in the district.

- Dakto has a hospital with 65 patient beds, 8 doctors, 39 physicians and technician; 52 midwives and nurses; 15 health care centers and 4 communes has only doctors (has not medical station yet).

- The district has a well-serviced primary health care. Widespread vaccination services reaches to 90%. Diseases like goitre; malaria, and petechial fever, diarrhoea are more and more reduced. More over, Dakto district has been in cooperation with other relevant offices to work well in population and family planning, protecting and taking care of mothers and children in the whole district.
4.5. **Present Situation of the Kon Dao Hydropower Plant**

Present situation of equipment and the rehabilitation and upgrade of the plant is shown in Table 2 and Table 3, of which Table 2 (alternative 1) shows only the rehabilitation and upgrade and Table 3 (alternative 2) includes the expansion.

**LIST OF EQUIPMENT TO BE REHABILITATED AND UPGRADED (ALTERNATIVE 1)**

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.</td>
<td>Equipment</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Hydraulic Turbine: Repairing of runners and guide-vane, and replacement of new turbine bearings.</td>
</tr>
<tr>
<td>2</td>
<td>Turbine inlet valve: Repairing of butterfly valve and replacement of a new control system.</td>
</tr>
<tr>
<td>3</td>
<td>Governor: Replacement</td>
</tr>
<tr>
<td>4</td>
<td>Generator breaker: Replacement</td>
</tr>
<tr>
<td>5</td>
<td>Installation of air conditioner cabinet in control room</td>
</tr>
<tr>
<td>6</td>
<td>Repainting of units</td>
</tr>
<tr>
<td>7</td>
<td>Installation of more trash racks for coarse rubbish in the headrace canal</td>
</tr>
<tr>
<td>8</td>
<td>Repairing and repainting of trash rack, valve gate of the headrace inlet</td>
</tr>
<tr>
<td>9</td>
<td>Repainting of penstock</td>
</tr>
<tr>
<td>10</td>
<td>Installation of new AVR (automatic voltage regulator) and excitation system.</td>
</tr>
<tr>
<td>11</td>
<td>Installation of new system of controlling, measuring, protecting and alarming.</td>
</tr>
<tr>
<td>12</td>
<td>Installation of new DC system</td>
</tr>
<tr>
<td>13</td>
<td>Installation of new 0.4kV distribution switchgear on generator line side</td>
</tr>
<tr>
<td>14</td>
<td>Installation of new 0.4kV AC distribution and control cubicle</td>
</tr>
<tr>
<td>15</td>
<td>Replacement of new bearing (ball type) of the generator</td>
</tr>
<tr>
<td>16</td>
<td>Lighting system</td>
</tr>
<tr>
<td>17</td>
<td>Cable (all categories) and 22kV dropping fuse</td>
</tr>
<tr>
<td>II.</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elongation of Intake to supplement more coarse trash rack in the headrace canal</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation of the Architecture of the Plant</td>
</tr>
</tbody>
</table>
LIST OF EQUIPMENT
TO BE REHABILITATED, UPGRADED AND EXPANDED
(ALTERNATIVE 2)

Table 3

<table>
<thead>
<tr>
<th>No</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>REHABILITATION AND UPGRADE OF THE PLANT</td>
</tr>
<tr>
<td></td>
<td>Similar to the works in Alternative 1</td>
</tr>
<tr>
<td>B</td>
<td>EXPANSION OF THE PLANT</td>
</tr>
<tr>
<td>I.</td>
<td>Equipment</td>
</tr>
<tr>
<td>1.</td>
<td>Installation of a completely new Unit with a capacity of 350kW (N = 350kW)</td>
</tr>
<tr>
<td>2.</td>
<td>Installation of a new fine trash rack for headrace intake</td>
</tr>
<tr>
<td>3.</td>
<td>Installation of a new valve at the inlet</td>
</tr>
<tr>
<td>4.</td>
<td>Installation of a new steel penstock</td>
</tr>
<tr>
<td>5.</td>
<td>Stop-log in the downstream of Unit 3</td>
</tr>
<tr>
<td>II.</td>
<td>Construction</td>
</tr>
<tr>
<td>1.</td>
<td>Expansion and heightening of diversion channel</td>
</tr>
<tr>
<td>2.</td>
<td>Expansion of pressure tank and headrace inlet</td>
</tr>
<tr>
<td>3.</td>
<td>Expansion of the ditch to place penstock in</td>
</tr>
<tr>
<td>4.</td>
<td>Expansion of the plant for placing Unit 3</td>
</tr>
<tr>
<td>5.</td>
<td>Expansion of tailrace canal</td>
</tr>
</tbody>
</table>
5. ENVIRONMENTAL ISSUES
Kon Dao Hydropower Plant is a small hydropower plant, derivation type with a small reservoir. The reservoir has a surface area of 3.2 ha. No households are inundated because of the reservoir. It is necessary to limit the environmental and social impact to the inundated land area. However, the construction, operation and maintenance of the project have caused certain negative impacts.

5.1. Matters Mentioned During Rehabilitating Design Period
5.1.1. Environmental Impact to Land Use
The rehabilitation and upgrade of Kon Dao Hydropower Plant is absolutely carried out inside the under operating plant area, so it has no affect to the local land use.

5.1.2. Physically Environmental Impact (hydrosphere, atmosphere).
Kon Dao Hydropower Plant is a small project, so it has inconsiderable and limitable impact to physical environment, such as hydrosphere, atmosphere, etc. During its construction, operation and maintenance, however, the project may cause certain impacts. It can be divided into three affected areas to assess: The first one is from the dam to the upper stream; the second one consists of the intake and intake canal to the powerhouse; and the last area is the outlet.

5.1.2.1. Upper Stream Impact (the 1st area).
- Hydrology:
  In flood seasons:
The flow is as usual because a part of the flood flow has been used for electric generation (6 m$^3$/s). The rest flow spilled over the dam to the downstream. After being used for generating, the flow will be discharged back to Dak Ta Kan river.
  In dry seasons:
Since the reservoir has a small storage (about 39,000 m$^3$), which is mainly for sedimentating during the operation, the reservoir still takes part in regulating the flow. Usually, in dry season, the flow is stored in the reservoir from 2 to 4 hours and the cycle repeats during the day. Therefore it may change the flow regime in the downstream of Dak Ta Kan stream. Changes in the flow regime does not have any serious impacts since there is no one use the water in the downstream.

Sedimentation in reservoir.
Because of the 4m dam, the inclination of this part of Dak Ta Kan river has reduced. The flow speed decreases enabling sediment to accumulate in the upstream of the dam.
According to the survey in the early June 2001 by Power Engineering Consulting Company No.1, at crest elevation of 77.80m, the surface area is 31,933m² and the reservoir storage is 38,961m³. Sediment in the reservoir has risen to 1.86m. Apart from the changes of sedimentation in the upstream of dam and flow regime in dry season, there are trees, rubbishes obstructing water to flow into the intake also creates losses for the powerhouse in flood seasons. Measures should be applied to enable the plant to operate well and continuously in flood seasons.

5.1.2.2. Impacts in the Area from Intake to Powerhouse (the 2nd area).

The hydrological regime in this area has been affected by the operation of the plant in flood seasons. However, this stretch of river is short and the short interval does not affect much to local population and economy as analyzed above.

Hydraulic regime in the canal and water conveying capacity of the canal are in good condition. The canal has an inclination of 2.0‰, trapezium shape with average upper width of 10.0m and average depth of 3.0m. In addition, it is built of reinforced concrete, so there is no erosion and sediment inside it.

Environment inside the plant

- The plant is located in a deep area, sheltered from the wind; the governor of the plant is controlled manually; controlling equipment, governors, turbines, and generators have been maintained and repaired asynchronously causing big noises in the powerhouse.

- Since the Plant is located underground and sheltered from the wind, its temperature is about 20°C in winter and from 30°C to 39°C in summer. It is necessary to have measures to solve the noise and reduce temperature inside the powerhouse, especially in the central building.

- During the rehabilitation, upgrade and expansion stage, there will be spillage, waste and refuse discharged from the Plant (oil, grease, for example). Though the volume of the waste is not much, it is still necessary to have measures to treat and to collect waste and refuse; construct a waste collecting tank then waste will be regenerated, burned or buried in proper places, for example. It is required to minimize the discharging of such waste and refuse into the downstream.

5.1.2.3. Impacts in the Outlet Canal Area (the 3rd area).

- Outlet canal has been improved after being widened and deepened since 1999-2000. However, negative impacts from previous flood in the mainstream to the outlet canal have not been solved.
- Short and sloppy outlet canal cannot cause sediment. However, it is necessary to have right constructing measures during rehabilitation and upgrade period to prevent materials from filling into the downstream.

- Fish and fishery: The downstream of Kon Dao is a short section of the Dak Ta Kan joining to Krong Po Ko river with an annual flow at the estuary of 10m$^3$/s. The annual flow of Krong Po Ko through this confluence is 86m$^3$/s. The construction and operation of the plant will not affect the flow. On the other hand, aquatic resource in this section is not abundant. Therefore, implementing the rehabilitation and upgrade project will not affect fish and fishery in the locality, either.

- Water use: The construction and operation of the plant. In addition, there is no work using this water resource for irrigating. Hence, there is no negative impacts on the water use, either.

5.1.3. Biology Natural Resources and Eco-systems

- Aquatic Biology:

Since the plant is operating in an uncompleted daily regulation (small reservoir with 39,000 m$^3$ of volume), current situation of aquatic biology has not been changed much. Only the dam affects fish migrating (it is difficult for fish to migrate through dam or spillway). There have not been any documents about the aquatic resources in Dak Ta Kan River. During field investigating, it is reported that aquatic resources are not abundant. Local inhabitants only go fishing for food when they have free time. Fishing equipment here are fishhook, fishing-net, and weir, etc. Fish production is low (0.3 – 0.5kg/day/people). In rainy seasons, the production is higher than it is in dry seasons. Name of fishes here are fresh water fish, such as carp, small fish fry, etc.

The local inhabitant has started to breed fish. There are some ponds breeding fishes like carp, chub, African carp, etc.

- Eco-system.

Interviewing results showed that the fish sources and fish species do not change much in comparison with they were before constructing the plant. As analyzed above, in the site area, the on land living things are poor in species and quantity, on the other hand, the plant has small scope with little inundated areas, so that it has little impact to the on-land species in the site area.

5.1.4. Impact to the Under-used Natural Resources.

- Water Resource

Kon Dao hydropower plant is using natural water resources from Dak Ta Kan River. After diverted through powerhouse, the whole flow water runs
completely out to the downstream. The operation of Kon Dao HPP is in accordance with the water demand of the irrigational system in Kon Dao in particular and in Dakto in general. It means the downstream area should be always in the same discharge condition in dry seasons as before.

However, when Kon Dao HPP operates, the flow from upstream will slow down (because of the dam), it is possible to create sediment in the expended riverbed. In fact, field study in Dak Ta Kan stream showed that there is no inundation or sedimentation of agricultural lands.

Land using

Other ongoing used facilities such as transportation, agriculture, and industry, etc, have not been affected by the project. However, a certain area of land (about 3 ha) has been used for headwork, control building, safe guarding area, and local access roads. All of the land area is hilly land with bushes of trees along two banks of Dak Ta Kan River. The project site area, which is now controlled by Dak To Power Company, has no inhabitant. Therefore, the requisition of lands here has no negative impacts to the local land-use planning.

Flow interruption: Kon Dao HPP is an under operating Plant. In case the rehabilitation and Upgrade project is implemented, only the Intakes should be closed and a dike should be embanked in front of the Intakes, so that the flow will spill over spillway down along the original river, and the flow will not be interrupted. There is no water transportation in the downstream.

Mineral resources

The rehabilitation and upgrading of the HPP will not involve inundation not earthworks outside the existing plant area so that no impacts on will be imposed mineral resources in the surrounding areas.

5.1.5. Impact to People's Living Standard.

Kon Dao HPP does not inundate any residential houses and their cultivating lands, and have no negative impact to human living, either. Since its first operation in 1989 the plant has created favorable condition for the district economic development. The stable and huge energy resource has significant importance for the local electric power system in dry season. It not only improve the quality of electric power, but also supply electric power to remote communes, which helps improve economic development and bring us positive social effects. The power supplied from Kon Dao HPP has been connected to the 22kV transmission line local network. Electric power has contributed to improve local people's awareness by radio and television. Therefore, people in remote area recognize well about their responsibility for society.
5.2. Environmental Issues During the Implementation of Rehabilitation and Upgrading process

5.2.1. Obstruct the Flow

When implementing the rehabilitation and upgrade with equipment part and civil work, the intake shall be closed so water will flow along the main stream to the downstream. Therefore, it will have no impacts to the flow.

5.2.2. Changes of Downstream Water Quality

During the rehabilitation, the reservoir will be dredged with a volume of 1,000m$^3$, leaking parts of the canal will be repaired within one month (Alternative 1), canal will be expanded and intake will be repaired (Alternative 2). It may have impact to the downstream environment but unremarkable because the implementing is short and the river part of Dak Ta Kan from downstream of the dam site to Krong Poko river is not too long, therefore water from the project will run into Krong Poko river. In addition, water in this area is only used for irrigating purpose, so the temporary turbidity of water will not affect the local environment.

5.2.3. Construction material and solid waste discharging

During the rehabilitation, upgrade and expansion stage, there will be waste and refuse discharged from the Plant (oil, grease, for example). Though the volume of the waste is not much, it is still necessary to have measures to treat and to collect waste and refuse; construct a waste collecting tank then waste will be regenerated, burned or buried in proper places, for instance. It is required to minimize the discharging of such waste and refuse into the downstream. Besides, it will take a short time to repair and replace parts of equipment and the plant, so that there will be inconsiderable impact to the environment in the locality and in the downstream.

Dredging waste materials are sands and have no toxic contamination. Disposal options include general land-fill materials for new construction filling or liner materials for an appropriate site, or as capping materials for a landfill. The place for disposal of the dredging materials will be discussed and agreed upon with the Kon Dao commune or Dak To district authorities.

5.2.4. Noise

Since the volume of work is not much, mainly in the machinery hall (repairing and replacement of equipment), noise only exists inside the control building and it does not have large impact. In addition, the site is far 1.7 km from residential area, so noise impact is inconsiderable.

5.2.5. Demolishing of Trees and Vegetation Covers

As mentioned above, the rehabilitation is mainly to replace equipment as mentioned in Alternative 1, while there is little work with canal extension causing
demolishment of seasonal trees that operators have planted, so this vegetation covers will not be changed.

5.2.6. **Impact from Worker’s Camping**

Number of workers for the rehabilitation is about 80 - 100 people (not too many). On the other hand, number of workers of the under operating plant is small at that time so it is only to make five or six temporary camps for workers. Workers can share the existing Water Closet area (W.C) in the Plant. If the W.C is not enough, it is necessary to build more in a proper place that can keep the environmental hygiene.

Time of construction is short, number of workers is small, so the impact from worker’s camping is inconsiderable.

5.2.7. **Labour Safety**

To have good labour safety, all construction counterparts should have good labour safety measures as well as safety working clothing and tools for workers, and they should have regularly checking with each worker on labour safety.

5.2.8. **PCBs disposal and Management**

The existing equipment is manufactured in Viet Nam in 1989. The transformers do not contain PCBs and therefore no specific management or disposal plan for PCBs will be required.

5.3. **Environmental Impact caused by Resettlement**

As mentioned above, there is no resettlement program for the rehabilitation and upgrade project.

5.4. **Environment in General**

Kon Dao Hydropower Plant only occupies a small area of hill and forest land, using the natural water resource form Dak Ta Kan stream. The operation of this plant does not affect the flow regime of Dak Ta Kan river. The plant has little environmental negative impact.

The benefit of the project is electric energy. It supplies the local electric system with 3.6million kWh per year.

Interested things is that Kon Dao is ongoing operation while supplied power is less than load power in Kon Tum area. Therefore, it is necessary to maintain and upgrade the project to have maximum use of the local available energy.
6. MITIGATION MEASURES FOR NEGATIVE ENVIRONMENTAL IMPACT FROM THE PROJECT

6.1. Natural Environment.


Following measures should be taken to mitigate negative environmental impact as follows:

- Reduce the quantity of sand and mud in the Dak Ta Kan river bed by disposing of construction materials and waste into Dak Ta Kan river to avoid water pollution during operation, etc. It is necessary to protect the upstream forest.

- Reduce the quantity of sand and mud in the reservoir by dredging annually to maintain the capacity of regulation as designed.

- It is essentially to upgrade the trash rack as well as the racking machine.

- It is necessary to replace controlling equipment, auxiliary governor, and upgrade turbines, generators, etc, to reduce noises.

- It is necessary to install separate control room with air-conditioner for staff to improve working conditions.

- It is necessary to reduce the disposing of construction materials and waste into Dak Ta Kan river to avoid water pollution during operation as well as when the rehabilitation and upgrading implemented.

- Investment cost of mitigation measures for physical environment is included in investment cost of upgrading and rehabilitating the project.

- It is necessary to construct a suitable waste tank to collect waste and refuse or grease. Then, such waste should be regenerated, burnt or buried in proper places. It is required to minimize the discharging of such waste and refuse into the downstream.

6.1.2. Environmental Impact Mitigation to Eco-system.

6.1.2.1. Aquatic Creatures, Fish and Flora.

- It is necessary to reduce water pollution to a maximum level to protect aquatic creatures, fish and flora, especially when the rehabilitation and upgrading is implemented by shortening the time executing the work on water.

- Protect natural national park in the catchment and in the adjacent, to afforest and to reduce deforest.
- Protect the floristic cover area and recover the desert lands with vegetation. Priority is given to the forest resource of DacTo to reduce erosion and to settle the slope sides.

6.1.2.2. Fauna

- Responsible offices should point out measures to protect value and rare animals.
- It is necessary to control people to entering remote areas by implementing permanent or temporary measures (for example, control access road, security guarding, etc.).


When the project is implemented, no households or cultivating lands shall be inundated of affected. Therefore, it is not necessary to prepare report on resettlement for the project.

6.3. Energy Supplying Plan

During the rehabilitation and upgrade, Kon Dao Hydropower Plant will have to cut electricity fully or partly. There will be a shortage of electricity. It is necessary to have a detailed energy supplying plan to propose to Power Company No.3 to generate electric power to the locality.
7. EVALUATION OF ALTERNATIVES

To meet the requirement of the project: Improvement of the power generating capacity of the Kon Dao HPP and the environmental and working conditions of the plant's operators, and lengthening lifetime of the evaluated plant, two alternatives have been evaluated as follows:

- Alternative 1: Rehabilitate and upgrade. Details are mentioned in table 2: "List of equipment to be rehabilitated and upgraded".

- Alternative 2: Rehabilitate, upgrade and expand. Details are mentioned in table 3: "List of equipment to be rehabilitated, upgraded and expanded".

- After comparing the two alternatives, it is shown that both alternatives have inconsiderable impacts. Alternative 1 (rehabilitate and upgrade) is proposed here because it can meet the requirement of the proposed target, having less environmental impacts than alternative 2.

- On the other hand, alternative 2 has only been studied at preliminary stage. It is necessary to study more carefully and in detail based on the completeness of the documents about topography, geology, and hydrology. This report proposes to implement alternative 2: Expand and Upgrade of Kon Dao HPP.

- By evaluating the two alternatives, it is understood that alternative 1 mainly proposes to replace and repair equipment, while the civil works is inconsiderable. Therefore, it has less environmental impact than alternative does. Apart from undertaking the same works as in alternative 1, alternative 2 proposes to install one more unit, so the volume of civil works will be more. As specified in the Feasibility Study Report, though alternative 2 has more impacts than alternative 1 does, such impacts are not so much, the whole volume of civil works is small and construction time is short, so it also has not much environmental impact in all aspects. We are suggested to carry out the upgrade and expand project (alternative 2) as soon as possible.

8. PCB MANAGEMENT:

The existing equipment is manufactured in Viet Nam in 1989. The transformers do not contain PCBs and therefore no specific management or disposal plan for PCBs will be required.
9. ENVIRONMENTAL MANAGEMENT PLAN

9.1 Mitigation Measures for Negative Impacts

- Construction work in the rehabilitation and upgrade includes soil and rock excavation, concrete casting, rock built, brick paving, plastering, roofing, installing and dissembling of equipment; and renewing road surfaces, etc...

- Soil and rock excavation, plastering, rock built, brick paving, roofing will be carried out by executing.

- Concrete casting is carried out by machine in combination with manual ways.

- Installing and dissembling of electrical and hydro-mechanical equipment is carried out by manual ways in combination with using winch and crane in the plant.

- Dredging sand from reservoir is carried out by using dredgers and transported by van to the waste area. Quantity of work is specified (are shown in "Feasibility Study Report").

- The construction site and local material exploitation area (for sand, stone and gravel) is in Kon Dao commune, Dak To district.

- Concrete, steel, timber, etc, are supplied from Kon Tum town, 50km far from the site.

- According to "Feasibility Study Report", we can see that quantity of material to be transported is not much: about 17 tons of cement, 5 tons of steel (various types), and dozens of tons of other materials. Transporting distance is 50km, so it is possible to transport the above-mentioned materials in weekends or in the time transportation density is little. Therefore, it will reduce traffic jam. Negative impacts from the transportation of material from Kon Tum to the construction site are inconsiderable.

- Quantity of exploiting material (sand, stone, gravel) is not much: 100m3 of stones and gravel; other 450m3 will be exploited in the site area, so there are no impacts to local environment and eco-system. The transportation of material is carried out in a small area where there are not many residents living in, so it does not affects people’s health.

- Installation work in the project is: dissembling of needed replacing equipment and installing new equipment.

- Material and equipment are easy to dissemble so arranging and collecting such material and equipment is easy, too.
Collecting oil and grease when dissembling equipment, such as governor and turbine, so that it can limit the environmental pollution.

Electricity of Kon Tum is responsible to arrange work and support in finance for labour force of the plant while implementing the project. Labour force of the plant is supposed to arrange as follows:

- Participating in the Project management board.
- Participating in some other work of the project.
- Having suitable work in offices of the electricity of Kon Tum.
- Stop working and having allowance (as agreed)
- Making a list of the affected households, planning suitable electricity supplying plan to maintain quantity and quality of electricity supplying so as not to affect households who are using electricity supplied by Kon Dao HPP.
- Taking seriously the labour safety supervision, especially to workers who are carrying out complicated work so as to reduce working accidents.
- Special measures to ensure the dam stability will be applied, based on the available technical design data and additional checking of the technical features

9.2 Environmental monitoring

The Environmental monitoring and management should be carried out regularly. The project has a small reservoir and modest site area, affects to the environment is not much, so it is not necessary to have specialized officials to supervise and manage this kind of work. The environmental monitoring and management of the mitigation measures can be carried out regularly by the existing staff of the Plant to improve their experience and to have treatment timely (Such staff should be trained in specialization). Contents of the monitoring and supervising work during the rehabilitation and operation are specified in Table 4 and 5.

9.3 Action Plan and Cost Estimation

9.3.1 Rehabilitation and Upgrade Plan

Time for implementing the project is 01 year. Total Cost for the project details are shown in “Feasibility Study Report”.

9.3.2 Environmental Management Plan

- As stated above, an engineer who is responsible for operating will be employed to supervise the environment management plan during implementing the project as well as in long term. Details are shown in Table 4 and 5.
Total cost for the whole environmental management plan is MVND 163.9; details as follows:

1. Cost for training management and operation staff: VND 10,000,000
   2,000,000 VND/person x 5 persons

2. Cost for supervision, checking and implementation for environment protection measures during construction phase
   VND 39,000,000

3. Annual Cost for supervision, checking and implementation for environment protection measures
   VND 100,000,000
   4,000,000 VND/year x 25 years
   Subtotal VND 149,000,000

4. Contingency: 10% (1+2+3) VND 14,900,000
   Total VND 163,900,000
   Total (by USD, Ex. Rate USD 1 = 15,000 VND) USD 10,927

The Environment Impact Assessment Report on the Rehabilitation and Upgrade Project of Kon Dao Hydropower Project in Kon Tum Province shall be reviewed by the Department of Science, Technology and Environment of Kon Tum Province. The Review report concluded that the project does not have any negative impacts on the natural environment and local socio-economy, and the project is supported to be implemented.

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1 Environment cost during construction consist of:
   - Salary of 2 officers in 12 months will be used to pay for supervisors who do extra work (apart from working in their specialized aspects):
     \[1,000,000 \times 2 \times 12 = VND 24,000,000\] (MVND 24).
   - Cost for taking and having water samples analyzed: VND 5,000,000 (MVND 5)
   - Costs such as costs for travel, stationary, equipment: VND 10,000,000 (MVND 10).

2 Environment costs during operation:
   - Annual monitoring of environment and water measuring and analyzing over 25 years is: VND 50,000,000 (MVND 50).
   - Cost for officers of the plant to work as environment supervisors to monitor environmental issues over 25 years is: VND 50,000,000 (MVND 50)
### A. Mitigating plan

<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigating Measure</th>
<th>Cost Installation</th>
<th>Institutional Responsibility Installation</th>
<th>Cost Operating</th>
<th>Institutional Responsibility Operating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Flow obstruction</td>
<td>Suitable construction plan, included in tender document of construction and installation parts</td>
<td>Included in the cost for construction</td>
<td>Contractor for construction and installation</td>
<td>None</td>
<td>n.a</td>
</tr>
<tr>
<td>Construction</td>
<td>Construction material, waste</td>
<td>Suitable construction plan, tight construction supervision; suitable tanks for waste collecting.</td>
<td>Included in the cost for construction</td>
<td>Contractor for construction and installation</td>
<td>None</td>
<td>n.a</td>
</tr>
<tr>
<td>Construction</td>
<td>Noise</td>
<td>No influence, far from residential areas</td>
<td>None</td>
<td>None</td>
<td>n.a</td>
<td>Electricity of Kon Tum</td>
</tr>
<tr>
<td>Construction</td>
<td>Tree cutting, affected vegetable cover</td>
<td>Tight monitoring; Supplying sufficient wood/timber for construction.</td>
<td>None</td>
<td>Contractor for construction and installation</td>
<td>None</td>
<td>Electricity of Kon Tum</td>
</tr>
<tr>
<td>Construction</td>
<td>Camps</td>
<td>Suitably arranged with WC area as regulated.</td>
<td>None</td>
<td>Contractor for construction and installation</td>
<td>None</td>
<td>Electricity of Kon Tum</td>
</tr>
<tr>
<td>Construction</td>
<td>Labour Safety</td>
<td>Instruction about labour safety, supplying sufficient labour safety tools and equipment</td>
<td>None</td>
<td>Contractor for construction and installation</td>
<td>None</td>
<td>Electricity of Kon Tum</td>
</tr>
<tr>
<td>Construction</td>
<td>Resettlement</td>
<td>No influence because there is no residential inundated area</td>
<td>None</td>
<td>None</td>
<td>n.a</td>
<td>Electricity of Kon Tum</td>
</tr>
<tr>
<td>Construction</td>
<td>Deforestation</td>
<td>There are only hills with grass and bushes in the project area. Tight management of tree cutting</td>
<td>None</td>
<td>Contractor for construction and installation</td>
<td>None</td>
<td>Electricity of Kon Tum</td>
</tr>
<tr>
<td>Construction</td>
<td>Dam safety</td>
<td>Safety measure to ensure the stability of the dam</td>
<td>Included in the cost for construction</td>
<td>Constructor</td>
<td>None</td>
<td>Electricity of Kon Tum</td>
</tr>
<tr>
<td>Operation</td>
<td>Inconsiderable because the weir is low with a height of 4m.</td>
<td>None</td>
<td>None</td>
<td>n.a</td>
<td>Electricity of Kon Tum</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-------------------------------------------------------------</td>
<td>------</td>
<td>------</td>
<td>-----</td>
<td>------------------------</td>
<td></td>
</tr>
<tr>
<td>Waste (oil, grease) from Construction material</td>
<td>Check, collect and treat timely</td>
<td>None</td>
<td>None</td>
<td>n.a</td>
<td>Electricity of Kon Tum</td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td>No influence, far from residential area</td>
<td>None</td>
<td>None</td>
<td>n.a</td>
<td>Electricity of Kon Tum</td>
<td></td>
</tr>
<tr>
<td>Tree cutting, affected vegetable cover</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>n.a</td>
<td>Electricity of Kon Tum</td>
<td></td>
</tr>
<tr>
<td>Camps</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>n.a</td>
<td>Electricity of Kon Tum</td>
<td></td>
</tr>
<tr>
<td>Labour Safety</td>
<td>Instruction about labour safety, supply sufficient labour safety tools and equipment</td>
<td>None</td>
<td>None</td>
<td>n.a</td>
<td>Electricity of Kon Tum</td>
<td></td>
</tr>
<tr>
<td>Resettlement</td>
<td>No influence because there is no resettlement plan</td>
<td>None</td>
<td>None</td>
<td>n.a</td>
<td>Electricity of Kon Tum</td>
<td></td>
</tr>
<tr>
<td>Deforestation</td>
<td>Tight management of tree demolishing and uncontrolled deforestation in the upstream area</td>
<td>None</td>
<td>Included in costs for the Provincial Forestry</td>
<td>n.a</td>
<td>Electricity of Kon Tum &amp; People's Committee at various levels</td>
<td></td>
</tr>
</tbody>
</table>
## B. MONITORING PLAN

<table>
<thead>
<tr>
<th>Phase</th>
<th>What parameter is to be monitored?</th>
<th>Where is the parameter to be monitored?</th>
<th>How is the parameter to be monitored/ type of monitoring equipment?</th>
<th>When is the parameter to be monitored - frequency of measurement of continuous?</th>
<th>Why is the parameter to be monitored (operated)?</th>
<th>Cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONSTRUCTION</td>
<td>Water quality</td>
<td>Downstream of Powerhouse</td>
<td>Taking sample, analyze 12 chemical factors</td>
<td>Completion of the Project</td>
<td>To see if water quality affects the downstream</td>
<td>None</td>
<td>VND 5,000,000</td>
</tr>
<tr>
<td></td>
<td>Waste, Oil and grease</td>
<td>Machinery Hall, Transformer Housing</td>
<td>Check to see if there is any leakage of oil and grease. If yes, does the oil and grease flow to the collecting tank or not? Is other kind of waste collected to a proper place or not?</td>
<td>During Construction</td>
<td>To see if there is environmental pollution due to waste.</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Noise</td>
<td>Power House</td>
<td>By listening, Normal</td>
<td>Regularly</td>
<td>If it is more than usual level, hire equipment to measure.</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Dust</td>
<td>Project Site</td>
<td>By observing</td>
<td>During Construction</td>
<td>If there is too much dust, eject water</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Operation</td>
<td>CONSTRUCTION</td>
<td>Dam stability</td>
<td>Dam</td>
<td>Checking of technical features</td>
<td>During construction</td>
<td>To ensure the safety of the dam</td>
<td>None</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------</td>
<td>---------------</td>
<td>-----</td>
<td>--------------------------------</td>
<td>---------------------</td>
<td>--------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Parameter of Environment</td>
<td>Project site</td>
<td>Project site</td>
<td>Dam</td>
<td>Checking of technical features</td>
<td>During construction</td>
<td>To see and inspect</td>
<td>None</td>
</tr>
<tr>
<td>Parameter of Environment</td>
<td>Project site</td>
<td>Environmental Supervising</td>
<td>During construction</td>
<td>To see and inspect</td>
<td>VND 24,000,000</td>
<td>n.a</td>
<td>Electricity of Kon Tum &amp; DOSTE</td>
</tr>
<tr>
<td>Parameter of Environment</td>
<td>Project site</td>
<td>General services for analyze water and other factors</td>
<td>During construction</td>
<td>To see and inspect</td>
<td>VND 5,000,000</td>
<td>VND 5,000,000</td>
<td>n.a</td>
</tr>
<tr>
<td>Water quality</td>
<td>Downstream of Powerhouse</td>
<td>Taking sample, analyze 12 chemical factors in 25 years</td>
<td>December, annually</td>
<td>To see if water quality affects the downstream</td>
<td>None</td>
<td>VND 50,000,000</td>
<td>n.a</td>
</tr>
<tr>
<td>Waste, Oil and grease</td>
<td>Machinery Hall, Transformer Housing</td>
<td>Check to see if there is any leakage of oil and grease. If yes, does the oil and grease flow to the collecting tank or not? Is other kind of waste collected to a proper place or not?</td>
<td>Every 6 month, during operation</td>
<td>To see if there is environmental pollution due to waste.</td>
<td>None</td>
<td>None</td>
<td>n.a</td>
</tr>
<tr>
<td>Noise</td>
<td>Power House</td>
<td>By listening. Normal</td>
<td>Regularly</td>
<td>If it is more than usual level, hire equipment to measure.</td>
<td>None</td>
<td>None</td>
<td>n.a</td>
</tr>
<tr>
<td>Dust</td>
<td>Project Site</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>n.a</td>
</tr>
<tr>
<td>Operation</td>
<td>Water flow</td>
<td>Downstream</td>
<td>Water level and water flow</td>
<td>Dry and rainy seasons</td>
<td>Change in the hydrological regime and the impacts on downstream fishery and agriculture</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------</td>
<td>------------</td>
<td>---------------------------</td>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------------------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Environmental supervising</td>
<td>Project Site</td>
<td>Cost for officers of the plant to work as environment supervisors to monitor environmental issues in 25 years</td>
<td>Every 6 months</td>
<td>Inspect and to test if it's necessary</td>
<td>None</td>
<td>VND 50,000,000</td>
<td>n.a</td>
</tr>
</tbody>
</table>
10. **RESETTLEMENT**

Kon Dao HPP has been operating since 1989. The Resettlement Plan had been completed before the plant came into operation. Resettled households are having stable life with local community. The rehabilitation and upgrade project will be carried out completely inside the existing plant. Other areas such as material area, workers’ camping for the construction work, and waste area, etc, are all inside the existing plant, too. There are no more land area or residential area to be occupied for the project, so it does not affect local residents. Therefore, there is no resettlement plan in this project.

11. **PUBLIC CONSULTATION AND DISCLOSURE**

- During implementation the rehabilitation and upgrade project, all the workers working in the plant have to stop or change their work, and their life may be more or less affected. When the project is completed, their living and working condition will be improved. Such workers have been informed about the project by Electricity of Kon Tum (their management board).

- The implementation of the project was informed to and asked for opinion from engineers and workers in Dak To Department and local authorities (people’s committees of Kon Dao commune and Dak To district) in June 2001.

- Records of these meetings are provided in annex. Information about the project and the summary of the environmental assessment was sent to Cultural Center of Kon Dao commune to be displayed and broadcasted for the public information and comments. Local NGOs such as the Women Union, the Farmer Union and the Fatherland Front were invited to provide comments. This public consultation process took place in end of February 2002. Records of the public consultation meetings provided in annex 5.

- Copies of the EA summary and the Environmental Management Plan (EMP) have been displayed at a public place such as DOSTE and the Kon Dao commune people’s committee from February 8, 2002 for four months for public comments.

- In general, no major environmental issues have been raised and the mitigation and monitoring plans for the project have been agreed in principle and highly supported by the above-mentioned people and offices Electricity of Kon Tum has got an agreement on the arrangement of suitable work for workers of Kon Dao HPP during the implementation of the project so as not to have negative impacts to living condition of the workers as well as their families.
11. CONCLUSION

Carrying out the rehabilitation and upgrade of the Kon Dao HPP in this period is necessary. Dak To town is far from the large national electricity grid. Supplying electricity for this area is only come from Kon Tum 22 kV transmission line, so the probability of stop supplying electricity is high. To maintain the local electricity source is very essential and has a special significant for the development of the economic and social of the Kon Tum in particular.

Negative impacts from the project are inconsiderable. Other small ones can be solved easily with little costs. There is no resettlement area in the project is also an advantage for the implementing of the project. It is suggested to carry out the expand project (alternative 2) as soon as possible.
ANNEXES


2. Minutes of Meeting about the meeting between representatives from Power Engineering Consulting Company 1, Power Company 3 in Power Company 3 dated May 14th 2001 on Site Investigation for the rehabilitation and upgrade project of Kon Dao HPP.


4. Letter №1946 EVN/ĐL3 dated June 5th 2001 by Power Company 3 on the agreement on investigation outline for the rehabilitation and upgrade of Kon Dao and An Diem HPP sent to Electricity of Vietnam, an appendix is enclosed).

5. Minutes of public consultation meetings with PAPs and NGOs.
ANNEX 1

To follow the document No. 1407 dated 25th April, 2001 by Director of Power Company 3 on the preparation of Feasibility Study Report on An Diem and Kon Dao Hydropower Plants with project investment capital borrowed from the World Bank 2002 - 2003, Electricity of Kon Tum would like to report on Kon Dao Hydropower Plants with following contents:

Background of Kon Dao Hydropower Plant:

Number of units : two (02).
Total installed capacity : 570kW.
Generator voltage : 400V.

1. Unit No.1 with Installed capacity of 210kW.
   Type of Generator : GANZ, manufactured in Hungary.
   Type of Turbine : KC42/60, manufactured by Vietnam Electrical Designing and Manufacturing Company.

2. Unit No.2 with Installed capacity of 260kW.
   Type of Generator : VEM, manufactured in former Germany.
   Type of Turbine : KC42/100, manufactured by Vietnam Electrical Designing and Manufacturing Company.

3. Number of Step-up Transformers: 02.
   Transformer No.1: 200kVA - 0.4/22kV.
   Transformer No.1: 400kVA - 0.4/22kV.

4. Type of connection:
   Generator - Step-up Transformers

5. Switchgear, protection for the Step-up Transformers
   In the 22kV side, transformer is switched and protected by FCO 22kV fuse.
   In the 0.4kV side, transformer is switched and protected by MCB (mini circuit breaker).
6. **Outline of the Plant structure**

Type of plant: Diversion canal powerhouse.

Penstocks:
- Penstock to Unit 1: Made of steel with diameter of 0.9m.
- Penstock to Unit 2: Made of steel with diameter of 1.2m.

Diversion canal: length is 373.4m, covered by concrete plates.

Dam and Spillway: Width of spillway is 61.5m, constructed of stone and reinforced concrete.

Reservoir: Natural earth dam, expanded along the stream. Reservoir area is 30,000m²; reservoir storage is 36,000m³; height of water head is 11m; full supply level is 1.2m.

7. **Technical Condition of Hydro-engineering Works and Equipment in The Powerhouse:**

Hydro-engineering works: in good condition

Equipment in the powerhouse: Generators and turbine are manually operated; other equipment is operating in normal condition; but the electrical cubicles are degraded, should be upgraded and replaced with the new ones.

8. **Operating Condition.**

Incidents often occur during operating: No interrupting with the operation in general, but there is damages in brush and habit of the main supporting pillow, sometimes.

Number of operating hours with maximum capacity (315kW) is 6 hours in a day and night.

Annual average energy production:

<table>
<thead>
<tr>
<th>No.</th>
<th>Generator 1</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>Annual average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Generator 1</td>
<td>238,622</td>
<td>189,160</td>
<td>458,040</td>
<td>295,274</td>
</tr>
<tr>
<td>2</td>
<td>Generator 2</td>
<td>555,494</td>
<td>1,558,281</td>
<td>2,114,960</td>
<td>1,409,578</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>794,166</td>
<td>1,747,441</td>
<td>2,573,000</td>
<td>1,704,852</td>
</tr>
</tbody>
</table>

**Recommendation**

It is proposed to Install one more 600kW unit and auxiliary equipment so as to absolutely exploit the energy from Dak To Kan river.

Upgrade the step-up transformer, electrical cubicles and panels as well as mechanical parts of the existing units so as to operate manually and automatically.

You are kindly informed by Electricity of Kon Tum.

Signed and sealed

By Mr. Huynh Trung Hieu

DIRECTOR OF ELECTRICITY OF KON TUM.
ANNEX 2

1. The meeting in Power Company 3
   - Date: May 14, 2001
   - Place: Power Company 3 (PC3)
   - Participants:

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Position</th>
<th>Place of work</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nguyen Minh Tien</td>
<td>Vice Director</td>
<td>Power Company 3 (PC3)</td>
</tr>
<tr>
<td>2</td>
<td>Phan Minh Tuan</td>
<td>Deputy Manager, Department of International Cooperation</td>
<td>PC3</td>
</tr>
<tr>
<td>3</td>
<td>Ho Thang Thu</td>
<td>Deputy Manager, Department of Finance</td>
<td>PC3</td>
</tr>
<tr>
<td>4</td>
<td>Truong Cong Gioi</td>
<td>Deputy Manager, Department of Construction Management</td>
<td>PC3</td>
</tr>
<tr>
<td>5</td>
<td>Le Van Truong</td>
<td>Manager, Department of Planning</td>
<td>PC3</td>
</tr>
<tr>
<td>6</td>
<td>Nguyen Nho Chau</td>
<td>Expert, Department of Construction Management</td>
<td>PC3</td>
</tr>
<tr>
<td>7</td>
<td>Pham Si Huan</td>
<td>Expert, Department of Construction Management</td>
<td>PC3</td>
</tr>
<tr>
<td>8</td>
<td>Tran Quang Hien</td>
<td>Expert, Department of Construction Management</td>
<td>PC3</td>
</tr>
<tr>
<td>9</td>
<td>Tran Xuan Tuy</td>
<td>Deputy Manager, Hydropower Division II</td>
<td>Power Engineering Consulting Company 1 (PECCI)</td>
</tr>
<tr>
<td>10</td>
<td>Pham Trong Nghiinh</td>
<td>Planning Officer</td>
<td>PECCI 1</td>
</tr>
<tr>
<td>11</td>
<td>Vu Si Thu</td>
<td>Project Manager</td>
<td>PECCI 1</td>
</tr>
<tr>
<td>12</td>
<td>Le Ngoc Ha</td>
<td>Electrical Engineer</td>
<td>PECCI 1</td>
</tr>
<tr>
<td>13</td>
<td>Do Van Duc</td>
<td>Environmental and Hydrological Engineer</td>
<td>PECCI 1</td>
</tr>
</tbody>
</table>

Contents of the meeting

- PC3 informed works to be done to prepare Feasibility Study (FS) for the rehabilitation and upgrade project for Kon Dao HPP.
- Discussion on how to cooperate between PC3 and PECCI.
- Discussion on field investigation, investigation schedule and FS schedule.
- PC3 informed current situation of An Diem and Kon Dao HPPs: Technical condition, incidents occurred during operation, project efficiencies, the roles of the project in the local electrical grid.
- Wishes of the locality about the scope and contents of the expansion of the plant.
- Environmental and social impact assessment; Proposing of mitigation measures.
Relevant documents need to be collected (about hydro-engineering works, plant's equipment, and environmental situation).

2. The meeting in Kon Dao plant
   - **Date**: May 17, 2001
   - **Place**: Electricity of Dak To
   - **Participants**:

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Position</th>
<th>Place of work</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tran Van Hieu</td>
<td>Head of Electricity of Dak To</td>
<td>Electricity of Dak To</td>
</tr>
<tr>
<td>2</td>
<td>Huynh Tan Phuc</td>
<td>Technical Expert</td>
<td>Electricity of Dak To</td>
</tr>
<tr>
<td>3</td>
<td>Vo Van Si</td>
<td>Technical Expert</td>
<td>Electricity of Dak To</td>
</tr>
<tr>
<td>4</td>
<td>Dong Xuan Nhung</td>
<td>Technical Expert</td>
<td>Electricity of Dak To</td>
</tr>
<tr>
<td>5</td>
<td>Nguyen Nho Chau</td>
<td>Expert, Department of Construction Management</td>
<td>PC3</td>
</tr>
<tr>
<td>6</td>
<td>Pham Si Huan</td>
<td>Expert, Department of Construction Management</td>
<td>PC3</td>
</tr>
<tr>
<td>7</td>
<td>Tran Xuan Tuy</td>
<td>Deputy Manager, Hydropower Division II</td>
<td>Power Engineering Consulting Company (PECC1)</td>
</tr>
<tr>
<td>8</td>
<td>Pham Trong Nghinh</td>
<td>Planning Officer</td>
<td>PECC1</td>
</tr>
<tr>
<td>9</td>
<td>Vu Si Thu</td>
<td>Project Manager</td>
<td>PECC1</td>
</tr>
<tr>
<td>10</td>
<td>Le Ngoc Ha</td>
<td>Electrical Engineer</td>
<td>PECC1</td>
</tr>
<tr>
<td>11</td>
<td>Do Van Duc</td>
<td>Environmental and Hydrological Engineer</td>
<td>PECC1</td>
</tr>
<tr>
<td>12</td>
<td>Tran Ngoc Lang</td>
<td>Expert</td>
<td>Electricity of Kon Tum</td>
</tr>
<tr>
<td>13</td>
<td>Pham Danh Tai</td>
<td>Expert</td>
<td>Electricity of Kon Tum</td>
</tr>
<tr>
<td>14</td>
<td>Huynh Tan Phuc</td>
<td>Expert</td>
<td>Electricity of Kon Tum</td>
</tr>
</tbody>
</table>

Contents of the meeting
- Representative from PC3 informed works to be done to prepare Feasibility Study (FS) for the rehabilitation and upgrade project for Kon Dao HPP.
- Discussion on how to cooperate between Electricity of Kon Tum, Electricity of Dak To, PECC1 and the field investigation team.
- Discussion on field investigation and studies.
- Assessment on the background, current situation of the hydro-engineering works, reservoir and equipment by Electricity of Dak To.
- Assessment on the environmental issues prior and after the operation of the plant Electricity of Dak To.
- Electricity of Dak To specified existing documents they were keeping.
- All sides discussed to outline the main items that need to be rehabilitated and upgraded.
- Asked for opinions of workers and local residents about impacts to the social and natural environment caused by the plant.
- Plan of Electricity of Dak To to announce the rehabilitation, upgrade and expand project to workers and local residents.

3. THE MEETING IN ELECTRICITY OF DAK TO
- Date: May 18, 2001 Place: Electricity of Dak To
- Participants:

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Position</th>
<th>Place of work</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tran Van Hieu</td>
<td>Head of Electricity of Dak To</td>
<td>Electricity of Dak To</td>
</tr>
<tr>
<td>2</td>
<td>Huynh Tan Phuc</td>
<td>Technical Expert</td>
<td>Electricity of Dak To</td>
</tr>
<tr>
<td>3</td>
<td>Vo Van Si</td>
<td>Technical Expert</td>
<td>Electricity of Dak To</td>
</tr>
<tr>
<td>4</td>
<td>Dong Xuan Nhung</td>
<td>Technical Expert</td>
<td>Electricity of Dak To</td>
</tr>
<tr>
<td>5</td>
<td>Nguyen Nho Chau</td>
<td>Expert, Department of Construction Management</td>
<td>PC3</td>
</tr>
<tr>
<td>6</td>
<td>Pham Si Huan</td>
<td>Expert, Department of Construction Management</td>
<td>PC3</td>
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<tr>
<td>7</td>
<td>Tran Xuan Tuy</td>
<td>Deputy Manager, Hydropower Division II</td>
<td>Power Engineering Consulting Company 1 (PECC1)</td>
</tr>
<tr>
<td>8</td>
<td>Pham Trong Nghinh</td>
<td>Planning Officer</td>
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<tr>
<td>9</td>
<td>Vu Si Thu</td>
<td>Project Manager</td>
<td>PECC1</td>
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<tr>
<td>10</td>
<td>Le Ngoc Ha</td>
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<td>PECC1</td>
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<td>11</td>
<td>Do Van Duc</td>
<td>Environmental and Hydrological Engineer</td>
<td>PECC1</td>
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<td>12</td>
<td>Tran Ngoc Lang</td>
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</tr>
<tr>
<td>13</td>
<td>Pham Danh Tai</td>
<td>Expert</td>
<td>Electricity of Kon Tum</td>
</tr>
<tr>
<td>14</td>
<td>Huynh Tan Phuc</td>
<td>Expert</td>
<td>Electricity of Kon Tum</td>
</tr>
<tr>
<td>15</td>
<td>Pham Vu Hung</td>
<td>Head of Hydrological and Topographical Group</td>
<td>Investigation Enterprise №3 - PECC1</td>
</tr>
</tbody>
</table>

**Contents of the meeting**
- After investigating project site.
- PECC1 asked for relevant documents that need to be collected.
- Discussion and agreement on items for preparing Feasibility Study.
- Electricity of Dak To informed its staff, the plant's workers, residents in Kon Dao commune, Dak To district the plan of PC3 about the rehabilitation and upgrade project for Kon Dao HPP.
- Discussion and agreement on items that need to be rehabilitated, upgraded and expanded.
- The Plant and Electricity of Dak To have wishes to install one more unit, separate the control room, reduce noise and temperatures inside the machinery hall.
ANNEX 3

Electricity of Vietnam
Power Company 3

SOCIALIST REPUBLIC OF VIETNAM
Independence - Freedom - Happiness

N°. 1750 EVN/ DL3-8

Da Nang, 23rd May, 2001


To: Power Engineering Consulting Company No1 (PECCI)

Based on the contents of the meeting dated 21st May, 2001 in head office of Power Company 3 (PC3) between PC3 and PECCI about the preparation of Feasibility Study Report (FS) on the Rehabilitation and Upgrade projects for An Diem Hydropower Plant in Quang Nam province and Kon Dao Hydropower Plant in Kon Tum province with invested capital for the two project borrowed from the World Bank (WB) in financial year 2002 - 2003, PC 3 has following comments:

1. General Requirement:

   Based on the current situation of the two above hydropower plants, PECCI is kindly required to study rehabilitating and upgrading alternatives to meet following requirements:

   - Make sure that the plants will operate continuously in a stable and safe condition so that they can develop with maximum capacity.
   - Improve working condition of the operators in the plants.

   We would like you to have comments, comparison so that we can number the priority order for work items that are necessary to be rehabilitated and upgrade in each alternatives. The selected alternative will be the optimum one in term of technical and economic efficiency.

2. Proposals for Studying and Evaluating

   a. An Diem HPP

      - A system of electro-conductivity and repairing of valves should be equipped in the headwork area.
      - Rehabilitating and repairing of bearing pillows for turbines and generators.
      - Rehabilitating and repairing of governors.
- Improving of working condition in the control building (temperature, noise).
- Treating of leakage and seepage places in hydro-engineering works and in the machinery hall.
- Treating of sedimentation in the reservoir and absolutely solving such matter occurring in the downstream of the plant.
- Rehabilitating and replacing of the secondary equipment of the electrical system in the plant (synchronously).
- Rehabilitating and upgrading of the internal access road inside the plant.

**b. Kon Dao Hydropower Plant**

- Upgrading of electrical system in the plant.
- Improving of turbine and generator efficiencies.
- Repairing of turbine bearings.
- Overcoming the interruption of the generators for rubbish collecting.
- Evaluating of the expansion plan for the plant in hydro-energy, layout and civil works.

Note: The above proposals are for reference only. The alternatives mentioned in FS will be absolutely depended on the studies and evaluation of your Company.

3. **Time of Preparing the FS**

First of all, PECC1 is kindly required to:

- Prepare and submit the detailed plan for investigation work as soon as possible.
- Because of the urgent requirement given by EVN, PECC1 should complete and hand over the FS and EIA of the two above projects to PC3 prior July 15th, 2001.

We are looking for your attention and co-operation.

*Signed and sealed*

*By Mr. Thai Van Thang*

*Vice Director of Power Company 3.*
ANNEX 4

Electricity of Viet Nam
Power Company No. 3

Socialist Republic of Vietnam
Independence - Freedom - Happiness

No: 1946 ĐNV/DL3-8

Da Nang, June 5th, 2001

Subject: Agreement for Investigation on the Rehabilitation and Upgrade Project for An Diem, Kon Dao HPP.

To: Power Engineering Consulting Company No1 (PECC1)

Power Company No. 3 (PC3) has been received the draft of the investigation and design plan for preparing of the Feasibility Study Report (FS) on An Diem and Kon Dao Hydropower Plants carried out by PECC1.

We agree with PECC1 about the above work items as defined in the draft plan. However, PECC1 is kindly required to pay attention to some more items mentioned in the enclosed annex as well as to complete and submit the FS and EIA to PC3 prior July 15th, 2001 in accordance with the requirements of EVN.

Signed and sealed.

By Director of Power Company No. 3
ANNEX 4 (CONTINUED)

(Enclosed with document No 1946 EVN/ DL3 - 8 dated June 5th, 2001)

1. Kon Dao Hydropower Plant
   - PECC1 is kindly required to clarify the necessity of expanding one more chamber for control cubicles and panels.
   - Replacing of butterfly valves in front of Generator 1 and 2.

2. An Diem Hydropower Plant
   - It is necessary to check and strengthen the turbine bearings.
   - It is necessary to calculate alternatives for road surface from spillway to surge tank.

3. General Works
   - You are required to number work items in priority order.
   - It is necessary to calculate economic and technical benefits when replacing the governor.
   - Prepare suitable and legal bills for establishing cost estimation.
   - Based on the actual condition to have a suitable quantity of works.
ANNEX 5

Socialist Republic of Vietnam

*Independence - Freedom - Happiness*

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*Kon Dao, 31 January 2002.*

MINUTES

(COMMUNITY CONSULTANCY ON IMPACTS OF
KONDAO HYDROPOWER PLANT)

The meeting opened at 8:00 p.m on Thursday, 31 January 2002.

Place: People’s Committee of Kon Dao Commune, Dak To district, Kon Tum province.

Subject: Consulting local people on the Kon Dao Hydropower Plant.

A. Attendants:

Representative of People’s Committee of Kon Dao Commune
Mr. Nguyen Danh Huong - Chairman of People’s Committee.
Representative of Power Engineering Consulting Company Nº.1
Mr. Vu Si Thu - Project Manager.
Representative of Electricity of Dak To
Mr. Tran Huy Hieu - Position: Director of Electricity of Dak To
Representative of Peasants’ Organization in the Commune
Mr. Nguyen Huu Manh - Chairman of Peasants’ Organization
Representative of Veterans’ Organization in the Commune
Mr. A Phet - Chairman of Veterans’ Organization
Representative of Woman’s Organization in the Commune
Mrs. Huynh Thi Tho - Chairman of Woman’s Organization
Representative of the Older Organization in the Commune
Mr. Bui Dat - Chairman of the Older Organization
Other attendants:
Mr. Tran Van Ngoc - Chairman of the National Front in the Commune.

B. Content and Comment

Mr. Vu Si Thu - Representative of Power Engineering Consulting Company Nº.1 and
Mr. Tran Huy Hieu - Representative of Electricity of Dak To presented the contents, purposes of the project and its impacts on households and the environment surrounding.

Attendants examined related document, made clear comments on impacts of the project, gave applied solution to minimize impacts on households and the environment.

Attendants gave their opinion as the following:
The representative of People’s Committee of Kon Dao Commune

46
We agree with the direction of People's Committee of the province for the following reasons: it is necessary to meet local people's power demand. There is no impact on the environment and there is no resettlement.

The representative of Peasants' Organization of Kon Dao Commune
- We agree with the rehabilitation and upgrade project of Kon Dao HPP.

The representative of Woman's Organization
- We agree with the project.

The representative of Veterans' Organization
- We agree with rehabilitating and upgrading of the Kon Dao HPP.

The representative of the Older Organization
- We agree with the project.

Other attendants in the National Front of the Commune
- We all agree with the report of environmental impact assessment in the project.

Attendants:

1. Mr. Nguyen Danh Huong (Signed)
2. Mr. Vu Si Thu (Signed)
3. Mr. Tran Huy Hieu (Signed)
4. Mr. Nguyen Huu Manh (Signed)
5. Mr. A Phet (Signed)
6. Mrs. Huynh Thi Tho (Signed)
7. Mr. Bui Dat (Signed)
8. Mr. Tran Van Ngoc (Signed)
SALIENT FEATURES OF KON DAO HPP DAM

4. Frequency of Design Flood: \( P = 1.5\% \) with \( Q_p = 867 \text{m}^3/\text{s} \).
5. Type of Dam: Dam with un-gated spillway.
7. Crest length: \( L = 61 \text{m} \).
8. Maximum height: \( H_{\text{max}} = 4.7 \text{m} \).
9. Maximum width: \( B_{\text{max}} = 6.0 \text{m} \).
10. Spilling discharge: \( Q_{\text{max}} = 867 \text{m}^3/\text{s} \).
11. Net head/spill head: \( H = 3.6 \text{m} \).
12. Dam Stability: The dam is calculated in such a way that it enable the stability of itself in all operation regimes/modes designed according to Vietnamese Standard.
Spillway and channel of Kon Dao HPP

Main channel of Kon Dao HPP
Kính gửi: Giám đốc Công ty Điện lực 3

Thực hiện công văn số: 1407 ngày 25 tháng 4 năm 2001 của Giám đốc Công ty Điện lực 3 về việc lập BCNKT dự án Thủy điện An Dĩm, Kon Đảo với vay WB 2002 - 2003, Điện lực Kon tum xin báo cáo về Trạm Thủy điện Kon Đảo theo nội dung sau:

I. Số lượng về Nhà máy thủy điện Kon đao:
Nhà máy thủy điện Kon đao gồm 02 tổ máy.
Tổng công suất lắp đặt: 470 kW. Cáp điện áp máy phát 400V.
1- Tổ máy số 1: công suất lắp đặt 210 kW.
   - Máy phát loại: GANZ do Hưng ga ri sản xuất
   - Tủ bin loại: KC42/60 do Công ty thiết kế chế tạo thiết bị điện Việt Nam sản xuất
2- Tổ máy số 2: công suất lắp đặt: 360 kW.
   - Máy phát loại: VEM do Cộng hòa dân chủ Đức (cũ) sản xuất.
   - Tủ bin loại: KC42/100 do Công ty thiết kế chế tạo thiết bị điện Việt Nam sản xuất
3- Trạm biến áp nang: gồm 2 máy biến áp nang
   - Máy biến áp T1 200 kVA - 0,4/22 kV.
   - Máy biến áp T2 400 kVA - 0,4/22 kV.
4- Kiểu nối các tổ máy: Máy phát - Máy biến áp nang.
5- Thiết bị đồng cáp, bảo vệ của TBA nang:
   - Phía 22kV được đồng cáp, bảo vệ bằng cấu chỉ từ rối FCO 22kV.
   - Phía 0,4kV được đồng cáp, bảo vệ bằng áp tổ mét.
6- Mô tả số lượng về kết cấu của nhà máy:
   - Kiểu nhà máy: Nhà máy thủy điện kềnh dân.
   - Ông áp lực:
     + Máy số 1: ông làm bằng thép, chiều áp lực 6ata, đường kính ông: 0,9m.
     + Máy số 2: ông làm bằng thép, chiều áp lực 8ata, đường kính ông: 1,2m.
   - Kênh dân: dài 373,4m, mặt kênh lát tấm bê tông.
   - Đập chắn nước: loại đập tran có chiều rộng 61,5m, xây đá và bê tông cốt thép.
   - Hố điều tiết: hố đất tự nhiên, mở rộng theo dòng suối. Diện tích mặt thoát: 30 000m², dung tích hồ: 36 000m³, độ cao cột nước: 11m, mức nước đăng bình thường: cao 1,2m.
7- Tình trạng kỹ thuật hiện nay của các công trình thủy công và các thiết bị trong nhà máy:
   - Công trình thủy công: tốt.
   - Các thiết bị trong nhà máy: hiện tại các tổ máy chỉ vận hành được bằng tay.
Các thiết bị vận hành bình thường. Riêng phần tu bàng điện đã xuống cấp cần phải được thay thế và nâng cấp.
8- Tình hình vận hành:
   - Những sự cố thường gặp: từ khi đưa vào vận hành đến nay do làm tổn công tác quản lý kỹ thuật và được bảo dưỡng thường xuyên nên không có sự cố gây
ngừng vận hành. Trong quá trình kiểm tra, bảo dưỡng các hư hỏng thường gặp phần máy phát là các béc gối đỏ đầu trực và béc bệt gối đỏ chính.
- Sở giở vận hành với công suất cực đại: thời gian vận hành với công suất cực đại 315kW là 6 giờ trong một ngày đêm.
- Sản lượng điện bình quân hàng năm:

<table>
<thead>
<tr>
<th>STT</th>
<th>MÁY PHÁT</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>BÌNH QUANNÁM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Máy phát số 1</td>
<td>238 622</td>
<td>189 160</td>
<td>458 040</td>
<td>295 274</td>
</tr>
<tr>
<td>2</td>
<td>Máy phát số 2</td>
<td>555 494</td>
<td>1 558 281</td>
<td>2 114 960</td>
<td>1 409 578</td>
</tr>
<tr>
<td>TỔNG CỘNG</td>
<td>794 116</td>
<td>1 747 441</td>
<td>2 573 000</td>
<td>1 704 852</td>
<td></td>
</tr>
</tbody>
</table>

Đơn vị tính: kWh

II. Kien nghi:
- Đề nghị lập đặt thêm tổ máy 600 kW và các thiết bị đi kèm để khai thác triệt để năng lượng dòng sông Dak tơ can.
- Cải tạo tran biến áp nâng, tủ bảng điện và các thiết bị phân cơ của các tổ máy hiện có nhằm bảo đảm vừa có thể vận hành hàng ngày vừa có thể vận hành tự động hoàn toàn.
- Vậy Điện lực Kon tum xin kính báo để Công ty biết.

GIÁM ĐỐC ĐIỆN LỰC KON TUM

Nơi nhận:
- Như trên.
- P2 C.ty DL 3.
- Lãnh KT-KH, VT.

HUYNH TRUNG HIỂU
Kính gửi: Công ty Tự vấn xây dựng điện I

Trên tình thần cuộc họp ngày 21/5/2001 tại Công ty Điện lực 3 với Đoàn công tác của Công ty tự vấn xây dựng điện I về việc lập Báo cáo nghiên cứu khả thi 2 dự án phục hồi cải tạo các trạm thủy điện nhỏ Thủy điện An Điền - tỉnh Quảng Nam và Thủy điện Kon Đảo - tỉnh Kon Tum sử dụng vốn vay của Ngân hàng thế giới (WB) trong tài khoản 2002-2003, Công ty Điện lực 3 có ý kiến như sau:

1. Yêu cầu chung:

Trên cơ sở tình trạng hiện tại của 2 nhà máy thủy điện, đề nghị Quyết định nghiên cứu các phương án phục hồi, cải tạo bảo đảm được các yêu cầu sau:
- Bảo đảm các nhà máy vận hành liên tục, ổn định, an toàn và phát huy được tối đa năng lực nguồn thủy năng của các nhà máy.
- Cải thiện điều kiện làm việc của công nhân vận hành nhà máy.

Đề nghị Quyết định của công ty có đánh giá, so sánh để sắp xếp thứ tự ưu tiên cho các hạng mục cần cải tạo, phục hồi trong các phương án. Phương án được lựa chọn sẽ là phương án tối ưu về kỹ thuật và hiệu quả kinh tế.

2. Một số đề nghị để nghiên cứu, đánh giá

a. Thủy điện An Điền:
- Trang bị hệ thống truyền động điện và sửa chữa các van trước khu vực đầu mối.
- Cải tạo, sửa chữa các cổng đổ trực tổ máy
- Cải tạo, sửa chữa các bố điều tốc.
- Cải thiện điều kiện làm việc tại phòng điều khiển vận hành (nhiệt độ, tiếng ồn).
- Xử lý các chớp rò, thấm của công trình thủy công và Gian máy.
- Xử lý hiện tượng bồn lắng tại hỗ điều tiết và khắc phục triệt để hiện tượng này tại hạ lưu nhà máy.
- Cải tạo, thay thế đồng bộ phân khí thụ của hệ thống điện nhà máy.
- Cải tạo, nâng cấp hệ thống đường nội bộ của nhà máy

b. Thủy điện Kon Đảo:
- Nâng cấp hệ thống điện tại nhà máy (phân nhất thụ và nhi thụ)
- Nâng cao hiệu suất của các tổ máy
- Cải tạo các ống đường tua bìn (dăng dùng bac bằng gó)
- Khắc phục việc phải dừng máy để vớt rác.
- Đánh giá khả năng mở rộng nhà máy về các mặt thủy năng, mặt bằng bỏ tri, công tác xây dựng v.v...

Lưu ý: Những đề nghị trên chỉ có tính chất tham khảo. Các phương án sẽ được đề cập trong BCNCKT hoàn toàn tùy thuộc vào việc nghiên cứu đánh giá của Quyết định Công ty.
3. Thời gian lập BCNCKT:
Trước mắt để nghị Công ty tự vấn xây dựng điện 1:
- Sơm lập và trình đề chương chỉ tiêu công tác khảo sát.
- Do yêu cầu cấp bách của Tổng Công ty, đề nghị Quy Công ty hoàn thành và nộp hồ sơ BCNCKT và báo cáo đánh giá tác động môi trường 2 dự án trên cho Công ty Điện lực 3 trước ngày 15/7/2001.
Rất mong nhận được sự quan tâm hợp tác của Quy Công ty của:

Nơi nhận:
- Như trên
- Tổng Công ty DL Việt Nam (đề bạ)
- P2, P4, P7
- Lưu P1, P8

GIÁM ĐỐC
CÔNG TY ĐIỆN LỰC 3

[Signature]

THÁI VĂN THÀNH
Kính gửi: Công ty Tư vấn xây dựng Điện 1

Công ty Điện lực 3 đã nhận được Đề cương khảo sát thiết kế phục vụ giai đoạn lập Báo cáo nghiên cứu khả thi của các Công trình phục hồi cải tạo thủy điện An Điềm và Kon Đảo do quý Công ty lập.

Công ty Điện lực 3 thông nhất với các thành phần công việc của đề đề cương trên, tuy nhiên đề nghị quý Công ty lưu ý một số điểm sau trong Phù thủy kèm theo:


GIÁM ĐỐC

CÔNG TY ĐIỆN LỰC 3

Nơi nhận:
- Như trên
- P2 Cty
- Lưu PL, PS + TV
CHUẨN KỸ THUẬT

PHÚ CƯ SƠN

PHƯƠNG PHÁP

Để thực hiện công việc này, cần chuẩn bị các dụng cụ và material cần thiết.

1. Chuẩn bị dụng cụ:
   - Máy xay dung tinh chất:
   - Máy pha sơn:
   - Máy hút bụi:
   - Máy cưa:

2. Chuẩn bị material:
   - sơn:
   - Vật liệu xây dựng:
   - Vật liệu bảo vệ:

3. Chuẩn bị nhà thầu:
   - Đội ngũ công nhân:
   - Đội ngũ kỹ sư:
   - Đội ngũ quản lý:

4. Chuẩn bị phương pháp:
   - Phương pháp xay dung:
   - Phương pháp pha sơn:
   - Phương pháp hút bụi:
   - Phương pháp cưa:

5. Chuẩn bị phương án:
   - Phương án xay dung:
   - Phương án pha sơn:
   - Phương án hút bụi:
   - Phương án cưa:

Xin phép thông báo cho các bên liên quan về việc thực hiện công việc này.

Ngày tháng năm

[Signature]

[Name]
THÔNG BÁO

Hiện nay ngành điện đang có chủ trương cải tạo, phục hồi năng cấp thủy điện Kon Đảo với mục đích nâng cao hiệu quả và khả năng phục vụ địa bàn.

Theo đề nghị của Điện lực Kon tum, UBND xã Kon Đảo xin thông báo đến toàn thể nhân dân trong xã về chủ trương này.

Nếu hộ nào có họa mâu đăng canh tác trên khu vực công trình có ý kiến khác nêu hoặc đề nghị, xin mời đến UBND xã Kon Đảo để giải quyết. Thời hạn kể từ ngày ra thông báo đến 11 giờ 00 phút ngày 15 tháng 02 năm 2002.

Rất mong nhân dân trong xã lưu ý thực hiện.

NB. UBND XÃ KON ĐẢO

Nơi nhận:
- Niệm yết tại trụ sở UBND xã
- Thông báo trên phương tiện thông tin đại chúng
- UBND huyện Đắk Tô (Thay báo cáo)
- Điện lực Kon tum (Để biết)
- Lưu.
CONG HOA XA Hoi CHU NGHIA VIET NAM

Doc lap — Tu do — Hanh phuc

Kon dao , ngay 31 thang 01 nam 2002

BIEN BAN

(LAY Y KIEN QUAN CHUNG VE ANH HUONG MOI TRUONG CUYA THUY
DIEN KON DAO)

I/ THOI GIAN -DIA DIEM:

Cuoc hop tien hanh vao luc 7 Gio 00 phut ,ngay 31thang 01 nam 2002 tai
Van phong UBND xa Kon dao huyen Dak to tinh Kon tum.

II/ NOI DUNG:

Lay y kiennhan dan dia phuong ve anh huong moi truong cu yan phuc
hoi, cai tao nhay thu dien Kon dao.

III/ THANH PHAN THAM DU :

1- Dai dien UBND xa Kon dao

2- Dai dien Cong ty Tu va'n Dien 1

3- Dai dien Dien luc Dak to

4- Dai dien MTTQ xa Kon dao:

5- Dai dien Ho nong dan xa Kon dao

6- Dai dien hoi Cui chien binh xa Kon dao

7- Dai dien hoi Phu nu xa Kon dao

8- Dai dien hoi nuoi cao tuoi:

9- Dai bieu khac :

IV/ DIEN BIEN:

* Ong Vu Sy Phu (Dai dien Cong ty tu va'n Dien 1) va ong Tran Huy Hiieu

Truong dien luc huyen Dak to trinh bay noi dung, muc dich cua du an va khai nang
anh huong den moi truong xung quanh.

* Cac dai bieu dua ra cac y kienn ro rang ve tac dong cua du an, dua ra cac
giai phap ap dung nhm giam thieu tac dong voi cac ho gan va moi truong xung
quanh. Cac y kienn nhu sau:

1- Dai bieu UBND xa:
CHÚ TRỢ CHỦ TỊCH UBND XÃ KON ĐẢO

THỦ KỲ PHIÊN HỘP

V/KẾT LUẬN:
Cục hợp kí恬 vụ lạc Hi giới chúng nguyện, biên bản được các bên thông qua các đại biểu cùng kỳ xác nhận.

1. Ông... Lãnh... Ký tên...

2. Ông... Lãnh... Ký tên...

3. Ông... Lãnh... Ký tên...

4. Ông... Lãnh... Ký tên...

5. Ông... Lãnh... Ký tên...

6. Ông... Lãnh... Ký tên...

CHỦ TRỊ CHỦ TỊCH UBND XÃ KON ĐẢO

[Signature]

[Date]