Government of Nepal
Ministry of Energy
Department of Electricity development

BUDHI GANGA HYDROPOWER PROJECT
Achham (20MW)

Progress Report
(Progress Period - First Quarter, 2015)

Development Partner
Kuwait Fund for Arab Economic Development (KFAED)
Saudi Fund for Development (SFD)

April 2015
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1 INTRODUCTION

The Budhi Ganga Hydropower Project is located at Babla VDC-5 and Hattikot VDC-4, near Thanti Bazar of Achham district, far western region. The project location is about 5 km north from Sanfebagar along the way to the Bajura district. The damsite is located at Kuskot VDC-5 and Babala VDC-3 near Budhabagar and power house site is proposed in Hattikot VDC-4. The project boundary lies between 29° 15' 30" and 29° 18' 35" latitude north and between 81° 14' and 81° 17' 50" longitude east.

The Feasibility Study and Environmental Impact Assessment of the Budhi Ganga Hydropower Project (BHP) was carried out by Canadian International Water and Energy Consultants (CIWEC) on behalf of Nepal Electricity Authority (NEA) and METCON Consultants Pvt. Ltd. on July 18 1997. This project is currently being developed by Budhi Ganga Hydropower Project under Government of Nepal, Ministry of Energy, Department of Electricity Development (DoED). The loan agreement has already been concluded between the Government of Nepal and Saudi Fund for Development and Kuwait Fund for Arab Economic Development (KFAED) to develop the project.

On the basis of feasibility study report, the Budhi Ganga Hydropower Project is a run-of-river (RoR) project with daily poundage configuration having 20 MW installed capacity. The annual average energy generation of the project is 106.28GWh. The flow of Budhi Ganga River is diverted by constructing 25m high and 54 m long dam in Babla and Kuskot VDC. Water is then conveyed through 5.1 diameter and 5.6km long headrace tunnel. Surge tank of 57.1m high and 7.5m diameter has been proposed for resisting water hammer effect. Then flow will conveyed to power house through 3.5m diameter and 206 m long penstock pipe. Water is discharged back into the Budhi Ganga river through 83m tailrace tunnel after the power is generated through two units of Francis turbine of 10 MW each capacity. The generated power is evacuated through the 132kV transmission line of length 88.6 km to the Lamki Sub-station in Kailali district.

This project is aimed to supply 20MW capacity of reliable power to the Independent National Power System of Nepal (INPS). It is believed that, the project brings the economic development of the Achham district as well as far western region of Nepal.
2 BHP STRATEGIC PLANNING

2.1 Vision

- "Brighter and prosperous Nepal through the sustainable hydropower generation harnessing the country's available water resources with the competent public sector"

2.2 Mission

- Capacity building of Public sector in hydropower development for sustainable economic growth of the country;
- Completion of the hydropower projects of desired quality within the stipulated time by the estimated cost;
- Supply of reliable energy in Integrated National Power System (INPS) by the early completion of the project.

2.3 Objectives

- Complete the 20MW capacity Budhi Ganga hydropower project, located in Achham district of specified standards within 2020 by the estimated cost.
- Develop 132KV transmission line from Budhi Ganga to Lamki (88km) to evacuate the power developed; this line may also used to evacuate the power developed by the private sector in this region.
- Capacity building of the public sector in hydropower generation as well as in regulation and monitoring activities learning from this project and implement larger projects successively.
- To open up the economic activities and other development program in integrated manner with this project, achieving the regional balance in development of far western region.

2.4 Targets

- Completion of the preconstruction activities including detailed design and environmental study by 2017
- Completion of the main construction activities (Civil, electromechanical and hydro-mechanical works) of the project by 2020.
- Completion of the 88km long 132kV transmission line from Budhi Ganga to Lamki by 2020.
3  PROJECT FEATURES

3.1  Dam and Reservoir Area

The dam site is proposed in between Kuskot VDC-3 and Babla VDC-5, near Budhabagar area. The proposed dam is 54m in length and 25m in height. Two numbers of radial gates of 12.5m diameter is proposed for water regulation and storage at the dam. The water diverted from the intake is conveyed to the desander basin by 57m length intake tunnel.

Figure 1 : Headworks (Damsite)

About 8.46 Ha of poundage area creates 0.236Mm³ volume of water upto 3km upstream of the 25m height dam.

3.2  Desander

The optimum design discharge of 27.6m³/sec is used for the design of the water conveyance system. Two parallel intake tunnels are designed upto desander basin to carry the diverted water. Two desander basin of 57m length has been proposed to settle sediment on bed of desander basin and flush the settled particle considering the design discharge.

3.3  Headrace Tunnel, Surge Tank and Penstock

The diverted water is conveyed through 5.6km long, 5.1m dia shortcrete lined and 3.9m dia concrete lined headrace tunnel up to the surge tank. To resist water hammer effect, 57.1m high and 7.5m dia surge tank is proposed and then the flow will conveyed to power house through 3.5m diameter and 206 m long penstock pipe.
3.4 Powerhouse and Tailrace

Surface Powerhouse having dimension of 30x14x26 m is designed with consisting 2 units of Francis turbine of each 10 MW of capacity connecting with generator on Hattikot VDC-4. After generation of electricity water will be conveyed through 83m of tailrace tunnel to Budhi Ganga River again.

![Image of Powerhouse area (Hattikot VDC-4)]

3.5 Transmission Line and Substation

The generated power from Budhi Ganga hydropower project, 20MW is evacuated to the Lamki Substation, Kailali by constructing 88.6km 132 KV transmission line.

3.6 Access Road

The project area is located about 5km north from the Sanfe Bazar, Achham district. Around 1.98km of access road is proposed for the access to powerhouse site from the Thanti point of the Achham-Bajura Road and about 650m length of access road is proposed for dam site from the Achham-Bajura Road near Budhabagar.

4 FINANCIAL ASPECT

On the basis of feasibility study carried out, the total cost of the project is estimated as 50.64 million US$ including transmission line. The project parameters such as B/C ratio is 1.2, IRR 13.70% and Payback period 6.12 year based on the price level of 1997.
The loan agreement has been concluded between Government of Nepal and Saudi Fund for development for Saudi Riyals 112.5 million (30 million US$) on 18 June 2014. And the loan agreement has been concluded between Government of Nepal and Kuwait fund for Arab economic development for Kuwaiti Dinar 5 million (18 million US$) on 4 July 2012. The remaining fund will be managed by Government of Nepal to develop the project.

5 PRESENT STATUS OF THE PROJECT

5.1 Land acquisition

- Land required for the project is identified based on the field survey as per the project layout of the Feasibility Study. Total 220 Ropani of land is estimated to be acquired for the project including for office building and camp site area.

- The land acquisition data has been collected with the total area of the land required, location and other detailed. The preliminary report has been prepared submitted to District Administration Officer, Mangalsen, Achham as per the provision of the existing Land Acquisition Act 2034.

- Public notice is published on National Daily Paper, Village Development committee offices, District Administration Office, District Development office and regarding the land acquisition of the proposed land.

- Land Rate Fixation Committee has been formed under the chairmanship of District Administrator Officer, Achham as per the provision of the Land Acquisition Act 2034.

- Discussion with the stakeholders regarding the land acquisition has been discussed with the project team and information dissemination regarding the acquisition timeline and compensation mechanism has been discussed.

5.2 Office Building and Camp Facilities

- Survey and design works of the office building and camp facilities are ongoing through the national consultant. After finalizing the design, estimate and drawing the implementation works shall be started. (The detailed work schedule and fund required for office building and camp facilities is attached in Annex-1)

5.3 Access Road to Powerhouse and Dam site

- The track opening works of the Access road to Powerhouse work was constructed in the previous fiscal year through the users association (upto Chainage 0+765). Upgrading survey, design and tender document of this access road to Powerhouse (upto chainage 0+765) has been completed.
• Survey and design with required supporting structure of dam site access road has completed. The land acquisition work of the dam site access road has been started.

• Survey design works of the remaining access road (from bridge point to powerhouse and bridge point to Surge tank) is also completed.

• During the discussion with the Saudi Fund for Development Mission, it was agreed to conduct the construction work of all access road and bridge work in a single package. However, the track opening of the access road upto chainage 0+765 to powerhouse has already been carried out from the GoN budget through the users association and GoN has allocated budget to conduct upgradation of this section in this fiscal year. So the tendering process of this portion has been initiated with the GoN’s budget. (The detailed work schedule and fund required for this portion of work is attached in Annex-1)

5.4 Bridge Construction

• National consultant has been selected for survey design and estimation of the bridge in the access road to powerhouse.

• Geological investigation and survey works has been completed and design and estimate has been ongoing from the consultant.

• The combined estimate and BoQ of bridge and access roads shall be prepared and the implementation process shall be started soon. (The detailed work schedule and fund required schedule is attached in Annex-1)

5.5 Detailed Engineering Design & Environmental Study including Social Impact Study

• The proposal submitted by the consultant for detailed design & environmental study including the social impact study was evaluated and the concurrence from Kuwait fund for Arab Economic Development was obtained. The financial proposal submitted by the consultant was opened on 23 March 2015. The financial proposal evaluation and combined evaluation (technical and financial) was carried out and sent for concurrence on 1 April 2015. (The detailed work schedule and fund required schedule to carried out the detailed engineering design and environmental study is attached in Annex-1)

6 PACKAGING OF WORKS

Budhi Ganga Hydropower Project has carried out the planning works and based on the loan agreement following packages of the works has been prepared for execution.
<table>
<thead>
<tr>
<th>S.No</th>
<th>Title</th>
<th>Fund</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Detailed Engineering Design and Environmental study</td>
<td>GoN+ 100% Kuwait Fund</td>
<td>GoN’s contribution for VAT and matching fund</td>
</tr>
<tr>
<td>2</td>
<td>Consultancy Services for Construction Supervision</td>
<td>GoN+ 100% Saudi Fund</td>
<td>GoN’s contribution for VAT and matching fund</td>
</tr>
<tr>
<td>3</td>
<td>Access Road (PH access Road, upto Bridge point (0+00 to 0+770)</td>
<td>GoN</td>
<td>This portion is fully financed by GoN- Track opening concluded by GoN fund in previous FY</td>
</tr>
<tr>
<td>4</td>
<td>Access Road (PH access Road, HW Access Road, ST Access road) including Bridge</td>
<td>GoN + 100% Saudi Fund</td>
<td>GoN’s contribution for VAT and matching fund</td>
</tr>
<tr>
<td>5</td>
<td>Office building and camp facilities</td>
<td>GoN + 100% Saudi Fund</td>
<td>GoN’s contribution for VAT and matching fund</td>
</tr>
<tr>
<td>6</td>
<td>Main construction (Civil)</td>
<td>GoN+ Saudi90%+Kuwait10%</td>
<td>GoN’s contribution for VAT and matching fund</td>
</tr>
<tr>
<td>7</td>
<td>Main construction (Hydromechanical)</td>
<td>GoN+ Saudi20%+Kuwait80%</td>
<td>GoN’s contribution for VAT and matching fund</td>
</tr>
<tr>
<td>8</td>
<td>Main construction (Electromechanical)</td>
<td>GoN+ Saudi 20%+Kuwait 80%</td>
<td>GoN’s contribution for VAT and matching fund</td>
</tr>
<tr>
<td>9</td>
<td>Transmission Line</td>
<td>GoN+ 50%Saudi+50%Kuwait</td>
<td>GoN’s contribution for VAT and matching fund</td>
</tr>
<tr>
<td>10</td>
<td>Land Acquisition</td>
<td>GoN</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Contingencies</td>
<td>GoN+ Saudi+Kuwait</td>
<td></td>
</tr>
</tbody>
</table>

**7  FUTURE PLAN**

The budget preparation works for next fiscal year 2072/073 (Mid April 2015 to Mid April 2016) of Government of Nepal has been carried out. Budhi Ganga Hydropower Project team has been involved in the budget preparation and discussion activities. Following provision is considered for the budget preparation for next fiscal year.

- Budget allocation and program prepared for remaining land to be acquired from Government of Nepal's portion. In this fiscal year, GoN has also allocated budget for the land acquisition activity.
- Budget allocation and program preparation for the upgradation of the Access road to Powerhouse upto ch 0+765. The track opening works of this portion has conducted from the GoN's budget through users association. The upgradation and structural improvement work of this portion is also planned to conduct from the Government of Nepal's fund.
• Budget allocation and program preparation for bridge and remaining all access roads (access road to dam site, access road to surge tank, access road to powerhouse site after bridge). For this portion, Saudi Fund for Development's fund shall be used. The GoN's fund is for VAT portion and for matching fund.

• Budget allocation and program preparation for Office Building and Camp: For this portion, Saudi Fund for Development's fund shall be used. The GoN's fund is for VAT portion and for matching fund.

• Budget allocation and program preparation for Detailed Engineering Design and environmental study including social impact assessment: For this portion, Kuwait Fund for Arab Economic Development's fund shall be used. The GoN's fund is for VAT portion and for matching fund. The contract agreement with the consultant shall be conducted in this fiscal year.

• Budget allocation to carry out Survey and Engineering Design works of transmission line component shall be initiated in the coming fiscal year.

• The preparatory works for the consultant selection for the construction supervision work shall be initiated in the next fiscal year.

8 HUMAN RESOURCES

The organization structure of Budhi Ganga Hydropower Project has been prepared for study phase (attached in annex 2). Total 29 positions have been approved for current fiscal year (2071/072), out of which 11 are executive staffs and 18 are support staffs. The fulfilled key personnel working in Budhi Ganga Hydropower Project are as shown in table below.

Table 1: The existing human resources in BHP

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Name of Staff</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sanjeeb Baral</td>
<td>Project Manager</td>
</tr>
<tr>
<td>2</td>
<td>Gopi Prasad Sah</td>
<td>S.D.E. (Hydropower)</td>
</tr>
<tr>
<td>3</td>
<td>Saroj Acharya</td>
<td>S.D.E. (Hydropower)</td>
</tr>
<tr>
<td>4</td>
<td>Sanjay Kumar Pokharel</td>
<td>Section Officer</td>
</tr>
<tr>
<td>5</td>
<td>Kisan Kumar Basel</td>
<td>Account Officer</td>
</tr>
<tr>
<td>6</td>
<td>Rishikesh Basnet</td>
<td>Engineer</td>
</tr>
<tr>
<td>7</td>
<td>Suraj Giri</td>
<td>Engineer</td>
</tr>
<tr>
<td>8</td>
<td>Badri Sapkota</td>
<td>Non Gazetted I</td>
</tr>
<tr>
<td>S.N.</td>
<td>Name of Staff</td>
<td>Position</td>
</tr>
<tr>
<td>------</td>
<td>---------------</td>
<td>----------------</td>
</tr>
<tr>
<td>9</td>
<td>Shiva Karki</td>
<td>Computer Operator</td>
</tr>
<tr>
<td>10</td>
<td>Janardan Oli</td>
<td>Surveyor</td>
</tr>
</tbody>
</table>

9 KEY ISSUES

Nepal is facing huge electricity crisis at present. Government has concluded the loan agreement with Kuwait Fund for Arab Economic Development and Saudi Fund for Development. All the stakeholders have put pressure to project team to carry out all the activities as early as possible. In this context, accelerating the project activities and execution on time is very important for project.

The project is located in far western region at Achham district which is far from Kathmandu. The development activities in this region is slow compared to others. Expectation of the local people from the project is high. Peoples are demanding some other supplementary infrastructures from the project. In this context, executing the project on time addressing some of the demands of the community is very challenging and important too.

The land acquisition works has been delayed since long time due to establishment of new survey system in the project area as whole cadastral maps were lost during the insurgency period of Nepal. The procedural time taking part could not be managed. However, BHP project team has imparted its full effort to conclude the land acquisition and acquisition distribution activity.

10 CONTACT ADDRESS

10.1 Head Office:

The address of the head office at Kathmandu is as shown below.

Budhi Ganga Hydropower Project
Thapagaun, Anamnagar, Kathmandu
Phone: 01-4478536
Fax no: 01-4464314
email - info@bhp.gov.np
Website: www.bhp.gov.np
10.2 Site Office:

BHP has identified the land for the office building and camp facilities at the project site. Until the completion of the construction activities, temporary office on rent has been established at the project area. The address of the site office is as shown below.

Thanti Bazaar, Ghughurkot VDC-2, Achham

Phone No.: 097-690553, 097-690554
**Salient Features of the Project**

<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Budhi Ganga Hydropower Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>District</td>
<td>Achham</td>
</tr>
<tr>
<td>Power House Site</td>
<td>Thapagaon Village (Hatikot VDC Ward No 4) (on Left Bank of River)</td>
</tr>
<tr>
<td>Dam Site</td>
<td>Budha Bagar (In between Babla VDC Ward No 3 and Kuskot VDC Ward No 5)</td>
</tr>
<tr>
<td>Latitude</td>
<td>81° 14' 00&quot; E - 81° 17' 50&quot; E</td>
</tr>
<tr>
<td>Longitude</td>
<td>29° 15' 30&quot; N - 29° 18' 35&quot; N</td>
</tr>
<tr>
<td>Name of the River</td>
<td>Budhi Ganga River</td>
</tr>
<tr>
<td>Type of Scheme</td>
<td>Run-of the River with Daily Pondage (6 hrs Peaking)</td>
</tr>
<tr>
<td>Installed Capacity</td>
<td>20 MW</td>
</tr>
</tbody>
</table>

**Accessibility**

| Nearest Market                  | Sanfe Bagar, Achham           |
| Power House Site                | Near Thanti Bazar of Ghugurkot VDC, approximately 5 Km from Sanfe Bagar (Just down side of motorable road) |
| Dam Site                        | Near Budha Bagar of Babla VDC, approximately 13 Km from Sanfe Bagar (Just down side of motor able road) |

**Powerhouse**

| Type                            | Surface (L = 30 m, W = 14 m, H = 26 m) |
| Installed Capacity              | 20 MW (2 X 10 MW)                     |
| Gross Head                      | 90 m                                   |
| Net Head                        | 83.2 m                                 |
| Type of Turbine                 | Francis (Vertical Axis)               |

**Hydrology**

| Design Discharge                | 27.63 m³/sec                          |
| 95 % Dependable Flow            | 7.34 m³/sec                           |
| Compensation Flow               | 0.96 m³/sec                           |

**Poundage Reservoir**

| Storage required for 6 hours peaking | 0.236 Million m³ |
| Minimum Operating Level            | 712 m             |
| Full Supply Level                  | 717 m             |
Pondage Fetch from Weir Site 3.0 Km
Pondage Surface Area 8.4 ha (0.084 Sq. km) (168 Ropani)

**Intake Structure**
Number of Intake Opening 2
Number of Intake Tunnel 2
Intake Tunnel Length 57 m
Diameter of Intake Tunnel 2.5 m

**Head Race Tunnel**
Type Circular ad Horseshoe
Length 5.6 Km
Diameter
  Concrete Lined 3.9 m
  Shortcrete Lined 5.1 m

**Transmission**
Voltage 132 kV
Length of TL 88.6 Km
Sub-Station Lamki, Kailali District
TL Route Sanfe – Mangalsen – Punyapato – Guttu – Kuene – Malchana - Lamki (13 Km west from Chisapani Bridge at Karnali between Kohalpur and Attariya)
Alternate Connection At Dipayal Substation (Attariya – Dipayal 66 kV TL) (High Voltage Drop – 31%)

**Energy Generation**
On Peak Firm Energy 36.139 GWh
Off Peak Firm Energy 44.58 GWh
Secondary Energy 25.57 GWh
Average Energy 106.28 GWh

**Energy Benefit**
Firm Peak Energy Benefit US$ 2.72 million
Firm Off Peak Energy Benefit US$ 1.97 million
Secondary Peak Energy Benefit US$ 1.11 million
## Cost and Economic Parameter (Price level 1997)

<table>
<thead>
<tr>
<th>Description</th>
<th>Excluding TL</th>
<th>Including TL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Project Cost</td>
<td>42.07 million US$</td>
<td>50.64 million US$</td>
</tr>
<tr>
<td>Per KW Cost</td>
<td>2103 US$</td>
<td>2532 US$</td>
</tr>
<tr>
<td>Pay Back Period</td>
<td>5.12 Years</td>
<td>6.12 Years</td>
</tr>
<tr>
<td>B/C Ratio</td>
<td>1.43</td>
<td>1.20</td>
</tr>
<tr>
<td>IRR</td>
<td>16.09 %</td>
<td>13.77 %</td>
</tr>
</tbody>
</table>

### Access Road

- Head Works Site: 0.650 Km
- Power House Site: 1.980 Km
Annex -1
Planning of Works
Annex - 2
Organization Structure of BHP