

# PROJECTS INFORMATION

## INTRODUCTION

Sanjen Jalavidhyut Company Limited (SJCL), a company promoted by Chilime Hydropower Company Limited (CHPCL), is a public limited company established in 2010 AD with the objective of harnessing hydropower potential of the county with maximum participation of local people in the projects' ownership and mobilization of local resources for the successful implementation of various hydroelectric projects. In the context of current annual growth in electricity demand in the country, the Company has planned to develop two hydroelectric projects, namely, Sanjen (Upper) Hydroelectric Project (14.8 MW) and Sanjen Hydroelectric Project (42.5 MW) in cascade, with its own equity and loan from financial institutions of Nepal as the first initiative.

Sanjen (Upper) and Sanjen Hydroelectric Projects are located in Chilime VDC of Rasuwa District about 160 km road head distance towards north of Kathmandu. The headworks site is located in Tiloche at an elevation of 2348.3 masl, Powerhouse of Sanjen (Upper) HEP is located in Simbu Village at an elevation of 2187 masl and Powerhouse of Sanjen HEP is located in Chilime Village at an elevation of 1745 masl.

The upper scheme is basically a run-of-river type with daily peaking facility of 1 hour 10 minutes and generates annual energy of 82.44 GWh with the available gross head of 161.3m. The design discharge of the project at exceedance Q40 is 11.07 m<sup>3</sup>/s.

The lower scheme is the cascade development of upper scheme and thus water from the tailrace of upper scheme is directly utilized by the lower scheme and generates annual energy of 241.865 GWh with the available gross head of 442 m. Additionally, 0.50 m<sup>3</sup>/s discharge from Chhupchung Khola will be added to the intake/forebay of the lower scheme and therefore, the design discharge of lower scheme is 11.57 m<sup>3</sup>/s.

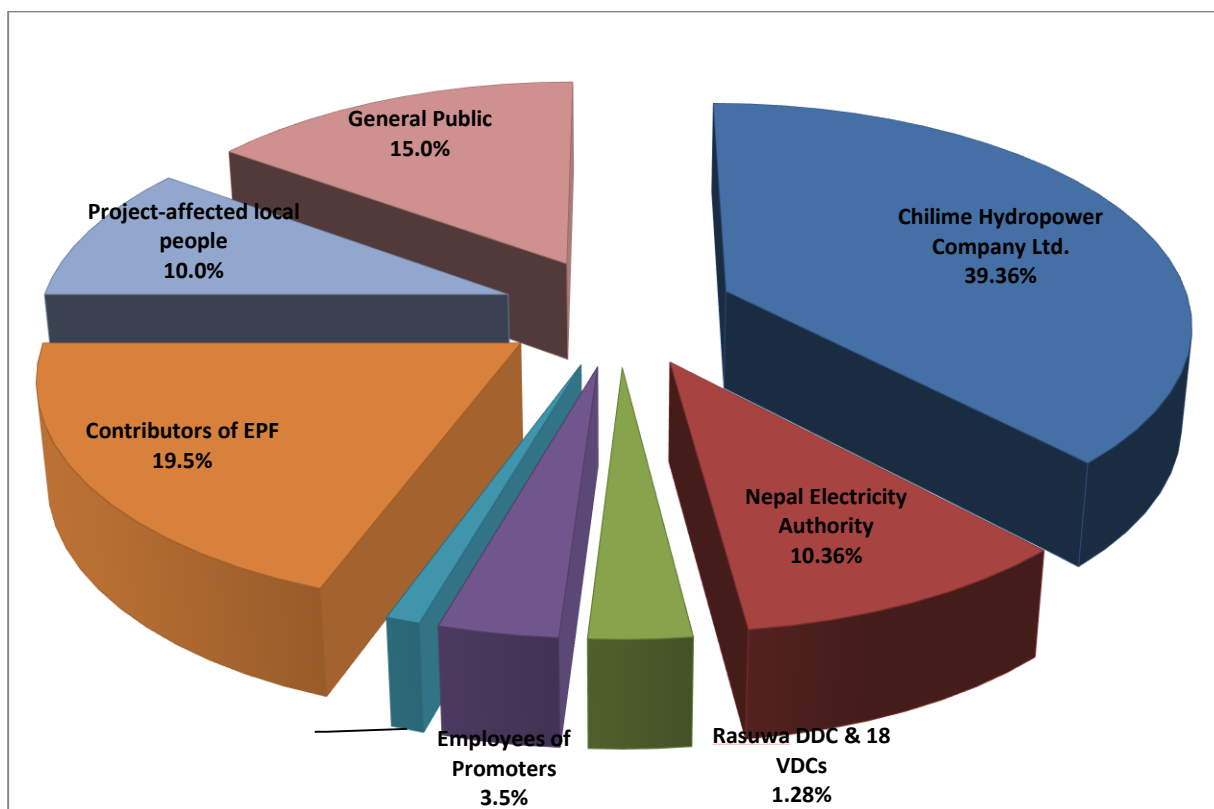
The total estimated project cost of these two projects is NRs 7,243,181,544 without financial cost. SJCL has planned to manage its total capital requirement for the construction of these two projects from debt and equity under debt equity ratio of 50:50 excluding IDC cost. For 100% of the debt part, a tripartite loan agreement among Employees' Provident Fund (EPF), Chilime Hydropower Company Limited (CHPCL) and Sanjen Jalavidhyut Company Limited (SJCL) has been signed under long term loan arrangement on 8<sup>th</sup> December, 2011. Equity investment will be made from 51% promoter share and 49% public share.

Power generated from Sanjen (Upper) and Sanjen Hydroelectric Projects will be evacuated by 132kV single circuit transmission line linking respective power plants and Chilime hub of NEA and then to the national grid via 220 kV double circuit line up to Trishuli 3B hub of NEA. A total of 324.31 GWh of electricity will be added into NEA Grid within 2017 AD. The Company has scheduled the construction of both projects simultaneously from October 2012. The commercial operation date has been slated for July 2015 for Sanjen (Upper) HEP and that for Sanjen HEP in December 2015.

## SHAREHOLDING COMPOSITION

<b>Promoter Shareholder: 51%(NRs. 1,851,563,570)</b>		<b>General Public: 49%(NRs. 1,779,347,626)</b>	
Chilime Hydropower Company Ltd.	39.36%	Employees of Promoter Companies	3.5%
Nepal Electricity Authority (NEA)	10.36%	Employees of EPF	1.0%
DDC and 18 VDCs of Rasuwa District	1.28%	Contributors of EPF	19.5%
-		Project affected local people	10%
-		General public	15%

## GRAPHICAL PRESENTATION OF SHARE STRUCTURE



## SANJEN (UPPER) AND SANJEN HYDROELECTRIC PROJECTS

### HYDROLOGY

The source river is known as Sanjen River which is a snow fed river. The catchment area at the SUHEP weir site at Tiloche is about 180 km<sup>2</sup> out of which only 4 km<sup>2</sup> lies below El. 3000 m. The catchment area at the SUHEP powerhouse site, Simbu, is about 190 km<sup>2</sup>. Annual precipitation is 1143 mm and monsoon precipitation is 958.7 mm. The long term mean monthly flows in the project area at SUHEP weir site reveals a maximum of 42.49 m<sup>3</sup>/s in August and minimum 2.33 m<sup>3</sup>/s in February. 100 years design flood is 194 m<sup>3</sup>/s. The design flow is 11.07 m<sup>3</sup>/s.

The tail water of the upper scheme of cascade development named Sanjen (Upper) Hydroelectric Project SUHEP feeds in to the intake arrangement of lower scheme of cascade development, the Sanjen Hydroelectric Project (SHEP). In addition, SHEP utilizes 0.5 m<sup>3</sup>/s flow from Chhupchung Khola. The catchment area of Chhupchung Khola at the weir site is 24 km<sup>2</sup>. Annual precipitation is 1200 mm and monsoon precipitation is 1000 mm. The long term mean monthly flows at Chhupchung weir site reveals a maximum of 3.58 m<sup>3</sup>/s in August and minimum 0.28 m<sup>3</sup>/s in April. 100 years design flood is 71 m<sup>3</sup>/s.

### GEOLOGY

The project area is situated in the Higher Himalaya and the Lesser Himalaya, Central Nepal.

#### **Sanjen (Upper) Hydroelectric Project (SUHEP):**

Diversion weir lies on the stable and relatively flat channel of the Sanjen River. It is characterized by about 3-4 m thick alluvial deposits consisting of predominately coarse gravel to boulder derived from gneiss, schist and quartzite in sand matrix with large boulders of augen gneiss. Desanding basin, peaking reservoir and forebay lie on a flat alluvial terrace.

Common rock types along the tunnel alignment, surge tank and penstock tunnel are fair to good and are therefore, suitable for the underground works. Penstock is partly underground and partly surface. Powerhouse will be founded on the bed rock.

### **Sanjen Hydroelectric Project (SHEP):**

Chhupchung weir lies in recent alluvial. Forebay/Intake of SHEP is in a gently sloping terrain consisting of about 25-30m thick deposits with angular gravel to boulder sized rock fragments of schist, quartzite and slate in loose soil sediments.

Common rocks along the headrace tunnel alignment are fair to good. Surface mapping reveals thin colluvial masses *i.e.* less than 1 m thick on downhill slope in surge tank area and rock cliff on its uphill section. Rock mass along the penstock is of mixed lithology. Thickness of the quartzite bands range from 5 to 20 m. The powerhouse site is proposed in a flat alluvial terrace. The switchyard is proposed in terrace deposits characterized by unconsolidated alluvium deposits.

## **PROJECT DESCRIPTION**

### **Sanjen (Upper) Hydroelectric Project (SUHEP):**

Sanjen (Upper) Hydroelectric Project is a run-of-river scheme with daily peaking facility for 1 hour 10 minutes. The whole scheme is divided into three work sites, *viz.* **Headworks Site** that covers diversion weir, undersluice, intake, gravel trap, spillway, desanding basin, peaking pond, forebay and pressure conduit, **Underground Works** that covers headrace tunnel, rocktrap, surge tank, penstock tunnel and construction adits, and **Powerhouse Site** powerhouse structure, tailrace and switchyard.

The headworks site is located at Tiloche of Chilime VDC. The headworks consist of overflow diversion weir of height 3.3m and one number of undersluice of size 3m wide and 3m high, side intake structure of 12m long, gravel trap of size 25 m long and 4.2 m wide, dufour type double chamber surface desander basin of size 60m long, 8.5 m wide and 7 m deep, peaking pond of size 138 m long and 65 m wide, forebay and 30m long low pressure conduit connecting to the headrace tunnel portal.

Headrace tunnel is 1386m long, inverted D shape of excavated section 3.5m x 3.75m and will be partly unlined, partly shotcrete lined and partly concrete lined. Surge tank is simple cylindrical type of height 40m and diameter 6m. Penstock is 567 m long. Surface powerhouse is located at Simbu Village of Chilime VDC. Powerhouse will accommodate three units of horizontal axis Francis turbines of capacity 5.1 MW each and three units of 3-phase synchronous AC generators of capacity 5.85 MVA each. Three numbers of tailrace canals each of 5 m long will discharge the tail water to the Forebay/Intake of Sanjen Hydroelectric Project (SHEP). Surface switchyard is located adjacent to the powerhouse complex.

Generated power from Sanjen (Upper) Hydroelectric Project will be evacuated through a 5km long 132 kV single circuit transmission line to connect from SUHEP powerhouse to the proposed Chilime Hub of NEA and then to the national grid via 220 kV double circuit line up to Trishuli 3B hub of NEA.

### **Sanjen Hydroelectric Project (SHEP):**

Sanjen Hydroelectric Project utilizes the tail water from the Sanjen (Upper) Hydroelectric Project and therefore is a cascade run-of-river scheme. The whole scheme is divided into three work sites, *viz.* **Headworks Site** that covers Chhupchung feeder system, spillway, intake/forebay and pressure conduit, **Underground Works** that covers headrace tunnel, rocktrap, surge tank, penstock shaft (inclined and horizontal) and construction adits, and **Powerhouse Site** that covers powerhouse structure, tailrace and switchyard.

The headworks site is located at Simbu Village of Chilime VDC. The headworks consist of overflow spillway, intake/forebay of size 80m long and 30m wide, a 115m long low pressure conduit leading to headrace tunnel portal that completes Chhupchung intake and feeder system.

Headrace tunnel is 3630m long, inverted D shape of excavated section 3.5m x 3.75m and will be partly unlined, partly shotcrete lined and partly concrete lined. Surge tank is restricted-orifice type of height 51m and

diameter 5.5 m. Penstock shaft (inclined and horizontal) is an underground structure which is 1056m. in length. Surface powerhouse is located at Chilime Village of Chilime VDC. Powerhouse will accommodate three units of vertical axis Pelton turbines of capacity 15 MW each and three units of 3-phase synchronous AC generators of capacity 16.85 MVA each. Three numbers of tailrace pits joined at tailrace manifold will discharge the tail water to the approach canal of existing Chilime Hydropower Plant. Excess water will be discharged into Chilime River. Surface switchyard is located adjacent to the powerhouse complex.

Generated power from Sanjen Hydroelectric Project will be evacuated through a 2km long 132 kV double circuit transmission line to connect from SHEP powerhouse to the proposed Chilime Hub of NEA and then to the national grid via 220 kV double circuit line up to Trishuli 3B hub of NEA.

## **PROJECT PROGRESS STATUS UPTO MANGSIR 2075**

- The Power Purchase Agreement for the two projects was signed with NEA.
- Generation Licenses for both the projects were received from the Ministry of Energy for a period of 35 years.
- Registrations in the Department of Industry (DoI) for both the projects were completed.
- Approval for Tree Cutting was obtained from the GoN, Department of Forest.
- Construction of Camps and Offices for Project Staffs at Thambuchet is completed.
- Construction of dedicated 11 kV transmission line (9 km) from Chilime Power Plant to the project site Thambuchet has been completed.
- Extension and strengthening of 11 kV line (10 km) up to Tiloche headworks and construction-adits and surge tank has been completed.
- Contract Agreement for the Construction of Lot 2 – Civil Works of Sanjen (Upper) Hydroelectric Project was signed with M/S ECI – BGCCPL J/V. Major activities progress status under this contract are:
  - Almost all the headwork structure has been completed and interfacing works with Lot 4 (Hydro-Mechanical) is undergoing and balancing pond construction work is underway with 20 percent completion status.
  - All tunnel works including Head Race Tunnel (HRT), Penstock Tunnel etc. excavation and lining work is completed and tunnel grouting work is underway.
  - Penstock installation work is undergoing.
  - Powerhouse substructure work is in progress and 50% of the Powerhouse back slope stabilization work is completed.
  - Overall 73% of the physical progress has been achieved.
- Contract Agreement for the Construction of Lot 2 – Civil Works of Sanjen Hydroelectric Project was signed with M/S SEW – TUNDI J/V. Major activities under this contract are going as follows:
  - The headwork structure work is in the final stage: Half portion of the weir is completed and the other second half is under construction, construction of desander is completed, peaking pond and forebay is almost completed and interfacing works with Lot 4 (Hydro-Mechanical) is undergoing.
  - Head Race Tunnel (HRT) is underway: 2658.2m excavation work is completed out of 3641.9m.
  - Surge-Shaft: 47m out of 51m height Surge shaft excavation work has been completed.
  - Penstock Tunnel: 644m excavation work is completed out of 939m.
  - Adit Tunnel: All adit tunnels work has been completed.
  - Powerhouse: 45 % of civil works of Powerhouse is completed.

- Overall 67% of the physical progress has been achieved.
- Contract Agreement for Lot 3 – Electromechanical Works of Sanjen (Upper) and Sanjen Hydroelectric Projects was signed with M/S Dongfang Electric International, China. Major activities undergoing in this contract are:
  - For SUHEP
    - Under this lot Design, Fabrication, Factory Inspection & delivery works are undergoing.
    - In Design part 89% of the work has been completed
    - In manufacturing part 75% of the work has been completed that includes manufacture of turbine, generator, transformer etc.
    - In delivery part delivery part 34% of the work has been completed.
    - Overall 61.2% of the physical progress has been achieved.
  - For SHEP
    - Under this lot Design, Fabrication, Factory Inspection & delivery works are undergoing.
    - In Design part 78% of the work has been completed
    - In manufacturing part 78% of the work has been completed that includes manufacture of turbine, generator, transformer etc.
    - In delivery part delivery part 43% of the work has been completed.
    - Overall 58.5% of the physical progress has been achieved.
- Contract Agreement for Lot 4 – Hydromechanical Works of Sanjen (Upper) and Sanjen Hydroelectric Projects was signed with M/S Nepal Hydro & Electric Limited, Nepal. Major project progress status under this contract are:
  - For SUHEP
    - Under this lot Design, Fabrication, Factory Inspection & delivery works are undergoing.
    - In Design part 99% of the work has been completed.
    - In manufacturing part 89% of the work has been completed that includes manufacture of penstock pipe, gates, stop logs etc.
    - In delivery part 58% of the work has been completed.
    - Overall 68% of the physical progress has been achieved.
  - For SHEP
    - Under this lot Design, Fabrication, Factory Inspection & delivery works are undergoing.
    - In Design part 96% of the work has been completed
    - In manufacturing part 71% of the work has been completed that includes manufacture of penstock pipe, gates, stoplogs etc.
    - In delivery part 42% of the work has been completed.
    - In Installation 6% of the work has been completed.
    - Overall 54% of the physical progress has been achieved.