Chapter 1

[Introduction]

1.1 Uttarakhand: Power Status

The State of Uttarakhand was created by carving out Kumaun and Garhwal regions out of Uttar Pradesh in November, 2000. The State is currently a net importer of power, but generates a seasonal surplus. Since its creation, the new State of Uttarakhand has been witnessing a sharp increase in energy demand. Power consumption has grown more than five times in the last seven years (2002-08). The position with regard to the sources of energy supply and consumption of energy based on use for the year 2008-09, is depicted in the charts below:

Chart : 1 Source of Energy
[in Million Units (MUs)]

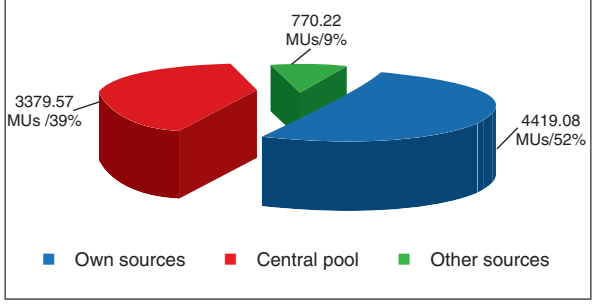
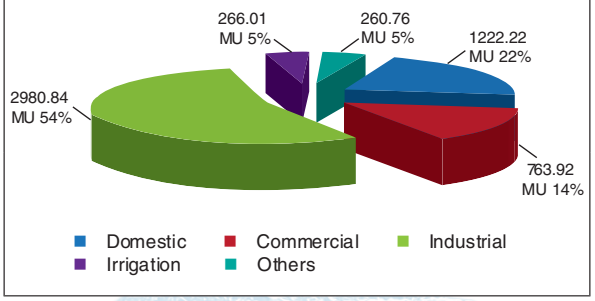


Chart : 2 Consumption of Energy
[in Million Unit (MU)]



Source : Information provided by UPCL.

As is evident from the charts above, the State is able to meet only 52 *per cent* of its power needs from its own resources. The State, however, plans to become a net exporter of power by 2010 by expanding its hydro-power generation capacity and by enhancing and improving high voltage transmission systems in the State.

1.2 Hydropower policy

Uttarakhand has a hydro-power potential of the order of 20,000 MW against which only about 3,124 MW has been harnessed so far. To encourage generation of hydro-power, the Government of Uttarakhand (GoU) has formulated and implemented policies (October 2002) with the following broad objectives:

- Creation of conducive conditions for encouraging private sector participation
- Harnessing water resources in an environment friendly manner.
- Meeting the energy demand of the State/ country.
- Promotion of the all-round development of the region.
- Generation of revenue from development of its hydel resources.

GoU came out with three separate policy documents in October 2002 covering the following three categories of hydro-power projects:

a. Up to 25 MW
b. Above 25 MW to 100 MW
c. Above 100 MW

The policy for Small Hydro Projects (SHP), upto 25 MW, was later revised in January 2008,

to include power projects based on biomass, wind power, solar energy, geothermal power etc. in addition to hydro power.

Small hydro power projects up to 25 MW can be set up in the private sector without Central government's involvement. Techno-economic clearance needs to be obtained from Central Electricity Authority (CEA) only if the estimated cost of the project exceeds Rs. 500 crore and/or there are inter-state issues involved.

The salient features of the policy instruments are tabulated below:

Table: 1
Terms and conditions of hydropower policy

CATEGORY	UPTO 25 MW	ABOVE 25 MW TO 100 MW	ABOVE 100 MW
Offer period on BOOT basis	40 years from the date of award at the end of which they shall revert to the GoU	45 years from the date of award at the end of which they shall revert to the GoU	Project will be allotted for an initial period of 45 years
Application fee	Rs. 1 lakh	Rs. 5 lakh	Rs. 5 lakh
Threshold premium[1]	Rs. 5 lakh per MW[2]	Rs. 5 lakh per MW	Rs. 5 crore per project
Wheeling charges[3]	Wheeling charges would be 10% of net energy supplied at the interconnection point	Wheeling charges would be 10% of net energy supplied at the interconnection point	No mention
Royalty	Exemption for first 15 years; beyond that 18% of net energy wheeled	First 15 years - 12% of net energy wheeled; beyond that 18%	12% of electricity generated during the entire life of the project.
Incentives	No entry tax on power generation/transmission equipment and building material	No entry tax on power generation/transmission equipment and building material	No entry tax on power generation/transmission equipment and building material.
Banking of power[4]	Banking of energy within fixed period spans of 2 months	Not permissible	No mention
R & R Policy	No mention	No mention	As per R&R policy of GoU
Environment Impact Assessment (EIA)	No mention	No mention	No mention

Source: State Power Policy document.

[1] The minimum premium/amount prescribed by GoU for a project.
[2] Revised in Jan 2008; for projects ranging between 2 MW to 5 MW – Rs. 1 lakh per MW whereas the projects ranging above 5 MW to 25MW – Rs. 5 lakh per MW.
[3] Charges raised by UPCL in lieu of transmission of electricity generated by IPPs for sale of generated energy outside the State and to captive users within the State.
[4] Inter grid arrangement for surplus power generated in different states for lean season use by deficient states.

Policy for harnessing renewable energy resources (January 2008) envisages community participation in power generation through gram panchayats and societies of Uttarakhand by way of self identified projects.

Allotment of project sites for developing hydropower projects is based on open competitive bidding which provides for pre-qualification based on technical and financial parameters. Participation in the bidding process is open to private sector entities, Central power utilities, State Governments; their entities and Joint Ventures. The developers to whom the projects get allotted would have the status of Independent Power Producers (IPPs).

Forty-eight (48) projects with a total planned generation capacity of 2423.10 MW have been taken up by the Independent Power Producers (IPPs) in the state. Out of these, allotment for 34 projects was done under the erstwhile combined state of Uttar Pradesh in the year 1993. However, after the creation of the state of Uttarakhand and the announcement of the state's own power policy in October 2002, the developers of these projects entered into a fresh Implementation Agreement (IA) with the GoU.

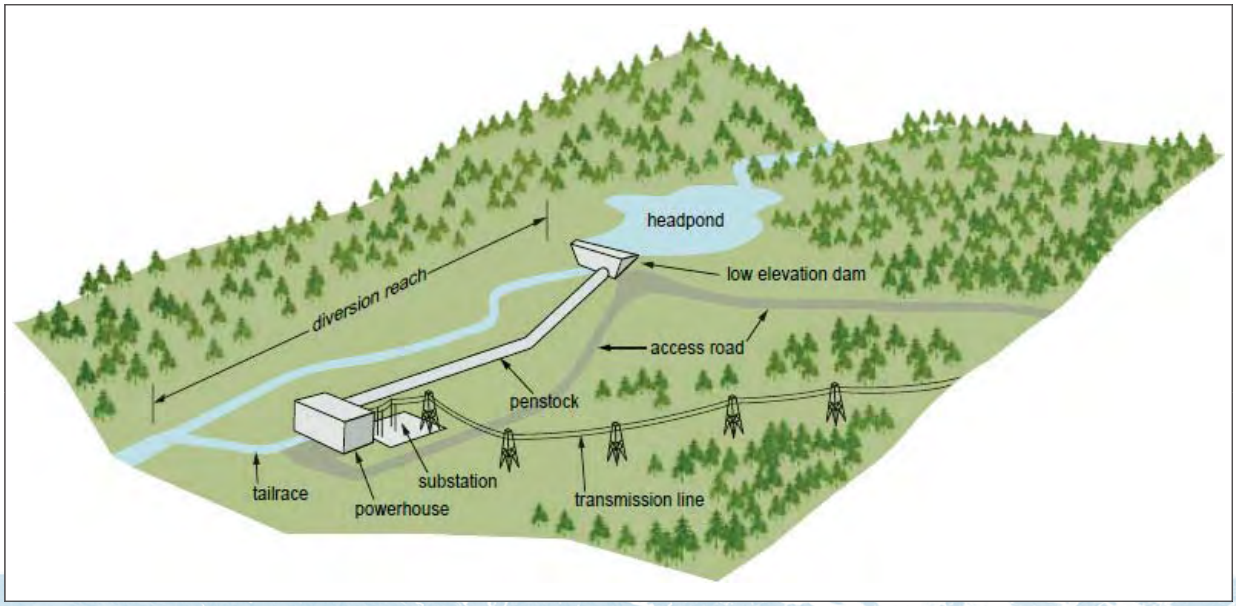
1.3 Hydropower basics

Hydropower, also known as hydroelectric power, uses water to generate electricity. When water is at a high point, it has potential energy and as it flows downhill, the potential energy gets converted into kinetic energy. The moving water in a hydroelectric plant acts on turbines to create electricity. The water flows through a turbine, making it spin. That turbine turns an electric generator, producing electricity.

1.3.1 Run-of-river (ROR) hydropower project

Run-of-river projects are different from conventional hydroelectric projects in design, appearance and impact. These power projects simply divert a portion of the flow of a stream into a turbine that generates electricity; there is no water storage other than the limited amount required to submerge the intake pipe. The water is then returned downstream without alteration. A typical run-of-river project consists of the following:

- A *weir* or small dam, to create a small *headpond*. This headpond does not store water; it merely floods an area sufficient to ensure that the intake of the penstock is under water.



- A pipe known as *penstock*, which carries water from the headpond to the turbines at a lower elevation.
- A powerhouse building containing the turbines that generate electricity from the flow of water.
- A *tailrace* channel through which the diverted water is returned to the river downstream of the powerhouse.
- Access roads to the powerhouse and the headpond.
- Transmission line from the powerhouse to the nearest transmission system.
- The section of river between the dam and the powerhouse is called the '*diversion reach*,' because significant quantities of water are diverted from this section of river.

The construction costs of run-of-river projects are significant, as are their terrestrial and aquatic impacts. When undertaken properly, with due care given to addressing environmental impacts, these projects can create sustainable green energy with minimal bearing on the surrounding environment and nearby communities.

1.3.2 Identification of ROR sites

Potential run-of-river sites must offer a significant elevation drop and sufficient water flow. A key component of the run-of-the-river plant's functionality is the height and pressure of falling water, known as "head." The power available at a site is the product of the flow volume and the head. Therefore higher the head, the less water needed to produce power. Run-of-the-river plants can be designed using large flow rates with low head or small flow rates with high head[5]. By virtue of its topographic location, Uttarakhand has a number of places endowed with substantial height and perennial water flow.

1.4 Steps to Hydropower

A hydro power project generally goes along the following steps to hydel-power generation as depicted in the diagram:

1.5 Organisational Set-up

The Secretary to the Government of Uttarakhand, Department of Energy is the administrative head in the Government for formulating policies relating to hydropower development. Uttarakhand Jal Vidyut Nigam Limited (UJVNL), a Government owned company has been designated as the nodal agency for hydropower development involving Independent Power Producers[6] (IPPs). It is responsible for implementation of policies and directions given by the Government from time to time. Uttarakhand Environment Protection and Pollution Control Board (UEPPCB), constituted in 2002, has been entrusted with the responsibility of enforcing various Environmental Acts and Rules including the use of water resources for hydropower generation.

[5] A "high head" site typically has a height of over 10 feet, whereas shorter drops are referred to as "low head." Sites with drops of less than 2 feet may not support a system.

[6] Any non-Uttarakhand State Government agency, which may include private sector entity, central power utility, state government or any other government entity and their joint ventures.

Steps of Hydropower