HYDEL POWER POTENTIAL IN LEH DISTRICT

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The programme and planning for the development of electric power.. forms one of the most integral parts of the overall economic strategy. Like in the irrigation and agriculture field, there is a basic production of energy in hydel schemes in the form of electric power from the available water resources. . Certain factors are very essential and to be kept in the mind at the stage of planning. These are the efficient use of resources, long term sustainability. freedom from the effects of environmental pollution and economic feasibility. Keeping in view these factors, the micro, mini and small hydel schemes meet these requirements and are the most suitable sources of energy or electric power in the Ladakh region. The sites identified for the construction of hydel schemes are as under:

Micro Hydel Schemes

1. Sasoma Nallah Hydel Scheme (in Nubra Valley)

Head available	=170 m
Minimum discharge	= 1 cumec
Power Generation	= 1 MW (Winter) 3 MW (Summer)
Estimated cost	= Rs. 18 Crores[1]

2. Hanu Hydel Scheme (Leh - Khalatse Block)

Head available	= 165 m
Minimum discharge	= 1 cumec
Power Generation	= 1 MW (Winter) 3 MW (Summer)
Estimated cost	= Rs. 12 Crores[1]

3. Upshi - Igo Hydel Scheme, Indus River

Head available	= 30m
Minimum discharge	= 11.33 Cumec
Length of Power Canal	= 7 Km
Power Generation	= 2.5 MW (Winter) 7.5 MW (Summer)
Estimated cost.	= Rs. 37.5. Crores[1]

4. Micro Hydel Scheme, Tingmosgang.

Head available	= 65m
Minimum discharge	= 0.4 cumec
Power Generation	= 167 kw (Winter) 500 kw (Summer)

[1] 1 crore = Rs10 million.

5. Nimo Hydel Scheme, Zanskar River

Head available	= 40m
Minimum discharge	= 32 cumec
Length of tunnel	= 15 km
Power Generation	= 10 MW (Winter) 30 MW (Summer)
Estimated cost	= Rs. 120 Crores[1].

6. Domkhar Hydel Scheme (on River Indus)

Length of water conductor (tunnel + open channel)	= 7 km
Head available	= 25m
Power Generation	= 6.5 MW (Winter) 19.5 MW (Summer)
Estimated cost	= Rs. 78 Crores[1].

Sites for a Low Head Run-of-river schemes are easily available at more than six places with a total generating capacity of 12 MW (in winter) and 40 MW in Summer. The overall cumulative power potential in Leh district is not less than 30 MW in winter and 100 MW in summer. This power potential is more than enough to meet the requirements of lighting, cooking, irrigation and agricultural operations, industries and various other related activities of the whole Leh district for a period of about a half century.

Before the start of the eighth five year plan, the work of all the micro-hydel schemes up to 3 MW was transferred to the Department of Non-Conventional Energy Sources (DNCES). The Hydel schemes up to 3 MW are now treated as Micro-Hydel scheme under the head of Non-Conventional. Funds and & other incentives are available from the Ministry of Non-conventional Energy Sources.

Freezing and icing problems in the Hydel Structures.

Due to the severe climatic conditions prevailing in the Ladakh region, there are acute problems of freezing and ice-formation in the hydel structures. As observed in the Stakna Hydel Project for more than the last six years, the hydel project with a gravity canal system can be run only for a period of 9 to 10 months i.e. from March to December. The problems faced due to ice formation at the intake structures and power house are manageable with some difficulties, but the problem faced in the canal system is totally unmanageable.

The ice formation in the power canal or water conductor can be divided into two parts.

1. The freezing of water surface and ice formation on the wetted perimeter due to sub-zero temperature and low velocity.
2. The adhesion of suspended crystals of frazil ice to the inner surface along the entire length of the canal and pipes.

The second icing problem is the most acute and uncontrollable. Normally trash racks are installed at the intake structure to trap the

debris and ice sheets but these trash racks cannot control or retain the flowing frazil ice. In the winter season, when the ambient temperature falls below -10°C, the formation and flow of frazil ice starts in the river and enters into the water conductor system. The accumulation of frazil ice reduces the sectional area of the channel and the discharge of the canal is progressively reduced. The power generation is similarly reduced and at a certain minimum limit closure of the project becomes unavoidable. Some suggestions and solutions to minimise the ice formation in the channel are:-

Water conductor and Hydel structure.

1. Materials with low heat-conductivity should be used for the water conductor system, with further insulation.
2. If possible the gravity type open conductor should be totally eliminated or the length should be minimised.
3. Preference should be given to a tunnel type water conductor or the cut-and covered type canal system.
4. A Low Head or Medium Head Run-of-River Scheme with standardised Tubular, Bulb and Package type Turbines is more suitable on the Indus River.

Low Head/Medium Head Run-of-River Scheme

Keeping in view the severe climatic conditions and water resource constraints especially during the winter months, the Low Head/Medium Head Run-off-River schemes are very suitable on the river Indus particularly down stream of the Zanskar-Indus confluence.

The Bharat Heavy Electrical Limited (BHEL) has now standardised Tubular type Horizontal Machines for a low head of 5m to 10m to generate power from 500 kW to 1000 kW with a river discharge of 6.8 cumec (250 cusec) to 13.6 cumec (500 cusec)

Bulb Turbines and package type turbines are also available for a low head of 5m to 20m with a discharge requirement of 10 to 50 cumec (i.e. 350 cusec to 1880 cusec) generation power in the range of 1500 to 7000 KW.

Energy Data[2]	**1990-91**	**1991-92**	**1992-93**	**1993-94**
All India				
Installed Capacity(MW)	68261	74619	83352	91593
Peak Availability (MW)	40430	43610	49045	52846
Peak Load(MW)	46509	50431	54634	59122
Energy Availability (MKWh/yr)	264125	283631	314471	348998
Energy Requirement (MKWh/yr)	262393	284501	308162	333407
All India per capita energy	411 KWh	or 63 watt		

[2] The derivation of some figures in this table is not clear. (Ed.)

Energy Data (cont.)[2]	**1990-91**	**1991-92**	**1992-93**	**1993-94**
J&K State				
Installed Capacity (MW)	457	463	472	507
Peak Availability (MW)	526	562	637	691
Peak load (MW)	654	727	808	896
Energy Availability(MK Wh/yr)	2888	3294	3716	4243
Energy Requirement (MKWh/yr)	3150	3503	3893	4318
J&K State per capita energy available = 653 KWh/yr or 106 watt				
Leh District, Energy Generation				
Stakna Hydel project (MKWh/yr)	6.007	7.078	10.520	13.565
Diesel power station (MKWh/yr)	0.823	1.467	1.678	1.522
Leh District per capita energy = 135 KWh/yr				

The per capita energy available of 135 units/yr is very low as compared to the State and All India level. To meet the normal requirement of energy consumption it should be increased by 4 to 5 times. Thus a minimum power generation of 15 to 20 MW is needed for the Leh District.

Solar and Wind Energy

Other renewable and sustainable sources of energy in the Leh District are Solar and Wind Energy. As compared to the Hydel Energy, the equipment and installation cost of energy from Solar and Wind is very high but from the ecological and environmental stand point the harnessing of energy from Solar & Wind is preferable to Diesel and other polluting sources.

Solar Photo Voltaic (SPV)

In a solar photo voltaic system, solar energy is converted directly into electricity. The existing technology is based on single and poly-crystalline cells and can continue for some time to supply lighting and pumping needs for irrigation and drinking water in villages. At present the average cost is about Rs.100 per watt but a cost range of 25 to 30 per unit is preferable.

Installation cost for Hydel Scheme = Rs. 55 to Rs.65/w.
Installation cost for Solar Scheme = Rs.1100/w, (20 times more than Hydel)

Leh District

No. of villages electrified with SPV units up to 1993 = 443 Units
Cost/per set = Rs. 20,000
Expected life = 20 to 25 years
Additional units proposed during 93-94 = 500 units

Wind Energy

The third alternative source of energy, Wind Energy, can be used for power generation or pumping water for drinking and irrigation purposes. So far three wind generators are installed in Leh area and are under test.