

**BHAGIRATHI ECO-SENSITIVE ZONE
DISTRICT: UTTARKASHI
ZONAL MASTER PLAN
FOR
POWER SECTOR**

**ENERGY DEPARTMENT,
GOVERNMENT OF UTTARAKHAND**

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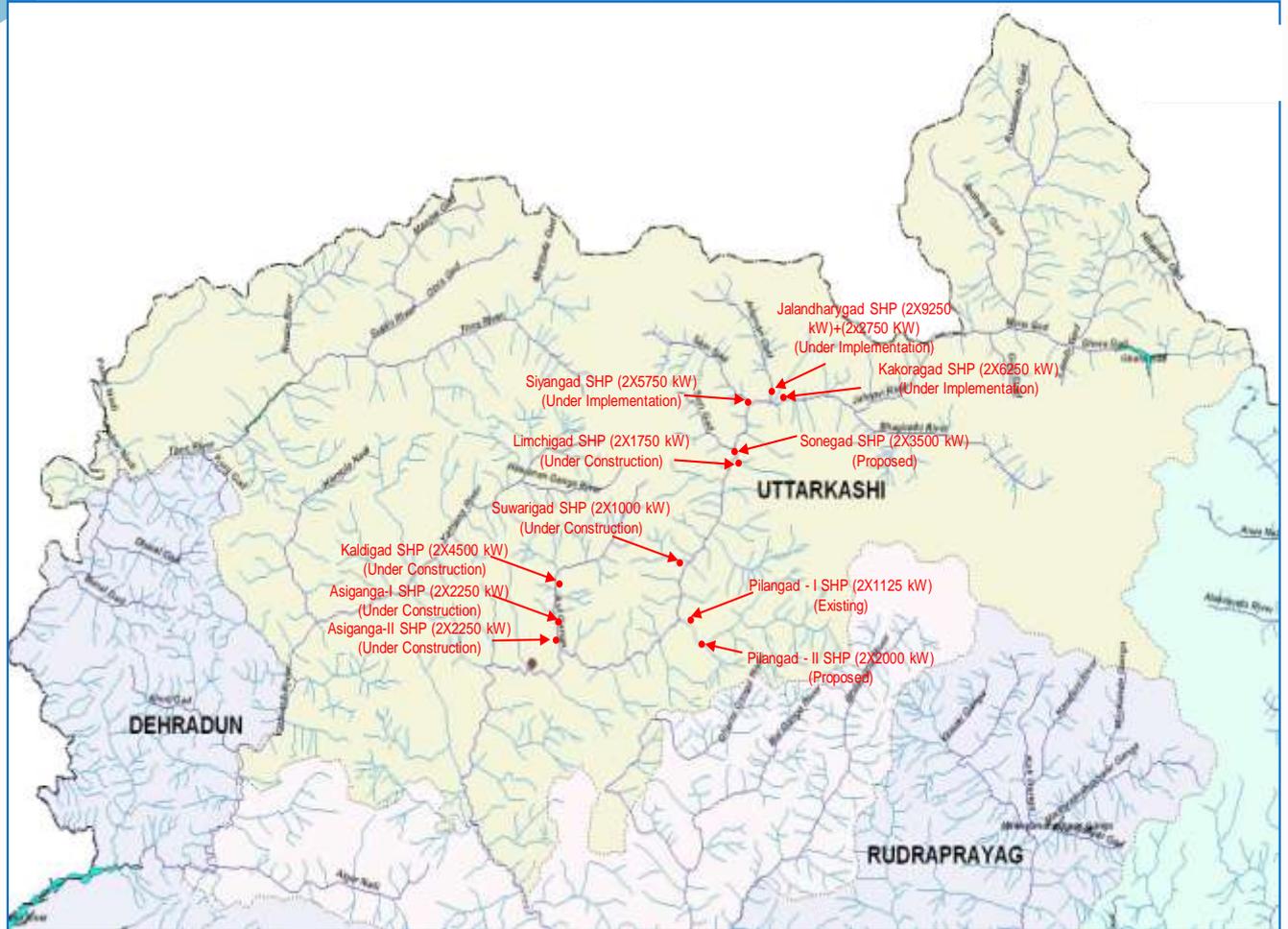
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LIST OF MICRO, MINI & SMALL HYDRO PROJECTS

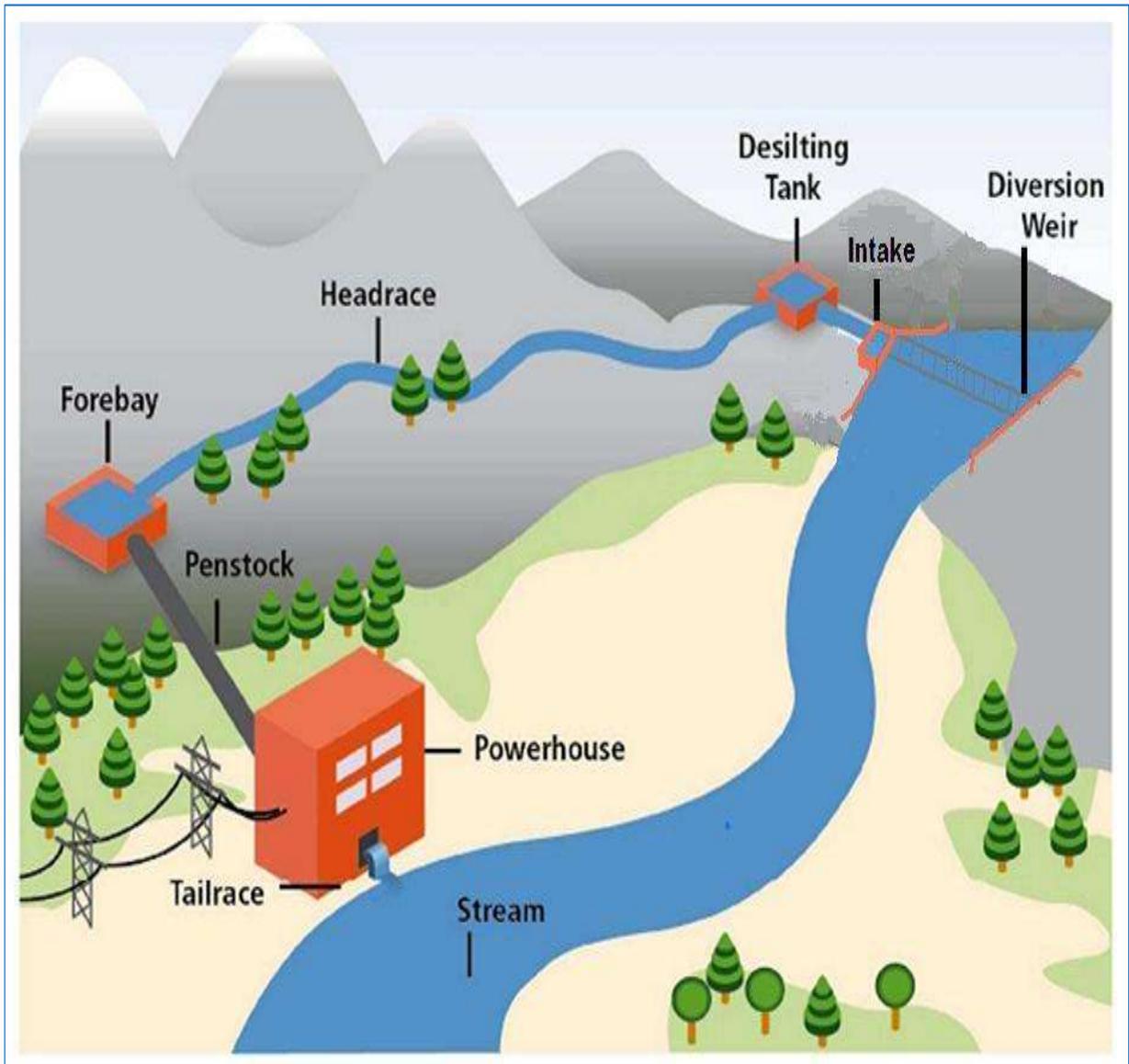
(ALLOTTED BEFORE DATE OF ESZ NOTIFICATION)

1. Pilangad-I	(2250 KW)	- UJVNL
2. Harshil	(200 KW)	- UREDA
3. Kedar Ganga	(20 KW)	- UREDA
4. Rudraganga	(150 KW)	- UREDA
5. Assiganga – I	(4500 KW)	- UJVNL
6. Assiganga – II	(4500 KW)	- UJVNL
7. Kaldigad	(9000 KW)	- UJVNL
8. Limachagad	(3500 KW)	- UJVNL
9. Swarigad	(2000 KW)	– UJVNL
10. Songad	(7 MW)	-UJVNL
11. Pilangad-II	(4 MW)	-UJVNL
12. Siyangad	(11.50 MW)	-Harsil Hydro Ltd.
13. Kakoragad	(12.50 MW)	-Harsil Hydro Ltd.
14. Jalandharygad	(24 MW)	-Harsil Hydro Ltd.

Location of SHPs



TYPICAL LAYOUT PLAN OF SHPs



COMMISSIONED SMALL HYDRO POWER PROJECTS

FALLING UNDER ESZ

1. Pilangad-I	(2250 KW)	- UJVNL
2. Harshil	(200 KW)	- UREDA
3. Kedar Ganga	(20 KW)	- UREDA
4. Rudraganga	(150 KW)	- UREDA

TOTAL: 3.07 MW

UNDER CONSTRUCTION SMALL HYDRO POWER PROJECTS

FALLING UNDER ESZ

1. Assiganga – I	(4500 KW)	- UJVNL
2. Assiganga – II	(4500 KW)	- UJVNL
3. Kaldigad	(9000 KW)	- UJVNL
4. Limachagad	(3500 KW)	- UJVNL
5. Swarigad	(2000 KW)	- UJVNL

TOTAL: 23.50 MW

SHPS UNDER IMPLEMENTATION FALLING IN ESZ

1. Songad	(7 MW)	-UJVNL
2. Pilangad-II	(4 MW)	-UJVNL
3. Siyangad	(11.50 MW)	-Harsil Hydro Ltd.
4. Kakoragad	(12.50 MW)	-Harsil Hydro Ltd.
5. Jalandharygad	(24 MW)	-Harsil Hydro Ltd.

TOTAL: 59.00 MW

ROPOESD LIST OF MICRO AND MINI HYDRO PROJECTS IN ESZ

SN	NAME OF THE PROJECT	CAPACITY (MW)	DISTRICT	RIVER VALLEY	SUB-TRIBUTARY /GADERA NAME	NAME OF AGENCY
1	Rano ki gad	0.04	Uttarkashi	Bhagirathi	Rano ki gad	UREDA
2	Varuni ganga	0.08	Uttarkashi	Bhagirathi	Varuni gad	UREDA
3	Mundragad	0.05	Uttarkashi	Bhagirathi	Mundragad	UREDA
4	Dharasu gad	0.07	Uttarkashi	Bhagirathi	Dharashugad	UREDA
5	Nago	0.03	Uttarkashi	Bhagirathi	Nago	UREDA
6	Nahrigad	0.12	Uttarkashi	Bhagirathi	Nahrigad	UREDA
7	Nigad gad	0.04	Uttarkashi	Bhagirathi	Nigad gad	UREDA
Total		0.43				

DETAILS OF MEETING HELD WITH VILLAGERS IN ESZ FOR FINALIZATION OF ZONAL MASTER PLAN

- As per the Point No. 02 (1) of ESZ Gazette Notification, Zonal Master Plan was to be made in consultation with the local people, particularly women within two years from the date of notification (18.12.2012).
- In compliance of District Magistrate letter no 5720 / 21-04 (2010-11) dated 09.15.2015, meetings were held at the different places with the local people to incorporate their suggestions/proposal in Zonal Master Plan.
- UJVNL's officials participated in the meetings but local people opposed the Gazette Notification and disrupted the meetings and suggestions/proposal could not be obtained for Zonal Master Plan.

Meetings conducted for preparation Zonal Master Plan in ESZ

Sl No.	Date & Time of Meeting	Place of Meeting
1	22/09/2015 at 11:00 AM	Harshil Inter College
2	24/09/2015 at 11:00 AM	Junior High school Sunagar.
3	28/09/2015 at 11:00 AM	Block Auditorium Room, Bhatwari
4	01/10/2015 at 11:00 AM	Govt. Inter College Netala
5	03/10/2015 at 11:00 AM	Govt. Inter College Gangori
6	05/10/2015 at 11:00 AM	Suman Auditorium Room, Bhatwari

NECESSITY & JUSTIFICATION OF MICRO, MINI & SMALL HYDRO PROJECTS

The development of new and renewable sources of green energy particularly hydropower, has become a global priority. For many developing countries like India, the generation of electric power from small hydro power plants provide a option for providing reliable source of energy for economic development of country.

Huge & fast consumption of fossil fules is a severe problem to the developing world. Reserves of fossile are decreasing day by day. As such renewable energy resources are very important for upcoming generation of the world.

Strategies for exploitation of renewable energy constitute a major part of the policies which aim at reducing dependence on fossil fuels to satisfy the growing demand for energy. In developing countries like India, particularly those short of fossil fuel resources, the renewable resources of energy constitute a promise for meeting part of the future energy at a reasonable price and by accelerating the process of development in rural areas. Hydro Power is an important renewable resource of energy and water resources in India is sufficient to meet the major energy demands of the future. Hydro Power is pollution free & clean energy.

Structures of Small Hydro Power plant are very small. Therefore, their construction does not affect the environment and they take less time for their construction. For construction of small hydro Power plants no reservoir is to be constructed and negligible rehabilitation occurs. The small hydro power Projects are run-off the river scheme. They donot affect any wildlife and the environment and also there is no possibility of submergence of any forest property, agriculture land.

Construction of the Small Hydro Projects is completed under the supervision of experienced technical experts and inconformity with the approved standards. The technology for Small Hydro Power plants is available in India itself and therefore, it helps in the economic growth of India. Due to construction of these plants, local population is benefited in the form of enhanced job opportunities and further their power requirements are met. Hence construction of Small hydropower Projects is an important step towards fulfilling State's energy requirement & towards enabling economic empowerment of the State.

PROPOSED STANDARD TO BE FOLLOWED FOR THE PROJECTS UNDER SURVEY

& INVESTIGATION STAGE IN ESZ

- ❖ For site selection, survey and investigation in SHPs, **temporary bridal paths** shall be constructed in the Project area. **Cutting of trees may be minimum as per the site requirement in unavoidable situations.** The survey pedestrian routes shall be absolutely temporary and will be used only for survey/ investigation work.
- ❖ While fixing alignment of the project, it will be ensured by project authority that **no population is required to be rehabilitated** due to construction of the project.
- ❖ The rights and privileges of the residents of the project area shall not be affected due to construction of the Project and construction may only be started **after obtaining formal approvals from the residents** as per laid down rules.
- ❖ During construction or operation of the project local residents shall be given **priority in employment** according to their qualifications.
- ❖ **During alignment of the Project Component, loss of vegetation cover shall be avoided or it shall be kept minimum.**
- ❖ Demolition of any natural heritage site shall be avoided during construction of and its pedestrian routes shall also be protected in its natural state.
- ❖ The project alignment shall not be proposed **in landslides area and fault zone.**
- ❖ In the design for construction of hydraulic structures, the Indian Standards & Specifications shall be followed in such a manner so that stability of the **hill slopes is not jeopardized.**
- ❖ It shall be ensured that 20% of average flow of lean period or as stipulated by State/Central Govt. shall be released in the river continuously from ecological and environmental point of view so that bio-diversity and aquatic environment is protected.
- ❖ **Services of experts for environment protection and pollution control** shall be taken during project implementation and it shall be ensured that periodic inspection reports of experts are submitted to Pollution Control Board timely.
- ❖ To acquire an adequate discharge for generation of the power, the construction of Diversion Structure shall be done in such a manner that the **natural boundaries of the river are not affected** and no reservoir shall be formed due to structures.

**PROPOSED STANDARD TO BE FOLLOWED FOR THE PROJECTS UNDER
CONSTRUCTION**

- ❖ Construction of water conductor system at the project site shall be preferred where the excavation work will be minimum. **Surface Channel shall be constructed in the water conductor system for the mild/moderate slope and small tunnels for the steep slope.**
- ❖ Construction material required for construction work such as stone, sand and aggregate etc shall be used **by transport only from pre-approved mines. No excavation/mining shall be done for the requirement of the above material at the site.**
- ❖ Stone/Boulder/Sand obtained from the excavation of structures etc. shall be used for construction of project. The portable small stone crusher shall be established at the site after obtaining required permission to meet requirement of aggregate through crushing stones/boulders obtained from the excavation.
- ❖ Material excavated from construction shall be used for construction only and unused material/debris shall be **dumped only at the places indentified for Muck Dumping Yards with treatment for providing vegetative cover.**
- ❖ **Use of heavy explosives shall be prohibited** during Project construction and **controlled blasting shall be used under guidance of the expert including monitoring of the vibration due to blasting.**
- ❖ For disposal of natural and seasonal water discharge in Project Area, **construction of drains** shall be made where ever required. Flow resulting from the drains will be connected with natural drainage flow/river flow.
- ❖ The **treatment for hill slopes shall be carried out** in the project area near project components so as to provide stability and avoid erosion. Protective works shall be undertaken on the suggestions from technical/ geological experts.
- ❖ Sewerage Treatment Plant (STPs) shall be constructed for the treatment of effluent from the Power Plant & Colony area.

SCHEDULE OF IMPLEMENTATION OF THE PROJECT

Schedule of Implementation of Suwarigad SHP (2.0 MW)												
S.No	Activity	Quarterwise Scheduling from Clearance of ESZ										
		Year-1		Year-2		Year 3		Year 4		Year 5		
1	Land Clearances from MOEF & other clearances required for construction	██████████										
2	Tree Felling		██████									
3	Amendment in Agreement/Retendering			██████████								
4	Award of work				██████							
5	Execution											
5.1	Muck Dumping Yard Construction					██████						
5.2	Earthwork excavation						██████████					
5.3	Slope stabilization							██████████				
5.4	Civil work execution							██				
5.5	E&M work execution								██████████████████			
6	Testing & Commissioning										██████	

Schedule of Implementation of Asiganga-I SHP (4.5 MW)

S.No	Activity	Quarterwise Scheduling from Clearance of ESZ									
		Year-1			Year-2			Year 3			
1	Invitation & Finalisation of Tender Process	■									
2	Award of Balance work		■								
3	Execution										
3.1	Muck Dumping Yard Construction			■							
3.2	Earthwork excavation				■						
3.3	Slope Stabilization				■						
3.4	Civil work execution				■						
3.5	E&M work execution						■				
4	Testing & Commissioning								■		

Schedule of Implementation of Asiganga-II SHP (4.5 MW)

S.No	Activity	Quarterwise Scheduling from Clearance of ESZ															
		Year-1			Year-2			Year 3			Year 4			Year 5			
1	Land Clearances from MOEF & other clearances required for construction	██████████															
2	Tree Felling			██████													
3	Invitation & Finalisation of Tender Process			██████████													
4	Award of Balance work				██████												
5	Execution																
5.1	Muck Dumping Yard Construction				██████												
5.2	Earthwork excavation					██████████											
5.3	Slope Stabilization						██████████										
5.4	Civil work execution							████████████████████									
5.5	E&M work execution											██████████████████					
6	Testing & Commissioning															██████	

Schedule of Implementation of Sonegad SHP (7.0 MW)

S.No	Activity	Quarterwise Scheduling from Clearance of ESZ																	
		Year-1			Year-2			Year 3			Year 4			Year 5			Year 6		
1	Land Clearances from MOEF & other clearances required for construction	██████████																	
2	Tree Felling				██████														
3	Invitation & Finalisation of Tender Process				██████████														
4	Award of work							██████											
5	Execution																		
5.1	Muck Dumping Yard Construction							██████											
5.2	Earthwork excavation							██████████											
5.3	Slope stabilization										██████████								
5.3	Civil work execution										██								
5.4	E&M work execution																██████████		
6	Testing & Commissioning																██████		

Schedule of Implementation of Pilangad-II SHP (4.0 MW)

S.No	Activity	Quarterwise Scheduling from Clearance of MOEF						
		Year-1	Year-2	Year 3	Year 4	Year 5	Year 6	Year 7
1	Survey & Investigation	██████████						
2	Land Clearances from MOEF & other clearances required for construction	██████████						
3	Tree Felling		██████					
4	Invitation & Finalisation of Tender Process		██████					
5	Award of work			██████				
6	Execution							
6.1	Muck Dumping Yard Construction			██████				
6.2	Earthwork excavation			██████████				
6.3	Slope stabilization				██████████			
6.4	Civil work execution				████████████████████			
6.5	E&M work execution						██████████	
7	Testing & Commissioning							██████

Schedule of Implementation of Siyangad SHP (11.50MW)

Project implementation schedule will be determined after final directions of Hon'ble Supreme Court of India in matter of Alaknanda Hydropower co. Ltd vs Anuj Joshi & Others in Case no 6736 of 2013 for review of 24 Hydropower Projects in Alaknanda_Bhagirathi River Basin. Commissioning from start of construction on ground was earlier estimated 3years, after receipt of all clearances, financial closure, and land transfer.

Schedule of Implementation of Kakoragad SHP (12.50MW)

Project implementation schedule will be determined after final directions of Hon'ble Supreme Court of India in matter of Alaknanda Hydropower co. Ltd vs Anuj Joshi & Others in Case no 6736 of 2013 for review of 24 Hydropower Projects in Alaknanda_Bhagirathi River Basin. Commissioning from start of construction on ground was earlier estimated 3years, after receipt of all clearances, financial closure, and land transfer.

Schedule of Implementation of Jalandharygad SHP (12.50MW)

Project implementation schedule will be determined after final directions of Hon'ble Supreme Court of India in matter of Alaknanda Hydropower co. Ltd vs Anuj Joshi & Others in Case no 6736 of 2013 for review of 24 Hydropower Projects in Alaknanda_Bhagirathi River Basin. Commissioning from start of construction on ground was earlier estimated 3years, after receipt of all clearances, financial closure, and land transfer.

OBSERVATIONS ON ESZ NOTIFICATION

❖ **Prior to ESZ Notification, Status of SHPs falling under ESZ are as under:**

(A) Under Construction:

Sl.No	Name of Project	Capacity (MW)
1	Limchi Gad	3.50
2	Suwari Gad	2.00
3	Assiganga-I	4.50
4	Assiganga-II	4.50
5	Kaldigad	9.00

(B) Under Implementation and/or Clearance:

SN	Name of Project	Capacity (MW)
1	Son Gad	7.50
2	Pilangad- II	4.00
3	Jalandharigad	24.00
4	Kakoragad	12.50
5	Syangad	11.50

OBSERVATIONS REGARDING BHAGIRATHI ESZ NOTIFICATION

- ❖ SHPs (below 25MW) under construction/implementation or allocated to developers prior to ESZ Notification would not be covered with retrospective effect under prohibited category.
- ❖ MOEF & CC vide OM dt 20.12.2013 on the Western Ghats Eco-sensitive Area has clarified that Prohibited Category of Projects /Activities which have applied for Environmental Clearance before date of listing HLWG Report on MOEF&CC website would not be by covered by the prohibition. All such prior projects would continue to be implemented as per the rules and guidelines prevailing at the time of submission of their applications.
- ❖ SHPs (below 25MW) come under Green Category of CPCB/Uttarakhand Pollution Control Board. Furthermore, Environmental Clearance is not applicable for SHPs due to low its impact.
- ❖ MOEF & CC's Guidelines dt 9.2.2011 for declaring Eco-sensitive Zones around National Parks & Sanctuaries states that ESZ should be "Regulatory" and not "Prohibitory". Guidelines do not include Small Hydro Power Projects in Prohibited category.

DETAILS OF LAND REQUIREMENT

SL.NO.	PROJECT NAME	TYPE & AREA OF LAND REQUIREMENT	LAND STATUS
1	SWARIGAD SMALL HYDRO PROJECT	A) CIVIL SOYAM LAND – 2.934 Ha. B) NAAP LAND- 0.198 Ha. C) TOTAL LAND - 3.132 Ha.	1. IN PRINCIPAL APPROVAL OF CIVIL LAND 2.934 Ha HAS BEEN OBTAINED ON JUNE, 2013 & COMPLIANCES OF CONDITION LAYDOWN BY MOEF HAS BEEN COMPLIED AND FORMAL APPROVAL IS AWAITED. 2. NAAP LAND OF 0.198 Ha PURCHASED FROM THE OWNER THOROUGH MUTUAL NEGOTIATION
2	LIMCHAGAD SMALL HYDRO PROJECT	RESERVE FOREST LAND – 4.275 Ha.	1. LEASE DEED OF 0.9875 Ha HAS BEEN DONE ON APRIL, 2006 2. LAND CASE OF ADDITIONAL LAND 3.288 Ha HAS BEEN SUBMITTED AT NODAL OFFICE DEHRADUN ON MARCH, 2013
3	ASIGANGA-I SMALL HYDRO PROJECT	RESERVE FOREST LAND – 2.162 Ha.	1. FINAL APPROVAL OF .923 Ha HAS BEEN RECEIVED ON JUNE, 2012 2. FINAL APPROVAL OF 1.239 Ha HAS BEEN RECEIVED ON MARCH, 2014.

SL.NO.	PROJECT NAME	TYPE & AREA OF LAND REQUIREMENT	LAND STATUS
4	ASIGNAGA-II SMALL HYDRO PROJECT	A) RESERVE FOREST LAND – 2.302 Ha. B) ADDITIONAL RESERVE FOREST LAND – 1.103 Ha. C) TOTAL – 3.405 Ha.	1. FINAL APPROVAL OF 0.719 Ha HAS BEEN RECEIVED ON JUNE, 2000 2. FINAL APPROVAL OF 1.583 Ha HAS BEEN RECEIVED ON AUGUST, 2010 3. LAND CASE OF ADDITIONAL LAND 1.103 Ha HAS BEEN SUBMITTED AT NODAL OFFICE DEHRADUN ON FEBRUARY, 2013
5	KALDIGAD SMALL HYDRO PROJECT	D) RESERVE FOREST LAND – 2.351 + 1.685 = 4.036 Ha. E) CIVIL SOYAM LAND – 0.66 Ha. F) ADDITIONAL LAND – 1.147 Ha G) TOTAL – 5.843 Ha	1. FINAL APPROVAL OF 2.351 & 1.685 Ha HAS BEEN RECEIVED IN APRIL, 2008 & MARCH, 2010 RESPECTIVELY AND LEASE DEED FOR BOTH HAVE BEEN EXECUTED IN FEBRUARY, 2012 2. LAND CASE OF ADDITIONAL LAND 1.147 Ha HAS BEEN SUBMITTED AT NODAL OFFICE DEHRADUN ON JUNE, 2013 3. LAND CASE OF ADDITIONAL 0.66 Ha WAS SUBMITTED TO NODAL OFFICE DEHRADUN ON JUNE, 2013
6	PILANGAD-I SMALL	NOT APPLICABLE	COMMISSIONED ON

SL.NO.	PROJECT NAME	TYPE & AREA OF LAND REQUIREMENT	LAND STATUS
	HYDRO PROJECT		2004
7	SONGAD SMALL HYDRO PROJECT	NOT APPLICABLE	SURVEY AND INVESTIGATION WORKS UNDER PROGRESS
8	PILANGAD-II SMALL HYDRO PROJECT		
9	SIYANGAD SMALL HYDRO PROJECT	FOREST LAND- 4.990 Ha	FOREST CLEARANCE APPLICATION SUBJUDICE UNDER HON'BLE SUPREME COURT IN MATTER OF 24 HYDROPROJECTS.
10	KAKORAGAD SMALL HYDRO PROJECT	FOREST LAND- 4.9675 Ha	FOREST CLEARANCE APPLICATION SUBJUDICE UNDER HON'BLE SUPREME COURT IN MATTER OF 24 HYDROPROJECTS.
11	JALANDHARYGAD SMALL HYDRO PROJECT	FOREST LAND- 13.2175 Ha	FOREST CLEARANCE APPLICATION SUBJUDICE UNDER HON'BLE SUPREME COURT IN MATTER OF 24 HYDROPROJECTS.

COMPLIANCE OF DIRECTIONS ISSUED BY MONITORING COMMITTEE

In compliance to the Directions received in the Meeting headed by Hon'ble Chief Secretary, Uttarakhand held on dated 21.11.2015 at Dehradun, further submission is as here under:

- ❖ The criterion of “*Permitted Category*” of Small Hydro Project Upto 02 MW capacity in the Eco Sensitive Zone seems technically irrelevant.
- ❖ The Design of any Hydro Power Project is done mainly on the basis of Available Head & Discharge of the River.
- ❖ Capacity of the Project is calculated as per the formula given below:

$$P = 8.47 \times Q \times H$$
 Where P = Proposed Capacity of the Plant (in KW)
 Q = Design Discharge of the Project (in Cumec)
 H = Net Available Head (in Meters)
- ❖ From the above formula, capacity of the Project is directly proportional to Q & H. Hence it is clear that for more discharge low head or for High Head Less discharge is required to achieve same capacity of the Project.
- ❖ For the design of Small Hydro Project of same capacity, less Discharge is required for High head. Therefore small structures of the Project shall be required due to less discharge.
- ❖ In the case of UJVNL, almost all the Small Hydro Projects are high head Projects (more than 100 m) and Projects are proposed on Small River/Gad (i.e. Tributary of the Main River) due to which structures of Projects are very small in sizes.
- ❖ Necessary measures with respect to safeguard the ecology & environment are already explained under the head of “proposed standard to be followed during construction of Small Hydro Project”.

Point wise compliance of directions is as under:

S.No	Direction received	Direction incorporated
1	Storing excess water flowing during monsoon only.	Since SHPs are run off the river Projects, hence no storage of excess water shall be made during monsoon.
2	Allowing non-monsoon flow of water downstream of the project as usual.	20% water of average non-monsoon flows is released continuously at the downstream of the Project for the ecological and environmental point of view.
3	Providing fish ladder in the reservoir area so that fishes can migrate from upstream to downstream and vice-versa as and when required.	As the Small Hydro Projects are run off the river & there is no formation of reservoir, hence, no fish ladder is required in the projects.
4	Doing proper treatment in the catechment area of the project.	Proper treatment in catchment area shall be ensured as already explained under the heading “proposed standard to be followed during construction of SHP”.

**BHAGIRATHI ECO SENSITIVE
ZONE
ZONAL MASTER PLAN**

For

MANERI BHALI HEP STAGE –I & II

UJVN Ltd

- NOTIFICATION REGARDING BHAGIRATHI ECO SENSITIVE ZONE REGULATES THE ACTIVITIES OF EXISTING POWER PLANTS
- UJVNL LTD SEEKS TO INCORPORATE THE ACTIVITIES OF ITS EXISTING HYDRO-POWER PLANT LOCATED IN BHAGIRATHI VALLEY UNDER THE PROVISION OF SAID ACT.

In Uttarakashi District UJVNL has two existing Hydro-Electric Projects on Bhagirathi River

1. Maneri Bhali HEP Stage-I: 3x30 MW: Stretching from Village Maneri to Village Tiloth
2. Maneri Bhali HEP Stage-II: 4x76 MW: Stretching from Village Kansain to Dharasu

Maneri Bhali HEP Stage-I

- Project was commenced in 1973
- Project was commissioned in 1984
- Brief Description of Project

Dam is located in D/s of Maneri Village. It is a diversion dam from where Head Race Tunnel of length 8.63 km takes off. Power house of project is located near Tiloth village, across the Bhagirathi river, in Uttarkashi city with total installed capacity 90MW (3x30MW)

Geographical Location of Maneri Dam: Longitude 78°30'E ; Latitude 30°44.5'N

Salient features are appended as Annexure-I

Routine Operational Activity

- For generating the power 90MW , flow of water in tunnel is maintained to 70 cumecs. (2662.5 cusecs)
- Water level is kept at 1294m El except monsoon season.
- During monsoon season water level is kept at 1290m. and excess discharge is allowed to flow into the river.

Usually, river discharge becomes more than 70 cumecs from May to mid of October

- When river discharge is decreased below 70 cumecs, all spillway Gates are fully closed. This condition usually prevails from mid of October to end of April.
- During monsoon, quantum of trash flowing in the river is used to very high, hence trash rack often gets choked and caused head loss. Limit of head loss is 100cm.

Similarly during monsoon, silt content in river water is used to very high and power house can not be run when silt content in river water reaches upto limiting value of 1500 ppm.

- Whenever one of the above two condition prevails at Dam, shut down for power house is allowed and all gates of dam are fully opened.

Before release of water from dam, warning is communicated in down stream through public address system and bulk sms

ROUTINE MAINTENANCE & Repair Activity

- After retreat of monsoon, structures and hydro-mechanical components of dam and power house, detail is in Annexure-I, are inspected and damages are repaired.

In monsoon season, most of the damages occurred in roller bucket and spillway of dam. Hence a periodic repair in every three years is required. Under this activity, after de-silting of roller bucket, spillway and roller bucket are repaired accordingly. This activity enhances the life of dam.

BENEFIT

- Generation from the project : 460 MU
- Market Rate (Approx) : Rs4.50 per unit
- Market Cost of Generated Electricity from the project (Approx) : Rs270/- crore
- Nos of Employees employed in the project (Permanent/Temporary) : 260 Nos
- Nos of person employed through contractor (Approx) : 100Nos

Cost of Project:-

- Cost of Project (1990 base) : Rs 92.19 crore
- Cost of Project (2015) : Rs 700/- crore (Approx)
- As Hydro-mechanical component like gates, sills , guides and stop-log gates etc always faced moist condition hence a periodic epoxy painting after sand blasting on surfaces is required which enhances the life of hydro-mechanical components
- Besides dam and power house, Joshiyara Barrage colony, Shaktipuram Colony Chinyalisaur are also maintained regularly where personnel deputed in operation and maintenance of Barrage and power house resides. Sweeping, cleaning and garbage disposal is an essential part of this activity.
- All above repair and maintenance are of regular schedule and mandatory for smooth operation of HEP's

MANERI BHALI HEP STAGE – II

- Project was commenced in 1981.
- Project was commissioned in 2008
- Brief description of project :- Barrage of the project is located just D/s of Uttarkashi city near village Kansain. It is a diversion barrage from where Head Race Tunnel of length 16 Kms takes off . power house of projects is located at Dharasu with total installed capacity 304 MW(4X76MW).
- Geographical location of Joshiyara Barrage Longitude 78⁰25'25'' E; Latitude 30⁰43'46'' N
- Salient features are appended as Annexure-II

Routine Operational Activity

- For generating the power 304MW , flow of water in tunnel is maintained to 142 cumecs. (5041 cusecs)
- Water level is kept at 1108m El except monsoon season.
- During monsoon season water level is kept at 1106m and excess discharge is allowed to flow into the river.
Usually, river discharge becomes more than 142 cumecs from June to September
- When river discharge is decreased below 142 cumecs, all spillway Gates are fully closed. This condition usually prevails from October to May.
- During monsoon, quantum of trash flowing in the river is used to very high, hence trash rack often gets choked and caused head loss. Limit of head loss is 100cm.
- Similarly during monsoon, silt content in river water is used to very high and power house can not be run when silt content in river water reaches upto limiting value of 3000 ppm.
- Whenever one of the above two condition prevails at Dam, shut down for power house is allowed and all gates of dam are fully opened.
- Before release of water from dam, warning is communicated in down stream through public address system and bulk sms
- Every year after retreat of monsoon, structures and hydro mechanical components of dam and power house, detail is in annexure-II are inspected and damages are repaired.
- In monsoon season, most of the damages occurred in Floor and Glacis of spillway of Barrage. Hence a periodic repair in every three years is required. Under this activity, after de-silting of Floor in U/s as well in D/s, spillway and floor are repaired accordingly. This activity enhances the life of Barrage.
- As Hydro-mechanical component like gates, sills , guides and stop-log gates etc always faced moist condition hence a periodic epoxy painting after sand blasting on surfaces is required which enhances the life of hydro-mechanical components
- Besides dam and power house, Joshiyara Barrage colony, Shaktipuram Colony Chinyalisaur are also maintained regularly where personnel deputed in operation and maintenance of Barrage and power house resides. Sweeping, cleaning and garbage disposal is an essential part of this activity.
- All above repair and maintenance are of regular schedule and mandatory for smooth operation of HEP's

BENEFIT

- Generation from the project : 1533 MU
- Market Rate (Approx) : Rs4.50 per unit
- Market Cost of Generated Electricity from the project (Approx) : Rs689/- crore
- Nos of Employees employed in the project (Permanent/Temporary) : 350 Nos
- Nos of person employed through contractor (Approx) : 150Nos

COST

Cost of Project (2008 base) : Rs 2323/- crore

APDA RELATED WORK

- During unprecedented flood of 2012 and 2013 both banks of Bhagirathi river got severally damaged hence threat was ahead incoming monsoon of 2014.
- To save the life and property of people of Uttarakashi, protection of river banks was started before monsoon of 2014 from Joshiyara Barrage to Tiloth Bridge under Disaster Management Act 2005 issued by Govt Of India
- Under the provision of clause-72 of this act, work related to disaster are not effected by the Act of Eco sensitive Zone. Hence Apda related on going works should be exempted from Prohibited and Regulated category of Eco sensitive zone.
- At present most of the river training works are on verge of completion.

Following are Apda related work carried by UJVNL:

1. River training work including misc. associated works on both banks of Bhagirathi river from Joshiyara Jhula pul to Tiloth bridge excluding left bank from Tiloth bridge to switch yard
 2. Construction of protection wall around the reservoir rim of Joshiyara Barrage, Uttarakashi.
 3. River Training works on left bank of Bhagirathi River near Tiloth Power House from TRC to 50 u/s of Tiloth Bridge
- All training works are constructed with rigid CC gravity / RCC wall.
 - No protruding structures / spurs are constructed in river training works are co
 - No flexible structures like gabions or CC blocks are constructed for training works.

**MANERI BHALI HYDRO ELECTRIC PROJECT STAGE-I
(3 X 30 MW)
SALIENT FEATURES**

1-DAM

LOCATION

Tehsil	Bhatwari
District	Uttarkashi
Longitude	78° 32'E
Latitude	30° 44.5'N
Source of Supply	Bhagirathi River
Catchment Area	4024 sq. km.
Average Rain fall	1000mm to 1500mm
Design Discharge	5000 Cumecs
Type	Concrete Gravity
R.L. of Top of the Dam	1298.00 m
Deepest Foundation Level	1259.00 m
Height of the Dam above Deepest Foundation	39.00 m
Crest Length	127.00 m
Crest Width	6.50 m
R.L. of Spillway Crest	1280.50 m
Spillway crest Length Including Piers	64.00 m
No. & Size of Spillway Gates	4 Nos. Each of 13.00 x 14.55 m Size
Type of Spillway Gates	Radial Tainted Type with Electrically Operated Hoists.
Energy Dissipaters	Slotted Roller Bucket Type
Volume content of Dam	600000.00 Cum
Maximum Storage Level	1294.50 m
Free Board	2.70 M
Seismic Intensity	8.00
Depth and Width of Cutoff	1.50 m & 1.00 m

2- Intake Works:

R.L. of Crest	1283.25 m
No. & Size of Bays	3 nos. 9.00 m Wide Each
By Pass Channel	3.00 m Wide on the Left Side
Trash Rack Opening	From Elevation 1283.252 m to 1289.00 m
Spacing of Trash Strips	85 mm Center to Center
Size of Each Trash Rack Unit	1750 mm Wide x 5840 mm Height
	8 nos. Hoppers in Two Rows. Size of Hoppers 15.00 x 15.70 m connected to a Single Flushing Conduit of 2.20 m Dia and 300 m Length

3.Sedimentation Tank

4. H.R.T.

Type	4.75 M Dia Circular Section
Length	8.63 Km.
	1278.50/1249.10
Slope	1:160,1:150
Thickness of Limning	300 mm is General and in Some Small Length it is 500 mm Thick
Construction Shaft	At chainage 158.5 m of H.R.T. 7.00 m Dia and

Adits	23.00 m Depth One at chainage 3332 m of H.R.T. is of 4.80 m width and 473.00 m Length. Another at Chainage 8476 m of H.R.T. is of 4.80 m Width and 274 m Length
5. Surge Shaft	
Type	Restricted Office Type Underground with Underground Lower and Upper expansion Chambers.
Size	11.00 Dia
Height	69.00 m
Lower Expansion Chamber	89.50 m Long and 6.00 Dia.
Upper Expansion Chamber	316.00 m Long and 6.00 m Dia
Ventilation Tunnel	118.00 m Long x 4.00 m x 4.50 m
5. Penstock	
Number and Type	Single Underground Penstock of 3.80 m Dia, With 3 Branches Each of 2.50 m Dia
Length	415 m
6. Power House	
Gross Head	180.00 m
Size	56.00 m 19.45 m
Installed Capacity	3x30 MW
Firm Power Capacity	33.23MW at 90% Availability of Discharge
Type of Turbines	Francis Vertical Shaft
General Level of Power House	1122.85 m
Lowest Foundation Level of Power House	1100.00 m
Annual Power Generation	545.829 x 106 K.W.H. The Power is Generated at 11.00 KV and is Stepped upto 220 KV by Three nos. 11/220 Transformers.
7. The Tail Race	
Length	120.00 m
Type & Size of Tail Race Channel	Trapezoidal Section 27.50 m Bed Width with Side Slopes 1:5:1
8. Cost	92.19 Crores. (1990 Base)
9. Year of Commencement	1973
10. Year of Completion	1984

MANERI BHALI HYDROELECTRIC PROJECT STAGE-II

SALIENT FEATURES

1.	Geographic Location	In Uttarakhand, India (District-Uttarkashi)
2.	Location of Barrage	At 950m downstream of Joshiyara steel bridge and about 2.5 Kms downstream of confluence of Tail Race Channel of Power house of Stage-I
3.	Hydrology	
	i. Catchment area of Barrage Site	4416 Sq. Kms.
	ii. Snow catchment area above 12000 ft.	3199 Sq. kms
	iii. 90% available discharge	27.0 Cumecs.
	iv. Design Flood	
	a. For hydraulic design	5000 Cumecs.
	b. For over topping	8000 Cumecs.
4.	Barrage	
	i. Overall length	81 Metres
	ii. Clear Spans	5 bay each 13 M wide with 4 M intermediate piers.
	iii. Number & Size of 5 Nos. gates	Radial gates of size 13 M(Width) x 15.35 M (height)
	iv. Crest level of barrage	El. 1093.0 M
	v. Pond level	
	a. Max.	El. 1108.0 M
	b. Min.	El. 1103.0 M
	vi. Top of gate	El. 1108.35 M
	vii. Live Storage	7.55 Lac Cum.
5.	Intake	
	i. Location	On left bank of barrage at an angle of 113° with the barrage axis
	ii. Total length	56.0 Metres
	iii. No. of bays	6 bays of 8.0 M wide with 1.5 M intermediate piers.
	iv. Crest elevation	El. 1099.25 M
	v. Number and size of gates	6 Nos. fixed wheel gates of size 8 M (width) x 6.75 M (height)
6.	Sedimentation Chamber	
	i. Size of silt settling tank	93.00 M wide x 182 M long
	ii. Number of hoppers	97 Nos.
	iii. Size of hoppers	13 M x 13 M
	iv. Top level of hoppers	El. 1098.8 M
	v. Bottom level of conduits at exit	El. 1096.4 M

	vi. Design discharge of flushing	77.6 Cumecs.
	vii. Full supply level in tank	El. 1108.0 M
	viii. Particle size to be removed	Above 0.15 MM
7	Fore Bay	
	i. Location	Downstream of the sedimentation chamber with gate arrangement.
	ii. Total length	93.0 M
	iii. Number of bays	10 Nos. fixed wheel gate of size 7.7 x 8.25 M
8	Cut and cover section	
	i. Location	Between the forebay and head race tunnel
	ii. Length	About 43 Metres
	iii. Size	6 M dia horse shoe shape
	iv. Invert level at Junction with H.R.T.	El. 1094.0 Metres
	Head Race Tunnel	
	i. Type	Horse shoe 6.0 M dia.
	ii. Length	16.00 Km
	iii. Thickness of lining	30 Cms. To 40 Cms.
	iv. Design Discharge (Max.)	142 Cumecs.
	v. Maximum Velocity	4.75 M per sec.
	vi. Invert Elevation	El. 1094.0 M
	a. Inlet	
	b. Intermediate adit junction	El. 1040.0 M
	c. Invert level at Surge tank	El. 1000.0 M
	vii. Grade	
	a. Upto intermediate adit	1 in 159
	b. Beyond	1 in 189
	viii. Intermediate adit at Dhanarigad	
	a. Size	D- Shaped 6 M dia.
	b. Length	760 Metres
	ix. Surge Tank adit	
	a. Type	D- Shaped 6 M dia.
	b. Size	137 Metres
1	Surge Tank	
	i. Type	Restricted orifice type
	ii. Size	13.7 M dia and about 172 M high
	iii. Bottom Elevation Of tank	El. 1002.20 M
1	Penstocks	
	i. Main Penstocks	4 Nos. , 3.0 M dia.
	ii. Length of each	About 800 M

	Penstock	
12.	Power House	
	i. Location	Near Dharasu on left bank of river Bhagirathi to be located in a cut at the terrace at El. 892 M.
13.	ii. Head	
	a. Gross Head	285 Metres
	b. Net Head at discharge of 142 Cumecs	247.30 Metres (on low level of Tehri reservoir) 237.60 Metres (on full level of Tehri reservoir)
	iii. Installed Capacity	304 MW (4 Machines of 76 MW each)
	iv. Type of Turbine	Francis Vertical Shaft
	v. Generator floor level	832.42 M
	vi. Rated flow	35.5 m ³ /sec through each turbine
14.	Tail Race Channel	
	i. Shape of TRC	Rectangular section
	ii. Width of TRC	16.00 m
	iii. Length of TRC	51.35 m
	iv. Bed level of TRC	El815.995 m
	v. Top level of front wall of TRC	El838.000 m
	vi. Draft tube opening)	two opening of size 4.2415 m width and 2.24 m height
	vii. Minimum TRC water level for 1 machine	El 822.0 m
	viii. Minimum TRC water level for 4 machine	El 823.0 m
	ix. Maximum TRC water level for 4 machine	El 830.0 m
	x. Design discharge of each machine	35.3 Cumec
15.	Year of commencement	1981
16.	Year of completion	2008

MANERI BHALI HYDRO ELECTRIC PROJECT STAGE-I (3 X 30 MW)

SALIENT FEATURES

1-DAM	
LOCATION	
Tehsil	Bhatwari
District	Uttarkashi
Longitude	78° 32'E
Latitude	30° 44.5'N
Source of Supply	Bhagirathi River
Catchment Area	4024 sq. km.
Average Rain fall	1000mm to 1500mm
Design Discharge	5000 Cumecs
Type	Concrete Gravity
R.L. of Top of the Dam	1298.00 m
Deepest Foundation Level	1259.00 m
Height of the Dam above Deepest Foundation	39.00 m
Crest Length	127.00 m
Crest Width	6.50 m
R.L. of Spillway Crest	1280.50 m
Spillway crest Length Including Piers	64.00 m
No. & Size of Spillway Gates	4 Nos. Each of 13.00 x 14.55 m Size
Type of Spillway Gates	Radial Tainted Type with Electrically Operated Hoists.
Energy Dissipaters	Slotted Roller Bucket Type
Volume content of Dam	600000.00 Cum
Maximum Storage Level	1294.50 m
Free Board	2.70 M
Seismic Intensity	8.00
Depth and Width of Cutoff	1.50 m & 1.00 m
2- Intake Works:	
R.L. of Crest	1283.25 m
No. & Size of Bays	3 nos. 9.00 m Wide Each
By Pass Channel	3.00 m Wide on the Left Side
Trash Rack Opening	From Elevation 1283.252 m to 1289.00 m
Spacing of Trash Strips	85 mm Center to Center
Size of Each Trash Rack Unit	1750 mm Wide x 5840 mm Height
Sedimentation Tank	8 nos. Hoppers in Two Rows. Size of Hoppers 15.00 x 15.70 m connected to a Single Flushing Conduit of 2.20 m Dia and 300 m Length

3. H.R.T.	
Type	4.75 M Dia Circular Section
Length	8.63 Km.
Slope	1278.50/1249.10
Thickness of Lining	1:160, 1:150
Construction Shaft	300 mm is General and in Some Small Length it is 500 mm Thick
Adits	At chainage 158.5 m of H.R.T. 7.00 m Dia and 23.00 m Depth
	One at chainage 3332 m of H.R.T. is of 4.80 m width and 473.00 m Length. Another at Chainage 8476 m of H.R.T. is of 4.80 m Width and 274 m Length
4. Surge Shaft	
Type	Restricted Office Type Underground with Underground Lower and Upper expansion Chambers.
Size	11.00 Dia
Height	69.00 m
Lower Expansion Chamber	89.50 m Long and 6.00 Dia.
Upper Expansion Chamber	316.00 m Long and 6.00 m Dia
Ventilation Tunnel	118.00 m Long x 4.00 m x 4.50 m
5. Penstock	
Number and Type	Single Underground Penstock of 3.80 m Dia, With 3 Branches Each of 2.50 m Dia
Length	415 m
6. Power House	
Gross Head	180.00 m
Size	56.00 m 19.45 m
Installed Capacity	3x30 MW
Firm Power Capacity	33.23MW at 90% Availability of Discharge
Type of Turbines	Francis Vertical Shaft
General Level of Power House	1122.85 m
Lowest Foundation Level of Power House	1100.00 m
Annual Power Generation	545.829 x 106 K.W.H. The Power is Generated at 11.00 KV and is Stepped upto 220 KV by Three nos. 11/220 Transformers.
7. The Tail Race	
Length	120.00 m
Type & Size of Tail Race Channel	Trapezoidal Section 27.50 m Bed Width with Side Slopes 1:5:1
8. Cost	
9. Year of Commencement	92.19 Crores. (1990 Base)
10. Year of Completion	1973
	1984

MANERI BHALI HYDROELECTRIC PROJECT STAGE-II**SALIENT FEATURES**

Geographic Location	In Uttarakhand, India (District-Uttarkashi)
Location of Barrage	At 950m downstream of Joshiyara steel bridge and about 2.5 Kms downstream of confluence of Tail Race Channel of Power house of Stage-I
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i. Catchment area of Barrage Site	4416 Sq. Kms.
ii. Snow catchment area above 12000 ft.	3199 Sq. kms
iii. 90% available discharge	27.0 Cumecs.
iv. Design Flood	
a. For hydraulic design	5000 Cumecs.
b. For over topping	8000 Cumecs.
Barrage	
i. Overall length	81 Metres
ii. Clear Spans	5 bay each 13 M wide with 4 M intermediate piers.
iii. Number & Size of 5 Nos. gates	Radial gates of size 13 M(Width) x 15.35 M (height)
iv. Crest level of barrage	El. 1093.0 M
v. Pond level	
a. Max.	El. 1108.0 M
b. Min.	El. 1103.0 M
vi. Top of gate	El. 1108.35 M
vii. Live Storage	7.55 Lac Cum.
Intake	
i. Location	On left bank of barrage at an angle of 113° with the barrage axis
ii. Total length	56.0 Metres
iii. No. of bays	6 bays of 8.0 M wide with 1.5 M intermediate piers.
iv. Crest elevation	El. 1099.25 M
v. Number and size of gates	6 Nos. fixed wheel gates of size 8 M (width) x 6.75 M (height)
Sedimentation Chamber	
i. Size of silt settling tank	93.00 M wide x 182 M long

ii.	Number of hoppers	97 Nos.
iii.	Size of hoppers	13 M x 13 M
iv.	Top level of hoppers	EI. 1098.8 M
v.	Bottom level of conduits at exit	EI. 1096.4 M
vi.	Design discharge of flushing	77.6 Cumecs.
vii.	Full supply level in tank	EI. 1108.0 M
iii.	Particle size to be removed	Above 0.15 MM
Fore Bay		
	Location	Downstream of the sedimentation chamber with gate arrangement.
ii.	Total length	93.0 M
iii.	Number of bays	10 Nos. fixed wheel gate of size 7.7 x 8.25 M
Cut and cover section		
i.	Location	Between the forebay and head race tunnel
ii.	Length	About 43 Metres
iii.	Size	6 M dia horse shoe shape
iv.	Invert level at Junction with H.R.T.	EI. 1094.0 Metres
Head Race Tunnel		
i.	Type	Horse shoe 6.0 M dia.
ii.	Length	16.00 Km
iii.	Thickness of lining	30 Cms. To 40 Cms.
iv.	Design Discharge (Max.)	142 Cumecs.
v.	Maximum Velocity	4.75 M per sec.
vi.	Invert Elevation	EI. 1094.0 M
a.	Inlet	
b.	Intermediate adit junction	EI. 1040.0 M
c.	Invert level at Surge tank	EI. 1000.0 M
vii.	Grade	
a.	Upto intermediate adit	1 in 159
b.	Beyond	1 in 189
iii.	Intermediate adit at	

Dhanarigad	
a. Size	D- Shaped 6 M dia.
b. Length	760 Metres
ix. Surge Tank adit	
a. Type	D- Shaped 6 M dia.
b. Size	137 Metres
Surge Tank	
Type	Restricted orifice type
ii. Size	13.7 M dia and about 172 M high
ii. Bottom Elevation Of tank	El. 1002.20 M
Penstocks	
Main Penstocks	4 Nos. , 3.0 M dia.
ii. Length of each Penstock	About 800 M
Power House	
Location	Near Dharasu on left bank of river Bhagirathi to be located in a cut at the terrace at El. 892 M.
ii. Head	
a. Gross Head	285 Metres
b. Net Head at discharge of 142 Cumecs	247.30 Metres (on low level of Tehri reservoir) 237.60 Metres (on full level of Tehri reservoir)
iii. Installed Capacity	304 MW (4 Machines of 76 MW each)
iv. Type of Turbine	Francis Vertical Shaft
v. Generator floor level	832.42 M
vi. Rated flow	35.5 m ³ /sec through each turbine
Tail Race Channel	
Shape of TRC	Rectangular section
ii. Width of TRC	16.00 m
iii. Length of TRC	51.35 m
iv. Bed level of TRC	El815.995 m
v. Top level of front wall of TRC	El838.000 m
vi. Draft tube opening)	two opening of size 4.2415 m width and 2.24 m height

vii.	Minimum TRC water level for 1 machine	EI 822.0 m
iii.	Minimum TRC water level for 4 machine	EI 823.0 m
ix.	Maximum TRC water level for 4 machine	EI 830.0 m
x.	Design discharge of each machine	35.3 Cumec
	Year of commencement	1981
	Year of completion	2008



भारत का राजपत्र The Gazette of India

असाधारण

EXTRAORDINARY

भाग II — खण्ड 1

PART II — Section 1

प्राधिकार से प्रकाशित

PUBLISHED BY AUTHORITY

नं० 64] नई दिल्ली, सोमवार, दिसम्बर 26, 2005 / पौष 5, 1927
No. 64] NEW DELHI, MONDAY, DECEMBER 26, 2005 / PAUSA 5, 1927

इस भाग में बिना पृष्ठ संख्या दी जाती है जिससे कि यह अलग संकलन के रूप में रखा जा सके।
Separate paging is given to this Part in order that it may be filed as a separate compilation.

MINISTRY OF LAW AND JUSTICE (Legislative Department)

New Delhi, the 26th December, 2005/Pausa 5, 1927 (Saka)

The following Act of Parliament received the assent of the President on the 23rd December, 2005 and is hereby published for general information:—

THE DISASTER MANAGEMENT ACT, 2005 No. 53 of 2005

[23rd December, 2005.]

An Act to provide for the effective management of disasters and for matters connected therewith or incidental thereto:

BE it enacted by Parliament in the Fifty-sixth Year of the Republic of India as follows:—

CHAPTER I

PRELIMINARY

1. (1) This Act may be called the Disaster Management Act, 2005.

(2) It extends to the whole of India.

(3) It shall come into force on such date as the Central Government may, by notification in the Official Gazette appoint; and different dates may be appointed for different provisions of this Act and for different States, and any reference to commencement in any provision of this Act in relation to any State shall be construed as a reference to the commencement of that provision in that State.

Short title,
extent and
commence-
ment.

71. No court (except the Supreme Court or a High Court) shall have jurisdiction to entertain any suit or proceeding in respect of anything done, action taken, orders made, direction, instruction or guidelines issued by the Central Government, National Authority, State Government, State Authority or District Authority in pursuance of any power conferred by, or in relation to its functions, by this Act.

Bar of jurisdiction of court.

72. The provisions of this Act shall have effect, notwithstanding anything inconsistent therewith contained in any other law for the time being in force or in any instrument having effect by virtue of any law other than this Act.

Act to have overriding effect.

73. No suit or prosecution or other proceeding shall lie in any court against the Central Government or the National Authority or the State Government or the State Authority or the District Authority or local authority or any officer or employee of the Central Government or the National Authority or the State Government or the State Authority or the District Authority or local authority or any person working for on behalf of such Government or authority in respect of any work done or purported to have been done or intended to be done in good faith by such authority or Government or such officer or employee or such person under the provisions of this Act or the rules or regulations made thereunder.

Action taken in good faith.

74. Officers and employees of the Central Government, National Authority, National Executive Committee, State Government, State Authority, State Executive Committee or District Authority shall be immune from legal process in regard to any warning in respect of any impending disaster communicated or disseminated by them in their official capacity or any action taken or direction issued by them in pursuance of such communication or dissemination.

Immunity from legal process.

75. (1) The Central Government may, by notification in the Official Gazette, make rules for carrying out the purposes of this Act.

Power of Central Government to make rules.

(2) In particular, and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely:—

(a) the composition and number of the members of the National Authority under sub-section (2), and the term of office and conditions of service of members of the National Authority under sub-section (4), of section 3;

(b) the allowances to be paid to the members of the advisory committee under sub-section (2) of section 7;

(c) the powers and functions of the Chairperson of the National Executive Committee under sub-section (3) of section 8 and the procedure to be followed by the National Executive Committee in exercise of its powers and discharge of its functions under sub-section (4) of section 8;

(d) allowances to be paid to the persons associated with the sub-committee constituted by the National Executive Committee under sub-section (3) of section 9;

(e) the number of members of the National Institute of Disaster Management under sub-section (2), the term of the office and vacancies among members and the manner of filling such vacancies under sub-section (3) and the manner of constituting the Governing Body of the National Institute of Disaster Management under sub-section (4) of section 42;

(f) the manner of constitution of the Force, the conditions of service of the members of the Force, including disciplinary provisions under sub-section (2) of section 44;

(g) the manner in which notice of the offence and of the intention to make a complaint to the National Authority, the State Authority, the Central Government, the State Government or the other authority or officer under clause (b) of section 60;

(h) the form in which and the time within which annual report is to be prepared under section 70;

**Zonal Master Plan of
UPCL in Eco sensitive zone
from
Matli to Gangotri**

Detail of Departmental assets established for continuous electric supply at Eco sensitive zone from Barethi bridge to Dharali, Gangotri.

33/11 S/s Ladari	:	8+8MVA Power T/f
33/11 S/s Gangori	:	3+3MVA Power T/f
33/11 S/s Malla, Bhatwari	:	3 MVA Power T/f
Length of 33 KV line	:	53.5 Km.
Length of 11 KV line	:	157 Km.
Length of LT line	:	360 Km.
11/0.4 KV 400 KVA S/s	:	8 Nos.
11/0.4 KV 250 KVA S/s	:	22 Nos.
11/0.4 KV 100 KVA S/s	:	65 Nos.
11/0.4 KV 63 KVA S/s	:	47 Nos.
11/0.4 KV 25 KVA S/s	:	83 Nos.
11/0.4 KV 16 KVA S/s	:	14 Nos.
No. of consumers	:	11250 Nos.

The current status of announcement no. 59/2008 by Hon'ble CM, Uttarakhand government.

According to the Hon'ble Chief Minister, Uttarakhand government announcement the construction of 33/11 Kv S/s has been proposed at Jhala, Harshil. The proposal for transferring of forest land to UPCL has been uploaded on the website of forest department. After transferring forest land to UPCL, the construction of 33/11 KV S/s at Jhala will be started soon.

Total Cos of work : 338.61 Lakh.

The proceeding work detail under financial year 2015-16, at Eco sensitive zone (Barethi bridge to Dharali, Gangotri)

- ▶ **Increasing capacity of power T/F from 1.5 MVA to 3.15 MVA at 33/11 KV S/s Malla, Bhatwari. (24.60 Lakh)**
- ▶ **Laying of LT Aerial bunch cable at Vill. Utraon, Ganeshpur, Pata] Sangrali, Kelsu, Agoda, Dasda, Dandalka, Bhankoli, Naugaon & Chinwa (33.10 Lakh)**
- ▶ **Laying of LT Aerial bunch cable at different places of Uttarkashi town like Bhairaw chowk, Vishwanath chowk, Barahaat, Tambakhani, Guphiyara, Ujeli, Ganga nagar & Kot-bangla. (91.491 Lakh)**
- ▶ **Construction of 4 No's 11 KV feeder from 33/11 KV S/s Gangori. (23.83 Lakh)**
- ▶ **Laying of LT aerial bunch cable at different places of block Bhatwa (24.85 Lakh)**
- ▶ **Laying of LT aerial bunch cable at Vill. Jaspur, Purali, Sukki, Jhala, Harsi, Mukhba, Dharali etc (37.47 Lakh)**
- ▶ **Laying of LT aerial bunch cable at Vill. Gorsali, Malla, Lata, Raithal, Nateen etc (55.53 Lakh)**
- ▶ **I/c of S/s from 100+100 KVA & construction of 11 KV line at vill. Raithal. (6.81 Lakh)**
- ▶ **Construction of 11 KV line from Harsil to Mukhba, Markunda, Dharali (29.37 Lac)**

The on-going work details under RAPDRP Project at Eco-sensitive zone at Uttarkashi Town (Barethi bridge to Dharali, Gangotri) (Expected to be completed by April-2016)

Total Cost of Work : 753.10 Lakh.

- ▶ Construction of 16.17 Kms 11 KV line at different places of Uttarkashi Town.
- ▶ Replacement of ACSR weasel conductor by laying of ACSR Raccoon conductor at different places of Uttarkashi town.
- ▶ Increasing capacity of different capacity 11/0.4 KV 59 No's DTR's at different places of Uttarkashi Town.
- ▶ Replacement of ACSR weasel conductor by laying of LT aerial bunch cable at different places of Uttarkashi town.
- ▶ Construction of HT/LT capacitor bank at 33/11 KV S/s Ladari.

The electrification work under Deen Dayal Upadhyay Gramya Jyoti Yojna (DDUGJY) of un-electrified Villages/toks of Block Bhatwari.

The electrification work of un-electrified villages/toks of block Bhatwari has been proposed under DDUGJY which has been approved by MoP, GoI. For electrification of un-electrified villages/toks 63.560 kms 11 KV/LT line & 18 nos. 11/0.4 kV S/s has to be constructed at the different places of block Bhatwari.

Total cost of the project is Rs. 547.91 Lac.

PROPOSED WORK UNDER IPDS

At present no UPCL grid supply is available at Gangotri Dham for which scheme for its electrification has been approved by MoP, GoI under IPDS in which following works are proposed

- ▶ Construction of 8 kms 11 KV line from Bhaironghati to Shri. Gangotri dham for connecting Shri. Gangotri dham to Grid supply.
- ▶ Replacement of old and damaged ACSR rabbit conductor from Gangotri to Harshil-17 kms.
- ▶ New LT line with LT ABC - 4 kms.
- ▶ New DTRs – 5Nos.

Total cost of work – 179.95 Lacs

The routine/necessary work for continuous electric supply by Electricity Department.

In case of damage of different capacity 11/0.4 KV DTR the damaged transformer has to be replace on priority basis as soon as possible for continuous supply.

District Uttarkashi has already got the largest area & also the border district of Uttarakhand state & also known as very sensitive according to the Devi apda point of view. So, due to Devi apda the lines & Sub-station are usually damage in apda period. Causes this for restoration of power supply repairing work of lines & sub-station has to be done on priority basis..

**Zonal Master Plan of
PTCUL in Eco sensitive
zone
from
Matli to Gangotri**

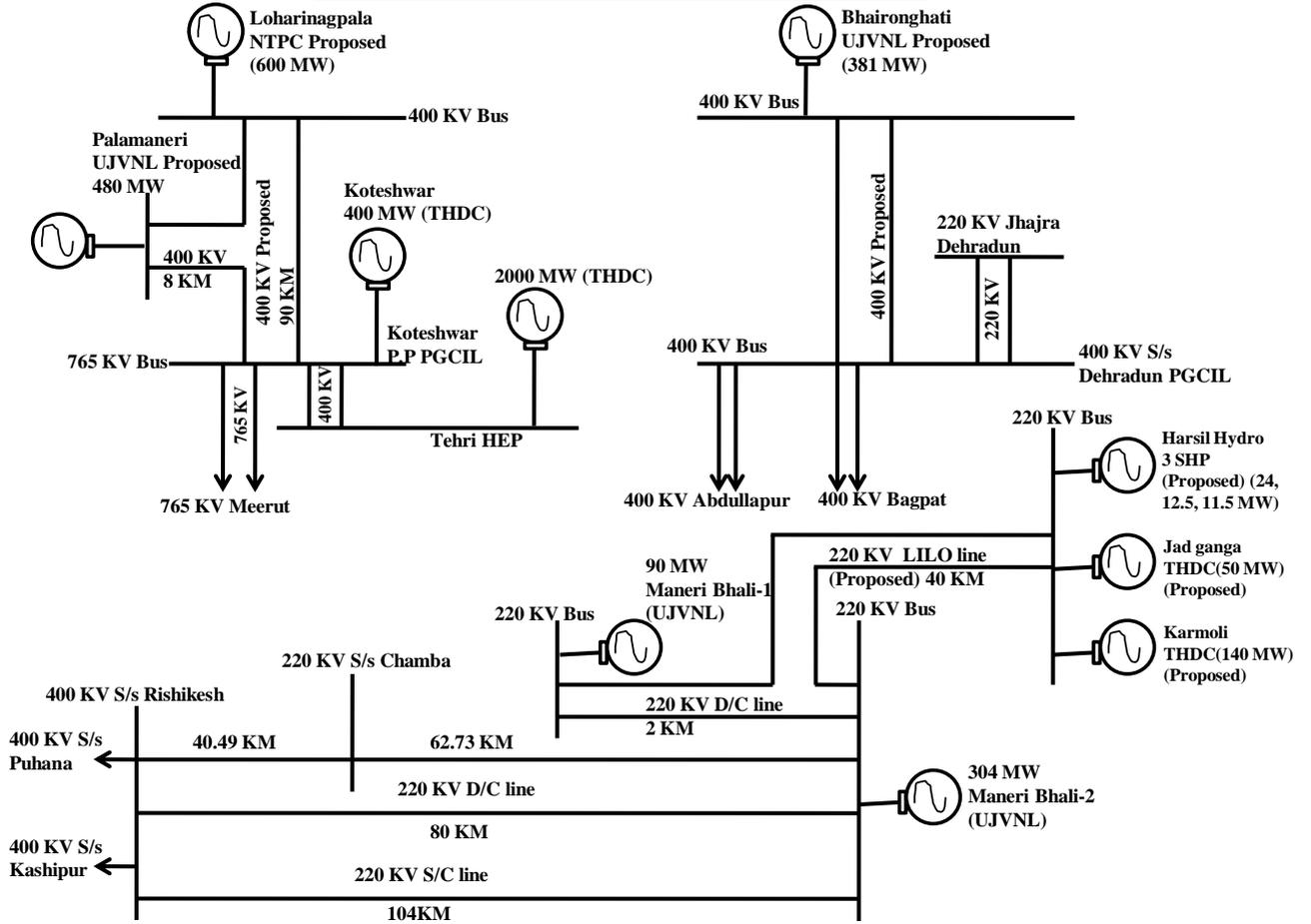
Zonal Master Plan of PTCUL in Eco sensitive zone from

Matli to Gangotri

- No fixed asset is present in Eco sensitive zone.
- As per UERC connectivity and long term open access Regulations 2015 PTCUL has planned evacuation for more than 10 MW generators.
- Proposed transmission plan for evacuation of power from proposed HEPPs in Bhagirathi basin.

Sl.No.	Name of proposed HEP	Proposed lines/Substations	Present Status
1	Lohanrinagpala (600 MW) - NTPC	400 KV D/C Loharinagpala – Koteswar line	Work has been stopped as per the decision of National Ganga River Basin Authority.
2	Pala Maneri (480 MW)- UJVNL	LILO of 1 circuit 400 KV D/C Loharinagpala – Koteswar line at Palamaneri	Work has been stopped as per the decision of National Ganga River Basin Authority.
3	Bhaironghati (381 MW) - UJVNL	400 KV D/C Bhaironghati – Dehradun Line	Work has been stopped as per the decision of National Ganga River Basin Authority.
4	Karmoli (140 MW) - THDC	1. 220 KV D/C Karmoli – Maneribhali –I Line. 2. LILO of 220 KV D/C Karmoli – Maneribhali –I Line at Jadhganga, Jalandharigad, Kakoragad & Syangad HEPPs	Transmission system shall be constructed after application for grid connectivity by proposed generators & approval from appropriate authority/regulator.
5	Jadhganga (50 MW) – THDC		
6	Jalandharigad (24 MW) – Harshil Hydro		
7	Kakoragad (12.50 MW) – Harsil Hydro		
8	Syangad (11.50 MW) – Harsil hydro		
9	Assiganga-I (4.50 MW), Assiganga-II (4.50 MW), Kaligad (9 MW), Limchi Gad (3.50 MW), Sawari Gad (2 MW), Assiganga-III (9 MW), Songad (7.50 MW), Pilangad-II (4 MW) - UJVNL	-	To be evacuated through nearest UPCL network.

Proposed Transmission System of BHAGIRATHI BASIN





SUWARIGAD SHP
(2x1000 Kw)
(UNDER CONSTRUCTION)

Suwarigad Small Hydro Project; (2 X 1000 Kw) Under Construction

- ❖ Eco-Sensitive Zone within the Project's status : Regulated
- ❖ Type of Project (Proposed / Operation/ Under Construction) : Under Construction
- ❖ Geographical Co-ordinates
 - Tranch Wier - 78⁰ 37 '18.3' 'East 30⁰ 50' 49.03 " North
 - Power House - 78⁰ 37 '42.52' 'East 30⁰ 50' 34.13 " North
- ❖ River on which the Project is located – Suwarigad
- ❖ Trench Weir river water catchment area - 35.67 sq km
- ❖ Area & Type of the land required for Construction of Project –
 - Civil Soyam Land - 2.934 Ha
 - Naap Land - 0.198 Ha
 - Total Land - 3.132 Ha
- ❖ Water conductor system type and length - Surface channel 500 m, Power Pipe 315 m

Project description: -

Suwarigad hydropower of capacity (2000 KW) classified as “MINI” Hydro Power Project. In accordance with the provisions contained in Gazette notification the Project of 02 MW the micro or small hydropower Project. To fulfill the energy requirements of the local communities with the consent of the Gram Sabha and other required subject to objections.

The Project comes under the “Regulated” category governed by gazette notification.

The Project Suwarigad is located on the right bank of the tributary of the Bhagirathi River in the mid from 1828 m to 1675 m. The provision shall be made for continuous flow in river, 20 percent water of minimum flow of the river flows continuously.

(A) Trench Weir: -

To acquire an adequate discharge for generation of the power, the construction of Diversion Structure 20 M Width (Equals to River width) shall be constructed in such a manner that neither any reservoir shall be formed nor any displacement or position of the sinking of the vegetative resources is involved due to structures to be constructed. The river flow will be sustained and it will always be ensured the flow in the river will be minimum 0.14 cumec i.e. 20% of the minimum flow of river. Natural boundaries of the river shall not affected due to construction of Trench Weir.

(B) Water Conductor System: -

The Total length of Water Conductor System will be 1240 m. In Water Conductor System, surface Channel (500 m X 1.5 m), Disilting Tank (35 m X 6.0 m), Power duct (30 m X 1.2 m) Pipe Channel (315 X 1.2 m), Forebay Tank (30 X 6.0 m) and Penstock Pipe (330 X 0.770 m) etc. are proposed.

The minimum cutting shall be done as per width of Proposed Hydraulic structures viz Power Pipes and Penstock Pipe whose lengths are 315 m and 330 m respectively. A steel Power Pipe of

1.20m dia is proposed to be laid in 1.20 m wide strip land. The surface of hill is proposed to be laid according to natural slope of the hill in width strip of 1.50 m and 1.20 m. Due to which Cutting of hill will be minimal. No tunnel is proposed in the Project. Surface channel & Power pipe are the main structures in the Water Conductor System. In which water will be carried up to Forebay for the production of electricity through 1.20m dia pipe in place of the channel. Hence due to use of 1.20m dia pipe in place of the channel, minimum land is required and hill cutting also shall be minimal accordingly.

(C) Land requirement for the construction of project: -

For the construction of the project Total 3.132 Ha Civil Soyam forest land & Private land is required. Mutation of 0.198 Ha land already has been done and in-principle approval of 2.934 Civil Soyam forest land has been received by Ministry of Environment and Forests, Government of India on 20.03.2013 after obtaining consent of local communities & Village Council in the prescribed forms.

In continuation of above land transfer proposal of 2.934 ha Civil Soyam forest land is still awaited for the formal approval from Environment and Forests, Government of India, Dehradun office since December 2014.

The suitable land have been identified and included in the proposal for the proper muck disposal excavated from construction. During Construction of the Project Provisions of task force and Indian Forest Conservation Act would be strictly followed.

(D) Switchyard and Power House :-

The construction of a Surface Power House of Size 35x8 m & Switchyard is of Size 30x36 m is proposed. Construction of Power House is proposed on a sloping terrace on the right bank of the river of Suwarigad about 15 meters from Uttarkashi-Gangotri National highway. Because of Power House is proposed on the terrace having gradient (5^0-10^0). So no hill cutting is required for the construction of Power House. Only small excavation shall be needed for leveling and foundation of the Terrace.

(E) Residential colony: -

Residential colony for the Project shall not be required. During the Project construction and operation the officers & officials of the project shall reside in Pre constructed residential colony in Bhatwari against the Pala Maneri Hydro Project. During the Project's operation personnel posted in shifts, shall go from Pala Maneri colony to Power House through vehicle.

(F) Technology to be adopted in the construction of Project: -

Detailed Project Report was prepared by the Technical experts of the IIT Roorkee after the Detail investigation, survey and study of site. The design of hydraulic structures was done after finding site suitability with the conformity of the site by site survey, detail investigation of the Technical and Geological experts of the IIT Roorkee prior to preparing the detailed Project report.

(G) COST BENEFIT ANALYSIS:

- | | |
|--|---|
| i. Total cost of the project | Rs 1550.00 lac (without interest during construction) |
| | Rs 1606.88 lac (with interest during construction) |
| ii. Debt Equity Ratio | 70:30 |
| iii. Loan Repayment Period | 07 years |
| iv. Financing Institution | NABARD |
| v. Expenditure till date | Rs 200.00 lac |
| vi. Net Saleable energy | 10.90 Million Unit |
| vii. Levelized cost of generation | Rs 2.50 per unit |
| viii. Annual Revenue from sale of energy | Rs 382.00 lac |

- **No change in costing shall be occurred due to implementation of Eco-sensitive gazette notification.**

The following standards shall be followed strictly during Project construction:

1. Heavy explosives as well as heavy machinery shall be prohibited during Project construction and all the construction work shall be done through labours and small machinery only.
2. Material excavated from construction and unused material/Debris shall be dumped only at the places indentified by the forest department.
3. Construction material required for construction work such as stone, sand and aggregate etc shall be used by transport only from pre-approved mines, No Excavation/mining shall be done for the requirement of the above material on the site. Construction material required for Remaining works shall also be transported only from pre-approved mines.
4. The natural boundaries of the Suwarigad River shall not be changed due to construction of Trench Weir and even after completion of Remaining works; natural boundaries of the river shall not change.
5. A minimum 0.14 Cumec i.e. 20% of minimum water flow in river flows shall be continuously for the environmental point of view.
6. It shall be ensured that Monthly inspection report of the experts on the environment and pollution control board shall be forwarded to Environment and Pollution control board.
7. The treatment for slopes of the hills from erosion in the Project Area shall be carried out for stability through protection works and bio-engineering techniques shall be used in protection works.
8. Treatment of debris/Muck and landscaping shall be done through Bio Engineering & Suggestions received from technical experts shall be incorporated therein.
9. In Project area construction of drains shall be made for prevention of seepage and these shall have obstacle-free flow. Flow resulting from the drains will be connected with natural drainage flow/River flow.
10. In the design for construction of hydraulic structures, the Indian standards & specifications shall be followed.

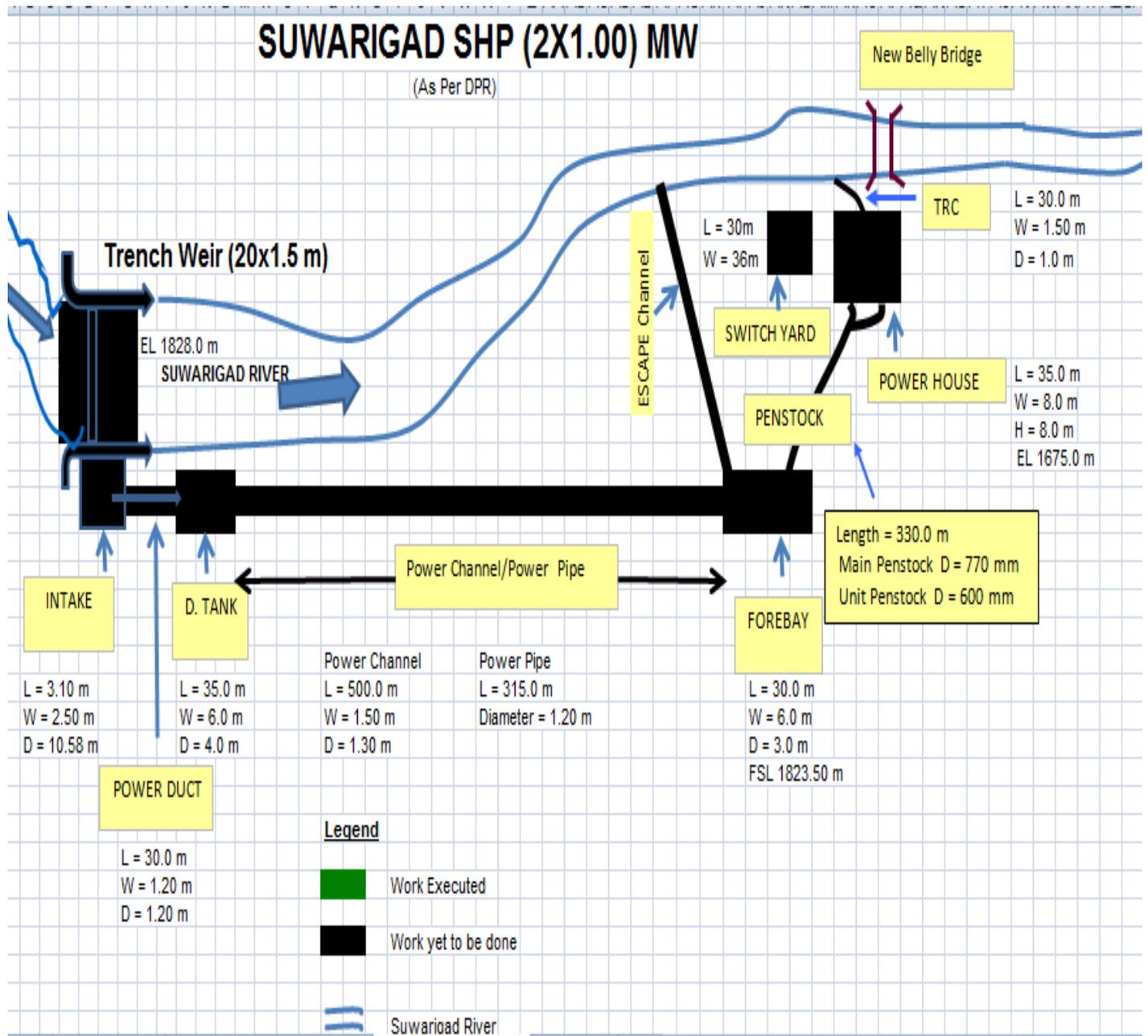
11. Appropriate design standards for the construction of hydraulic structures will be followed so that the hill is not eroded.
12. There is no landslide and fault zone in the Project area.
13. There is no any irrigation or water supply scheme proposed in the upstream of the project & Project area on Suwarigad River. Hence any other scheme will not be affected due to construction of the project.
14. In the Project area there is no population and agriculture land. So there shall be no need to change agriculture land use and due to small structures of the project, no Reservoir shall be formed and hence no population shall be rehabilitated.
15. The rights and Privileges of the residents of the Project area shall not be affected with the construction of the Project and construction shall be started only after obtaining formal approvals from the residents as per rules.
16. The priority in employment shall be given to the local residents according to their qualifications during Project construction or operation.
17. The alignment of the structures of the Project shall be marked such that Loss of vegetative cover shall be minimal.
18. Construction of the Project will not affect any natural heritage site built in the Project area and pedestrian routes will be protected in its natural state.

(H) Clarification for the “Regulated” category of the project under the Gazette notification of the Eco-Sensitive Zone:-

1. Government Gazette Notification No. 2429 dated 18.12.2012 Page No.- 31 Regulated activities in the Eco-Sensitive Zone, only mini or micro hydropower projects in river valley projects, which would serve the energy requirements of the local communities can only be permitted.
2. In- principle approval for the required land was obtained before the declaration of partial area into Eco-Sensitive Zone in district Uttarkashi and construction of the project had been started in year 2010. Under construction projects are also not Prohibited in the above Gazette.
3. As per gazette notification provision No. 3 (a) (i) at page number 31 contains that this Project of capacity (2000 KW) is classified as “MINI” Hydro Power Project. In accordance with the provisions contained in Gazette notification the construction of the project is not prohibited.
4. In reference to the project, it is to apprise that the estimated annual Power Generation of the project shall be 10.90 MU from which state government shall receive annual revenue of Rs 3.82 Crore. The above Electricity shall be consumed by the villegers & state residents as per government policies of the Uttarakhand.

Hence it is requested from the Eco-Sensitive Zone monitoring committee to grant the permission for works of above Project.

Layout of Suwarigad SMALL HYDRO PROJECT (2000 Kw):



The Salient features of the Project are given as below:

SALIENT FEATURES

LOCATION:

State	Uttarakhand
District	Uttarkashi
Village	Pala
Nearest Town	Bhatwari, Uttarkashi
Geographical Coordinates	Longitude 78° 37'
	Latitude 30° 51'

HYDROLOGY:

Name of stream	Suwarigad
Catchment Area	35.67 sq. km. upto diversion weir site
50% dependable flow	1.60 cumec
Minimum flow	0.70 cumec
Maximum flow (Flood)	220 cumec

DIVERSION WORK:

Weir	Trench type intake
Weir Elevation (Top)	1828.00 m
H.F.L.	1831.45 m
Design Discharge	2.12 Cumec

Size of Weir	Width 1.5 m
Depth Varies from	1.20 m to 2.20m
Length	20m
Intake Bulk Head Gate	2.0 m x 2.5 m
Intake Service Gate	1.50 m x 1.65 m

INTAKE WELL, INTAKE CHANNEL AND SHINGLE FLUSHING CHANNEL:

Shape	Rectangular
Size	
Width	2.50 m
Height	10.58 m
Length	3.10 m
Intake Channel	
Size	1200mm X 1200mm
Length	30m
Type	RCC Rectangular Channel
Shingle Flushing Channel	
Size	400mm diameter M.S. Pipe
Length	25m
Type	Circular M.S. Pipe
Mode of operation of Intake Gates	Electrically / Manually operated Gates
Mode of operation of	Manually operated Gates/ Sluice Valve

flushing Channel/ Pipe

DESILTING CHAMBER

Full Supply Elevation	1827.63 m
Length	35 m (Including splays & Fluming)
Maximum Width	6 m
Nos. of Chamber	One
Depth	4.0m
Design Discharge	2.02 Cumec
Discharge for flushing	0.26 Cumec
Flow through Velocity	0.22 m/sec.

Power Channel / Conduit Power Channel Conduit (M.S. Pipe)

Width	1500 mm	1200mm dia
Depth	1300 mm	150 mm free board
Length	500 m	315 m
Bed Elevation at beginning	1826.33m	
Slope	1 in 500	1 in 500
Flow Velocity	1.25m/sec.	1.6 m/sec.
Depth of Flow	1 m	1.05 m

BYEPASS STRUCTURE & BYEPASS CHANNEL

Location	RD 900 m
Crest Length & level	4.0 m at 1825.70
Depth of flow above crest	0.40m
Shape of Bypass channel	Rectangular
Size of Bye pass channel	1.5m x 1.0 m

FOREBAY

Width	6.0m
Water Depth	3.0m
Free Board	1.0m
Length	30m
Full Reservoir Elevation	1825.70 m
MDDL	1823.60 m
Storage Capacity	540 cu m. (2 min. storage)
Trash Rack (1 Nos.)	1200 mm wide X 1200mm high
Penstock Gate (1 Nos.)	1200 mm wide X 1200 mm high

PENSTOCK

Center-line El. at fore-bay	1823.30 m
Diameter of Main Penstock	770 mm OD
Diameter of Unit Penstock	600 mm OD
Number of Main Penstock	1 Nos.
Flow Through Velocity	3.98 m/sec
Plate Thickness	Varies from 8 to 10 mm
Penstock Plate	Material Confirming to IS 2002 Gr. B or ASTM 285 Gr. C
Anchor Blocks	8 Nos.
Saddle Supports	40 Nos.
Saddle Plate material	Confirming to IS 2062

Expansion Joints per Penstock	8 Nos.
Manhole (500 mm Diameter) Not Required	
Y – Pieces	1 Nos. made from 25 mm thick plates
Length of Penstock	(a) 770mm OD – (i) 8 mm thick -200m (ii) 10 mm thick –100m (b) 600mm OD - 10mm thick 30 m

POWERHOUSE

Length	35 m
Width	8 m
Height	8 m
Max. TWL	1675.00 m
Min. TWL	1675.00 m

SWITCHYARD

Size	30 m X 36 m
Elevation	1678 m

ELECTRO-MECHANICAL EQUIPMENT

Turbine

Type of Turbine	Horizontal Francis
Capacity of each turbine	1500 MHP
Number	2 Nos.
Rated Head	145.00 m

Generator

Type of Generator	Synchronous
Capacity of each Generator	1000 KW
Voltage, number of phases,	3.3 KV (three phase, 50 Hz)
Frequency	
Number	2 Nos.
Type of excitation	Brushless

TAILRACE

Shape	Rectangular Channel
Size:	Width 1.5 m, depth 1 m, length 30 m

POWER AND ENERGY

Installed Capacity	2x1.0 MW
Annual energy	11.06 million kwh
Energy available for sale	10.90 million kwh
Plant load factor	62.2 %

FINANCIAL

Estimated cost of Project	: Rs. 1550 lakhs
Cost of civil works	: Rs. 757.38 lakhs
Cost of Electro-mechanical works	: Rs. 714.50 lakhs
Others	: Rs 78.12Lacs
CDM Benefits	: Rs 54.48 Lacs
levelised cost of generation	: Rs. 2.5 per Kw/hr with CDM benefits
levelised cost of generation	: Rs. 2.67 per Kw/hr without CDM benefits



LIMCHAGAD SHP
(2x1750 Kw)
(UNDER CONSTRUCTION)

Limchagad Small Hydro Project; (2 X 1750 Kw) Under Construction

- ❖ Eco-Sensitive Zonewithin the Project's status : Undefined
- ❖ Type of Project (Proposed / Operation/ Under Construction) : Under Construction
- ❖ Geographical Co-ordinates
 - Tranch Wier - 78⁰ 41 '28" East 30⁰ 55' 31 " North
 - Power House - 78⁰ 40 '55' 'East 38⁰ 55' 13 " North
- ❖ River on which the Project is located – Limchagad
- ❖ Trench Weir river water catchment area – 14.75 sq km
- ❖ Area & Type of the land required for Construction of Project – Reserve Forest Land -4.275 Ha. (Formal approval of 0.9875 Ha. Land has been obtained on dated 13.04.2006 and the land case of additional 3.288 Ha. Land is still awaited form the Nodal office, Dehradun since 16.03.2013)
- ❖ Water conductor system type and length - Surface channel 450m.
- ❖ **Project description: -**
- ❖ The Limchagad SMALL HYDRO PROJECT (3500 KW) is located on the right bank of the tributary Limchagad of the Bhagirathi River in the mid from 2378.50 m to 1960 m. The provision shall be made for continuous flow in river, 20 percent water of minimum flow of the river flows continuously.

The brief descriptions of proposed Hydraulic Structures are given hereunder:

(A) Trench Weir: -

To acquire an adequate discharge for generation of the power, the construction of Diversion Structure 12 M Width (Equals to River width) shall be constructed in such a manner that neither any reservoir shall be formed nor any displacement or position of the sinking of the vegetative resources involved due to constructed structures to be constructed. The river flow will be sustained and it will always be ensured that the flow in the river will be minimum 0.08 cumec i.e 20% of the minimum flow of river. Natural boundaries of the river shall not affected due to construction of Trench Weir.

(B) Water Conductor System: -

The Total length of Water Conductor System will be 1383 m. In Water Conductor System, surface Channel (450 m X 1.0 m), Disilting Tank (28.4 m X 5.0 m), Power duct (35 m X 2.5 m) Pipe Channel (1.0 m dia as per requirement), Forebay Tank (20 X 5.0 m) and Penstock Pipe (850 X 0.80 m) etc. are proposed.

The minimum cutting shall be done as per width of Proposed Hydraulic structures viz Power Pipes and Penstock Pipe whose length are 450 m and 850 m respectively. A steel Power Pipe of 1.00 m diameter is proposed to be laid in 1.0 m wide strip land. The surface of hill is proposed to be laid according to natural slope of the hill in width strip of 1.00 m. Due to which Cutting of hill

will be minimal. No tunnel is proposed in the Project. Surface channel & Power pipe are the main structures in the Water Conductor System.

(C) Land requirement for the construction of project: -

For the construction of the project Total 4.275 Ha Reserve Forest land is required. Formal approval of 0.9875 Ha. Land has been obtained on dated 13.04.2006 and the land case of additional 3.288 Ha. Reserve forest Land has been submitted to additional chief conservator Forest, Ministry of Forest, F.R.I, Dehradun office since 16.03.2013.

The suitable land have been identified and included in the proposal for the proper muck disposal excavated from construction. During Construction of the Project Provisions of task force and Indian Forest Conservation Act would be strictly followed.

(D) Switchyard and Power House : -

The construction of a Surface Power House of Size 30x20 m & Switchyard is of Size 30x20 m is proposed. Construction of Power House is proposed on a sloping terrace on the right bank of the river of Limchagad about 500 meters from Uttarkashi-Gangotri National highway. Because of Power House is proposed on the terrace having gradient (5^0 - 10^0). So no hill cutting is required for the construction of Power House. Only small excavation shall be needed for leveling and foundation of the Terrace.

(E) Residential colony: -

Residential colony for the Project shall not be required. During the Project construction and operation the officers & officials of the project shall reside in Pre constructed residential colony in Bhatwari against the Pala Maneri Hydro Project. During the Project's operation personnel posted in shifts, shall go from Pala Maneri colony to Power House through vehicle.

(F) Technology to be adopted in the construction of Project: -

Detailed Project Report was prepared by the Technical experts of the IIT Roorkee after the Detail investigation, survey and study of site. The design of hydraulic structures was done after finding site suitability with the conformity of the site by site survey, detail investigation of the Technical and Geological experts of the IIT Roorkee prior to preparing the detailed Project report.

(G) COST BENEFIT ANALYSIS:

i.	Total cost of the project	Rs 2571.70 lac (without interest during construction) Rs 2646.00 lac (with interest during construction)
ii.	Debt Equity Ratio	70:30
iii.	Loan Repayment Period	07 years
iv.	Financing Institution	NABARD
v.	Expenditure till date	Rs 223.00 lac
vi.	Net Saleable energy	20.124 Million Unit
vii.	Levelized cost of generation	Rs 1.95 per unit
viii.	Annual Revenue from sale of energy	Rs 704.00 lac

- **No change in costing shall be occurred due to implementation of Eco-sensitive gazette notification.**

The following standards shall be followed strictly during Project construction:

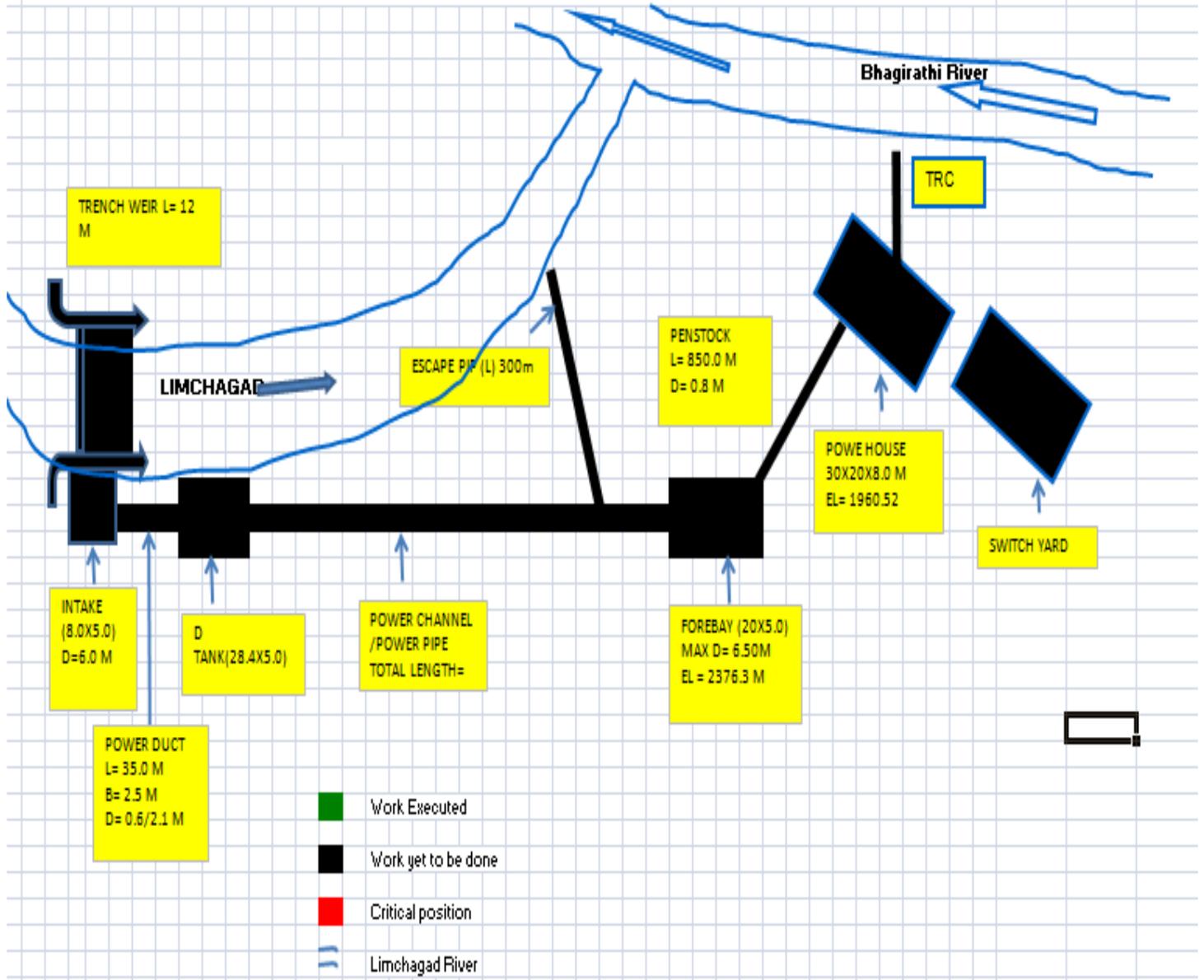
1. Heavy explosives as well as heavy machinery shall be prohibited during Project construction and all the construction work shall be done through labours and small machinery only.
2. Material excavated from construction and unused material/Debris shall be dumped only at the places indentified by the forest department.
3. Construction material required for construction work such as stone, sand and aggregate etc shall be used by transport only from pre-approved mines, No Excavation/mining shall be done for the requirement of the above material on the site. Construction material required for Remaining works shall also be transported only from pre-approved mines.
4. The natural boundaries of the Limchagad River shall not be changed due to construction of Trench Weir and even after completion of Remaining works; natural boundaries of the river shall not change.
5. A minimum 0.14 Cumec i.e. 20% of minimum water flow in river flows shall be continuously for the environmental point of view.
6. It shall be ensured that Monthly inspection report of the experts on the environment and pollution control board shall be forwarded to Environment and Pollution control board.
7. The treatment for slopes of the hills from erosion in the Project Area shall be carried out for stability through protection works and bio-engineering techniques shall be used in protection works.
8. Treatment of debris/Muck and landscaping shall be done through Bio Engineering & Suggestions received from technical experts shall be incorporated therein.
9. In Project area construction of drains shall be made for prevention of seepage and these shall have obstacle-free flow. Flow resulting from the drains will be connected with natural drainage flow/River flow.
10. In the design for construction of hydraulic structures, the Indian standards & specifications shall be followed.
11. Appropriate design standards for the construction of hydraulic structures will be followed so that the hill is not eroded.
12. There is no landslide and fault zone in the Project area.
13. There is no any irrigation or water supply scheme proposed in the upstream of the project & Project area on Suwarigad River. Hence any other scheme will not be affected due to construction of the project.
14. In the Project area there is no population and agriculture land. So there shall be no need to change agriculture land use and due to small structures of the project, no Reservoir shall be formed and hence no population shall be rehabilitated.
15. The rights and Privileges of the residents of the Project area shall not be affected with the construction of the Project and construction shall be started only after obtaining formal approvals from the residents as per rules.
16. The priority in employment shall be given to the local residents according to their qualifications during Project construction or operation.

17. The alignment of the structures of the Project shall be marked such that Loss of vegetative cover shall be minimal.
18. Construction of the Project will not affect any natural heritage site built in the Project area and pedestrian routes will be protected in its natural state.

(H) Clarification for the “Undefined” category of the project under the Gazette notification of the Eco-Sensitive Zone:-

1. Formal approval of 0.9875 Ha. Reserve forest land was obtained before the declaration of partial area into Eco-Sensitive Zone in district Uttarkashi and construction of the project had been started in year 2010. Under construction projects are also not prohibited in the above Gazette.
2. As per Government Gazette Notification No. 2429 dated 18.12.2012 Page No.- 31 following activities shall be prohibited within the Eco-sensitive Zone:
3(a)(i) River Valley projects: Setting up of new hydro-electric power plants (dams, tunneling, and construction of reservoir) and expansion of existing plants on the river Bhagirathi and all its tributaries from Gaumukh to Uttarkashi except micro or mini hydel power projects, which would serve the energy needs of the local communities, subject to consent of the gram sabha and all other requisite clearances;
3. In reference to the project, it is to apprise that the estimated annual Power Generation of the project shall be 20.12 MU from which state government shall receive annual revenue of Rs 7.04 Crore per year. The above Electricity shall be consumed by the villegers & state residents as per government policies of the Uttarakhand.

PROPOSED LAYOUT OF LIMCHAGAD SHP (2x1.75) MW as per DPR



The Salient features of the Project are given as below:

SALIENT FEATURES

LOCATION:

I.	State:	Uttarakhand		
II.	District:	Uttarkashi		
III.	Village:	Gangnani		
IV.	Nearest Town:	Bhatwari, Uttarkashi		
V.	Geographical Coordinates	Trench weir	Power House	
		Longitude		78 ⁰ 41' 28" 30 ⁰ 55' 13"
		Latitude		30 ⁰ 55' 31" 30 ⁰ 55' 13"

HYDROLOGY:

I.	Name of stream:	Limcha-Gad
II.	Catchment Area:	14.75 sq. km. upto diversion weir site
III.	50% dependable flow	1.1 cumec
IV.	Minimum flow	0.4 cumec
V.	Maximum flow (Flood)	105 cumec

DIVERSION WORK:

I.	Weir:	Trench type intake
II.	Weir Elevation (Top)	2378.5 m
III.	H.F.L.	2381.5 m
IV.	Design Discharge for Power generation	1.1 Cumec Size of Weir: Width 1.5 m Depth Varies from 0.6 m to 1.20m Length 12 m
V.	Intake Bulk Head Gate:	1.8 m x 1.5 m
VI.	Intake Service Gate:	2.8 m x 1.0 m

INTAKE WELL, INTAKE CHANNEL AND SHINGLE FLUSHING CHANNEL

I.	Shape	Rectangular
II.	Size	
	Width	5.0 m
	Height	6.0 m
	Length (parallel to river)	8.0 m

POWER DUCT

Size	:	2.5 m mm X 0.6 m /2.1 m (in box section slab)
Length		35m
Type		RCC Rectangular Channel/box section

SINGLE FLUSHING CHANNEL

Size	:	1.0 m X 0.3 m (B=1.0 m, FSD = 0.3 m)
Length		120 m
Type		RCC Rectangular Channel/covered withremovable slabs
Mode of operation of	:	Electrically Manually operated Gates
Power duct and shingle excluder		

DESILTING TANK

I.	Full Supply Elevation	2377.0 m
II.	Length	28.4 m (Including splays & Fluming)

III.	Width	5.0 m
IV.	Nos. of hoppers	4
V.	Depth	1.3+2.7 = 4.0 m
VI.	Average Design Discharge	2.2 Cumec
VII.	Discharge for flushing	0.5 Cumec
VIII.	Flow through Velocity	0.35 m/sec.

	Power Channel/ Free Flow pipe	Power Channel (open/box)	Free Flow M.S Pipe
I.	Width	1.0 m	1.0 m dia
II.	Depth (FSD)	1.8 m	0.85 m
III.	Bed Elevation at beginning	2375.1	
IV.	Slope	1 in 700	1 in 260
V.	Flow velocity	1.11 m/ sec.	2. m/sec.
VI.	Total length of power Channel including free flow MS pipe in short pieces as and Where required	450 m	

BYPASS SPILLWAY STRUCTURE & ESCAPE CHANNEL

I.	Location	Just before forebay
II.	Crest Length & level	5.0 m at RL 2376.3 m
III.	Depth of flow above crest	0.40 m
IV.	Shape of Bypass channel	Rectangular
V.	Size of Bye pass channel	1.5m X1.0 m, stepped spillway

FOREBAY

I.	Width:	5.0m
II.	Water Depth:	6.5 m
III.	Free Board:	1.0 (+0.4)=1.4 m
IV.	Length	20m
V.	Full Reservoir Elevation:	2376.3 m
VI.	MDDL:	2373.8 m
VII.	Storage Capacity:	240 cu m. (2 min. storage)
VIII.	Trash Rack (1 Nos.)	3.0 m wide X 2.55 m high
IX.	Gate on power channel before forebay	1.4 m wide x 3.2 m height

PENSTOCK

I.	Center-line El. at fore-bay	2372. 04 m
II.	Diameter of Main Penstock	0.8 m
III.	Diameter of Unit Penstock	0.6 m
IV.	Number of Main Penstock	1 Nos.
V.	Flow Through Velocity	3.8 m/sec
VI.	Plate Thickness	8 to mm to 20 mm
VII.	Penstock Plate	Material Confirming to IS 2002 Gr. B
VIII.	Anchor Blocks	40 Nos.
IX.	Saddle Supports	100 Nos.
X.	Saddle plate material	Confirming to IS 2062
XI.	Expansion joints per penstock	40 Nos.

XII.	Y- Pieces	01	No made form 25 mm thick plates
XIII.	Length of main penstock	800 metres	(thickness 8 to 20 mm)
	Length of unit penstock	50 metres	(plate thickness-16 mm)

POWERHOUSE

I.	Length	30 m
II.	Width	20 m
III.	Height	8 m
IV.	Max. TWL	1960.00 m
V.	Min. TWL	1958.5 m

SWITCHYARD

I.	Size	30 m X 20 m
II.	Elevation	1962 m

ELECTRO-MECHANICAL EQUIPMENT

A. TURBINE

I.	Type of Turbine	Horizontal pelton -2 jet
II.	Capacity of each turbine	1750 KW
III.	Number	2 Nos.
IV.	Rated Head	400 m

B. GENERATOR

.I.	Type of Generator	Synchronous
II.	Capacity of each Generator	1750 KW
III.	Voltage, number of phase, Frequency	3.3 KV (Three phase, 50 HZ)
IV.	Rated RPM	1000
V.	Number	2 Nos.
VI.	Type of excitation	Brushless

TAILRACE

I.	Shape	Rectangular Channel
II.	Size	Width 2.5 m , FSD 0.6 m, Length 100 m , bed slope 1in 500

POWER AND ENERGY

I.	Installed Capacity	2x 1.75 MW (3500 KW)
II.	Annual energy	20.644 million kwh
III.	Energy available for sale	20.124 million kwh
IV.	Plant load factor	67.32% million kwh

FINANCIAL

I.	Estimated cost of project	Rs. 2571.70 Lacs
II.	Cost of Civil works	Rs. 1508.26 Lacs
III.	Cost of Electro-mechanical works	Rs. 958.43 Lacs
IV.	Cost of Transmission works:	Rs. 75 Lacs
V.	Cost of Land and other preliminary works	Rs. 30.00 Lacs
VI.	Total CDM Benefit	Rs. 79.69 Lacs
VII.	Levelised cost of generation Over a 30 year period	Rs. 1.95 per Kwhr with CDM Benefit for 10 yrs & Rs. 2.08 per kwhr without CDM Benfit
VIII.	Equity (30% of project cost)	Rs. 642.18 lacs
IX.	Levelised return on equity (with Rs. 2.80 per kwhr as sale price over the 30 year period	Rs. 14.00 %



ASIGANGA-I SHP
(2x2250 Kw)
(UNDER CONSTRUCTION)

Asiganga-I Hydro Electric Project (2X2250KW)

- Status of the Project as per Eco Sensitive Zone Gazette notification – Undefined.
- Actual Status of the Project- Under construction.
- Geographical Coordinates-
 - ❖ Trench weir -30⁰ 48' 37'' North, 78⁰ 27'05'' East
- Name of the River on which project is situated- Asiganga
- Water catchment area of the River on Trench Weir – 147 Sq Km
- Type & Area of the Land for the project- 2.162 Ha Reserve forest Land
- Type & Length of water conductor system –
 - ❖ Open channel -1410 m
 - ❖ Pressure free Tunnel -800m

Detail of the Asiganga-I Project :-

✚ Project is situated on the left bank of the river Asiganga from the base of the river from 1496.00m to 1394.25 m. Provision is made for release of Minimum 20% (0.81 cumec) water continuously in the downstream of project to maintain the continuous flow of water in the river . This project was started in 2004-05. Now 70% Construction work of the project has been completed Before the flash flood of 03.08.2012.

✚ Detail of the various component of the project is as followings-

1) **Trench Weir-**

22 m wide Trench weir has been constructed before the flash flood 03.08.2013 but due to flash flood of 03.08.2013 flash flood, the trench weir has been completely damaged hence the restoration work of the trench weir is proposed in the revised DPR. Due to restoration of the trench weir natural boundaries of the river will not be affected. Hence no rehabilitation of the population shall be required and life of flora and fauna will not be disturbed.

2) **Water Conductor System-**

Proposed component of the water conductor system as per DPR-

Length of Water Conductor System- 2552m

Open Channel-1410 x 2.1 m

Desilting Tank- 70 x 8m

Pressure free Tunnel- 800x2.1m

Forebay- 32x10m

Penstock- 150 x1.3m

Tail Race Channel- 90m

The construction work of the above said various component of the water conductor system has been completed before flash flood of june 2013. But due to the flash flood all the component of the water conductor system have been damaged partially. The restoration work of the above will not disturb the life of nearby population & surroundings of the Asiganga river.

3) **Land Details of the Project-**

Total 2.162 ha Reserve forest land is required for completion of the project. In which formal approval of 0.923 ha reserve forest land has been approved on dated – 26.06.2001 & formal approval of remaining 1.239 ha reserve forest land has been approved on dated-31.08.2010. The lease deed of the 2.162 ha Reserve forest land has been done on dated-14.06.2012. There is no requirement of any additional land for restoration of the project. The provision will be made to strict compliance of rules & regulation of Indian forest conservation act & Task force during the restoration of the Project.

4) Switchyard and Power House:-

The construction of 30X 18 m size surface Power House and 30x20m size Switch Yard are proposed in this project. In which the construction of Power House has been completed before the flash flood of August 2012 but due to flash flood Power House building has been damaged. Now the construction of New Power House is proposed on the left bank of the river Asiganga on Gangori-SangamChatti Road. The provision shall be made for the stabilization & protection of hill slopes during the leveling of Terrace and excavation of Foundation of Power House building as per Bio Engineering & Views of the Experts.

5) Residential building

The construction of residential building for the project has been completed in 2010 at Gangori.

6) Cost Benefit Analysis:

ix. Total cost of the project	Rs 5360.81 lac (without interest during construction)
	Rs 6361.47 lac (with interest during construction)
x. Debt Equity Ration	70:30
xi. Loan Repayment Period	12 Years
xii. Financing Institution	NABRAD
xiii. Expenditure till date	Rs 3274 lac
xiv. Net Saleable energy	26.33 Million Unit
xv. Levelized cost of generation	Rs 3.89 per unit
xvi. Annual Revenue from sale of energy	Rs 921.00 lac

➤ **No change in costing shall be occurred due to implementation of Eco-sensitive gazette notification.**

7) Technology used in the Restoration of the Project-

The DPR of the project has been prepared by the technical experts of Indian Institute of Technology, Roorkee. After the flash flood, the revised DPR has been prepared incorporating the views of technical Experts of IIT Roorkee, UJVNL & other departments which has been approved by the BoD of UJVNL.

The following parameters will be considered during the restoration & construction of balance work of the Project-

- a) Maximum work, as far as possible shall be carried out by labour in place of heavy machinery.
- b) There is no need of any kind of blasting in this project. but Controlled blasting will be done if required.

- c) Muck produced during the restoration of the project will be disposed off on demarcated lands as per instruction of Forest department.
- d) RBM used in the project will be carted from the government approved quarries. RBM will not be taken from the river at project site.
- e) Natural boundaries of the river will not be disturbed due to restoration of the project.
- f) To maintain the environmental discharge minimum 20% (0.81 cumec) water will be released continuously in downstream of the project in the river Asiganga.
- g) The monthly inspection report of the project construction will be sent to the Environment pollution control board and construction work will be carried out as per instruction of Environment pollution control board.
- h) The hilly slopes will be maintained & protected by using latest bio engineering technologies.
- i) Treatment of produced muck & land scaping will be done with the help of bio engineering & according to the views of experts.
- j) Systematic Drainage system will constructed to avoid the unnecessary storage of the water with in the project & surroundings and the drainage system will be connected to the natural drainage.
- k) The various component of the project will be construct as per suitable design parameter to avoid the decay of the slopes.
- l) The project is not situated in sliding zone & fault zone.
- m) The flow of the Asiganga river will not be disturbed due to project restoration.
- n) Irrigation & water supply projects are not proposed in this area and no other project will be affected by the restoration of this project.
- o) Habitation & Agricultural land is not situated in the project area hence there is no need to rehabilitation of population & conversion of Land.
- p) Priority will be made for the employment of the people of the project affected area according to their qualification.
- q) Suitable alignment of the various component of the project will be adopted to maintain the forest/vegetal cover.
- r) Heritage of state/country will not be affected due to restoration of the project. Roads situated in the project will be conserved in their natural condition.
- s) 70% Restoration work of the project and remaining 30% balance construction work will be done as per gazette notification of Eco Sensitive Zone.

8) Recommendation of the gazette notification of Eco Sensitive Zone for this project-

- ✓ Construction of Asiganga-I (4.5 MW) SMALL HYDRO PROJECT has been started in 2004. This project is not defined in the Eco sensitive zone gazette notification.
- ✓ According to Eco sensitive zone gazette notification GOI point no-03 para(1) the following activities are prohibited for the river velly projects-
“Setting up of new hydro-electric power plants(dams, tunneling, and construction of reservoir) and expansion of existing plants on the river Bhagirathi and all its tributaries from Gaumukh to Uttarkashi except micro or mini hydel power projects, which would serve the energy needs of the local communities, subject to consent of the gram sabha and all other requisite clearances”.

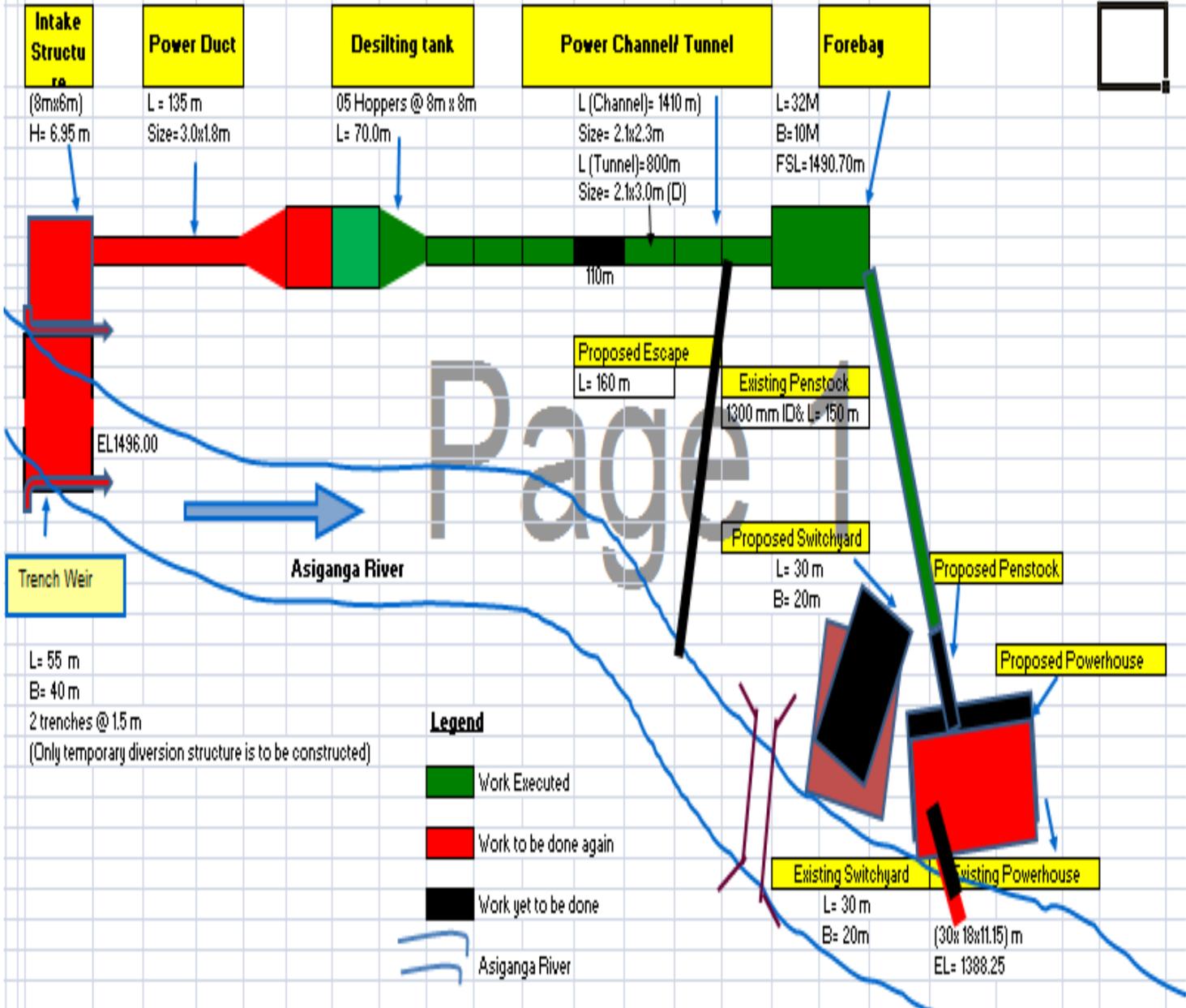
9) Conculsion-

The status of this project is not defined in the Gazette notification. This is an under construction project. In addition to this, this project does not included in the 24 projects which were prohibited by the Honorable Supremecourt of India. 70% construction work of

this project has already been completed which requires only restoration & maintenance and remaining 30% balance construction work is still to be carried out. The above said restoration work (70%) & balance construction work (30%) will be done as per provision made in Eco Sensitive Zone gazette notification Hence there is no harm to the Eco sensitive zone form this project.

Layout of Asiganga-I SHP (2x2.25 MW)

Design discharge	: - 5.63 Cumec
Net Head	: - 94 m
Total Energy Generation	: - 26.33 MU
Total cost	: - Rs. 6361.47



Salient features of the Project

1-	LOCATION			
	State		Uttarakhand	
	District		Uttarkashi	
	Taluka		Bhatwari	
	Access:	i. Road	Uttarkashi-Sangamchatti	
		ii. Rail head	Rishikesh (174km)	
	Geographical coordinates	(Diversion site)		
	- Latitude		30°48'37"N	
	- Longitude		78°27'05"E	
2-	RIVER CATCHMENT:			
	Catchment		Ganga	
	River		Ganga	
	Tributary		Bhagirathi	
	Sub-tributary		Asiganga	
3-	HYDROLOGY:			
	Catchment area at the diversion site.			
	Gross		147sq km	
	Intercepted in the scheme, if any		Nil	
	Snow bound catchment area		Negligible	
	Precipitation			
	Average rainfall (mm)		1630mm	
	Dependable yield			
	50%		5.63 cumec	
	75%		4.09 cumec	
	Climate data	Normal	Max	Min
	Atmospheric temperature	20°C 32°C	Below 0°C	
	Humidity	60%	85%	30%
	Floods			
	Historical			
	Maximum discharge estimated		NA	
	Date of occurrence		NA	
	Max. Design flood discharge		594 cumec	
	Month of nil flows		Nil	
4-	MEDIUM/HIGH HEAD PROJECTS:			
A.	Diversion structure			
	Type of structure		Trench type weir with trash rack	
	Length		22M	
	Overflow section		33M	
	Non-overflow section		NIL	
	Shingle excluder duct			
	Length (approx.)		140 M	

	Size	1MX1M
	Material	RCC
	Maximum discharging Capacity (Cumec)	594cumec
B.	Intake structure	
	Shape and size	Rect. 8MX6M
	Height above deepest foundation	6.79M
	Number of gates	Two
	Size of gates	3.6 MX 2.4M & 2.5X2.15M
	Power Duct:	
	(a) Length	110M
	(b) Size	3.00MX 2.00M
C.	Desilting tank	
	T ype	Hopper Type
	Material of construction	RCC
	Size	70MX 8M
	Particle size to be removed	0.2mm
	Size of silt flushing pipe	450mm dia (05nos)
D.	Water conductor system	
	Open Power channel	
	Length (approx.)	1700M
	Shape	Rectangular
	Size	2.10MX2.30M
	supply depth	2.00M
	MaterialFull	RCC
	Design discharge	5.63cumec
	Free flow head race Tunnel	
	Length (approx.)	700M
	Shape	D-Shaped
	Size	2.10MX3.00M
	Full supply depth	1.70M
	Material	RCC
	Design discharge	5.63cumec
E.	Forebay	
	Size	32MX7M
	Full supply level	RL1490.38M
F.	Penstock	
(I)	Main penstock	
	Number	with bifurcation at ends
	Diameter and Thickness	1321mm(10mm)
	Length	175M
	Design discharge	5.63cumec
(II)	Branch Main penstock (after bifurcation)	
	Number	Two
	Diameter and Thickness	938mm (10mm)
	Length	20M each

	Design discharge	2.815 cumec for each branch
5-	POWER HOUSE	
	Type	Surface
	Head	
	Design - Gross	96.60M
	- Net	94.03M
	Size of power house	29.00 MX 14.90MX8.5M
	Installed capacity	2X2250KW
	Turbines:	
	Type	Horizontal Francis
	Number	Two
	Capacity	2X2250KW
	Type of generator	Synchronous
	Excitation system	Static Brushless excitation
	Regulation system	AVR
	Power house crane	HOT
	Lifting tackle capacity	18MT
6-	POWER HOUSE	
	Type	Surface
	Head	
	Design - Gross	96.60M
	- Net	94.03M
	Size of power house	29.00 MX 14.90MX8.5M
	Installed capacity	2X2250KW
	Turbines:	
	Type	Horizontal Francis
	Number	Two
	Capacity	2X2250KW
	Type of generator	Synchronous
	Excitation syste	Static Brushless excitation
	Regulation system	AVR
	Power house crane	HOT
	Lifting tackle capacity	18MT

View of Trench Weir & Intake Structure across the River Asiganga before flash flood of Aug 2012.



View of Trench Weir location after flash flood in the River Asiganga on 03.08.2012.



View of RCC Power duct before flood.



View of damaged Power duct after flood.



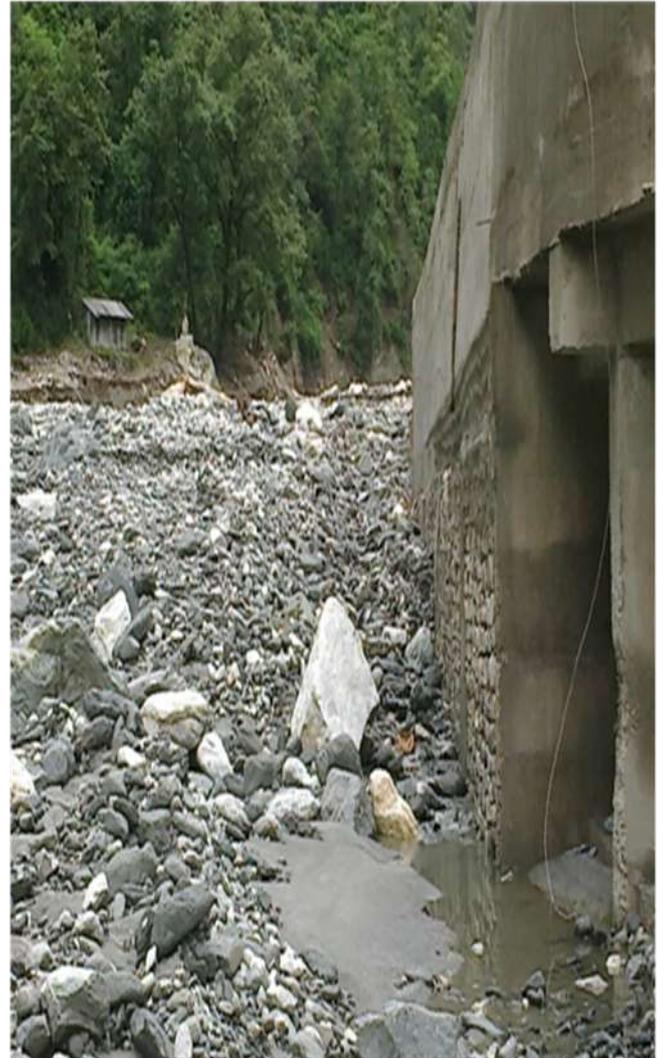
A View of Completed RCC De-silting chamber before flood.



View of damaged De-Silting Tank after flood.



View of RCC Silt Flushing channel before and after flood.



View of RCC Power channel after flood.



View of Powerhouse Building before flood



Inside view of Powerhouse Building before flood



View of Powerhouse Building after flood



View of machine hall & Control Room before flood



View of machine hall & Control Room after flood





ASIGANGA-II SHP
(2X2250 Kw)
(UNDER CONSTRUCTION)

Asiganga-II Hydro Electric Project (2X2250KW)

- Status of the Project as per Eco Sensitive Zone Gazette notification – Undefined.
- Actual Status of the Project- Under construction.
- Geographical Coordinates-
 - ❖ Trench weir -78⁰ 26' 40'' North, 30⁰ 47'40'' East
- Name of the River on which project is situated- Asiganga
- Water catchment area of the River on Trench Weir – 167 Sq Km
- Type & Area of the Land for the project- (Total Land Required- 3.405 ha Reserve Forest Land)
 - ❖ 2.302 Ha Reserve forest Land
 - ❖ Additional Land Required -1.103 Ha Reserve forest Land
- Type & Length of water conductor system –
 - ❖ Open channel -271m
 - ❖ Free Flow Tunnel -1604m

Detail of the Asiganga-I Project :-

- ✚ Project is situated on the right bank of the river Asiganga from the base of the river from 1378.42m to 1306.00 m. Provision is made for release of Minimum 20% (0.50 cumec) water continuously in the downstream of project to maintain the continuous flow of water in the river . This project was started in 2008-09. Now 41% Construction work of the project has been completed before the flash flood of 03.08.2012 & June-2013. After the flash flood on dated 03.08.2012 some land of the project has been washed away in the flood. Hence for further construction of the project additional land was required. Therefore land case for additional land of 1.103 ha reserve forest land has been submitted to the Nodal officer Dehradun in march 2013 which is pending in the nodal office Dehradun till date. The status of the under construction project is not defined in the Eco Sensitive Zone gazette notification of GOI.
- ✚ Detail of the various component of the project is as followings-

10) Trench Weir-

32 m wide Trench weir has been constructed before the flash flood 03.08.2013 but due to flash flood of 03.08.2013, the trench weir has been completely damaged hence the restoration work of the trench weir is proposed in the revised DPR. Due to restoration of the trench weir natural boundaries of the river will not be affected. Hence no rehabilitation of the population shall be required and life of flora and fauna will not be disturbed.

11) Water Conductor System-

Propose component of the water conductor system as per DPR-

Length of Water Conductor System- 2228m

Open Channel- 271 x 2.0 m

Desilting Tank- 78 x 10m

Tunnel- 1604 x 2.0m

Forebay- 40x9.0m

Penstock- 135 x1.6m

Tail Race Channel-100m

The construction work of the above said various component of the water conductor system has been completed before flash flood of June 2013 except 728m free flow tunnel. But due to flash flood all the component of the water conductor system have been damaged partially. The restoration work of the above component and construction of 878m tunnel will not disturb the life of nearby population & surroundings of the Asiganga river.

12) Land Details of the Project-

According to the revised DPR the total 3.405 ha Reserve forest land is required for the restoration of the project in which 1.103 ha additional Reserve forest land is required for completion of the project. Formal approval of 2.302 ha reserve forest land has been approved & case for the formal approval of remaining 1.103 ha reserve forest land is pending in the nodal office Dehradun. The lease deed of the 2.302 ha Reserve forest land has been done for mutation & transfer of land. The provision will be made to strict compliance of rules & regulation of Indian forest conservation act & Task force during the restoration & balance construction of the Project.

13) Switchyard & Power house-

For the construction of the project 30x15m size Power House Building is proposed on the right bank of the river Asiganga which is located 400m away from the bridge situated on Gangori-Sangamchatti road for Uttrown village.

14) Transmission Line-

Every year 20.38 MU electricity generation is proposed in DPR from this project. The 12 .00Km 33KV transmission line is under construction from Kaldigad Power House to Tiloth Power House sub-station(220KV).The land case of 20.25 ha reserve forest land for the construction of transmission line has been approve by the MoEF.

15) Residential building

The construction of residential building for the project has been completed in 2010 at Gangori, Uttarkashi.

16) Cost Benefit Analysis:

xvii.	Total cost of the project	Rs 5360.81 lac (without interest during construction)
		Rs 6361.47 lac (with interest during construction)
xviii.	Debt Equity Ration	70:30
xix.	Loan Repayment Period	25 years
xx.	Financing Institution	NABRAD
xxi.	Expenditure till date	Rs 3274 lac
xxii.	Net Saleable energy	26.33 Million Unit
xxiii.	Levelized cost of generation	Rs 3.89 per unit
xxiv.	Annual Revenue from sale of energy	Rs 921.00 lac
xxv.	Internal Rate of Return (IRR)	11.92%
xxvi.	Benefit cost Ratio	1.06

- **No change in costing shall be occurred due to implementation of Eco-sensitive gazette notification.**

17) Technology used in the Restoration and construction of balance work of the Project-

The DPR of the project has been prepared by the technical experts of Indian Institute of Technology, Roorkee. After the flash flood, the revised DPR has been prepared incorporating the views of technical Experts of IIT Roorkee, UJVNL & other departments which have been approved by the BoD of UJVNL.

The following parameters will be considered during the restoration of the Project :-

- t) Maximum work, as far as possible shall be carried out by labour in place of heavy machinery.
- u) For the construction of remaining tunnel Controlled blasting will be done.
- v) Muck produced during the restoration of the project will be disposed off on demarcated lands as per instruction of Forest department.
- w) RBM used in the project will be carted from the government approved quarries. RBM will not be taken from the river at project site.
- x) Natural boundaries of the river will not be disturbed due to restoration of the project.
- y) To maintain the environmental discharge minimum 20% (0.50 cumec) water will be released continuously in downstream of the project in the river Asiganga.
- z) The monthly inspection report of the project construction will be sent to the Environment pollution control board and restoration & construction work will be done as per instruction of Environment pollution control board.
- aa) The hilly slopes will be maintained & protected by using latest bio engineering technologies.
- bb) Treatment of produced muck & land scaping will be done with the help of bio engineering & according to the views of experts.
- cc) Systematic Drainage system will constructed to avoid the unnecessary storage of the water with in the project & surroundings and the drainage system will be connected to the natural drainage.
- dd) The various component of the project will be constructed as per suitable design parameter to avoid the decay of the slopes.
- ee) The project is not situated in sliding zone & fault zone.
- ff) The flow of the Asiganga River will not be disturbed due to project restoration & construction.
- gg) Irrigation & water supply projects are not proposed in this area and no other project will be affected by the restoration & construction of this project.
- hh) Habitation & Agricultural land is not situated in the project area hence there is no need to rehabilitation of population & conversion of Land.
- ii) Priority will be made for the employment of the people of the project affected area according to their qualification.
- jj) Suitable alignment of the various component of the project will be adopted to maintain the forest/vegetal cover.
- kk) Heritage of state/country will not be affected due to restoration of the project. Roads situated in the project area will be conserved in their natural condition.

- 11) 41% Restoration work of the project and remaining 59% balance construction work will be done as per gazette notification of Eco Sensitive Zone.

18) Recommendation of the gazette notification of Eco Sensitive Zone for this project-

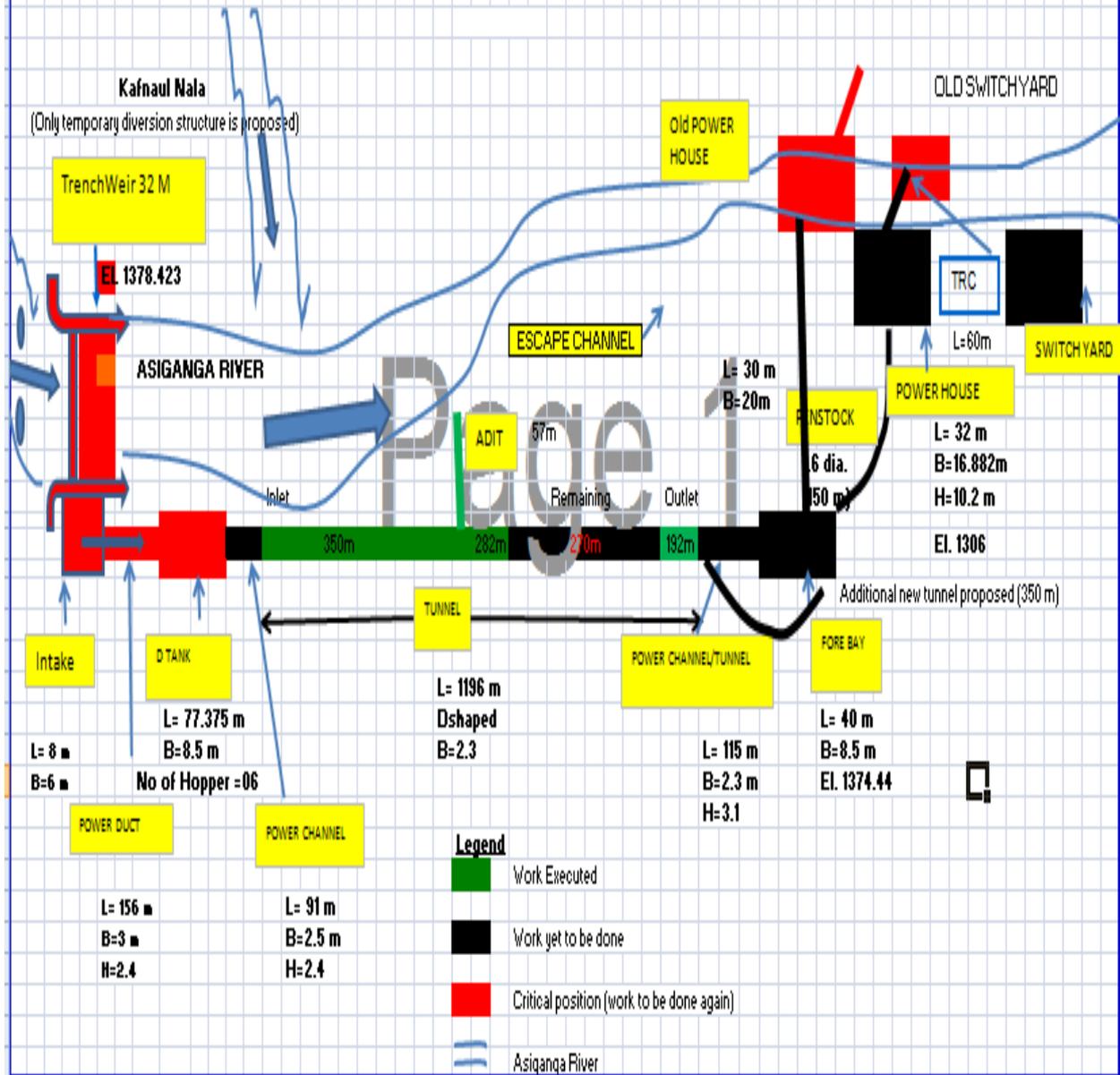
- ✓ Construction of Asiganga-II (4.5 MW) SMALL HYDRO PROJECT has been started in 2008. This project is not defined in the Eco sensitive zone gazette notification.
- ✓ According to Eco sensitive zone gazette notification GOI point no-03 para (1) the following activities are prohibited for the river valley projects-
“Setting up of new hydro-electric power plants(dams, tunneling, and construction of reservoir) and expansion of existing plants on the river Bhagirathi and all its tributaries from Gaumukh to Uttarkashi except micro or mini hydel power projects, which would serve the energy needs of the local communities, subject to consent of the gram sabha and all other requisite clearances”.

19) Conclusion-

The status of this project is not defined in the Gazette notification. This is an under construction project. In addition to this, this project does not included in the 24 projects which were prohibited by the Honorable Supreme Court of India. 41% construction work of this project has already been completed which requires only restoration & maintenance and 59% balance construction work will be done as per provision mention in the Eco Sensitive Zone gazette notification. Hence there is no harm to the Eco sensitive zone form the restoration and construction of balance work of this project.

LAYOUT OF ASIGANGA-II SHP (2X2.25) MW

Design discharge 9.6 cumec
 Net Head 88 m
 Total Energy Generated 20.3 MU



SALIENT FEATURES ASIGANGA-II SMALL HYDRO PROJECT

LOCATION

State	Uttarakhand
District	Uttarkashi
Taluka	Bhatwari
Access Road	Uttarkashi-Sangamchatti
Rail head	Rishikesh (185 km)
Geographical coordinates (Diversion site)	
Latitude	30°47'40"N
Longitude	78°26'40"E

LOCATION

State	Uttarakhand
District	Uttarkashi
Taluka	Bhatwari
Access Road	Uttarkashi-Sangamchatti
Rail head	Rishikesh (185 km)
Geographical coordinates (Diversion site)	
Latitude	30°47'40"N
Longitude	78°26'40"E

3- HYDROLOGY

Catchment area at the diversion site.

Gross	167 sq km
Intercepted in the scheme, if any	Nil
Snow bound catchment area	Negligible
Precipitation	
Average rainfall (mm)	1620 mm
Dependable yield	
50%	5.63 cumec
75%	4.09 cumec
100% (minimum discharge)	2.14 cumec
Climate data	Normal Max Min
Atmospheric temperature	20° C 30° C 5° C
Humidity	60% 85% 30%

e. Floods

Historical

Maximum discharge estimated	NA
Date of occurrence	NA
Max. Design flood discharge	650 cumec
Month of nil flows	Nil

4- MEDIUM/HIGH HEAD PROJECTS

A Diversion structure

Type of structure	Trench type weir with trash rack
-------------------	----------------------------------

Length	32 M
ductOverflow section	22 M
Non-overflow section	10 M
Shingle excluder	
Length (approx.)	180 m
Size	1 m x 1 m
Material	RCC
Maximum discharging Capacity (Cumec)	650 cumec

B. Intake structure

Shape and size	Rect. 8 m x 6 m
Height above deepest foundation	6.79 m
Number of gates	Two
Size of gates	3.6 m x 2.4 m & 2.5 m x 2.15 m

Power Duct:

Length	180 m
Size	3.00 m x 2.30 m

2- RIVER CATCHMENT

Catchment	Ganga
River	Ganga
Tributary	Bhagirathi
Sub-tributary	Asiganga

D. Desilting tank

Type	Hopper Type
Material of construction	RCC
Size	70 m x 8.5 m
Particle size to be removed	0.2 mm
Size of silt flushing pipe	450 mm dia(04 nos.)600 mm dia (02 Nos)

E. Water conductor system

(I)Open Power channel

Length (approx.)	91 m
Shape	Rectangular
Size	2.5 m x 2.3 m
Full supply depth	2.00 m
Material	RCC

(II) Free flow head race Tunnel

Length (approx.)	1604 m
Shape	D-Shaped
Size	2.10 m x 3.00 m
Full supply depth	1.70 m
Material	RCC

F. Forebay

Size	40 m x 8.5 m
Full supply level	RL 1374.44 m

G. Penstock

(I) Main penstock

Number	One with bifurcation at ends
Diameter and Thickness	1600 mm ID & 10 mm
Length	110 m

(II) Branch Main penstock (after bifurcation)

Number	Two
Diameter and Thickness	1250 mm ID & 10 mm
Length	20 m each

5- POWER HOUSE

Type	Surface		
Head			
Design - Gross	56.63 m	Net	55.33 m
Size of power house	30.00 m x 15 m x 8.5 m		
Installed capacity	2x2250 kW		

Turbines:

Type	Horizontal Francis
Number	Two
Capacity	2x2250 kW
Type of generator	Synchronous
Excitation system	Static Brushless excitation
Regulation system	AVR
Power house crane	HOT
Lifting tackle capacity	18MT

6- TAIL RACE

Shape	Rectangular
No.	One
Length.	100 m

TRENCH WEIR AND INTAKE STRUCTURES





Power Duct before 03/08/2012



Power Duct after 03/08/2012

Power Duct alignment



POWER CHANNEL BEFORE FLOOD



Tunnel Outlet portal
BEFORE FLOOD



FOREBAY



POWER HOUSE BEFORE FLOOD



View of Power House, TRC & Switchyard site After Flood of 03/08/2012





KALDIGAD SHP
(2x4500 Kw)
(UNDER CONSTRUCTION)

KALDIGAD SMALL HYDRO PROJECT (2x4500KW) UNDER CONSTRUCTION

- 1- Category of Project under Eco –Sensitive Zone - Undefined
- 2- Condition of Project (Proposed/Commissioned/Under Construction) – Under Construction
Geographical Coordinates
A – Trench Weir $30^{\circ} 50' 28''$ E & $78^{\circ} 28' 30''$ N
B – Power House $30^{\circ} 28' 30''$ E & $78^{\circ} 27' 5''$ N
- 3- Name of River Kaldigad (a tributary of Asiganga River)
- 4- Catchment area 111.46 SqKm
- 5- Type & requirement of land for the project 4.036 Ha; Reserve Forest land
0.66 Ha Civil Soyam Land
- 6- Type of water conductor system and length Contour channel 100 m & free flow tunnel, length – 2386 m

7- Brief description of the project

Kaldigad Small Hydroelectric Project (2X4500 kW) is situated on the left bank of Kaldigad River between El 1785 m – 1505 m. A provision of 20% of the minimum flow of river i.e. 0.50 cumec has been made for environmental release continuously in the River. This project is under construction prior to decalaration of Eco-Sensitive Zone in District Uttarkashi. About 21% works of the project were completed up to occurrence of flash flood in Asiganga Valley. Due to flash flood in Asiganga Valley, some part of of Project's land was washed away, therefore; case for transfer of additional land was submitted in the office of Nodal Officer, Forest Department, Dehradun, which is still pending at their level. The category of under constructiuon hydro electric projects is not defined in GoI Gazette Notification of Eco-Sensitive Zone. The brief description of under construction / proposed hydraulic structures of the project are hereunder:

(A) TRENCH WEIR

A trench weir having 52 m span (equal to the width of River) has been proposed to divert the required discharge from the River, out of which approximate 40% works has been completed. Due to construction of Trench Weir, neither any reservoir will form nor any displacement or any situation of drown of vegetation will occur. The natural boundary of River will also not be affected due to construction of Trench weir.

(B) WATER CONDUCTOR SYSTEM

The total length of water conductor system is 2531 m. Water conductor system having, contour channel (100.0 X 2.0 m), Desilting Tank (45.0X10.0 m), Free flow tunnel (2386.0X2.0 m), Forebay (28.0X7.0 m), Penstock (590.0X1.10 m) & Tail Race Channel 228.0 m are under construction. According to the width of hydraulic structures, the minimum hill cutting has been done and minimum cutting will be done for remaining structures. The length of contour channel and penstock is 100 m and 590 m respectively.

The contour channel is proposed to be constructed on 3.00 m wide strip/patra. The penstock will be laid on 1.10 m wide strip along the hill slope. The minimum hill cutting will be required for construction of these structures. Approximate 740 m free flow tunnel of the project is completed and 1646 m is yet to be completed.

(C) REQUIREMENT OF LAND

For construction of project, total 5.506 Ha reserve forest land and 0.66 Ha Civil Soyam land shall be required, out of which 4.036 Ha reserve forest land has been sanctioned under the provision of Forest Conservation Act, whose lease deed has also been executed in favour of UJVNL. The land case for construction of the project for 1.147 Ha reserve forest land and 0.66 Ha Civil Soyam land is pending in the office of Nodal Officer, Dehradun since June 2013. A provision for proper disposal of unutilized muck at appropriate low land has been made in the sanctioned land. The muck generated from the construction of structures has been disposed off at pre demarcated dumping yard. The proper protection work has been made, to avoid the spilling of muck from the dumping yard. Land scaping of the filled dumping yard is proposed to be done by bio engineering as per suggestion of the experts. The provision of Forest Conservation Act and Task Force has been strictly complied during construction and its compliance shall be ensured during construction of remaining structures.

(D) POWER HOUSE & SWITCH YARD

A surface power house having size 36X23 m is proposed to be constructed in the project. Power House is proposed on the left bank of Asiganga River at 400 m down stream from the bridge, constructed on Asiganga River for travelling from Gangori – Sangamchatti Motor Road to Seku Village. The hill slopes is proposed to be stabilized by bio engineering as per consultation of experts after excavation and leveling of the terrace.

(E) ELECTRIC TRANSMISSION LINE

Kaldigad Small Hydro Electric Project will generate 56.30 MU electricity per year. For transmission of generated electricity, 12 km long, 33 kV double circuit transmission line from power house to Tiloth 220 kV switch yard is under construction. An approval from MOEF for 20.25 Ha reserve forest land for construction of 33 kV, double circuit transmission line has been obtained. The conditioned laid down in the approval letter and Forest Conservation Act is being complied strictly and shall also be complied during construction of remaining works. The generated electricity from the project shall be fed to the Uttarakahdn grid which shall be consumed as per the policy of Uttarakahnd.

(F) RESEDENTIAL COLONY

The residential colony for the project has been constructed in 2011 on the land of Gangori Power House. The staff posted on the project during operation will reside in the Gangori Colony and during operation they will be transported to and fro from Gangori Colony to Power House by shift bus.

(G) TECHNIQUE IMPLEMENTED IN PROJECT CONSTRUCTION

The Detailed Project Report of the project was prepared by Indian Institute of Technology, Roorkee after detailed investigation and surveying of the site. Revised Detailed Project

Report has been prepared incorporating the suggestions of technical experts and Geologist after flash flood occurred on 03.08.2012. The Revised Detailed Project Report has been approved by the Board of Director of UJVNL. The hydraulic structures have been designed after surveying, site inspection and detailed investigation by a team of Technical Experts & Geologist of IIT, Roorkee after establishing the suitability of the site before preparation of the Detailed Project Report.

(H) COST BENEFIT ANALYSIS

- | | | |
|-------|------------------------------------|---|
| i. | Total cost of the project | Rs 9955.37 lac (without interest during construction) |
| | | Rs 10366.00 lac (with interest during construction) |
| ii. | Debt Equity Ration | 70:30 |
| iii. | Loan Repayment Period | 25 years |
| iv. | Financing Institution | Asian Development Bank |
| v. | Expenditure till date | Rs 2100.00 lac |
| vi. | Net Saleable energy | 56.30 Million Unit |
| vii. | Levelized cost of generation | Rs 3.59 per unit |
| viii. | Annual Revenue from sale of energy | Rs 2094.36 lac |
| ix. | Internal Rate of Return (IRR) | 11.92% |
| x. | Benefit cost Ratio | 1.06 |

➤ **No change in costing shall be occurred due to implementation of Eco-sensitive gazette notification.**

The following standard shall be followed strictly during construction of the project:

- 1- The earth moving and heavy equipments are not used at site but all works has been carried out through labour and small equipments. Controlled blasting shall be used in construction of free flow tunnel.
- 2- The unutilized muck, generated from construction is being disposing at demarcated and sanctioned place by the forest department.
- 3- The construction material such as stone, sand and aggregate has been brought from approved quarries and same has been used in construction. No mining and quarrying has been done at site for construction material. The construction material shall be brought from approved quarries for remaing works.
- 4- The natural boundary of Kaldigad remained unchanged during construction of Trench Weir and no change will occur in the natural boundary of river due to construction of remaing works of Trench Weir.
- 5- A 0.50 cumec environmental water discharge will be release always to keep the river flow continuous.
- 6- The monthly report of experts of environment & pollution control unit shall be ensured to submit to Environment and Pollution Control Board

- 7- The hill slopes shall be stabilized by appropriate protection works to avoid erosion of hills in the project area and the technique of bio-engineering shall be used in slope stabilization.
- 8- The treatment of construction generated muck shall be done as per suggestion of experts by using bio engineering.
- 9- The proper drains shall be constructed in project area for disposal of seepage or runoff and shall be kept free from blockage. These drains shall be connected with the natural drainage system.
- 10- The appropriate design standard shall be followed in design of hydraulic structures so that hill erosion could be avoided.
- 11- There is no any fault zone in the project area.
- 12- The flow of Kaldigad / Asiganga River shall remain undisturbed during construction of project.
- 13- There is no irrigation or water supply scheme on the Kaldigad in project area or in upstream of the project therefore; no other project shall be affected due to construction this project.
- 14- There is no habitation and agricultural land in the project area, therefore conversion of land use shall not be required. Rehabilitation shall not be required due to non formation of reservoir in the project.
- 15- The rights of villagers in the vicinity of the project area shall not be affected due to construction of the project.
- 16- The priority in employment during construction and operation of the project shall be given to local villagers as per their eligibility.
- 17- The alignment of the project shall be done such that loss of vegetal cover could be minimized.
- 18- No natural heritage shall be affected due to construction of the project and the old foot path lies in the project area shall be maintained in its natural state.

The Salient Features of the Project are hereunder:

1.	Location		
(i)	State	:	Uttarakhand
(ii)	District	:	Uttarkashi
(iii)	Tehsil	:	Bhatwari
(iv)	Village	:	Sangam Chatti
(v)	Access-road	:	16 kms from Uttarkashi by Uttarkashi-Gangori-Sangam Chatti Road
(vi)	Reference of topo sheet	:	53 J/5
		:	Weir site PH site
	Geographical coordinator	Latitude	: 30 ⁰ -50' 28'' N 30' 49' 45'' N
		Longitude	: 78 ⁰ 28' 30'' E 78 ⁰ 27' 5'' E
(vii)	Altitude	:	1781 m 1514 m above mean sea level
2(a)	River Catchment		
(i)	Catchment	:	111.46 sq. km. (Snow catchment 33.82 sq.km.)
(ii)	River	:	Kaldigad (a major tributary of Asiganga River)
(iii)	Max flood discharge	:	872 cumecs
3.	Medium / High Head Projects:		
(a)	Diversion Structure (Head works)		
(i)	Type of structure (Weir/barrage)		Trench type Weir of RCC
(ii)	Length (a) Trench	:	22 m
	Length (b) Solid crest (over flow section)	:	30 m
(iii)	C.L. of Penstock		1512.70

(iv)	Maximum discharge capacity of trench Weir	:	6.25 cumecs
(v)	Gates on entry to intake chamber	:	1 no.
(b)	Desilting Tank (Gutter type)		
	Length (including transition)	:	44.0 m
	Size of gutter	:	28m x8m
	Depth of water above Gutter	:	2.0 m
	Proposed particle size to be removed	:	0.2 mm and above
(c)	Water Conductor System	:	630 m Tunnel before Desilting tank, 100m Power Channel & 1756m Tunnel
(i)	Length (m)	:	630 m Tunnel from intake to Desilting Tank & 30 m Power Channel from Desilting Tank to Inlet portal of Tunnel followed by unpressurised free flow 1756 m long Tunnel followed by 70 m long Power Channel upto Forebay
(ii)	Slope	:	(a) in Power Duct/Tunnel : 1 in 350 (b) in Tunnel & Power Channel 1 in 1000
(iii)	Size (a) Power Duct (b) Open channel - rectangular (c) Tunnel – D-shaped	:	Width 1.75m, Total Depth 1.55 m Width 2.30m, Total Depth 1.55 m Width 2.30m, total height upto crown 3.015 m
(iv)	Thickness of lining of Tunnel Thickness of wall of rectangular channel	:	0.225 m thick, CC M-20 0.200 m thick, RCC M-20
(v)	Design discharge	:	4.12 cumecs
(c)	Forebay:	:	2 minutes storage capacity
(i)	Size of forebay (upto MDDL) Maximum depth near penstock	:	L=27.4 m; B = 6.8, D = 4.8m
(ii)	Full forebay level (FSL)	:	1777.20 m
(d)	Penstocks		

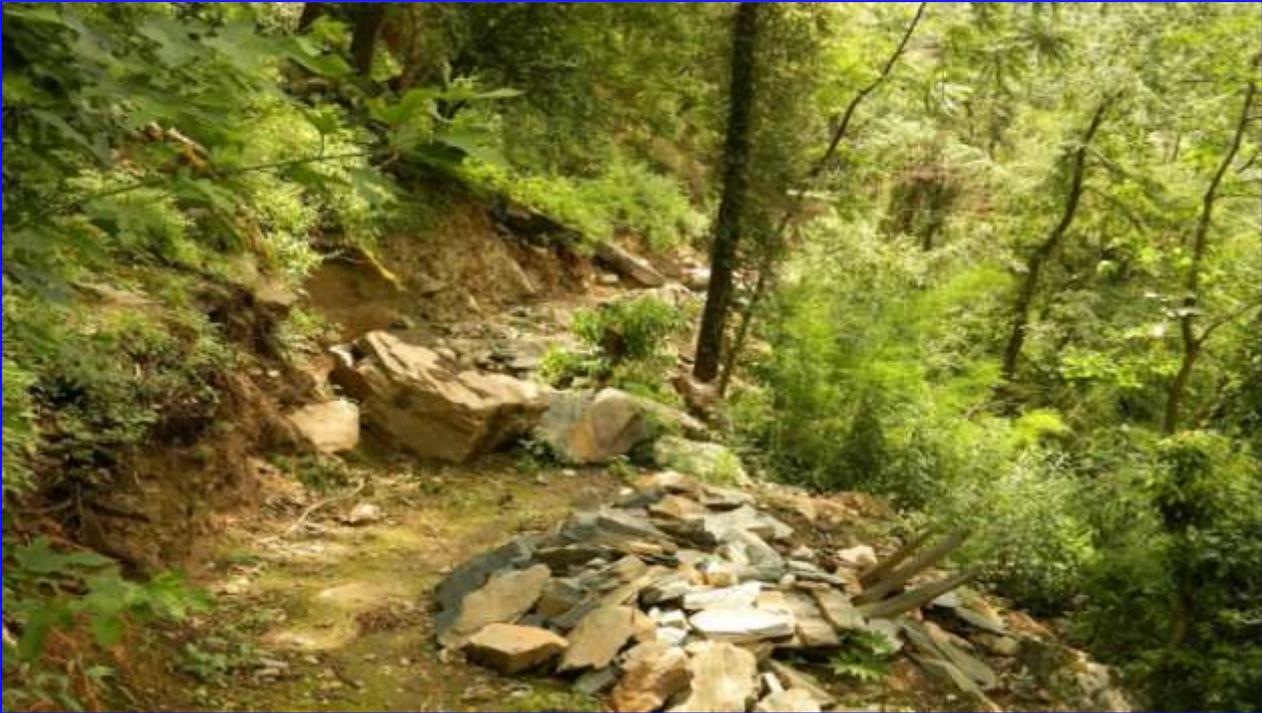
(i)	Number	:	One
(ii)	Diameter Thickness of steel liner	:	1.1 m 8 to 20mm
(iii)	Length	:	580 m
(iv)	Size of gate on penstock at forebay	:	2.20 m high x 1.65 m long
(v)	Bifurcations at lower end	:	Bifurcation just before PH to two 0.8 m dia, 14 mm thick to feed two units
4.	Power House		
(i)	Type	:	Over ground surface type Power House E.L. at Power House 1511.26 m
(ii)	HFL of Asiganga River at Power House site	:	1509.500m on 03.08.2012
(iii)	Head <ul style="list-style-type: none"> • Gross Head • Net head • Design 	:	264.50 m 255.94 m 255.94 m
(iv)	Turbine <ul style="list-style-type: none"> • Type • Number • Output (Kw/Hp) 	:	Pelton horizontal shaft Two 4500 KW
(v)	Size of Power House : <ul style="list-style-type: none"> • Length • Width • Height • Machine hall floor 	:	36.00 m 23.00 m 12.85 m 1511.26 m
(vi)	Installed capacity (KW)	:	2 x 4500 KW (Machine of 2 x 4500

			kW already procured)
(vii)	Type of generator Generator specification Excitation system Regulation system	:	Synchronous salient pole type 4500 Kw, 11 KV, 600 rpm, 0.85 power factor Brush-less AVR type
(viii)	Power House crane/lifting tackle capacity	:	25 tonnes
5.	Power	:	
(i)	Installed capacity	:	9000 KW (Machine of 2X4500 kW already procured)
(ii)	Plant Load Factor	:	74.58 %
(iii)	Seasonal (max) Power (KW)	:	8800 KW
(iv)	Annual energy (KWH) for sale After accounting for machine outages and auxiliary consumption on 50% dependability	:	56.30 mkwh
6.	Switchyard:		
(i)	Voltage level / basic insulation level	:	33 kV
(ii)	No. of bays	:	2 bays
(iii)	Size : Length and Width h	:	30 x 20 m

TRENCH WEIR



POWER CHANNEL





PILANGAD – I SHP

(2x1125 Kw)

(EXISTING)

PILANGAD – I SMALL HYDRO ELECTRIC PROJECT (2x1125 Kw) (EXISTING)

- 1- Category of Project under Eco –Sensitive Zone - Regulated
- 2- Condition of Project (Proposed/Commissioned/Under Construction) – Existing Project (Damaged due to flash flood of 15 – 17 June 2013, Works of restoration under progress)
Geographical Coordinates

A – Power House 30⁰ 46⁰ E & 78⁰ 38⁰ N

- 3- Name of River Pilangad (a tributary of Bhagirathi River)
- 4- Catchment area 198.50 SqKm
- 5- Type & requirement of land for the project Existing Project
- 6- Type of water conductor system and length Contour channel 1350 m

7- BRIEF DESCRIPTION OF THE PROJECT

Pilangad Small Hydro Electric Project is located in Tehsil Bhatwari, District Uttarkashi in between 30⁰ 46⁰ E & 78⁰ 38⁰ N. The project was commissioned in year 2003 -04 and since then the project is generating electricity.

Due to flash flood occurred in 15 – 17 June 2013 in Uttarakhand, the Trench Weir, Desilting Tank and partial Contour channel of the project was got damaged and electricity generation was stopped from the project. The project generated average 10.60 MU per year since its commissioning year 2004 to 2013, upto its damage. The project is connected to Uttarakhand grid, the electricity generated from the project was utilized directly or indirectly by the villagers of Uttarkashi and Uttarakhand. The restoration of the damaged structures of the project is essential for the development of Uttarakhand. Central Govt has sanctioned central assistance for restoration of the project under disaster packages (SPA – R).

8- RESTORATION WORKS OF DAMAGED STRUCTURES

- A – No additional land is required for restoration of the damaged structures of the project.
- B – The restoration of the damaged structures of the project shall be done on its original alignment and on earlier sanctioned land similar (without changing the length, breadth and height of earlier structures) to earlier constructed structures as per their earlier design.
- C – No excavation shall be required on the hill slopes for restoration of the damaged structures. The treatment to stabilize the eroded hill slopes due to flash flood shall be done.
- D – The works are related to maintenance and repair, therefore little muck will generate, and that will be used in filling behind the structures. No heavy equipments and blasting will be used during restoration works therefore no possibility of noise and air pollution. The natural boundary of the Pilangad shall remain unchanged despite of restoration of damaged structures, and the flow of River shall remain as it is. Any type of expansion in

the installed capacity of the projected shall not occur after completion of the restoration works.

No adverse effect shall occur on the environment of the area due to restoration of damaged structures and the provision of Forest Conservation Act 1986 shall be strictly followed.

9- ECO SENSITIVE ZONE

As per sub para XIII of para 3 (b) of MOEF Notification No. 24291 dated 18.12.2012 “The existing hydro-electric power projects shall continue to operate with strict environmental compliance and social audit”, Pilinagad – I Small Hydro Electric Project lies under “Regulated Activities under Eco Sensitive Zone”.

10-COST BENEFIT ANALYSIS

- | | |
|--|--|
| i. Total cost of the project | Rs 904.93 lac (without interest during construction) |
| | Rs 993.43 lac (with interest during construction) |
| ii. Financial Assistance | Central Assistance under disaster package |
| | (SPA-R) Rs 904.00 lac |
| iii. Expenditure till date | Nil |
| iv. Net Saleable energy | 14.21 Million Unit |
| v. Levelized cost of generation | Rs 3.28 per unit |
| vi. Annual Revenue from sale of energy | Rs 557.03 lac |
| vii. Internal Rate of Return (IRR) | 18.29% |
| viii. Benefit cost Ratio | 1.42 |

➤ **No change in costing shall be occurred due to implementation of Eco-sensitive gazette notification.**

The following standards shall strictly be followed in restoration of damaged structures of the Project:

- 1- The earth moving and heavy equipments shall not be used at site but all works shall be carried out through labour and small equipment, therefore blasting shall not be required.
- 2- The unutilized muck, generated from restoration shall be disposed off in the filling behind the structures.
- 3- The construction material such as stone, sand and aggregate has been brought from approved quarries and same is being used in construction. No mining and quarrying has been done at site for construction material.
- 4- The natural boundary of Pilangad remained unchanged during construction of Trench Weir and no change will occur in the natural boundary of river due to construction of remaining works of Trench Weir.

- 5- The hill slopes shall be stabilized by appropriate protection works to avoid erosion of hills in the project area. The technique of bio-engineering shall be used in slope stabilization.
- 6- The proper drains shall be constructed in project area for disposal of seepage or runoff and shall be kept free from blockage. These drains shall be connected with the natural drainage system.
- 7- The appropriate design standard shall be followed in design of hydraulic structures so that hill erosion could be avoided.
- 8- There is no any fault zone in the project area.
- 9- The flow of Pilangad River shall remain undisturbed during construction of project.
- 10- No natural heritage shall be affected due to construction of the project and the old foot path lies in the project area shall be maintained in its natural state.

The Salient Features of the Project are hereunder:

1.	Location		
(i)	State	:	Uttarakhand
(ii)	District	:	Uttarkashi
(iii)	Tehsil	:	Bhatwari
(iv)	Village	:	Malla (Bhela Tepry)
(v)	Access-road	:	About 26 kms from Uttarkashi on Uttarkashi - Gangotri Route.
(vi)	Reference of topo sheet	:	53 J/9
	Geographical coordinator	Latitude	: 30 ⁰ -46' N
		Longitude	: 78 ⁰ - 38' E
(vii)	Altitude	:	1450 m to 1600 m above mean sea level
2(a)	River Catchment		
(i)	Catchment	:	198.5 Sqkm
(ii)	River	:	Pilangad, a tributary of Bhagirathi River
(iii)	Max flood discharge	:	825.00 Cumec
3.	Medium / High Head Projects:		
(a)	Diversion Structure (Head works)		
(i)	Type of structure (weir/barrage)		Trench type weir of RCC
(ii)	Length (a) Trench	:	22.00 m
	Length (b) Solid crest (over flow section)	:	3.00 m
(iii)	Min ^m TWL		1473.00 m

(iv)	Maximum discharge capacity of trench weir	:	3.50 cumecs
(v)	Gates on entry to intake chamber	:	1 no.
(b)	Desilting tank (Hopper type)		
	Length (including transition)	:	35.74 m
	Size of gutter	:	27.74m x4.10m
	Depth of water above Gutter	:	Varying from 2.30 to 3.30 m
	Proposed particle size to be removed	:	0.2 mm and above
(c)	Water Conductor System	:	1350 m
(i)	Size (a) Power Duct (b) Open channel - rectangular	:	Length – 110 m Width 1.80 m, Total Depth 1.20 m, (FSD – 0.90 m) Length – 1200 m Width 1.80 m, Total Depth 1.20 m; (FSD – 0.90 m)
(ii)	Design discharge	:	2.75 cumecs
(d)	Forebay:	:	2 minutes storage capacity
(i)	Size of forebay (upto MDDL) Maximum depth near penstock	:	L=18.00 m; B = 12.00, D = 5.5 m
(e)	Penstocks		
(i)	Number	:	One
(ii)	Diameter Thickness of steel liner	:	900 mm 8 to 10 mm
(iii)	Length	:	140 m
(iv)	Size of gate on penstock at forebay	:	Sluice vale at penstock of 900 mm dia
(v)	Bifurcations at lower end	:	Bifurcation just before PH to two 600 mm dia, 10 mm thick to feed two units
4.	Power House		
(i)	Type	:	Over ground surface type power house E.L. at power house 1475.00 m
(ii)	Size	:	30 x 11 x 8.5 m
(iii)	Head <ul style="list-style-type: none"> • Gross Head • Net head • Design 	:	105.245 m 102.00 m 102.00 m
(iv)	Turbine <ul style="list-style-type: none"> • Type 	:	Francis horizontal shaft

	<ul style="list-style-type: none"> • Number • Output (Kw/Hp) 	: Two 1125 KW
(v)	Size of power house : <ul style="list-style-type: none"> • Length • Width • Height 	: 30.00 m : 11.00 m : 8.50 m
(vi)	Installed capacity (KW)	: 2 x 1125 KW
(vii)	Type of generator Generator specification Excitation system Regulation system	: Synchronous salient pole type : 1250 kVA Kw, 3.3/33 KV, 1000 rpm, 0.9 power factor Synchronous AVR type
(viii)	Power house crane/lifting tackle capacity	: 15 tonnes
5.	Power	:
(i)	Installed capacity	: 2250 KW (2X1125 kW)
(ii)	Plant Load Factor	: 54 % (As per previous average generation)
	TRC	
(i)	Shape	Rectangular RCC
(ii)	Size	1.80x1.20 (internal dimensions)
(iii)	Length	10 mtrs
(iv)	Water level (El.M) at PH site Max min	1475.00 m 1473.80 m
(v)	Number of size of draft tubes gates	
	Power	
(i)	Seasonal (max) Power (KW)	: 2250 KW
(ii)	Annual energy (KWH) for sale After accounting for machine outages and auxiliary consumption	: 14.21 MU
6.	Switchyard:	
(i)	Voltage level / basic insulation level	: 33 kV
(ii)	No. of bays	: 2 bays
(iii)	Size : Length and Width	: 30 x 15 m

TRENCH WEIR



TRENCH WEIR





DAMAGED DESILTING TANK



TRC PIPE BURIED



TRC PIPE BURIED



TRC PIPE BURIED





SONEGAD SHP
(2x3500 Kw)
(PROPOSED)

SONEGAD SMALL HYDRO PROJECT (2x3500KW) PROPOSED

- 1- Category of Project under Eco –Sensitive Zone - Undefined
- 2- Condition of Project (Proposed/Commissioned/Under Construction) – Proposed (Investigation and Planning completed)
Geographical Coordinates
A – Trench Weir 30⁰ 58⁰ 27” E & 78⁰ 41⁰ 11” N
B – Power House 30⁰ 58⁰ 25” E & 78⁰ 41⁰ 46” N
- 3- Name of River Sonegad (a tributary of Bhagirathi River)
- 4- Catchment area 98.31 SqKm
- 5- Type & requirement of land for the project 1.47 Ha; Reserve Forest land
0.33 Ha Barren Nap land
- 6- Type of water conductor system and length Contour channel / Pipe Channel length –
730 m.

7- **DESCRIPTION OF THE PROJECT**

Sonegad Small Hydro Electric Project (installed capacity 7000 kW) is located on the left bank of tributary of Bhagirathi River, Sonegad between 2370 m to 2165 m. A provision to release minimum 20% water discharge of river i.e. 0.30 cumec continuously has been made in the Detailed Project Report of the Project. The brief description of the hydraulic structures of the project is as hereunder:

(A) TRENCH WEIR

A trench weir having 13 m span (equal to the width of River) shall be constructed to divert the required discharge from the River. Due to construction of Trench Weir, neither any reservoir will form nor any displacement or any situation of drown of vegetation will occur. The flow of River will remained continuous and 0.30 cumec flow shall be ensured. The natural boundary of River will also not affect due to construction of Trench weir.

(B) WATER CONDUCTOR SYSTEM

The total length of water conductor system is 1130 m. Water conductor system having, power duct (30.0X3.0 m), vortex tube chamber (25.0X4.50 m), Desilting Tank (48.4X8.7 m), Pipe Channel (600.0X1.65 m), Forebay (26.0X6.0 m), Penstock (400.0X1.20 m) etc are proposed. According to the width of hydraulic structures, the minimum hill cutting shall be done. The length of contour channel and penstock is 234 m and 590 m respectively. The Mild Steel power pipe of 1.65 m diameter is proposed to be laid on 1.65 m wide strip along contour, which shall carry the required water discharge up to Fortebay. The penstock will be laid on 1.60 & 1.20 m wide strip along the hill slope to minimize the excavation. There is no tunnel construction in the project. The main structure of water conductor system is power pipe, wherein required water discharge through 1.65 m mild steel pipe shall be carried out up to Forebay in place of

iii.	Loan Repayment period	12 years
iv.	Financing Institution	NABARD
v.	Expenditure till date	NIL
vi.	Net Saleable energy	45.43 Million Unit
vii.	Levelized cost of generation	Rs 3.60 per unit
viii.	Annual Revenue from sale of energy	Rs 1908.24 lac
ix.	Internal Rate of Return (IRR)	11.99%
x.	Benefit cost Ratio	1.12

- **No change in costing shall be occurred due to implementation of Eco-sensitive gazette notification.**

The following standard shall be followed strictly during construction of the project:

- 1- The earth moving and heavy equipments shall not be used at site but all works shall be carried out through labour and small equipments.
- 2- The unutilized muck, generated from construction shall be disposed off at approved and demarcated land by forest department.
- 3- The construction material such as stone, sand and aggregate shall be brought from approved quarries. No mining and quarrying shall be done at site for construction material.
- 4- The natural boundary of Sonegad remained unchanged during construction of Trench Weir.
- 5- A 0.30 cumec environmental discharge will be release always to keep the river flow continuous.
- 6- The monthly report of experts of environment & pollution control unit shall be ensured to submit to Environment and Pollution Control Board.
- 7- The hill slopes shall be stabilized by appropriate protection works to avoid erosion of hills in the project area. The technique of bio-engineering shall be used in slope stabilization.
- 8- The treatment of muck generated from construction shall be done as per suggestion of experts by using bio-engineering.
- 9- The proper drains shall be constructed in project area for disposal of seepage or runoff and shall be kept free from blockage. These drains shall be connected with the natural drainage system.
- 10- The appropriate design standard shall be followed in design of hydraulic structures so that hill erosion could be avoided.
- 11- There is no any fault zone in the project area.

- 12- The flow of Sonengad River shall remain undisturbed during construction of project.
- 13- Due to provision of power pipe for construction of the project, the excavation works shall be minimum.
- 14- There is no irrigation or water supply scheme on the Sonengad in project area or in upstream of the project therefore; no other project shall be affected due to construction of this project.
- 15- There is no habitation and agricultural land in the project area, therefore conversion of land use shall not be required. Rehabilitation shall not be required due to non formation of reservoir in the project.
- 16- The rights of villagers in the vicinity of the project area shall not be affected due to construction of the project.
- 17- The priority in employment during construction and operation of the project shall be given to local villagers as per their eligibility.
- 18- The alignment of the project shall be done such that loss of vegetal cover could be minimized.
- 19- No natural heritage shall be affected due to construction of the project and the old foot path lies in the project area shall be maintained in its natural state.



PILANGAD-II SHP
(2x2000 Kw)
(PROPOSED)

PILANGAD – II SMALL HYDRO ELECTRIC PROJECT (2x2000 KW)

- 1- Category of Project under Eco –Sensitive Zone - Undefined
- 2- Condition of Project (Proposed/Commissioned/Under Construction) – Under Investigation and Planning.

Geographical Coordinates

A – Trench Weir 30° 58' 27" E & 78° 41' 11" N

B - Power House 30° 58' 25" E & 78° 41' 46" N

Name of River Pilangad (a tributary of Bhagirathi River)

Catchment area 105.00 SqKm

3- **DESCRIPTION OF THE PROJECT**

Pilangad Small Hydro Electric Project is located on the right bank of the tributary of Bhagirathi River, Pilangad near Pilang village. The work of discharge measurement is being done under investigation and planning of the project. A provision to release minimum 20% discharge of river continuously for environment and ecology shall be made in the Detailed Project Report of the Project and accordingly the installed capacity of the project shall be kept. The Detailed Project Report of the Project shall be prepared after detailed investigation, surveying and inspection of the site by technical experts and geologist ensuring the suitability of the site. The construction works of the projects shall be done as per design and drawing issued by appropriate technical expert and technical specification & standards shall be followed strictly.

(I) COST BENEFIT ANALYSIS

The project is under preliminary investigation and planning stage, therefore cost benefit analysis could not be ascertained at this stage.

- **No change in costing shall be occurred due to implementation of Eco-sensitive gazette notification.**

The following standard shall be followed strictly during construction of the project:

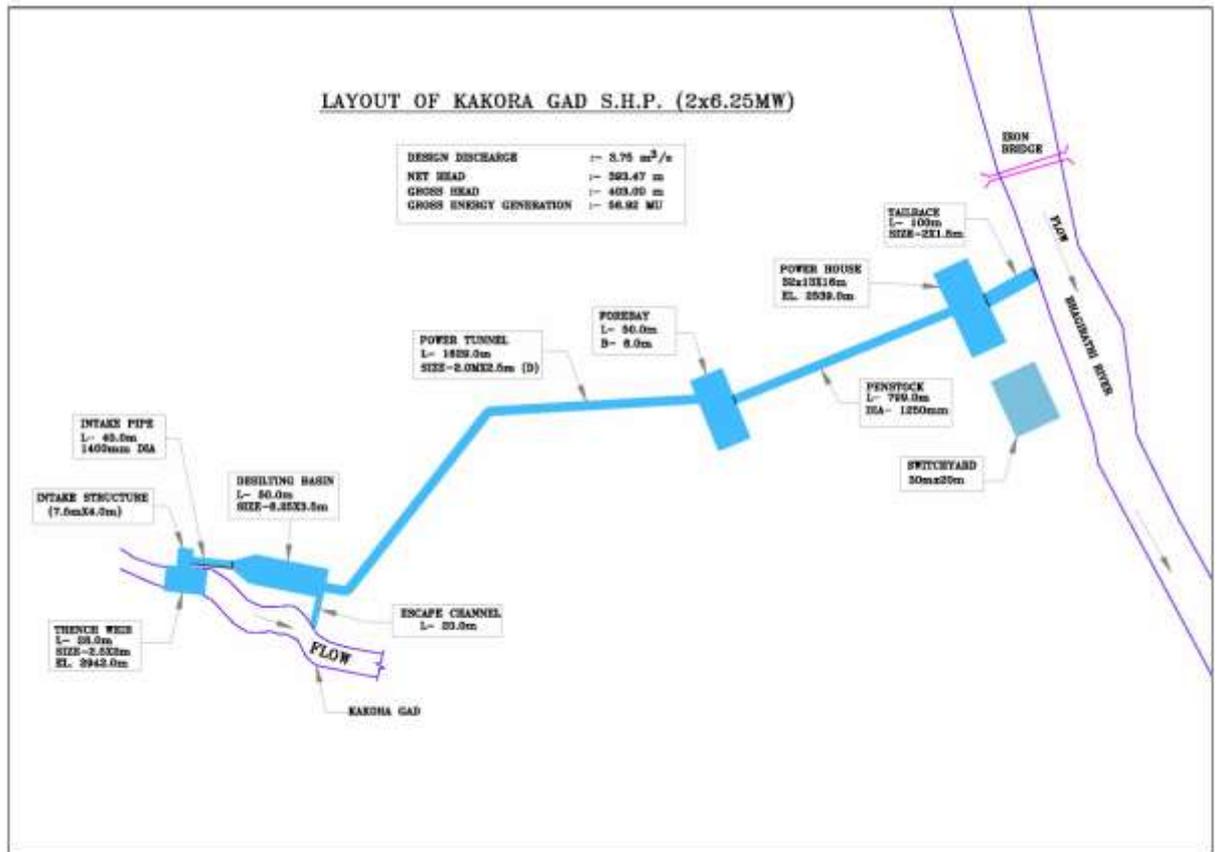
- 1- The earth moving and heavy equipments shall not be used at site but all works has been carried out through labour and small equipments.
- 2- The unutilized muck, generated from construction shall be disposed off at approved and demarcated land by forest department.
- 3- The construction material such as stone, sand and aggregate shall be brought from approved quarries. No mining and quarrying shall be done at site for construction material.
- 4- The natural boundary of Pilangad remained unchanged during construction of Trench Weir.
- 5- A 0.50 cumec environmental discharge will be release always to keep the river flow continuous.

- 6- The monthly report of experts of environment & pollution control unit shall be ensured to submit to Environment and Pollution Control Board
- 7- The hill slopes shall be stabilized by appropriate protection works to avoid erosion of hills in the project area. The technique of bio-engineering shall be used in slope stabilization.
- 8- The treatment of construction generated muck shall be done as per suggestion of experts by using bio engineering.
- 9- The proper drains shall be constructed in project area for disposal of seepage or runoff and shall be kept free from blockage. These drains shall be connected with the natural drainage system.
- 10- The appropriate design standard shall be followed in design of hydraulic structures so that hill erosion could be avoided.
- 11- There is no any fault zone in the project area.
- 12- The flow of Pilangad River shall remain undisturbed during construction of project.
- 13- Power Pipe / Contour Channel shall be provided in the construction of the project to minimize the excavation.
- 14- There is no irrigation or water supply scheme on the Pilangad in project area or in upstream of the project therefore; no other project shall be affected due to construction of this project.
- 15- There is no habitation and agricultural land in the project area, therefore conversion of land use shall not be required. Rehabilitation shall not be required due to non formation of reservoir in the project.
- 16- The rights of villagers in the vicinity of the project area shall not be affected due to construction of the project.
- 17- The priority in employment during construction and operation of the project shall be given to local villagers as per their eligibility.
- 18- The alignment of the project shall be done such that loss of vegetal cover could be minimized.
- 19- No natural heritage shall be affected due to construction of the project and the old foot path lies in the project area shall be maintained in its natural state.



KAKORAGAD SHP
(12.50 MW)
(Under Implementation)

LAYOUT PLAN



Kakoragad SHP (12.50 MW)

1. Name of Project:Kakoragad SHP
2. Type:Run of River Small Hydropower Project, involves No Dam/Barrage/ Reservoir
3. Location: Kakoragad Stream, tributary of River Bhagirathi,Harsil, Distt Uttarkashi.
4. Capacity: 12.5MW
5. Developer: Harsil Hydro Ltd , 24/73 Birhana Road, Kanpur -208001
6. Development Agreement: Year 2004 -2005
7. DPR Approved : 2011
8. Project Cost (Including Interest During Construction): Rs 9195.8 Lacs
9. Implementation Agreement : Signed 9.9.2011(for period 40 years)
10. Electricity Generation Yearly: Gross 56.92MU , Nett Saleable (30 yrAvg). 49.75 MU
11. Tariff Assumed(2011): Rs. 3.50/unit. (Actual as applicable on commissioning under Renewable Energy Tariff determined by UERC).
12. Net Saleable Yearly Revenue (30yrs average):Rs 1741.1 lacs
13. Royalty to State- Free ElectricityYearly(30yrs average):4.92 MU
14. Carbon Emissions Reduction : Yearly 41,000 tonnes
15. Project Land requirement: 4.9675 HA.
16. Compensatory Afforestation Area Allocated: 9.935 HA.
17. Consent to Establish from State Pollution Control Board : Obtained dt. 17.7.2012
18. Environmental Clearance: Not applicable for SHPs (below 25MW)
19. Other Clearances Obtained:(i) Drinking Water Deptt,(ii) Jal Sansthan Dept, (iii) Minor Irrigation Dept, (iv) Irrigation Dept., (v) PWD Dept.,(vi) Public Health dept., (vii) EcoTask Force and Geology Dept ., (viii) Agriculture dept.,(ix) Fishery Dept, (x) Village (xi) Religious & Historical monument.(xii) Forest Rights.
20. Environmental Flow: Presently 0.3 cumecs, as applicable. However, Environmental Flow will be maintained as may be stipulated by State/Central Govt. Authorities, Monitoring Committee, and as may be directed by Hon'ble Courts.
21. STATUS: Under Implementation as per terms of Implementation Agreement signed with Uttarkhand Govt. on 9.9.2011 and Consent to Establish from State Pollution Board dt 17.7.2014. However, matters relating to implementation and Forest Clearance for 24 Hydropower Projects in Alaknanda-Bhagirathi Basin, including above Project, is sub-judice before Hon'ble Supreme Court and halted till further orders in Case no 6736 of

2013 Alaknanda HydroPower Co. Ltd vs Anuj Joshi & Others vide Hon'ble Court order dt 13.8.2013 and subsequent orders. Project to be included in Zonal Masterplan, subject to final orders of Hon'ble Supreme Court.

22. STANDARDS & SAFEGUARDS.- All applicable Rules, Regulation, Conditions, Best Practices, Design Standards will be followed during Construction and Operation as stipulated by State/Central Govt. Authorities, Monitoring Committee, State Pollution Board and as may be directed by Hon'ble Courts. Due expert advice and supervision will be ensured to keep environmental impact to bare minimum and adherence to stipulated conditions. Regular reports, as applicable, will be sent to concerned Authorities as specified.

	Discharge Capacity	3.75 m ³ /s
6.7	Forebay Tank	
	Length	: 50.0 m
	Width	: 6.0 m
	Depth	: 2.5 m
	Free Board	: 1.0 m
	Type	: Rectangular RCC
	Approximate Detention Time	: 3 Minute
	No of Gates	: 1 no. for penstock Intake
	Valve	1 no. for sluice valve 300 mm diameter
6.8	Penstock	
	Diameter	: 1250 mm
	Length	: 799.00 m
	Unit Penstock	
	Diameter	: 900 mm
	Length	: 2 X 10 m
	Type	: Fabricated from Steel plate confirming to IS 2002
	Thickness	Varies from 8 mm to 32 mm.
	Design discharge	: 3.75 m ³ /s
	Anchors and Saddle Supports	: Anchor block at each vertical & horizontal bend, and supported on saddle support at every 6 m spacing
6.9	Power House	
	Type	: Surface
	Size of the Power House building	: L = 32 m W = 13 m H = 16.0 m
	Service Bay Elevation	: EL. ±2540.50 m
	Centre Line of turbine	: EL. ±2539.0 m
	Installed Capacity	: 2 X 6.25 MW
	Power House Crane	: 50/10 Pendent Operated EOT
7.	E&M Equipment	
7.1	Turbines	
	Type	: Two Jet horizontal Pelton Machine with a directly coupled generator
	No. & Capacity	: 2 x 6250 kW
	Design head	: 393.47 m
	Speed	: 500 rpm

7.2	Generators	
	Type	: Horizontal shaft alternating current synchronous type.
	No. & Capacity	: 2 x 6250 KW
	Power factor	: 0.9pf
7.3	Transformer	
	Type and Numbers	: Twono.10MVA,11/33kV Delta/Star step up transformer of ONAF type
7.4	Tail Race	
	Shape	: Rectangular
	Size	: 2 m wide X 1.5m deep
	Bed Slope	: 1 in 600
	Length	: 100 m
	FSL at Maximum Tail water level	: ± 2535.5m asl (Tail discharge is into Bhagirathi river)
8	Power	
	Installed Capacity	: 12500 KW
	Average year of 95% plant Availability	: 56.92 MU
	Plant Load Factor	: 54.72%
9	Transmission Lines	
	Voltage	: 33 KV Single Circuit
	Length	: 3 Km
	Feeding Point into Grid	: Harsil Switchyards

KAKORAGAD SHP (12.5MW) : FINANCIAL ANALYSIS

FINANCIAL STATEMENTS : (As per DPR2011)					
<u>Assumptions</u>					
Construction Period (Yrs)				3.00	
PROJECT COST (Rs. Lacs)				9195.8	
Cost per MW (Rs. Lacs)				730.7	
DEBT/EQUITY RATIO				2.33:1	
RATE OF INTEREST ON LOAN				12.00%	
Income Tax Rate (%)				33.66%	
		Tax Relief	100%	For 10 years	
REPAYMENT OF LOAN			Yrs	10	
TARIFF RATE FOR IST 15 YEARS			Rs/Kwh	3.50	
ESCALATION ON TARIFF IN 16TH YEAR @ 18%				3.50	
GROSS GENERATION(Million Unit)			Average year	56.92	
Free Power		For 1st 15 Years and thereafter		0%	18%
NET SALEABLE ENERGY (Million Unit)				54.67	
Carbon Credits in tonnes = 41000 tonnes					
Revenue from Sale of Energy (Average 30yrs)			Yearly	1741.1	Lacs INR
Revenue from sale of carbon credits			Yearly	125.92	lacs INR
NOTE: ACTUAL FINAL TARIFF TO BE AS DETERMINED BY UERC UNDER RENEWABLE ENERGY TARIFF					
<u>INDICATORS</u>					
TARIFF COST LEVELISED			Rs/Kwh	2.33	
AVERAGE DSCR				1.49	
IRR(AFTER TAX)				12.96%	

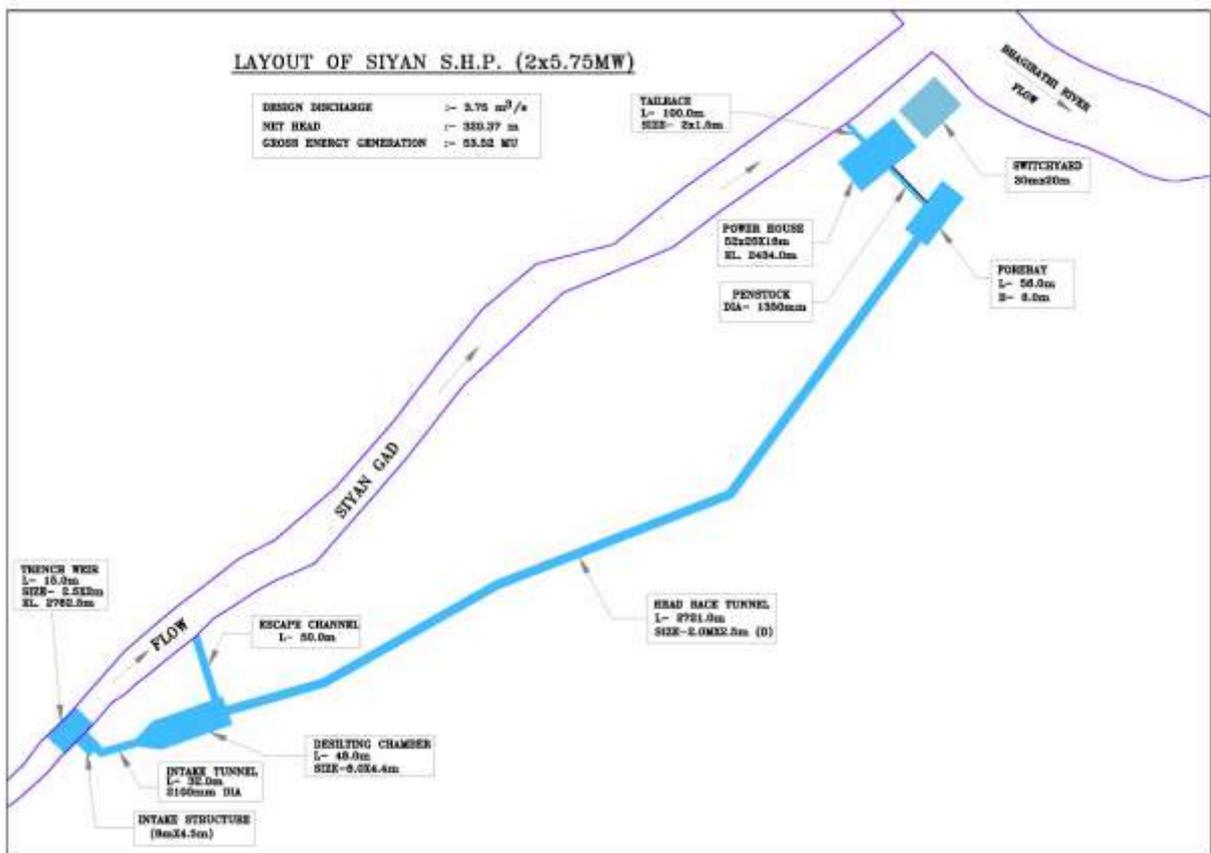
Cost Details

Items	Estimated Cost (Rs. In Lacs)
Building and Civil Work	: 4015.2
Plant & Machinery	: 2853.7
Pre Operative Expenses	: 702.0
Project Cost (Excl. Escalation & IDC)	: 7570.9
Project Cost (Incl. Escalation & IDC)	: 7195.8



**SIYANGAD SHP
(11.50MW)
(Under Implementation)**

LAYOUT PLAN



SIYANGAD SHP (11.50MW)

1. Name of Project: Siyangad SHP
2. Type: Run of River Small Hydropower Project, involves No Dam/Barrage/ Reservoir
3. Location: Siyangad Stream, tributary of River Bhagirathi, Harsil, Distt Uttarkashi.
4. Capacity: 11.5MW
5. Developer: Harsil Hydro Ltd , 24/73 Birhana Road, Kanpur -208001
6. Development Agreement: Year 2004 -2005
7. DPR Approved : 2011
8. Project Cost (Including Interest During Construction): Rs 9361.4Lacs
9. Implementation Agreement : Signed 1.9.2011 (for period 40 years)
10. Electricity Generation Yearly: Gross 53.52MU , Nett Saleable (30 yr Avg). 46.77 MU
11. Tariff Assumed(2011): Rs. 3.50/unit. (Actual as applicable on commissioning under Renewable Energy Tariff determined by UERC).
12. Net Saleable Yearly Revenue (30yrs average):Rs 1637.1 Lacs
13. Royalty to State - Free Electricity Yearly(30yrs average): 4.72 MU
14. Carbon Emissions Reduction : Yearly 38,555 tonnes
15. Project Land requirement: 4.990 HA.
16. Compensatory Afforestation Area Allocated: 9.980HA.
17. Consent to Establish from State Pollution Control Board : Obtained dt. 12.7.2012
18. Environmental Clearance: Not applicable for SHPs (below 25MW)
19. Other Clearances Obtained: (i) Drinking Water Deptt,(ii) Jal Sansthan Dept, (iii) Minor Irrigation Dept, (iv) Irrigation Dept., (v) PWD Dept.,(vi) Public Health dept., (vii) EcoTask Force and Geology Dept ., (viii) Agriculture dept.,(ix) Fishery Dept, (x) Village (xi) Religious & Historical monument. (xii) Forest Rights.
20. Environmental Flow: Presently 0.3 cumecs, as applicable. However, Environmental Flow will be maintained as may be stipulated by State/Central Govt. Authorities, Monitoring Committee, and as may be directed by Hon'ble Courts.

21. STATUS: Under Implementation as per terms of Implementation Agreement signed with Uttarkhand Govt. on 1.9.2011 and Consent to Establish from State Pollution Board dt 12.7.2014. However, matters relating to implementation and Forest Clearance for 24 Hydropower Projects in Alaknanda-Bhagirathi Basin, including above Project, is sub-judice before Hon'ble Supreme Court and halted till further orders in Case no 6736 of 2013 Alaknanda HydroPower Co. Ltd vs Anuj Joshi & Others vide Hon'ble Court order dt 13.8.2013 and subsequent orders. Project to be included in Zonal Masterplan, subject to final orders of Hon'ble Supreme Court.
22. STANDARDS & SAFEGUARDS.- All applicable Rules,Regulation, Conditions, Best Practices, Design Standards will be followed during Construction and Operation as stipulated by State/Central Govt. Authorities, Monitoring Committee, State Pollution Board and as may be directed by Hon'ble Courts. Due expert advice and supervision will be ensured to keep environmental impact to bare minimum and adherence to stipulated conditions. Regular reports, as applicable, will be sent to concerned Authorities as specified.

SIYANGAD SHP (11.50MW) : MAIN FEATURES

1. Location				
	State		:	Uttaranchal
	District		:	Uttarkashi
	Tehsil		:	Bhatwari
	Village		:	Harsil
	Access distance from		:	
	State Capital		:	Dehradun : 275 km
	District Head Quarter		:	Uttarkashi : 75 km
	Nearest Road Head		:	Harsil : 35 km from Bhatwari :4 km u/s of PH Site
	Nearest Rail Head		:	BG – Rishikesh (230 km)
2. Geographical Co-ordinate of proposed Project Structure: Approx. Location--				
	Diversion Weir: Northing		:	31°03.16' N
	Easting		:	078°41.73'E
	Altitude		:	± 2763 m
3. Details of the Stream				
	Name of the stream		:	Siyan Gad.
	Catchments area at diversion		:	136.00Sq.Km.
	Lean period discharge		:	1.10 cumec
	Status of the stream snow / glacier / rain fed		:	Glacier, snow and rain fed
4. Meteorological Information				
	Annual Rainfall		:	1590 mm
	Temperature		:	Min. -12°C, Max +26°C
5. Availability of Labor				
	Availability of Labor in nearby area		:	
	(i) Skilled		:	Available at Uttarkashi.
	(ii) Unskilled		:	Available near project site
6. Preliminary Technical Parameters				
6.1	Basic parameters		:	

	Net head	:	320.37 m
	Design discharge	:	4.21 m ³ /s
	Installed Capacity	:	11.5 MW
6.2	Diversion structure & intake		
	Type	:	Trench type weir with intake structure made of RCC.
	Design discharge for Intake structure	:	5.47 m ³ /s
	Altitude (above MSL)	:	2763 m
	Size	:	Width : 2.5 Varies from 1.0 m to 3.0 m
	Length FSL at Diversion/Intake is at elevation :	:	15 m 2762.50 m
6.3	Intake Tunnel		
	Size	:	D shaped
	Length Height Diameter Max depth of water	:	32 m 2.8 m 2.1 m 1.9 m
	Design Discharge	:	5.26 m ³ /s
6.4	Underground Desilting chamber		
	Design Criteria	:	To remove silt particles of size 0.2mm and above
	Size (With Hopper Shape) Discharge capacity	:	L = 48.0 m B = 8.0 m D = 4.4 m Side Slope of Hopper : 1.H : 1V 5.26 m ³ /s
	Flushing Arrangement	:	Sloping bed, sluice valve at the bottom
6.5	Head Race Tunnel		
	Size :	:	D Shaped Width: 2.0m Height: 2.5m
	Length Discharge capacity	:	2721m 4.21 m ³ /s
6.6	Adit Size Length	:	D Shaped Width: 2.0m Height: 2.5m 50m
6.7	Forebay Tank		
	Length	:	56.00 m

	Width	:	6.00 m
	Depth	:	2.5 m
	Free Board	:	1.0 m
	Type	:	Rectangular RCC
	Approximate Detention Time	:	3 Minute
	Gross Capacity	:	1155 m ³
	No of Gates Valve	:	1 no. for penstock Intake 1 no. for sluice valve 300 mm diameter
6.8	Penstock		
	Diameter	:	1350 mm
	Length	:	637m
	Unit Penstock Diameter	:	900 mm
	Length	:	2 X 10 m
	Type	:	Fabricated from Steel plate confirming to IS 2002
	Thickness	:	Varies from 8 mm to 28 mm.
	Design discharge	:	4.21 m ³ /s
	Anchors and Saddle Supports	:	Anchor block at each vertical & horizontal bend, and supported on saddle support at every 6 m spacing
6.9	Power House		
	Type	:	Surface
	Size of the Power House building	:	L = 52 m W = 25.0 m H = 16.0 m
	Service Bay Elevation Centre Line of turbine	:	EL. ±2436.00 m EL. ±2434.00 m
	Installed Capacity	:	2 X 5.75 MW
	Power House Crane	:	50/10 EOT
7.	E&M Equipment		
7.1	Turbines		
	Type	:	Two Jet horizontal Pelton Machine with a directly coupled generator
	No. & Capacity	:	2 x 5750 kW
	Design head	:	320.37 m
	Speed	:	428 rpm
7.2	Generators		
	Type	:	Horizontal shaft alternating current synchronous type.
	No. & Capacity	:	2 x 5750 KW
	Power factor	:	0.9pf
7.3	Transformer		

	Type and Numbers	:	Twono.7.5MVA,11/33kV Delta/Star step up transformer of ONAF type
7.4	Tail Race		
	Shape	:	Rectangular
	Size	:	2 m wide X 1.5m deep
	Bed Slope	:	1 in 600
	Length	:	100 m
	FSL at Maximum Tail water level is at elevation	:	2430.50 m
8	Power		
	Installed Capacity	:	11500 KW
	Annual Energy (Gross)	:	56.34 MU
	Annual Energy at 95% plant availability in Average Year	:	53.52 MU
	Plant Load Factor (Gross)	:	55.92%
	Plant Load Factor (95 % plant availability)	:	53.12 %
9	Transmission Lines		
	Voltage	:	33 kV Single Circuit
	Length	:	3 km
	Feeding Point into Grid	:	Harsil Switchyard (Proposed PTCUL/UPCL)

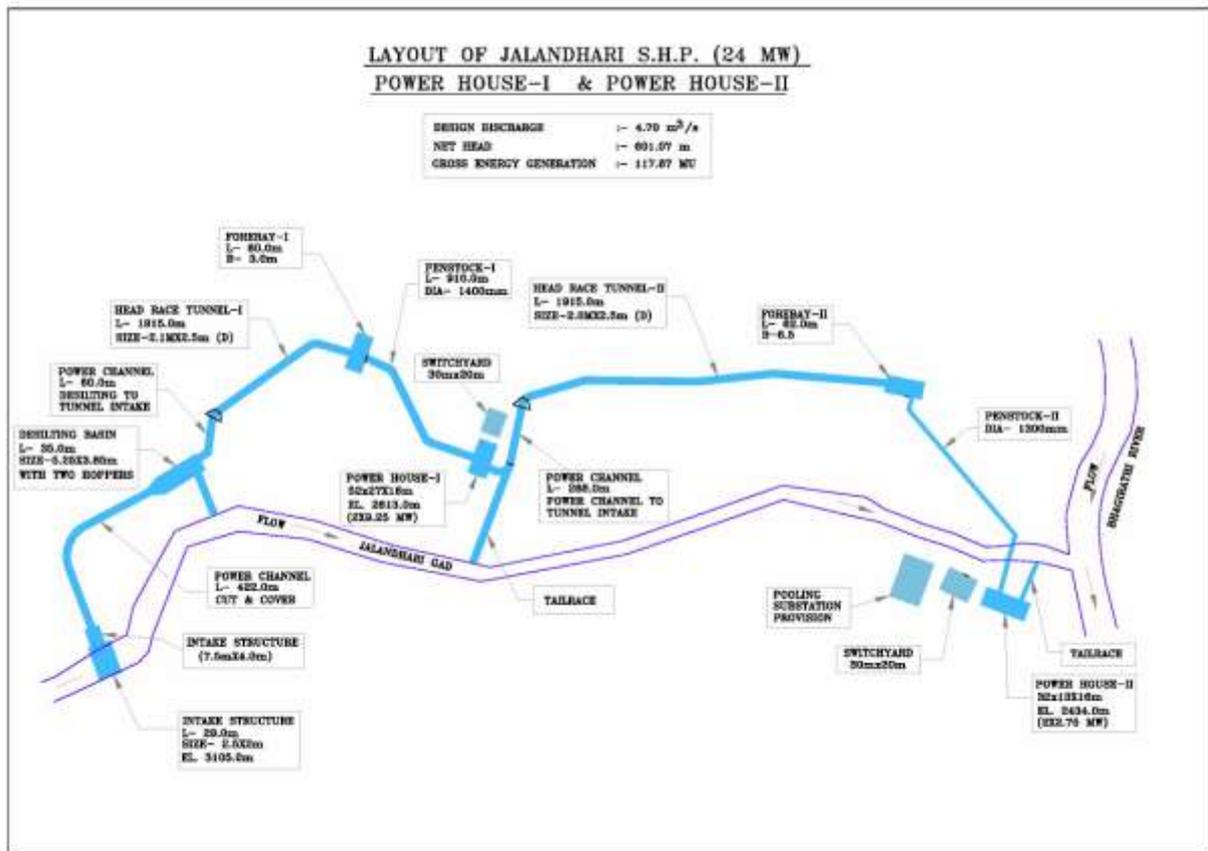
SIYANGAD SHP (11.50MW): FINANCIAL ANALYSIS

FINANCIAL STATEMENTS: (As per DPR 2011)					
Assumptions					
Construction Period (Yrs)					
				3.00	
PROJECT COST (Rs. Lacs)					
				9361.4	
Cost per MW (Rs. Lacs)					
				814.0	
DEBT/EQUITY RATIO					
				2.33	:1
RATE OF INTEREST ON LOAN					
				12.00%	
Income Tax Rate (%)					
				33.66%	
		Tax Relief	100%	For 10 years	
REPAYMENT OF LOAN					
		Yrs	10		
TARIFF RATE FOR IST 15 YEARS					
		Rs/Kwh	3.50		
ESCALATION ON TARIFF IN 16TH YEAR @ 18%					
				3.50	
GROSS GENERATION(Million Unit)					
		Average year	53.52		
Free Power					
		For 1st 15 Years and thereafter		0%	18%
NET SALEABLE ENERGY (Million Unit)					
				51.40	
Carbon Credits in tonnes = 38555 tonnes					
Revenue from Sale of Energy (Average 30yrs)					
		Yearly	1637.1	Lacs INR	
Revenue from sale of carbon credits					
		Yearly	118.4	Lacs INR	
NOTE: ACTUAL FINAL TARIFF TO BE AS DETERMINED BY UERC UNDER RENEWABLE ENERGY TARIFF					
INDICATORS					
TARIFF COST LEVELISED					
		Rs/Kwh	2.46		
AVERAGE DSCR					
				1.36	
IRR(AFTER TAX)					
				11.51%	
Cost Details					
Items		Estimated Cost (Rs. In Lacs)			
Building and Civil Work		:	4491.80		
Plant & Machinery		:	2666.10		
Pre Operative Expenses		:	579.20		
Project Cost Total (excl IDC & Escalation)		:	7737.10		
Project Cost Total (Incl IDC & Escalation)		:	9361.40		



JALANDHARYGAD SHP
(24MW)
(Under Implementation)

LAYOUT PLAN



JALANDHARYGAD SHP (24MW)

1. Name of Project: Jalandharygad SHP
2. Type: Run of River Small Hydropower Project, involves No Dam/Barrage/ Reservoir. Cascade with single Diversion weir and dual powerhouse.
3. Location: Jalandharygad Stream, tributary of River Bhagirathi, Harsil, Distt Uttarkashi.
4. Capacity: 24 MW
5. Developer: Harsil Hydro Ltd , 24/73 Birhana Road, Kanpur -208001
6. Development Agreement: Year 2004 -2005
7. DPR Approved : 2011
8. Project Cost (Including Interest During Construction): Rs 19715.1Lacs
9. Implementation Agreement : Signed 2.9.2011 (for period 40 years)
10. Electricity Generation Yearly: Gross 117.87MU, Nett Saleable (30 yr Avg). 105.12 MU
11. Tariff Assumed(2011): Rs. 3.25/unit. (Actual as applicable on commissioning under Renewable Energy Tariff determined by UERC).
12. Net Saleable Yearly Revenue (30yrs average): Rs 3679.2Lacs
13. Royalty to State - Free Electricity Yearly (30yrs average): 10.40 MU
14. Carbon Emissions Reduction : Yearly 88,400 tonnes
15. Project Land requirement: 13.2175 HA.
16. Compensatory Afforestation Area Allocated: 26.435 HA.
17. Consent to Establish from State Pollution Control Board : Obtained dt. 12.7.2012
18. Environmental Clearance: Not applicable for SHPs (below 25MW)
19. Other Clearances Obtained: (i) Drinking Water Deptt., (ii) Jal Sansthan Dept, (iii) Minor Irrigation Dept, (iv) Irrigation Dept., (v) PWD Dept., (vi) Public Health dept., (vii) EcoTask Force and Geology Dept ., (viii) Agriculture dept., (ix) Fishery Dept, (x) Village (xi) Religious & Historical monument (xii) Forest Rights.
20. Environmental Flow: Presently 0.3 cumecs, as applicable. However, Environmental Flow will be maintained as may be stipulated by State/Central Govt. Authorities, Monitoring Committee, and as may be directed by Hon'ble Courts.
21. STATUS: Under Implementation as per terms of Implementation Agreement signed with Uttarkhand Govt. on 2.9.2011 and Consent to Establish from State Pollution Board dt 17.7.2014. However, matters relating to implementation and Forest Clearance for 24 Hydropower Projects in Alaknanda-Bhagirathi Basin, including above Project, is sub-

judice before Hon'ble Supreme Court and halted till further orders in Case no 6736 of 2013 Alaknanda HydroPower Co. Ltd vs Anuj Joshi & Others vide Hon'ble Court order dt 13.8.2013 and subsequent orders. Project to be included in Zonal Masterplan, subject to final orders of Hon'ble Supreme Court.

22. STANDARDS & SAFEGUARDS.- All applicable Rules, Regulation, Conditions, Best Practices, Design Standards will be followed during Construction and Operation as stipulated by State/Central Govt. Authorities, Monitoring Committee, State Pollution Board and as may be directed by Hon'ble Courts. Due expert advice and supervision will be ensured to keep environmental impact to bare minimum and adherence to stipulated conditions. Regular reports, as applicable, will be sent to concerned Authorities as specified.

	Design discharge	:	4.70 m ³ /s
	Anchors and Saddle Supports	:	Anchor block at each vertical & horizontal bend, and supported on saddle support at every 6 m spacing
6.9	Power House-1		
	Type	:	Surface
	Size of the Power House building	:	L = 52 m W = 27.0 m H = 16.0 m
	Service Bay Elevation	:	EL. ±2614.00 m
	Centre Line of turbine	:	EL. ±2613.00 m
	Installed Capacity	:	2 X 9.25 MW
	Power House Crane	:	80/20 Pendent Operated EOT
6.10	E&M Equipment		
6.10.1	Turbines		
	Type	:	Two Jet horizontal Pelton Machine with a directly coupled generator
	No. & Capacity	:	2 x 9250 kW
	Design head	:	461.50 m
	Speed	:	500 rpm
6.10.2	Generators		
	Type	:	Horizontal shaft alternating current synchronous type.
	No. & Capacity	:	2 x 9250 KW
	Power factor	:	0.8 pf
6.10.3	Transformer		
	Type and Numbers	:	Two no. 14.5MVA, 11/33kV Delta/Star step up transformer of ONAF type Two Nos. UAT 33 KV/433 V
6.11	Tail Race		
	Shape	:	Rectangular
	Size	:	2.1 m wide X 2.5m deep
	Bed Slope	:	1 in 600
	Length	:	200 m
6.12	Power		
	Installed Capacity	:	18500 KW
	Annual Energy at 95% Plant	:	90.69 MU
	Availability in average year	:	
	Plant Load Factor	:	58.90 %
6.13	Transmission Lines		
	Voltage	:	33 KV Single Circuit
	Length	:	2.5 Km

7. Preliminary Technical Parameters for Stage-II

7.1	Basic parameters		
	Gross Head (Intake to Powerhouse)	:	147.00 m
	Gross Head (Forebay to Powerhouse)	:	144.60 m
	Net head	:	139.57 m
	Design discharge	:	4.65 m ³ /s
	Installed Capacity	:	5.5 MW
7.2	Channel from intake to Tunnel Inlet Portal		
	Type	:	RCC Channel
	Length	:	268 m
	Design Discharge in channel	:	4.65 m ³ /s
7.3	Tunnel		
	Size	D shaped	Width: 2.1 m Height: 2.5 m
	Length		1568 m
	Discharge Capacity		4.65 m ³ /s
7.4	Forebay Tank		
	Length	:	62.0 m
	Width	:	6.5 m
	Depth	:	2.5 m
	Free Board	:	1.0 m
	Type	:	Rectangular RCC
	Approximate Detention Time	:	3 Minute
	Gross Capacity	:	1008 m ³
	No of Gates	:	1 no. For penstock Intake
	Valve		1 no. For sluice valve 500 mm diameter
7.5	Penstock		
	Diameter	:	1300 mm
	Length	:	230.00 m
	Unit Penstock		
	Diameter	:	900 mm
	Length	:	2 X 10 m
	Type	:	Fabricated from Steel plate confirming to IS 2002
	Thickness		Varies from 8 mm to 16 mm.
	Design discharge	:	4.65 m ³ /s
	Anchors and Saddle Supports	:	Anchor block at each vertical & horizontal bend, and supported on saddle support at every 6 m spacing
7.6	Power House-II		
	Type	:	Surface
	Size of the Power House building	:	L = 28 m W = 14.8 m H = 13.0 m

	Service Bay Elevation	: EL. ±2464.00 m
	Centre Line of turbine	: EL. ±2463.00 m
	Installed Capacity	: 2 X 2.75 MW
	Power House Crane	: 25/8 Pendent Operated EOT
7.7	E&M Equipment	
7.7.1	Turbines	
	Type	: Two Jet horizontal Francis Machine with a directly coupled generator
	No. & Capacity	: 2 x 2750 kW
	Design head	: 139.57 m
	Speed	: 500 rpm
7.7.2	Generators	
	Type	: Horizontal shaft alternating current synchronous type.
	No. & Capacity	: 2 x 2750 KW
	Power factor	: 0.8 pf
7.7.3	Transformer	
	Type and Numbers	: One no. 9.0 MVA, 11/33kV Delta/Star step up transformer of ONAF type
7.8	Tail Race	
	Shape	: Rectangular
	Size	: 2 m wide X 1.5m deep
	Bed Slope	: 1 in 600
	Length	: 200 m
7.9	Power	
	Installed Capacity	: 5500 KW
	Annual Energy at 95% Plant Availability in average year	: 27.18 MU
	Plant Load Factor	: 59.39 %
7.10	Transmission Lines	500M 33 KV Directly feeding into Pooling substation at Harsil
	Feeding Point	Harsil Substation Pooling substation

8.6 Pooling substation & Power Evacuation:

8.7 Power generated from stage I and stage II power houses will be fed into a pooling substation of appropriate capacity upto 33/220 KV to be located near Harsil village. Power from Kakora SHP (12.5 MW) and Siyan SHP (11.5 MW) will also be fed into this substation. Power beyond the substation will be fed into local/regional grid which will be made available by UPCL/PTCUL.

JALANDHARYGAD SHP (24.0 MW) : FINANCIAL ANALYSIS

<u>FINANCIAL STATEMENTS:</u> (As per DPR 2011)					
<u>Assumptions</u>					
Construction Period (Yrs)				3.00	
PROJECT COST (Rs. Lacs)				19715.1	
Cost per MW (Rs. Lacs)				821.5	
DEBT/EQUITY RATIO				2.33:1	
RATE OF INTEREST ON LOAN				12.00%	
Income Tax Rate (%)				33.66%	
			Tax Relief	100%	For 10 years
REPAYMENT OF LOAN			Yrs	10	
TARIFF RATE FOR IST 15 YEARS			Rs/Kwh	3.25	
ESCALATION ON TARIFF IN 16TH YEAR @ 18%				3.25	
GROSS GENERATION(Million Unit)			Average year	117.87	
Free Power		For 1st 15 Years and thereafter		0%	18%
NET SALEABLE ENERGY (Million Unit)				115.51	
Carbon Credits in tonnes = 88400 tonnes					
Revenue from Sale of Energy (Average 30yrs)			Yearly	3679.2	Lacs INR
Revenue from sale of carbon credits			Yearly	271.5	Lacs INR
NOTE: ACTUAL FINAL TARIFF TO BE AS DETERMINED BY UERC UNDER RENEWABLE ENERGY TARIFF					
<u>INDICATORS</u>					
TARIFF COST LEVELISED			Rs/Kwh	2.30	
AVERAGE DSCR				1.35	
IRR(AFTER TAX)				11.47%	

Cost Details	:	(In Rs lacs)
Combined cost of Building and Civil Work	:	7819.1
Combined cost of E& M Work	:	7238.1
Total Pre Operative Expenses	:	1319.4
Project Cost Total (excluding IDC & Escalation)	:	16376.6
Project Cost Total (including IDC & Escalation)	:	19715.1