Sneha Kinetic Power Projects Private Limited

Sonam Complex Jeewanthang marg, Development area – Gangtok Sikkim – 737 101 CIN: U40109DL2000PTC231172

Ref: SKPPPL/MOEF/16-17/05

Date: November 8, 2016

To Director IA.1 Ministry of Environment, Forest and Climate Change Indira Parvayaran Bhawan, Aliganj Jor Bagh, New Delhi-110003

Sub: Dikchu HEP (96 MW) in Sikkim by M/s. Sneha Kinetic Power Projects Private Limited - Request for approval of scope change for already obtained Environmental clearance vide your letter No: J-12011/91/2007-IA.I dated 01-04-2008 – reg.

Letter from your office no: J-12011/91/2007 – 1A1 dated 12/9/2016

Dear Sir,

Ref:

This is in response to your above referred letter wherein you have asked us to submit a detailed report regarding the changes made in Dikchu HEP, post Environment clearance.

As required, we have prepared a detailed report covering Project description, details of changes made during detailed engineering and construction phase, justification for changes, their likely impacts and mitigation/ management measures adopted during the course of construction to ensure no additional impacts on surrounding environment.

Please find enclosed herewith a detailed report addressing all the relevant issues. As evident from the report, the essential changes made post EIA study and environment clearance are purely based on the detailed investigations and site specific technical requirements. It is pertinent to mention that even with these changes there is no change in project domain and the study area for which EIA study was conducted. Furthermore mitigation and management measures have been adequately taken care for all possible envisaged impacts during implementation of the project.

As the project is near commissioning, we request you to review the enclosed report and approve the changes at the earliest. Please let us know if we need to provide any further information.

Thanking you, Yours faithfully,

For M/s. Sneha Kinetic Power Projects Private Limited

Authorized signatory

Detailed Report on changes post Environmental Clearance

for

96MW Dikchu Hydro Electric Project

in

Sikkim

of

Sneha Kinetic Power Projects Private Limited 16, Green Avenue, Vasant Kunj, New Delhi, Delhi – 110016, India

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1.0 BACKGROUND

M/s Sneha Kinetic Power Projects Private Limited (SKPPPL), Hyderabad has been issued a Letter of Intent vide no. SPDC/229/2003-04/141 dated Sep 03, 2004 for the development of Dikchu Hydro Power Project on a Build, Own, Operate and Transfer (BOOT) basis by Sikkim Power Development Corporation (SPDC), a Government of Sikkim enterprise. After obtaining environment and forest clearance in 2008, construction work was started in March 2011 and project is near completion. Detailed engineering exercise has resulted in minor changes in project location and change in turbine configuration. These were brought to the notice of Ministry of Environment Forest & Climate Change (MOEF & CC) by us vide our letter dated August 05, 2016. In response, MOEF & CC vide their letter dated September 12, 2016 has sought detailed report regarding the changes, their likely impacts, mitigation measures, etc. for further consideration.

In view of the above, the present report is prepared covering the project description, justification of changes, their likely impacts and mitigation/ management measures adopted by us during the course of construction to ensure no additional impacts on surrounding environment.

As can be seen from the details in ensuing paragraphs, the essential changes made post EIA study and environment clearance are minimal and they do not lead to any significant additional environment impacts. There is no change in project domain and therefore, the changes made are well within the study area for which EIA study was conducted. Further, implemented mitigation and management measures have adequately take care of all the impacts.

2.0 THE PROJECT

2.1Project Location

The river Dikchu is one of the tributary of the Teesta River originating in the glaciers of East Sikkim at an elevation of about 4500 m above mean sea level. The main tributaries of the Dikchu River are Ratey Chu and Bakcha Chu. Both the rivers Bakcha Chu and Dikchu (Ratey Chu) meet near village Lingdok. After running about 7.5 Km from the confluence, the Dikchu River joins the Teesta River on left bank near village Dikchu. The confluence of Dikchu with Teesta River is about 3.0 Km u/s of the dam axis of Teesta-V H.E project, which is under operation by NHPC.

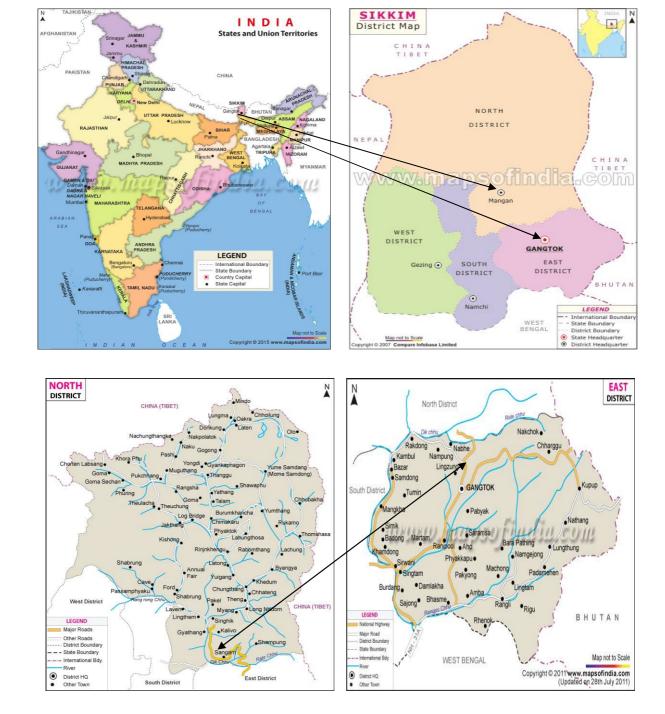
Dikchu Hydroelectric Project (96 MW), components of which are located in Northern and Eastern Districts of Sikkim, envisages utilization of the waters of the river Dik Chu, a tributary of River Teesta for power generation on a run-of-the-river type development, harnessing a head of about 350m. The proposed diversion scheme on Dikchu is located near village Lingdok, which is about 32 km from Gangtok, the state capital of Sikkim. The Lingdok village can also be accessed from Singtam-Mangan highway via Samdong and Tintek Villages.

The Power house of the project activity is located near the village Dikchu. The Dikchu village is about 30 km from National Highway (NH) number 31A at Singtam on Singtam-Mangan state highway. The nearest railway station is New Jalpaiguri located at a distance of about 140 km and nearest airport is Bagdogra Airport located at a distance of about 45 km.

Project location map details are given at **Figure 1**.

Figure 1: Project Location details

Figure 1a: Maps depicting project location



Yumthang Route Map of Sikkim Lachen₂₁ [24 Lachung Chungthang Singhik Mangan 30\16 Phensang Phodong **Project Location** KabiTsahu Tsomgo /iewpoint Makha Rumtek Gangtok Song pZemathang Ranipool 20 Tarku Rangba Dzongri akyong Bakhim Rangoli ODamthan 13 Rangpo Yuksam Rhenok lamtha 932 Tashiding Bhalumarg Khecheopalri 13 Namchi 16 Algarah Uttary 11 Kewzing 16 Hee Martam Lava 10 githra Gorubathar Jorthang NayaBaza eesta Bridge Darjeeling Coronation Bridge Siliguri All Distance in Kms Map not to Scale Bagdogra Njp Railway Airport

Figure 1b: Route map showing project location

2.2Project Description

Dikchu Hydroelectric Project (96 MW) has following major components:

- a) 35m high concrete gravity dam across river Dik Chu to provide a live storage of 0.33 M cum with FRL at EL 950.0m;
- b) De-silting chamber of size 140m (L) and size 12m (W) x 15.5m (H) to remove silt particles of size 0.25 mm and above;
- c) 5.46km long and 4.8m dia horseshoe shaped head race tunnel terminating in a surge shaft;
- d) 10.5m dia surge shaft;
- e) 3m dia pressure shaft;
- f) An underground powerhouse having an installation of 2 Francis Turbines driven generating units of 48 MW each operating under a rated head of 350m; and
- g) 4.5m diameter tailrace tunnel to carry the powerhouse releases back to the river.

Salient Features of Dikchu HEP is given at Table 1; project layout is given at Figure 2

Figure 2 – Project Layout



Table 1: Salient Features

1	LOCATION	
	State	Sikkim
	District	East Sikkim and North Sikkim
	River	Dikchu
	Dam Site location	
	Location	150m d/s of confluence of Bakchachu
		and Dikchu (Near village Lingdok)
	Latitude	27°24´00´´N
	Longitude	88°35´20"E
	Power house location	Near Dikchu village
	Latitude	27°24'14.32"N
	Longitude	88°31′37.83′′E
	Nearest Airport	Bagdogra
	Nearest Airport	New Jalpaiguri
2	HYDROLOGY	
	Catchment Area at Dam Site	240 km ²
	Design Flood/Probable maximum flood (PMF)	1100m ³ / sec
3	RESERVOIR	
	Maximum water level	EL 952.0m
	Full Reservoir Level (FRL)	EL 950.0m
	Minimum Draw down Level (MDDL)	EL 939.0m
	Gross storage upto FRL	0.52 M cum
	Live Storage at FRL	0.33 M cum
4	DAM	
	Type	Concrete Gravity dam
	Top Elevation of Dam	EL 954.0 m
	Height of dam above riverbed level	36.0 m
	Length of Dam	93 m
_	Riverbed level	EL 920.0 m (avg)
5	SPILLWAY Design flood	1100 m ³ / sec (PMF)
	Type	Ogee Spillway
	Maximum head over crest (w.r.t. FRL)	28.0 m
	Type of Gate	Radial sluice
	Length of spillway	35 m
	Crest level of ogee portion	EL 924.0 m
	No of gates	4
	Size of each radial gate	6m (W) x 6.85m (H)
	Energy dissipation	Trajectory bucket
6	TUNNEL INTAKE	Trajectory suchor
_	Invert level	EL 929.40 m
	Size of each Gate	4.8m x 4.8m
	Trash Rack Size	4m x 12.5 m (Steel Trash Racks of 2 no:s)
	Design discharge	40.20 m ³ / sec
7	DESILTING CHAMBER	
	Size	12m wide, 15.5m high
	Length	140m
	Number & type	1number, Dufour
	Design Discharge	40.20 m ³ / sec
	Silt Flushing tunnel	
	Size	3.0m dia; D Shaped
	Length	453m
8	HEADRACE TUNNEL	
	Adits	3 adits
	Gradient	1 in 126.85

	Size	4.8 m dia
	Туре	Modified Horse Shoe shaped
	Length	5.46 km
9	SURGE SHAFT	
	Size & Type	10.5 m diameter, Orifice
	Vertical Shaft height	58.70 m
	Minimum surge level	EL 919.0m
	Maximum surge level	EL 970.0 m
	Top level	EL 975.0 m
	Bottom level	EL 916.3 m
10	PRESSURE SHAFT & PENSTOCKS	
	Pressure Shaft	
	Diameter	3.0 m ϕ (Circular)
	Number	1
	Underground Pressure Shaft Length	555 m
	Unit Penstock	
	Type & Number	Circular, 2 Nos
	Diameter	2.1 m ф
	Length	84m
11	POWER HOUSE	
11	POWER HOUSE Type	Underground
11	POWER HOUSE Type Installed Capacity	Underground 96 MW
11	POWER HOUSE Type Installed Capacity Number of units	96 MW 2 x 48
11	POWER HOUSE Type Installed Capacity Number of units Powerhouse cavern size (main)	96 MW 2 x 48 62m x 18m x 38m
11	POWER HOUSE Type Installed Capacity Number of units Powerhouse cavern size (main) Type of turbine	96 MW 2 x 48
11	POWER HOUSE Type Installed Capacity Number of units Powerhouse cavern size (main) Type of turbine Minimum Tail water level at outlet	96 MW 2 x 48 62m x 18m x 38m Vertical Axis Francis Turbine EI.581.95 m
11	POWER HOUSE Type Installed Capacity Number of units Powerhouse cavern size (main) Type of turbine Minimum Tail water level at outlet C.L of Turbine	96 MW 2 x 48 62m x 18m x 38m Vertical Axis Francis Turbine
11	POWER HOUSE Type Installed Capacity Number of units Powerhouse cavern size (main) Type of turbine Minimum Tail water level at outlet C.L of Turbine Rated Head	96 MW 2 x 48 62m x 18m x 38m Vertical Axis Francis Turbine EI.581.95 m EL 576.0m 350.00 m
	POWER HOUSE Type Installed Capacity Number of units Powerhouse cavern size (main) Type of turbine Minimum Tail water level at outlet C.L of Turbine Rated Head Design Discharge	96 MW 2 x 48 62m x 18m x 38m Vertical Axis Francis Turbine EI.581.95 m EL 576.0m
11	POWER HOUSE Type Installed Capacity Number of units Powerhouse cavern size (main) Type of turbine Minimum Tail water level at outlet C.L of Turbine Rated Head Design Discharge TAILRACE	96 MW 2 x 48 62m x 18m x 38m Vertical Axis Francis Turbine EI.581.95 m EL 576.0m 350.00 m
	POWER HOUSE Type Installed Capacity Number of units Powerhouse cavern size (main) Type of turbine Minimum Tail water level at outlet C.L of Turbine Rated Head Design Discharge TAILRACE Size	96 MW 2 x 48 62m x 18m x 38m Vertical Axis Francis Turbine EI.581.95 m EL 576.0m 350.00 m 15.23 m³ / sec
	POWER HOUSE Type Installed Capacity Number of units Powerhouse cavern size (main) Type of turbine Minimum Tail water level at outlet C.L of Turbine Rated Head Design Discharge TAILRACE Size Type	96 MW 2 x 48 62m x 18m x 38m Vertical Axis Francis Turbine EI.581.95 m EL 576.0m 350.00 m 15.23 m³ / sec 4.5 m D Shaped
	POWER HOUSE Type Installed Capacity Number of units Powerhouse cavern size (main) Type of turbine Minimum Tail water level at outlet C.L of Turbine Rated Head Design Discharge TAILRACE Size Type Length	96 MW 2 x 48 62m x 18m x 38m Vertical Axis Francis Turbine EI.581.95 m EL 576.0m 350.00 m 15.23 m³ / sec 4.5 m D Shaped 230m
12	POWER HOUSE Type Installed Capacity Number of units Powerhouse cavern size (main) Type of turbine Minimum Tail water level at outlet C.L of Turbine Rated Head Design Discharge TAILRACE Size Type Length Tail Water level at outlet	96 MW 2 x 48 62m x 18m x 38m Vertical Axis Francis Turbine EI.581.95 m EL 576.0m 350.00 m 15.23 m³ / sec 4.5 m D Shaped
	POWER HOUSE Type Installed Capacity Number of units Powerhouse cavern size (main) Type of turbine Minimum Tail water level at outlet C.L of Turbine Rated Head Design Discharge TAILRACE Size Type Length Tail Water level at outlet POWER GENERATION	96 MW 2 x 48 62m x 18m x 38m Vertical Axis Francis Turbine EI.581.95 m EL 576.0m 350.00 m 15.23 m³ / sec 4.5 m D Shaped 230m EL 581 m
12	POWER HOUSE Type Installed Capacity Number of units Powerhouse cavern size (main) Type of turbine Minimum Tail water level at outlet C.L of Turbine Rated Head Design Discharge TAILRACE Size Type Length Tail Water level at outlet POWER GENERATION Installed capacity	96 MW 2 x 48 62m x 18m x 38m Vertical Axis Francis Turbine EI.581.95 m EL 576.0m 350.00 m 15.23 m³ / sec 4.5 m D Shaped 230m EL 581 m
12	POWER HOUSE Type Installed Capacity Number of units Powerhouse cavern size (main) Type of turbine Minimum Tail water level at outlet C.L of Turbine Rated Head Design Discharge TAILRACE Size Type Length Tail Water level at outlet POWER GENERATION	96 MW 2 x 48 62m x 18m x 38m Vertical Axis Francis Turbine EI.581.95 m EL 576.0m 350.00 m 15.23 m³ / sec 4.5 m D Shaped 230m EL 581 m

2.3 Clearances Obtained

Chronology of various clearances obtained including environmental and forest clearances is given at Table 2 below.

Table 2: Chronology of Clearances Obtained

SI. No.	Description	Regulatory Authority	Date
1	Letter of Intent	State Govt	3 rd September 2004
2	Implementation agreement	State Govt	1 st March 2006
3	Environmental clearance (Annexure I)	MOEF, GOI	1 st April 2008
4	Techno Economic clearance	State Govt	28 th Nov 2008
5	Stage I clearance for diversion of required forest land from MOEF	MOEF, GOI	31 st Oct 2008
6	Stage I clearance for diversion of required forest land from Sikkim Government	State Govt	17 th Dec 2008
7	Stage II clearance for diversion of required forest land from MOEF (Annexure II)	MOEF, GOI	22 nd Jan 2010
8	Stage II clearance for diversion of required forest land from Sikkim Government	State Govt	9 th February 2010
9	Final approval for adjustment of reduced diversion of required forest land from MoEF	MOEF regional office	21 st March 2013
10	Final approval for adjustment of reduced diversion of required forest land from Sikkim Government (Annexure III)	State govt.	26 th March 2013
11	Lease agreement for total required private land was entered with Sikkim government	State govt.	22 nd December 2011
12	Fisheries NOC	State Govt	10 th January 2012
13	NOC from Irrigation and Flood control department	State Govt	29 th June 2012

2.4 Status of Construction Work

Construction work started during March 2011 and status of completion of various components (as on September 2016) is given at **Table 3** below:

Table 3: Status of Completion of Project Components

SI. No.	Description	Progress Made	Balance Quantity		
Civil	Civil				
1	DAM	100.00%	-		
2	Intake	100.00%	-		
3	HRT	99.95%	0.05%		
4	Desilting Chamber	100.00%	0.00%		
5	Surge Shaft	100.00%	-		
6	Power House	100.00%	-		
7	VPS	98.50%	1.50%		
8	TRT	99.94%	0.06%		
H&M					
1	Dam Gates	100.00%	-		
2	Intake Gates	100.00%	0.00%		
3	DC Gates	97.60%	2.40%		
4	Surge Shaft Gates	95.00%	5.00%		
5	TRT Gates	94.00%	6.00%		
E&M					
1	Main Equipment	100.00%	-		
2	BOP	95.00%	5.00%		
1. Civil	Works: 99.53% Completed				
2. HM W	2. HM Works: 97% Completed				
3.E&M V	3.E&M Works: 97% Completed				

3.0 CHANGE OF SCOPE

As discussed earlier, Dikchu HEP started construction during March 2011 after obtaining all the necessary approvals viz. Detailed Project Report from Energy and Power Department, Government of Sikkim; Environment and Forest Clearance from Ministry of Environment, Forest & Climate Change (MOEF & CC), Government of India and other required approvals and land acquisition. Simultaneously, detailed engineering study was also undertaken. During detailed engineering exercise, certain changes were suggested in components locations and configuration with technical justification. These changes were brought to the notice of Energy and Power Department, Government of Sikkim and necessary approvals were obtained. This has also lead to change in land requirement for which approval of diversion of forest land was issued by MOEF & CC.

Details of the changes and approvals obtained are briefly discussed below.

3.1 Change of turbine configuration from 3x32 to 2x48 MW

At the DPR stage, two options were considered viz. 3 x 32 MW i.e. three turbines of 32 MW each giving total installed capacity of 96 MW or 2 x 48 MW i.e. two turbines of 48 MW each again giving total installed capacity of 96 MW. It was left to the detailed engineering exercise to finalize the turbine configuration.

During detailed engineering study, based on techno-economic considerations for increased efficiency and better life of machines in silt laden waters of Himalayan region; 2x48 MW configuration have been recommended. This configuration had 2.5% higher turbine efficiency and 100 rpm lower rated speed for better life of equipment. The objective of this study was optimal selection of type and size of Hydro turbine along with powerhouse size assessment. **Table 4** gives the comparison of turbine configuration.

Required Details32MW Francis turbine installation48MW Francis turbine installationRated speed600 rpm500 rpmEstimated Turbine Peak Efficiency91%93.50%Power House Machine size (LxBxH)65m x 15m x 35m62m x 18m x 38m

Table 4: Comparison of Turbine Configuration

In addition to above, the other aspects which impact the project economics directly or indirectly are:

- Substantial reduction in requirement/cost of Auxiliaries and spares etc.
- Substantial reduction (6-9 months) in erection and commissioning time because of reduction in number of units.
- No additional transportation constraint as 1200 MW Teesta III project is already under implementation upstream of this project. Considering all these aspects it was decided to adopt 2x48 MW in place of 3x32MW while keeping approved overall capacity of 96MW as same.

• Substantial reduction in excavation quantities in Power House complex because of reduction in length of Transformer cavern, Bus ducts and other associated excavation requirements in view of two units.

This changes was envisaged at the DPR stage itself and was mentioned in DPR (submitted to MOEF & CC along with all other project documents during appraisal) 8th chapter at Page 94 (**Annexure IV**) it was mentioned that we are presently adopting 3x32 MW but option to change to 2x48 is still open and will be decided at the detailed engineering stage as this required to be studied in detail. Even with change in configuration the installed capacity of the project has remained the same i.e. 96 MW as mentioned in the Environmental clearance.

The approval for the change in turbine configuration was obtained on 15/10/2011 from Sikkim government (**Annexure V**).

3.2 Change in Location of Powerhouse and Surge Shaft due to Geological Reasons

During detailed geological study, it was observed that suitable geological conditions for powerhouse construction are available at much nearer than what has been envisaged at the DPR stage; accordingly, after studying all technical and geological aspects the location of Power house was finalized. Geological report for suitability of Surge Shaft is enclosed for ready reference (Annexure VI).

In September 2011, Sikkim witnessed an earth Quake of 6.8 magnitude. Post-earthquake, a detailed assessment and physical survey of project components locations was carried out with a view to observe any impact/resultant change due to earthquake. All project components locations were found to be unaffected by the earthquake except for some movements of boulders at the surge shaft location. Therefore, after detailed geological assessment of the area, it was decided to shift the location of surge shaft.

Revised layout was prepared and got approved from State Government. Even with these changes the already approved periphery of the project remained the same i.e. Dam location and TRT outfall location remain the same.

Approval for revised layout and salient features was obtained from Sikkim government on 7/11/2011. (Annexure VII)

3.3 Change in Land Requirement for Project

Environment clearance was accorded in March-2008 whereas forest land diversion case was submitted in April-2008. At the EIA/EMP studies stage the land assessment was made based on the preliminary assessment as forest land diversion case and private land acquisition cases were not yet prepared. Secondly, land of underground components was also not considered in total land requirement mentioned in EIA report, however, it was included later in diversion of forest land proposal. A comparative statement of land at various stages i.e. at the time of EIA/EMP studies, in the first diversion and as per actual is given at **Annexure VIII**.

Increase quantum of land was due to two reasons, viz.:

- Addition of land for construction power sub-station because earlier it was presumed that construction power will be supplied by Sikkim government.
- Increase land requirement for stabilization of slopes of Dam abutments

Effectively, forest land requirement increased from 7.794 hectare (as per EC letter) to 9.5319 hectare i.e. total increase is 1.738 hectare but actual increase is only 0.718 hectare from EIA report as 1.02 hectare of land for underground components was not considered during EIA/EMP report.

Private land increased from 31.332 hectare (as per EC letter) to 46.001 hectare but actual used land for the project is 34.101 hectare only as about 11.9 hectare of land remained un-utilized because it was acquired for earlier location of surge shaft and access road. Therefore, net increase of private land from estimate made at the time of EIA study is 2.769 hectare only.

The revised approval for diversion of required forest land was obtained on 26/3/2013 (Annexure III).

All the changes were well within the domain of the project and study area for environment impact assessment study remains unchanged. These changes were brought to the notice of Energy and Power Department, Government of Sikkim and necessary approvals obtained. Change in forest land requirement has been approved by Ministry of Environment & Forests.

3.4 Comparison of Salient Features

To understand the environmental impacts of changes, as discussed above, a comparative of salient features is prepared and given at **Table 5** below.

Table 5: Comparison of Salient Features

S.	Details	As per approved EIA report	As per actuals	
no.			Tio per detadio	
1	LOCATION			
	State	Sikkim	Sikkim	
	District	East Sikkim and North	East Sikkim and North	
	District	Sikkim	Sikkim	
	River	Dikchu	Dikchu	
	Dam Site location			
		150m d/s of confluence of	150m d/s of confluence of	
	Location	Bakchachu and Dikchu	Bakchachu and Dikchu (Near	
		(Near village Lingdok)	village Lingdok)	
	Latitude	27°24 ['] 00 ["] N & 27°24 ['] 45 ["] N	27°24 ['] 00"N	
	Longitude	88°35 ['] 20E & 88°32 ['] 00"E	88°35 ['] 20"E	
	Power house location		Near Dikchu village	
	Latitude		27°24'14.32"N	
	Longitude		88°31 ['] 37.83"E	
	Nearest Airport	Bagdogra	Bagdogra	
	Nearest Airport	New Jalpaiguri	New Jalpaiguri	
2	HYDROLOGY			
	Catchment Area at Dam Site	240 km ²	240 km ²	

	Design Flood/Probable	2 .	2 .
	maximum flood (PMF)	1100 m ³ / sec	1100m ³ / sec
3	RESERVOIR		
	Full Reservoir Level (FRL)	EL 950.0m	EL 950.0m
	Minimum Draw down Level		
	(MDDL)	EL 939.0m	EL 939.0m
	Maximum water level		EL 952.0m
	Gross storage upto FRL		0.52 M cum
	Live Storage at FRL	0.33 M cum	0.33 M cum
4	DIVERSION TUNNEL	5.55 W 54.11	orea m cam
	Number	1	NR
	Size	6.0 m ϕ (Circular)	NR
	Length	300.0m	NR
5	DAM	000.0111	, All
	Type	Concrete Gravity dam	Concrete Gravity dam
	Top Elevation of Dam	EL 956.0 m	EL 954.0 m
	Height of dam above	EE 700.0 III	EE 70 1.0 111
	riverbed level	35.0 m	36.0 m
	Height of dam above		
	deepest foundation level		42.50m
	Length of Dam	116 m	93 m
	Riverbed level	EL 920.0 m (avg)	EL 920.0 m (avg)
6	SPILLWAY	22 /20.0 III (avg)	22 720.0 iii (avg)
	Design flood	1100 m ³ / sec (PMF)	1100 m ³ / sec (PMF)
	Type	Ungated Ogee Spillway	Ogee Spillway
	Maximum head over crest	Ungated Ogec Spiriway	
	(w.r.t. FRL)		28.0 m
	Type of Gate	Radial	Radial sluice
	Length of spillway	60.0 m	35 m
	Crest level of ogee portion	EL 950.0 m	EL 924.0 m
	No of under sluices	2	4 with radial gates
	Size of each radial gate	7m (W) x 8m (H)	6m (W) x 6.85m (H)
	Energy dissipation	7111 (W) X 0111 (11)	Trajectory bucket
	Sill level of radial under		Trajectory bucket
	sluice gate	EL 924.0m	
6	TUNNEL INTAKE		
-	Invert level	EL 927.00 m	EL 929.40 m
	Size of each Gate	4m x 4m	4.8m x 4.8m
	Size of each date	7.3m x 8.8m (Steel Trash	4m x 12.5 m (Steel Trash
	Trash Rack Size	Racks)	Racks)
	Design discharge	39 m ³ / sec	40.20 m ³ / sec
7	DESILTING CHAMBER	57 III 7 300	10.20 111 / 300
		15m wide, 11.5m high,	
	Size	106m long	12m wide, 15.5m high
	Length	5.7km (approx)	140m
	Number & type	1 number & Dufour	
	Design Discharge	39 m ³ / sec	40.20 m ³ / sec
	Silt Flushing tunnel	57 III 7 300	10.20 111 / 300
	Size	4.0m dia	3.0m dia
	Length	250m	453m
8	HEADRACE TUNNEL	230111	755111
0	Number & Adits	2 numbers adits	3 adits
	Gradient	Z Humbers duits	1 in 126.85
		4 m dia	4.8 m dia
	Size	4 m dia Horse Shoe shaped, CC lined	
	Type	5.7 km (approx)	Horse Shoe shaped 5.46 km (approx)
0	Length	σ. / κιτι (αμμισχ)	σ.40 κπ (αμρισχ)
9	SURGE SHAFT	9 m diameter	10 E m diameter Simple
	Size & Type	7 in diameter	10.5 m diameter, Simple

	Vertical Shaft height	90m	58.70 m
	Minimum surge level		EL 919.0m
	Maximum surge level		EL 970.0 m
	Top level		EL 975.0m
	Bottom level		EL 916.3 m
40	PRESSURE SHAFT &		
10	PENSTOCKS		
	Pressure Shaft		
	Diameter	4.0 m φ(Circular)	3.0 m ¢ (Circular)
	Number	1	1
	Underground Pressure Shaft	500m	555m
	Length	50011	555111
	Penstocks		
	Type & Number	Circular, 3 Nos	Circular, 2 Nos
	Diameter	1.6 m ф	2.1 m ф
	Length	50m	84m
11	POWER HOUSE		
	Туре	Underground	Underground
	Installed Capacity	96 MW	96 MW
	Number of units	3	2
	Powerhouse cavern size	65m x 15m x 35m	62m x 18m x 38m
	(main)		02111 X 10111 X 30111
	Type of turbine	Vertical Axis Francis Turbine	Vertical Axis Francis Turbine
	Tail water level at outlet	EL 581.0 m	EL 581.95 m
	C.L of Turbine	EL 582.0m	EL 576.0m
	Rated Head	350 m	350.00 m
	Design Discharge	10.3 m ³ / sec	15.23 m ³ / sec
12	TAILRACE		
	Size	4 m dia	4.5 m
	Type	Horse Shoe shaped	D Shaped
	Length	1200m	230m
	Tail Water level at outlet	EL 581.0 m	EL 581 m
13	POWER GENERATION		
	Installed capacity	96 MW	96 MW
	Annual energy generation in		
	a 90% dependable year (95%	439 Mu	431 Mu
	machine availability)		

4.0 STUDY OF IMPACTS

Impacts have been studied for the changes in the project components; with a view to understand the need of implementation of any additional mitigation/management measures and status thereof. Changes and Impacts are listed in Table 6 below.

Table 6: Changes from EIA stage vis-à-vis Impacts

Changes from EIA stage	Description of Changes	Impacts and Management Measures
Change in Location of	Elimination of diversion tunnel Change in LIDT size from 4m dia	Major impact of change in location and resulting change
Powerhouse	 Change in HRT size from 4m dia x 5.7 Km length to 4.8m dia x 	in components sizes is muck
and Surge Shaft	5.46 Km length	generation.
	 Change in surge shaft size from 9m dia x 90m height to 10.5 m dia x 58.7m height Change in pressure shaft size from 4 m dia x 500m length to 3m dia x 555m length 	A comparison is made with the muck quantities estimated at the time of EIA study and actual muck generated.

Change in Turbine Configuration from 3x32 MW to 2x48 MW Change in forest land requirement	 Change in penstock size and number from 3 (number) x 1.6 m dia x 50m length to 2 (number) x 2.1 m dia x 84 m length Change in powerhouse size from 65m x 15m x 35m to 62m x 18m x 38m Change in tailrace channel size from 4 m dia x 1200m length to 4.5m dia x 230m length Change in Powerhouse size and decrease in design discharge from 30.9 cumec to 30.46 cumec Increase in forest land requirement by 0.718 ha 	Slight increase in spills due to slightly lower design discharge Additional forest land has already been acquired and Compensatory Afforestation Plan implemented
Change in private land requirement	Increase in effective private land requirement by 2.769 ha - impacts on PAF	Additional project affected families - payment of compensation and other benefits under R&R Plan

4.1 Muck Generation and Management

The excavation activity of all the project components has been completed. Up till now, the disposal of excavated muck from project components has been carried out as proposed in approved EMP document by dumping the muck in designated muck disposal yards. In order to contain the disposed muck in the dump yards, various engineering measures such as crate walls, concrete plugs and masonry walls were created and all the disposed muck could be retained all through the excavation period.

The excavated muck from different components was utilized to generate concrete aggregate material for lining works and development of various access roads of the project. This has resolved the problem of muck disposal to a considerable extent i.e. about 30-40%.

The restoration of the remaining muck lying in various disposal yards is now proposed to be undertaken by adopting various engineering and biological measures for the final disposal. In order to restore the balance muck, it is proposed that the dumping sites will be filled, levelled and landscaped by adopting engineering and biological measures.

To understand the additional impacts of change of location and sizing of project components on muck generation, a comparison is made with the quantities of muck estimated in the EIA study report and actual quantities generated along with muck management practice. Table 13.2 of EIA report, mentioned that about 360610 m³ of muck will be generated and after utilization of about 30% of the generated muck, 252427 m³ of muck will required proper disposal. Excavated muck volume swell by 45-50% depending upon its characteristics, however, EIA did not take the swell factor into account. Four

dumping areas, totaling 6.8 ha have been identified in the EIA report for muck disposal as per details given in **Table 7**.

Table 7: Muck Dumping Areas as per EIA Report

S. No.	Dumping Site	Area (m²)	
1	Powerhouse Site dumping area East District	20000	
2	2 Powerhouse Site dumping area North District		
3	Dam Site dumping area East District	12000	
4	4 Dam Site dumping area North District		
	Total		

With the revision of component sizing, revised calculations for muck generation showed a quantity of 329541 m³; which is a decrease of 31069 m³ from that of estimated at the time of EIA study. Major reason for reduction in quantity of muck generated is elimination of diversion tunnel and reduced length of tailrace tunnel. At the DPR stage, a diversion tunnel was planned to divert the river water for construction of dam, however, dam construction was carried out by partially blocking the river, hence construction of diversion tunnel was eliminated. Tailrace tunnel length is reduced from 1200m to 230m thereby reducing the quantity of muck. A comparison of component muck generation as estimated at the time of EIA study with that of actually generated is given at Table 8 for ready reference.

Table 8: Comparison of Muck Generation - EIA Stage v/s Actual

S. No	Component	Muck generated as per EIA (in cu.m)	Muck generated as per actuals (in cu.m)
1	Diversion Dam	45,000	52,694
2	Tunnel Intake	3,000	4,144
3	De-Silting Chamber	9,630	28,735
5	HRT + Adits	1,30,000	1,48,204
6	Surge Shaft	11,000	8,356
7	Pressure Shaft	9,980	11,322
8	Under Ground Power House + Access Tunnel	82,000	70,663
9	Tailrace Tunnel	30,000	5,423
4	Diversion Tunnel	40,000	-
	Total	3,60,610	3,29,541

As the all underground activities involving muck generation have been completed; muck management work was undertaken as per the management plan presented and got approved as part of the EMP.

In actual practice, muck management was carried out at 6 sites instead of 4 sites as planned at the time of EIA study; as per the following details:

- 1. Muck Dumping yard no: 1 Dam complex & Adit-I at Lower Rongong village.
- 2. Muck Dumping yard no: 2 Adit-II at Lower Phodong village.
- 3. Muck Dumping yard no: 3 Adit-II (A) & Surge Shaft at Sangam village.
- 4. Muck Dumping yard no: 4 Surge Shaft & Adit-III (A) at Lower Tanek.
- 5. Muck Dumping yard no: 5 Power House at Dikchu village.
- 6. Muck Dumping yard no: 6 Power House at Dikchu village.

Actual muck dumping details are given at Table 9 below.

Table 9: Muck Dumping Details

		Muck	Quantity o	f Muck (In m ³)) Including sv	velling factor)	Name of
S. No	Project Component	dumping area in ha	Generated	Utilized	Dumped	Capacity of dumping area	the Dumping yard
1	Dam Complex & Adit-I	1.23	1,41,563	49,547	92,016	1,32,160	MD No.1
2	Adit-II	0.75	1,13,100	39,585	73,515	84,480	MD No.2
3	Adit-II (A) & Surge Shaft	1.39	87,766	30,718	57,048	80,000	MD No.3
4	Surge Shaft & Adit-III (A)	0.72	15,950	5,583	10,368	20,800	MD No.4
5	Power House	4.66	1,19,456	41,809	77,646	1,78,656	MD No. 5 & 6
	Total	8.85	4,77,834	1,67,242	3,10,592	4,96,096	

As can be seen from above comparison, the six dumping areas have been chosen keeping in view the locations of generation and accessibility. Increase in total muck dumping area is 2ha i.e. from an area of 6.8 ha of four sites as estimated in EIA study to a total dumping area used of 8.8ha. Although the muck quantity has reduced increased area is on account of swell factor which was not accounted for at the time of EIA study. Along with this as MD No.3 was not accessible, an additional dumping area was taken for disposal of muck during innerving period.

A budget of Rs. 76.03 lakh has been provided for Muck Management under Environmental Management Plan (EMP); however, actual expenditure under this head is Rs. 240.77 Lakhs; which has already been incurred on various engineering measures such as constructing retaining structures like crate walls, concrete plugs & masonry walls. To complete the biological activities and site remediation, an additional amount of Rs. 86.08 Lakhs has been proposed.

The detailed plan is prepared for landscaping and restoration with activities like creation of crate walls, RRM grid, Jute Matting & Plantation, etc. and is given at **Annexure IX**.

4.2 Impacts of increase in Forest Land Requirement

As discussed above, forest land has been diverted in two phases - 9.7129 ha in the first phase in 2010 and 1.2610 ha in second phase after finalizing the new locations for powerhouse and surge shaft, at the same time 1.4420 ha was surrendered from the first phase. Therefore, net forest land diverted including that for underground components is 9.5319 ha; as can be seen from the Government of Sikkim's letter dated March 26, 2013 (Annexure III). As the diversion of forest land has already been completed and required payments made to the Forest Department, no additional impact is envisaged on this count.

4.3 Impacts of Increase in Private Land Requirement

Private land requirement for the project was estimated at the time of EIA study was 31.332 hectare. However, due to change in location of project components, additional

14.669 ha of private land was acquired for the project i.e. a total of 46.001 hectare. However, actual used private land is only 34.101 hectare only and 11.9 hectare of land remained un-utilized because it was acquired for earlier location of surge shaft and access road. Therefore, net increase of private land from estimate made at the time of EIA study is 2.769 hectare only.

Impacts of acquisition of private land have been discussed in EIA study and a detailed R&R plan is proposed covering compensation to project affected families. A total of 75 project affected families have been identified in EIA report whose land came under acquisition and who was compensated under the R&R Plan. The addition, of 14.669 ha has added another 15 families to the list of project affected families; making it a total of 90 families. Private land largely consist of agriculture land and no houses/shops, etc. have come under acquisition i.e. no displacement of population has taken place as a result of the land acquisition for the project.

All the private land is acquired by the state government for the purpose of the project and required compensation as finalized by the government covering the cost of the land and other benefits have already been paid. An expenditure of Rs. 13.10 crore has already been made under this head as against the budgetary provision of Rs. 7.20 crore in EIA study.

4.40ther Local Area Development Activities

Apart from compensation to Project Affected Families (PAFs); substantial work has been done in consultation with local Gram Panchayat Units (GPU) for improving the local infrastructure and bringing benefits to local population. Major activities are listed below:

Ramthang - Tanek GPU

- Construction of Foot Bridge vide W/O No. 396 in place of Community Center at Tanek
 (Demand Note Dated 20thNov. 11) Agreement signed between SKPPL & GPU
- Fund for Gumpa amount agreed Rs. 10 Lakh (Demand Note Dated 20thNov. 11)
- Umbrella Distribution to the Students of Tanek School (42 Nos)
- Water supply for Ramthang village (Agreement dated 29 May 2013) Paid in 3 installments.
- Financial aid to Jr. Sec. School Tanek for calibration of Independence Day. Request letter dated 14/08/13 Through Karma Thinlay- Teacher
- Construction of temporally 6 School Rooms at Tanek with CGI Sheets
- Financial aid to Govt. Primary School Ramthang for calibration of Independence Day. (Request letter dated 12/08/13 Through Head Master)
- Medical Camp at Tanek (On verbal request by Committee/GPU)
- Providing of Ambulance Facilities to Local public as and when required (as per GPU request)
- Employment to the Local Youth Through GPU (Demand Note Dated 20thNov. 11)
- Contract for civil work/supply of material to Local (Public hearing report at S. No. 8) (All Protection/Non-technical work done by Local only)
- Financial aid to Primary School, Ramthang for calibration of Independence Day.

- Financial aid to Jr. Sec. School Tanek for calibration of Independence Day. Request letter dated 27/07/15 Through Karma Panchayat
- Financial aid to Govt. Primary School Ramthang for calibration of Independence Day. (Request letter dated 06/08/15 Through Head Master)
- Financial support for celebration of Puja at Ramthang Tengyal Manilhagong Gumpa. (Request letter dated 09/10/15)
- Construction of Protection Work at Solobong Tanek at Surge Shaft.
- 1 set Computer & Printer donated to Tanek Primary School Government of Sikkim, North Sikkim (Dt: 31/3/2016)

Ramthang - Tanek GPU

- Rongong Tumlong GPU (Phodong & Kabi)
- Phodong Monastery, North Sikkim for the development of Gumpa Fund Rs. 17,00,000/-
- Construction of Community Hall at Phodong Estimated Cost Rs. 8,35,306/- Agreement dated 05/08/11 and material
- 15 August Football Tournament at Phodong Request letter dated 06/08/11 (GPU)
- Water Supply at Phodong
- Financial aid for Losar Request letter dated 19/02/12 (Youth Club)
- Financial aid to NGO for Waste management Request letter dated 19/01/12 Through GPU & Sh T.T. Bhutia Paid to Secretary Phodong GPU (Ashuk Bhutia) dated, July 13
- Financial aid to Sr. Sec. School Phodong for celebration of Independence Day. Request letter dated 30/07/13 Through GPU
- Material provided to Public during Earth quake on Sep.11 through GPU (400 Bags Cement @ 500/-)
- Steel Dustbins 40 Nos. provided to GPU
- Employment to the Local Youth Request letter dated 19/01/12 Through GPU
- Contract for civil work/supply of material to Local (Public hearing report at S. No. 8) (All Protection/Non-technical work done by Local only)
- Financial Assistance for 15 August Football Tournament at Sr. Secondary School at Phodong
- 2 Trucks Provided for cleaning of Garbage from Tumlung
- Financial Assistance for Kogay Dupey Jeusay Pooja at Phansong
- CGI Sheets (350 Nos.) Provided to Sr. Sec. School Phodong for construction of school building
- Financial Assistance support for Annual function of Kanchenjunga Academy Kabi.,
- Financial aid for Losar Request letter dated 19/02/12 (Youth Club)
- CGI Sheets (25 Nos.) Provided to Sh. Aitey Tamang for re-construction of Damages House at Lower Phodong due to heavy rainstorm building
- Financial Assistance for renovation of Phodong Panchayat Bhawan damages during Earthquake
- Construction of Foot path from Adit-II to lower Rongong vide W/O No. 363 Dated 26/08/2014
- Repair of Foot Bridge at Lingdok, vide W/O No. 366 Dated 28/08/2014
- Financial Assistance for celebration of 15 August At Sr. Secondary School at Phodong -
- Financial Assistance for celebration of 15 August at Sub-Division Kabi along with GPU

- Financial support for organizing pooja at slide area due to heavy rain at Tumlong
- Financial support for organizing cultural & sports events during Gandhi Jayanti at Tumlong North Sikkim
- Construction material provided for construction of Phensong Gumpa, North Sikkim
- Materials provided to Phodong PHC, North Sikkim, Mangan
- Construction of Crematorium shed at Phodok, under Lower Rongong, Phodong, North Sikkim

Lingdok-Nampong GPU

- Computer Centre with Instructor & Building (3 Sets Rs. 90000/- + Room Rent and Salary etc) Minutes of meeting dated 16/09/12 (+Yearly 1.5 Lac updated up to 15)
- Computer with printer for Panchayat (50,000) Request letter dated 12/02/13 GPU
- Construction of wash room & flooring at Rainbow School 8th Mile Lingdok
- Providing of PRIZES for annual function at Govt. Jr. School Pangthag Request letter dated 07/12/12
- Providing of PRIZES for 66th Independence Day function at Sr. Sec. School Lingdok Request letter dated 13/08/12
- Financial aid for Bishwakarma Pooja Sep 12, Sep. 2013 & Sep 14 (Youth Club)
- Construction of ICDS Hall Recommended by Area MLA Sh. T.T Bhutia dt.28/09/13
- Construction Material for Sibik Samdup Manilakhang (Gumpa) latter dated 07' May 13
- Financial aid to Jr. High School Pangthag for calibration of Independence Day.
- Const. Material provided to Public during Earthquake Relief on Sep. 2011
- Const. Material provided for SHIV Mandir at Lingdok On verbal request by Panchayat/Committee
- Const. Material Provided for Durga Mandir at Lingdok Request letter dated 12/02/13 Through GPU Stage-1
- Medical Camp at 8th mile Lingdok (On verbal request by Committee/GPU)
- Construction Material provided for primary Health Center at Lingdok 4 Truck Sand & 4
 Truck aggregate
- Machinery/Equipment provide (Pangthag School 2 Days, Health center at Lingdok 2 days)
- Construction Material Provided for Nampong Lingdok Gumpa 4 Truck Sand & 4 Truck aggregate
- Employment to the Local Youth as per MOU
- Contract for civil work/supply of material to Local (Public hearing report at S. No. 8)
 (All Protection/Non-technical work done by Local only)
- Providing of Ambulance Facilities to Local in Emergency cases only Minutes of meeting dated 16/09/12
- Road maintenance form Pangthang to Lingdok Request letter dated 23/02/12 by Lingdok GPU and as per MOU
- Fund & Material Provide to fir Victim Mr. Tara Bahadur, Lingdok on 26/04/14
- Medical Camp at 8th mile Lingdok (On verbal request by Committee/GPU
- Financial aid to Jr. High School Pangthag for calibration of Independence Day.
- Financial aid to Sr. Secondary School Lingdok for calibration of Independence Day.
- Excavator provide for construction of Penlong Road 7th Mile Lingdok Area

- Const. Material Provided for Sr. secondary School at Lingdok Request letter dated 27/08/14 through Zila Panchayat & Labour welfare Association
- DTH connection provided to Jr. High School Nampong Request letter dated 04/09/14
- Financial aid to Sr. Secondary School Lingdok for District level KHO-KHO tournament
- Construction Material Provided for Durga Mandir at Lingdok Request letter dated 20/07/14 through GPU and Area MLA Sh. Ugen (Kabi) Stage-II
- Maintenance of Water Supply at 7th, 8th & 9th Mile at Lingdok
- Const. Material Provided for Duchi/ Manazing committee Lingdok, Tsangkhar Gumpa at Lingdok Request letter dated Oct./14 Through committee and Area MLA Sh. Ugen (Kabi)
- Const. Material Provided for BAPTIST CHURCH Lingdok, Request letter dated 24/03/15
 Through committee and Zila Panchayat
- Const. Material provided to Public for Construction of Houses damaged due to blasting from 2013 to july 2015
- Const. Material Provided for construction of foot path at Manilhakhang Gumpa at Lingdok Request letter dated 29/04/15
- Const. Material Provided for construction of Alpha mashi andala Church, at Lingdok Request letter dated 05/05/15
- Financial aid to Jr. High School Pangthag for calibration of Independence Day 2015.
- Financial aid to Labour welfare association Lingdok for calibration of Independence Day SSS at Lingdok
- Financial aid for celebration of Bishwakarma Pooja at Lingdok on 17 Sept. 15
- Financial aid for celebration of Durga Pooja at 8th Mile Lingdok on 14 Oct to 21st Oct.
- Financial aid for Namphong Primitive Lepcha Namsong Festival 2015 at Lingdok on 15th Dec 15.
- Construction of Crematorium Shed at Lingdok Dam Site.(Dt: 23rd January 2016)
- Construction of new PHSC (Dispensary) near 9th mile at Lingdok Dam Site.(Dt: 23rd January 2016)
- Const. Material Provided for repairing of Lingdok Sen. Sec. School Mid-Day Meal building at Lingdok
- Financial support given to S.H.G members of Lingdok/Namphong GPU for Organic Farming Training at Himachal Pradesh (Dt:06/6/2016)
- Financial aid for Lingdok Chankar Gumpa for purchasing Utensils & furniture (Plastic Chairs) for Gumpa at Lingdok on 10th June. 16
- Financial aid for Lingdok Educated Unemployed Youth for the celebration of Bhanu Jayanti on 13th of July 2016 at Lingdok Dt: 06/07/2016.

Dikchu -Tintek GPU

- Construction of Shivalaya Mandir, Tumin Shely (Panchayat Request letter dated 27/11/12 & recommended by Area MLA)
- World AIDS Days (Run for AIDS) Request letter dated 27/11/12 (Youth club) 15000/-Cash & 5000/- T Shirt, Fruits & water etc.
- Computer Center with Instructor & Building (3 Sets, Room Rent and Salary etc) on request of Public & Dikchu Youth Association

- Medical Camp at Dikchu On request of Dikchu Public & GPU
- Financial aid for Organizing Independence Day celebration Football Tournament at Dikchu Sr. Sec. School
- Financial aid for Bishwakarma Pooja Request letter dated 11/09/13 & Sept. 14 (Youth Club)
- World AIDS Days (Run for AIDS) Request letter dated 05/10/13 (Youth club)
- World AIDS Days (Run for AIDS) Request letter dated Dec. 2007 (Youth club)
- Funding for International Women's Day on 08th March 14
- Construction of Merry Kids Pvt. School 5 Rooms
- Const. Material provided to Public during Earthquake Relief on Sep. 2011
- Repair of PHC damaged during flood on 3rd may 13 vide W/O No. 278,396,279 ,280 & 289 & Misc
- Const. Material provided for Sr. Secondary School Dikchu Sand and Aggregate
- Employment to the Local Youth as per MOU
- Contract for civil work/supply of material to Local (Public hearing report at SNo. 8) (All Protection/Non-technical work done by Local only)
- Providing of Ambulance Facilities to Local in Emergency cases only
- Medical Camp at Dikchu On request of Dikchu Public & GPU
- Financial aid for Organizing Independence Day celebration Football Tournament at Dikchu Sr. Sec. School
- Diesel & other Material Provided for cleaning of approach Road at Raidong (Dikchu -Tintek)
- Financial aid for celebration of DURGA Pooja Dikchu Bazar.
- Const. Material provided for Dungdung (Ralap) Durga Mandir Sand and Aggregate
- CGI Sheet (400) provided for Dzogchen Tenzung Gumpa at Rakdong, East Sikkm
- Room Heaters, Water Filter & Fire Extinguishers cylinder etc. provided for Dikchu PHC on Dec. 14
- Financial aid for inauguration of DURGA Mandir at Ralap, East Sikkim.
- Const. Material provided for Dikchu Sr Secondary School -Sand, Aggregate, Steel & Cement
- Financial aid for celebration of Independence Day at Sr. Sec. School Ralap, East Sikkim.
- Financial aid to 69th Independence Day celebration open football tournament 2015 at Sr. Sec. School Dikchu, East Sikkim.
- Financial aid to cricket committee Dikchu, East Sikkim.
- Financial aid for celebration of Durga Pooja from 13 to 23rd October at Dikchu Bazar,
 East Sikkim.
- Construction of Drinking Water Pipe Line connection of Dikchu PHC
- Const. Material provided for Dikchu Rajiv Gandhi Sewa Kendra -Rod 10 mm, & Cement

Others Donation/Relief Fund

- Fund given under CM Relief Fund during Earthquake on 18 sept. 2011
- Lepcha Youth Association for Himalayan Ethnic Lepcha Fashion Event at Gangtok Request letter dated 12/10/12

- Eklavya Tribal School near Tanek (2 Nos. Color T.V. with DTH)
- SDF Bhawan Trust Gangtok
- Financial aid for Tourism carnival at Mangan
- Financial aid to Sikkim Archery Association (Request letter received form Sh. T.T. Bhutia, Minister)
- Financial aid to North District Football Association (Request letter received from S.P. North Sh. S. Yadav)
- Financial aid to North District for Independence Day celebration Committee Mangan (Request letter No. 719/DC (N) Dt. 31/07/13)
- Employment to other Sikkimees (West & South Skkim)
- All Sikkim Students Association (Request letter received form Sh. Sonam Gyatso, Power Minister (dated 29th Aug. 13)
- Sikkim Press Association (Request letter No.120/SPA/13 Dt. Nil)
- Namprikdang Namsong celebration committee North Sikkim (Request letter received form Sh. Sonam Gyatso, Power Minister (dated 09th Dec. 13)
- Sikkim Newar Guthi (Annual Magazine) Pradhan community
- Financial aid to Takuney Maha Boudha Biswasanti Puja at Role, East Sikkim
- Financial aid to North District for Independence Day celebration Committee Mangan (Request letter No. 181/DC (N) Dt. 08/07/14)
- Financial aid for celebration of Pang Lhabsol Festival at Ravangla (Ref : Power Minister)
- Financial support to promote CM Archery Gold Cup 2014) at Mangan (Request letter received form Sh. Sonam Gyato- Dy. Speaker) Govt. of Sikkim
- Financial support to President South District Football association Namchi,
- Renovation work of Chemistry Lab of Govt. Girls Sr. Sec. School Deorali (East Sikkim)
- Namprikdang Namsong celebration committee North Sikkim (Request letter received from Sh. Sonam Gyatso, Power Minister (dated 09th Dec. 13) & Forest Minister Sh. T.W. Wangdi
- Financial support for 3rd Sr. Master Men & women international strength lifting championships-2015
- Financial aid for SDF Day
- Financial support to Police personnel Sh. Navin Kumar to participate in world police Game on 25th June 15 at Virginia (America)
- Financial aid to North District for Independence Day celebration Committee Mangan (Request letter No. 674/DC (N) Dt. 05/08/15)
- Financial aid to 69th Independence Day celebration Committee Namok at Eklavya Tribal School at Namok North Distt.
- Financial aid for celebration of Pang Lhabsol Festival at Ravangla (Ref : Power Minister) later dated 13th Aug 15
- Financial aid to Badminton Association of Sikkim (Request letter received from D.C. East Sh. P. Varma)
- Financial aid to Lepcha Mani Gumpa 7th Mile J.N. Road Kyongnosla GPU East Sikkim
- Namprikdang Namsong celebration committee North Sikkim (Request letter received through Sh. Sonam Gyatso Lepcha, Dy. Speaker- cum -MLA (dated 02nd Dec. 15) & Namsong celebration committee, Namprikdang, Dzongu

Expenditure incurred on above activities is given at Table 10 below.

Table 10: Expenditure Incurred on Local Area Development Activities

S. No.	Name of Gram Panchayat Unit (GPU)	Total expenditure (Rs. in lakh)	Remarks
1	Rongong Tumlong GPU (Phudong)/Kabi	39.832	
2	Ramthang - Tanek GPU	31.367	
3	Lingdok-Nampong GPU	74.712	
4	Dikchu -Tintek GPU	46.064	
5	Others Donation/Relief Fund etc.	43.560	Employment
6	PMGSY Road maintenance at Tanek & Protection work for Public Houses at Lingdok/ Dikchu & Tanek	108.209	cost not included
7	PWD Road maintenance & Protection work at Pangthang to Lingdok 8 th Mile	167.960	
	Total amount	511.704	

In addition, various local area development activities which have been planned and are under execution are listed at Table 11 below along with the funds allocated during the FY 2016-17; 2017-18 are as given below.

Table 11: Local Area Development Activities and Budget (FY 2016-17 and 2017-18)

S. No.	Year	Location	Expenditure (Rs. In Lakh)
1	2016-17 & 18	Lingdok	
	a.	PHC 9 th Mile	12.00
	b.	Cremation Shed	2.00
2	2016-17 & 18	Dikchu	
	а	ICDS Room	3.00
	b	Durga Tample Tintek	20.00
	С	PCC Foot Path to Dikchu School	1.00
3	2016-17 & 18	Tanek- Ramthang	
	а	CC Foot Path at Ramthnag Gumpa	14.00
	b	Beautification of View point at Ramthang	8.00
	С	Cremation Shed at Tanek	2.00
	d	Traditional Lepcha House Tanek	10.00
4	2016-17 & 18	Tumlong-Phodong	
	а	Protection Wall at lower Tumlong	3.00
	b	RCC Foot Bridge Lower Rongong	3.00
		TOTAL	78.00

Also local contractors have been given preference in awarding the contract, wherever, practical and locals have been employed. Details and given at Table 12 and 13 respectively.

Table 12: Engagement of Local Contractors in Project

S. No.	Name of GPU	Nos. of local Contractors	Amount (Rs. in Lakhs)
1	Lingdok GPU	82 Nos.	1132.11
2	Tanek/Ramthang GPU	20 Nos.	119.48
3.	Dikchu/Tintek GPU	90 Nos.	476.88
Tota	I	192 Nos.	1728.47

Note: Above amounts are direct contracts. The local contractors are also appointed by main contractors for several works which is not accounted above.

Table 13: Employment to Locals in Project

S. No	GPU	Executives	Supervisory Staff	Skilled Worker	Labors
1	Phodong	1	21	4	6
2	Dikchu	2	0	7	8
3	Lingdok	4	9	15	15
4	Others Sikkimese	11	5	18	3
5	Locals Employed by Contractors	9	14	81	66
Total	299	27	49	125	98

5.0 STATUS OF ENVIRONMENT MANAGEMENT PLAN

As the project is near completion, most components of the EMP, as planned during EIA and EMP stage and budgeted has already been implemented. Table 14 below, gives a list of EMP components along with budget and actual expenditure incurred. It can be noted, that against the budget provision of Rs. 23.46 crore, an expenditure of 32.35 crore has been incurred and additional 3.59 crore will be incurred shortly i.e. a total of Rs. 35.95 crore, which is about 53% higher than the budget.

Table 14: EMP Budget and Actual Expenditure Incurred

		Amount (in Lakhs of Rupees)				
S. No.	Plan	Approved Budget as	Actual expenditure	Balance (yet to		
		per EIA/EMP	incurred	spend)		
1	Biodiversity Conservation	234.72	0	234.72		
2	Catchment Area Treatment	780.92	780.92	0		
3	Compensatory Afforestation	82.97	84.14	0		
4	Green Belt/ Beautification	7.32	3.74	3.58		
5	Quarry Rehabilitation	20.18	0.00	20.18		
6	Control of Water and Air Pollution	4.00	30.79	0.00		
7	Solid Waste Management	46.76	84.23	0.00		
8	Muck Management Plan	76.03	240.77	86.00		
9	EMP in Road Construction	148.00	303.17	0.00		
10	Public Health	85.00	112.49	0.00		
11	Resettlement and Rehabilitation Plan	720.00	1460.32	0.00		
12	Disaster Management Plan	100.00	70.00	30.00		
13	Free Fuel Provision	24.83	55.35	0.00		
14	Environmental Monitoring Programme	16.15	10.00	6.15		
	Total	2346.88	3235.92	380.63		

6.0 CONCLUSION

As is evident from the above detailed discussion, changes have been made in the project components during the detailed engineering study i.e. post DPR and EIA study and this is a standard practice in industry. While, doing the EIA study and preparing the DPR, best efforts are made to carry out detailed investigation and design the project components accordingly. However, minor changes in component sizing and locations for construction management and improved project efficiency are inevitable during engineering and construction stage as these do happen in almost all the hydropower projects. Due care has

been taken to ensure that no additional environmental impacts are envisaged and environment management plan as discussed with and improved by MOEF & CC is implemented in letter and spirit.

We reiterate that project boundaries i.e. FRL and TWL remains unchanged and therefore study are for the EIA Study carried out for environment clearance remains unchanged. Similarly, there is no change in project capacity and any other major project feature/component leading to change of scope of project. Essential changes made during detailed engineering did not lead to any additional impacts. In fact, muck quantity has reduced and design discharge has also marginally reduced. Therefore, we request you to update the environment clearance accordingly.

तार:

Telegram : PARYAVARAN, NEW DELHI

दूरमाय:

Telephone: & Fax 24362827

टेलेक्स :

Telex: W-66185 DOE IN

FAX: 4360678

भारत सरकार
पर्यावरण एवं वन मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT & FORESTS
पर्यावरण भवन, सी. जी. ओ. कॉम्पलेक्स
PARYAVARAN BHAVAN, C.G.O. COMPLEX
लोदो रोड, नई दिल्ली-110003
LODHI ROAD, NEW DELHI-110003

Dated: 01.04.2008

No. J-12011/91/2007-IA.I

Shri B. Murali Mohan Reddy Managing Director Sneha Kinetic Power Projects Limited, 7-65, Habsiguda, Hyderabad-500 007 (Andhra Pradesh)

Subject:- Dikchu Hydroelectric Power Project 96 MW (3 x 32 MW) in the Districts of North & East of Sikkim by M/s Sneha Kinetic Power Projects Limited – Environmental Clearance regarding.

Sir.

This has reference to your letter No SKPPL/MOEF/07-08/05 dated 29-11-2007 and subsequent letters dated 3.10.2007 and 11-02-2008 on the subject.

2. The above mentioned project was considered by the Expert Appraisal Committee for River Valley & Hydroelectric projects at its meeting held on 16-01-2008 and reconsidered on 21-02-2008. The project envisages construction of a 36 m high concrete gravity dam across river Dikchu located between Dikchu & Lingdok villages which is about 1 km upstream of the confluence of River Dikchu with Teesta. This is a run-of-the river scheme. The power house will be under ground and to be located about 1.5 kms upstream of Dikchu-Teesta confulence. The total land requirement is 39.126 ha. Out of which 7.794 ha. forest land and 31.332 ha. is private land. The total catchment area up-to dam site is 240 sq. kims. The project will submerge about 5.7 ha.

of land. 75 families are likely to be partially affected due to this project. The total cost of the project is about Rs. 499 Crores and will be completed in 48 months.

3. The Ministry of Environment and Forest hereby accords environmental clearance as per the provisions of Environmental Impact Assessment Notification, 1994 & 2006 subject to strict compliance of the terms and conditions as follows:

Part A: Specific Conditions

 Catchment Area Treatment Plan as has been proposed should be completed in four years. The plan is given below:

Treatment Measures	Year I	Year II	Year III	Year IV	Total
(A) Biological Measures				Teal IV	Total
Afforestation (ha)		70	105	75	250
Afforestation maintenance (ha)			70	175	
Bamboo Plantation (ha)	: :	70	50	50	170
Bam(m³)boo maintenance (ha)		-	70	120	
Pasture Development (ha)		30	30	20	80
Pasture maintenance (ha)		-	30	60	
Horticulture Development (ha)		25	25	50	100
Broom Grass Development(ha)	-	50	30	20	100
Natural Regeneration (ha)	40	30	20	10	100
Natural regeneration maintenance (ha)		40	70	50	
NTFP/Medicinal Plants (ha)		25	25	5	55
NTFP maintenance (ha)			25	50	
Seed Sowing & Broadcasting (ha)	40	30	20	10	100
Nursery Development (Nos)	3	0	0	0	3
Nursery maintenance (Nos)		3	3	3	-
B) Engineering Measures					
Ory Stone Wall (m³)	3000	2300	1500	1300	8100
Ory Stone Sausage Wall(m³)	2500	1300	1000	850	5650
CCM Wall(m ³)	900	600	350	150	2000
Catch Water Drain (m³)	1500	900	800	500	3700

Bally Benching (ha)	30	35	20	15	100
Soil & Moisture Conservation (ha)	50	50	50	40	190
Contour Bunding (ha)	10	20	30	30	90

- (ii) The land holding of project affected persons whose land is being acquired has to be submitted to this Ministry. During the construction of the project, if any person/family whose acquired land is more than 70% of the total land holding is identified, such family/person shall be treated as fully affected person. NPRR – 2007 as well as Sikkim R&R package would be followed for R&R of project affected persons.
- (iii) A Monitoring Committee for R & R should be constituted which must include representatives of project-affected persons from SC / ST category and a woman beneficiary.
- (iv) The commitment made during the public hearing should be fulfilled.
- (v) All the equipment which are likely to generate high noise levels are to be fully taken care (noise reduction measures) to meet the ambient noise control standards.
- (vi) The proposed plan for 3.6 lakh Cu m of muck disposal- i.e. about 1.1 lakh Cu m is proposed to be reutilized during construction and the remaining 2.5 lakh cumecs of muck to be disposed of at 6 designated areas in North and South Sikkim Districts. Consolidation and compilation of the muck should be carried-out in the muck dumping sites and the dumping sites should be above high flood level.
- (vii) The fishery management plan as proposed in the letter dated 11-02-2008 should be implemented in totality. Creating hatcheries, establishment of fish farms and reservoir fishery has been proposed for conservation and fisheries development and suitable sites for establishment of hatcheries should be identified in consultation with the State Fisheries Department. The total budget of Rs 55.75 lakhs for the fishery development and conservation should not be diverted for any other purpose.
- (viii) The proposed afforestation programme in double of degraded forest area of 15.6 ha (10 ha in North & 5.6 in East districts) using native plant species are identified for this afforestation programme should be strictly implemented. Necessary forest clearance under Forest (Conservation) Act, 1980 should be obtained in this regard.
- (ix) The proposed green belt within the 39.1 ha of the project area along the network of approach roads, residential areas, office complex, dam site, around the periphery of the reservoir should be strictly adhered and also proposed to in-situ

/ex-situ conservation of Orchids and take-up rehabilitation of these species along the road from Rangpo to Ranipoo which are ideal places for rehabilitation should be strictly implemented.

x) During lean season 4.92 cumec of water flow is available in the river. A minimum one Cu m of the water shall be released during the lean season for maintaining the aquatic life in the river.

Part-B: General Conditions

- (i) Adequate free fuel arrangement should be made for the labour force engaged in the construction work at project cost so that indiscriminate felling of trees is prevented.
- (ii) Fuel depot may be opened at the site to provide the fuel (kerosene/wood/LPG). Medical facilities as well as recreational facilities should also be provided to the labourers.
- (iii) All the labourers to be engaged for construction works should be thoroughly examined by health personnel and adequately treated before issuing them work permit.
- (iv) Restoration of construction area including dumping site of excavated materials should be ensured by leveling, filling up of burrow pits, landscaping etc. The area should be properly treated with suitable plantation.
- (v) Financial provision should be made in the total budget of the project for implementation of the above suggested safeguard measures.
- (vi) A Multidisciplinary committee in consultation with the Ministry should be constituted with Ecologists, Environmental Scientists, Conservationists and experienced administrators etc. to oversee the effective implementation of the suggested safeguard measures.
- (vii) Six monthly monitoring reports should be submitted to the Ministry and its Regional Office, Shillong for review.
- 4. Officials from Regional Office MOEF, Shillong who would be monitoring the implementation of environmental safeguards should be given full cooperation, facilities and documents / data by the project proponents during their inspection.
- The responsibility of implementation of environmental safeguards rests fully with Sneha Kinetic Power Projects Limited & Government of Sikkim

- 6. The total amount of Rs.2346.88 lakhs kept in the budgetary provisions in the letter dated 11.2.2008 for implementation of environmental management plan should be strictly adhered and not to be diverted for any other purpose.
- In case of change in the scope of the project, project would require a fresh appraisal.
- 8. The Ministry reserves the right to add additional safeguard measures subsequently, if found necessary and to take action including revoking of the clearance under the provisions of the Environment (Protection) Act, 1986, to ensure effective implementation of the suggested safeguard measures in a time- bound and satisfactory manner.
- 9. This clearance letter is valid for a period of 10 years from the date of issue of this letter for commencement of construction work.
- 10 A copy of the clearance letter will be marked to concerned Panchayat / local NGO, if any, from whom any suggestion/ representation has been received while processing the proposal.
- 11. State Pollution Control Board / Committee should display a copy of the clearance letter at the Regional Office, District Industries Center and Collector's office/ Tehsildar's office for 30 days.
- 12. The project proponent should advertise within 7 days at least in two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned informing that the project has been accorded environmental clearance and copies of clearance letters are available with the State Pollution Control Board / Committee and may also be seen at Website of the Ministry of Environment and Forests at http:// www.envfor.nic.in
- 13. Any appeal against this environmental clearance shall lie with the National Environment Appellate Authority, if preferred within a period of 30 days as prescribed under Section 11 of the National Environment Appellate Act, 1997.

(Dr. S. Bhowmik) Additional Director

Copy to:

- 1. The Secretary, Ministry of Power, Shram Shakti, Bhawan, Rafi Marg, New Delhi-110001.
- 2. The Adviser (Power), Planning Commission, Yojna Bhawan, New Delhi 110001.
- 3. Secretary, Department of Power, Government of Sikkim, Secretariat, Gangtok.
- 4. The Secretary, Department of Forest, Environment & Wildlife Management, Forest Secretariat, Government of Sikkim, Deoral, Gangtok-737 102, Sikkim
- 5. The Chief Engineer, Project Appraisal Directorate, Central Electricity Authority, Sewa Bhawan, R.K. Puram, New Delhi-110066.
- 6. The Regional Office, Ministry of Environment & Forests, Shillong
- 7. Member Secretary, State Pollution Control Board, Department of Forests, Environment & Wildlife Management Department, Deorali, Gangtok- 737 102, Sikkim
- 8. El- Division, Ministry of Environment & Forests, New Delhi-110003.
- 9. Guard file.

(Dr. S. Bhowmik) Additional Director



GOVERNMENT OF SIKKIM

OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS-CUM-SECRETARY
DEPARTMENT OF FORESTS, ENVIRONMENT AND WILDLIFE MANAGEMENT
FOREST SECRETARIAT, DEORALI, GANGTOK-737 102
[PHONE: 281877 (O), 281145 (O) FAX: 03592 – 281778, 281145]

Ref. No.1110/FCA /FEWMD / 51.5...

Dated: 09/02/10.

To,
The Managing Director,
M/S Sneha Kinetic Power Project Limited,
7-65, Habsigudo,
Hyderabad – 500 007,
(Andhra Pradesh).

SUB: Proposal for diversion of 9.7129 Ha of forest land (Surface = 8.6968 Ha + Underground = 1.0161 Ha) for construction of 96 MW Dikchu Hydel Electric Project in North and East District of Sikkim by M/s Sneha Kinetic Power Project Limited - (Final Approval).

Sir.

In continuation to this office letter No. 1110/456/FCA/FEWMD dated 06/01/10. I am directed to convey the final approval accorded by the Ministry of Environment & Forests, Government of India vide letter No.3 – SK C 086/2008-SHI/2471-72, dated 22/10/2010 (a copy of which is enclosed for ref.) under Section 2 of the Forest (Conservation) Act, 1980 for diversion of 9.7129 Ha of forest land (Surface = 8.6968 Ha + Underground = 1.0161 Ha) for construction of 96 MW Dikchu Hydel Electric Project in North and East District of Sikkim by M/s Sneha Kinetic Power Project Limited, subject to strict compliance of the conditions stipulated in the approval letter.

In this connection, you may direct your concerned officer to contact the DFO (T) North/East, Mangan/Gangtok to take over the possession of the diverted forest land and a copy of the handing and taking over documents may be forwarded to this office for record. As per the approval, following conditions are to be complied with:-

- The legal status of the forest land shall remain unchanged.
- Compensatory Afforestation as per guideline shall be carried out over 18.0 ha of degraded forest land identified in East and North Districts from the fund deposited by the User Agency.
- The forest land shall not be used for any purpose other than that specified in the proposal.
- Additional amount of the Net Present Value (NPV) of the diverted forest land, if any, becoming due after finalization / revision of the same by the Hon'ble Supreme Court of India shall be charged by the State Govt. from the User Agency.
- The project area shall be demarcated on ground at the project cost, using four feet high RCC pillars, with each pillar inscribed with the serial number, forward and backward bearings and distance between two adjacent pillars.
- The User Agency shall ensure that muck and debris, if any, is disposed safely on the site/pits/land earmarked for the purpose and do not spread out or roll down the slopes or pollute the natural streams, water bodies and land surrounding the area.
- The State Forest Department shall allow only such felling of trees which is unavoidable and blank created if any shall be planted before the completion of the project.
- Normally no explosive shall be used but when unavoidable the same may be used to the
 minimum extent with the prior permission of the State Forest Department and preferably
 using noiseless trunk line delay technique for the purpose.
- User Agency shall provide fuelwood, preferably alternate fuel to the labourers and the staff working at the site so as to avoid any damage and pressure on adjacent forest areas.

- There should be no damage to the surrounding forests, environment, wildlife, natural
 resources and other properties and, if any, the same shall be compensated along with the
 reclamation measures.
- No labour camp shall be set up or any habitation shall be allowed to come up in the forest land or non-diverted forest land.
- The User Agency shall provide necessary cooperation and logistic support to the State Forest Department as and when necessary for protecting the adjoining wildlife sanctuary and non diverted forest land.
- Environment clearance shall be obtained prior to any land development at the projects site.
- 14. The handover of the forest land will be done only after realizing Catchment Area Treatment Plan and fund for execution of plan and as per the release of fund by the User Agency for Annual CAT Plan based on revised cost.
- In case of non-compliance of any of the above conditions the Nodal Officer, Sikk m Forest Department shall suspend the non-forest use of land and submit a report to this office.
- Any other conditions as may be found appropriate in future for the betterment of environment & wildlife, may be imposed by CCF (Central), North Eastern Regional Office.

Encl: Copy of Final approval letter.

Yours aithfully,

Winisten

(M.L. Srivastava), IFS CCF-cum-Nodal Officer (FCA)

Department of Forest, Environment & Wildlife Management, Government of Sikkim, Gangtok.



GOVERNMENT OF SIKKIM OFFICE OF THE PCCF-CUM-PRINCIPAL SECRETARY DEPARTMENT OF FORESTS, ENVIRONMENT AND WILDLIFE MANAGEMENT GANGTOK, SIKKIM, DEORALI - 737 102

[Phone No.:281778, 281145[FAX NO.03592:281145] E-mail ID ; fca.sikkim@gmail.com

Ref. No. 1110 /FCA/FEWMD / 166.4. Date: 26.3.2013 To,

The Managing Director, Sneha Kinetic Power Projects Pvt. Limited, Sonam Complex, Development Area, East Sikkim, Gangtok Tel. Fax: 03592-280418.

SUB: Diversion of 1.2610 Ha of additional Forest land (adjustment) for construction of approach road and Surge Shaft in Tanek Block respectively for 96 MW Dikchu HEP by Sneha Kinetic Power Projects Pvt. Ltd. In North District and surrender of 1.4420 Ha of diverted forest land; the revised net diversion of forest land shall be 9.5319 ha (i.e. 9.7129 + 1.2610 - 1.4420) only instead of 9.7129 Ha for required realignment in its linear components and few other components on technical grounds-(Final Approval).

Sir,

I am directed to convey the Final Approval accorded by the Ministry of Environment & Forests, Government of India, North Eastern Regional Office, Shillong under Section 2 of Forest (Conservation) Act 1980 and subsequently conveyed in its letter No. 3 - SK C 086/2008-SHI/3863-64 dated 21st March 2013 for diversion of 1.2610 Ha of additional Forest land (adjustment) for construction of approach road and Surge Shaft in Tanek Block respectively for 96 MW Dikchu HEP by Sneha Kinetic Power Projects Pvt. Ltd. In North District and surrender of 1.4420 Ha of diverted forest land; the revised net diversion of forest land shall be 9.5319 ha (i.e. 9.7129 + 1.2610 - 1.4420) only instead of 9.7129 Ha for required re-alignment in its linear components and few other components on technical grounds, subject to strict compliance of the following conditions:-

- Legal status of forest land shall remain unchanged. 1.
- The Compensatory Afforestation shall be raised over 2.5 ha. in degraded 2. forest land as identified by the State Govt. at Tanek (contiguous to the previous Afforestation areas) in Phodong Block of North (T) Division as per the funds deposited by the User Agency
- Tree felling shall be done only when it is absolutely necessary and 3. unavoidable and that too under strict supervision of the State Forest Department.
- No damage to the flora and fauna of the surrounding area shall be caused . 4.

- The forest land shall not be used for any purpose other than that specified in the proposal.
- The User Agency shall provide fuel preferably alternate fuel to the labourers working at site to avoid damage / felling of trees..
- 7. The muck generated in the earth cuttings if any will be disposed off at the designated dumping sites and in no case the muck / debris will be allowed to roll down the4 hill slopes.
- The forest land proposed to be diverted shall under no circumstances be transferred to any other agency, department or person.
- The layout of the plan of the proposal shall not be changed without the prior approval of the Central Government.
- 10. Any other conditions as may be found appropriate in future for the betterment of environment & wildlife, may be imposed by APCCF (C), North Eastern Regional Office.
- 11. In case of non-compliance of any of the above conditions the Nodal Officer, Sikkim Forest Department shall suspend the non-forest land use of land and submit a report to this office.

Therefore, you are requested to take over the possession of the diverted forest land from the DFO (T) North, Mangan and submit a copy of report to the undersigned for record. Please ensure that conditions stipulated herein above are complied judiciously.

Yours Faithfully,

(B.K. Tewari, JFS) CCF-cum-Nodal Officer (FCA)

Copy to:

Conservator of Forest (T)
 DFO (T), North, Mangan.

: for information

: for information with a direction to hand over the diverted forest land accordingly



GOVERNMENT OF INDIA MINISTRY OF ENVIRONMENT & FORESTS NORTH EASTERN REGIONAL OFFICE

Law-U-Sib, Lumbatngen

No.3-SK C 086/2008-SHI

Near MTC Workshop, Shillong 793 021

टेली/Tel: (0364) - 253-7609/7340/7395/7278

GRAM: PARYAVARAN, SHILLONG

ईमेल/Email - mofner-meg@nic.in & moefner@dataone.in

भारत सरकार प्रयावरण एवं वन मंत्रालय पूर्वोत्तर क्षेत्रीय कार्यालय लाउसीब, लुम्बट्गेंन एम.वी.सी व्रक्तिप के पास, शिलांग 793021 फैक्स्स ax: (0364) – 2536041 तुर् भूषावरण, शिलांग

21th March, 2013

CF-COMD-NO. (FOR

The Principal Chief Conservator of Forests-Cum Secretary

Deptt. of Forests, Environment & Wildlife

Govt. of Sikkim

Deorali, Gangtok

Sikkim.

Sub: Proposal for diversion of 1.2610 ha. of additional forest land (adjustment) for construction of approach road and Surge Shaft in Tanek Block respectively for 96 MW Dikchu HEP by Sneha Kinetic Power Projects Pvt. Ltd. in North District and surrender of 1.4420 ha. of diverted forest land; the revised net diversion of forest land shall be 9.5319 ha. (i.e. 9.7129 + 1.2610 - 1.4420) only instead of 9.7129 ha. for required re-alignment in its linear components and few other components on technical grounds.

Sir,

This has got reference to the State Government's letter No. 1110/FCA/FEWMD/614-17 Dated 04.10.2012 on the subject mentioned above, seeking prior approval of the Central Government in accordance with Section 2 of the FCA, 1980. In-principle approval was granted vide this office letter of even number dated 08.02.2013 subject to fulfillment of certain conditions. The State Government has furnished compliance report in respect of the conditions stipulated in the in-principle approval and has requested the Central Government to grant final aproval.

In this connection, I am to inform that on the basis of the compliance report furnished by the State Government vide letter No.1022/FCA/FEWMD/1457-61 21.02.2013, final approval of the Central Government is hereby granted under Section-2 of the Forest (Conservation) Act, 1980 for diversion of diversion of 1.2610 ha. of additional forest land (adjustment) for construction of approach road and Surge Shaft in Tanek Block respectively for 96 MW Dikchu HEP by Sneha Kinetic Power Projects Pvt. Ltd. in North District and surrender of 1.4420 ha. of diverted forest for required re-alignment in its linear components and few other components on technical grounds (as detailed in the proposal), subject to the following conditions:

(1) The legal status of the forest land shall remain unchanged.

(2) Compensatory Afforestation shall be raised over 2.5 ha. in degraded forest land as identified by the State Govt. at Tanek (contiguous to the previous Afforestation areas) in Phodong Block of North (T) Division as per the fund deposited by the User Agency.

(3) Tree felling shall be done only when it is absolutely necessary and unavoidable, and that too under strict supervision of the State Forest Department.

(4) No damage to the flora and fauna of the surrounding area shall be caused.

(5) The forest land shall not be used for any purpose other than that specified in the proposal.

(6)The User Agency shall provide fuel preferably alternate fuel to the labourers working at site to avoid damage/felling of trees.

(7) The muck generated in the earth cuttings if any will be disposed off at the designal dumping sites and in no case the muck/debris will be allowed to roll down the hill slopes.

(8) The forest land proposed to be diverted shall under no circumstances be transferred to any other agency, department or person.

(9) The layout of the plan of the proposal shall not be changed without the prior approval of the Central Government.

(10) Any other conditions as may be found appropriate in future for the betterment of environment & wildlife, may be imposed by APCCF (C), North Eastern Regional Office.

(11) In case of non-compliance of any of the above conditions the Nodal Officer, Sikkim Forest Deptt. shall suspend the non-forest land use of land and submit a report to this office.

This is issued with approval of Addl. Principal Chief Conservator of Forests (C).

Yours faithfully,

(B. S. Kharmawphlang)
Chief Conservator of Forests (C)

Copy to:

The Chief Conservator of Forests & The Nodal Officer, O/o The PCCF, Department of Forest, Env. & WL Management, Government of Sikkim, Deorali, Gangtok.

Chief Conservator of Forests (C)



- the installation of more than one unit, it is possible to utilize more lean flows and hence more annual generation.
- b) If a single machine is used, there is a loss in annual energy because of the non-availability of the unit for generation due to unforeseen / unscheduled outage of the machine.
- 6. Therefore, the option of installation of two (2 x 48 MW) or three units (3 x 32 MW) is considered for further study.
- 7. Budgetary enquiries were floated and the response from equipment manufacturers was more in favour of 32 MW capacity units. Keeping in view the ease of availability and obtaining competitive price from the TG vendors, three units are considered. Further, the loss in annual energy because of the non-availability of the unit for generation due to unforeseen / unscheduled outage of the machine will be less than that with two units. However, the option of 3 x 32 MW TG units or 2 x 48 MW Francis type TG units may be further reviewed during detailed engineering before placing the order for equipment.
- 8. In view of the above reasons, it is proposed to consider installation of three units each of capacity 32 MW.

Mechanical Equipment

9. The mechanical equipment will mainly consist of turbine, main turbine inlet valve, governor, instrumentation and control system, oil pumping system, other power house auxiliaries viz. crane, air-conditioning and ventilation system, cooling water system, dewatering and drainage system and fire protection system.

Turbine

10. The type of turbine will be vertical shaft Francis type directly coupled to the vertical synchronous generator. The turbine will have adjustable guide vanes for control of the flow. The guide vanes will be actuated by guide vane servomotor through the governor. The main parameters of the proposed turbine are furnished below:

Telex : 0264202 POWER IN : 03592 222927 Fax



Phones: 202244 PBX: 222908 222916 222028

GOVERNMENT OF SIKKIM ENERGY AND POWER DEPARTMENT

The Vijay Atluri, Chief Executive Officer, 96 MW Dikchu HEP, Sneha Kinetic Power Projects Limited, Near SNDO Pump, Deorali, Gangtok.

Sub : Approval For Installation of 2 units of 48 MW Generating Units.

Ref: Your letter No. SKPPL/GTK/11-12/160 dated 15.10.2011.

With reference to the above subject, I am directed to convey that the proposal submitted by you for installing 2 units of 48 MW each Generating Units for 96 MW Dikchu HEP vide your above referred letter has been approved by the Government of Sikkim.

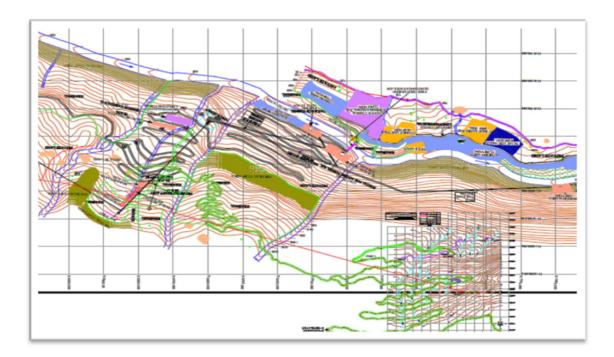
However, increasing the turbine rating has also increased the size and the weight of the turbine/generators/transformers etc and therefore you are advised to take into consideration the transportation constraints and ensure that transportation issues are seriously taken into account.

Thanking you,

Additional Chief Engineer(HQ-II).

<u>Geotechnical appraisal of Surge Shaft Iocations of Dikchu</u> <u>Hydro Electric Project (96MW)</u>

A traverse was taken on first week of august 2012 along old location and new proposed location of surge shaft. The old Location of surge Shaft located at about 1km distance from Dikchu and proposed new location is shifted towards Dikchu power house and can be approach from top side i.e. North Sikkim Highway.



Location -1 (Old Location of Surge Shaft)

The location 1 comes at area comprising with denudational ridge, residual soil with huge size of boulders which have been transported or derived from top of mountain, just because of earthquake and some tectonic movements. Topographically the area comprising big size of transported rocky boulders and flatter surface having in-situ residual soils with a thick layer of humes soil.



Complete View of Rocky area at proposed new location of Surge Shaft

During of investigations stage an exploratory drill hole has been conducted at this location. The bed rock has not been encountered up to 35m depth; only few core samples big rocky boulders and residual soil have been recorded.

In attached photograph a man standing near the big boulder having blue shirt is showing the old surge shaft location.

Based upon topography and record of geotechnical investigations the location is not suitable for making a surge shaft of hydro power project.

Therefore the location of surge shaft needs to change.

<u>Location -2 (Alternate Surge Shaft Location)</u>

The second location of surge shaft (Location -2) comes at rocky/hilly area comprising with high hills of phylitic quartzite of middle shivalik group. The rocky area has a gentle slope showing strike of strata. A valley dipping foliation joint noticed having gentle dips. Three sets of joints have been recorded and found very suitable for vertical as well as horizontal tunneling also. The average UCS is recorded between 40-60Mpa.



Complete View of Rocky area at proposed new location of Surge Shaft

Another closer view of proposed surge shaft location



Closer View of Rocky area at proposed new location of Surge Shaft

Area is approachable from Dikchu power house through a footpath.

Conclusions

- 1. The location -1 (Older Location of Surge Shaft) is not suitable for making a surge shaft.
- 2. The proposed location is quite suitable from every angles i.e. site suitability & stability, showing good quality of in-situ rock, easy approachability and economically also.
- 3. It is suggested please shift the surge shaft location as newer location.

VINOD KUMAR VERMA (Geologist) Telex : 0264202 POWER IN : 03592 222927



Phones: 202244 PBX: 222908

GOVERNMENT OF SIKKIM ENERGY & POWER DEPARTMENT

No SPDC 290/05-06/46

Dated 07 · N/DV: 20/)

To,

The General Manager, Sneha Kinetic Power Limted Near SNOD Pump Deorali, Gangtok

Sub: Revised salient features of Dikchu HEP.

Sir,

This has reference to your letter dated 15-10-2011 where in revised salient features were enclosed for perusal.

In this context it is mentioned that the revised Salient features and layout have been examined and proposed changes have been found acceptable, duly signed Salient features and Layout are enclosed herewith for your reference and record."

Thanking you,

Yours Sincerely

Additional Chief Engineer (HQ-II) Add Energy on Power Department

Energy & Power Department Govt, of Sikkim

DIKCHU HYDRO ELECTRIC PROJECT (96MW)

SALIENT FEATURES

LOCATION

Country India

State Sikkim

River Dikchu river (Tributary of Teesta river)

River Dam East Sikkim & North Sikkim Dikchu

Site Location 150m d/s of confluence of Bakchachu and

Rateychu (near village Lingdok)

Latitude & Longitude 27°24'00" N; 88° 35'20"E

Power House Location Near Dikchu Village

Latitude & Longitude 27°24'14.32" N; 88° 31'37.83"E

Nearest Airport Bagdogra (West Bengal)

Nearest Railway Station New Jalpaiguri (West Bengal)

HYDROLOGY

Catchment area at dam site 240Km²

Design Flood 1100m³/sec

RESERVOIR

Maximum Water level El 952.00 m

Full reservoir Level (FRL) Max. EL 950.00m

Reservoir Level (MDDL) minimum Draw Level EL 939.00m

Gross Storage up to FRL 0.52M cum

Live Storage at FRL 0.33M cum

DAM

Type Concrete Gravity dam

Top Elevation of dam EL954.00m

SNEHA KINETIC POWER PROJECT PVT LTD-

SALIENT FEATURES

Height of Dam 36.00m

Length of Dam 93.00m

River Bed Level EL 920.00m

SPILL WAY

Design Flood 1100cum/sec (PMF)

Type: Ogee shape

Crest level 924.00m

Maximum head over crest (w.r.t FRL) 28m

No's of gate 4 no's

Size of each radial gate: 6m (W) x 6.85m (H)

Energy Dissipation Trajectory bucket

TUNNEL INTAKE

Invert level 929.40m

Size of each Gate 4.8m X 4.8m

Trash Rack size 4m x 12.5m

Design Discharge 40.20cumec

DESILTING CHAMBER

Type Underground

Number 1

Length 140m

Size 12m (w) x 15.50m (H)

Design Discharge 40.20cumec

Particle size to be removed 0.20mm & above (90% efficiency).

HEAD RACE TUNNEL:

Size 4.8m dia horse shoe shape

Length 5460m

Lined Concrete lined

No's of Adits 3 No's

SNEHA KINETIC POWER PROJECT PVT LTD-

SALIENT FEATURES

SURGE SHAFT

Type Underground

Size of Surge shaft 10.50m finished dia X 58.7m height

Surge shaft Top EL 975.00m

Surge shaft bottom EL 916.30m

PRESSURE SHAFT & PENSTOCK

Type Underground

Size of Pr. Shaft 555m length; 3.0m dia circular steel liner

No's of Penstock 2 no's

Size of Penstock 84m long (both) x 2.10m dia circular Steel liner

POWER HOUSE

Type Underground

Installed capacity 96mw

Number of unit 2

Power house cavern size: 62m (L) x 18m (W) x 38m (H)

Type of turbine Vertical Axis Francis Turbine

Tail water level at outlet: 581.95m

Related Head 350m

Design Discharge 15.23m³/sec

TAIL RACE TUNNEL

Size of TRT 4.5m D shaped finished size.

Length of Tail Race Tunnel 230m

SWITCH YARD

Type Open

Size 60m x 30m

SNEHA KINETIC POWER PROJECT PVT LTD-

SALIENT FEATURES

Addl. Chief Engineer (HQ-II) Energy & Power Department Govt. of Sikkliff

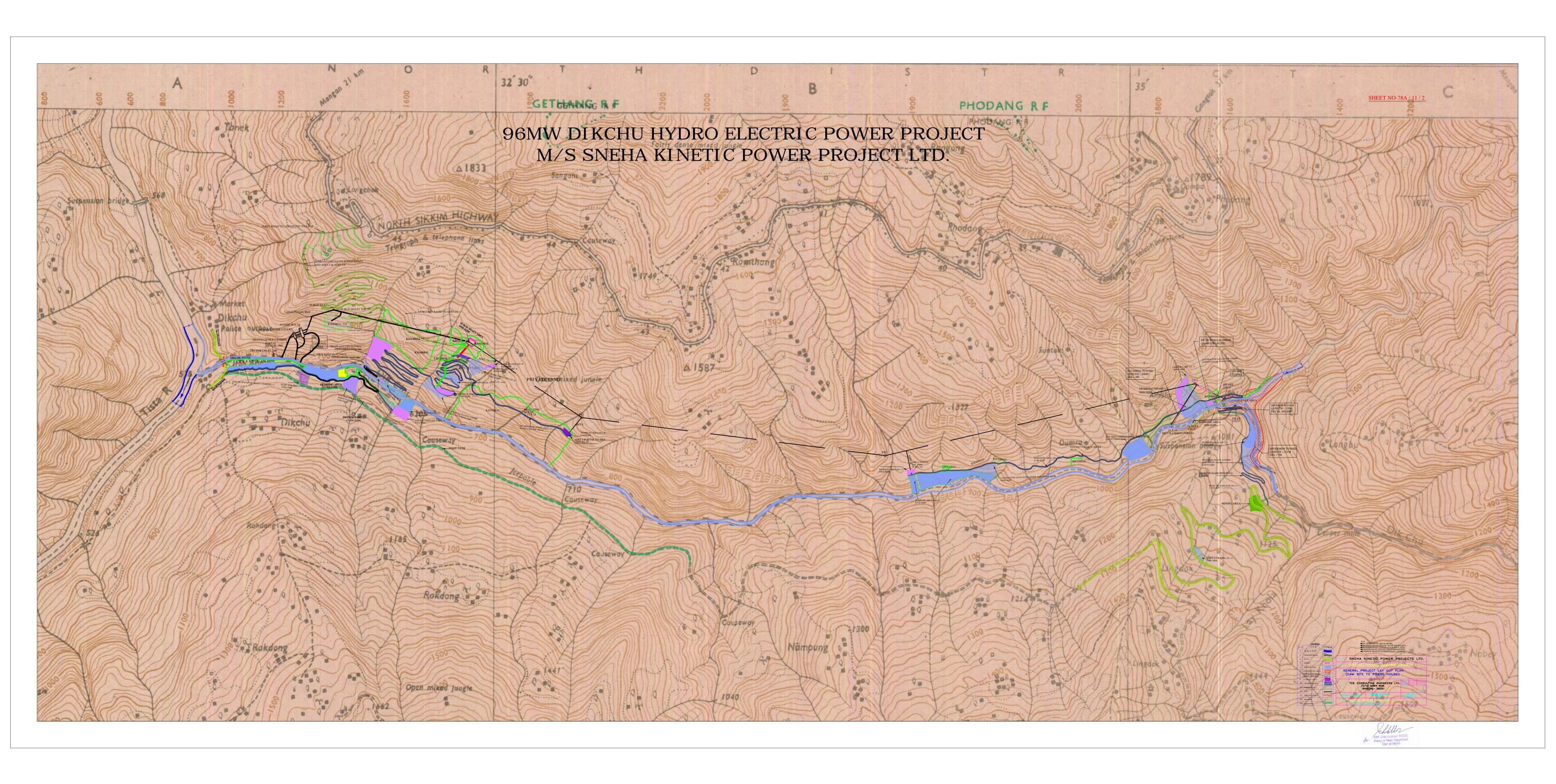
POWER GENERATION

Installed Capacity 96mw

Annual Energy Generation in 90% dependable year 431MU

(95% machine Availability)

Construction Period 4 years



Comparative statement of required land at various stages

	Details	Area of Land (in ha)				
S. no.		As per approved EMP/EC	As per application for land diversion	In Actuals	Component wise/ Purpose details	Remarks
1	Private Land					
i.	East Sikkim	13.28	13.846	15.064	Of this 0.498ha - for dam axis slope land, 0.038ha -construction power	
ii.	North Sikkim	18.02	25.336	30.937	Of this 5.147ha - for relocated surge shaft and access roads 11.9ha - though acquired earlier for surge shaft and access road, presently unused/ barren	The mentioned about 11.9ha land is left barren. If this land not considered as project land then about 34ha of private land has been used for project construction i.e. about 5ha less than total approved private land
	Sub total	31.3 i.e. 31.332 as in EC	39.182	46.001		
2	Forest land				1	
i.	East Sikkim	0.43	2.7454	2.7463	No new components included	0.055ha of Underground components was included. An area of about 1.28ha of forest land was added due to revised bifurcation of submerged forest land by forest dept.
ii.	North Sikkim	7.37	6.9675	6.7856	Inclusion and deletion for surge shaft and access roads	0.96ha of Underground components was included. 1.4420ha was surrendered and in place of it forest land of 1.2610ha was diverted.
	Sub total	7.8 i.e. 7.794 as in EC	9.7129	9.5319		1.02ha of Underground components was included. 0.7ha of additional forest land is due to final demarcation of boundaries between forest and private land. No additional component was added on forest land