Department of Hydro Power Development (Monitoring), Itanagar

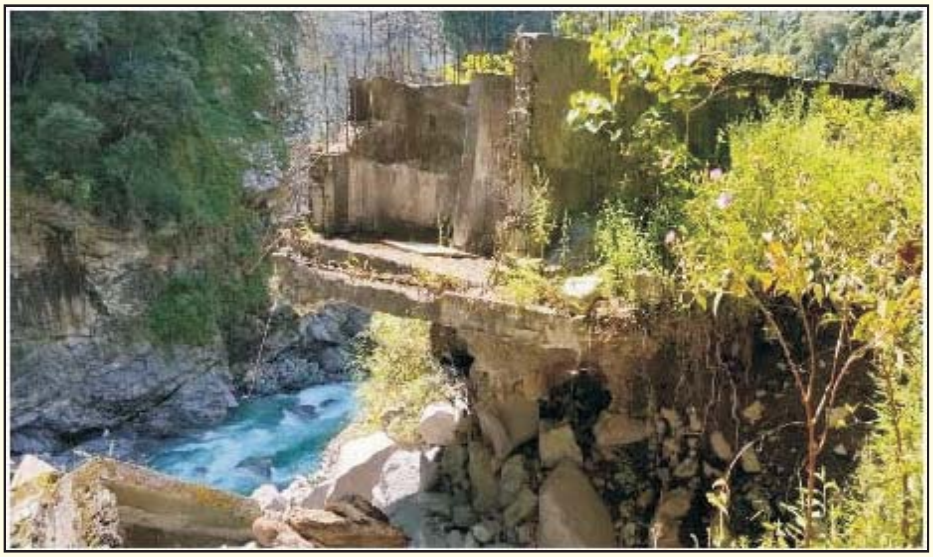
TECHNO-ECONOMIC REVIEW REPORT

Halaipani Small Hydro Electric Project

(4 x 4.0 MW)

District : Anjaw (Arunachal Pradesh)

Developer: M/s PK Hospitality Services Pvt. Ltd.



Prepared by:

Department of Hydro and Renewable Energy
Indian Institute of Technology
Roorkee, India

March 2021

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TABLE OF CONTENT

Recommendation for Acceptance of the Project
Techno-Economic Appraisal Report of HRED, IIT Roorkee for
Halaipani Small Hydro Electric Project in Anjaw District of Arunachal Pradesh

After detailed scrutiny of the DPR and other relevant information/site details, we confirm that:

(i) The project is technically feasible and financially viable.
(ii) Cost estimates of the project have been reviewed and the project is observed to be feasible for implementation.

Based on techno-economic analysis of the project, promoted by M/s P.K. Hospitality Service Pvt. Ltd. the project has been found techno-economically feasible for execution within the time frame of 24 months from commencement and 06 months in pre-construction activities as indicated in the concerned DPR. Following information are recommended for Halaipani HEP.

Project Name and Developer	**Consultants**	**Parameter**	**As per DPR (Cost base Dec .2020)**	**As Reviewed by HRED (Feb. 2021)**
Halaipani Small Hydro-Electric Project (4 × 4 MW) Arunachal Pradesh (M/s P.K. Hospitality Service Pvt. Ltd.)	Shri Manoj Patne Prime Consulting Group, Gurugram, India	Estimated Project Cost (Lakh)	15875.77	14784.95
		Power Generation Unit Available for Sale (MU)	(i) At 55% PLF – 8.55(MU) (ii) At 100 % PLF – 106.45(MU)	(i) at 55% PLF – 58.43 (MU) (ii) at 50 % PLF – 53.12 (MU) (iii) at 60% PLF – 63.74 (MU) (iv) at 73.88 % PLF – 79.68 (MU)
		Levellised Tariff for 40 Years (Without subsidy)	(i) at 55% PLF – Rs. 5.27 (ii) at 100 % PLF – Rs. 2.90	(i) at 73.88 % PLF – Rs. 3.13 (ii) at 60% PLF – Rs. 3.91 (iii) at 55% PLF Rs. 4.27 (iv) at 50% PLF Rs. 4.69

SALIENT FEATURES

A	GENERAL	:	As per DPR Dec. 2020	As per HRED (Mentioned if there is any change and agreed by the firm)
1	**Name of the project**	:	**Halaipani SHP (4×4 MW)**	
2	Project Location			
	State	:	Arunachal Pradesh	
	District	:	Anjaw	
	Village		Hilong	
	Assess	:	180 km from Tezu	
3	**Geographical Coordinates**	:		
(a)	**Barrage Site**			
	Longitude	:	96º43′ 10.98″ E	
	Latitude	:	27º58′ 40.75″ N	
(b)	**Power House Site**			
	Longitude	:	96º42′ 45.31″ E	
	Latitude	:	27º57′ 57.28″ N	
(c)	Reference Topo sheets		91D/12, 91D/16, 90A/9	
4	**Hydrology**			
(a)	Name of stream	:	Halai River	
(b)	Catchments area	:	270 sq.km.	
(c)	Maximum flood discharge	:	1938 cumecs	
(d)	Type of stream	:	Perennial	
(e)	Design flood (SPF)	:	1938 cumecs	
5	**Barrage**			
(a)	Barrage top	:	EL 891 m	EL 895 m
(b)	River bed level at Barrage site	:	EL 879 m	
(c)	Barrage height (above river bed level)	:	12 m	16 m
(d)	Design flood (1 in 100 years)	:	1938 cumecs	
(e)	Crest elevation in spillway portion	:	EL 879 m	
(f)	Crest elevation in Intake portion	:	281.0 m	
(g)	Nos. and size of bays in spillway	:	4 Nos. (6 m × 6.4 m)	3 Nos. (6 m wide)
(h)	Energy dissipation	:	Straight Reach	
6	**Reservoir**			
(a)	Full Reservoir level (FRL)	:	EL 883.20 m	EL 894.30 m
7	**Feeder Channel**			
(a)	Shape of feeder	:	Rectangular Box	
(b)	Material	:	RCC	
(c)	Size	:	4 m × 2.64 m	
(d)	Length	:	405 m	
(e)	Bed slope	:	1 in 275	
(f)	Full supply depth	:	2.04 m	

(g)	Design discharge	:	27.20 cumec	
8	**Desilting Tank**			
(a)	Size	:	63 m (L) × 18 m (W)	
(b)	Transition length (upstream)	:		42.0 m
(c)	Transition length (downstream)	:		21.0 m
(d)	Particle size to be removed	:		0.2 mm
(e)	Design discharge	:	27.20 cumecs	
9	**Power Channel**			
(a)	Length	:	1539 m	
(b)	Shape	:	Rectangular	
(c)	Size	:	Width – 4.00 m Depth – 2.42 m	
(d)	Bed Slope	:	1 in 400	
(e)	Full supply depth	:	1.97 m	
(f)	Design discharge	:	21.75 cumecs	
10	**Forebay Tank**			
(a)	Size	:	66 m × 10 m	
(b)	Depth	:	4.80 m to 8.30 m	
(c)	Storage	:	2 minutes (2600 m^3)	
11	**Spillway Channel**			
(a)	Length of bypass Crest	:	38 m	
(b)	Length of bypass Channel	:	200 m	
(c)	Shape of bypass Channel	:	Circular MS pipe 1300 mm dia	
12	**Penstock**			
(i)	Type	:	Steel	Steel
(ii)	No. of Main Penstock	:	4	
(iii)	Length	:	174.0 m	
(iv)	Diameter	:	1.40 m	1.30 m
(v)	Design discharge	:	5.4 cumec each pipe	5.44 cumec for each pipe
13	**Power House**			
(a)	Type	:	Surface Power House	
(b)	Gross Head	:	102.965 m	
(c)	Machine floor level	:	EL 770.15 m	
(d)	Type of Turbine	:	Horizontal Francis	
(e)	Generating units	:	4 × 4 MW	
(f)	Installed Capacity	:	16 MW	
(g)	Rated net head (Design head)	:	95.0 m	
(h)	Size (M/c Hall)	:	66 m (L) × 15 m (W) × 7.5 m (H)	46.6 m (L) × 16.5 m (W) × 25.05 m (H)
14	**Tailrace Channel**			
(a)	Number	:	One	
(b)	Size & type	:	4.0 (W) × 2.5 m (H) concrete lined	Rectangular 4.0 (W) × 2.5 m (D) concrete lined
(c)	Design discharge	:	21.75 cumecs	
(d)	Length	:	20 m	

15	**Turbine**			
(a)	Type	:	Francis	
	Number	:	4	
	Capacity	:	16 MW	
16	**Type of Generator**			
(a)	Type	:	Synchronous	
(b)	Nos.	:	4	
(c)	Capacity	:	4 MW each	
17	**Switchyard**			
(a)	Type & size	:	Surface 60 m × 35 m	Surface 53.50 × 30 m
18	**Power Generation**			
	Installed capacity	:	16 MW (4×4 MW)	
(i)	Energy generation for sale (after free to home state)	:	at 55% PLF – 58.55	at 55% PLF – 58.43 MU
		:	-	at 50 % PLF – 53.12 MU
		:	-	at 60% PLF – 63.74 MU
		:	at 100 % PLF – 106.45	at 73.88 % PLF – 79.68 MU
19	**Construction Period**	:	30 Months	
20	**Estimates of Cost**	:		
(a)	**Project Basic Cost**	:	Rs. 13951.58 Lakh	Rs. 12942.77 Lakh
	(i) Cost of civil works	:	Rs. 12187.45 Lakh	Rs. 11178.64 Lakh
	(ii) Cost of E&M works (Including Transmission Line)	:	Rs. 1764.13 Lakh	Rs. 1764.13 Lakh
(b)	Escalation during construction period	:	Rs. 463.13 Lakh	Rs. 650.58 Lakh
(c)	IDC	:	Rs. 1149.77 Lakh	Rs. 987.47 Lakh
	Finance Charge @ 2 % of loan	:	Rs. 311.29 Lakh	Rs. 204.13 Lakh
(d)	Total Project Cost	:	**Rs. 15875.77 Lakh**	**Rs. 14784.95 Lakh**
17	**Generation Cost Rs./kWh**			
	Levellised Tariff (Without Subsidy)	:	- - (i) At 55 % PLF Rs. 5.27 (ii) At 100 % PLF Rs. 2.90	(i) at 73.88 % PLF Rs. 3.13 (ii) at 60% PLF Rs. 3.91 (iii) at 55% PLF Rs. 4.27 (iv) at 50% PLF Rs. 4.69

HALAIPANI HYDRO POWER PROJECT (4 × 4.0 MW)

1.0 INTRODUCTION

Halaipani hydroelectric project is proposed to be developed by M/s PK Hospitality Services Pvt. Ltd. The project is located in Anjaw District in the state of Arunachal Pradesh and envisages utilization of the flow of Halai River, a tributary of Lohit River for generation of power as run-of-the-river scheme.

The project envisages a generation capacity of 4 × 4.0 MW of power by utilizing the available head between the river elevations EL 883.20 m (FRL) & EL 780 m near powerhouse location. The project comprises a barrage which diverts the water into an intake channel on the right bank of the river. The diverted water would go to a surface desilting tank after passing through a feeder tunnel under free flow condition. Desilted water enters into head race channel, forebay and the steel lined pressure shaft before feeding the turbines. The proposed surface powerhouse is suitably located on a terrace close to the river. Tail water from the powerhouse will be discharged back into the Halai river. The project envisages utilization of a net head of about 95m.

Development rights of the project have been accorded to M/s PK Hospitality Services Pvt. Ltd., who has appointed M/s Prime Consulting Group, Gurgaon to prepare the DPR for the project.

2.0 THE SPONSOR

M/s PK Hospitality Services Pvt. Ltd. has been allotted the Halaipani Hydro Electric Project (16 MW) by the Government of Arunachal Pradesh in district Anjaw to develop the project. The detailed project report has been prepared by M/s Prime Consulting Group, Gurgaon.

3.0 THE ASSIGNMENT

M/s PK Hospitality Services Pvt. Ltd. has assigned Department of Hydro and Renewable Energy, Indian Institute of Technology, Roorkee (HRED) in Dec. 2020 to undertake the techno-economic review of the Detailed Project Report (DPR) of this project as per directive of Department of Hydropower Development (Monitoring), Itanagar, Arunachal Pradesh.

4.0 TECHNICAL REVIEW REPORT

4.1 General

The firm submitted the DPR of the project vide E-mail dated Dec. 07, 2020 for review. Comments/ observations on Civil /Hydro-Mechanical Electrical works, financial analysis and cost estimate were sent to the firm vide the letter given below.

(i) HRED/C-1126/129 dt Dec. 02, 2020

(ii) HRED/C-1126/134 dt Dec. 18, 2020

(iii) HRED/C-1126/SD/SS/01 dt Jan. 01, 2021

(iv) HRED/C-1126/10 dt Jan. 20, 2021

(v) HRED/C-1126/15 dt Feb. 06, 2021

The firm sent their replies vide E-mail dated Dec. 21, 2020. All points suggested by HRED were agreed by and the revised financial & evaluation of cost estimate was sent to HRED, through E-mail dated Feb. 08, 2021.

4.2 Hydrology of the Project

The project site is located on Halai River and having catchment area of 270.0 km^2. The observed discharge data at project site for about 6 years are available which has been used for carrying out the water availability at site. The average 10 daily flows for the year 1995 to 1999 have been given in Table 4.1

The design flood has been estimated by CWC unit hydrograph method laid down in Flood Estimation Report for North Brahmaputra basin (Sub Zone 2A) and empirical approach. The design calculation for estimated design flood discharge of 1880 cumecs for 100 years return period were sent to HRED in Oct. 2020. These calculations were reviewed and a design flood of 1938 cumec was recommended by HRED, IIT, Roorkee in Nov. 2020 vide letter no. HRED/M-56/SD/119 dated Nov. 04, 2020.

Table 4.1: Average 10 Daily Flow Statement

PERIOD	1991	1992	1995	1996	1997	1998	1999	2000	AVG.
JAN-I		23.95	27.45	21.42	17.45	14.76	11.77	15.32	18.87
JAN-II		18.55	19.41	16.48	18.80	23.96	11.55	13.52	17.47
JAN-III		18.55	19.47	15.89	18.14	23.63	11.73	12.23	17.09
FEB-I		27.79	26.54	15.38	17.15	19.11	11.85	11.91	18.53
FEB-II		25.40	22.69	18.98	16.17	15.21	11.52	13.24	17.60
FEB-III			21.33	19.96	19.36	14.65	11.31	14.98	16.93
MAR-I			20.06	20.19	24.06	15.03	11.71		18.21
MAR-II			20.94	20.20	28.38	18.03	14.79		20.47

MAR-III			21.79	20.44	26.14	23.40	15.13		21.38
APR-I			21.57	21.63	21.21	17.06	11.86		18.67
APR-II			21.12	22.88	21.62	19.79	12.59		19.60
APR-II			20.57	21.73	22.90	20.61	13.03		19.77
MAY-I			22.47	22.61	25.19	18.49	20.61		21.87
MAY-II			24.45	23.12	24.60	17.76	23.09		22.60
MAY-III			23.61	23.10	23.31	16.96	24.77		22.35
JUN-I			23.54	23.44	21.96	17.42	26.33		22.54
JUN-II			23.69	23.72	25.23	18.17	28.22		23.81
JUN-III			24.11	25.77	24.04	17.80	29.74		24.29
JUL-I			24.52	26.92	24.77	25.97	30.02		26.44
JUL-II			26.12	32.07	25.63	26.01	28.80		27.73
JUL-III			26.22	29.53	25.39	25.49	30.58		27.44
AUG-I			21.48	31.02	20.72	25.88	28.24		25.47
AUG-II			27.22	29.48	26.01	27.03	29.83		27.91
AUG-III			26.42	29.01	25.27	22.59	30.84		26.83
SEP-I			23.34	25.21	26.97	23.38	30.21		25.82
SEP-II			34.63	23.70	28.17	20.40	29.72		27.32
SEP-III			27.67	29.14	32.59	18.54	28.88		27.36
OCT-I			24.46	27.09	37.38	17.34	28.99		27.05
OCT-II			21.98	19.88	34.02	17.81	27.92		24.32
OCT-III			20.50	19.67	23.30	19.46	28.82		22.35
NOV-I			19.98	17.83	17.79	11.03	25.28		18.38
NOV-II			19.48	17.62	17.66	11.31	26.94		18.60
NOV-III			19.13	18.37	17.68	11.49	26.59		18.65
DEC-I			17.95	17.33	17.80	11.59	23.03		17.54
DEC-II	21.10		19.33	17.30	18.58	11.64	18.17		17.69
DEC-III	24.83		19.15	17.50	18.39	11.47	15.17		17.75
Note: All discharges are in cumec									

Table 4.2: Derived discharge (Cumec) at Project Site

Observed Series		**Rank**	**Descending Order**		**Probability of Exceedance**
Year	**Annual Runoff at Project Site, MCM**		**Year**	**Annual Runoff at Project Site, MCM**	
1995	722.17	1	1997	730.90	16.67%
1996	706.00	2	1995	722.17	33.33%
1997	730.90	3	1996	706.00	50.00%
1998	588.94	4	1999	693.85	66.67%
1999	693.85	5	**1998**	**588.94**	**83.33%**

4.2.1 Derivation of 75% dependable year

Using the method recommended by CEA 75% dependable year has been determined on the following basis:

75% Dependable Year: (N+1) × 0.75

Where N is the number of years for which the flow series is considered.

In the present case, N=5 Thus,

75% Dependable Year: = (5+1) × 0.75 = 4th year.

Based on the above year 1998 has been determined as the 75% dependable year.

4.2.2 Flow Duration Curve

The Flow duration analysis is carried out and the average 10-daily flow duration is given in Table 4.1 and the corresponding flow duration curve is shown in Figure 4.1. The discharge equalled or exceeded with time is as flows:

For Average Flows,

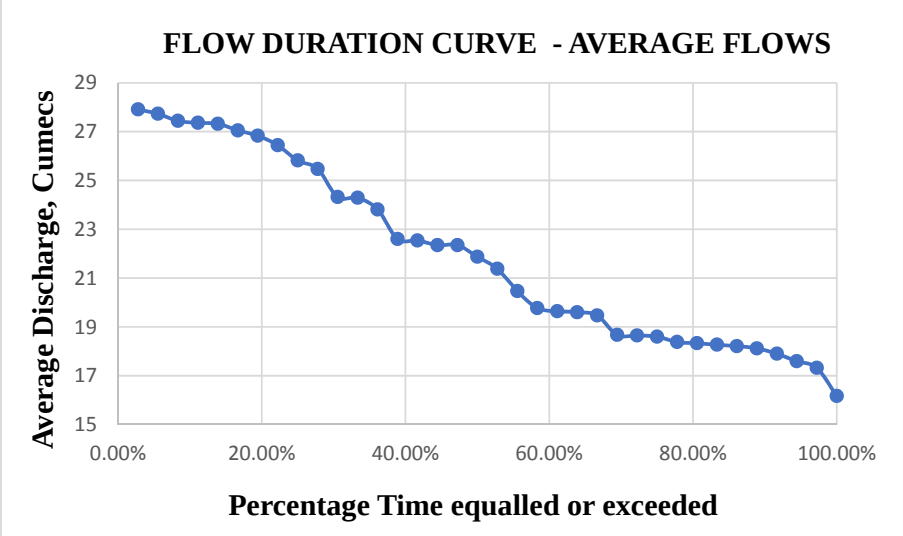
At 100 percent time equalled or exceeded = 16.97 Cumecs

At 75 percent time equalled or exceeded = 18.53 Cumecs

At 50 percent time equalled or exceeded = 21.87 Cumecs

At 25 percent time equalled or exceeded = 25.82 Cumecs

Figure 4.1: Flow Duration Curve for Average Flows



The flow duration curve for 75% dependable year (1998) is shown in Fig. 4.2 and the discharge equalled or exceeded with time is given below:

For 75% dependable year – 1998,

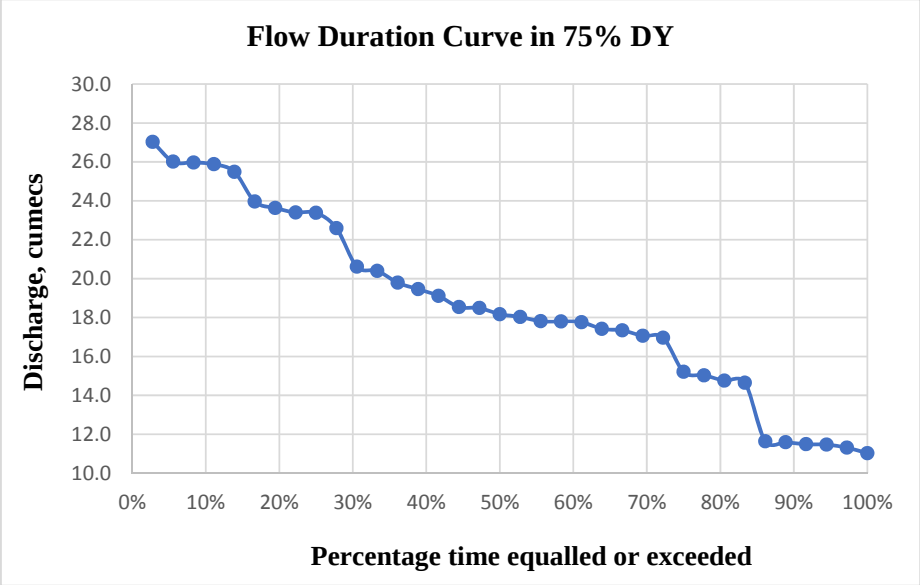
At 100 percent time equalled or exceeded = 11.03 Cumecs

At 75 percent time equalled or exceeded = 15.21 Cumecs

At 50 percent time equalled or exceeded = 18.17 Cumecs

At 25 percent time equalled or exceeded = 23.38 Cumecs

Figure 4.2: Flow Duration Curve for 75% Dependable Year – 1998



The design discharge for power generation has been fixed at 21.75 cumecs which is available for 50% of the time in an average year and 30% of time in 75% Dependable Year - 1998.

Design Flood

The design flood at diversion structure for Halaipani HEP is estimated at 1938 cumecs as approved by HRED, IIT Roorkee vide letter no. HRED/M-56/SD/119 dated 04th November 2020.

4.2.3 Project Catchment Area

The catchment area at the proposed diversion site is 270 km^2.

4.3 Topographic Data

4.3.1 General

Topographical data are essential for any design, and in particular layout of a hydropower scheme. They are the basis for identification and selection of suitable diversion sites, alignments of water conductor system and powerhouse sites. Survey of India Topo sheet no. 91D/12, 91D/16 and 90A/9 cover the topography of the project area and its surroundings.

Halaipani Hydro-Electric Project is located across river Halai in District Anjaw of Arunachal Pradesh. The proposed Barrage site is located at 27°58'40.75" N and longitude 96°43'10.98" E is located near village Latul/Hilong, while the proposed Powerhouse is located just downstream of Latul Village. The nearest rail head is at Tinsukia and the nearest airport is at Dibrugarh. It is planned to have installed capacity of 16 MW having 4 units of 4 MW each.

River Halai is a tributary of river Lohit, which is a major tributary of Brahmaputra River. A diversion barrage, desilting tank, free flow channel, forebay, penstock and a surface powerhouse on right bank of Halai river are envisaged in this project. The water conductor system is proposed on the right bank of Halai river.

Field survey and investigations were carried out with the objective of preparing grid maps, establishing ground control points, fixing alignments and obtaining the river's L-section, cross sections etc.

Detailed topographical survey covering the head works area and the powerhouse complex area was carried out for designing the project components. The river profile was mapped at key points for assessing the power potential of the river.

Geological investigations comprising subsurface investigations, surface geological mapping and traverse along WCS alignment were carried out after preliminary surveys. Subsurface investigations included study of rock properties using exploratory drill holes has been carried out.

Topographical Survey and Geological investigation of the proposed Halaipani hydroelectric project has been again carried out by the Developer. The investigation consisted of geological mapping of the project on 1:1000 and 1:5000 scales and development of geological section through proposed engineering structure on same scale.

4.3.2 Topographical Survey

The Survey work of the project has been conducted by DHPD, Arunachal Pradesh. The detailed survey was carried out at the site from barrage site to powerhouse site along the river Halai. This survey covered the area from proposed location of the barrage to tail race channel in scale of 1:2000 with 5m contour interval.

The topographical survey of diversion weir available in 1:500 scale and forebay area to tail race available in 1:500 scale covered mainly the location of the structures as

proposed by Department of Power, Arunachal Pradesh. Longitudinal section of penstock from the location of the forebay tank as proposed by DHPD, in vertical and horizontal scale of 1:500 is also available. Longitudinal section of Hali river from the weir site as proposed by DHPD is also available in a vertical scale of 1:500 and horizontal scale of 1:2000.

4.4 Halai River

Halai river is a right bank tributary of river Lohit in Lohit basin. The Halai river basin is fan shaped and the catchment elevation ranges from El 4500 m to El 720 m. In the initial reaches the river falls in the Southern direction and then takes South western direction till it joins river Lohit on its right bank in the Anjaw District. The average slope of the river is about 10.1 m / Km. The slope of the river is steep in the initial reaches up to the barrage site. There after the river flows at less steep slope up to its confluence with Lohit River. Total length of the river from its origin up to its confluence with Lohit river is about 41 Km. The river length up to diversion site of Halaipani project is 36.7 Km. The confluence with Lohit River is 5 Km downstream of Halaipani diversion site. In the downstream 5 Km reach, the river bed elevation drops from El 879 m (at Halaipani diversion site) to El 720 m at Lohit confluence.

The catchment area of the river basin up to the proposed diversion site of Halaipani project is 270 sq. km., while the total catchment area of river up to Lohit confluence is 280 sq. km.

4.5 Design flood

In the present case, no long term hourly discharge data is available at site. In the absence of site specific short interval rainfall-runoff records, synthetic unit hydrograph based upon physiographic characteristics of the catchment as recommended in “Flood Estimation Report for North Brahmaputra basin, subzone 2(a), Central Water Commission, 1991” is adopted. The 100-year return flood at the project site has been estimated as 1938 cumecs and adopted for planning the project. Design flood values computed by various empirical formulas are lower than this value.

As per the Detailed Project Report submitted in 2009, the diversion structure was proposed at river bed level of El.878 m. This barrage site was situated in a V shaped gorge with width of river close to 20 m. The diversion structure was designed for a flood of 600 cumecs corresponding to 1 in 50 years return period.

The earlier hydraulic head of the diversion structure as per DPR was close to 7 m which has been revised to 16 m (approx.) for newly proposed barrage. As per CWC guidelines, the diversion structure must be designed for a flood corresponding to 1 in 100 years flood as against 1 in 50 years return period as per the earlier designs.

4.6 Site Geology

The area contains granodiorite rock with magnetic banding as well as foliation development which is parallel to the magmatic banding. Apart from these massive insitu granodiorites there are also big boulders of these massive rock are present, which may cause problems for the construction of any structures. The soil is also well developed due to high rain and shadow below the trees, which cause several slide zones along the channel. Therefore, it is advisable that the proper precaution should also be taken during the construction.

These granodioritic rocks are cut by the set of joints, where, all three are equally prominently developed because of the massive character of the rock. Sometimes, the thinly banded variety appears to be mylonitic zone with a very narrow zone, otherwise the rocks are massive in nature. The main foliation paralleling the magmatic banding strikes N 45° - N 225° with a dip of moderate to high (average 60°) angle towards southeast.

Detailed geotechnical investigations and surface geological mapping of the entire project area has been carried out. Based on available data, prima facie it has been found that the site is suitable for construction of project components. No adverse geological feature on the surface and during the investigations has been observed. Hence, the project area may be categorized to the extent having satisfactory geological conditions.

4.7 Barrage Site

The proposed Barrage site is located across Halai river with crest El 879.0 m. The river bed at barrage site and upstream has boulders of large size.

Keeping in view the high seismic status, the area has been assigned to Zone-V as per Map of India showing Seismic Zones (IS-1893 (Part-I): 2002). Therefore, it is proposed that suitable site-specific seismic coefficient may be got determined and considered in the designs of main appurtenances of the project.

4.8 Seismicity

The project area lies in the Seismic zone 'V' of India as incorporated in the Indian Standard Criteria for Earthquake Resistant Design of Structures (IS: 1893 Part 1-2002) and lies in Seisat 15 of "Seismotectonic Atlas of India and its Environ**"**.

4.9 Construction Materials Surveys

i. Coarse Aggregates

Major quantity of coarse aggregates will be obtained from rock excavation for construction of barrage and other structures of the project. The suitability of these aggregates will be tested in laboratory before the construction activity starts. Boulder will also be procured from the river bed itself. These boulders will be crushed at site to produce suitable coarse aggregates for construction.

ii. Fine Aggregates and Sand

The fine aggregates can be obtained from the river and by crushing of the aggregate. The suitability of its use as construction material should be studied before the construction of project. Most of the quantity will be procured from the river bed near the site or secondary crushing of the aggregates.

iii. Manufactured Items

Manufactured items will be procured from open market. Cement, steel and other construction material can be procured from the nearest wholesale dealers or as may be convenient at the time of procurement.

4.10 Muck Disposal

Muck will be produced from the following activities:

i. Excavation for construction of barrage and Intake structure
ii. Feeder Channel
iii. Desilting tank
iv. Head race channel
v. Forebay
vi. Excavation at the Power House
vii. TRC

viii. Other construction activities

A good amount of quantity of muck will be utilized in crushing to get the aggregates for the construction of different components of project. The balance amount of muck will be disposed in the different sites selected for this purpose.

Tentative dumping areas on the left and right banks of the river have been identified.

5.0 CIVIL WORKS

5.1 General

Halaipani Hydroelectric Project is a run of the river scheme proposed on Halai River in Anjaw District of Arunachal Pradesh near Hilong. Halai River is a tributary of main river Lohit, which is a major tributary of river Brahmaputra at the head of Brahmaputra valley.

The project is located near Latul Village. The project envisages a generation capacity of 16 MW of power by utilizing the available head. The project components include a barrage on Halai River and an intake structure for diversion of 21.75 cumecs of water for power generation. The project is envisaged as run of the river scheme with no pondage. The plant will operate as a base load station. Water diverted from the barrage is proposed to flow through feeder channel feeding to surface desilting basin. Silt flushing duct emanating from desilting basin discharge silted water back to the river. The water from desilting basin is led to the forebay tank through power channel. The forebay is located on a flat topography with spill arrangements. Water from forebay is being taken to the surface power house to run four horizontal Francis turbines (each 4 MW capacity) through four individual pressurized penstocks running from forebay tank. Turbine discharge from the power house shall be fed back to Halai River through the tail race channel of 40 m length.

5.2 Civil Components

Main civil structures of the project are

- Temporary River Diversion works
- Barrage
- Power Intake
- Desilting and Silt Flushing arrangements
- Headrace Channel

- Forebay & Spill Pipe Arrangements
- Penstocks
- Powerhouse complex
- Tailrace channel
- Switch yard

5.3 River Diversion

Prior to the commencement of construction of any work in the bed of a river, it becomes obligatory to exclude temporarily the river flow from the proposed work area during the construction period, so as to permit the work to be done in dry or semidry conditions. An efficient scheme of diverting the river flow away from the work area should aim at limiting the seepage into the work area to a minimum, so that the work area can be kept dry with minimum effort.

The barrage shall be planned in two stages. During the non-monsoon period the water will be diverted through right bank by constructing pier in the river. This pier shall form an integral part of the barrage later. The excavation of the hill side slope on the left bank shall be carried out to provide enough space for the barrage construction. After the construction of left portion of barrage, the water shall be allowed to flow through the left portion of the river and the right bank barrage construction work shall be commenced along with the intake portion.

5.4 Barrage

The barrage has a total length of 39 m across river Halai. It has 3 bays of 6.0 m width each in spill portion and 2 bays of 5.0 m width in intake portion. The crest level of spill portion has been kept at river bed level i.e. El. 879.0 m. The crest level in intake portion is at 881.0 m with pond level of 883.2 m. Top of the barrage piers has been kept at 895.0 m.

Barrage has been designed for a flood of 1 in 100 years which has been calculated as 1938 cumec. Length of pucca floor of barrage is 30 m with 500 mm thick high performance concrete on the top of floor to protect it from damages by boulders. To protect the piers from impact of moving boulders, a 12 mm thick steel plate cladding on piers upto a height of 2.0 m above the floor has been provided. A grid of stiffeners of size 500 m × 500 m with ISA 50 × 50 × 6 behind the steel late would be provided.

5.5 Power Intake

Based on the study of the topographical features of the area, the power house is proposed on right bank of Halai River. A power Intake with design discharge of 27.20 cumec is provided on the right bank in line with Barrage axis. The crest level of the Intake has been kept at EL. 881 m. which shall help to minimize sediment entry in the flowing water before entering into the water conductor system. The flow in to the feeder channel shall be controlled through two vertical lift gates provided in to the body of the Intake structure. A set of stop logs has also been provided for maintenance of the Intake gates. A rectangular RCC box section has been provided to feed the water in to the desilting basin.

To control the entry of the trash in to feeder channel an inclined trash rack has been provided up to the top of the Intake structure. Mechanical cleaning arrangement has been provided to prevent entry of any floating material into feeder tunnel. Suitable arrangement to dispose off the trash shall be made. A separate rope drum hoist has been provided for intake bulk head and intake gates. A platform has been provided at an elevation of 895.0 m for operating the Intake gates.

5.6 Feeder Tunnel

The water from intake is led to desilting tank through a rectangular feeder channel (bed width 4.00 m, water depth 2.04 m and free board 0.60 m). Since the section of channel may get submerged under water during heavy floods so it is proposed that section of channel may be provided as R.C.C. box section with manholes at suitable locations for maintenance purposes. The length of feeder channel is 405 m.

The design discharge for feeder channel is taken as 27.20 m^3/s 20% of this discharge shall be used for silt flushing in desilting tank. The bed slope in channel is kept as 1 in 275. The flow velocity in the channel shall be 3.33 m/s. This will keep the sediments moving.

5.7 Desilting Basin

The nallah carries appreciable quantities of coarse silt during rainy season. A desilting chamber is considered necessary to remove silt particles to minimise the abrasion effects on the turbine runners. The Halaipani small hydro scheme is medium head scheme, so it is proposed to provide a desilting chamber to remove sediment particles of 0.20 mm size and above.

The design features of desilting tank are as follows:

1. The discharge coming from feeder channel is 27.20 cumecs. It is proposed that 5.45 cumecs may be used in continuous flushing of silt deposited in the tank and balance 21.75 cumecs may be led to head race channel.
2. Particles of 0.20 mm size and above have been proposed to be trapped in the tank, keeping in view the turbine type proposed.
3. The size of the main tank provided is 63 m (L) × 18 m (W) excluding transition length of 42 m and 21 m at inlet and outlet end respectively, based on the time taken by particles to settle down. The desilting tank is proposed to be constructed in M 25 R.C.C mix.
4. Due to the larger width the tank it is divided into two chambers of equal width. The width of each chamber is 9 m. Control gates have been provided at entry and exit of each chamber so that in case of requirement, one chamber may be closed without effecting the operation in other chamber.
5. The free board in the tank is kept 0.60 m.

   It is proposed to carryout continuous flushing during monsoon, when the discharge in the river is more than the design discharge for power generation. Sediment basin is designed to carry additional 20% discharge for flushing out the sediment deposited at the bottom of the basin.

5.8 Head Race Channel (WCS)

The water from the desilting basin is led to forebay tank through power channel running along the contour on the right bank of Halai river. The length of the power channel has been estimated at 1539 m. Along its course, the power channel crosses 3 nos. of existing nallah for which cross drainage structures have been provided.

The section for channel adopted is rectangular RCC section. The bed width of the channel is 4.00 m and the full supply depth is 1.97 m. Design discharge of power channel is 21.75 cumec. The total depth of channel is 3.57 m with bad slope of as 1 in 400. The velocity generated is 2.76 m/sec.

5.9 Forebay

The forebay, penstocks and power house are treated as integral unit so far as their location is concerned. The power channel terminates into a forebay tank located at RD 2070 m from the diversion structure. The forebay would be located on a rather flat area followed by the penstock provided along moderately sloping hill side leading to the power house on a flat terrace. The geology and the terrain is

favourable. The forebay has been provided with a silt excluding pipe and water storage for 2 minutes supply.

The design features of the forebay tank are as flows:

1. The storage time has been kept 2 minutes as per guidelines issued by Central Electricity Authority: 1982. Accordingly, the size of tank is kept as 66.0 m x 10.0 m x 4.80 m to 8.30 m, silt storage and its flushing. Spillway with crest length of 38m is provided in the forebay for passing the surplus discharge.
2. A Mild Steel bell mouth of circular section is provided at the inlet of penstock to reduce the entry losses.
3. Four mild steel trash racks of size 2.06 m (W) × 8.30 m (H) each with racks at 30 mm clear spacing is provided at penstock intake to check the entry of trash into the penstock.

5.10 Penstock

Water from forebay would be taken to the power house to run hydraulic turbines through pressurised penstock pipe running from forebay tank. Four Separate steel penstocks of 1300 mm inner dia. and 12.0 mm thickness are proposed for each unit of 4000 kW. The design head for the penstock pipe is about 95 m plus 50 percent water hammer pressure. The penstock is supported over saddles and anchor blocks. The saddles are provided at a spacing of 5.50 m c/c. The anchor blocks are provided at bends. The penstock intake is provided with bell mouthing to have smooth entry of water and to reduce entry losses. A slide type gate of size 1.8 m × 1.8 m along with manually operated screw hoist arrangement is proposed near the intake to control the flow in penstock along with bye pass valve of 150 mm NB which shall fill the penstock in the start to have balancing head across the gate valve. A trash rack before the bell mouthing is provided for preventing entry of trash in the penstock. An air vent pipe of 300 mm dia. is provided with each pipe just downstream of gate (provided near penstock intake) to pass the air during filling and emptying of the penstock.

5.11 Power House Building

Power house building is a simple structure housing the generating units, auxiliary equipment, control panels and suitable outlet for tail water discharge. The main features of the power house building are as follows:

i) The building of size 46.6 m (L) × 16.5 m (W) m in plan is provided to accommodate 4 machines of 4000 KW each, control panels, auxiliary equipment etc. One service bay for the maintenance of machine is also provided in the same space.

ii) The height of the building is kept 25.05 m including the position of Crane to facilitate handling of equipment during erection and maintenance.

iii) Walls of the building are made of stone masonry with intermediate R.C.C columns.

iv) An E.O.T Crane of 20 tons capacity to facilitate the handling of equipment is provided over rails supported on R.C.C columns.

v) A trench of 0.3 m × 0.3 m with slope of 1 in 100 for drainage is provided around the power house building discharging into tail race channel to cater to rain water, plinth protection etc.

vi) Machine foundation has been provided as block foundation of reinforced cement concrete of M 20.

vii) The floor of power house building is provided at an elevation of 785.0 m which is above the highest flood level of Halai river at the proposed location of the power house.

viii) Four nos. draft tube gates of size 2m × 1.6 m with chain pulley block. A valve of 50 mm dia. may be provided for dewatering of the penstock.

5.12 Tail Race Channel

Turbine discharge shall be fed back to river Halai through the tail race channel. The width of Tail Race Channel is 4.0 m with a depth of 2.42 m. The length of Tail Race Channel is approximately 40 m including upstream transition. To dissipate energy and to prevent erosion on account of high velocity occurring due to steep slope of terrain, the tailrace channel has been provided with a series of falls. At the end of channel where it joins with river, protection works have been provided consisting of boulders in crates.

5.13 Switch Yard

An open switchyard of 53.5 m (L) × 30 m (W) has been envisaged by the side of power house main building at an elevation of 785.0 m protection works have been provided consisting of boulders in crates.

5.14 Approach Road & Buildings

A suitable motorable approach road is proposed to be constructed to reach the barrage and power house site for transportation of equipment. Suitable provision in cost for road construction has been made. Provision has also been kept for office, stores and residential buildings.

6.0 HYDRO – MECHANICAL EQUIPMENT

6.1 General

In accordance with the provision of civil structures planning following hydro mechanical equipment have been envisaged for Halaipani Hydroelectric Project.

6.2 HM Equipment in Barrage

Barrage Spillways consists of three bays of opening size 6.0 m × 4.5 m with crest at EL 879 00 m. Three nos. fixed vertical gates of opening size of 6.0 m × 4.5 m shall be provided to control the discharge through the spillway. The sill of the gate is located at EL 879.00 m. These vertical gates shall be designed to sustain and operate against a head corresponding to HFL i.e. EL 894.300 m. Each gate shall be operated by means of electrically operated rope drum hoist of designed Capacity.

The inspection and maintenance of the vertical gate shall be carried out by lowering one set of slide type stop logs on the upstream side of these gates The stop logs shall be fabricated in three units for opening size 6 m wide × 4.5 m high. The stoplog shall have u/s skin plate and d/s sealing. The stoplogs shall be designed for a head corresponding to HFL (EL 894.300 m) and shall be operated under balanced head condition. The top unit shall be provided with a filling-in-valve to create balance head condition. The stop log units shall be operated under balance head condition by means of a gantry crane of 10 T capacity and a lifting beam. The total cost of these equipment shall be Rs. 350.37 lakhs as per enclosed annexure.

6.3 HM Equipment in Feeder Channel

Two nos. feeder channel gates are envisaged to feed water into the feeder channel. Dedicated fixed wheel type gate for opening size 5.0 m wide × 2.20 m high shall be provided. The sill of the gate is located at El 881.00 m. The gate is to be designed for a head corresponding to Pond Level (EL. 883.200 m). The gate will have an upstream skin plate & upstream sealing. The gate shall be lifted under balanced head conditions created by crack opening of gate against U/S water level up-to FRL i.e. EL 883.200 m. The gate shall be designed for self-lowering under emergency conditions. The hoist capacity is calculated accordingly. The gate shall be operated by means of electrically operated rope drum hoist of suitable capacity located on the hoist platform installed over trestles. A hoist platform for accommodating rope drum hoists of intake gate is proposed. The operation of the gate is done by local control panels provided adjacent to the rope drum hoist. The inspection and maintenance of the vertical gate shall be carried out by lowering one set of slide type stop logs on the upstream side of these gates. The stop logs shall be fabricated in one unit for opening size 5 m wide × 2.2 m high. The stoplog shall have u/s skin plate and d/s sealing. The stop log unit shall be operated under balance head condition by means of the same barrage gantry crane of 10 T capacity and a lifting beam as the barrage and feeder channel are in same line.

On upstream face of the intake, inclined trash rack (2 nos.) shall be provided. Each trash rack screen shall be of size 5 m wide × 14.0 m high approximately and shall be fabricated in panels of suitable height. Two such screens are provided in the intake structure.

The cleaning of incoming trash accumulated at the trash rack panels shall be done by manual means at El. 895.000 m on the intake deck. Suitable trash removal trolley/lorry shall be provided.

6.4 HM equipment in Desilting Basin

The desilting basin is proposed to be provided with inlet (from feeder channel) and outlet (To power channel) gates. 2 nos. vertical fixed wheel gates at starting of desilting basin and 2 nos. vertical fixed wheel gates at end of desilting basin are proposed to isolate the two chambers of desilting basins. The size of each gate shall be 2.0 m × 2.3 m. The gates shall be operated with manually & electrically driven

screw hoist mounted over a frame and hoist bridge suitable for taking out gate up to pier top for maintenance.

7 sets of silt flushing steel pipes have been proposed in Desilting Basin. The diameters of each pipe is 600 mm at outlet. To control the flow in the pipe sluice valve of 600 mm dia. has been provided in each pipe as shown in the relevant drawing. These pipes would discharge silt laden water into the adjoining water tank where from it will be taken to the River.

6.5 HM equipment in Forebay & Penstock

4 nos. vertical fixed wheel gates are proposed for four nos. individual penstocks feeding the water to the turbines. The size of each gate shall be 1.85 m × 2.4 m. The gates shall be operated with manually & electrically driven screw hoist (5 MT) mounted over a frame and hoist bridge suitable for taking out gate up to pier top for maintenance.

4 nos. inclined trash racks each sized at 2.06 m × 8.30 m is provided at the penstock entrance. A provision is also being made for the flushing of silt from forebay using 20 m long steel pipe having thickness of 8 mm and 300 mm diameter. The penstock is also well equipped with inlet bell mouth transition and Sluice valves.

5 nos. steel pipes each 110 m long 1300 mm dia. 10 mm thick and 60 m long 1300 mm dia. 12 mm thick spirally welded have been proposed to feed the water from the forebay to the turbines. Out of 5 nos., 1 pipe is for surplus water escape from the forebay during power house shutdown in emergency condition.

6.6 HM equipment in Draft Tube

Independent d/s draft tube gate at the outlet have been proposed for each of the four generating units. Each d/s draft tube flume has been provided with a gate of opening size 4.5 m wide × 2.8 m high to enable isolation of each generating unit from tail water and for maintenance purpose. The gate is of fixed wheel type. The gate shall have both sealing and skin plate on the tailrace channel side and wheels on the turbine side. A total four such gates are provided one in each draft tube opening to isolate all the units at a time. These gates shall be operated under balanced head condition and shall be designed to sustain a head corresponding to normal TWL and shall be checked for maximum tail water level corresponding to flood with increased stresses. Each individual gate shall be operated by means of an electrically &

manually operated rope drum hoist of designed capacity. Balanced head shall be achieved by a filling in valve provided on the gate. The gate shall be generally kept in dogged position within the gate groove below the deck level of the gate opening bay using suitable dogging devices. Suitable interlocks shall be provided between draft tube gate positions and generating unit to prevent starting of turbine till the gate is in dogged position.

The total cost of remaining hydro mechanical equipment described in clause 6.3 to 6.6 above is estimated as Rs. 1396.70 lakhs as per enclosed annexure.

7.0 OBSERVATIONS ON CIVIL WORKS

1. Barrage

In DPR, it has been proposed to construct barrage with a total length of 50 m. The river width available at this location is only 20.5 m. Therefore, for the construction of barrage, huge rock excavation on the left-bank will be involved. This quantity has been estimated in DPR as 35000 m^3). This is an unviable option. It is therefore proposed that the width of barrage may not be increased and confined within the available width of river. To pass the design flood, the barrage height may be increased. The necessity for increase in height may be in the order of 4-5m, which may be finalized after detailed design calculation. The design of barrage may be modified accordingly.

2. Intake and Feeder channel

(i) In the cost estimate of Intake cum feeder channel, the excavation quantity of RCC is shown as 585.75 m^3 (refer J-1, Sl.no. 6). But no details are available in the drawing. These details may be provided.

(ii) The Item of centering & shuttering is included in estimate of various civil structures but this has not been included in the estimate of intake cum feeder channel. The same may be included.

3. Power House

In the cost estimate of power house, the amount for strengthening of power house has been mentioned as Rs. 2214.30 Lakh. This item is not required as strengthening of power house is carried out for existing power house. In this case, a new power house is to be constructed. Further, in the DPR the amount for flood protection works of power house has been mentioned as Rs. 46.17 Lakh. This item is also not

as item of the flood protection works of power house should be included in the design and drawings of Power House Building.

There are some discrepancies in the DPR which are shown in the following table. These discrepancies are to be clarified/Corrected.

Sl. No.	Items	As per DPR	HRED Observations	Response of Firm
1.	Name of project	On page 9-32 of DPR, name of project has been mentioned as Yameng HE project	The name should be corrected as Halaipani HEP	Agreed by firm vide their E-mail dated February 03, 2021
2.	Balance of works	On page 9-2 of DPR, the percentage of balance works have been mentioned for different in the order of 10%-20%.	In executive summary of DPR, the percentage balance works have been mentioned differently.	Agreed by firm vide their E-mail dated February 03, 2021
3.	Average 10-daily discharge	On page 6-3 of DPR (table 6.1), the average 10-daily discharge for December has been mentioned as 17.54,17.69,17.75 respectively	On page 6-5 of DPR, (refer table 6.2), the average 10-daily discharge for December has been mentioned as 16.17, 17.59, 18.29 respectively.	Agreed by firm vide their E-mail dated February 03, 2021
4.	Size of radial gates	On page 9-19 of DPR (clause 9.8), Size of radial gates for barrage has been mentioned as 10.0 m (W) × 9.4 m (H).	In the drawing of barrage, size of the radial gate has been mentioned as 6.0m (W) × 6.4m (H).	Agreed by firm vide their E-mail dated February 03, 2021
5.	Desilting chamber	On page 9-23 of DPR in (clause 9.8), it is mentioned that desilting chamber has been designed to remove sediment size of 0.25 mm and more	In the design calculation of desilting tank (shown in DPR), the size of silt particle to be removed is mentioned as 0.20 mm and more.	Agreed by firm vide their E-mail dated February 03, 2021
6.	Silt particles in Power channel	On page 9-24 of DPR (clause 9.9), it is mentioned that power channel has been carry silt particles up to 2 mm.	It is worth mentioning that the power channel is not designed to carry silt particle above 0.2 mm.	Agreed by firm vide their E-mail dated February 03, 2021

7.	Silt particle size	On page 9-25 of DPR, it is mentioned that suspended silt above 2 mm present in water would get removed in the settling basin	2 mm should be replaced by 0.2 mm as per design of settling basin.	Agreed by firm vide their E-mail dated February 03, 2021
8.	Design of desilting basin	In the design calculation of desilting basin (shown in DPR), flare angle has been mentioned as 6.6 degree.	As per the dimension shown in the drawing of desilting tank, flare angle is worked out to be about 9.5 degree.	Agreed by firm vide their E-mail dated February 03, 2021
9.	Penstock diameter	On page 9-26 of DPR, the penstock diameter is mentioned as 1400mm.	In penstock drawing, penstock diameter has been shown as 1300 mm.	Agreed by firm vide their E-mail dated February 03, 2021
10.	Design of penstock	In the design of penstock, thickness of penstock is mentioned as 14 mm.	On page 9-26 of DPR, penstock thickness has been shown as 12mm.	Agreed by firm vide their E-mail dated February 03, 2021

8.0 OBSERVATIONS ON E&M WORKS

A. Discrepancy in Inventory list and DPR

Sl. No.	Items	Inventory list	DPR	Response of Firm
1	Generator capacity	At sl. no. 2, Generator capacity is shown as 5 MVA	In clause 10.4 of chapter 10 (page no 21), Generator capacity has been shown as 4.8 MVA.	Agreed by firm vide their E-mail dated January 14, 2021
2	Number of generators	At sl. no. 2, No of Generators has been mentioned as 4	In clause no 10.4.1 of chapter 10 (page no 16), No of Generators has been mentioned as 3*	
3	Unit Auxiliary transformer	At sl. no. 6, auxiliary transformer capacity is mentioned as 100 kVA	In clause 10.4.14 point b of chapter 10 (page no 27), the rating of Auxiliary capacity is mentioned as 200 kVA	
5	DG Set	At sl. no. 12, rating of DG set is shown as 125 kVA	In clause no 10.4.15 of chapter 10 (page no 28), DG capacity has been shown as 250 kVA	Agreed by firm vide their E-mail dated January 14, 2021
6	Transformer	At sl. no. 18, the capacity of transformer is mentioned as 6 MVA	In clause 10.4.5 of chapter 10 (page no 20), Transformer capacity has been mentioned as 8 MVA	
7	No. of Isolators	At sl. no. 18, the no. Isolators is mentioned as 16	In cost estimate (Annexure S4), the no of isolators have been taken as 8	

* The number of generator shall be 4.

B. Following points to be corrected

1. In clause no 10.2 (page no 1), the overloading of Generator has been mentioned as 20% while in clause no 10.4.5 (page no 20), it is mentioned that 4000 kW Generator with 10% overloading.
2. In clause no 10.4.18 of Chapter 10 (page no 30), the Communication arrangement between SHP and Receiving station has been shown as optical fiber cable type while in Chapter 11, this arrangement has been mentioned as PLCC type.
3. In clause 10.3.3 of Chapter 10 (page no 8), it is mentioned that a High-pressure air compressor system will be provided to cater the need of Governor and Main inlet valve oil systems, alternatively providing a Nitrogen bladder in the accumulator (to maintain the system pressure) will be examined during implementation. The system already available at site should be used and cost of making this system operational may be taken in cost estimate.
4. In SLD, the single sectionalized bus has been shown while in Flovel Lay out Drawing, double bus system has been shown.
5. In SLD, VCB rating has been shown as 800A while in clause 10.4.5 (page 20), the rating has been shown as 630 A.

C. Following Details/Documents required

1. Details of components of NGT cubicle
2. Details of Bus bar protection.
3. BOQ as per SLD as specification & quantities of CTs, PTs, LAs and Isolators differ in cost estimate, SLD and Inventory list.
4. SLD of 33kV system, LT system and layout of switchyard to be reviewed as there is mismatch in specification and quantities everywhere. Corrected SLD and switchyard layout drawings may be submitted.
5. The cost estimate for restoration and replacement of E&M equipment is not prepared as per Inventory list. The cost estimate may be revised accordingly.

9.0 OBSERVATIONS ON HYDRO-MECHANICAL WORKS

A Details requested vide our letter referred above but still missing

(i) Detailed list of Hydro-Mechanical equipment supplied at site by the earlier executing agency along with status of these items and detailed list of balance items required.

(ii) Present defects report of gate components with details of their reconditioning costs.

(iii) Present defects report of penstock pipe and expansion joint with details of their reconditioning cost.

(iv) List of gates, valves and trash racks in the whole water conductor system (From diversion barrage site to tailrace site) with their sizes, quantities and type of hoisting arrangements is required.

B Details available in the report but need clarifications/corrections

(i) In abstract of cost estimate (Chapter 16), the cost of H-M works (excluding barrage gates) has been mentioned as Rs. 1195.97 Lakh. The breakup of this cost is required.

(ii) In civil drawings of diversion barrage, Dimensions of gates are not matching in different sections. The necessary corrections may be made.

(iii) In C-works (Under the heading of barrage and cofferdam), the Cost of HM works (radial gates) for barrage has been shown as Rs.77.16 lakhs (refer Chapter 16) which is as per current rates. However, it is mentioned in the report that this cost is as per ASPR 2018 and further increased by 15% which is not correct. The necessary corrections may be made.

(iv) The 3% contingencies and 1% cess on Rs. 514.42 have been calculated as Rs. 36.37 lakh which is not correct. These should be Rs.15.43 and Rs. 5.14 respectively. The necessary corrections may be made

(v) At Sl. No. 6 in cost estimate, the cost of 10T Capacity Gantry crane has been mentioned (including hoisting support and operation facilities) as Rs. 50 lakhs which appears to be without hoisting support and operation facilities. The cost of hoisting supports, operation facilities, gantry crane girders and rails etc. may be given separately.

10.0 OBSERVATION ON FINANCIAL ANALYSIS

Sl. No.	Items	As mentioned in DPR (Ref Chapter -17)	HRED Observation	Response of Firm
1	Phasing of expenditure of Civil / Electro-mechanical works	In the financial analysis, the phasing is done for 24 months	As per DPR, the construction period is 30 months (ref page 12-2), therefore the phasing has to be done over 30 months	Agreed by firm vide their E-mail dated February 08, 2021
2	Useful life of hydro generating station	This is taken as 35 years	This should be taken as 40 years*	
3	Receivable working capital	This is taken as equivalent for 60 days	This should be taken as equivalent for 45 days*	

4	Repayment period (including moratorium)	This is taken as 13 years	This should be taken as equivalent to 15 years.*	
5	O & M expenses	This is taken as 30.18 Lakh per MW and escalation rate as 5.72% per annum	This should be taken for first year as 31.34 Lakh per MW and for subsequent years with escalation rate of 3.84% per annum*	
6	Rate of interest on loan and interest on working capital	This is taken as 10.41% and 11.41 % respectively	This should be taken as 9.67% and 11.17% respectively*	
7	Return on equity rate	This is taken as 17.60% p.a.	This should be taken as 16.96% p.a. for first 20 years and after 20 years 21.52%p.a*	
8	Discount rate	This is taken as 9.36% p.a.	This should be taken as 8.61%*	
9	Financing charges	This is calculated on total amount	This should be taken as calculated on loan amount	
10	Escalation Rate	This is taken as 2 % on Civil, HM and E & M Works	As per practice, it should be taken based on consumer price index that is @ 2.42 % p.a. on Civil & H M and 3.26% p.a. on E & M Works	
11	Depreciation Rate	This is taken as 5.28% p.a. for first 13 years and after 13 year 0.97 %	This should be taken as 4.67% for first 15 years and after 15 year 0.80 %*.	
12	Corporate Tax	This is taken as 33.99%	This should be taken as 34.94%*	

* As per CERC RE Tariff order July 2020

11.0 WATER POWER STUDIES

Halaipani HEP is conceived as a run-of-river scheme to utilize the seasonal flows available in Halaipani River. The dependable discharge for Halaipani River has been computed at the proposed barrage site for 75% dependable (year 1998) for average flow.

Net Head

Based on the details provided in the DPR, following data are chosen.

FRL in Forebay	=	877.725 m
Maximum Gross Head	=	105.600 m
Net Head	=	95.00 m

11.1 Power Potential Studies

The power potential studies carried out in DPR on the dependable year reveals an optimum installation of based on incremental energy and cost benefit ratio-criterion

which is in order. Based on the flow duration curve and available net head and considering an allowance of environmental flow as advised by MOEF, the incremental power potential and energy availability of Halaipani HEP has been computed.

DESIGN ENERGY CALCULATION

Months	Days	Available Discharge (Cumec)	Discharge for Biodiversity (Cumec)	Net Discharge for Generation (Cumec)	Net Head (m)	Un-restricted Power (MW)	Restricted Power (MW)	Restricted Design Energy (MU)
Jan	1-10	14.76	2.737	12.02	95.00	95.21	95.21	2.29
	11-20	23.96	2.737	21.22	95.00	168.10	152.00	3.65
	21-31	23.63	2.737	20.89	95.00	182.04	167.20	4.01
Feb	1-10	19.11	2.737	16.38	95.00	129.72	129.72	3.11
	11-20	15.21	2.737	12.47	95.00	98.77	98.77	2.37
	21-28	14.65	2.737	11.91	95.00	75.47	75.47	1.81
March	1-10	15.03	2.737	12.29	95.00	97.38	97.38	2.34
	11-20	18.03	2.737	15.30	95.00	121.18	121.18	2.91
	21-31	23.40	2.737	20.66	95.00	180.04	167.20	4.01
April	1-10	17.06	2.737	14.32	95.00	113.47	113.47	2.72
	11-20	19.79	2.737	17.05	95.00	135.09	135.09	3.24
	21-30	20.61	2.737	17.88	95.00	141.61	141.61	3.40
May	1-10	18.49	2.737	15.75	95.00	124.78	124.78	2.99
	11-20	17.76	2.737	15.03	95.00	119.03	119.03	2.86
	21-31	16.96	2.737	14.22	95.00	123.93	123.93	2.97
June	1-10	17.415	2.737	14.68	95.00	116.27	116.27	2.79
	11-20	18.174	2.737	15.44	95.00	122.29	122.29	2.93
	21-30	17.794	2.737	15.06	95.00	119.28	119.28	2.86
July	1-10	25.794	2.737	23.06	95.00	182.65	152.00	3.65
	11-20	26.008	2.737	23.27	95.00	184.34	152.00	3.65
	21-31	25.489	2.737	22.75	95.00	198.25	167.20	4.01
August	1-10	25.877	2.737	23.14	95.00	183.31	152.00	3.65
	11-20	27.026	2.737	24.29	95.00	192.41	152.00	3.65
	21-31	22.593	2.737	19.86	95.00	173.02	167.20	4.01
September	1-10	23.377	2.737	20.64	95.00	163.50	152.00	3.65
	11-20	20.403	2.737	17.67	95.00	139.94	139.94	3.36
	21-30	18.537	2.737	15.80	95.00	125.16	125.16	3.00
October	1-10	17.341	2.737	14.60	95.00	115.69	115.69	2.78
	11-20	17.807	2.737	15.07	95.00	119.38	119.38	2.87
	21-31	19.463	2.737	16.73	95.00	145.75	145.75	3.50
November	1-10	11.031	2.737	8.29	95.00	65.70	65.70	1.58
	11-20	11.311	2.737	8.57	95.00	67.92	67.92	1.63
	21-30	11.489	2.737	8.75	95.00	69.33	69.33	1.66

December	1-10	11.594	2.737	8.86	95.00	70.16	70.16	1.68
	11-20	11.643	2.737	8.91	95.00	70.55	70.55	1.69
	21-31	11.468	2.737	8.73	95.00	76.08	76.08	1.83
							Design Energy (MU)	**105.12**
							Energy after auxiliary consumption@1% (MU)	104.07
							Energy after transformer losses@0.05% (MU)	**103.55**
							Energy Available for Commercial Purpose	**103.55**
							Free power to home state (%)	**23.05**
							Plant load Factor	**73.88**
							Energy for sale (MU)	**79.68**

Units Available for Sale

The calculations have been carried out for annual energy generation corresponding to 75% dependable year (1998) with 95% plant availability factor, Auxiliary consumption @1% and Transmission losses @ 0.5%. The combined efficiencies of turbine and generator have been taken as 85%. A release of environment flow as advised by MOEF has been taken as 20% (2.737 cumec) of the average flow of three consecutive lean months (Oct – Dec.) in 75% dependable year.

Sl. No.	Units Available For Sale (After Free Power To Home State) As Per DPR	Units Available For Sale (After Free Power To Home State) As Per HRED Observation
1	(i) 106.45 MU at 100 % PLF .(ii) 58.55 MU at 55 % PLF	(i) 79.68 MU at 73.88 % PLF (ii) 63.74 MU at 60 % PLF (iii) 58.43 MU at 55 % PLF (iv) 53.12 MU at 50 % PLF

12.0 ELECTRO-MECHANICAL EQUIPMENT

12.1 General

The Halaipani Hydro-Electric Project is proposed as a surface Powerhouse having 16.0 MW with 10% continuous overloading capacities. Based on the hydrology of the available discharge data for the desired dependable year and calculated head losses of the waterways, the project is proposed to have four numbers horizontal Francis type hydro turbine-generating units of 4.0 MW capacity operating at rated net head of 95.00 m.

12.2 Type and size of Turbine Generating Unit

The optimum plant capacity as per power potential studies is 16 MW. The rated net head is 95.00 m and discharge about 5.44 cumec per unit Francis turbines are best suited for this head. The rating of each unit and number of units are selected with the criterion of operational flexibility vis-à-vis seasonal variations in availability of water during the year, plant reliability, flexibility of operation, part load operation, maintenance of equipment etc. provision of single unit alternative is not considered. Installation of four units shall fully meet all the technical aspects with the lowest investment, flexibility and hydrology, as identified above.

The project is, therefore, proposed to have four numbers horizontal Francis type hydro turbine-generating units of 4.0 MW capacity operating at rated net head of 95.00m and rated discharge per unit of about 5.44 m^3/s. Francis turbine's part load is 50%, as recommended in Table 1 of IS 12837. However, as per latest market trend, the Francis turbine operates safely upto 40% of part load.

The generator directly coupled to the Turbine would have a rated output of 4000 kW with continuous over load capacity of 10%, synchronous type with 11 KV generating voltage, 50 Hz frequency and 0.85 lagging power factor. Mechanical Equipment

The mechanical equipment will consist of horizontal Francis turbine, main inlet valve, governor, oil pumping system, guide apparatus with servomotors, compressed air system and other powerhouse auxiliaries such as Crane, Air conditioning and ventilation system, cooling water, dewatering system, drainage and fire protection system.

12.2.1 Turbine

Selection of Turbine Speed

It is proposed to specify the type of turbine as Horizontal Francis type, since the rated head of 95.0m lies within the operating range of Francis turbine (125m-65m) as per IS: 12837-1989, Table 1 & clause no. 5.

For the selection of the turbine speed & dimensioning of the power house reference is made as per Indian Standard IS: 12800 (Part 1, 3): 1991,

As per Figure 1 of IS: 12800 (Part 1) specific speed range is 70-400 for Francis turbines. For rated head of 95.00 m the specific speed of 238.85 m-kW is considered, and the nearest synchronous speed determined as 750 rpm.

Pressure Rise and Speed rise

As per IS 12837, permissible pressure-rise for Francis type turbine is 30% to 35 % of static head and permissible speed rise for Francis type turbine is 35 % to 55% of synchronous speed. Water conductor system and TG components will be designed accordingly. Pressure rise, and speed rise values are proposed as 35% of static head and 55 % synchronous speed respectively. The flywheel effect of generator and guide vane closing and opening times will be chosen to achieve these limits.

Turbine Setting

The setting of the turbine with respect to minimum tailrace level must be set to limit cavitation damage to the turbine. Refer clause 4.3 Turbine Setting of IS 12000 (Part 1), the turbine setting against the given installation (Runner center line elevation) & operating data (net head, specific speed) is determined and final setting of (–)3 m is adopted based on data obtained from various equipment-manufactures.

Major Assemblies of Turbine

The horizontal Francis turbines, each consisting of the main parts, which are specified as below:

a) Francis runner

   The runner blade and runner crown & skirt is proposed of stainless steel - 13/4 Chromium-Nickel or better material conforming to ASTM A-743, grade CA6 NM, with high resistance to silt erosion. It shall be mounted at the other end of turbine shaft. The runner and the rotating parts of turbine shall be dynamically balanced at the manufacturer's works as per requirements of ISO 1940-1973.

b) Shaft and Coupling:

   Turbine shaft of forged steel conforming to ASTM A-338, having connection at one end with runner flange and on another end with generator flange, is proposed. The shaft shall be properly heat treated to relieve all stresses due to forging and machining. Shaft will be designed to operate in all conditions of normal operation, load throw off, maximum run-away speed and short circuit at generator terminals safely without undue vibrations and distortions.in. Runner, shaft and other rotating parts shall operate at any speed without vibration and distortions

c) Shaft seal arrangement:

Stuffing box type with PTFE packing of adequate size shall be provided on the generator side end of the turbine shaft.

d) Stay ring:

The stay ring is proposed of cast steel or welded steel plates. The stay ring shall be designed to guide the water flow to guide vanes.

The stay ring is proposed of welded steel construction of boiler quality plates designed to bridge the throat of spiral casing with hydraulically profiled stay vanes.

e) Spiral case

The spiral case shall consist of several spiral carbon steel plate sections, which shall be welded to the side plates of the stay ring. On the upstream side, one welded-on flange with a make-up piece shall be provided for connection between spiral casing and penstock

Spiral case shall be tested to water pressure of 1.5 times the working pressure for duration of 30 minutes after assembly at site. Pressure testing pump-motor set, of adequate capacity, along with pipes and other accessories shall be provided.

Spiral case shall be complete with a water tight inspection hole & its cover; drain outlet with S.S. grating, foundation plates, anchoring material, flanges, studs, and other fittings etc.

f) Draft tube cone and elbow Liner:

Draft tube is proposed of elbow type consisting of plate steel welded suction cone, steel lined elbow of enough length along with levelling / tightening / anchoring material to prevent erosion and a concrete lined horizontal section upto draft tube outlet.

g) Guide Apparatus

- Guide vanes with its operating mechanism:

  The guide vanes of aerofoil positive self-closing type and having 13Cr, 4Ni stainless steel material (to ASTM A-743 CA) resistant to silt, shall guide & control the water flow. The spindles and vanes will be cast in one piece. Suitable special packing or synthetic rubber seals will be provided at the stems to prevent leakage of water. The guide vanes will have one bottom guide in pivot ring and two top guides in top cover. The guide bushes will be of PTFE type and self-lubricating.

- Regulating Mechanism

  The guide vane operating ring of rigid construction is proposed to transfer the motion of servomotor to individual guide vanes through the connecting levers, links, pins etc. for safe uniform and synchronous operation of guide vanes. The ring will be provided with suitable bearing and renewable guides. Shear pin or breaking links will be provided on each connecting rod which will break or shear when any vane movement gets blocked and protects rest of the mechanism. Such failure of shear pins will give alarm and will not cause progressive failure of adjacent shear pins.

  The operating mechanism shall be easily accessible for maintenance and inspection and as well as for easy resetting of guide vanes.

h) Guide vane Servomotors:

The guide vanes are proposed to be positioned with precision by the oil operated servomotors, and suitably mounted at appropriate place, through regulating ring. Two double acting servomotors acting as a couple will move the guide vanes. The capacity will be designed to operate the guide vanes through full range at maximum head and with minimum operating pressure of oil. Servomotors will be controlled by the directional control valves of the governing system.

Servomotors shall actuate the gate operating ring and shall be complete with integral feedback transmitter, adjustable throttling retarding device, oil piping, flanges, fasteners, air vent, drain cock, manual locking device etc.

12.2.2 Governing System

Turbine governor is proposed of modern design and shall comprise of an electronic, microcomputer-based part for control and regulating function and a hydraulic part acting as a power amplifying servo unit conforming to IEC 61262 & 60308 with combined proportional, integral and derivative function (P.I.D.). The PID governor shall be of digital type and shall comprise of a CPU, the electronic processing and interface boards. It shall house all the digital / electronic devices and circuitry of the governor viz. microprocessor circuits, speed sensing transducer and circuits, stabilizing circuits and other essential circuits / controls for adjustment of various governor parameters, indications etc. The governor system shall be complete with feedback sensors, oil pressure pumping unit, Hydraulic Actuator (Proportional) valves, piping, valves, instrumentation and various devices for automatic shutdown,

emergency shutdown, devices for adjustment of governor closing and opening times and all accessories and equipment necessary for operation. The governor shall prevent the turbine and generator from hunting and instability at all levels and ensure stable operation under all possible operating conditions. All the basic features of the governor shall be specific software based. The governor shall receive the signals from speed signal generator (SSG) directly on the turbine shaft and transmit through an Actuator (Proportional Valve) an amplified signal to the guide vane servomotors.

The Governor will perform the following functions.

(i) Speed control for start-up and synchronizing and block loading.

(ii) Steady State, Small transient, Large transient control of machine

(iii) Isolated Operation

(iv) Grid Operation

(v) Manual and automatic Control

(vi) Over speed detection

(vii) Adjustable speed drop control

(viii) Load control/position control/flow control selectable with settable load limiter

The digital control system of governor will output the appropriate current / voltage signal which will be interfaced to hydraulic proportional control valves. The proportional control valves will allow the required oil flow through the servomotors of guide vane to position them. The governor control will achieve the guide vane closing time to limit the speed-rise and pressure-rise within limits in all transient operating conditions. The governor will function as a closed loop control system with PID control having speed, position and load as measured input para meters, guide vane position as measured input parameters, guide vane position as manipulated variable and speed or load or flow as the controlled variable. Toothed wheel speed signal generator with speed sensor or PMG will provide the turbine speed input flow meter / level meter with transducer will provide the flow / level input and load transducer will provide the load input to the governing system functions. Governor panel will have the required indications of speed, load, flow, position, etc. Control modes of position or load will be selectable and whenever the unit goes to isolated grid operation governor will automatically change over to speed control.

12.2.3 Oil Pressure System

The final control elements for positioning of guide vanes will be hydraulic oil servomotors through directional valves. The required oil pressure and oil flow will be provided unit wise by the Governor Hydraulic system consisting of anoil-sump, a set of two screw type oil pumps, accumulator, oil filters, proportional control valves, servomotors, logic elements etc. Accumulator will be provided with high-pressure nitrogen or air cushion depending on the oil pressure chosen. There will be two (2) (one running and other as stand by) pump-motor-sets. The stand by pump will be automatically switched on upon failure of the pump in service. A set of smooth operating unloader valves, non-return valves and safety valves will be provided to regulate the oil pressure. Pressure switches will be provided for loading/unloading of pumps and for stand by pump starting. Pressure switch will also be provided for alarm and trip at desired values

A High-pressure air compressor system will be provided to cater to the needs of Governor and Main inlet valve oil systems, alternatively providing a Nitrogen bladder in the accumulator to maintain the system pressure will be examined during implementation

Common oil-pressure-units for Turbine& Governor and main inlet valve shall be provided for each generating unit.

12.2.4 Main Inlet Valve

Inlet valve is required to shut off water to the turbine in case of shut down and to permit dewatering of the turbine for inspection. This valve will also close against turbine flow under emergency conditions. The inlet valve will be designed to operate and seal properly under pressure during all operating conditions and during transient water hammer conditions.

The diameter of valve will be about 1000 mm (matching with spiral case inlet diameter) and will be designed for the expected pressure rise up to 135% of maximum head. Butterfly valves are better suited for these duty parameters.

Body and disc will be fabricated steel construction. Valve-door will be with piston-ring type of seal. The service seal on the downstream side of the valve body will consist of stainless-steel ring type. Maintenance seal on the upstream side will be used when maintenance work is to be carried out on the service seal.

The inlet valves will be located immediately upstream from each of the spiral cases, to which they will be directly Connected via a downstream dismantling joint.

The opening of the valve will be by oil pressure and closing will be by counter weight. Oil-hydraulic pumping set for this MIV, shall be common required for turbine & governor for each unit. The set will be complete with a motor operated bypass valve and dismantling joint.

12.2.5 Cooling Water System

Cooling water system is proposed to be provided to meet the cooling water requirements of turbine bearing, generator bearings and turbine shaft seal (if applicable) and potable water etc. Each of the four units will be provided with a cooling water pump and one common stand by pump which can be lined up to any of the unit's cooling water system. Alternatively, the cooling water can be tapped from inlet side of the turbine and provided with a suitable pressure reducer. The system will be complete with non-return valves, discharge and suction valves, sectionalizing valves, motorized valve duplex filters, sectionalizing valves, piping, pressure gauges and flow meters fine mesh filters, flow indicators, flow relays, pressure gauges, etc.

12.2.6 Drainage & Dewatering System

Drainage and dewatering pumping system are proposed to be provided which will be common to all the units. The drainage and dewatering system shall permanently and automatically ensure the delivery to the outside of all effluents collected in the plant.

The dewatering system (dewatering the water from penstock and draft-tube elbow), including necessary valves, piping, pump-motor sets, instruments, will be used to dewater the turbine and draft tube for accessing the runner and other underwater parts during routine maintenance and also during emergencies caused by abnormal inflows.

The drainage system shall handle all leakage and drains from all the equipment within the power station. The main flows and volumes to be handled by the systems shall account for permanent drainage of all floors, turbine shaft seals cooling system, fire-fighting water, emptying of a unit waterway, emptying of the draft tube and downstream waterways. Drainage & dewatering pumps will be of submersible type so that, in the event of partial flooding, the pumps will continue to operate to de

water the power station. The pumps shall operate automatically based on the rising and falling water level in the sump.

The turbine drainage & dewatering system pits will be designed to enable dewatering of the turbine within four hours' time. This system will act as back up to the drainage system in the event of emergency in-flows. Suitable arrangement for interconnection of both dewatering and drainage pit by gate shall be provided. Normally the pumps shall operate automatically based on the rising and falling water level in the sump. D&D systems will have pump-motor sets controlled by level float switches. Pumps of each system will be connected to an independent common outlet. Pumps will discharge to the tailrace.

12.2.7 Workshop Equipment

Workshop having suitable facility shall be provided in the powerhouse for carrying out the normal O&M of various electro-mechanical equipment. The workshop shall be mainly equipped with the requisite machine tools like lathes, drilling machines as described below.

i) Lathe
ii) Drilling machine
iii) Welding set
iv) Grinding machine
v) Cutting machine
vi) Bench vice

12.2.8 Air Conditioning System

The control room is proposed to be air conditioned using spilt AC for maintaining the temperature and to avoid ingress of dust and foreign materials thereby providing comfort and maintaining the accuracy and performance of sophisticated instruments and controls located inside the control room.

Ventilation system shall be conforming to IS: 4720-1982 "Code of Practice for Ventilation of Surface Hydel Power Stations" comprising of

a. Inlet Ventilation blowers, air-ducts, louvers, etc. shall be for ventilation purpose in power house.

b. Axial type Exhaust fans shall be provided for exhausting the used air from (i) battery fumes from Battery room, (ii) Wash / WC Rooms, (iii) Powerhouse Building.

12.2.9 EOT Crane and Hoists

One number electrically operated Overhead Crane for installation and maintenance of E&M in the power house is proposed.

EOT crane capacity of 35/5 MT hook shall be provided in the powerhouse for erection and maintenance purpose of handling the generating unit's parts such as Runner, Main Inlet Valves, Guide Apparatus, Bearings, Generator, Transformer etc.

The crane shall be as per IS: 3177 and shall have cabin/pendent controls. The crane shall be complete with electrical control panels, pendent controls, hoist, brakes, safety devices, platform, ladders, fittings and connections, rails for runway. Operation of crane shall be smooth and silent for all travels. The cranes shall be assembled in the manufacturer's workshop and test run with rated load and 125% load.

12.2.10 Fire Protection System

Fire Detection & Protection system is provided to meet following requirements:

a) To detect Fire Situation

b) To Protect, Control and Extinguish Fire.

An effective Fire Detection & Protection System results in minimizing the loss of property, human-life and downtime.

Following stated codes are proposed to be referred

Sl. No.	Standard	Description
1.	NFPA 10	Standard for Portable Fire Extinguishers
2.	NFPA 13	Standard for the Installation of Sprinkler System
3.	NFPA 14	Standard for the Installation of Standpipes and Hose Systems
4.	NFPA 15	Standard for Water Spray Fixed Systems for Fire Protection
5.	NFPA 20	Standard for the installation of stationary fire pumps for fire protection
6.	LPA	Guide lines of LPA (Loss Prevention Association of India) Earlier known as TAC (Tariff Advisory Committee)

a) Fire Detection, Alarm and Control System

i. The fire detection, alarm and control system shall consist of different types of fire detectors, fire alarm panels, repeater panel (in electrical room), local panels etc. The system shall be microprocessor based, analogue addressable type.

i) Fire Detection System

The system is suitable to detect the presence of fire's smoke / heat in the room or around the equipment. Following are the types of fire's smoke / heat detectors:

- Ionization type Smoke Detector is suitable for automatic water sprinkler / Inert gas system
- Quartzoid bulb heat detection system is proposed to be provided for Oil hazard area, Transformer area etc. protected by HVW spray.
- Electrical type Heat Detector is proposed for Battery Room.
- Manual Break Glass Boxes is proposed to have a push button element kept in pressed condition by the glass fitted in the front of the box. Break glass boxes shall be used as manual call points.

ii) Fire Alarm System

A Fire alarm system will be installed to provide visual and audible alarm in the power station for fire detection. This system will comprise manual call points located at strategic location in areas which are normally manned, and automatic smoke and heat detectors located at important points such as the cable vault, the control room, the switchgear room etc. It detects fire at an early stage and provide visual and audible alarm. The Fire alarm system consist of following:

- Hooters, in the event of fire, shall raise pulsating audio alarm and lamp shall flash.
- The panel shall consist of solid circuitry on a printed circuit board, a loudspeaker and flashing lamp housed in weatherproof dust tight, wall mounted type enclosure. Fire Alarm Panel and operate with DC supply.
- Siren shall be industrial type of 2.5 km (min) against the wind direction.

- In case of any Multi Sensor Detectors or Manual Call Points being actuated a signal shall be transmitted to the Fire Alarm Panel which in turn actuates an Audio /Visual alarm in the Fire alarm panel and simultaneously initiate the signal for external hooters at the various places - such as on Pontoon, Pathway to Pontoon, Security room, control & Switchgear room, etc.

iii) Public Address / Talk Back System

The public address & talk back system shall be provided for power house, switchyard area, Dam area and shall consist of a main communication console located in the Electrical room and speaker / talk back units located along the above said area.

b) Fire Protection System

Fire protection systems of following types (as applicable) shall be provided.

ii. Overhead Fire Storage Water Tank Filling Arrangement

iii. It is proposed to provide the overhead fire water tank near the Surge shaft, so that operating pressure of Hydrant system shall be 4.5 bar to 6.9 bar, as stated in clause No. 7.8.1 of NFPA 14.

iv. This tank shall be filled by water drawn from Surge shaft through pump-motor set. The water storage tank shall be of capacity suitable for, as per NFPA 851, Clause Nos. 6.2.2 & 8.7.4-(2). The water supply for the, permanent / in-service, fire protection installation should be based on the largest fixed fire suppression not less than 500 g pm (1890 L/min) for a 2-hour duration.

v. Hydrant system

The System comprises of a reliable source of water supply; network of pipe, combination of underground and above ground piping throughout the project. The system includes Hydrant arrangement, water mains network, hydrant valves, landing valves at each landing locations, water monitors. Hose cabinets with hoses, branch pipes, nozzles, hose boxes, central hose houses etc. at strategic locations.

The Hydrant system, along with Hose Reel and wet riser, is proposed to be provided for the complete project, including at least the following:

- In the power house at Turbine and Generator Floor

- Switchyard area including around Transformer (Oil Type), DG Set area

vi. Water Spray Emulsifier system for Generator-Transformer

The system comprises of network of underground and above ground piping, control valve, compressor receiver, deluge valve, HVW Spray Nozzles / Projectors.

In HVWS system the deluge Valve which is normally in closed position. Whenever the fire breaks down and temperature around the protected equipment goes beyond the temperature rating of (79°C) Quartzoid Bulb detector, installed around the equipment), then Quartzoid Bulb detector will collapse, and it reduces the pressure in the detection line by draining the air, which results in opening of deluge valve and then water will rush to spray water network, through the opened Deluge Valve. The DV operation makes the diaphragm in action to spray the water on protected transformer.

vii. Portable Fire Extinguisher

Portable fire extinguishers along with sand buckets shall be provided at strategic locations considering easy access as per NFPA 10 & TAC Guidelines at all strategic points of the Power house, Barrage, Switchyard.

Various portable extinguishers are selected as per applicability as stated in below **Table - 10.3**

Table 10.3 Portable Fire Hydrant Classification

Sl. No.	Class of Fire	Description	Type of Extinguishers
1	Class A	Fires in ordinary combustible materials, such as wood, cloth, paper, rubber, and many plastics.	Water type, Multipurpose dry chemical type & Wet chemical type
2	Class B	Fires in flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, and flammable gases.	Aqueous film-forming foam (AFFF), Film-forming Fluor protein foam (FFFP), Carbon dioxide, and Dry chemical type.
3	Class C	Fires that involve energized electrical equipment where the electrical non-conductivity of the extinguishing media is of importance. (When electrical equipment is de-energized, fire extinguishers for Class A or Class B fires can be used safely.)	Carbon dioxide, Dry chemical type.

viii. Piping Layout and Schematic

Piping for all the protection systems will generally be laid over ground, on RCC pedestals, except in locations such as road or in main plant area where it may not be feasible to route over ground.

12.3 Electric System

The electric system scheme consists of 5.0 (+10% continuous overload) MVA, 11kV, 50 Hz 0.85 power factor synchronous Generators, 11 kV Switchgears; 6MVA, 11/33kV Transformers; 33kV Switchyard; Unit Auxiliary Transformers, Station auxiliary Transformer, LT Switchgears, 110 V DC System; Emergency DG Sets; etc.

The Scheme is as shown in Single Line diagram, which is described below:

Generators will be connected through 11 KV XLPE cables to11 KV switchgear. Each generator will have one 33 KV vacuum circuit breaker for synchronizing and tripping. 33 KV switchgear will be connected to6 MVA generator transformer through 33 KV vacuum circuit breakers. Generator transformer will be connected on 33 KV side through set of isolators and Vacuum circuit breakers. 2 Nos. Power Evacuation lines take off from 33 KV bus through set of isolators and circuit breakers.

Station Auxiliary Transformer will be connected on 33 KV switchgear through 33 KV breakers. The 415-volt side of SAT will be connected to 415-volt switchgear through LT power cable and ACBs. The 415-volt switchgear bus will also be fed from emergency supply DG set. The 2 incomers in 415-volt switchgear will be interlocked so that only one breaker can be closed without paralleling.

12.3.1 Generators

It is proposed to install four generators conforming to IS: 4722 /IEC 60034 and major parameters would be as given below:

Table 10.4: Generator Parameters

Description	Value
Type	Horizontal, salient pole synchronous generator
Capacity	4 MW (with 10% continuous overloading)
Rated Voltage	11 kV
Range of voltage variation	± 10%

Power Factor	0.85 lagging
Rated Speed	750 rpm
Frequency	50Hz
Range of frequency variation	±5%
Phase	3 phases
Inertia Constant	> 1.0
Short Circuit ratio	1.1 (minimum)
Stator Winding Connection	Star
Generator Earthing	Star point earthed through distribution transformer
Insulation Class of Stator and Rotor Winding	Class-F (155-degree Centigrade)
Excitation	Brushless
Protection Class of Generator	IP 44
Cooling	Air cooled

The generator will be complete with standstill heaters, excitation system, and neutral grounding arrangement, phase and neutral side CTs, RTDs, bearings with bearing oil level and temperature monitoring / protection system, brake assembly. The generator insulation will be class F with temperature rise limited to that corresponding to class B so that generator will have possibility of overloading for short durations. As hydro station will be operated under varying conditions and intent of specifying higher insulation class is to have winding life of 35 years or more. The short circuit ratio will be at least 1 .1 considering stability of the machine. Generator is not likely to charge long line hence the line-charging mode for the generator may not be required.

Major assemblies of Generator

(a) Generator Stator

Generator stator core will be built up of insulated CRNGO silicon steel laminations of high quality and low loss designed to prevent any hot spots. The winding will have epoxy rich resin non-hygroscopic insulation. Type of winding will be coil or bar type.

(b) Generator Rotor

The rotor comprises of a welded steel rotor center (outside serves as a yoke) and magnetic poles bolted on the periphery of salient pole type with damper windings on

face of the pole. Rim will be made up of laminated tensile steel. Rim plates are assembled on to the spider. The field winding will be strip on edge copper with class F insulation.

(c) Generator bearings

The Generators will be equipped with horizontal bearings. The bearings will be pad type or sleeve type with Babbitt-metal lined type and oil lubricating. The bearings will be cooled by oil-to water heat exchanger. The DE bearing shall be thrust cum journal bearing while NDE bearing shall be journal bearing.

The bearing will be capable of operating at runaway speed and from zero (0) to 115% of rated speed for 15 minutes without cooling water supply. The maximum operating temperature will be 70 degrees centigrade for metal and65 degrees centigrade for oil.

Instrumentation for monitoring and protections consisting of RTD's, dial thermometers, alarm and trip contacts either from scanner or from thermostat/dial will be provided.

12.3.2 Excitation System

The excitation cum digital automatic voltage regulation system shall be of brushless rotating type comprising of field in the stator of the exciter & rotating rectifier to be mounted on the shaft. The surge suppressors are also mounted along with the diodes to protect the diodes. The voltage regulation system shall be both manual as well as automatic control. The system shall be capable enough to maintain the output terminal voltage constant within the regulation limits. The power for the excitation system will be taken from the Generator mains by means of a dry type step down transformer (normally installed inside the LAVT panel). The excitation system will be self-contained requiring only an external power source for field flashing at unit starting. The field flashing supply will be taken from the station battery or Low Voltage (LV) Switchboard.

The brushless excitation system will be will be suitable for parallel operation of the generators with the grid. The system will include AVR, field suppression equipment, field circuit breaker, brushless excitation system etc.

The ceiling voltage of the excitation system will be at least 180% of the normal field voltage and response ratio will be at least 2.0. The regulation shall be within ±

0.25% of the set value. The voltage set point shall be adjustable from 90 % to 110 % and PF set point shall be adjustable from 0.8 lead to 0.8 lag. The excitation system shall have the following features.

a) AVR will have one manual channel working as a field current regulator and one auto channel working as selectable voltage regulator or PF regulator with reference setters and auto-manual follow up features and PID adjustment features. Smooth change from 'Auto position of voltage regulator to Manual position and vice -versa will be provided. AVR will have soft start features, such as following

(i) Compounding system with current transformers for quadrature droop characteristic.
(ii) Rotor current limiter
(iii) Stator current limiter
(iv) Automatic Power factor regulator
(v) Exciter diode monitor
(vi) Under excitation MVAR limiter
(vii) PT Fuse failure protection
(viii) Automatic Fault detector
(ix) Automatic over fluxing control of generator transformer.
(x) Solo and parallel operation modes.
(xi) Rotor earth fault protection

12.3.3 Brakes

Generator will be provided with air-operated brakes to bring the rotary parts of the generator and turbine to stop from about 15% of rated speed during normal operation. The brakes will also be suitable for application at higher speed during emergency shutdown of the unit, to bring the rotor to rest at faster rate. The brakes will operate automatically/ manually from local control panel/unit control board.

12.3.4 33 KV Switchgear

The power generated from the generator will be fed to outdoor 33 kV switchgear. The main electrical parameters of switchgear will be:

a) Rated voltage : 33 KV
b) 1 sec. withstanding current : 25 KA.
c) Rated current of bus bar : 800 Amps.

The 33 KV Switchgear will comprise draw out type circuit breakers housed in indoor, metal clad cubicles. The circuit breaker will be of vacuum type.

The main electrical parameters of circuit breaker will be:

a) Rated voltage : 33KV

b) 1 sec. withstanding current : 25KA.

c) Rated current : 630 Amps.

d) Type of breaker : Vacuum.

Synchronizing of the Generator with Bus will be at 33 KV.

12.3.5 Generator Transformers

Each generator will be provided with a step-up generator transformer to step up the voltage from 11 kV to 33 kV. Transformers of 6 MVA rated capacity which will cater to each 4000 kW generators with 10% over load are proposed. These will be connected as shown in Single Line Diagram enclosed.

The transformers will be installed in outdoor switchyard in the proximity of the power station building. To encounter voltage variations of the grid and for satisfactory operation of the generating units, on-load tap changers on the HT side of the transformer having a voltage range of –10% to +5% in steps of 1.25% will be provided. The main electrical characteristics of the transformers are proposed as stated below:

Table 10.5: Transformer Parameters

Sl. No.	Description	Generator Transformer
1	Rating in KVA	6000 kVA
2	Number of units	4
3	No. of Phases	3
4	Standard applicable	IS 2026
5	Vector group	Ynd11
6	Guaranteed no load voltage ratio	33 / 11 kV
7	Frequency	50 Hz
8	Type of cooling	ONAN
9	Temperature Rise	60/65°C as per IS 2026
10	Type of Tapping	OLTC, (-) 10% TO +5% insteps of 1.25%

The primary terminals shall be suitable for cable connection to the 33 KV Switchgear. The secondary terminals will be brought out through bushings for connection to switchyard equipment.

12.3.6 LAVT Cubicle& Generator Neutral Grounding Transformer

The lightning arrestor or surge protection and voltage transformer (SPVT) cubicle will consist of surge protection equipment and voltage transformers. The surge protection equipment would comprise of lightning arresters with suitable discharge characteristics to suit the generator insulation level in parallel with suitable rated capacitor for smoothening the rate of rise of impulse voltage. The LAVT cubicle will be connected by means of 11 KV XLPE Cables to generator. The voltage transformer will be single phase, star connected, dry type units withdraw-out features. The VTs for metering and protection shall be as indicated in the single line diagram.

The neutral connection includes a single-phase disconnecting switch, a single-phase distribution transformer 11 kV/ 110 V and a grounding resistance connected to the low voltage side of the distribution transformer.

12.3.7 33 KV Switchyard

The 33kV outdoor type switchyard equipped with 33 kV Vacuum type circuit breakers, Oil filled type Current Transformer and Potential Transformers, horizontal double break type motor operated type isolators, LA, support structures & other ancillary items are proposed. Protective equipment shall be provided for protection of the feeder under fault condition. Over current, overvoltage protection shall be provided for the feeder. DC power for the switchyard shall be provided from the power house DC system.

The switchyard shall have provision for the following feeders:

- Power evacuation feeders – 2 Nos.
- Incomers from generating units – 4 Nos.
- Station Auxiliary transformers – 2 Nos.

The proposed 33kV Switchyard having double bus bar system with bus coupler shall be installed adjacent to power house. Basic system parameter of the 33kV system:

Equipment	Characteristics
Highest System Voltage	36kV
Power frequency withstand voltage	70 KV (rms)

Basic Insulation Level	170 KV peak
33 KV breaker	Vacuum type
Short Circuit level	25 KA for 1 second

12.3.8 Control &Protection and Metering System

A. Control & Monitoring System

Control & monitoring system will have all the necessary sensors, devices monitoring and logging the various temperatures of all the vital components of the generator, turbine, generator transformer, etc. All the operating parameters of the unit shall have visual display as well as logging of the same. Variation in the operating parameters from the pre-set values shall result as audible alarm and visual display or shutting of the unit as the condition may be. It will have provision for SCADA control comprising computer for plant control, unit control, switching equipment control, essential auxiliary control and data acquisition system. The system will also include provision of data base, uninterrupted power supply system, mosaic boards etc. however, the extent of computerization will be worked out at the time of detailed design stage.

B. Protection System

Electrical protection system consisting of numerical multifunctional relays and static discreet relays, for sensing

(i) the faults and high-speed tripping relays

(ii) Alarm, annunciation and tripping functions, will be provided for isolation of affected equipment during faults and abnormal operating conditions.

The configuration and protection philosophy of the system will be as follows.

a) One numerical multifunction generator protection relay catering to all major generator protections and some discreet relays as back up and for catering to those functions not provided by numerical relay will form the generator protection. The tripping functions will be grouped in to 3 groups as follows.

- Emergency trip function to trip GCB, Field circuit breaker and turbine for complete isolation of generator on serious faults.
- Electrical shut down function to trip GCB and Field circuit breaker to electrically isolate the generator and keep the machine running at rated speed on such electrical faults not requiring turbine trip.

- Controlled action shut down function to trip the turbine first and then GCB and FCB after closure of guide vanes to provide tripping without sudden load throw off on such mechanical faults like bearing temperature very high etc. For all generator faults the 33kV Breakers will trip to isolate the unit from grid.
- For all generator and transformers faults the respective 33 kV VCB will trip.

b) One numerical transformer protection relay catering to transformer overall differential over fluxing and restricted earth fault and static discreet over current and earth fault relay as back up protection will form transformer protection. All transformer protections will trip the 33-kV side Breaker in addition to tripping the generator.

Protection of functions will be as follows:

(1) Generator

The following protections will be provided for the generator:

i.	Over Speed	12
ii.	Trip Circuit Supervision Relay	95
iii.	Under voltage protection	27
iv.	Reverse power protection	32
v.	Bearing Temperature High	38
vi.	Loss of field protection.	40
vii.	Negative phase sequence current protection	46
viii.	High temperature	49 S
ix.	Breaker Failure Relay	50 BI
x.	Voltage restraint over current	51 V
xi.	Over voltage protection	59
xii.	Stator earth fault protection	64 S
xiii.	Rotor earth fault protection.	64 R
xiv.	Under / Over frequency	81 O/U
xv.	Master Trip Relay	86
xvi.	Differential protection	87 G
xvii.	Over voltage relay	59
xviii.	Over current relay	50/51
xix.	Over/under frequency relay	81 O/U
xx.	Fuse failure supervision	60

xxi.	Over excitation	24

(2) Step-Up Generator Transformer

The following protections will be provided for step-up generator transformers:

i.	OTI Alarm	49 OA
ii.	OTI Trip	49 OT
iii.	WTI Alarm	49 WA
iv.	WTI Trip	49 WT
v.	Over-current	50/51
vi.	Earth fault current	50N/51N
vii.	Buchholz, oil and winding temperature alarm/trip.	63 A
viii.	WTI Alarm / Trip	63 T
ix.	Restricted earth fault	64 REF
x.	Master Trip	86T
xi.	Overall differential protection	87 GT
xii.	Oil level alarm	LOLA
xiii.	Pressure relief valve	PRV
xiv.	Trip circuit supervision relay	95
xv.	Breaker failure protection	50Z

(3) Transmission line protection

33 KV Transmission line will be provided with two numerical protection relays as main and Directional over current and Earth fault protections as back up. Rate of change of frequency and rate of change of voltage (df / dt and dv / dt) protection will be provided for tripping the lines during isolated grid conditions. Under voltage and overvoltage (27, 59) protections shall also be provided.

(d) Bus bar protection

- Bus differential protection & Local Breaker backup protection;
- Bus PT / Line PT Protection (Voltage Balance relays);

12.3.9 Power & Control Cables

a) All cables will be selected to carry the load current under site conditions, with permissible voltage drop. In addition, high voltage cables would be sized to withstand the short circuit current. For connection of CTs, 4 mm^2/2.5 mm^2

size cable shall be preferred. For control cable, size of 2.5 mm^2 and 1.5 mm^2 cables shall also be considered. The following types of cables would be used.

b) For 11 KV System: 11KV unearthed grade, single /multi core, stranded aluminum conductor, cross linked polyethylene insulated, screened, aluminum wire /galvanized steel wire armored and over all PVC sheathed cables conforming to IS7097 – Part II.

c) Low voltage power cables: 1100 V grad e stranded aluminum conductor, HR PVC /PVC insulated, Color coded, P VC sheathed and aluminum wire/galvanized steel wire armored overall PVC sheathed cables conforming to IS –1554.

d) Control, protection, signaling, DC and supervisory cables would be of 1100 V grade, annealed high conductivity stranded copper conductor, PVC/ Elastomer insulated overall.

e) PVC / Elastomer sheathed, signaling and supervisory cables would be in twisted pairs and screened wherever required.

f) The inner and outer sheaths of all the above cables would have firm retardant capabilities. Cables would be laid in steel ladder type cable trays. In outdoor areas, cables will be laid in racks/built up trenches or will be buried directly underground.

12.3.10 Lightning Protection System

A lightning protection system will be provided as per IS: 2309 and Indian Electricity rules. The protections shall consist of roof conductors, air terminals and down conductors and will be provided for all structures.

12.3.11 Communication System

It is proposed to provide a separate P&T line with four extension handsets at the powerhouse for external communication.

12.3.12 Earthing System

A separate earthing grid will be provided for powerhouse and switch yard and will be interconnected with the buried portion of the earth conductor, which will be of mild steel. Exposed earth conductor will be of galvanized steel. Required number of earth pits will be provided. A separate earthing mesh will be laid in the tailrace if required and interconnected with plant grid.

Earthing system shall be designed considering adequate fault level, earth resistivity and various potentials with sizes of mats to achieve system resistivity below 1 ohm.

12.3.13 11 KV Connection between Generator & SPVT Cubicle

The connection between generator and 11 KV SPVT cubicle will be by11 KV XLPE Cables.

12.3.14 11 KV Connection between 11 KV SPVT and Generator Transformer

The connection between 11 KV SPVT cubicle and Generator Transformer will be by suitably rated 11 KV XLPE Cable.

12.3.15 Station Auxiliary Power Supply Arrangement

a) Station Auxiliary Transformers

The total station auxiliary load of the power plant is estimated to be below 315 KVA. A 100% capacity oil cooled auxiliary transformer will cater to this load. Two numbers station Auxiliary transformers, connected to 33kV Bus bar and station Service Board shall be provided. The main electrical parameters of the transformers will be as stated below:

i) Voltage ratio	: 33 KV/433V, 3 phases, 50Hz.
ii) Rating	:315 KVA
iii) Primary connection	: Delta
iv) Secondary connection	: Star with neutral solidly earthed
v) Type of cooling	: ONAN
vi) Off circuit tap changer	: ± 7.5% in steps of 2.5%

b) Unit Auxiliary Transformer

11 kV/0.433 kV, 100 kVA dry type unit auxiliary transformers shall be provided for each unit for unit auxiliary requirement.

c) 415V Switchgears (Station Service Board)

The auxiliary transformers will be connected to bus bar of 415V auxiliary switchgear. The 415V Auxiliary Switchgear will feed the entire unit's and station loads. The main electrical parameters of switchgear will be:

Auxiliary boards

i) Rated voltage	: 415 V
ii) 1 sec. withstanding current	: 40 KA
iii) Rated current of bus bars	: 1200 Amps.

The 415V Switch gear will be of metal enclosed construction type with signalized main bus bar and will be equipped with all the associated accessories.

The various auxiliaries of the power plant will be supplied at the following nominal voltages depending upon their ratings and functions.

i) Motors : 415V, 3 phase AC supply

ii) Lighting & space heaters : 240V, Single phase AC Supply.

iii) Power receptacles : 415V, 3 phase AC supply.

iv) Control Circuit : 110V ungrounded DC supply

d) Appurtenant works

i. **Barrage site**

11 kV line is available at barrage. 250kVA 11 kV/433 V, 3 phase, 50 Hz auxiliary transformer shall be provided for barrage power requirement and for emergency conditions, it is proposed to provide one DG set of 100 kVA, 415V, 50Hz, 0.8PF silent type.

ii. **Colony**

One 125 kVA 11/0.433 kV distribution transformer shall be provided for colony requirement.

12.3.16 DG Set (Emergency Power System)

Both the transformers (SST-1 & 2) shall be supplied through the 33 kV switchboard bus. Each transformer is capable of feeding all the units & station auxiliary loads individually in case of unavailability of the second transformer. In case of emergency i.e. non availability of bus power, station auxiliaries (including lighting etc.) shall be supplied through a Diesel Generator. Suitable interlocking shall be provided among circuit breakers (ACB) connected to SST feeders, one bus coupler and DG set feeder.

It is proposed to provide two sets of 125 kVA, 415V, 50Hz, 0.8PF silent type DG set for emergency purposes. The DG sets shall have Auto Main Failure panel, shall automatically start in case of failure of supply from SAT. It shall be complete with acoustic enclosure, battery chargers, battery etc.

12.3.17 Direct Current Supply System

The Direct Current System (DC) is the most reliable source of supply in the power station and will be used for the control and protection of the power plant equipment. The DC system will be used for the following:

i) Electrical control of equipment and indications on the control panel.

ii) Power supply to the following services in case of total AC power failure:

a) Communication system

b) DC lighting of strategic areas for safe personnel movement.

iii) The battery sizing will be done to cater to the following type of loads

(a) Momentary load for 1 minute

(b) Emergency load for 2 hours

(c) Continuous load for 10 hours

Under normal conditions, the battery will be on float charger. The float charger is connected to a distribution board and meets the requirements of the DC load. In case of additional demand of load or AC supply failure; the battery will meet the requirements of DC loads.

The boost charger will be designed to charge the fully discharged battery in 10 hours before bringing it back on float charge. A set of 110V battery banks of 300AH with float and boost chargers and a direct current switchboard will meet the DC load. The batteries would be of stationary lead acid type, complete with racks, porcelain insulators, inter-cell and inter connectors. The chargers would be of silicon rectifier type with automatic voltage control and load limiting features.

12.3.18 Lighting

The power station lighting system would comprise of the following:

i) Normal 240V AC Lighting System

The lighting circuit in the normal 240V AC lighting system would be fed through 415/433 volts, 3 phase, 4 wire lighting transformers connected to 415V feeders from SSB.

ii) Direct Current Emergency Lighting System

Direct current emergency lights would be provided at strategic points in the power station, viz. near entrances, staircases, the main control room etc.

These would be fed from the station 110V DC system and would be off when the normal AC power supply is available. These would be automatically switched on when the normal AC supply fails. The proposed illumination levels for various areas are given below: -

Area level	**: Illumination**
Control room	: 300 lux
Switchgear/MCC room	: 200 – 250 lux
TG building	: 200 lux
Open areas	: 50 lux
Transformer yard and switch yard	: 10 – 20 lux
Work shop	: 300 lux
Stores	: 100 – 150 lux
Battery room	: 100 lux
Administration building and office rooms	: 300 lux
Roads	: 20 lux.

12.3.19 Power Evacuation

Transmission

The evacuation of power is proposed through two outgoing 33 kV transmission lines for 16 MW of power from Halaipani hydroelectric project. There is an existing 33 kV substation at Halaipani Substation. The length of power evacuation line from power house to the nearest pooling station is about 5 km.

12.3.20 Communication

A fibre-optic cable system consisting of terminals at both ends with multiplexing equipment, and a transmitter and receiver coupled to fibre-optic light conductors that are routed to the other terminal, which also has a receiver, transmitter and multiplexing equipment shall be provided. Optical Fibre Cables with terminal equipment shall be used between project and grid substation for voice and data communication, on- line monitoring and control.

12.3.21 Material Already Procured

The details of material available at Halaipani store and its present condition is as per following table

INVENTORY LIST OF E&M EQUIPMENT AT HALAIPANI

Sl. No.	**Particulars**	**Qty.**	**Unit**	**Remarks**
1	**Turbine parts**			On inspection it was
	Draft tube cone	4 pcs.		noticed that most of

	Draft tube section Bend	4 pcs.	the items are stored
	Spiral Casing	4 pcs	outside exposed to
	Distributor Assembly	4 pcs	Sun, rain and other
	Runner Assembly	4 pcs.	climatic condition. It
	Shaft Seal	4 pcs.	is therefore, evident
	Embeded Parts	1 set	that these items may
	Main Inlet (Butterfly Valve)	4 pcs	not be in good
	Oil Pressure unit	4 pcs.	condition and may
	Cooling Water System	1 Lot	need overhauling and
	Drainage & De Watering	1 Lot	reconditioning. Some
2	**Generator And Auxiliaries**		of items may be found
	Synchronous Generator 5.0 MVA,(4.0MW)	4 nos.	beyond repair and
	Brushless Excitor System (AVR Panel)	4 nos.	require to be replaced.
	Lube Oil System	4 nos.	
	Line Terminal Equipment (LAVT)	4 nos.	
	Neutral Grounding Transformer (NGT)	4 nos.	
3	**Electrical Control Panel**		
	Turbine Auxiliary governor Panel (TAGP)	4 nos.	
	Generator Control Protection Rely And Metering Panel (GRMP)	4 nos.	
	33 KV Power Transformer Protection Rely & Metering Panel	4 nos.	
	33 KV Feeder Panel	2 nos.	
	33kV Bus Protection Panel	1 nos.	
	Synchronizing Panel	1 nos.	
	SCADA system	1lot	
	LT AC Panel	1lot	
4	Batteries and Charger Panel (110 V)	1lot	
5	**Cables**		
	Power Cable	1lot	
	Control Cable	1lot	
	Instrumentation cables	1lot	
	Cable Trays	1lot	

	Cable Glands & Joining Kits	1lot	
6	100 KVA 11/.415 KV Auxiliary Transformers	4 nos.	
7	Lighting System	1lot	
8	Internal Communication System	1lot	
9	Grounding System For Power House And Switch Yard	1lot	
10	Lightening Protection For Power House & Switch Yard	1lot	
11	30/5 Tonnes EOT Crane	1lot	
12	Diesel Generator 125 KW	1 pc	
13	Transformer Oil Purifiers	1 pc	
14	Electrostatic Type Oil Purifier For Governor Oil	1 pc	
15	Air Conditioning System	1lot	
16	Ventilation System	1lot	
17	Fire Protection system	1lot	
18	**Outdoor Switchyard Equipment**		
	6 MVA 11 kV / 33 kV Power Transformer	4 nos.	Mostly in damaged
	315 KVA, 33/0.415 kV Station Transformer	1 nos.	condition
	33 kV Vacuum Circuit Breaker	8 nos.	
	33 kV Motorized Isolator	16 nos.	
	33 kV Motorized Isolator With Earthing Blade	2 nos.	
	33 kV Current Transformer (Single Phase)	21 nos.	
	33 kV Potential Transformer (Single Phase)	12 nos.	
	30 kVA Lighting Arrestor	18 nos.	
	Bus bars Conductors, Insulators, Hardware Clamps and Connector	1 lot	
	Emulsy fire System For 6 MVA Transformers	1 lot	
	Galvanised Steel Structure 33 kV	1 lot	

In view above it is evident that all the E&M equipment will be thoroughly inspected and tested at site to decide whether these are restorable or replacement is unavoidable. Action is proposed to be taken as per above inspection and tests.

At present, however the cost of restoration and replacement may be assumed to be 50% of the cost of E&M equipment.

12.3.22 Material required as per Revised SLD

Main Equipment's			
Sl. No.	**Equipment Name**	**Specifications**	**Quantity**
1 Turbine:			
1	Horizontal Francis turbine complete with spiral casing, draft tube, stay ring, guide vanes, guide apparatus and servomotors etc.	Rated head 95.0m, rated discharge 5.3 cumec per unit, rated capacity 4 MW at generator terminal with 10% over load continuous, rated speed 750 rpm, specific speed 238.85 m-kW, operating range 125m-65m	**4 sets**
2	Governing system & Oil Pressure unit		**4 sets**
3	Main Inlet (Butterfly Valve)		**4 Nos.**
2 Generator:			
1	Alternator	5MVA, 4.0 MW with 10% over load continuous, 11kV, 0.85 PF, 50Hz Synchronous, 750 rpm	4
2	Brushless Exciter System (AVR Panel)		4
3	Lube Oil System		4
4	Line Terminal Equipment (LAVT)		4

5	Neutral Grounding cubicle with Transformer (NGT) etc.		4
3	**Electrical Control Panel**		
	Turbine Auxiliary Governor Panel (TAGP)		4 nos.
	Generator Control Protection Rely And Metering Panel (GRMP)		4 nos.
	33 KV Power Transformer Protection Rely & Metering Panel		4 nos.
	33 KV Feeder Panel		2 nos.
	33kV Bus Protection Panel		1 nos.
	Synchronizing Panel		1 nos.
	SCADA system		1lot
	LT AC Panel		1lot
4	Auxiliary Transformer(dry type)	100 KVA 11/.415 KV DyN11,	4 nos.
5	Set of 110V battery banks of 300AH with float and boost chargers 110 V	300 AH, 110 V	1 lot
6	**Cables**		1 lot
	Power Cable		1 lot
	Control Cable		1 lot
	Instrumentation cables		1 lot
	Cable Trays		1 lot
	Cable Glands & Joining Kits		1 lot
7	**Auxiliaries**		
	Lighting System		1 lot
	Internal Communication System		1 lot
	30/5 Tones EOT Crane		1 no.
	Cooling Water System		1 Lot

	Drainage & De Watering		1 Lot
	Diesel Generator	125 kVA, 415V, .85 pf, 50 Hz	1 set
	Transformer Oil Purifiers		1 no.
	Electrostatic Type Oil Purifier For Governor Oil		1 set
	Air Conditioning System		1 lot
	Ventilation System		1 lot
	Fire Protection system		1 lot
8	**Outdoor Switchyard Equipment**		
	Power Transformer	6 MVA ,11/33kV , Ynd11	4 nos.
	Station Transformer	315 KVA, 33/0.415 kV DyN11	2 nos.
	33 kV Vacuum Circuit Breaker	33 Kv,800 V 25kA	9 nos.
	33 kV Motorized Line Isolator with Earthing Blade	33 Kv,800V 25kA	2 nos.
	33 kV Motorized Bus Isolator without Earthing Blade	33 Kv,800V 25kA	18 nos.
	33 kV Current Transformer (Single Phase)	33 kV, oil filled outdoor type	24 nos.
	33 kV Potential Transformer (Single Phase)	33 kV, oil filled outdoor type	12 nos.
	Lighting Arrestor	30 kVA	18
	Bus bars Conductors, Insulators, Hardware Clamps and Connector		1 lot
	Emulsifier System for 6 MVA Transformers		1 lot for 4 transformers
	Galvanized Steel Structure 33kV		1 lot
	Grounding system for switch yard & power house		1 lot

	Lightening Protection For Switch Yard & Power House		1 lot
9	**Barrage Area**		
	Distribution Transformer	250 kVA, 11kV/0.433, DyN11	1 no.
	DG Set	100 kVA, 415V,.85 pf,50Hz	1 no.
10	**Colony electrification**		
	Distribution Transformer	250 kVA, 11kV/0.433, DyN11	1 no.
	LT lines and service connections		1 lot

13.0 TRANSMISSION OF POWER

The evacuation of power is proposed through two outgoing 33 kV transmission lines for 16 MW of generated power from Halaipani hydroelectric project to the existing 33 kV substation having 1 x 1 MVA, 33/11 kV at Halaipani.

The length of power evacuation line from power house to the nearest pooling station is about 5 km.

The Halaipani - Hayuliang 33 kV line and Tezu – Hayuliang 33 kV line are being upgraded to 132 kV by State Government.

The power from Yammeng hydroelectric project would be pooled to the to be upgraded Tezu 132 KV substation which is under planning by Arunachal Power Department and to feed other nearby loads the Power will be given at 33 kV level.

14.0 COMMUNICATION

A fibre-optic cable system consisting of terminals at both ends with multiplexing equipment, and a transmitter and receiver coupled to fibre-optic light conductors that are routed to the other terminal, which also has a receiver, transmitter and multiplexing equipment shall be provided. Optical Fibre Cables with terminal equipment shall be used between project and grid substation for voice and data communication, on- line monitoring and control.

15.0 COST SAVING BASED ON DPR OF DEC 2020

Sl. No.	Name of works	As per DPR Dec 2020 (Rs. Lakh)	As per HRED FEB (2021) (Rs. Lakh)	Difference (Rs. Lakh)	Remark
1	C-Works J-Power Plant Civil Works, H-Mechanical works	11206.81	10210.46	-996.35	
2	P-Maintenance	115.84	105.87	-9.97	-
3	Losses of stock	28.96	26.47	-2.49	-
4	Escalation during construction period	463.13	650.58	187.45	
13	Finance Charges	311.29	204.13	-107.16	
14	IDC	1149.77	987.48	-162.29	Amount reduced due to restructuring of finances required.
	Total	13275.8	12184.99	-1090.81	

16.0 COST ESTIMATE

The total cost of project (Table-6) considered in financial analysis of DPR Dec. 2020 was Rs. 15875.77 Lakh. The cost of the project as per CEA guide line is given in Table-7. The cost includes Excise duty, CST, transportation charges, establishment charges, insurance, erection and commissioning charges, audit & account, T & P, interest during construction, cost escalation etc. The total cost of the project as estimated by HRED is Rs. 14784.95 Lakh (without subsidy) for civil works, Hydro mechanical works and electro mechanical works. These estimated cost have been agreed by the firm for inclusion in the revised DPR. The "Abstract of cost estimate" is given below in Table-7.

Table-6: Abstract of Cost Estimate as per DPR Dec. 2020

Sl. No.	Items	Civil works	E&M works	Total
		(Amount in Lakh)		
1	A- Preliminary	69.00		69.00
2	B-Land	0.00		0.00
3	C-Works	4011.43		4011.43
(i)	Barrage and Coffer Dams	3240.61		3240.61
(ii)	HM works	770.82		770.82
4	J-Power Plant Civil works	7195.38		
(i)	Feeder Channel	110.99		110.99

(ii)	Desilting basin	352.24		352.24
(iii)	Power Channel	32.11		32.11
(iv)	Forebay Tank and Spillway	106.39		106.39
(v)	Penstock	436.18		436.18
(vi)	Power House & Tail race Channel	2679.99		2679.99
(vii)	Strengthening & Protection of vulnerable Portion of Power House and Tail Race	2214.30		2214.30
(viii)	Protection wall, Retaining Wall of Anchor Block & Saddle Block and GREF Road	46.17		46.17
(ix)	Switchyard	21.04		21.04
(x)	HM works (52.5% enhancement on 2011 rates as per DHPD document & add GST 18% & labour Cess @ 1%)	1195.97		1195.97
	Total C+J- Works	11206.81		11206.81
5	K- Buildings	376.84		376.84
6	O- Miscellaneous	375.00		375.00
	C+J+K+R	11598.66		
7	P- Maintenance @1% of (C+J+K)	115.84		115.84
8	Q- Spl. T&P	0.00		0.00
9	R- Communication	15.00		15.00
10	X-Environment	0.00		0.00
11	Y-losses on stocks @ 0.25% of C+J+K	28.96		28.96
I	Total I works	12187.45		12187.45
II	Establishment	0.00		0.00
III	Ordinary Tools and Plants			
1	Ordinary T&P	0.00		0.00
IV	Receipt and Recoveries	0.00		0.00
	Total of direct charges	0.00		0.00
V	Indirect Charges	0.00		0.00
1	Audit and Account @ 0.5% of I-Work	0.00		0.00
2	Capitalization of abatement cost	0.00		
	Grand Total	12187.45	1764.13	13951.58
	TOTAL HARD COST	13951.58	LAKHS	
VI	ESCALATION	396.09	67.04	463.13
VIII	IDC	1033.72	116.05	1149.77
VIII	FINANCING CHARGES	311.29		311.29
	Sum of Escalation, IDC, Financing Charges	1741.10	183.09	1924.19
	TOTAL SOFT COST	13928.55	1065.15	15875.77
	TOTAL PROJECT COST, LAKHS		15875.77	

Table-7: Abstract of Cost Estimate

(Reviewed by HRED as per CEA guide lines)

Sl. No.	Particulars	Cost (Lakh)		
		Civil & HM Works	**E & M Works Including Transmission Line**	**Total cost (Lakh)**
I	**WORKS**			
1	A- Preliminary	69.00		
2	B- Land	0.00		
3	C- Works	3030.00		
4	J- Works	7180.46		
5	K- Buildings	376.84		
6	M- Plantation	0.00		
7	O- Miscellaneous	375.00		
8	P - Maintenance (1% of C, J & K Work)	105.87		
9	Q- Special T & P	0.00		
10	R- Communication	15.00		
11	X-Environment and Ecology	0.00		
12	Y-Loss of stock 0.25% of C, J & K- Work	26.47		
	Total (I Works)	**11178.64**	**1764.13**	**12942.77**
I	Establishment 8% of I- Works excluding cost of B- land	0.00	Already Considered	
II	Ordinary T & P 1% of I- Works excluding cost of B- land	0.00	Already Considered	
III	Receipt and Recoveries	0.00		
	Total Direct Cost	**11178.64**		
INDIRECT COST				
V	Audit & Accounts (0.5% of I-Works)	0.00	Already Considered	
VI	Capitalization on Abatement of Land Revenue	0.00		
	Total Indirect Cost	0.00		
	11178.64	**1764.13**	12942.77	12942.77
Project Cost		11178.64	1764.13	12942.77
Escalation during construction period		513.99	136.59	650.58
Finance Charges 2% of loan		204.13		204.13
IDC		905.80	81.67	987.47
Project cost including Escalation, IDC, Financial Charges		**12802.56**	**1982.39**	**14784.95**
Total Project Cost				**14784.95**

17.0 COST AS PER DPR DEC. 2020

The cost of civil works has not been worked out in the DPR Dec 2020 as per the guidelines prescribed by CEA. The cost given in Table-7 has been suggested by HRED as per CEA guide line for inclusion in the revised DPR.

17.1 C-Works

It was found that the cost of Rs. 4011.43 lakh against C-works given in the DPR Dec. 2020 is on higher side. Considering the revised preliminary design of civil components, it comes to Rs. 3030.00 lakh as per revised estimate.

17.2 J-Works

The provision of Rs. 7195.38 against J-works given in DPR Dec. 2020. It is taken Rs. 7180.46 lakh considering revised design of the project components.

17.3 P-Maintenance

In DPR Dec. 2020, it was taken Rs. 115.84 lakh. As per CEA guidelines, it should be 1% of C-Works + J-Power plant civil works + K-Building and the value as per the revised cost comes to Rs. 105.87 lakh.

17.4 Y-Losses on Stocks

A provision of Rs. 28.96 lakh was made in the DPR Dec. 2020. worked out as 0.25% of C-Works, J-Works and K-Buildings. The amount comes to Rs. 26.47 lakh computed in accordance with revised cost of C-works, J-works and K-buildings.

17.5 The calculation of tariff, IIR, DSCR & BC Ratio

The calculation of tariff and other financial parameter were carried out by HERD as shown below.

Sl. No.	Financial parameters	As given in DPR Dec. 2020	As Per HRED Feb. 2021
1	Tariff Rs. per unit • Without subsidy	at 55% PLF Rs. 5.27	(i) at 50% PLF Rs. 4.69 (ii) at 55% PLF Rs. 4.27 (iii) at 60% PLF Rs. 3.91 (iv) at 73.88 % PLF Rs. 3.13
2	DEBT service coverage ratio • Without subsidy	-	(i) at 50% PLF – 1.30 (ii) at 55% PLF – 1.30 (iii) at 60% PLF – 1.30 (iv) at 73.88 % PLF – 1.30

3	IRR • Without subsidy	-	(i) at 50% PLF – 10.72% (ii) at 55% PLF – 10.73% (iii) at 60% PLF – 10.73% (iv) at 73.88 % PLF – 10.74%
4	B.C. Ratio • Without subsidy	-	(i) at 50% PLF – 1.02% (ii) at 55% PLF – 1.02% (iii) at 60% PLF – 1.02% (iv) at 73.88 % PLF – 1.02%

ABSTRACT OF COST (WITHOUT SUBSIDY)
HALAIPANI HYDRO ELECTRIC PROJECT (4X4 MW)

S. No.	Particulars	Cost (Rs. in Lacs)		Total cost
		Civil	E & M (Including Transmission Line)	
I	Works			
1	A- Preliminary	69.00		
2	B- Land	0.00		
3	C- Works	3030.00		
4	J- Works	7180.46		
5	K- Buildings	376.84		
6	M- Plantation	0.00		
7	O- Miscellaneous	375.00		
8	P - Maintenance (1% of C, J & K Work)	105.87		
9	Q- Special T & P	0.00		
10	R- Communication	15.00		
11	X-Environment and Ecology	0.00		
12	Y-Loss of stock 0.25% of C, J & K- Work	26.47		
	Total (I Works)	11178.64	1764.13	12942.77
I	Establishment 8% of I- Works excluding cost of B-land	0.00	Already Considered	
II	Ordinary T & P 1% of I- Works excluding cost of B- land	0.00	Already Considered	
III	Receipt and Recoveries	0.00		
	Total Direct Cost	11178.64		
INDIRECT COST				
IV	Audit & Accounts (0.5% of I-Works)	0.00	Already Considered	
V	Capitalisation os Abatement of Land Revenue	0.00		
	Total Indirect Cost	0.00		
	Grand Total	11178.64	1764.13	12942.77
Project Cost		11178.64	1764.13	12942.77
Escalation during construction period		513.99	136.59	650.58
Finance Charges 2% of loan		204.13		204.13
IDC		905.80	81.67	987.47
Project cost including Escalation, IDC, Financial Charges		12802.56	1982.39	14784.95
	Total Project Cost			14784.95

BASIC PARAMETER

1.	**Unit Generated Lacs after auxiliry consumption @1% & transfomer losses@0.05%**			1035.50	
	Free power to state and local area development			23.05%	
	Unit of Sale			796.82	
2.	**Sale Price (Rs)**	(Levelised teriff for 40 years)		3.13	
	Useful Life		Year	40.00	
3.	**Debt Equity Ratio**				
	(a) Debt (%)			70%	
	(b) Equity (%)			30%	
	Moratorium Period	Year		30	
4	**Construction period (years)**	year of preconstruction of one year			
	Repayment Quarterly	**No of Installment**		48	
	Repayment Quarterly	**in Lacs**			
5	**Period of repayment**			12	year
6	CDM Benefit			0	
7	**Return on Equity (%)**				
		for first 20 years		16.96%	p.a
		after 20 years onwards		21.52%	p.a

8 Depreciation (%) for Tariff

DEPRECIATION A	**(AS PER SLM METHOD)**		
	Depreciation for 15 Years	Rs.in lakhs	4.67%
	Depreciation Thereafter	Rs.in lakhs	0.80%
DEPRECIATION A	**(AS PER SLM METHOD)**		
	Depreciation for Buildings	Rs.in lakhs	3.34%
	Plant and Machinery	Rs.in lakhs	5.28%
DEPRECIATION A	**(AS PER WDV METHOD)**		
Depreciation for Buildings			10.00%
Plant and Machinery			15.00%

9	**Operation & Maintenance expenses**	31.34%	Rs. Lakh/MW
10	**Annual escalation of O & M cost (%)**	3.84%	per annum
11	**Income tax as per normal provisions**		
	(Tax hpliday for ocntinuous block of 10 years during first 15 years and theerafter normal corporate rates of taxes)		
	(a) as per normal provision	34.94%	
	(b) under MAT (for first 10 years)	17.47%	
12	**Discounitng factor (%)**	8.61%	
13	**Interest on WC @11.17% & Increase in WC**	11.17%	
14	**Interest on loan**	9.67%	

HALAIPANI HYDRO ELECTRIC PROJECT (4X4 MW)

SUMMARISED COST OF CIVIL AND E&M COST WITH ESCALATION

Cost in Rs in Lac as on 31.01.2021								
Sl. No.	Item	Escalation p.a	Present day Cost (INR Lacs)	Half Yearly Phasing (months)				
				0-6	7-12	13-18	19-24	24-30
	TOTAL (CIVIL COST incl HM COST)		11178.64	1117.86	1676.80	2794.60	3912.52	1676.80
	Civil Cost in % Phase Wise			10.00%	15.00%	25.00%	35.00%	15.00%
	Escalation in Months			9	15	21	27	33
	Escalation Rate @ 2.42% p.a			1.82%	3.03%	4.24%	5.45%	6.66%
	Escalation 2.42% p.a	**2.42%**	513.99	20.29	50.72	118.35	213.04	111.59
	%							
	TOTAL (CIVIL COST with Escalation	**A**	**11692.63**	**1138.15**	**1727.52**	**2912.95**	**4125.56**	**1788.39**
	TOTAL (E & M COST) & Audit & Accounts		1764.13	0	88.21	176.41	705.65	793.86
	E & M COST & Audit & Accounts in % Phase wise			0.00%	5.00%	10.00%	40.00%	45.00%
	Escalation in Months			9	15	21	27	33
	Escalation Rate @ 3.26% p.a			2.445%	4.075%	5.71%	7.34%	8.97%
	Escalation 3.26% p.a	**3.26%**	136.59	0.00	3.59	10.06	51.76	71.17
	%							
	Total E&M Cost With Escalation	**B**	**1900.72**	**0.00**	**91.80**	**186.47**	**757.41**	**865.03**
	GRAND TOTAL (CIVIL, E&M COSTS, Accounts & Audit) without Escalation		12942.77	1117.86	1765.01	2971.01	4618.17	2470.66
	GRAND TOTAL (CIVIL , E&M COSTS, Audit & Accounts)	**A+B**	**13593.35**	**1138.15**	**1819.33**	**3099.43**	**4882.97**	**2653.42**
	WITH ESCALATION							

HALAIPANI HYDRO ELECTRIC PROJECT (4X4 MW)

INTEREST DURING CONSTRUCTION PERIOD				
Description	**%**	**Units**		**Total cost**
Civil Cost without IDC		INR Lakhs		11692.63
Means of Finance				
Promoter	30%	INR Lakhs		3507.79
Loan	70%	INR Lakhs		8184.84

	Infrastructure Period	Construction Period 30 months					
	6 months	**1st year**		**2nd year**		**3rd year**	**Total**
		I^{st} 6 Months	II^{nd} 6 Months	I^{st} 6 Months	II^{nd} 6 Months	I^{st} 6 Months	
Promoter Contribution	0.00	341.44	518.26	873.89	1237.67	536.52	3507.77
Bank T/L	0.00	796.70	1209.27	2039.07	2887.89	1251.87	8184.80
Total Requirement	0.00	1138.15	1727.52	2912.95	4125.56	1788.39	11692.57
%		9.73%	14.77%	24.91%	35.28%	15.30%	100%

Interest during Construction for 30 Months						
Interest @		**9.67%**				**Rs. Lakhs**
1st year		**2^{nd} year**		**3^{rd} year**		**Total IDC**
1^{st} Sem	2^{nd} Sem	1^{st} Sem	2^{nd} Sem	1^{st} Sem		
19.26	68.69	150.54	276.92	390.39		905.80

Semester wise Interest Calculation

	FIRST YEAR		**SECOND YEAR**		**THIRD YEAR**		**Total**
	1^{st} Sem	2^{nd} Sem	1^{st} Sem	2^{nd} Sem	1^{st} Sem		**Rs. Lakhs**
% of Debt	9.73%	14.77%	24.91%	35.28%	15.30%		
DEBT	796.70	1,209.27	2,039.07	2,887.89	1,251.87		8,184.80
INTEREST							
1-1	19.26						19.26
1-2	39.45	29.23					68.69
2-1	41.36	59.88	49.29				150.54
2-2	43.36	62.78	100.97	69.81			276.92
3-1	45.46	65.81	105.85	143.01	30.26		390.39
TOTAL							**905.80**

HALAIPANI HYDRO ELECTRIC PROJECT (4X4 MW)

INTEREST DURING CONSTRUCTION PERIOD				
Description	**%**	**Units**		**Total cost**
E & M Cost without IDC		INR Lakhs		1900.72
Means of Finance				
Promoter	30%	INR Lakhs		570.22
Loan	70%	INR Lakhs		1330.50

	Infrastructure Period	**Construction Period 30 months**					
	6 months	**1st year**		**2nd year**		**3rd year**	**Total**
		Ist 6 Months	Iind 6 Months	Ist 6 Months	Iind 6 Months	Ist 6 Months	
Promoter Contribution	0.00	0.00	27.54	55.94	227.22	259.51	570.22
Bank T/L	0.00	0.00	64.26	130.53	530.19	605.52	1330.50
Total Requirement	0.00	0.00	91.80	186.47	757.41	865.03	1900.72
%		0.00%	4.83%	9.81%	39.85%	45.51%	100%

Interest during Construction for 30 Months						
Interest @		**9.67%**				**Rs. Lakhs**
1st year		**2nd year**		**3rd year**		**Total IDC**
1st Sem	2nd Sem	1st Sem	2nd Sem	1st Sem		
0.00	1.55	6.34	22.62	51.17		81.67

Semester wise Interest Calculation

	FIRST YEAR		**SECOND YEAR**		**THIRD YEAR**		**Total**
	1st sem	**2nd Sem**	**1st Sem**	**2nd Sem**	**1st Sem**		**Rs. Lakhs**
% of Debt	0.00%	4.83%	9.81%	39.85%	45.51%		
DEBT	0.00	64.26	130.53	530.19	605.52		1,330.50
INTEREST							
1-1	0.00						0.00
1-2	0.00	1.55					1.55
2-1	0.00	3.18	3.16				6.34
2-2	0.00	3.34	6.46	12.82			22.62
3-1	0.00	3.50	6.78	26.25	14.64		51.17
TOTAL							**81.67**

HALAIPANI HYDRO ELECTRIC PROJECT (4X4 MW)

INTEREST DURING CONSTRUCTION PERIOD				
Description	**%**	**Units**		**Total Cost**
Total Project Cost without IDC		INR Lakhs		13593.35
Means of Finance				
Promoter	30%	INR Lakhs		4078.01
Loan	70%	INR Lakhs		9515.35

	Infrastructure Period	Construction Period 30 months					
	6 months	**1st year**		**2nd year**		**3rd year**	**Total**
		Ist 6 Months	IInd 6 Months	Ist 6 Months	IInd 6 Months	Ist 6 Months	
Promoter Contribution	0.00	341.44	545.80	929.83	1464.89	796.03	4077.99
Bank T/L	0	796.70	1273.53	2169.60	3418.08	1857.39	9515.30
Total Requirement	0.00	1138.15	1819.33	3099.43	4882.97	2653.42	13593.29
%		8.37%	13.38%	22.80%	35.92%	19.52%	100%

Interest during Construction for 30 Months						
Interest @		**9.67%**				**Rs. Lakhs**
1st year		**2nd year**		**3rd year**		**Total IDC**
1st Sem	2nd Sem	1st Sem	2nd Sem	1st Sem		
19.26	70.24	156.87	299.54	441.56		987.47

Semester wise Interest Calculation

	FIRST YEAR		**SECOND YEAR**		**THIRD YEAR**		**Total**
	1st sem	2nd Sem	1st Sem	2nd Sem	1st Sem		**Rs. Lakhs**
% of Debt	8.37%	13.38%	22.80%	35.92%	19.52%		
DEBT	796.70	1,273.53	2,169.60	3,418.08	1,857.39		9,515.30
INTEREST							
1-1	19.26						19.26
1-2	39.45	30.79					70.24
2-1	41.36	63.06	52.45				156.87
2-2	43.36	66.11	107.44	82.63			299.54
3-1	45.46	69.31	112.63	169.26	44.90		441.56
TOTAL							**987.47**

NAME OF THE PROJECT : HALAPANI HYDRO ELECTRIC PROJECT

Cost Of Project	**13797.48**	**Land**	**0.00**
IDC	**987.47**	**E&M**	**1982.39**
Total Cost Of Project	**14784.95**	**Civil & others**	**12802.56**
Promoters Equity 30 %	**4435.49**		**14784.95**
Loan 70 %	**10349.47**		

GENERATION COST AND TARIFF (WITHOUT SUBSIDY) (Rs. In Lakhs)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Capacity	MW	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00
2	Power Generation/annum Free Energy to State & Local Community @ 23.05% (Moratorium for 1 year from Scheduled Commercial Operation Date)	Units (in Lakhs)	1035.50	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82
3	Sale Price per unit	in Rs	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13
	Fixed Cost																																									
3	O & M Expenses @ 31.34 lakh/MW , escalated @ 3.84 % per annum	Rs.in lakhs	501.44	520.70	540.69	561.45	583.01	605.40	628.65	652.79	677.85	703.88	730.91	758.98	788.13	818.39	849.82	882.45	916.33	951.52	988.06	1026.00	1065.40	1106.31	1148.79	1192.91	1238.71	1286.28	1335.67	1386.96	1440.22	1495.53	1552.96	1612.59	1674.51	1738.82	1805.59	1874.92	1946.92	2021.68	2099.31	2179.92
4	Interest on WC Loan @ 11.17 % interset	Rs.in lakhs	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51
5	Interest on loan @ 9.67% interest	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Return on equity @16.96 % p.a for 20 years and @ 21.52 % after 20 years onwards	Rs.in lakhs	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52
7	CDM Benifits		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Depreciation for 1st 15 years@ 4.67% and 16th onwards @ 0.80%	Rs.in lakhs	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28
9	local area development @1 P/unit		10.36	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97	7.97
10	**Total Expenses (3+4+5+6+7+8)**	Rs.in lakhs	**2968.12**	**2901.59**	**2838.18**	**2775.54**	**2713.70**	**2652.69**	**2592.54**	**2533.28**	**2474.95**	**2417.58**	**2361.21**	**2305.88**	**2293.32**	**2323.58**	**2355.01**	**1815.47**	**1849.35**	**1884.54**	**1921.08**	**1959.02**	**2200.68**	**2241.59**	**2284.07**	**2328.18**	**2373.99**	**2421.56**	**2470.95**	**2522.24**	**2575.50**	**2630.80**	**2688.23**	**2747.87**	**2809.79**	**2874.09**	**2940.86**	**3010.20**	**3082.19**	**3156.95**	**3234.59**	**3315.20**
11	Tariff Per Unit	Rs per Unit	**2.87**	**3.64**	**3.56**	**3.48**	**3.41**	**3.33**	**3.25**	**3.18**	**3.11**	**3.03**	**2.96**	**2.89**	**2.88**	**2.92**	**2.96**	**2.28**	**2.32**	**2.37**	**2.41**	**2.46**	**2.76**	**2.81**	**2.87**	**2.92**	**2.98**	**3.04**	**3.10**	**3.17**	**3.23**	**3.30**	**3.37**	**3.45**	**3.53**	**3.61**	**3.69**	**3.78**	**3.87**	**3.96**	**4.06**	**4.16**
12	Discount Factor	8.61%	**0.92**	**0.85**	**0.78**	**0.72**	**0.66**	**0.61**	**0.56**	**0.52**	**0.48**	**0.44**	**0.40**	**0.37**	**0.34**	**0.31**	**0.29**	**0.27**	**0.25**	**0.23**	**0.21**	**0.19**	**0.18**	**0.16**	**0.15**	**0.14**	**0.13**	**0.12**	**0.11**	**0.10**	**0.09**	**0.08**	**0.08**	**0.07**	**0.07**	**0.06**	**0.06**	**0.05**	**0.05**	**0.04**	**0.04**	**0.04**
13	Present value of cost	Rs per Unit	**2.64**	**3.09**	**2.78**	**2.50**	**2.25**	**2.03**	**1.83**	**1.64**	**1.48**	**1.33**	**1.19**	**1.07**	**0.98**	**0.92**	**0.86**	**0.61**	**0.57**	**0.53**	**0.50**	**0.47**	**0.49**	**0.46**	**0.43**	**0.40**	**0.38**	**0.35**	**0.33**	**0.31**	**0.29**	**0.28**	**0.26**	**0.25**	**0.23**	**0.22**	**0.20**	**0.19**	**0.18**	**0.17**	**0.16**	**0.15**
14	Levelised tariff for 15 Years	Rs per Unit	**3.223**																																							
15	Levelised tariff for 40 Years	Rs per Unit	**3.13**																																							
16	**Working capital**																																									
a	Maintenance for spares @15% of O&M	Rs.in lakhs	75.216	78.104	81.103	84.218	87.452	90.810	94.297	97.918	101.678	105.583	109.637	113.847	118.219	122.758	127.472	132.367	137.450	142.728	148.209	153.900	159.810	165.947	172.319	178.936	185.807	192.942	200.351	208.045	216.034	224.329	232.944	241.889	251.177	260.822	270.838	281.238	292.038	303.252	314.897	326.989
b	O&M charges for one month	Rs.in lakhs	41.79	43.39	45.06	46.79	48.58	50.45	52.39	54.40	56.49	58.66	60.91	63.25	65.68	68.20	70.82	73.54	76.36	79.29	82.34	85.50	88.78	92.19	95.73	99.41	103.23	107.19	111.31	115.58	120.02	124.63	129.41	134.38	139.54	144.90	150.47	156.24	162.24	168.47	174.94	181.66
c	45 days receivables	Rs.in lakhs	371.02	362.70	354.78	346.95	339.22	331.59	324.07	316.66	309.37	302.20	295.16	288.24	286.67	290.45	294.38	226.94	231.17	235.57	240.14	244.88	275.09	280.20	285.51	291.03	296.75	302.70	308.87	315.28	321.94	328.86	336.03	343.49	351.23	359.27	367.61	376.28	385.28	394.62	404.33	414.40
d	Total Working Capital	Rs.in lakhs	488.02	484.20	480.94	477.95	475.25	472.85	470.76	468.98	467.54	466.44	465.70	465.33	470.57	481.41	492.67	432.84	444.99	457.59	470.69	484.28	523.68	538.34	553.57	569.37	585.79	602.83	620.53	638.91	657.99	677.81	698.39	719.76	741.95	764.99	788.92	813.76	839.56	866.35	894.17	923.05
e	Interest on WC @11.17 % & Increase in WC	Rs.in lakhs	54.51	-3.82	-3.26	-2.99	-2.70	-2.40	-2.09	-1.77	-1.44	-1.10	-0.74	-0.37	5.23	10.84	11.26	-59.83	12.14	12.61	13.09	13.60	39.40	14.66	15.22	15.81	16.41	17.04	17.70	18.38	19.08	19.82	20.58	21.37	22.19	23.04	23.93	24.84	25.80	26.79	27.82	28.89

	DEPRECIATION (WITHOUT SUBSIDY)		
1	Land	Rs.in lakhs	0.00
2	Building	Rs.in lakhs	12802.56
3	Machinery	Rs.in lakhs	1982.39
		Rs.in lakhs	14784.95

	DEPRECIATION AS PER CERC NORMS	(AS PER SLM METHOD)	
1	Depreciation for 15 Years	Rs.in lakhs	4.67%	690.46
2	Depreciation Thereafter	Rs.in lakhs	0.80%	118.28

	DEPRECIATION AS PER COMPANIES ACT	(AS PER SLM METHOD)	
1	Depreciation for Buildings	Rs.in lakhs	3.34%	427.61
2	Plant and Machinery	Rs.in lakhs	5.28%	104.67
		Rs.in lakhs		**532.28**

	DEPRECIATION AS PER IT ACT	(AS PER WDV METHOD)
1	Depreciation for Buildings	10.00%
2	Plant and Machinery	15.00%

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
	Opening Value																																										
1	Building	Rs.in lakhs	12802.56	11522.30	10370.07	9333.07	8399.76	7559.78	6803.80	6123.42	5511.08	4959.97	4463.98	4017.58	3615.82	3254.24	2928.81	2635.93	2372.34	2135.11	1921.60	1729.44	1556.49	1400.84	1260.76	1134.68	1021.21	919.09	827.18	744.47	670.02	603.02	542.72	488.44	439.60	395.64	356.08	320.47	288.42	259.58	233.62	210.26
2	Plant and Machinery	Rs.in lakhs	1982.39	1685.03	1432.28	1217.44	1034.82	879.60	747.66	635.51	540.18	459.16	390.28	331.74	281.98	239.68	203.73	173.17	147.19	125.12	106.35	90.40	76.84	65.31	55.51	47.19	40.11	34.09	28.98	24.63	20.94	17.80	15.13	12.86	10.93	9.29	7.90	6.71	5.71	4.85	4.12	3.50
	Depreciation																																									
3	Building	Rs.in lakhs	1280.26	1152.23	1037.01	933.31	839.98	755.98	680.38	612.34	551.11	496.00	446.40	401.76	361.58	325.42	292.88	263.59	237.23	213.51	192.16	172.94	155.65	140.08	126.08	113.47	102.12	91.91	82.72	74.45	67.00	60.30	54.27	48.84	43.96	39.56	35.61	32.05	28.84	25.96	23.36	21.03
4	Plant and Machinery	Rs.in lakhs	297.36	252.76	214.84	182.62	155.22	131.94	112.15	95.33	81.03	68.87	58.54	49.76	42.30	35.95	30.56	25.98	22.08	18.77	15.95	13.56	11.53	9.80	8.33	7.08	6.02	5.11	4.35	3.69	3.14	2.67	2.27	1.93	1.64	1.39	1.18	1.01	0.86	0.73	0.62	0.53
5	**Total (3+4)**	Rs.in lakhs	**1577.61**	**1404.99**	**1251.85**	**1115.92**	**995.20**	**887.92**	**792.53**	**707.67**	**632.14**	**564.87**	**504.94**	**352.00**	**319.29**	**289.47**	**262.32**	**237.62**	**215.15**	**194.74**	**176.21**	**159.38**	**167.17**	**149.88**	**134.40**	**120.55**	**108.14**	**97.02**	**87.07**	**78.14**	**70.14**	**62.97**	**56.54**	**50.77**	**45.60**	**40.96**	**36.79**	**33.05**	**29.70**	**26.69**	**23.98**	**21.55**
	Closing Balance																																									
6	Building	Rs.in lakhs	11522.30	10370.07	9333.07	8399.76	7559.78	6803.80	6123.42	5511.08	4959.97	4463.98	4017.58	3615.82	3254.24	2928.81	2635.93	2372.34	2135.11	1921.60	1729.44	1556.49	1400.84	1260.76	1134.68	1021.21	919.09	827.18	744.47	670.02	603.02	542.72	488.44	439.60	395.64	356.08	320.47	288.42	259.58	233.62	210.26	189.23
7	Plant and Machinery	Rs.in lakhs	1685.03	1432.28	1217.44	1034.82	879.60	747.66	635.51	540.18	459.16	390.28	331.74	281.98	239.68	203.73	173.17	147.19	125.12	106.35	90.40	76.84	65.31	55.51	47.19	40.11	34.09	28.98	24.63	20.94	17.80	15.13	12.86	10.93	9.29	7.90	6.71	5.71	4.85	4.12	3.50	2.98
8	**Total (6+7)**	Rs.in lakhs	**13207.34**	**11802.35**	**10550.50**	**9434.58**	**8439.38**	**7551.46**	**6758.93**	**6051.27**	**5419.13**	**4854.26**	**4349.32**	**3897.80**	**3493.92**	**3132.54**	**2809.10**	**2519.53**	**2260.22**	**2027.94**	**1819.83**	**1633.33**	**1466.15**	**1316.27**	**1181.87**	**1061.32**	**953.19**	**856.16**	**769.10**	**690.96**	**620.81**	**557.84**	**501.30**	**450.53**	**404.93**	**363.97**	**327.18**	**294.13**	**264.43**	**237.74**	**213.76**	**192.21**

PROFITABILITY STATEMENT (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Annual Revenue	Rs.in lakhs	3241.76	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54
2	CO_2 Revenue	Rs.in lakhs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Total Income (1+2)	Rs.in lakhs	**3241.76**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**	**2494.54**
	Fixed Cost																																									
4	O & M Expenses @ 31.34 lakh/MW , escalated @ 3.84 % per annum	Rs.in lakhs	501.44	520.70	540.69	561.45	583.01	605.40	628.65	652.79	677.85	703.88	730.91	758.98	788.13	818.39	849.82	882.45	916.33	951.52	988.06	1026.00	1065.40	1106.31	1148.79	1192.91	1238.71	1286.28	1335.67	1386.96	1440.22	1495.53	1552.96	1612.59	1674.51	1738.82	1805.59	1874.92	1946.92	2021.68	2099.31	2179.92
5	Depreciation	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Interest on loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Interest on W/c loan	Rs.in lakhs	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51	54.51
8	Total Cost (4+5+6+7)	Rs.in lakhs	**2047.32**	**1983.18**	**1919.77**	**1857.14**	**1795.30**	**1734.28**	**1674.13**	**1614.87**	**1556.54**	**1499.17**	**1442.80**	**1387.47**	**1374.91**	**1405.18**	**1436.60**	**1469.24**	**1503.12**	**1538.31**	**1574.85**	**1612.79**	**1652.19**	**1693.10**	**1735.58**	**1779.69**	**1825.50**	**1873.07**	**1629.92**	**1441.48**	**1494.74**	**1550.04**	**1607.47**	**1667.10**	**1729.03**	**1793.33**	**1860.10**	**1929.43**	**2001.43**	**2076.19**	**2153.82**	**2234.44**
9	Profit Before Tax (3-8)	Rs.in lakhs	1194.44	511.36	574.76	637.40	699.24	760.25	820.40	879.66	938.00	995.37	1051.74	1107.07	1119.62	1089.36	1057.93	1025.30	991.41	956.23	919.69	881.75	842.35	801.44	758.95	714.84	669.03	621.47	864.61	1053.06	999.80	944.50	887.07	827.43	765.51	701.21	634.44	565.10	493.11	418.35	340.71	260.10
10	Less Tax	Rs.in lakhs	208.67	89.33	100.41	111.35	122.16	132.82	143.32	153.68	163.87	173.89	183.74	193.40	195.60	190.31	184.82	179.12	173.20	167.05	160.67	154.04	147.16	140.01	132.59	393.62	381.95	369.22	355.44	340.64	324.82	308.00	290.19	271.37	251.54	230.69	208.82	185.90	161.92	136.85	110.67	83.35
11	Profit After Tax (9-10)	Rs.in lakhs	985.77	422.02	474.35	526.05	577.08	627.44	677.08	725.99	774.13	821.48	868.00	913.66	924.02	899.05	873.11	846.18	818.21	789.17	759.02	727.71	695.19	661.43	626.37	321.22	287.08	252.25	509.17	712.42	674.98	636.49	596.88	556.07	513.97	470.52	425.62	379.21	331.19	281.50	230.05	176.75
	INCOME TAX (WITHOUT SUBSIDY)																																									
Sl.No	**Description**	**UNIT**	**Year1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year10**	**Year 11**	**Year 12**	**Year 13**	**Year 14**	**Year 15**	**Year 16**	**Year 17**	**Year 18**	**Year 19**	**Year 20**	**Year 21**	**Year 22**	**Year 23**	**Year 24**	**Year 25**	**Year 26**	**Year 27**	**Year 28**	**Year 29**	**Year 30**	**Year 31**	**Year 32**	**Year 33**	**Year 34**	**Year 35**	**Year 36**	**Year 37**	**Year 38**	**Year 39**	**Year 40**
1	Book Profit	Rs.in lakhs	1194.44	511.36	574.76	637.40	699.24	760.25	820.40	879.66	938.00	995.37	1051.74	1107.07	1119.62	1089.36	1057.93	1025.30	991.41	956.23	919.69	881.75	842.35	801.44	758.95	714.84	669.03	621.47	864.61	1053.06	999.80	944.50	887.07	827.43	765.51	701.21	634.44	565.10	493.11	418.35	340.71	260.10
2	Add Depreciation as per books	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Less Depreciation as per IT Act	Rs.in lakhs	1577.61	1404.99	1251.85	1115.92	995.20	887.92	792.53	707.67	632.14	564.87	504.94	352.00	319.29	289.47	262.32	237.62	215.15	194.74	176.21	159.38	167.17	149.88	134.40	120.55	108.14	97.02	87.07	78.14	70.14	62.97	56.54	50.77	45.60	40.96	36.79	33.05	29.70	26.69	23.98	21.55
4	Taxable Profit	Rs.in lakhs	149.10	-361.35	-144.81	53.75	236.32	404.61	560.15	704.27	838.14	962.77	1079.07	1287.35	1332.61	1332.16	1327.89	1319.96	1308.54	1293.76	1275.76	1254.64	1207.45	1183.83	1156.83	1126.57	1093.17	1056.72	1017.28	974.92	929.66	881.52	830.53	776.66	719.91	660.25	597.65	532.05	463.41	391.66	316.73	238.55
5	Normal Income Tax Rate	%	34.94%	34.94%	34.94%	34.94%	34.94%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%
6	Income tax under normal provisions	Rs.in lakhs	0.00	-126.26	-50.60	18.78	82.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	461.19	457.20	452.04	445.75	438.37	421.88	413.63	404.20	393.62	381.95	369.22	355.44	340.64	324.82	308.00	290.19	271.37	251.54	230.69	208.82	185.90	161.92	136.85	110.67	83.35
7	MAT RATE	%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%
8	Tax as per MAT	Rs.in lakhs	208.67	89.33	100.41	111.35	122.16	132.82	143.32	153.68	163.87	173.89	183.74	193.40	195.60	190.31	184.82	179.12	173.20	167.05	160.67	154.04	147.16	140.01	132.59	124.88	116.88	108.57	151.05	183.97	174.67	165.00	154.97	144.55	133.73	122.50	110.84	98.72	86.15	73.08	59.52	45.44
9	TAX PAYABLE	Rs.in lakhs	208.67	89.33	100.41	111.35	122.16	132.82	143.32	153.68	163.87	173.89	183.74	193.40	195.60	190.31	184.82	461.19	457.20	452.04	445.75	438.37	421.88	413.63	404.20	393.62	381.95	369.22	355.44	340.64	324.82	308.00	290.19	271.37	251.54	230.69	208.82	185.90	161.92	136.85	110.67	83.35
10	MAT Credit Available	Rs.in lakhs	208.67	89.33	100.41	111.35	122.16	132.82	143.32	153.68	163.87	173.89	183.74	193.40	195.60	190.31	184.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	MAT credit availed	Rs.in lakhs					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	282.07	284.00	284.99	285.08	284.33	274.72	273.62	271.61																	
12	Income Tax payable after availing MAT Credit	Rs.in lakhs	208.67	89.33	100.41	111.35	122.16	132.82	143.32	153.68	163.87	173.89	183.74	193.40	195.60	190.31	184.82	179.12	173.20	167.05	160.67	154.04	147.16	140.01	132.59	393.62	381.95	369.22	355.44	340.64	324.82	308.00	290.19	271.37	251.54	230.69	208.82	185.90	161.92	136.85	110.67	83.35
																	1715.45							2240.42																	
																									-524.97																	

CASH FLOW (WITHOUT SUBSIDY)

Sl.No	Description	PRE OPERATIVE PERIOD	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Profit as per profit and loss		1194.44	511.36	574.76	637.40	699.24	760.25	820.40	879.66	938.00	995.37	1051.74	1107.07	1119.62	1089.36	1057.93	1025.30	991.41	956.23	919.69	881.75	842.35	801.44	758.95	714.84	669.03	621.47	864.61	1053.06	999.80	944.50	887.07	827.43	765.51	701.21	634.44	565.10	493.11	418.35	340.71	260.10
2	ADD Non cash expences – Depreciation		532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	CASH PROFIT		**1726.72**	**1043.63**	**1107.04**	**1169.68**	**1231.52**	**1292.53**	**1352.68**	**1411.94**	**1470.27**	**1527.64**	**1584.01**	**1639.34**	**1651.90**	**1621.63**	**1590.21**	**1557.58**	**1523.69**	**1488.50**	**1451.96**	**1414.02**	**1374.62**	**1333.71**	**1291.23**	**1247.12**	**1201.31**	**1153.74**	**1104.35**	**1053.06**	**999.80**	**944.50**	**887.07**	**827.43**	**765.51**	**701.21**	**634.44**	**565.10**	**493.11**	**418.35**	**340.71**	**260.10**
4	Equity	**4435.49**																																								
5	Term Loan	**10349.47**																																								
6	W/C Loan		341.62																																							
7	**Total**	**14784.95**	**2068.33**	**1043.63**	**1107.04**	**1169.68**	**1231.52**	**1292.53**	**1352.68**	**1411.94**	**1470.27**	**1527.64**	**1584.01**	**1639.34**	**1651.90**	**1621.63**	**1590.21**	**1557.58**	**1523.69**	**1488.50**	**1451.96**	**1414.02**	**1374.62**	**1333.71**	**1291.23**	**1247.12**	**1201.31**	**1153.74**	**1104.35**	**1053.06**	**999.80**	**944.50**	**887.07**	**827.43**	**765.51**	**701.21**	**634.44**	**565.10**	**493.11**	**418.35**	**340.71**	**260.10**
	Application of Funds																																								
8	Assets	**14784.95**																																								
9	Increase in W/c	Rs.in lakhs	488.02	-3.82	-3.26	-2.99	-2.70	-2.40	-2.09	-1.77	-1.44	-1.10	-0.74	-0.37	5.23	10.84	11.26	-59.83	12.14	12.61	13.09	13.60	39.40	14.66	15.22	15.81	16.41	17.04	17.70	18.38	19.08	19.82	20.58	21.37	22.19	23.04	23.93	24.84	25.80	26.79	27.82	28.89
10	Repayment of Loan	Rs.in lakhs	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Income Tax	Rs.in lakhs	208.67	89.33	100.41	111.35	122.16	132.82	143.32	153.68	163.87	173.89	183.74	193.40	195.60	190.31	184.82	179.12	173.20	167.05	160.67	154.04	147.16	140.01	132.59	393.62	381.95	369.22	355.44	340.64	324.82	308.00	290.19	271.37	251.54	230.69	208.82	185.90	161.92	136.85	110.67	83.35
12	**TOTAL**	**14784.95**	**1559.15**	**947.97**	**959.61**	**970.82**	**981.91**	**992.87**	**1003.69**	**1014.36**	**1024.88**	**1035.25**	**1045.45**	**1055.49**	**200.83**	**201.16**	**196.08**	**119.29**	**185.34**	**179.66**	**173.76**	**167.64**	**186.56**	**154.67**	**147.81**	**409.43**	**398.37**	**386.26**	**373.14**	**359.02**	**343.91**	**327.82**	**310.76**	**292.73**	**273.73**	**253.73**	**232.74**	**210.74**	**187.71**	**163.64**	**138.48**	**112.24**
13	**Opening Cash Balance**	0.00	0.00	509.19	604.85	752.29	951.14	1200.74	1500.40	1849.39	2246.97	2692.37	3184.76	3723.32	4307.17	5758.24	7178.72	8572.84	10011.13	11349.48	12658.32	13936.52	15182.90	16370.97	17550.01	18693.43	19531.12	20334.06	21101.54	21832.75	22526.79	23182.69	23799.36	24375.66	24910.36	25402.15	25849.62	26251.32	26605.68	26911.07	27165.78	27368.01
14	**Net cash inflow**	0.00	509.19	95.67	147.43	198.85	249.60	299.66	348.99	397.58	445.39	492.39	538.56	583.85	1451.07	1420.48	1394.13	1438.28	1338.35	1308.84	1278.20	1246.39	1188.07	1179.04	1143.42	837.69	802.94	767.48	731.21	694.04	655.89	616.67	576.30	534.70	491.78	447.48	401.69	354.36	305.39	254.71	202.23	-27368.01
15	**Closing Balance**	0.00	509.19	604.85	752.29	951.14	1200.74	1500.40	1849.39	2246.97	2692.37	3184.76	3723.32	4307.17	5758.24	7178.72	8572.84	10011.13	11349.48	12658.32	13936.52	15182.90	16370.97	17550.01	18693.43	19531.12	20334.06	21101.54	21832.75	22526.79	23182.69	23799.36	24375.66	24910.36	25402.15	25849.62	26251.32	26605.68	26911.07	27165.78	27368.01	0.00

INTERNAL RATE OF RETURN (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	PAT	Rs.in lakhs	985.77	422.02	474.35	526.05	577.08	627.44	677.08	725.99	774.13	821.48	868.00	913.66	924.02	899.05	873.11	846.18	818.21	789.17	759.02	727.71	695.19	661.43	626.37	321.22	287.08	252.25	509.17	712.42	674.98	636.49	596.88	556.07	513.97	470.52	425.62	379.21	331.19	281.50	230.05	176.75
2	Add Depreciation	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Add Interest on term loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Terminal Value	**-14784.95**	2477.14	1829.99	1798.92	1767.22	1734.85	1701.81	1668.05	1633.56	1598.30	1562.25	1525.37	1487.64	1456.30	1431.32	1405.39	1378.46	1350.49	1321.45	1291.29	1259.98	1227.47	1193.70	1158.64	853.49	819.36	784.52	748.91	712.42	674.98	636.49	596.88	556.07	513.97	470.52	425.62	379.21	331.19	281.50	230.05	176.75
	IRR	**10.74%**																																								

DEBT SERVICE COVERAGE RATIO (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year11	Year12
1	PAT	Rs.in lakhs	985.77	422.02	474.35	526.05	577.08	627.44	677.08	725.99	774.13	821.48	868.00	913.66
2	Interest on term loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70
3	Add Depreciation	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28
4	**TOTAL**	Rs.in lakhs	**2477.14**	**1829.99**	**1798.92**	**1767.22**	**1734.85**	**1701.81**	**1668.05**	**1633.56**	**1598.30**	**1562.25**	**1525.37**	**1487.64**
6	Interest on term loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70
7	Principle Repayment	Rs.in lakhs	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46
8	**TOTAL**	Rs.in lakhs	**1821.55**	**1738.15**	**1654.75**	**1571.35**	**1487.95**	**1404.55**	**1321.15**	**1237.75**	**1154.35**	**1070.95**	**987.55**	**904.16**
9	DSCR		1.36	1.05	1.09	1.12	1.17	1.21	1.26	1.32	1.38	1.46	1.54	1.65

Average DSCR		**1.30**

NET PRESENT VALUE AND BENEFIT COST RATIO (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Expences																																										
	O & M Expenses @ 31.34 lakh/MW , escalated @ 3.84 % per annum	Rs.in lakhs	501.44	520.70	540.69	561.45	583.01	605.40	628.65	652.79	677.85	703.88	730.91	758.98	788.13	818.39	849.82	882.45	916.33	951.52	988.06	1026.00	1065.40	1106.31	1148.79	1192.91	1238.71	1286.28	1335.67	1386.96	1440.22	1495.53	1552.96	1612.59	1674.51	1738.82	1805.59	1874.92	1946.92	2021.68	2099.31	2179.92
2	Income tax under normal provisions	Rs.in lakhs	208.67	89.33	100.41	111.35	122.16	132.82	143.32	153.68	163.87	173.89	183.74	193.40	195.60	190.31	184.82	179.12	173.20	167.05	160.67	154.04	147.16	140.01	132.59	393.62	381.95	369.22	355.44	340.64	324.82	308.00	290.19	271.37	251.54	230.69	208.82	185.90	161.92	136.85	110.67	83.35
3	Total Expences	Rs.in lakhs	710.11	610.03	641.10	672.81	705.17	738.22	771.97	806.46	841.72	877.77	914.65	952.39	983.72	1008.70	1034.64	1061.57	1089.53	1118.57	1148.73	1180.04	1212.56	1246.32	1281.38	1586.53	1620.67	1655.50	1691.11	1727.60	1765.05	1803.53	1843.14	1883.96	1926.05	1969.51	2014.40	2060.82	2108.83	2158.52	2209.98	2263.27
4	Income																																									
5	Power Generation/annum Free Energy to State & Local Community @ 23.05% (Moratorium for 1 year from Scheduled Commercial Operation Date)	Units (in Lakhs)	1035.50	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82	796.82
6	Sale Price per unit	in Rs	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13
7	**Total Income**	Rs in Lakhs	3241.76	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54	2494.54
8	Net Surplus/Short fall	Rs in Lakhs	2531.65	1884.51	1853.43	1821.73	1789.37	1756.32	1722.56	1688.07	1652.81	1616.76	1579.88	1542.15	1510.81	1485.84	1459.90	1432.97	1405.00	1375.96	1345.81	1314.49	1281.98	1248.21	1213.15	908.01	873.87	839.04	803.42	766.94	729.49	691.00	651.39	610.58	568.49	525.03	480.13	433.72	385.70	336.01	284.56	231.26
9	Discount Factor	8.61%	0.92	0.85	0.78	0.72	0.66	0.61	0.56	0.52	0.48	0.44	0.40	0.37	0.34	0.31	0.29	0.27	0.25	0.23	0.21	0.19	0.18	0.16	0.15	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.08	0.07	0.07	0.06	0.06	0.05	0.05	0.04	0.04	0.04
10	Net Presesnt Value	Rs in Lakhs	2330.96	1597.56	1446.66	1309.20	1184.00	1070.00	966.24	871.83	785.95	707.86	636.88	572.39	516.30	467.51	422.94	382.23	345.06	311.14	280.19	251.98	226.26	202.84	181.51	125.09	110.84	97.99	86.39	75.93	66.50	57.99	50.34	43.44	37.24	31.67	26.66	22.18	18.16	14.56	11.36	8.50
11	**NPV of 40 years Revenues at a discounting factor of 8.61%**		15,063.87																																							
12	**Benefit Cost Ratio**		1.02																																							

LOAN REPAYMENT SCHEDULE (WITHOUT SUBSIDY)

Quarter Number	Opening Balance	Installment	Closing Balance	Av Loan	Interest @ 9.67 %	Total Interest	Principle
1	10349.47	215.61	10133.85	10241.66	247.59		
2	10133.85	215.61	9918.24	10026.05	242.38		
3	9918.24	215.61	9702.62	9810.43	237.17		
4	9702.62	215.61	9487.01	9594.82	231.95	959.09	862.46
5	9487.01	215.61	9271.40	9379.20	226.74		
6	9271.40	215.61	9055.78	9163.59	221.53		
7	9055.78	215.61	8840.17	8947.98	216.32		
8	8840.17	215.61	8624.56	8732.36	211.10	875.69	862.46
9	8624.56	215.61	8408.94	8516.75	205.89		
10	8408.94	215.61	8193.33	8301.13	200.68		
11	8193.33	215.61	7977.71	8085.52	195.47		
12	7977.71	215.61	7762.10	7869.91	190.25	792.29	862.46
13	7762.10	215.61	7546.49	7654.29	185.04		
14	7546.49	215.61	7330.87	7438.68	179.83		
15	7330.87	215.61	7115.26	7223.07	174.62		
16	7115.26	215.61	6899.64	7007.45	169.41	708.90	862.46
17	6899.64	215.61	6684.03	6791.84	164.19		
18	6684.03	215.61	6468.42	6576.22	158.98		
19	6468.42	215.61	6252.80	6360.61	153.77		
20	6252.80	215.61	6037.19	6145.00	148.56	625.50	862.46
21	6037.19	215.61	5821.57	5929.38	143.34		
22	5821.57	215.61	5605.96	5713.77	138.13		
23	5605.96	215.61	5390.35	5498.15	132.92		
24	5390.35	215.61	5174.73	5282.54	127.71	542.10	862.46
25	5174.73	215.61	4959.12	5066.93	122.49		
26	4959.12	215.61	4743.51	4851.31	117.28		
27	4743.51	215.61	4527.89	4635.70	112.07		
28	4527.89	215.61	4312.28	4420.08	106.86	458.70	862.46
29	4312.28	215.61	4096.66	4204.47	101.64		
30	4096.66	215.61	3881.05	3988.86	96.43		
31	3881.05	215.61	3665.44	3773.24	91.22		
32	3665.44	215.61	3449.82	3557.63	86.01	375.30	862.46
33	3449.82	215.61	3234.21	3342.02	80.79		
34	3234.21	215.61	3018.59	3126.40	75.58		
35	3018.59	215.61	2802.98	2910.79	70.37		
36	2802.98	215.61	2587.37	2695.17	65.16	291.90	862.46
37	2587.37	215.61	2371.75	2479.56	59.94		
38	2371.75	215.61	2156.14	2263.95	54.73		
39	2156.14	215.61	1940.52	2048.33	49.52		
40	1940.52	215.61	1724.91	1832.72	44.31	208.50	862.46
41	1724.91	215.61	1509.30	1617.10	39.09		
42	1509.30	215.61	1293.68	1401.49	33.88		
43	1293.68	215.61	1078.07	1185.88	28.67		
44	1078.07	215.61	862.46	970.26	23.46	125.10	862.46
45	862.46	215.61	646.84	754.65	18.24		
46	646.84	215.61	431.23	539.03	13.03		
47	431.23	215.61	215.61	323.42	7.82		
48	215.61	215.61	0.00	107.81	2.61	41.70	862.46

BASIC PARAMETER

1.	**Unit Generated after auxiliry consumption @ 1% & transformer losses @ 0.05%**	**at 60 % PLF**		**828.39**	**Lakh**
	Free power to state and local area development			23.05%	
	Unit of Sale			637.44	
2.	**Sale Price (Rs)**	(Levelised teriff for 40 years)		3.91	
	Useful Life	Year		40.00	
3.	**Debt Equity Ratio**				
	(a) Debt (%)			70%	
	(b) Equity (%)			30%	
	Moratorium Period	Year		30	
4	**Construction period (years)**	year of preconstruction of one year			
	Repayment Quarterly	**No of Installment**		48	
	Repayment Quarterly	**in Lacs**			
5	**Period of repayment**			12	year
6	CDM Benefit			0	
7	**Return on Equity (%)**				
		for first 20 years		16.96%	p.a
		after 20 years onwards		21.52%	p.a
8	**Depreciation (%) for Tariff**				
	DEPRECIATION A	**(AS PER SLM METHOD)**			
		Depreciation for 15 Years	Rs.in lakhs	4.67%	
		Depreciation Thereafter	Rs.in lakhs	0.80%	
	DEPRECIATION A	**(AS PER SLM METHOD)**			
		Depreciation for Buildings	Rs.in lakhs	3.34%	
		Plant and Machinery	Rs.in lakhs	5.28%	
	DEPRECIATION A	**(AS PER WDV METHOD)**			
	Depreciation for Buildings			10.00%	
	Plant and Machinery			15.00%	
9	**Operation & Maintenance expenses**			31.34%	Rs. Lakh/MW
10	**Annual escalation of O & M cost (%)**			3.84%	per annum
11	**Income tax as per normal provisions**				
	(Tax hpliday for ocntinuous block of 10 years during first 15 years and theerafter normal corporate rates of taxes)				
		(a) as per normal provision		34.94%	
		(b) under MAT (for first 10 years)		17.47%	
12	**Discounitng factor (%)**			8.61%	
13	**Interest on WC @11.17% & Increase in WC**			11.17%	
14	**Interest on loan**			9.67%	

NAME OF THE PROJECT : HALAPANI HYDRO ELECTRIC PROJECT

Cost Of Project	**13797.48**	**Land**	**0.00**
IDC	**987.47**	**E&M**	**1982.39**
Total Cost Of Project	**14784.95**	**Civil & others**	**12802.56**
Promoters Equity 30 %	**4435.49**		**14784.95**
Loan 70 %	**10349.47**		

GENERATION COST AND TARIFF (WITHOUT SUBSIDY) (Rs. In Lakhs)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Capacity	MW	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00
2	Power Generation/annum Free Energy to State & Local Community @ 23.05% (Moratorium for 1 year from Scheduled Commercial Operation Date)	Units (in Lakhs)	828.39	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44
3	Sale Price per unit	in Rs	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91
	Fixed Cost																																									
3	O & M Expenses @ 31.34 lakh/MW , escalated @ 3.84 % per annum	Rs.in lakhs	501.44	520.70	540.69	561.45	583.01	605.40	628.65	652.79	677.85	703.88	730.91	758.98	788.13	818.39	849.82	882.45	916.33	951.52	988.06	1026.00	1065.40	1106.31	1148.79	1192.91	1238.71	1286.28	1335.67	1386.96	1440.22	1495.53	1552.96	1612.59	1674.51	1738.82	1805.59	1874.92	1946.92	2021.68	2099.31	2179.92
4	Interest on WC Loan @ 11.17 % interset	Rs.in lakhs	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48
5	Interest on loan @ 9.67% interest	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Return on equity @16.96 % p.a for 20 years and @ 21.52 % after 20 years onwards	Rs.in lakhs	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52
7	CDM Benifits		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Depreciation for 1st 15 years@ 4.67% and 16th onwards @ 0.80%	Rs.in lakhs	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28
9	local area development @1 P/unit		8.28	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37
10	**Total Expenses (3+4+5+6+7+8)**	Rs.in lakhs	**2966.02**	**2899.96**	**2836.56**	**2773.92**	**2712.08**	**2651.07**	**2590.92**	**2531.66**	**2473.33**	**2415.96**	**2359.59**	**2304.25**	**2291.70**	**2321.96**	**2353.39**	**1813.84**	**1847.73**	**1882.92**	**1919.45**	**1957.40**	**2199.05**	**2239.96**	**2282.45**	**2326.56**	**2372.37**	**2419.93**	**2469.33**	**2520.62**	**2573.88**	**2629.18**	**2686.61**	**2746.24**	**2808.17**	**2872.47**	**2939.24**	**3008.57**	**3080.57**	**3155.33**	**3232.96**	**3313.58**
11	Tariff Per Unit	Rs per Unit	**3.58**	**4.55**	**4.45**	**4.35**	**4.25**	**4.16**	**4.06**	**3.97**	**3.88**	**3.79**	**3.70**	**3.61**	**3.60**	**3.64**	**3.69**	**2.85**	**2.90**	**2.95**	**3.01**	**3.07**	**3.45**	**3.51**	**3.58**	**3.65**	**3.72**	**3.80**	**3.87**	**3.95**	**4.04**	**4.12**	**4.21**	**4.31**	**4.41**	**4.51**	**4.61**	**4.72**	**4.83**	**4.95**	**5.07**	**5.20**
12	Discount Factor	8.61%	**0.92**	**0.85**	**0.78**	**0.72**	**0.66**	**0.61**	**0.56**	**0.52**	**0.48**	**0.44**	**0.40**	**0.37**	**0.34**	**0.31**	**0.29**	**0.27**	**0.25**	**0.23**	**0.21**	**0.19**	**0.18**	**0.16**	**0.15**	**0.14**	**0.13**	**0.12**	**0.11**	**0.10**	**0.09**	**0.08**	**0.08**	**0.07**	**0.07**	**0.06**	**0.06**	**0.05**	**0.05**	**0.04**	**0.04**	**0.04**
13	Present value of cost	Rs per Unit	**3.30**	**3.86**	**3.47**	**3.13**	**2.82**	**2.53**	**2.28**	**2.05**	**1.85**	**1.66**	**1.49**	**1.34**	**1.23**	**1.15**	**1.07**	**0.76**	**0.71**	**0.67**	**0.63**	**0.59**	**0.61**	**0.57**	**0.54**	**0.50**	**0.47**	**0.44**	**0.42**	**0.39**	**0.37**	**0.35**	**0.33**	**0.31**	**0.29**	**0.27**	**0.26**	**0.24**	**0.23**	**0.21**	**0.20**	**0.19**
14	Levelised tariff for 15 Years	Rs per Unit	**4.026**																																							
15	Levelised tariff for 40 Years	Rs per Unit	**3.91**																																							
16	**Working capital**																																									
a	Maintenance for spares @15% of O&M	Rs.in lakhs	75.216	78.104	81.103	84.218	87.452	90.810	94.297	97.918	101.678	105.583	109.637	113.847	118.219	122.758	127.472	132.367	137.450	142.728	148.209	153.900	159.810	165.947	172.319	178.936	185.807	192.942	200.351	208.045	216.034	224.329	232.944	241.889	251.177	260.822	270.838	281.238	292.038	303.252	314.897	326.989
b	O&M charges for one month	Rs.in lakhs	41.79	43.39	45.06	46.79	48.58	50.45	52.39	54.40	56.49	58.66	60.91	63.25	65.68	68.20	70.82	73.54	76.36	79.29	82.34	85.50	88.78	92.19	95.73	99.41	103.23	107.19	111.31	115.58	120.02	124.63	129.41	134.38	139.54	144.90	150.47	156.24	162.24	168.47	174.94	181.66
c	45 days receivables	Rs.in lakhs	370.76	362.50	354.57	346.74	339.01	331.39	323.87	316.46	309.17	302.00	294.95	288.04	286.47	290.25	294.18	226.74	230.97	235.37	239.94	244.68	274.89	280.00	285.31	290.82	296.55	302.50	308.67	315.08	321.74	328.65	335.83	343.29	351.03	359.06	367.41	376.08	385.08	394.42	404.13	414.20
d	Total Working Capital	Rs.in lakhs	487.76	484.00	480.74	477.75	475.05	472.65	470.55	468.78	467.34	466.24	465.50	465.13	470.36	481.21	492.47	432.64	444.78	457.39	470.48	484.08	523.48	538.14	553.36	569.17	585.58	602.63	620.33	638.71	657.79	677.61	698.19	719.56	741.75	764.79	788.71	813.56	839.36	866.15	893.96	922.85
e	Interest on WC @11.17 % & Increase in WC	Rs.in lakhs	54.48	-3.76	-3.26	-2.99	-2.70	-2.40	-2.09	-1.77	-1.44	-1.10	-0.74	-0.37	5.23	10.84	11.26	-59.83	12.14	12.61	13.09	13.60	39.40	14.66	15.22	15.81	16.41	17.04	17.70	18.38	19.08	19.82	20.58	21.37	22.19	23.04	23.93	24.84	25.80	26.79	27.82	28.89

	DEPRECIATION (WITHOUT SUBSIDY)		
1	Land	Rs.in lakhs	0.00
2	Building	Rs.in lakhs	12802.56
3	Machinery	Rs.in lakhs	1982.39
		Rs.in lakhs	14784.95

	DEPRECIATION AS PER CERC NORMS	(AS PER SLM METHOD)	
1	Depreciation for 15 Years	Rs.in lakhs	4.67%	690.46
2	Depreciation Thereafter	Rs.in lakhs	0.80%	118.28

	DEPRECIATION AS PER COMPANIES ACT	(AS PER SLM METHOD)	
1	Depreciation for Buildings	Rs.in lakhs	3.34%	427.61
2	Plant and Machinery	Rs.in lakhs	5.28%	104.67
		Rs.in lakhs		**532.28**

	DEPRECIATION AS PER IT ACT	(AS PER WDV METHOD)
1	Depreciation for Buildings	10.00%
2	Plant and Machinery	15.00%

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
	Opening Value																																										
1	Building	Rs.in lakhs	12802.56	11522.30	10370.07	9333.07	8399.76	7559.78	6803.80	6123.42	5511.08	4959.97	4463.98	4017.58	3615.82	3254.24	2928.81	2635.93	2372.34	2135.11	1921.60	1729.44	1556.49	1400.84	1260.76	1134.68	1021.21	919.09	827.18	744.47	670.02	603.02	542.72	488.44	439.60	395.64	356.08	320.47	288.42	259.58	233.62	210.26
2	Plant and Machinery	Rs.in lakhs	1982.39	1685.03	1432.28	1217.44	1034.82	879.60	747.66	635.51	540.18	459.16	390.28	331.74	281.98	239.68	203.73	173.17	147.19	125.12	106.35	90.40	76.84	65.31	55.51	47.19	40.11	34.09	28.98	24.63	20.94	17.80	15.13	12.86	10.93	9.29	7.90	6.71	5.71	4.85	4.12	3.50
	Depreciation																																									
3	Building	Rs.in lakhs	1280.26	1152.23	1037.01	933.31	839.98	755.98	680.38	612.34	551.11	496.00	446.40	401.76	361.58	325.42	292.88	263.59	237.23	213.51	192.16	172.94	155.65	140.08	126.08	113.47	102.12	91.91	82.72	74.45	67.00	60.30	54.27	48.84	43.96	39.56	35.61	32.05	28.84	25.96	23.36	21.03
4	Plant and Machinery	Rs.in lakhs	297.36	252.76	214.84	182.62	155.22	131.94	112.15	95.33	81.03	68.87	58.54	49.76	42.30	35.95	30.56	25.98	22.08	18.77	15.95	13.56	11.53	9.80	8.33	7.08	6.02	5.11	4.35	3.69	3.14	2.67	2.27	1.93	1.64	1.39	1.18	1.01	0.86	0.73	0.62	0.53
5	**Total (3+4)**	Rs.in lakhs	**1577.61**	**1404.99**	**1251.85**	**1115.92**	**995.20**	**887.92**	**792.53**	**707.67**	**632.14**	**564.87**	**504.94**	**352.00**	**319.29**	**289.47**	**262.32**	**237.62**	**215.15**	**194.74**	**176.21**	**159.38**	**167.17**	**149.88**	**134.40**	**120.55**	**108.14**	**97.02**	**87.07**	**78.14**	**70.14**	**62.97**	**56.54**	**50.77**	**45.60**	**40.96**	**36.79**	**33.05**	**29.70**	**26.69**	**23.98**	**21.55**
	Closing Balance																																									
6	Building	Rs.in lakhs	11522.30	10370.07	9333.07	8399.76	7559.78	6803.80	6123.42	5511.08	4959.97	4463.98	4017.58	3615.82	3254.24	2928.81	2635.93	2372.34	2135.11	1921.60	1729.44	1556.49	1400.84	1260.76	1134.68	1021.21	919.09	827.18	744.47	670.02	603.02	542.72	488.44	439.60	395.64	356.08	320.47	288.42	259.58	233.62	210.26	189.23
7	Plant and Machinery	Rs.in lakhs	1685.03	1432.28	1217.44	1034.82	879.60	747.66	635.51	540.18	459.16	390.28	331.74	281.98	239.68	203.73	173.17	147.19	125.12	106.35	90.40	76.84	65.31	55.51	47.19	40.11	34.09	28.98	24.63	20.94	17.80	15.13	12.86	10.93	9.29	7.90	6.71	5.71	4.85	4.12	3.50	2.98
8	**Total (6+7)**	Rs.in lakhs	**13207.34**	**11802.35**	**10550.50**	**9434.58**	**8439.38**	**7551.46**	**6758.93**	**6051.27**	**5419.13**	**4854.26**	**4349.32**	**3897.80**	**3493.92**	**3132.54**	**2809.10**	**2519.53**	**2260.22**	**2027.94**	**1819.83**	**1633.33**	**1466.15**	**1316.27**	**1181.87**	**1061.32**	**953.19**	**856.16**	**769.10**	**690.96**	**620.81**	**557.84**	**501.30**	**450.53**	**404.93**	**363.97**	**327.18**	**294.13**	**264.43**	**237.74**	**213.76**	**192.21**

PROFITABILITY STATEMENT (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Annual Revenue	Rs.in lakhs	3239.65	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91
2	CO_2 Revenue	Rs.in lakhs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Total Income (1+2)	Rs.in lakhs	**3239.65**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**	**2492.91**
	Fixed Cost																																									
4	O & M Expenses @ 31.34 lakh/MW , escalated @ 3.84 % per annum	Rs.in lakhs	501.44	520.70	540.69	561.45	583.01	605.40	628.65	652.79	677.85	703.88	730.91	758.98	788.13	818.39	849.82	882.45	916.33	951.52	988.06	1026.00	1065.40	1106.31	1148.79	1192.91	1238.71	1286.28	1335.67	1386.96	1440.22	1495.53	1552.96	1612.59	1674.51	1738.82	1805.59	1874.92	1946.92	2021.68	2099.31	2179.92
5	Depreciation	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Interest on loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Interest on W/c loan	Rs.in lakhs	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48	54.48
8	Total Cost (4+5+6+7)	Rs.in lakhs	**2047.29**	**1983.15**	**1919.74**	**1857.11**	**1795.27**	**1734.25**	**1674.10**	**1614.84**	**1556.51**	**1499.14**	**1442.77**	**1387.44**	**1374.88**	**1405.15**	**1436.57**	**1469.21**	**1503.09**	**1538.28**	**1574.82**	**1612.76**	**1652.16**	**1693.07**	**1735.55**	**1779.67**	**1825.47**	**1873.04**	**1629.89**	**1441.45**	**1494.71**	**1550.01**	**1607.44**	**1667.07**	**1729.00**	**1793.30**	**1860.07**	**1929.40**	**2001.40**	**2076.16**	**2153.79**	**2234.41**
9	Profit Before Tax (3-8)	Rs.in lakhs	1192.36	509.77	573.17	635.81	697.65	758.66	818.81	878.07	936.40	993.77	1050.14	1105.48	1118.03	1087.77	1056.34	1023.71	989.82	954.63	918.10	880.15	840.76	799.84	757.36	713.25	667.44	619.87	863.02	1051.47	998.21	942.90	885.47	825.84	763.92	699.62	632.85	563.51	491.51	416.75	339.12	258.51
10	Less Tax	Rs.in lakhs	208.31	89.06	100.13	111.08	121.88	132.54	143.05	153.40	163.59	173.61	183.46	193.13	195.32	190.03	184.54	178.84	172.92	166.77	160.39	153.76	146.88	139.73	132.31	393.07	381.40	368.66	354.88	340.08	324.27	307.45	289.63	270.81	250.98	230.14	208.26	185.34	161.36	136.29	110.11	82.79
11	Profit After Tax (9-10)	Rs.in lakhs	984.06	420.71	473.04	524.73	575.77	626.12	675.76	724.67	772.81	820.16	866.68	912.35	922.71	897.73	871.80	844.87	816.90	787.86	757.70	726.39	693.88	660.11	625.05	320.18	286.04	251.21	508.14	711.39	673.94	635.45	595.84	555.03	512.94	469.48	424.58	378.17	330.16	280.46	229.01	175.71
	INCOME TAX (WITHOUT SUBSIDY)																																									
Sl.No	**Description**	**UNIT**	**Year1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year10**	**Year 11**	**Year 12**	**Year 13**	**Year 14**	**Year 15**	**Year 16**	**Year 17**	**Year 18**	**Year 19**	**Year 20**	**Year 21**	**Year 22**	**Year 23**	**Year 24**	**Year 25**	**Year 26**	**Year 27**	**Year 28**	**Year 29**	**Year 30**	**Year 31**	**Year 32**	**Year 33**	**Year 34**	**Year 35**	**Year 36**	**Year 37**	**Year 38**	**Year 39**	**Year 40**
1	Book Profit	Rs.in lakhs	1192.36	509.77	573.17	635.81	697.65	758.66	818.81	878.07	936.40	993.77	1050.14	1105.48	1118.03	1087.77	1056.34	1023.71	989.82	954.63	918.10	880.15	840.76	799.84	757.36	713.25	667.44	619.87	863.02	1051.47	998.21	942.90	885.47	825.84	763.92	699.62	632.85	563.51	491.51	416.75	339.12	258.51
2	Add Depreciation as per books	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Less Depreciation as per IT Act	Rs.in lakhs	1577.61	1404.99	1251.85	1115.92	995.20	887.92	792.53	707.67	632.14	564.87	504.94	352.00	319.29	289.47	262.32	237.62	215.15	194.74	176.21	159.38	167.17	149.88	134.40	120.55	108.14	97.02	87.07	78.14	70.14	62.97	56.54	50.77	45.60	40.96	36.79	33.05	29.70	26.69	23.98	21.55
4	Taxable Profit	Rs.in lakhs	147.02	-362.94	-146.40	52.16	234.72	403.02	558.56	702.68	836.54	961.18	1077.48	1285.75	1331.02	1330.57	1326.29	1318.36	1306.94	1292.17	1274.16	1253.05	1205.86	1182.24	1155.23	1124.98	1091.58	1055.13	1015.69	973.33	928.06	879.93	828.93	775.07	718.32	658.66	596.05	530.46	461.82	390.07	315.14	236.95
5	Normal Income Tax Rate	%	34.94%	34.94%	34.94%	34.94%	34.94%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%
6	Income tax under normal provisions	Rs.in lakhs	0.00	-126.81	-51.15	18.23	82.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	460.64	456.65	451.48	445.19	437.81	421.33	413.07	403.64	393.07	381.40	368.66	354.88	340.08	324.27	307.45	289.63	270.81	250.98	230.14	208.26	185.34	161.36	136.29	110.11	82.79
7	MAT RATE	%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%
8	Tax as per MAT	Rs.in lakhs	208.31	89.06	100.13	111.08	121.88	132.54	143.05	153.40	163.59	173.61	183.46	193.13	195.32	190.03	184.54	178.84	172.92	166.77	160.39	153.76	146.88	139.73	132.31	124.60	116.60	108.29	150.77	183.69	174.39	164.73	154.69	144.27	133.46	122.22	110.56	98.45	85.87	72.81	59.24	45.16
9	TAX PAYABLE	Rs.in lakhs	208.31	89.06	100.13	111.08	121.88	132.54	143.05	153.40	163.59	173.61	183.46	193.13	195.32	190.03	184.54	460.64	456.65	451.48	445.19	437.81	421.33	413.07	403.64	393.07	381.40	368.66	354.88	340.08	324.27	307.45	289.63	270.81	250.98	230.14	208.26	185.34	161.36	136.29	110.11	82.79
10	MAT Credit Available	Rs.in lakhs	208.31	89.06	100.13	111.08	121.88	132.54	143.05	153.40	163.59	173.61	183.46	193.13	195.32	190.03	184.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	MAT credit availed	Rs.in lakhs					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	281.80	283.72	284.71	284.80	284.05	274.45	273.34	271.33																	
12	Income Tax payable after availing MAT Credit	Rs.in lakhs	208.31	89.06	100.13	111.08	121.88	132.54	143.05	153.40	163.59	173.61	183.46	193.13	195.32	190.03	184.54	178.84	172.92	166.77	160.39	153.76	146.88	139.73	132.31	393.07	381.40	368.66	354.88	340.08	324.27	307.45	289.63	270.81	250.98	230.14	208.26	185.34	161.36	136.29	110.11	82.79
																	1712.67							2238.20																	
																									-525.53																	

CASH FLOW (WITHOUT SUBSIDY)

Sl.No	Description	PRE OPERATIVE PERIOD	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Profit as per profit and loss		1192.36	509.77	573.17	635.81	697.65	758.66	818.81	878.07	936.40	993.77	1050.14	1105.48	1118.03	1087.77	1056.34	1023.71	989.82	954.63	918.10	880.15	840.76	799.84	757.36	713.25	667.44	619.87	863.02	1051.47	998.21	942.90	885.47	825.84	763.92	699.62	632.85	563.51	491.51	416.75	339.12	258.51
2	ADD Non cash expences – Depreciation		532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	CASH PROFIT		**1724.64**	**1042.04**	**1105.45**	**1168.08**	**1229.92**	**1290.93**	**1351.09**	**1410.35**	**1468.68**	**1526.05**	**1582.42**	**1637.75**	**1650.31**	**1620.04**	**1588.62**	**1555.98**	**1522.10**	**1486.91**	**1450.37**	**1412.43**	**1373.03**	**1332.12**	**1289.64**	**1245.52**	**1199.72**	**1152.15**	**1102.76**	**1051.47**	**998.21**	**942.90**	**885.47**	**825.84**	**763.92**	**699.62**	**632.85**	**563.51**	**491.51**	**416.75**	**339.12**	**258.51**
4	Equity	**4435.49**																																								
5	Term Loan	**10349.47**																																								
6	W/C Loan		341.43																																							
7	**Total**	**14784.95**	**2066.07**	**1042.04**	**1105.45**	**1168.08**	**1229.92**	**1290.93**	**1351.09**	**1410.35**	**1468.68**	**1526.05**	**1582.42**	**1637.75**	**1650.31**	**1620.04**	**1588.62**	**1555.98**	**1522.10**	**1486.91**	**1450.37**	**1412.43**	**1373.03**	**1332.12**	**1289.64**	**1245.52**	**1199.72**	**1152.15**	**1102.76**	**1051.47**	**998.21**	**942.90**	**885.47**	**825.84**	**763.92**	**699.62**	**632.85**	**563.51**	**491.51**	**416.75**	**339.12**	**258.51**
	Application of Funds																																								
8	Assets	**14784.95**																																								
9	Increase in W/c	Rs.in lakhs	487.76	-3.76	-3.26	-2.99	-2.70	-2.40	-2.09	-1.77	-1.44	-1.10	-0.74	-0.37	5.23	10.84	11.26	-59.83	12.14	12.61	13.09	13.60	39.40	14.66	15.22	15.81	16.41	17.04	17.70	18.38	19.08	19.82	20.58	21.37	22.19	23.04	23.93	24.84	25.80	26.79	27.82	28.89
10	Repayment of Loan	Rs.in lakhs	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Income Tax	Rs.in lakhs	208.31	89.06	100.13	111.08	121.88	132.54	143.05	153.40	163.59	173.61	183.46	193.13	195.32	190.03	184.54	178.84	172.92	166.77	160.39	153.76	146.88	139.73	132.31	393.07	381.40	368.66	354.88	340.08	324.27	307.45	289.63	270.81	250.98	230.14	208.26	185.34	161.36	136.29	110.11	82.79
12	**TOTAL**	**14784.95**	**1558.52**	**947.75**	**959.33**	**970.55**	**981.64**	**992.59**	**1003.41**	**1014.08**	**1024.60**	**1034.97**	**1045.18**	**1055.21**	**200.55**	**200.88**	**195.80**	**119.01**	**185.06**	**179.38**	**173.48**	**167.36**	**186.28**	**154.39**	**147.53**	**408.87**	**397.81**	**385.71**	**372.58**	**358.46**	**343.35**	**327.27**	**310.21**	**292.18**	**273.17**	**253.18**	**232.19**	**210.19**	**187.16**	**163.08**	**137.93**	**111.68**
13	**Opening Cash Balance**	0.00	0.00	507.55	601.84	747.96	945.50	1193.78	1492.13	1839.81	2236.07	2680.15	3171.23	3708.47	4291.01	5740.76	7159.93	8552.74	9989.71	11326.74	12634.27	13911.15	15156.23	16342.98	17520.70	18662.81	19499.46	20301.36	21067.80	21797.98	22490.99	23145.84	23761.48	24336.75	24870.41	25361.16	25807.60	26208.25	26561.58	26865.94	27119.61	27320.80
14	**Net cash inflow**	0.00	507.55	94.29	146.12	197.54	248.29	298.34	347.68	396.27	444.08	491.08	537.24	582.54	1449.75	1419.16	1392.81	1436.97	1337.03	1307.53	1276.89	1245.07	1186.75	1177.73	1142.10	836.65	801.90	766.44	730.17	693.01	654.86	615.64	575.27	533.66	490.75	446.44	400.66	353.32	304.36	253.67	201.19	-27320.80
15	**Closing Balance**	0.00	507.55	601.84	747.96	945.50	1193.78	1492.13	1839.81	2236.07	2680.15	3171.23	3708.47	4291.01	5740.76	7159.93	8552.74	9989.71	11326.74	12634.27	13911.15	15156.23	16342.98	17520.70	18662.81	19499.46	20301.36	21067.80	21797.98	22490.99	23145.84	23761.48	24336.75	24870.41	25361.16	25807.60	26208.25	26561.58	26865.94	27119.61	27320.80	0.00

INTERNAL RATE OF RETURN (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	PAT	Rs.in lakhs	984.06	420.71	473.04	524.73	575.77	626.12	675.76	724.67	772.81	820.16	866.68	912.35	922.71	897.73	871.80	844.87	816.90	787.86	757.70	726.39	693.88	660.11	625.05	320.18	286.04	251.21	508.14	711.39	673.94	635.45	595.84	555.03	512.94	469.48	424.58	378.17	330.16	280.46	229.01	175.71
2	Add Depreciation	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Add Interest on term loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Terminal Value	**-14784.95**	2475.43	1828.68	1797.61	1765.90	1733.54	1700.49	1666.74	1632.24	1596.99	1560.93	1524.06	1486.32	1454.99	1430.01	1404.07	1377.14	1349.18	1320.14	1289.98	1258.67	1226.15	1192.39	1157.33	852.46	818.32	783.49	747.87	711.39	673.94	635.45	595.84	555.03	512.94	469.48	424.58	378.17	330.16	280.46	229.01	175.71
	IRR	**10.73%**																																								

DEBT SERVICE COVERAGE RATIO (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year11	Year12
1	PAT	Rs.in lakhs	984.06	420.71	473.04	524.73	575.77	626.12	675.76	724.67	772.81	820.16	866.68	912.35
2	Interest on term loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70
3	Add Depreciation	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28
4	**TOTAL**	Rs.in lakhs	**2475.43**	**1828.68**	**1797.61**	**1765.90**	**1733.54**	**1700.49**	**1666.74**	**1632.24**	**1596.99**	**1560.93**	**1524.06**	**1486.32**
6	Interest on term loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70
7	Principle Repayment	Rs.in lakhs	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46
8	**TOTAL**	Rs.in lakhs	**1821.55**	**1738.15**	**1654.75**	**1571.35**	**1487.95**	**1404.55**	**1321.15**	**1237.75**	**1154.35**	**1070.95**	**987.55**	**904.16**
9	DSCR		1.36	1.05	1.09	1.12	1.17	1.21	1.26	1.32	1.38	1.46	1.54	1.64

Average DSCR		**1.30**

NET PRESENT VALUE AND BENEFIT COST RATIO (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Expences																																										
	O & M Expenses @ 31.34 lakh/MW , escalated @ 3.84 % per annum	Rs.in lakhs	501.44	520.70	540.69	561.45	583.01	605.40	628.65	652.79	677.85	703.88	730.91	758.98	788.13	818.39	849.82	882.45	916.33	951.52	988.06	1026.00	1065.40	1106.31	1148.79	1192.91	1238.71	1286.28	1335.67	1386.96	1440.22	1495.53	1552.96	1612.59	1674.51	1738.82	1805.59	1874.92	1946.92	2021.68	2099.31	2179.92
2	Income tax under normal provisions	Rs.in lakhs	208.31	89.06	100.13	111.08	121.88	132.54	143.05	153.40	163.59	173.61	183.46	193.13	195.32	190.03	184.54	178.84	172.92	166.77	160.39	153.76	146.88	139.73	132.31	393.07	381.40	368.66	354.88	340.08	324.27	307.45	289.63	270.81	250.98	230.14	208.26	185.34	161.36	136.29	110.11	82.79
3	Total Expences	Rs.in lakhs	709.75	609.75	640.82	672.53	704.89	737.94	771.69	806.19	841.44	877.50	914.37	952.11	983.44	1008.42	1034.36	1061.29	1089.26	1118.30	1148.45	1179.76	1212.28	1246.04	1281.10	1585.97	1620.11	1654.94	1690.56	1727.04	1764.49	1802.98	1842.59	1883.40	1925.49	1968.95	2013.85	2060.26	2108.28	2157.97	2209.42	2262.72
4	Income																																									
5	Power Generation/annum Free Energy to State & Local Community @ 23.05% (Moratorium for 1 year from Scheduled Commercial Operation Date)	Units (in Lakhs)	828.39	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44	637.44
6	Sale Price per unit	in Rs	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91	3.91
7	**Total Income**	Rs in Lakhs	3239.65	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91	2492.91
8	Net Surplus/Short fall	Rs in Lakhs	2529.91	1883.16	1852.09	1820.39	1788.02	1754.98	1721.22	1686.73	1651.47	1615.42	1578.54	1540.81	1509.47	1484.49	1458.56	1431.62	1403.66	1374.62	1344.46	1313.15	1280.63	1246.87	1211.81	906.94	872.80	837.97	802.36	765.87	728.42	689.94	650.33	609.51	567.42	523.96	479.07	432.65	384.64	334.95	283.49	230.20
9	Discount Factor	8.61%	0.92	0.85	0.78	0.72	0.66	0.61	0.56	0.52	0.48	0.44	0.40	0.37	0.34	0.31	0.29	0.27	0.25	0.23	0.21	0.19	0.18	0.16	0.15	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.08	0.07	0.07	0.06	0.06	0.05	0.05	0.04	0.04	0.04
10	Net Presesnt Value	Rs in Lakhs	2329.35	1596.42	1445.62	1308.23	1183.11	1069.18	965.49	871.14	785.31	707.27	636.34	571.89	515.84	467.09	422.55	381.87	344.73	310.83	279.91	251.72	226.03	202.62	181.31	124.94	110.71	97.86	86.27	75.82	66.40	57.90	50.25	43.37	37.17	31.60	26.60	22.12	18.11	14.52	11.31	8.46
11	**NPV of 40 years Revenues at a discounting factor of 8.61%**		15,051.72																																							
12	**Benefit Cost Ratio**		1.02																																							

BASIC PARAMETER

1.	**Unit Generated after auxiliry consumption @ 1% & transformer losses @ 0.05%**	**at 55 % PLF**		**759.36**	**Lakh**
	Free power to state and local area development			23.05%	
	Unit of Sale			584.32	
2.	**Sale Price (Rs)**	(Levelised teriff for 40 years)		4.27	
	Useful Life	Year		40.00	
3.	**Debt Equity Ratio**				
	(a) Debt (%)			70%	
	(b) Equity (%)			30%	
	Moratorium Period	Year		30	
4	**Construction period (years)**	year of preconstruction of one year			
	Repayment Quarterly	**No of Installment**		48	
	Repayment Quarterly	**in Lacs**			
5	**Period of repayment**			12	year
6	CDM Benefit			0	
7	**Return on Equity (%)**				
		for first 20 years		16.96%	p.a
		after 20 years onwards		21.52%	p.a
8	**Depreciation (%) for Tariff**				
	DEPRECIATION A	**(AS PER SLM METHOD)**			
		Depreciation for 15 Years	Rs.in lakhs	4.67%	
		Depreciation Thereafter	Rs.in lakhs	0.80%	
	DEPRECIATION A	**(AS PER SLM METHOD)**			
		Depreciation for Buildings	Rs.in lakhs	3.34%	
		Plant and Machinery	Rs.in lakhs	5.28%	
	DEPRECIATION A	**(AS PER WDV METHOD)**			
	Depreciation for Buildings			10.00%	
	Plant and Machinery			15.00%	
9	**Operation & Maintenance expenses**			31.34%	Rs. Lakh/MW
10	**Annual escalation of O & M cost (%)**			3.84%	per annum
11	**Income tax as per normal provisions**				
	(Tax hpliday for ocntinuous block of 10 years during first 15 years and theerafter normal corporate rates of taxes)				
		(a) as per normal provision		34.94%	
		(b) under MAT (for first 10 years)		17.47%	
12	**Discounitng factor (%)**			8.61%	
13	**Interest on WC @11.17% & Increase in WC**			11.17%	
14	**Interest on loan**			9.67%	

NAME OF THE PROJECT : HALAPANI HYDRO ELECTRIC PROJECT

Cost Of Project	**13797.48**	**Land**	**0.00**
IDC	**987.47**	**E&M**	**1982.39**
Total Cost Of Project	**14784.95**	**Civil & others**	**12802.56**
Promoters Equity 30 %	**4435.49**		**14784.95**
Loan 70 %	**10349.47**		

GENERATION COST AND TARIFF (WITHOUT SUBSIDY) (Rs. In Lakhs)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Capacity	MW	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00
2	Power Generation/annum Free Energy to State & Local Community @ 23.05% (Moratorium for 1 year from Scheduled Commercial Operation Date)	Units (in Lakhs)	759.36	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32
3	Sale Price per unit	in Rs	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27
	Fixed Cost																																									
3	O & M Expenses @ 31.34 lakh/MW , escalated @ 3.84 % per annum	Rs.in lakhs	501.44	520.70	540.69	561.45	583.01	605.40	628.65	652.79	677.85	703.88	730.91	758.98	788.13	818.39	849.82	882.45	916.33	951.52	988.06	1026.00	1065.40	1106.31	1148.79	1192.91	1238.71	1286.28	1335.67	1386.96	1440.22	1495.53	1552.96	1612.59	1674.51	1738.82	1805.59	1874.92	1946.92	2021.68	2099.31	2179.92
4	Interest on WC Loan @ 11.17 % interset	Rs.in lakhs	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47
5	Interest on loan @ 9.67% interest	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Return on equity @16.96 % p.a for 20 years and @ 21.52 % after 20 years onwards	Rs.in lakhs	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52
7	CDM Benifits		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Depreciation for 1st 15 years@ 4.67% and 16th onwards @ 0.80%	Rs.in lakhs	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28
9	local area development @1 P/unit		7.59	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84	5.84
10	**Total Expenses (3+4+5+6+7+8)**	Rs.in lakhs	**2965.32**	**2899.42**	**2836.02**	**2773.38**	**2711.54**	**2650.53**	**2590.38**	**2531.12**	**2472.78**	**2415.41**	**2359.04**	**2303.71**	**2291.16**	**2321.42**	**2352.85**	**1813.30**	**1847.19**	**1882.37**	**1918.91**	**1956.85**	**2198.51**	**2239.42**	**2281.91**	**2326.02**	**2371.83**	**2419.39**	**2468.79**	**2520.08**	**2573.34**	**2628.64**	**2686.07**	**2745.70**	**2807.63**	**2871.93**	**2938.70**	**3008.03**	**3080.03**	**3154.79**	**3232.42**	**3313.04**
11	Tariff Per Unit	Rs per Unit	**3.91**	**4.96**	**4.85**	**4.75**	**4.64**	**4.54**	**4.43**	**4.33**	**4.23**	**4.13**	**4.04**	**3.94**	**3.92**	**3.97**	**4.03**	**3.10**	**3.16**	**3.22**	**3.28**	**3.35**	**3.76**	**3.83**	**3.91**	**3.98**	**4.06**	**4.14**	**4.23**	**4.31**	**4.40**	**4.50**	**4.60**	**4.70**	**4.80**	**4.91**	**5.03**	**5.15**	**5.27**	**5.40**	**5.53**	**5.67**
12	Discount Factor	8.61%	**0.92**	**0.85**	**0.78**	**0.72**	**0.66**	**0.61**	**0.56**	**0.52**	**0.48**	**0.44**	**0.40**	**0.37**	**0.34**	**0.31**	**0.29**	**0.27**	**0.25**	**0.23**	**0.21**	**0.19**	**0.18**	**0.16**	**0.15**	**0.14**	**0.13**	**0.12**	**0.11**	**0.10**	**0.09**	**0.08**	**0.08**	**0.07**	**0.07**	**0.06**	**0.06**	**0.05**	**0.05**	**0.04**	**0.04**	**0.04**
13	Present value of cost	Rs per Unit	**3.60**	**4.21**	**3.79**	**3.41**	**3.07**	**2.76**	**2.49**	**2.24**	**2.01**	**1.81**	**1.63**	**1.46**	**1.34**	**1.25**	**1.17**	**0.83**	**0.78**	**0.73**	**0.68**	**0.64**	**0.66**	**0.62**	**0.58**	**0.55**	**0.51**	**0.48**	**0.45**	**0.43**	**0.40**	**0.38**	**0.36**	**0.33**	**0.31**	**0.30**	**0.28**	**0.26**	**0.25**	**0.23**	**0.22**	**0.21**
14	Levelised tariff for 15 Years	Rs per Unit	**4.392**																																							
15	Levelised tariff for 40 Years	Rs per Unit	**4.27**																																							
16	**Working capital**																																									
a	Maintenance for spares @15% of O&M	Rs.in lakhs	75.216	78.104	81.103	84.218	87.452	90.810	94.297	97.918	101.678	105.583	109.637	113.847	118.219	122.758	127.472	132.367	137.450	142.728	148.209	153.900	159.810	165.947	172.319	178.936	185.807	192.942	200.351	208.045	216.034	224.329	232.944	241.889	251.177	260.822	270.838	281.238	292.038	303.252	314.897	326.989
b	O&M charges for one month	Rs.in lakhs	41.79	43.39	45.06	46.79	48.58	50.45	52.39	54.40	56.49	58.66	60.91	63.25	65.68	68.20	70.82	73.54	76.36	79.29	82.34	85.50	88.78	92.19	95.73	99.41	103.23	107.19	111.31	115.58	120.02	124.63	129.41	134.38	139.54	144.90	150.47	156.24	162.24	168.47	174.94	181.66
c	45 days receivables	Rs.in lakhs	370.66	362.43	354.50	346.67	338.94	331.31	323.80	316.39	309.10	301.93	294.88	287.96	286.39	290.18	294.10	226.66	230.90	235.30	239.86	244.61	274.81	279.93	285.24	290.75	296.48	302.42	308.60	315.01	321.67	328.58	335.76	343.21	350.95	358.99	367.34	376.00	385.00	394.35	404.05	414.13
d	Total Working Capital	Rs.in lakhs	487.67	483.92	480.66	477.68	474.98	472.57	470.48	468.71	467.26	466.17	465.43	465.06	470.29	481.13	492.39	432.57	444.71	457.32	470.41	484.01	523.41	538.07	553.29	569.10	585.51	602.56	620.25	638.63	657.72	677.54	698.11	719.48	741.67	764.71	788.64	813.48	839.28	866.07	893.89	922.78
e	Interest on WC @11.17 % & Increase in WC	Rs.in lakhs	54.47	-3.74	-3.26	-2.99	-2.70	-2.40	-2.09	-1.77	-1.44	-1.10	-0.74	-0.37	5.23	10.84	11.26	-59.83	12.14	12.61	13.09	13.60	39.40	14.66	15.22	15.81	16.41	17.04	17.70	18.38	19.08	19.82	20.58	21.37	22.19	23.04	23.93	24.84	25.80	26.79	27.82	28.89

	DEPRECIATION (WITHOUT SUBSIDY)		
1	Land	Rs.in lakhs	0.00
2	Building	Rs.in lakhs	12802.56
3	Machinery	Rs.in lakhs	1982.39
		Rs.in lakhs	14784.95

	DEPRECIATION AS PER CERC NORMS	(AS PER SLM METHOD)	
1	Depreciation for 15 Years	Rs.in lakhs	4.67%	690.46
2	Depreciation Thereafter	Rs.in lakhs	0.80%	118.28

	DEPRECIATION AS PER COMPANIES ACT	(AS PER SLM METHOD)	
1	Depreciation for Buildings	Rs.in lakhs	3.34%	427.61
2	Plant and Machinery	Rs.in lakhs	5.28%	104.67
		Rs.in lakhs		**532.28**

	DEPRECIATION AS PER IT ACT	(AS PER WDV METHOD)
1	Depreciation for Buildings	10.00%
2	Plant and Machinery	15.00%

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
	Opening Value																																									
1	Building	Rs.in lakhs	12802.56	11522.30	10370.07	9333.07	8399.76	7559.78	6803.80	6123.42	5511.08	4959.97	4463.98	4017.58	3615.82	3254.24	2928.81	2635.93	2372.34	2135.11	1921.60	1729.44	1556.49	1400.84	1260.76	1134.68	1021.21	919.09	827.18	744.47	670.02	603.02	542.72	488.44	439.60	395.64	356.08	320.47	288.42	259.58	233.62	210.26
2	Plant and Machinery	Rs.in lakhs	1982.39	1685.03	1432.28	1217.44	1034.82	879.60	747.66	635.51	540.18	459.16	390.28	331.74	281.98	239.68	203.73	173.17	147.19	125.12	106.35	90.40	76.84	65.31	55.51	47.19	40.11	34.09	28.98	24.63	20.94	17.80	15.13	12.86	10.93	9.29	7.90	6.71	5.71	4.85	4.12	3.50
	Depreciation																																								
3	Building	Rs.in lakhs	1280.26	1152.23	1037.01	933.31	839.98	755.98	680.38	612.34	551.11	496.00	446.40	401.76	361.58	325.42	292.88	263.59	237.23	213.51	192.16	172.94	155.65	140.08	126.08	113.47	102.12	91.91	82.72	74.45	67.00	60.30	54.27	48.84	43.96	39.56	35.61	32.05	28.84	25.96	23.36	21.03
4	Plant and Machinery	Rs.in lakhs	297.36	252.76	214.84	182.62	155.22	131.94	112.15	95.33	81.03	68.87	58.54	49.76	42.30	35.95	30.56	25.98	22.08	18.77	15.95	13.56	11.53	9.80	8.33	7.08	6.02	5.11	4.35	3.69	3.14	2.67	2.27	1.93	1.64	1.39	1.18	1.01	0.86	0.73	0.62	0.53
5	**Total (3+4)**	Rs.in lakhs	**1577.61**	**1404.99**	**1251.85**	**1115.92**	**995.20**	**887.92**	**792.53**	**707.67**	**632.14**	**564.87**	**504.94**	**352.00**	**319.29**	**289.47**	**262.32**	**237.62**	**215.15**	**194.74**	**176.21**	**159.38**	**167.17**	**149.88**	**134.40**	**120.55**	**108.14**	**97.02**	**87.07**	**78.14**	**70.14**	**62.97**	**56.54**	**50.77**	**45.60**	**40.96**	**36.79**	**33.05**	**29.70**	**26.69**	**23.98**	**21.55**
	Closing Balance																																								
6	Building	Rs.in lakhs	11522.30	10370.07	9333.07	8399.76	7559.78	6803.80	6123.42	5511.08	4959.97	4463.98	4017.58	3615.82	3254.24	2928.81	2635.93	2372.34	2135.11	1921.60	1729.44	1556.49	1400.84	1260.76	1134.68	1021.21	919.09	827.18	744.47	670.02	603.02	542.72	488.44	439.60	395.64	356.08	320.47	288.42	259.58	233.62	210.26	189.23
7	Plant and Machinery	Rs.in lakhs	1685.03	1432.28	1217.44	1034.82	879.60	747.66	635.51	540.18	459.16	390.28	331.74	281.98	239.68	203.73	173.17	147.19	125.12	106.35	90.40	76.84	65.31	55.51	47.19	40.11	34.09	28.98	24.63	20.94	17.80	15.13	12.86	10.93	9.29	7.90	6.71	5.71	4.85	4.12	3.50	2.98
8	**Total (6+7)**	Rs.in lakhs	**13207.34**	**11802.35**	**10550.50**	**9434.58**	**8439.38**	**7551.46**	**6758.93**	**6051.27**	**5419.13**	**4854.26**	**4349.32**	**3897.80**	**3493.92**	**3132.54**	**2809.10**	**2519.53**	**2260.22**	**2027.94**	**1819.83**	**1633.33**	**1466.15**	**1316.27**	**1181.87**	**1061.32**	**953.19**	**856.16**	**769.10**	**690.96**	**620.81**	**557.84**	**501.30**	**450.53**	**404.93**	**363.97**	**327.18**	**294.13**	**264.43**	**237.74**	**213.76**	**192.21**

PROFITABILITY STATEMENT (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Annual Revenue	Rs.in lakhs	3238.95	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37
2	CO_2 Revenue	Rs.in lakhs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Total Income (1+2)	Rs.in lakhs	**3238.95**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**	**2492.37**
	Fixed Cost																																									
4	O & M Expenses @ 31.34 lakh/MW , escalated @ 3.84 % per annum	Rs.in lakhs	501.44	520.70	540.69	561.45	583.01	605.40	628.65	652.79	677.85	703.88	730.91	758.98	788.13	818.39	849.82	882.45	916.33	951.52	988.06	1026.00	1065.40	1106.31	1148.79	1192.91	1238.71	1286.28	1335.67	1386.96	1440.22	1495.53	1552.96	1612.59	1674.51	1738.82	1805.59	1874.92	1946.92	2021.68	2099.31	2179.92
5	Depreciation	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Interest on loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Interest on W/c loan	Rs.in lakhs	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47	54.47
8	Total Cost (4+5+6+7)	Rs.in lakhs	**2047.28**	**1983.14**	**1919.73**	**1857.10**	**1795.26**	**1734.24**	**1674.09**	**1614.83**	**1556.50**	**1499.13**	**1442.76**	**1387.43**	**1374.87**	**1405.14**	**1436.56**	**1469.20**	**1503.08**	**1538.27**	**1574.81**	**1612.75**	**1652.15**	**1693.06**	**1735.54**	**1779.66**	**1825.46**	**1873.03**	**1629.88**	**1441.44**	**1494.70**	**1550.00**	**1607.43**	**1667.06**	**1728.99**	**1793.29**	**1860.06**	**1929.39**	**2001.39**	**2076.15**	**2153.78**	**2234.40**
9	Profit Before Tax (3-8)	Rs.in lakhs	1191.67	509.23	572.64	635.28	697.12	758.13	818.28	877.54	935.87	993.24	1049.61	1104.94	1117.50	1087.23	1055.81	1023.18	989.29	954.10	917.56	879.62	840.22	799.31	756.83	712.72	666.91	619.34	862.49	1050.94	997.68	942.37	884.94	825.31	763.39	699.08	632.31	562.98	490.98	416.22	338.59	257.98
10	Less Tax	Rs.in lakhs	208.18	88.96	100.04	110.98	121.79	132.44	142.95	153.31	163.50	173.52	183.37	193.03	195.23	189.94	184.45	178.75	172.83	166.68	160.30	153.67	146.79	139.64	132.22	392.88	381.21	368.48	354.70	339.89	324.08	307.26	289.44	270.62	250.79	229.95	208.08	185.16	161.17	136.10	109.92	82.61
11	Profit After Tax (9-10)	Rs.in lakhs	983.48	420.27	472.60	524.29	575.33	625.68	675.33	724.23	772.37	819.72	866.24	911.91	922.27	897.30	871.36	844.43	816.46	787.42	757.27	725.95	693.44	659.67	624.61	319.84	285.70	250.87	507.79	711.04	673.60	635.11	595.50	554.69	512.59	469.14	424.24	377.82	329.81	280.12	228.66	175.37
	INCOME TAX (WITHOUT SUBSIDY)																																									
Sl.No	**Description**	**UNIT**	**Year1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year10**	**Year 11**	**Year 12**	**Year 13**	**Year 14**	**Year 15**	**Year 16**	**Year 17**	**Year 18**	**Year 19**	**Year 20**	**Year 21**	**Year 22**	**Year 23**	**Year 24**	**Year 25**	**Year 26**	**Year 27**	**Year 28**	**Year 29**	**Year 30**	**Year 31**	**Year 32**	**Year 33**	**Year 34**	**Year 35**	**Year 36**	**Year 37**	**Year 38**	**Year 39**	**Year 40**
1	Book Profit	Rs.in lakhs	1191.67	509.23	572.64	635.28	697.12	758.13	818.28	877.54	935.87	993.24	1049.61	1104.94	1117.50	1087.23	1055.81	1023.18	989.29	954.10	917.56	879.62	840.22	799.31	756.83	712.72	666.91	619.34	862.49	1050.94	997.68	942.37	884.94	825.31	763.39	699.08	632.31	562.98	490.98	416.22	338.59	257.98
2	Add Depreciation as per books	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Less Depreciation as per IT Act	Rs.in lakhs	1577.61	1404.99	1251.85	1115.92	995.20	887.92	792.53	707.67	632.14	564.87	504.94	352.00	319.29	289.47	262.32	237.62	215.15	194.74	176.21	159.38	167.17	149.88	134.40	120.55	108.14	97.02	87.07	78.14	70.14	62.97	56.54	50.77	45.60	40.96	36.79	33.05	29.70	26.69	23.98	21.55
4	Taxable Profit	Rs.in lakhs	146.33	-363.48	-146.93	51.63	234.19	402.49	558.03	702.15	836.01	960.65	1076.95	1285.22	1330.49	1330.04	1325.76	1317.83	1306.41	1291.64	1273.63	1252.51	1205.33	1181.71	1154.70	1124.45	1091.05	1054.60	1015.16	972.79	927.53	879.40	828.40	774.54	717.79	658.13	595.52	529.93	461.28	389.54	314.61	236.42
5	Normal Income Tax Rate	%	34.94%	34.94%	34.94%	34.94%	34.94%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%
6	Income tax under normal provisions	Rs.in lakhs	0.00	-127.00	-51.34	18.04	81.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	460.45	456.46	451.30	445.01	437.63	421.14	412.89	403.45	392.88	381.21	368.48	354.70	339.89	324.08	307.26	289.44	270.62	250.79	229.95	208.08	185.16	161.17	136.10	109.92	82.61
7	MAT RATE	%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%
8	Tax as per MAT	Rs.in lakhs	208.18	88.96	100.04	110.98	121.79	132.44	142.95	153.31	163.50	173.52	183.37	193.03	195.23	189.94	184.45	178.75	172.83	166.68	160.30	153.67	146.79	139.64	132.22	124.51	116.51	108.20	150.68	183.60	174.29	164.63	154.60	144.18	133.36	122.13	110.47	98.35	85.77	72.71	59.15	45.07
9	TAX PAYABLE	Rs.in lakhs	208.18	88.96	100.04	110.98	121.79	132.44	142.95	153.31	163.50	173.52	183.37	193.03	195.23	189.94	184.45	460.45	456.46	451.30	445.01	437.63	421.14	412.89	403.45	392.88	381.21	368.48	354.70	339.89	324.08	307.26	289.44	270.62	250.79	229.95	208.08	185.16	161.17	136.10	109.92	82.61
10	MAT Credit Available	Rs.in lakhs	208.18	88.96	100.04	110.98	121.79	132.44	142.95	153.31	163.50	173.52	183.37	193.03	195.23	189.94	184.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	MAT credit availed	Rs.in lakhs					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	281.70	283.63	284.62	284.71	283.96	274.35	273.25	271.24																	
12	Income Tax payable after availing MAT Credit	Rs.in lakhs	208.18	88.96	100.04	110.98	121.79	132.44	142.95	153.31	163.50	173.52	183.37	193.03	195.23	189.94	184.45	178.75	172.83	166.68	160.30	153.67	146.79	139.64	132.22	392.88	381.21	368.48	354.70	339.89	324.08	307.26	289.44	270.62	250.79	229.95	208.08	185.16	161.17	136.10	109.92	82.61
																	1711.74							2237.45																	
																								-525.72																	

CASH FLOW (WITHOUT SUBSIDY)

Sl.No	Description	PRE OPERATIVE PERIOD	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Profit as per profit and loss		1191.67	509.23	572.64	635.28	697.12	758.13	818.28	877.54	935.87	993.24	1049.61	1104.94	1117.50	1087.23	1055.81	1023.18	989.29	954.10	917.56	879.62	840.22	799.31	756.83	712.72	666.91	619.34	862.49	1050.94	997.68	942.37	884.94	825.31	763.39	699.08	632.31	562.98	490.98	416.22	338.59	257.98
2	ADD Non cash expences – Depreciation		532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	CASH PROFIT		**1723.94**	**1041.51**	**1104.92**	**1167.55**	**1229.39**	**1290.40**	**1350.56**	**1409.81**	**1468.15**	**1525.52**	**1581.89**	**1637.22**	**1649.77**	**1619.51**	**1588.08**	**1555.45**	**1521.57**	**1486.38**	**1449.84**	**1411.90**	**1372.50**	**1331.59**	**1289.11**	**1244.99**	**1199.19**	**1151.62**	**1102.23**	**1050.94**	**997.68**	**942.37**	**884.94**	**825.31**	**763.39**	**699.08**	**632.31**	**562.98**	**490.98**	**416.22**	**338.59**	**257.98**
4	Equity	**4435.49**																																								
5	Term Loan	**10349.47**																																								
6	W/C Loan		341.37																																							
7	**Total**	**14784.95**	**2065.31**	**1041.51**	**1104.92**	**1167.55**	**1229.39**	**1290.40**	**1350.56**	**1409.81**	**1468.15**	**1525.52**	**1581.89**	**1637.22**	**1649.77**	**1619.51**	**1588.08**	**1555.45**	**1521.57**	**1486.38**	**1449.84**	**1411.90**	**1372.50**	**1331.59**	**1289.11**	**1244.99**	**1199.19**	**1151.62**	**1102.23**	**1050.94**	**997.68**	**942.37**	**884.94**	**825.31**	**763.39**	**699.08**	**632.31**	**562.98**	**490.98**	**416.22**	**338.59**	**257.98**
	Application of Funds																																								
8	Assets	**14784.95**																																							
9	Increase in W/c	Rs.in lakhs	487.67	-3.74	-3.26	-2.99	-2.70	-2.40	-2.09	-1.77	-1.44	-1.10	-0.74	-0.37	5.23	10.84	11.26	-59.83	12.14	12.61	13.09	13.60	39.40	14.66	15.22	15.81	16.41	17.04	17.70	18.38	19.08	19.82	20.58	21.37	22.19	23.04	23.93	24.84	25.80	26.79	27.82	28.89
10	Repayment of Loan	Rs.in lakhs	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Income Tax	Rs.in lakhs	208.18	88.96	100.04	110.98	121.79	132.44	142.95	153.31	163.50	173.52	183.37	193.03	195.23	189.94	184.45	178.75	172.83	166.68	160.30	153.67	146.79	139.64	132.22	392.88	381.21	368.48	354.70	339.89	324.08	307.26	289.44	270.62	250.79	229.95	208.08	185.16	161.17	136.10	109.92	82.61
12	**TOTAL**	**14784.95**	**1558.31**	**947.67**	**959.24**	**970.45**	**981.54**	**992.50**	**1003.31**	**1013.99**	**1024.51**	**1034.88**	**1045.08**	**1055.12**	**200.46**	**200.78**	**195.71**	**118.92**	**184.97**	**179.29**	**173.39**	**167.27**	**186.19**	**154.30**	**147.44**	**408.69**	**397.63**	**385.52**	**372.40**	**358.27**	**343.16**	**327.08**	**310.02**	**291.99**	**272.98**	**252.99**	**232.00**	**210.00**	**186.97**	**162.89**	**137.74**	**111.49**
13	**Opening Cash Balance**	0.00	0.00	507.00	600.84	746.52	943.62	1191.47	1489.37	1836.61	2232.44	2676.08	3166.72	3703.52	4285.62	5734.94	7153.67	8546.04	9982.57	11319.17	12626.25	13902.70	15147.33	16333.65	17510.94	18652.60	19488.91	20290.46	21056.56	21786.39	22479.05	23133.57	23748.86	24323.78	24857.10	25347.50	25793.59	26193.90	26546.88	26850.89	27104.22	27305.07
14	**Net cash inflow**	0.00	507.00	93.84	145.68	197.10	247.85	297.91	347.24	395.83	443.64	490.64	536.80	582.10	1449.32	1418.73	1392.37	1436.53	1336.59	1307.09	1276.45	1244.63	1186.31	1177.29	1141.67	836.30	801.56	766.10	729.83	692.66	654.51	615.29	574.92	533.32	490.40	446.09	400.31	352.98	304.01	253.33	200.85	-27305.07
15	**Closing Balance**	0.00	507.00	600.84	746.52	943.62	1191.47	1489.37	1836.61	2232.44	2676.08	3166.72	3703.52	4285.62	5734.94	7153.67	8546.04	9982.57	11319.17	12626.25	13902.70	15147.33	16333.65	17510.94	18652.60	19488.91	20290.46	21056.56	21786.39	22479.05	23133.57	23748.86	24323.78	24857.10	25347.50	25793.59	26193.90	26546.88	26850.89	27104.22	27305.07	0.00

INTERNAL RATE OF RETURN (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	PAT	Rs.in lakhs	983.48	420.27	472.60	524.29	575.33	625.68	675.33	724.23	772.37	819.72	866.24	911.91	922.27	897.30	871.36	844.43	816.46	787.42	757.27	725.95	693.44	659.67	624.61	319.84	285.70	250.87	507.79	711.04	673.60	635.11	595.50	554.69	512.59	469.14	424.24	377.82	329.81	280.12	228.66	175.37
2	Add Depreciation	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Add Interest on term loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Terminal Value	**-14784.95**	2474.85	1828.24	1797.17	1765.46	1733.10	1700.05	1666.30	1631.81	1596.55	1560.50	1523.62	1485.89	1454.55	1429.57	1403.63	1376.70	1348.74	1319.70	1289.54	1258.23	1225.71	1191.95	1156.89	852.11	817.97	783.14	747.53	711.04	673.60	635.11	595.50	554.69	512.59	469.14	424.24	377.82	329.81	280.12	228.66	175.37
	IRR	**10.73%**																																								

DEBT SERVICE COVERAGE RATIO (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year11	Year12
1	PAT	Rs.in lakhs	983.48	420.27	472.60	524.29	575.33	625.68	675.33	724.23	772.37	819.72	866.24	911.91
2	Interest on term loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70
3	Add Depreciation	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28
4	**TOTAL**	Rs.in lakhs	**2474.85**	**1828.24**	**1797.17**	**1765.46**	**1733.10**	**1700.05**	**1666.30**	**1631.81**	**1596.55**	**1560.50**	**1523.62**	**1485.89**
6	Interest on term loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70
7	Principle Repayment	Rs.in lakhs	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46
8	**TOTAL**	Rs.in lakhs	**1821.55**	**1738.15**	**1654.75**	**1571.35**	**1487.95**	**1404.55**	**1321.15**	**1237.75**	**1154.35**	**1070.95**	**987.55**	**904.16**
9	DSCR		1.36	1.05	1.09	1.12	1.16	1.21	1.26	1.32	1.38	1.46	1.54	1.64

Average DSCR		**1.30**

NET PRESENT VALUE AND BENEFIT COST RATIO (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Expences																																										
	O & M Expenses @ 31.34 lakh/MW , escalated @ 3.84 % per annum	Rs.in lakhs	501.44	520.70	540.69	561.45	583.01	605.40	628.65	652.79	677.85	703.88	730.91	758.98	788.13	818.39	849.82	882.45	916.33	951.52	988.06	1026.00	1065.40	1106.31	1148.79	1192.91	1238.71	1286.28	1335.67	1386.96	1440.22	1495.53	1552.96	1612.59	1674.51	1738.82	1805.59	1874.92	1946.92	2021.68	2099.31	2179.92
2	Income tax under normal provisions	Rs.in lakhs	208.18	88.96	100.04	110.98	121.79	132.44	142.95	153.31	163.50	173.52	183.37	193.03	195.23	189.94	184.45	178.75	172.83	166.68	160.30	153.67	146.79	139.64	132.22	392.88	381.21	368.48	354.70	339.89	324.08	307.26	289.44	270.62	250.79	229.95	208.08	185.16	161.17	136.10	109.92	82.61
3	Total Expences	Rs.in lakhs	709.62	609.66	640.73	672.44	704.80	737.84	771.60	806.09	841.35	877.40	914.28	952.01	983.35	1008.33	1034.26	1061.20	1089.16	1118.20	1148.36	1179.67	1212.19	1245.95	1281.01	1585.79	1619.93	1654.76	1690.37	1726.86	1764.30	1802.79	1842.40	1883.21	1925.31	1968.76	2013.66	2060.08	2108.09	2157.78	2209.24	2262.53
4	Income																																									
5	Power Generation/annum Free Energy to State & Local Community @ 23.05% (Moratorium for 1 year from Scheduled Commercial Operation Date)	Units (in Lakhs)	759.36	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32	584.32
6	Sale Price per unit	in Rs	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27
7	**Total Income**	Rs in Lakhs	3238.95	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37	2492.37
8	Net Surplus/Short fall	Rs in Lakhs	2529.33	1882.71	1851.64	1819.94	1787.57	1754.53	1720.77	1686.28	1651.02	1614.97	1578.09	1540.36	1509.02	1484.04	1458.11	1431.18	1403.21	1374.17	1344.01	1312.70	1280.19	1246.42	1211.36	906.58	872.45	837.62	802.00	765.51	728.07	689.58	649.97	609.16	567.06	523.61	478.71	432.30	384.28	334.59	283.14	229.84
9	Discount Factor	8.61%	0.92	0.85	0.78	0.72	0.66	0.61	0.56	0.52	0.48	0.44	0.40	0.37	0.34	0.31	0.29	0.27	0.25	0.23	0.21	0.19	0.18	0.16	0.15	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.08	0.07	0.07	0.06	0.06	0.05	0.05	0.04	0.04	0.04
10	Net Presesnt Value	Rs in Lakhs	2328.81	1596.04	1445.27	1307.91	1182.81	1068.91	965.24	870.91	785.10	707.08	636.16	571.72	515.69	466.95	422.42	381.75	344.62	310.73	279.82	251.63	225.95	202.55	181.25	124.89	110.66	97.82	86.24	75.79	66.37	57.88	50.23	43.34	37.15	31.58	26.58	22.10	18.09	14.50	11.30	8.45
11	**NPV of 40 years Revenues at a discounting factor of 8.61%**		15,047.67																																							
12	**Benefit Cost Ratio**		1.02																																							

BASIC PARAMETER

1.	**Unit Generated after auxiliry consumption @ 1% & transformer losses @ 0.05%**	**at 50 % PLF**	**690.32**	**Lakh**
	Free power to state and local area development		23.05%	
	Unit of Sale		531.20	
2.	**Sale Price (Rs)**	(Levelised teriff for 40 years)	4.69	
	Useful Life	Year	40.00	
3.	**Debt Equity Ratio**			
	(a) Debt (%)		70%	
	(b) Equity (%)		30%	
	Moratorium Period	Year	30	
4	**Construction period (years)**	year of preconstruction of one year		
	Repayment Quarterly	**No of Installment**	48	
	Repayment Quarterly	**in Lacs**		
5	**Period of repayment**		12	year
6	CDM Benefit		0	
7	**Return on Equity (%)**			
	for first 20 years		16.96%	p.a
	after 20 years onwards		21.52%	p.a

8 Depreciation (%) for Tariff

DEPRECIATION A	**(AS PER SLM METHOD)**		
	Depreciation for 15 Years	Rs.in lakhs	4.67%
	Depreciation Thereafter	Rs.in lakhs	0.80%
DEPRECIATION A	**(AS PER SLM METHOD)**		
	Depreciation for Buildings	Rs.in lakhs	3.34%
	Plant and Machinery	Rs.in lakhs	5.28%
DEPRECIATION A	**(AS PER WDV METHOD)**		
Depreciation for Buildings			10.00%
Plant and Machinery			15.00%

9	**Operation & Maintenance expenses**	31.34%	Rs. Lakh/MW
10	**Annual escalation of O & M cost (%)**	3.84%	per annum
11	**Income tax as per normal provisions**		
	(Tax hpliday for ocntinuous block of 10 years during first 15 years and theerafter normal corporate rates of taxes)		
	(a) as per normal provision	34.94%	
	(b) under MAT (for first 10 years)	17.47%	
12	**Discounitng factor (%)**	8.61%	
13	**Interest on WC @11.17% & Increase in WC**	11.17%	
14	**Interest on loan**	9.67%	

NAME OF THE PROJECT : HALAPANI HYDRO ELECTRIC PROJECT

Cost Of Project	**13797.48**	**Land**	**0.00**
IDC	**987.47**	**E&M**	**1982.39**
Total Cost Of Project	**14784.95**	**Civil & others**	**12802.56**
Promoters Equity 30 %	**4435.49**		**14784.95**
Loan 70 %	**10349.47**		

GENERATION COST AND TARIFF (WITHOUT SUBSIDY) (Rs. In Lakhs)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Capacity	MW	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00
2	Power Generation/annum Free Energy to State & Local Community @ 23.05% (Moratorium for 1 year from Scheduled Commercial Operation Date)	Units (in Lakhs)	690.32	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20
3	Sale Price per unit	in Rs	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69
	Fixed Cost																																									
3	O & M Expenses @ 31.34 lakh/MW , escalated @ 3.84 % per annum	Rs.in lakhs	501.44	520.70	540.69	561.45	583.01	605.40	628.65	652.79	677.85	703.88	730.91	758.98	788.13	818.39	849.82	882.45	916.33	951.52	988.06	1026.00	1065.40	1106.31	1148.79	1192.91	1238.71	1286.28	1335.67	1386.96	1440.22	1495.53	1552.96	1612.59	1674.51	1738.82	1805.59	1874.92	1946.92	2021.68	2099.31	2179.92
4	Interest on WC Loan @ 11.17 % interset	Rs.in lakhs	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46
5	Interest on loan @ 9.67% interest	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Return on equity @16.96 % p.a for 20 years and @ 21.52 % after 20 years onwards	Rs.in lakhs	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	752.26	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52	954.52
7	CDM Benifits		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Depreciation for 1st 15 years@ 4.67% and 16th onwards @ 0.80%	Rs.in lakhs	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	690.46	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28	118.28
9	local area development @1 P/unit		6.90	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31	5.31
10	**Total Expenses (3+4+5+6+7+8)**	Rs.in lakhs	**2964.62**	**2898.88**	**2835.48**	**2772.84**	**2711.00**	**2649.99**	**2589.84**	**2530.58**	**2472.24**	**2414.87**	**2358.50**	**2303.17**	**2290.62**	**2320.88**	**2352.31**	**1812.76**	**1846.65**	**1881.83**	**1918.37**	**1956.31**	**2197.97**	**2238.88**	**2281.36**	**2325.48**	**2371.29**	**2418.85**	**2468.25**	**2519.54**	**2572.80**	**2628.10**	**2685.53**	**2745.16**	**2807.09**	**2871.39**	**2938.16**	**3007.49**	**3079.49**	**3154.25**	**3231.88**	**3312.50**
11	Tariff Per Unit	Rs per Unit	**4.29**	**5.46**	**5.34**	**5.22**	**5.10**	**4.99**	**4.88**	**4.76**	**4.65**	**4.55**	**4.44**	**4.34**	**4.31**	**4.37**	**4.43**	**3.41**	**3.48**	**3.54**	**3.61**	**3.68**	**4.14**	**4.21**	**4.29**	**4.38**	**4.46**	**4.55**	**4.65**	**4.74**	**4.84**	**4.95**	**5.06**	**5.17**	**5.28**	**5.41**	**5.53**	**5.66**	**5.80**	**5.94**	**6.08**	**6.24**
12	Discount Factor	8.61%	**0.92**	**0.85**	**0.78**	**0.72**	**0.66**	**0.61**	**0.56**	**0.52**	**0.48**	**0.44**	**0.40**	**0.37**	**0.34**	**0.31**	**0.29**	**0.27**	**0.25**	**0.23**	**0.21**	**0.19**	**0.18**	**0.16**	**0.15**	**0.14**	**0.13**	**0.12**	**0.11**	**0.10**	**0.09**	**0.08**	**0.08**	**0.07**	**0.07**	**0.06**	**0.06**	**0.05**	**0.05**	**0.04**	**0.04**	**0.04**
13	Present value of cost	Rs per Unit	**3.95**	**4.63**	**4.17**	**3.75**	**3.38**	**3.04**	**2.73**	**2.46**	**2.21**	**1.99**	**1.79**	**1.61**	**1.47**	**1.37**	**1.28**	**0.91**	**0.85**	**0.80**	**0.75**	**0.71**	**0.73**	**0.68**	**0.64**	**0.60**	**0.57**	**0.53**	**0.50**	**0.47**	**0.44**	**0.42**	**0.39**	**0.37**	**0.35**	**0.33**	**0.31**	**0.29**	**0.27**	**0.26**	**0.24**	**0.23**
14	Levelised tariff for 15 Years	Rs per Unit	**4.830**																																							
15	Levelised tariff for 40 Years	Rs per Unit	**4.69**																																							
16	**Working capital**																																									
a	Maintenance for spares @15% of O&M	Rs.in lakhs	75.216	78.104	81.103	84.218	87.452	90.810	94.297	97.918	101.678	105.583	109.637	113.847	118.219	122.758	127.472	132.367	137.450	142.728	148.209	153.900	159.810	165.947	172.319	178.936	185.807	192.942	200.351	208.045	216.034	224.329	232.944	241.889	251.177	260.822	270.838	281.238	292.038	303.252	314.897	326.989
b	O&M charges for one month	Rs.in lakhs	41.79	43.39	45.06	46.79	48.58	50.45	52.39	54.40	56.49	58.66	60.91	63.25	65.68	68.20	70.82	73.54	76.36	79.29	82.34	85.50	88.78	92.19	95.73	99.41	103.23	107.19	111.31	115.58	120.02	124.63	129.41	134.38	139.54	144.90	150.47	156.24	162.24	168.47	174.94	181.66
c	45 days receivables	Rs.in lakhs	370.58	362.36	354.44	346.61	338.88	331.25	323.73	316.33	309.04	301.86	294.82	287.90	286.33	290.11	294.04	226.60	230.84	235.23	239.80	244.54	274.75	279.87	285.18	290.69	296.42	302.36	308.54	314.95	321.60	328.52	335.70	343.15	350.89	358.93	367.27	375.94	384.94	394.29	403.99	414.07
d	Total Working Capital	Rs.in lakhs	487.58	483.86	480.60	477.62	474.92	472.51	470.42	468.64	467.20	466.10	465.36	465.00	470.23	481.07	492.33	432.50	444.65	457.26	470.35	483.94	523.34	538.00	553.23	569.03	585.45	602.49	620.19	638.57	657.66	677.47	698.05	719.42	741.61	764.65	788.58	813.42	839.22	866.01	893.83	922.72
e	Interest on WC @11.17 % & Increase in WC	Rs.in lakhs	54.46	-3.72	-3.26	-2.99	-2.70	-2.40	-2.09	-1.77	-1.44	-1.10	-0.74	-0.37	5.23	10.84	11.26	-59.83	12.14	12.61	13.09	13.60	39.40	14.66	15.22	15.81	16.41	17.04	17.70	18.38	19.08	19.82	20.58	21.37	22.19	23.04	23.93	24.84	25.80	26.79	27.82	28.89

	DEPRECIATION (WITHOUT SUBSIDY)		
1	Land	Rs.in lakhs	0.00
2	Building	Rs.in lakhs	12802.56
3	Machinery	Rs.in lakhs	1982.39
		Rs.in lakhs	14784.95

	DEPRECIATION AS PER CERC NORMS	(AS PER SLM METHOD)		
1	Depreciation for 15 Years	Rs.in lakhs	4.67%	690.46
2	Depreciation Thereafter	Rs.in lakhs	0.80%	118.28

	DEPRECIATION AS PER COMPANIES ACT	(AS PER SLM METHOD)		
1	Depreciation for Buildings	Rs.in lakhs	3.34%	427.61
2	Plant and Machinery	Rs.in lakhs	5.28%	104.67
		Rs.in lakhs		**532.28**

	DEPRECIATION AS PER IT ACT	(AS PER WDV METHOD)
1	Depreciation for Buildings	10.00%
2	Plant and Machinery	15.00%

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
	Opening Value																																									
1	Building	Rs.in lakhs	12802.56	11522.30	10370.07	9333.07	8399.76	7559.78	6803.80	6123.42	5511.08	4959.97	4463.98	4017.58	3615.82	3254.24	2928.81	2635.93	2372.34	2135.11	1921.60	1729.44	1556.49	1400.84	1260.76	1134.68	1021.21	919.09	827.18	744.47	670.02	603.02	542.72	488.44	439.60	395.64	356.08	320.47	288.42	259.58	233.62	210.26
2	Plant and Machinery	Rs.in lakhs	1982.39	1685.03	1432.28	1217.44	1034.82	879.60	747.66	635.51	540.18	459.16	390.28	331.74	281.98	239.68	203.73	173.17	147.19	125.12	106.35	90.40	76.84	65.31	55.51	47.19	40.11	34.09	28.98	24.63	20.94	17.80	15.13	12.86	10.93	9.29	7.90	6.71	5.71	4.85	4.12	3.50
	Depreciation																																								
3	Building	Rs.in lakhs	1280.26	1152.23	1037.01	933.31	839.98	755.98	680.38	612.34	551.11	496.00	446.40	401.76	361.58	325.42	292.88	263.59	237.23	213.51	192.16	172.94	155.65	140.08	126.08	113.47	102.12	91.91	82.72	74.45	67.00	60.30	54.27	48.84	43.96	39.56	35.61	32.05	28.84	25.96	23.36	21.03
4	Plant and Machinery	Rs.in lakhs	297.36	252.76	214.84	182.62	155.22	131.94	112.15	95.33	81.03	68.87	58.54	49.76	42.30	35.95	30.56	25.98	22.08	18.77	15.95	13.56	11.53	9.80	8.33	7.08	6.02	5.11	4.35	3.69	3.14	2.67	2.27	1.93	1.64	1.39	1.18	1.01	0.86	0.73	0.62	0.53
5	**Total (3+4)**	Rs.in lakhs	**1577.61**	**1404.99**	**1251.85**	**1115.92**	**995.20**	**887.92**	**792.53**	**707.67**	**632.14**	**564.87**	**504.94**	**352.00**	**319.29**	**289.47**	**262.32**	**237.62**	**215.15**	**194.74**	**176.21**	**159.38**	**167.17**	**149.88**	**134.40**	**120.55**	**108.14**	**97.02**	**87.07**	**78.14**	**70.14**	**62.97**	**56.54**	**50.77**	**45.60**	**40.96**	**36.79**	**33.05**	**29.70**	**26.69**	**23.98**	**21.55**
	Closing Balance																																								
6	Building	Rs.in lakhs	11522.30	10370.07	9333.07	8399.76	7559.78	6803.80	6123.42	5511.08	4959.97	4463.98	4017.58	3615.82	3254.24	2928.81	2635.93	2372.34	2135.11	1921.60	1729.44	1556.49	1400.84	1260.76	1134.68	1021.21	919.09	827.18	744.47	670.02	603.02	542.72	488.44	439.60	395.64	356.08	320.47	288.42	259.58	233.62	210.26	189.23
7	Plant and Machinery	Rs.in lakhs	1685.03	1432.28	1217.44	1034.82	879.60	747.66	635.51	540.18	459.16	390.28	331.74	281.98	239.68	203.73	173.17	147.19	125.12	106.35	90.40	76.84	65.31	55.51	47.19	40.11	34.09	28.98	24.63	20.94	17.80	15.13	12.86	10.93	9.29	7.90	6.71	5.71	4.85	4.12	3.50	2.98
8	**Total (6+7)**	Rs.in lakhs	**13207.34**	**11802.35**	**10550.50**	**9434.58**	**8439.38**	**7551.46**	**6758.93**	**6051.27**	**5419.13**	**4854.26**	**4349.32**	**3897.80**	**3493.92**	**3132.54**	**2809.10**	**2519.53**	**2260.22**	**2027.94**	**1819.83**	**1633.33**	**1466.15**	**1316.27**	**1181.87**	**1061.32**	**953.19**	**856.16**	**769.10**	**690.96**	**620.81**	**557.84**	**501.30**	**450.53**	**404.93**	**363.97**	**327.18**	**294.13**	**264.43**	**237.74**	**213.76**	**192.21**

PROFITABILITY STATEMENT (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Annual Revenue	Rs.in lakhs	3238.25	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83
2	CO_2 Revenue	Rs.in lakhs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Total Income (1+2)	Rs.in lakhs	**3238.25**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**	**2491.83**
	Fixed Cost																																									
4	O & M Expenses @ 31.34 lakh/MW , escalated @ 3.84 % per annum	Rs.in lakhs	501.44	520.70	540.69	561.45	583.01	605.40	628.65	652.79	677.85	703.88	730.91	758.98	788.13	818.39	849.82	882.45	916.33	951.52	988.06	1026.00	1065.40	1106.31	1148.79	1192.91	1238.71	1286.28	1335.67	1386.96	1440.22	1495.53	1552.96	1612.59	1674.51	1738.82	1805.59	1874.92	1946.92	2021.68	2099.31	2179.92
5	Depreciation	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Interest on loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Interest on W/c loan	Rs.in lakhs	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46	54.46
8	Total Cost (4+5+6+7)	Rs.in lakhs	**2047.27**	**1983.13**	**1919.72**	**1857.09**	**1795.25**	**1734.24**	**1674.08**	**1614.82**	**1556.49**	**1499.12**	**1442.75**	**1387.42**	**1374.86**	**1405.13**	**1436.55**	**1469.19**	**1503.07**	**1538.26**	**1574.80**	**1612.74**	**1652.14**	**1693.05**	**1735.53**	**1779.65**	**1825.45**	**1873.02**	**1629.87**	**1441.43**	**1494.69**	**1549.99**	**1607.42**	**1667.05**	**1728.98**	**1793.28**	**1860.05**	**1929.38**	**2001.38**	**2076.14**	**2153.77**	**2234.39**
9	Profit Before Tax (3-8)	Rs.in lakhs	1190.98	508.70	572.11	634.75	696.58	757.60	817.75	877.01	935.34	992.71	1049.08	1104.41	1116.97	1086.70	1055.28	1022.64	988.76	953.57	917.03	879.09	839.69	798.78	756.30	712.19	666.38	618.81	861.96	1050.40	997.14	941.84	884.41	824.78	762.86	698.55	631.78	562.45	490.45	415.69	338.06	257.44
10	Less Tax	Rs.in lakhs	208.06	88.87	99.95	110.89	121.69	132.35	142.86	153.21	163.40	173.43	183.27	192.94	195.13	189.85	184.36	178.66	172.74	166.59	160.21	153.58	146.69	139.55	132.13	392.70	381.03	368.29	354.51	339.71	323.89	307.08	289.26	270.44	250.61	229.76	207.89	184.97	160.99	135.92	109.74	82.42
11	Profit After Tax (9-10)	Rs.in lakhs	982.91	419.83	472.16	523.86	574.89	625.24	674.89	723.79	771.94	819.28	865.81	911.47	921.83	896.86	870.92	843.99	816.02	786.98	756.83	725.51	693.00	659.23	624.17	319.49	285.35	250.52	507.45	710.70	673.25	634.76	595.15	554.34	512.25	468.79	423.89	377.48	329.46	279.77	228.32	175.02
	INCOME TAX (WITHOUT SUBSIDY)																																									
Sl.No	**Description**	**UNIT**	**Year1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year10**	**Year 11**	**Year 12**	**Year 13**	**Year 14**	**Year 15**	**Year 16**	**Year 17**	**Year 18**	**Year 19**	**Year 20**	**Year 21**	**Year 22**	**Year 23**	**Year 24**	**Year 25**	**Year 26**	**Year 27**	**Year 28**	**Year 29**	**Year 30**	**Year 31**	**Year 32**	**Year 33**	**Year 34**	**Year 35**	**Year 36**	**Year 37**	**Year 38**	**Year 39**	**Year 40**
1	Book Profit	Rs.in lakhs	1190.98	508.70	572.11	634.75	696.58	757.60	817.75	877.01	935.34	992.71	1049.08	1104.41	1116.97	1086.70	1055.28	1022.64	988.76	953.57	917.03	879.09	839.69	798.78	756.30	712.19	666.38	618.81	861.96	1050.40	997.14	941.84	884.41	824.78	762.86	698.55	631.78	562.45	490.45	415.69	338.06	257.44
2	Add Depreciation as per books	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Less Depreciation as per IT Act	Rs.in lakhs	1577.61	1404.99	1251.85	1115.92	995.20	887.92	792.53	707.67	632.14	564.87	504.94	352.00	319.29	289.47	262.32	237.62	215.15	194.74	176.21	159.38	167.17	149.88	134.40	120.55	108.14	97.02	87.07	78.14	70.14	62.97	56.54	50.77	45.60	40.96	36.79	33.05	29.70	26.69	23.98	21.55
4	Taxable Profit	Rs.in lakhs	145.64	-364.01	-147.47	51.10	233.66	401.95	557.50	701.62	835.48	960.12	1076.42	1284.69	1329.96	1329.51	1325.23	1317.30	1305.88	1291.10	1273.10	1251.98	1204.79	1181.18	1154.17	1123.92	1090.52	1054.06	1014.63	972.26	927.00	878.87	827.87	774.01	717.26	657.60	594.99	529.40	460.75	389.00	314.08	235.89
5	Normal Income Tax Rate	%	34.94%	34.94%	34.94%	34.94%	34.94%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%	34.94%
6	Income tax under normal provisions	Rs.in lakhs	0.00	-127.18	-51.52	17.85	81.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	460.27	456.27	451.11	444.82	437.44	420.96	412.70	403.27	392.70	381.03	368.29	354.51	339.71	323.89	307.08	289.26	270.44	250.61	229.76	207.89	184.97	160.99	135.92	109.74	82.42
7	MAT RATE	%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%	17.47%
8	Tax as per MAT	Rs.in lakhs	208.06	88.87	99.95	110.89	121.69	132.35	142.86	153.21	163.40	173.43	183.27	192.94	195.13	189.85	184.36	178.66	172.74	166.59	160.21	153.58	146.69	139.55	132.13	124.42	116.42	108.11	150.58	183.51	174.20	164.54	154.51	144.09	133.27	122.04	110.37	98.26	85.68	72.62	59.06	44.98
9	TAX PAYABLE	Rs.in lakhs	208.06	88.87	99.95	110.89	121.69	132.35	142.86	153.21	163.40	173.43	183.27	192.94	195.13	189.85	184.36	460.27	456.27	451.11	444.82	437.44	420.96	412.70	403.27	392.70	381.03	368.29	354.51	339.71	323.89	307.08	289.26	270.44	250.61	229.76	207.89	184.97	160.99	135.92	109.74	82.42
10	MAT Credit Available	Rs.in lakhs	208.06	88.87	99.95	110.89	121.69	132.35	142.86	153.21	163.40	173.43	183.27	192.94	195.13	189.85	184.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	MAT credit availed	Rs.in lakhs					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	281.61	283.54	284.52	284.62	283.87	274.26	273.16	271.14																	
12	Income Tax payable after availing MAT Credit	Rs.in lakhs	208.06	88.87	99.95	110.89	121.69	132.35	142.86	153.21	163.40	173.43	183.27	192.94	195.13	189.85	184.36	178.66	172.74	166.59	160.21	153.58	146.69	139.55	132.13	392.70	381.03	368.29	354.51	339.71	323.89	307.08	289.26	270.44	250.61	229.76	207.89	184.97	160.99	135.92	109.74	82.42
																	1710.81							2236.71																	
																									-525.90																	

CASH FLOW (WITHOUT SUBSIDY)

Sl.No	Description	PRE OPERATIVE PERIOD	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Profit as per profit and loss		1190.98	508.70	572.11	634.75	696.58	757.60	817.75	877.01	935.34	992.71	1049.08	1104.41	1116.97	1086.70	1055.28	1022.64	988.76	953.57	917.03	879.09	839.69	798.78	756.30	712.19	666.38	618.81	861.96	1050.40	997.14	941.84	884.41	824.78	762.86	698.55	631.78	562.45	490.45	415.69	338.06	257.44
2	ADD Non cash expences – Depreciation		532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	CASH PROFIT		**1723.25**	**1040.98**	**1104.38**	**1167.02**	**1228.86**	**1289.87**	**1350.02**	**1409.28**	**1467.62**	**1524.99**	**1581.36**	**1636.69**	**1649.24**	**1618.98**	**1587.55**	**1554.92**	**1521.03**	**1485.85**	**1449.31**	**1411.37**	**1371.97**	**1331.06**	**1288.58**	**1244.46**	**1198.65**	**1151.09**	**1101.69**	**1050.40**	**997.14**	**941.84**	**884.41**	**824.78**	**762.86**	**698.55**	**631.78**	**562.45**	**490.45**	**415.69**	**338.06**	**257.44**
4	Equity	**4435.49**																																								
5	Term Loan	**10349.47**																																								
6	W/C Loan		341.31																																							
7	**Total**	**14784.95**	**2064.56**	**1040.98**	**1104.38**	**1167.02**	**1228.86**	**1289.87**	**1350.02**	**1409.28**	**1467.62**	**1524.99**	**1581.36**	**1636.69**	**1649.24**	**1618.98**	**1587.55**	**1554.92**	**1521.03**	**1485.85**	**1449.31**	**1411.37**	**1371.97**	**1331.06**	**1288.58**	**1244.46**	**1198.65**	**1151.09**	**1101.69**	**1050.40**	**997.14**	**941.84**	**884.41**	**824.78**	**762.86**	**698.55**	**631.78**	**562.45**	**490.45**	**415.69**	**338.06**	**257.44**
	Application of Funds																																								
8	Assets	**14784.95**																																							
9	Increase in W/c	Rs.in lakhs	487.58	-3.72	-3.26	-2.99	-2.70	-2.40	-2.09	-1.77	-1.44	-1.10	-0.74	-0.37	5.23	10.84	11.26	-59.83	12.14	12.61	13.09	13.60	39.40	14.66	15.22	15.81	16.41	17.04	17.70	18.38	19.08	19.82	20.58	21.37	22.19	23.04	23.93	24.84	25.80	26.79	27.82	28.89
10	Repayment of Loan	Rs.in lakhs	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Income Tax	Rs.in lakhs	208.06	88.87	99.95	110.89	121.69	132.35	142.86	153.21	163.40	173.43	183.27	192.94	195.13	189.85	184.36	178.66	172.74	166.59	160.21	153.58	146.69	139.55	132.13	392.70	381.03	368.29	354.51	339.71	323.89	307.08	289.26	270.44	250.61	229.76	207.89	184.97	160.99	135.92	109.74	82.42
12	**TOTAL**	**14784.95**	**1558.10**	**947.60**	**959.14**	**970.36**	**981.45**	**992.40**	**1003.22**	**1013.89**	**1024.42**	**1034.78**	**1044.99**	**1055.03**	**200.37**	**200.69**	**195.62**	**118.83**	**184.88**	**179.20**	**173.30**	**167.17**	**186.09**	**154.21**	**147.35**	**408.50**	**397.44**	**385.33**	**372.21**	**358.09**	**342.98**	**326.89**	**309.84**	**291.81**	**272.80**	**252.81**	**231.82**	**209.82**	**186.79**	**162.71**	**137.56**	**111.31**
13	**Opening Cash Balance**	0.00	0.00	506.46	599.83	745.08	941.74	1189.15	1486.61	1833.42	2228.81	2672.01	3162.21	3698.57	4280.23	5729.11	7147.40	8539.34	9975.43	11311.59	12618.24	13894.25	15138.44	16324.32	17501.17	18642.39	19478.35	20279.56	21045.32	21774.80	22467.12	23121.28	23736.23	24310.80	24843.78	25333.83	25779.58	26179.55	26532.18	26835.85	27088.83	27289.33
14	**Net cash inflow**	0.00	506.46	93.38	145.24	196.66	247.41	297.47	346.80	395.39	443.20	490.20	536.37	581.66	1448.88	1418.29	1391.94	1436.09	1336.16	1306.65	1276.01	1244.19	1185.87	1176.85	1141.23	835.96	801.21	765.75	729.48	692.32	654.17	614.95	574.58	532.97	490.06	445.75	399.97	352.63	303.67	252.98	200.50	-27289.33
15	**Closing Balance**	0.00	506.46	599.83	745.08	941.74	1189.15	1486.61	1833.42	2228.81	2672.01	3162.21	3698.57	4280.23	5729.11	7147.40	8539.34	9975.43	11311.59	12618.24	13894.25	15138.44	16324.32	17501.17	18642.39	19478.35	20279.56	21045.32	21774.80	22467.12	23121.28	23736.23	24310.80	24843.78	25333.83	25779.58	26179.55	26532.18	26835.85	27088.83	27289.33	0.00

INTERNAL RATE OF RETURN (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	PAT	Rs.in lakhs	982.91	419.83	472.16	523.86	574.89	625.24	674.89	723.79	771.94	819.28	865.81	911.47	921.83	896.86	870.92	843.99	816.02	786.98	756.83	725.51	693.00	659.23	624.17	319.49	285.35	250.52	507.45	710.70	673.25	634.76	595.15	554.34	512.25	468.79	423.89	377.48	329.46	279.77	228.32	175.02
2	Add Depreciation	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	239.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Add Interest on term loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Terminal Value	**-14784.95**	2474.28	1827.80	1796.73	1765.03	1732.66	1699.62	1665.86	1631.37	1596.11	1560.06	1523.18	1485.45	1454.11	1429.13	1403.20	1376.26	1348.30	1319.26	1289.10	1257.79	1225.27	1191.51	1156.45	851.77	817.63	782.80	747.18	710.70	673.25	634.76	595.15	554.34	512.25	468.79	423.89	377.48	329.46	279.77	228.32	175.02
	IRR	**10.72%**																																								

DEBT SERVICE COVERAGE RATIO (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year11	Year12
1	PAT	Rs.in lakhs	982.91	419.83	472.16	523.86	574.89	625.24	674.89	723.79	771.94	819.28	865.81	911.47
2	Interest on term loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70
3	Add Depreciation	Rs.in lakhs	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28	532.28
4	**TOTAL**	Rs.in lakhs	**2474.28**	**1827.80**	**1796.73**	**1765.03**	**1732.66**	**1699.62**	**1665.86**	**1631.37**	**1596.11**	**1560.06**	**1523.18**	**1485.45**
6	Interest on term loan	Rs.in lakhs	959.09	875.69	792.29	708.90	625.50	542.10	458.70	375.30	291.90	208.50	125.10	41.70
7	Principle Repayment	Rs.in lakhs	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46	862.46
8	**TOTAL**	Rs.in lakhs	**1821.55**	**1738.15**	**1654.75**	**1571.35**	**1487.95**	**1404.55**	**1321.15**	**1237.75**	**1154.35**	**1070.95**	**987.55**	**904.16**
9	DSCR		1.36	1.05	1.09	1.12	1.16	1.21	1.26	1.32	1.38	1.46	1.54	1.64

Average DSCR		**1.30**

NET PRESENT VALUE AND BENEFIT COST RATIO (WITHOUT SUBSIDY)

Sl.No	Description	UNIT	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
1	Expences																																										
	O & M Expenses @ 31.34 lakh/MW , escalated @ 3.84 % per annum	Rs.in lakhs	501.44	520.70	540.69	561.45	583.01	605.40	628.65	652.79	677.85	703.88	730.91	758.98	788.13	818.39	849.82	882.45	916.33	951.52	988.06	1026.00	1065.40	1106.31	1148.79	1192.91	1238.71	1286.28	1335.67	1386.96	1440.22	1495.53	1552.96	1612.59	1674.51	1738.82	1805.59	1874.92	1946.92	2021.68	2099.31	2179.92
2	Income tax under normal provisions	Rs.in lakhs	208.06	88.87	99.95	110.89	121.69	132.35	142.86	153.21	163.40	173.43	183.27	192.94	195.13	189.85	184.36	178.66	172.74	166.59	160.21	153.58	146.69	139.55	132.13	392.70	381.03	368.29	354.51	339.71	323.89	307.08	289.26	270.44	250.61	229.76	207.89	184.97	160.99	135.92	109.74	82.42
3	Total Expences	Rs.in lakhs	709.50	609.57	640.64	672.34	704.71	737.75	771.51	806.00	841.26	877.31	914.19	951.92	983.26	1008.24	1034.17	1061.10	1089.07	1118.11	1148.27	1179.58	1212.09	1245.86	1280.92	1585.60	1619.74	1654.57	1690.19	1726.67	1764.12	1802.61	1842.22	1883.03	1925.12	1968.58	2013.48	2059.89	2107.90	2157.60	2209.05	2262.35
4	Income																																										
5	Power Generation/annum Free Energy to State & Local Community @ 23.05% (Moratorium for 1 year from Scheduled Commercial Operation Date)	Units (in Lakhs)	690.32	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20	531.20
6	Sale Price per unit	in Rs	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69	4.69
7	**Total Income**	Rs in Lakhs	3238.25	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83	2491.83
8	Net Surplus/Short fall	Rs in Lakhs	2528.74	1882.27	1851.19	1819.49	1787.13	1754.08	1720.32	1685.83	1650.57	1614.52	1577.64	1539.91	1508.57	1483.60	1457.66	1430.73	1402.76	1373.72	1343.57	1312.25	1279.74	1245.97	1210.91	906.23	872.09	837.26	801.65	765.16	727.71	689.23	649.62	608.80	566.71	523.25	478.36	431.94	383.93	334.24	282.78	229.49
9	Discount Factor	8.61%	0.92	0.85	0.78	0.72	0.66	0.61	0.56	0.52	0.48	0.44	0.40	0.37	0.34	0.31	0.29	0.27	0.25	0.23	0.21	0.19	0.18	0.16	0.15	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.08	0.07	0.07	0.06	0.06	0.05	0.05	0.04	0.04	0.04
10	Net Presesnt Value	Rs in Lakhs	2328.28	1595.66	1444.92	1307.59	1182.51	1068.64	964.99	870.67	784.89	706.88	635.98	571.55	515.54	466.81	422.29	381.63	344.51	310.63	279.73	251.55	225.87	202.48	181.18	124.84	110.62	97.78	86.20	75.75	66.33	57.85	50.20	43.32	37.12	31.56	26.56	22.09	18.07	14.49	11.29	8.43
11	**NPV of 40 years Revenues at a discounting factor of 8.61%**		15,043.63																																							
12	**Benefit Cost Ratio**		1.02																																							

18.0 CONCLUSIONS

On the basis of detailed techno-economic review of the project following conclusions are drawn.

(i) The Project with its proposed technical parameters is found to be technically feasible.

(ii) The design and cost estimates for works appear in order as the geo-technical investigations have been carried out for different civil works.

(iii) The costs of some components of electro-mechanical equipment appeared on the higher side and of some components on lower side. Accordingly, the cost of electro-mechanical equipment has been revised in line with assessment of works quantities and prevailing market prices. The total cost of the project has been revised from Rs.158.76 Crores to Rs.147.85 Crores (without subsidy).

(iv) Further looking at the projected financial indices like generation cost and average DSCR, it appears to be economically viable and financially profitable.

19.0 OTHER ASPECTS TO BE CONSIDERED FOR TERM LENDING

(i) Power Purchase Agreement should be in place with Govt. of Arunachal Pradesh or any other reputed power trading organization/third party sale.

(ii) The orders/contracts are to be placed well in time with reputed manufacturers for Hydro-Mechanical and Electro-Mechanical Equipment with necessary guarantees.

(iii) The necessary clearances are to be obtained from concerned departments and agencies especially from the forest department.

(iv) Project being located in the remote area of Arunachal Pradesh participation of local bodies in the project execution and site development need to be ensured with suitable mechanism of regulation and monitoring.

(v) There should be adequate and suitable Insurance cover during the construction of the project and after completion of the project as a safety aspect.

(vi) Applications at appropriate time are made for Carbon Credits under CDM.

(vii) Hydro-Mechanical, Electro-Mechanical Equipment and Electrical System – are to be automated for power generation and project should have minimum operating staff for regular operation & maintenance of the power station.

(viii) Excavations/Transmission system should be finalized before commissioning of the project.

LIST OF PERSONNEL INVOLVED

DHPD, Govt. of Arunachal Pradesh

Chief Engineer (Monitoring)

Department of Hydro and Renewable Energy

1. Shri M.K. Singhal, Associate Professor & PI
2. Shri S.K. Tyagi, Consultant
3. Shri Y.N. Goel, Consultant
4. Shri Rajesh Kansal, Consultant
5. Shri Sumit Saini, Project Associate
6. Shri Sumit, Project Associate
7. Shri Vinay Kumar, Project Associate
8. Shri Anil Kumar, Project Assistant

M/s P.K. Hospitality Service Pvt

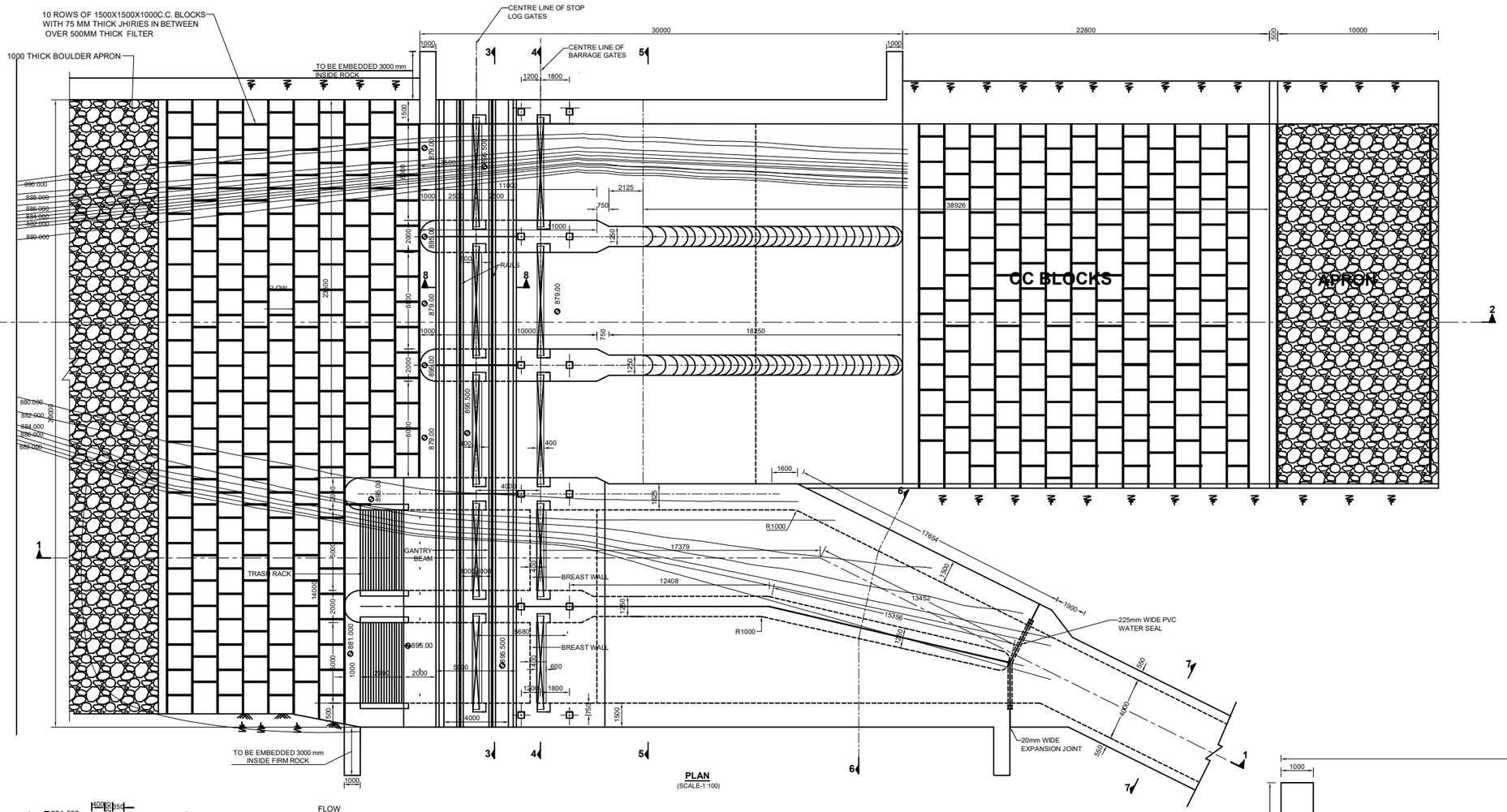
Shri Shiv Kumar Singh

M/s Prime Consulting Group Gurugram

Shri Manoj Patne

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS ARE IN METRES.



PLAN
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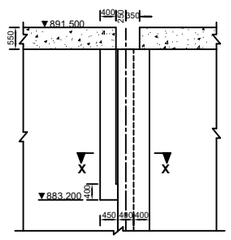
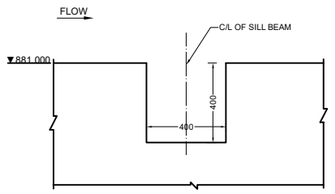
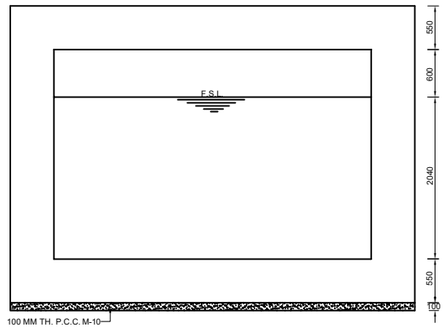


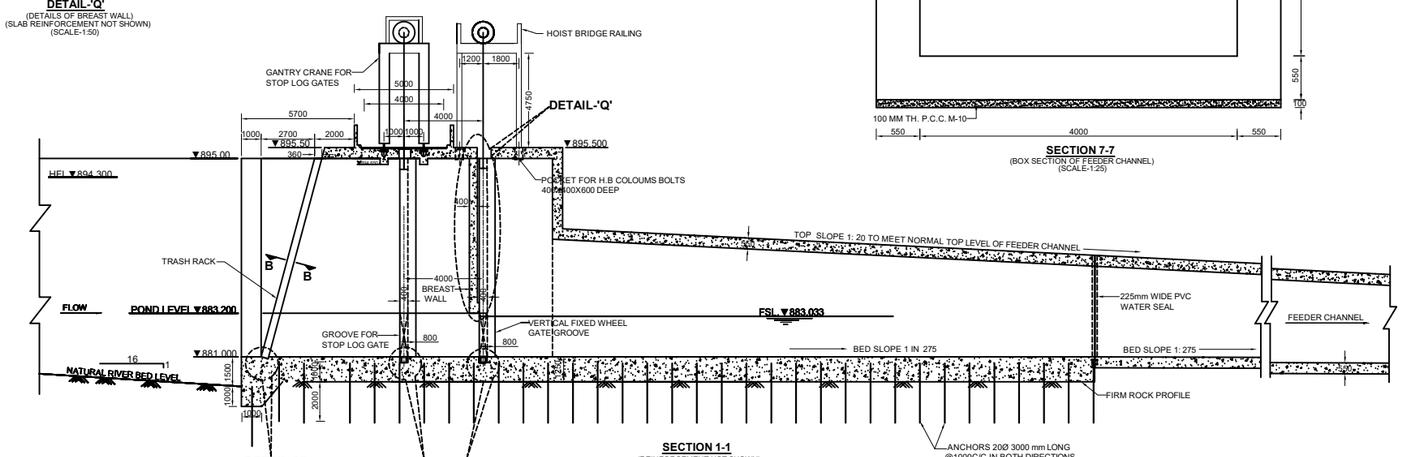
DETAIL-'Q'
(DETAILS OF BREAST WALL)
(SLAB REINFORCEMENT NOT SHOWN)
(SCALE-1:50)



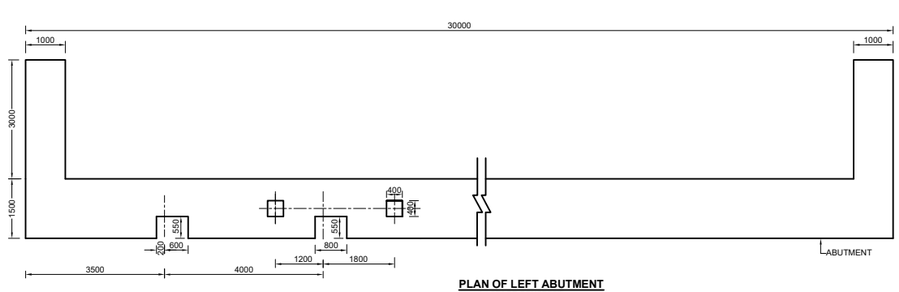
DETAIL-'S'
(Ist STAGE CONCRETE)
(SCALE-1:10)



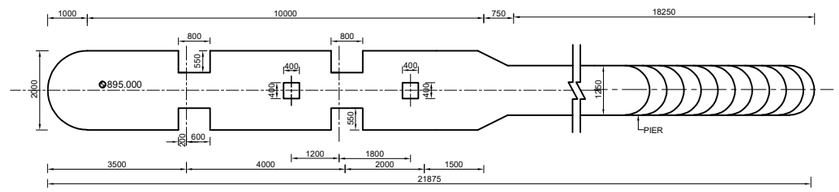
SECTION 7-7
(BOX SECTION OF FEEDER CHANNEL)
(SCALE-1:25)



SECTION 1-1
(REINFORCEMENT NOT SHOWN)
(SCALE-1:100)



PLAN OF LEFT ABUTMENT
(Ist STAGE CONCRETE)
(SCALE-1:50)



PLAN OF PIER
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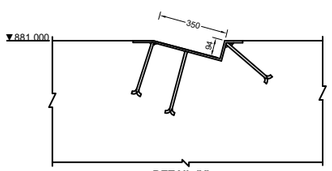

DETAIL-'Y'
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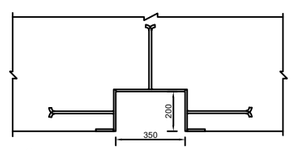


SECTION B-B
(SECTIONAL PLAN THROUGH TRASHRACK)
(SCALE-1:10)

(SHEET 1 OF 2)

PK HOSPITALITY SERVICES. LTD. JV

Consultant :

PRIME CONSULTING GROUP,FARIDABAD

HALAPANI SHEP HYDRO ELECTIC PROJECT (4x4 MW)

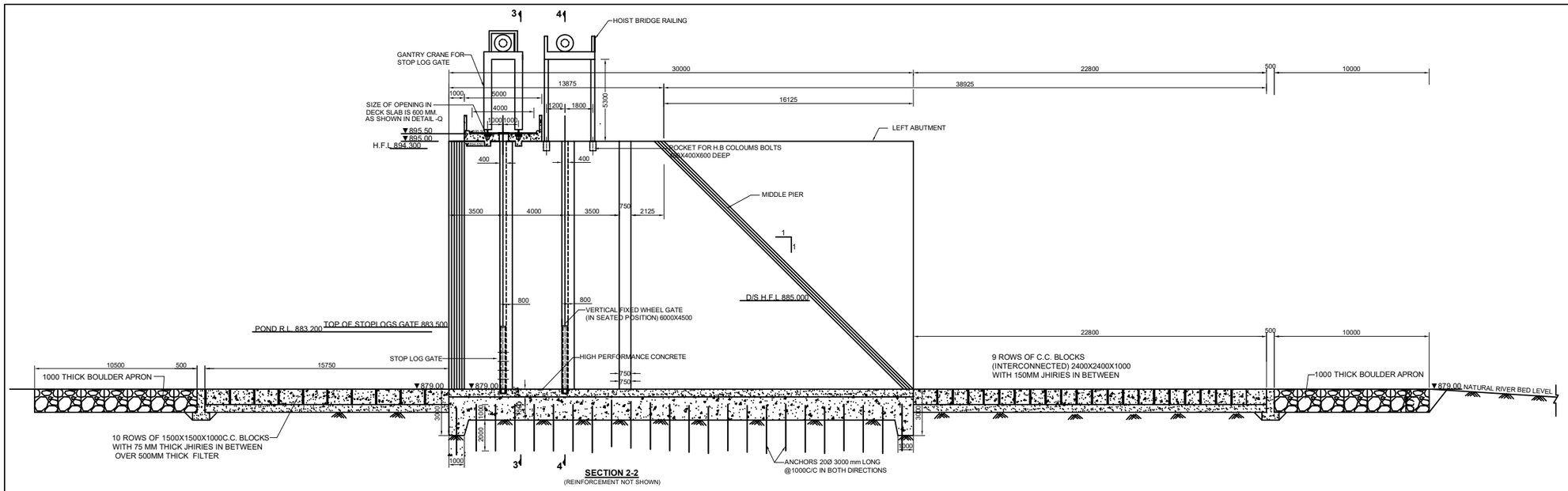
DIVERSION BARRAGE

DRAWN BY:	DSGN BY:	SUB.
		INSP.
		APPD.

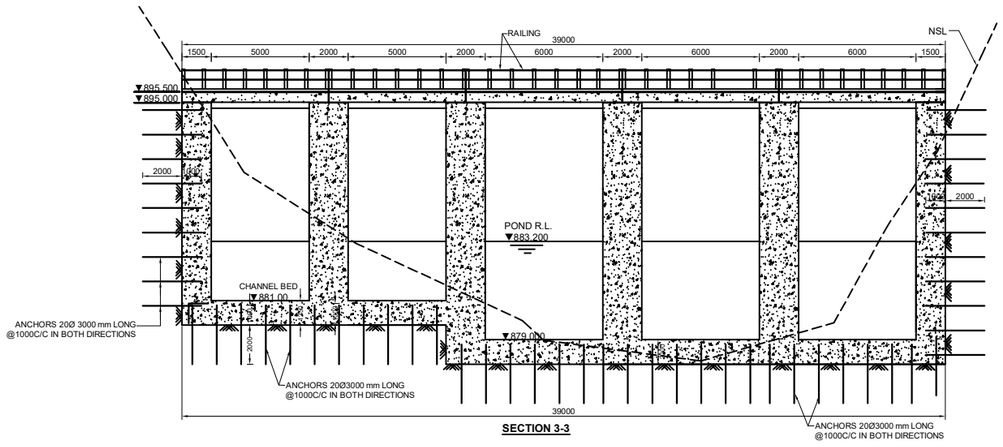
DRG. NO. PKHS/HAL/BRG/01 | FARIDABAD, FEB. 2021

NOTES:-

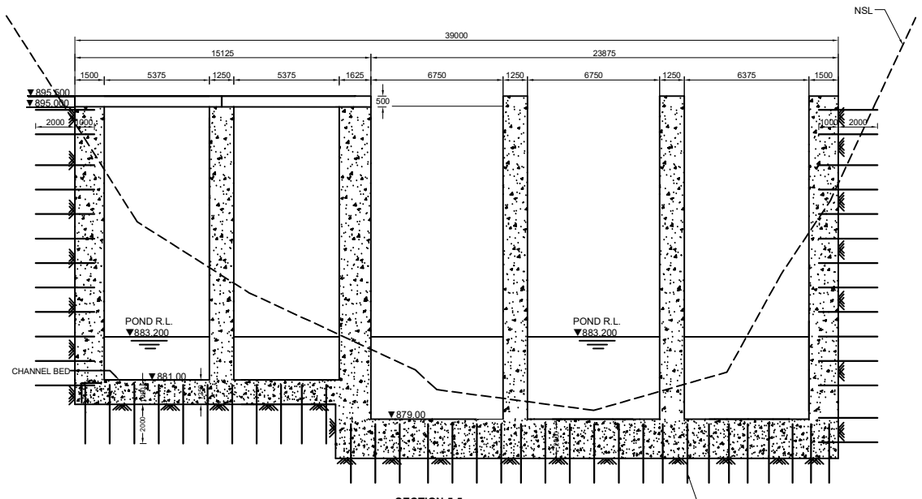
1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS.
2. THE RIVER CROSS SECTION ADOPTED AT BARRAGE IS BEFORE THE CONSTRUCTION OF FEEDER INTAKE AND BARRAGE.



SECTION 2-2
(REINFORCEMENT NOT SHOWN)

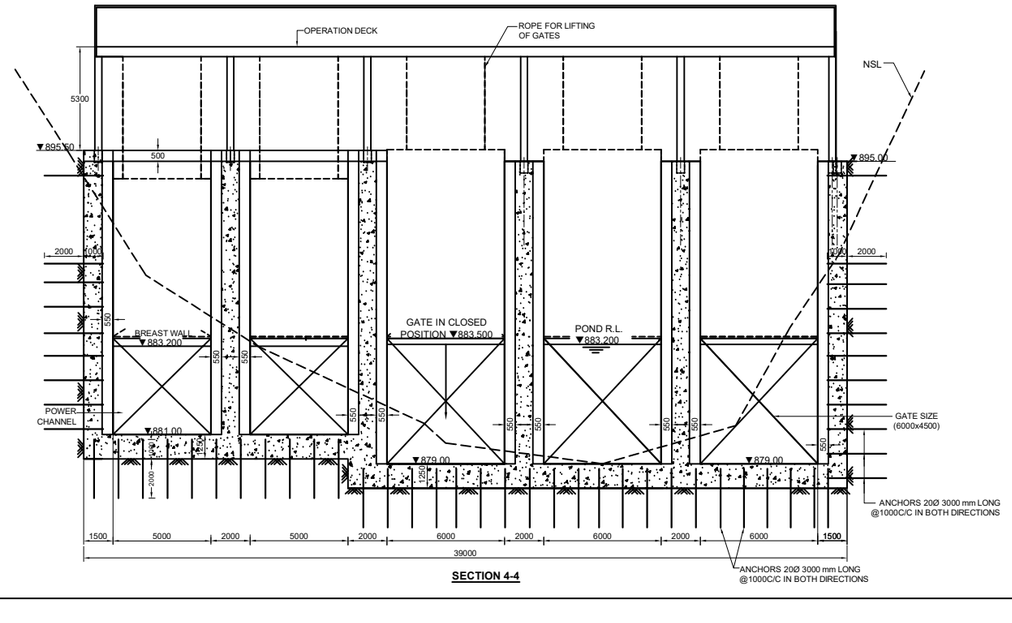


SECTION 3-3

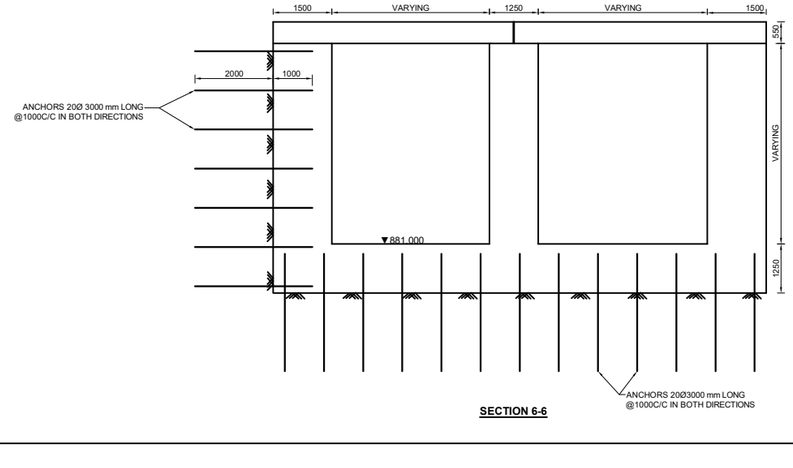


SECTION 5-5

SECTION X-X
(PIER & ABUTMENT REINFORCEMENT NOT SHOWN)
(SCALE-1:50)



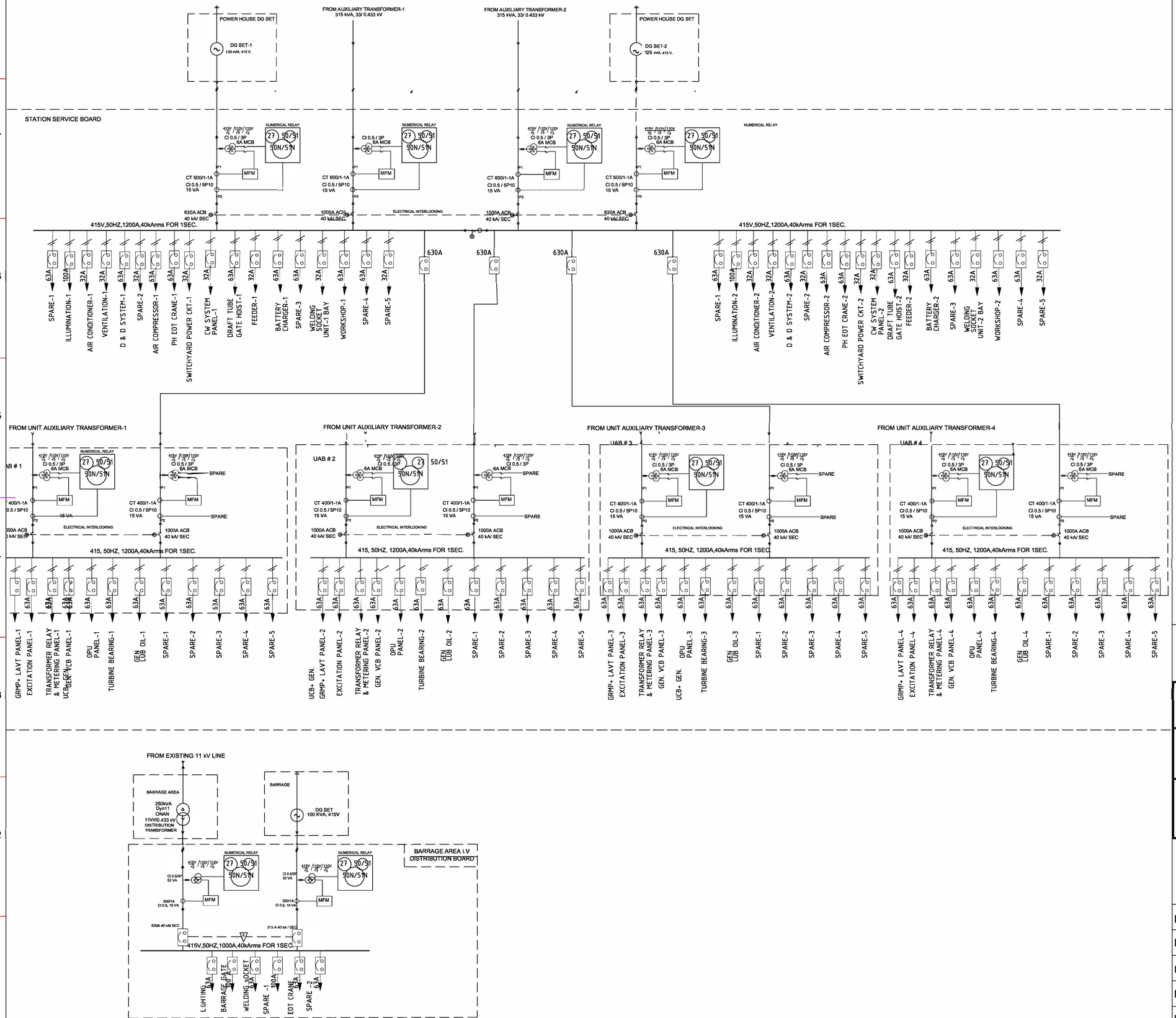
SECTION 4-4



SECTION 6-6

(SHEET 2 OF 2)

PK HOSPITALITY SERVICES. LTD. JV	
Consultant : PRIME CONSULTING GROUP, FARIDABAD	
HALAPANI SHEP HYDRO ELECTIC PROJECT (4x4 MW)	
DIVERSION BARRAGE	
DRAWN BY: DSGN BY: SUB. INSP. APPD.	
DRG. NO. PKHS/HAL/BRG/02	FARIDABAD, FEB. 2021



NOTE

1. RATINGS OF EQUIPMENTS MAY CHANGE DURING DETAIL ENGG,
2. OTHER PARAMETERS SHALL BE AS PER DPR.

LEGEND

	WITHDRAWABLE AIR CIRCUIT BREAKER WITH INBUILT PROTECTION		MCCB
	TRANSFORMER WITH 2 WINDINGS		POTENTIAL TRANSFORMER
	CURRENT TRANSFORMER	V	VOLTMETER
	CABLE	A	AMPERE METER
	EARTH	Wh	ENERGY METER
E	ELECTRICAL INTERLOCK	MFM	MULTIFUNCTION METER- A,V, kW, kVA, kWH, F

CLIENT :
P.K HOSPILITY SERVICES PVT. LTD. JV

PROJECT:
HILAIPANI HYDROELECTRIC PROJECT

CONSULTANTS:
PRIME CONSULTING GROUP, FARIDABAD

DRAWING TITLE
SINGLE LINE DIAGRAM LT SYSTEM

DRAWN : -	REVIEWED : -		
DESIGNED : -	INSPECTED : -		
CHECKED : -	APPROVED : -		
DRG.NO. : HALAI-SLD-002	SCALE. : -	REV.NO. :	R1
DATE : JAN 2021	ORIGINAL PRINT SIZE:	A1	

UCB+ GEN. VCB+ GRMP+ LAVT PANEL

40	FIELD FAILURE RELAY
27	UNDER VOLTAGE RELAY
59	OVER VOLTAGE RELAY
32	REVERSE POWER RELAY
50/51	OVER CURENT RELAY
81 O/U	OVER/ UNDER FREQUENCY RELAY
46	NEGATIVE PHASE SEQUENCE RELAY
86	MASTER TRIP RELAY
95	TRIP CIRCUIT SUPERVISION RELAY
50BI	BREAKER FAILURE RELAY
24	OVER EXCITATION RELAY
51V	VOLTAGE RESTRAINT O/C. RELAY
87G	DIFF PROTECTION FOR GENERATOR
49S	GENERATOR THERMAL OVERLOAD
60	FUSE FAILURE SUPREVISION
38	GENERATOR BEARING TEMPERATURE
64S	STATOR EARTH FAULT PROTECTION
12	OVER SPEED DEVICE PROTECTION
ANN	ANNUNCIATOR WINDOW
TS	TEMP. SCANNER
GVPI	GUIDE VANE POSITION
SPEED	GENERATOR SPEED IN RPM
NIS	NIS CLOSE INDICATION

EXCITATION PROTECTION

76	DC OVER CURRENT PROTECTION
64R	ROTOR EARTH FAULT
50/51	OVER CURRENT
49	TRANSFORMER THERMAL OVERLOAD
59	FIELD OVER VOLTAGE

UAT PROTECTION

50N/51N	OVER CURENT PROTECTION
49	THERMAL OVERLOAD PROTECTION
27	UNDER VOLTAGE REALY
26	WINDING TEMP. HIGH

TR. RELAY & METERING PANEL

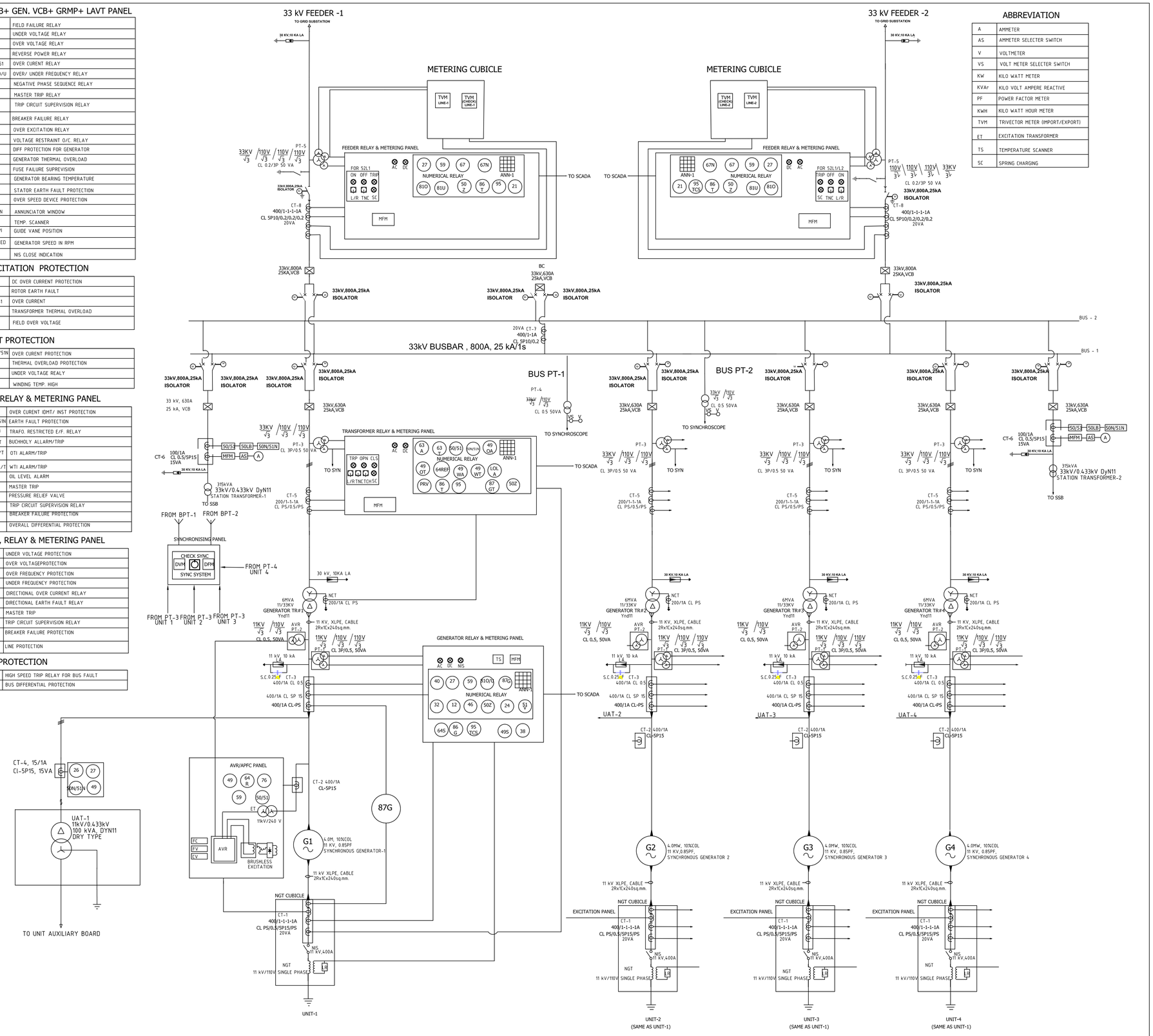
51/50	OVER CURENT IDMT/ INST PROTECTION
50N/51N	EARTH FAULT PROTECTION
64REF	TRAFO. RESTRICTED E/F. RELAY
63A/T	BUCHHOLY ALLARM/TRIP
49A/T	OTI ALARM/TRIP
49WA/T	WTI ALARM/TRIP
LOLA	OIL LEVEL ALARM
86T	MASTER TRIP
PRV	PRESSURE RELIEF VALVE
95	TRIP CIRCUIT SUPERVISION RELAY
50Z	BREAKER FAILURE PROTECTION
87GT	OVERALL DIFFERENTIAL PROTECTION

LINE, RELAY & METERING PANEL

27	UNDER VOLTAGE PROTECTION
59	OVER VOLTAGEPROTECTION
81 O	OVER FREQUENCY PROTECTION
81 U	UNDER FREQUENCY PROTECTION
67	DIRECTIONAL OVER CURRENT RELAY
67N	DIRECTIONAL EARTH FAULT RELAY
86L	MASTER TRIP
95	TRIP CIRCUIT SUPERVISION RELAY
50Z	BREAKER FAILURE PROTECTION
21	LINE PROTECTION

BUS PROTECTION

86 B	HIGH SPEED TRIP RELAY FOR BUS FAULT
87 B	BUS DIFFERENTIAL PROTECTION



ABBREVIATION

A	AMMETER
AS	AMMETER SELECTER SWITCH
V	VOLTMETER
VS	VOLT METER SELECTER SWITCH
KW	KILO WATT METER
KVAr	KILO VOLT AMPERE REACTIVE
PF	POWER FACTOR METER
KWH	KILO WATT HOUR METER
TVM	TRIVECTOR METER (IMPORT/EXPORT)
ET	EXCITATION TRANSFORMER
TS	TEMPERATURE SCANNER
SC	SPRING CHARGING

NOTE

1. RATINGS OF EQUIPMENTS MAY CHANGE DURING DETAIL ENGG,
2. OTHER PARAMETERS SHALL BE AS PER DPR.
3. SYNCHRONIZATION SHALL BE AT 33kV BUSBAR.
4. ALL THREE GENERATOR CIRCUITS AND BOTH LINES SHALL BE SIMILAR HAVING INTERCHANGEABLE EQUIPMENTS.

LEGEND

G	GENERATOR
	TRANSFORMER
MFM	MULTI FUNCTION METER A, V, F, PF, kW, kVA, kVAR, kWh
	ISOLATOR
	LIGHTNING ARRESTOR
	VACUUM CIRCUIT BREAKER
	CT-OUTDOOR
	PT-OUTDOOR
	CT-INDOOR
	PT-INDOOR
	3 PHASE CONDUCTOR
	CABLE

CLIENT :
P.K HOSPITALITY SERVICES PVT. LTD. JV

PROJECT:
HALAIPANI SHEP HYDROELECTRIC PROJECT

CONSULTANTS:
PRIME CONSULTING GROUP, FARIDABAD

DRAWING TITLE
SINGLE LINE DIAGRAM

DRAWN : -	REVIEWED : -		
DESIGNED : -	INSPECTED : -		
CHECKED : -	APPROVED : -		
DRG.NO. : HALAI-SLD-001	SCALE. : -	REV.NO. :	R1
DATE : DEC 2020	ORIGINAL PRINT SIZE:	A1	