भारत सरकार
Government of India

विद्युत मंत्रालय
Ministry of Power

केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority

जल विद्युत गृहों के निष्पादन का पुनर्विलोकन-2021-22

REVIEW OF PERFORMANCE OF HYDRO POWER STATIONS 2021-22

नई दिल्ली
NEW DELHI
सितम्बर, 2023
SEPTEMBER, 2023

विद्युत अधिनियम, 2003 की धारा 73 (आई) व (जे) के तहत के0वि0प्रा0 के सांविधिक दायित्व का निर्वहन करते हुए प्रकाशित

(PUBLISHED IN FULFILMENT OF CEA'S STATUTORY OBLIGATION UNDER SECTION 73 (i) & (j) OF THE ELECTRICITY ACT, 2003)

FUNCTIONS AND DUTIES OF CEA AS PER SECTION-73 OF ELECTRICITY ACT-2003

The Authority shall perform such functions and duties as the Central Government may prescribe or direct, and in particular to –

a) Advise the Central Government on the matters relating to the national electricity policy, formulate short-term and perspective plans for development of the electricity system and coordinate the activities of the planning agencies for the optimal utilization of resources to sub serve the interests of the national economy and to provide reliable and affordable electricity to all consumers;

b) Specify the technical standards for construction of electrical plants, electric lines and connectivity to the grid;

c) Specify the safety requirements for construction, operation and maintenance of electrical plants and electric lines;

d) Specify the Grid Standards for operation and maintenance of transmission lines;

e) Specify the conditions for installation of meters for transmission and supply of electricity;

f) Promote and assist in the timely completion of schemes and projects for improving and augmenting the electricity system;

g) Promote measures for advancing the skills of persons engaged in electricity industry;

h) Advise the Central Government on any matter on which its advice is sought or make recommendation to that Government on any matter if, in the opinion of the Authority, the recommendation would help in improving the generation, transmission, trading, distribution and utilization of electricity;

i) Collect and record the data concerning the generation, transmission, trading, distribution and utilization of electricity and carry out studies relating to cost, efficiency, competitiveness and such like matters;

j) Make public from time to time the information secured under this Act, and provide for the publication of reports and investigations;

k) Promote research in matters affecting the generation, transmission, distribution and trading of electricity;

l) Carry out, or cause to be carried out, any investigation for the purpose of generating or transmitting or distributing electricity;

m) Advise any State Government, licensees or the generating companies on such matters which shall enable them to operate and maintain the electricity system under their ownership or control in an improved manner and where necessary, in coordination with any other Government, licensee or the generating company owning or having the control of another electricity system;

n) Advise the Appropriate Government and the Appropriate Commission on all technical matters relating to generation, transmission and distribution of electricity; and

o) Discharge such other functions as may be provided under this Act.

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REVIEW OF PERFORMANCE OF HYDRO POWER STATIONS 2021-22

जल परियोजना आयोजन तथा अन्वेषण प्रभाग

HYDRO PROJECT PLANNING & INVESTIGATION DIVISION

नई दिल्ली

NEW DELHI

सितम्बर, 2023

September, 2023

(विद्युत अधिनियम, 2003 की धारा 73 (आई) व (जे) के तहत के0वि0प्रा0 के सांविधिक दायित्व का निर्वहन करते हुए प्रकाशित)

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SUMMARY

SUMMARY

1.0 General

1.1 This review covers the performance of Hydro-Electric (HE) Stations having installed capacity of more than 25 MW. As on 31st March, 2022 there were 727 HE generating units installed in 210 Hydro-Electric Stations with an aggregate installed capacity of 46722.50 MW in operation. Performance of 44 important Reservoir based schemes has also been discussed separately in the report.

1.2 Region-wise summary of the existing HE Stations in operation with installed capacity above 25 MW as on 31.3.2022 in the country vis-à-vis that on 31.3.2021 is given below in **Table S-1.**

TABLE S-1

REGION-WISE SUMMARY OF HYDRO-ELECTRIC STATIONS (2021-22 VIS-A-VIS 2020-21)

Region	No of Stations as on		No of Units as on		Capacity (MW) as on	
	31.03.22	**31.03.21**	**31.03.22**	**31.03.21**	**31.03.22**	**31.03.21**
Northern	75	73	256	251	19576.25	19233.27
Western	28	28	101	101	7392	7392
Southern	70	70	246	247	11739.5	11694.5
Eastern	23	24	86	85	5987.75	5862.45
N-Eastern	14	14	38	36	2027.0	2027
All India	**210**	**209**	**727**	**720**	**46722.50**	**46209.22**

1.3 The report contains outage data of 210 H.E. Stations (above 25 MW) covering 727 units and having an aggregate installed capacity of 46722.50 MW which was made available by various utilities for the purpose of this Review.

1.4 The performance review also analyses year-wise generation, planned maintenance, forced outages and operating availability for the last 10 years (viz 2011-12 to 2021-22).

1.5 This review covers information in respect of renovation & modernization, uprating and life extension of HE stations in the country for the year 2021-22, achievements during the year 2021-22and programme for renovation, modernization, life extension and uprating of HE Stations for the year 2021-22.

1.6 The report comprises of ten chapters as under:

Chapter No.	Particulars
1	Hydro-Electric Potential and Development
2	Generation Performance
3	Major Reservoir Based H.E. Schemes
4	Planned Maintenance of H.E. Units
5	Forced Outage of H.E. Units
6	Operating Availability of H.E. Units
7	Miscellaneous Outages of H.E. Units
8	Generation Programme for the year 2019-20
9	Renovation & Modernisation of Hydro-Electric Power Projects
10	Definitions and Abbreviations

2.0 Generation Performance

The generation from the hydro electric power stations in the country during 2021-22 was 151627.33 MU (excluding import from Bhutan), which was about 0.86 % higher than the generation during 2020-21 and about 1.39% higher than the generation targets for 2021-22.

2.1 Utility-wise/ Sector-wise Performance of H.E. Stations

The utility-wise/ sector-wise target of energy generation vis-à-vis actual generation and surplus /shortfall in respect of Hydro Electric stations are given below in **Table S-2.**

TABLE S-2

UTILITY-WISE PERFORMANCE OF HYDRO ELECTRIC STATIONS
(2021-22 VIS-A-VIS 2020-21)

Utilities	Installed Capacity (MW) (As on 31.03.2022)	Energy Generation					
		Target (MU)		Actual (MU)		Surplus (+)/ Shortfall (-) in %	
		2021-22	2020-21	2021-22	2020-21	2021-22	2020-21
CENTRAL SECTOR							
BBMB	2938.3	9650	9600	9794.82	11478	1.50	19.56
NHPC LTD	5451.2	26000	24542	24382.6	24084.69	-6.22	-1.86
SJVNLTD	1912.02	9111	8678	9048.61	9094.35	-0.68	4.80
NTPC LTD	800	3100	3482	3120.14	3221.41	0.65	-7.48
THDC LTD	1400	4160	4160	4288.75	4261.72	3.09	2.45
NHDC LTD	1520	3900	2700	2645.41	4236.17	-32.17	56.90
DVC	143.2	215	206	466.89	365.47	117.16	77.41
NEEPCO LTD	1500	4908	4472	4674.39	3881.89	-4.76	-13.20
SUB TOTAL	**15664.72**	**61044**	**57840**	**58421.61**	**60623.7**	**-4.30**	**4.81**

Utilities	Installed Capacity (MW) (As on 31.03.2022)	Energy Generation					
		Target (MU)		Actual (MU)		Surplus (+)/ Shortfall (-) in %	
		2021-22	2020-21	2021-22	2020-21	2021-22	2020-21
PRIVATE SECTOR							
MPCL	86.00	344	157	314.96	334.88	-8.44	113.30
EPPL	100.00	367	367	345.66	370.47	-5.81	0.95
ADHPL	192.00	676	692	637.44	640.53	-5.70	-7.44
GBHPPL	70.00	270	260	251.37	275.95	-6.90	6.13
JSW ENERGY	1345.00	5431	5407	5563.8	5672.61	2.45	4.91
IAEPL	36.00	158	273	146.54	159.35	-7.25	-41.63
AHPC LTD	330.00	1310	1310	1421.89	1438	8.54	9.77
JPVL	400.00	1590	1438	1801.24	1778.42	13.29	23.67
DLHP	34.00	36	36	33.94	34.29	-5.72	-4.75
GIPL	110.00	500	500	514.21	488.37	2.84	-2.33
TPCL	447.00	1470	1470	1589.99	1524.7	8.16	3.72
DEPL	96.00	408	408	424.69	399.92	4.09	-1.98
SEPL	97.00	421	421	453.07	369.75	7.62	-12.17
SNEHA KINETIC	96.00	460	460	481.45	458.95	4.66	-0.23
NTPGPL	0.00	0	344	0	0	0	0
HSPPL	100.00	39	0	57.18	0	46.62	0
L&T	99.00	293	145	80.44	0	-72.55	-100.00
GMR	180	273	39	0	0	-100.00	-100.00
MBPC	113.00	256	22	295.43	0	15.40	-100.00
SUB TOTAL	**3931.00**	**14302**	**13749**	**14413.3**	**13946.19**	**0.78**	**1.43**
STATE SECTOR							
JKSPDCL	1110	4887	4915	5116.09	4940.83	4.69	0.53
HPPCL	406	821	805	649.55	437.76	-20.88	-45.62
HPSEBL	372	1603	1602	1768.66	1564.35	10.33	-2.35
BVPC	0	0	272	0	0		-100.00
RRVUNL	411	370	340	481.84	469.63	30.23	38.13
PSPCL	1051	3969	3805	3007.86	3951	-24.22	3.84
UPJVNL	501.6	1519	1115	1402.68	1572.35	-7.66	41.02
UJVNL	1252.15	4612	4410	4987.18	4487.97	8.13	1.77
SSNNL	1450	2832	3200	1748.01	3245.24	-38.28	1.41
GSECL	540	889	754	873.5	988.12	-1.74	31.05
MAHAGENCO	2406	4109	3755	4078.97	3574.57	-0.73	-4.81
MPPGCL	875	2526	2092	2345.79	2656.06	-7.13	26.96
CSPGCL	120	280	250	404.13	419.19	44.33	67.68

Utilities	Installed Capacity (MW) (As on 31.03.2022)	Energy Generation					
		Target (MU)		Actual (MU)		Surplus (+)/ Shortfall (-) in %	
		2021-22	2020-21	2021-22	2020-21	2021-22	2020-21
APGENCO	1796.75	3636	3174	4037.32	4129.94	11.04	30.12
TSGENCO	2405.6	4018	3211	5626.63	3645.38	40.04	13.53
KPCL	3617.2	12409	11468	13731.48	12403.59	10.66	8.16
KSEBL	1856.5	6505	5900	9317.44	6628.39	43.24	12.35
TANGEDCO	2178.2	4483	4040	5212.07	5212.71	16.26	29.03
JUUNL	130	110	110	302.49	50	174.99	-54.55
OHPC	2039.80	5959	5372	4512.12	6193.91	-24.28	15.30
TUL	1200	5652	5300	6315.53	6043.98	11.74	14.04
WBSEDCL	986	1578	1578	1630.14	1759.64	3.30	11.51
APGCL	100	380	380	401.12	203.03	5.56	-46.57
MePGCL	322	1051	920	841.82	1151.99	-19.90	25.22
SUB TOTAL	**27126.80**	**74198**	**68768**	**78792.42**	**75729.63**	**6.19**	**10.12**
TOTAL ALL INDIA	**46722.52**	**149544**	**140357**	**151627.33**	**150299.5**	**1.39**	**7.08**

During the year 2021-22, overall hydro generation was more than the target in respect of BBMB, SJVNL, DVC, THDC, & NHDC LTD in Central Sector and MPCL, EPPL, GBHPPL, JSW ENERGY, IAEPL, AHPCL, JPVL, TPCL in Private Sector. As regards generation by State Electricity Boards/Corporations / Departments, hydro generation was more than the target in respect of JKSPDCL, RRVUNL, PSPCL, UPJVNL, UJVNL, SSNNL, MPPGCL, GSECL, CSPGCL, APGENCO, TSGENCO, KPCL,TANGEDCO, OHPC, TUL, WBSEDCL and MePGCL.

2.2 Sector-wise and Region Wise Performance of H.E. Stations

Sector-wise and Region-wise generation performance of H.E. Stations during 2021-22 is given in **Table S-3 & S-4**. It is seen that there was excess generation as compared to target in State Sector & Private Sector. The overall generation of Central Sector hydro stations remained below the targets.

TABLE S-3

SECTOR-WISE PERFORMANCE OF HYDRO ELECTRIC STATIONS (2021-22 VIS-A-VIS 2020-21)

Sector	Installed Capacity (MW) (As on 31.03.2022)	Energy Generation (MU)					
		Target		Actual		Surplus (+)/ Deficit(-)in %	
		2021-22	2020-21	2021-22	2020-21	2021-22	2020-21
Central	15664.72	61044.00	57840.00	58421.61	60623.70	-4.30	4.81
State	27126.80	74198.00	68768.00	78792.42	75729.63	6.19	10.12
Private	3931	14302	13749.00	14413.3	13946.19	0.78	1.43
Total	**46722.52**	**149544**	**140357.00**	**151627.33**	**150299.52**	**1.39**	**7.08**

TABLE S-4

REGION-WISE PERFORMANCE OF HYDRO ELECTRIC STATIONS (2021-22 VIS-A-VIS 2020-21)

Sector	Installed Capacity (MW) (As on 31.03.2022)	Energy Generation (MU)					
		Target		Actual		Surplus (+)/ Deficit(-)in %	
		2021-22	2020-21	2021-22	2020-21	2021-22	2020-21
Northern	19576.25	75684	73243	73866.02	75233.86	-2.40	2.72
Western	7392	16042	14257	13719.74	16678.34	-14.48	16.98
Southern	11739.5	30439	27293	37206.43	31353.95	22.23	14.88
Eastern	5987.75	20540	19192	20462.33	21174.84	-0.38	10.33
North Eastern	2027.0	6839	6372	6372.81	5858.53	-6.82	-8.06
Total	**46722.50**	**149544.00**	**140357**	**151627.33**	**150299.52**	**1.39**	**7.08**

3.0 Outage Analysis

For outage data analysis during 2021-22, outage data of 210 H.E. Stations (above 25 MW capacity) covering 727 units and having an aggregate installed capacity of 46722.50 MW made available by various utilities have been considered for the purpose of this Review. Region-wise details of these 210 hydro power stations are given below in **Table S-5**.

TABLE S-5

REGION-WISE SUMMARY OF HE STATIONS ANALYSED
(2021-22 VIS-A-VIS 2020-21)

Region	No. of Stations		No. of Units		Capacity(MW) as on	
	2021-22	2020-21	2021-22	2020-21	2021-22	2020-21
Northern	75	73	256	251	19576.25	19233.27
Western	28	28	101	101	7392	7392
Southern	70	70	246	247	11739.5	11694.5
Eastern	23	24	86	85	5987.75	5862.45
North Eastern	14	14	38	36	2027.0	2027
All India	**210**	**209**	**727**	**720**	**46722.50**	**46209.22**

3.1 Planned Maintenance

The number of H.E. Stations falling under various ranges of non-availability due to planned maintenance during the year 2021-22 vis-à-vis 2020-21 is summarized below in **Table S-6.**

TABLE S-6

NON-AVAILABILITY OF HE STATIONS DUE TO PLANNED OUTAGES
(2021-22 VIS-A-VIS 2020-21)

% Non-Availability due to planned maintenance	2021-22				2020-21			
	Stations		Capacity		Stations		Capacity	
	No.	% of Total	MW	% of Total	No.	% of Total	MW	% of Total
≤ 5	165	78.57	37515.57	80.29	158	76.33	34696.37	75.09
>5 to 10	23	10.95	3814.95	8.17	27	12.08	6465.20	13.99
>10 to 15	12	5.71	3594.20	7.69	9	4.35	1530.15	3.31
>15 to 20	4	1.90	1087.80	2.33	4	1.93	1550.00	3.35
>20 to 25	1	0.48	30.00	0.06	1	0.48	304.00	0.66
>25 to 30	1	0.48	50.00	0.11	5	2.42	938.50	2.03
above 30	4	1.90	630.00	1.35	5	2.42	725.00	1.57
Total	**210**	**100**	**46722.52**	**100**	**209**	**100**	**46209.22**	**100**

It could be seen from above that 165 nos. (78.57% of total) hydro-electric stations had non-availability factor less than or equal to 5% due to planned maintenance during 2021-22 as compared to 158 nos. (76.33% of total) during 2020-21.

Non-availability due to planned maintenance was more than 30% at 4 nos. (1.90% of total) H.E. Stations during 2021-22 and which is similar to 2019-20. The details of these stations for 2021-22 is given below in **Table S-7.**

TABLE S-7

H.E. STATIONS HAVING HIGH PLANNED MAINTENANCE FOR THE PERIOD: (2021-22)

Sl. No	Name of Station/ Utility	Capacity (MW)	N.A. due to P.M.*(%)	Remarks
1	BANSAGAR TONS-I HPS / MPPGCL	315.0	33.333	CAPITAL/3 YEARLY MTCE.
2	NARIAMANGLAM HPS / KSEB	52.6500	33.333	ANNUAL MAINTENANCE
3	PYKARA ULTMATE HPS / TANGEDCO	150.0	33.333	ANNUAL MAINTENANCE
4	SEWA-II HPS / NHPC	120.0	89.492	SURGE SHAFT

*** N.A.** -Non-Availability, **P.M. -** Planned Maintenance

43% of stations had operational availability lower than 95% on account of planned maintenance. These utilities, therefore, need to improve their O&M practices to bring down their total outages.

It is observed from above that stations may be having high planned maintenance outages on account of ageing, O&M management issues, etc. Further, those stations which are having continuously high planned maintenance/forced outages over past few years may be requiring major repair & maintenance works or Renovation & Modernisation (R&M) works for improving the availability, reliability & security of the plant besides providing life extension where the assets have outlived their useful life.

The duration of various types of periodic planned maintenance varied considerably from station to station. Details of average time taken for various types of maintenance are given in **Table S-8.**

TABLE S-8

AVERAGE DURATION OF VARIOUS TYPES OF PLANNED MAINTENANCE FOR THE PERIOD: (2021-22)

Sl. No	Type of Planned maintenance	Average duration at any unit (hrs.)
1	ANNUAL MAINTENANCE	649.76
2	AUXILIARY SYSTEM	4.53
3	CAPITAL/3 YEARLY MTCE.	795.93
4	GENERATOR	89.13
5	INSPECTION /MTCE	16.96
6	MONTHLY MAINTENANCE	37.18
7	OTHER EQUIPMENT	146.46
8	RENOVATION/MODERNISATION	2821.34
9	ROUTINE MAINTENANCE	3.5
10	TURBINE	15.41
11	MISCELLANEOUS	732.21

It has been observed that there were wide variations in the time taken at different hydro units for the same type of periodic maintenance. The reasons for this can be attributed to following factors.

- The nature and the extent of work involved may vary from unit to unit.
- Availability of spare parts could be a constraint at some units.
- The working of the agency entrusted with the maintenance work could be different.
- Administrative and procedural difficulties may be faced at some of the stations.

However, the analysis of outage data indicates there is enough scope of considerable reduction in outage duration of units by adopting best management practices including planning and contract management.

Summary of planned maintenance carried out on various equipments like generators, turbine and other equipments during 2021-22 vis-à-vis 2020-21 is given below in **Table S-9.**

TABLE S–9

DURATION OF PLANNED MAINTENANCE FOR GENERATOR, TURBINE & OTHER EQUIPMENTS (2021-22 vis-à-vis 2020-21)

S.No.	Equipments	Duration			
		Maximum Hours for any unit		Average Hours	
		2021-22	2020-21	2021-22	2020-21
1	Generator	751.27	5271.93	89.13	819.55
2	Turbine	75.82	4313.53	15.41	426.28
3	Other Equipment	684.42	2167.62	146.46	552.64
4	Civil Structure	9.70	0	9.70	0

It could be seen that the average hours utilized for carrying out various repairs decreased for generator and turbine during 2021-22 as compared to 2020-21.

3.2 Forced Outages

The summary of forced outages caused due to break-down of generator, turbine and other equipment during 2021-22 vis-à-vis 2020-21 is given below in **Table S-10.**

TABLE S–10

FORCED OUTAGES DUE TO GENERATOR, TURBINE & OTHER EQUIPMENT FAULTS (2021-22 vis-à-vis 2020-21)

Sl. No.	Equipment	Forced Outage (Hours)		% of total Forced Outage	
		2021-22	2020-21	2021-22	Increase/ Decrease vis-à-vis 2020-21
1	Generator	44588.94	29383.71	28.58	-51.75
2	Turbine	64968.00	77437.71	41.64	16.10
3	Civil Structure	42932.26	45016.77	27.51	4.63
4	Other Equipment	3551.99	21805.83	2.28	83.71
	Total	**156041.19**	**173644.02**	**100.00**	**10.14**

It is observed that forced outages in 2021-22 vis-à-vis 2020-21 have decreased on account of turbine and other equipment whereas the same have decreased on account of generator and civil structures.

3.3 Operating Availability

The number of H.E. Stations falling under various ranges of operating availability during the year 2021-22 is summarized below in **Table S-11.**

TABLE S-11

OPERATING AVAILABILITY OF H.E. STATIONS
PERIOD: 2021-22

OPERATING AVAILABILITY (%)	NO. OF STATIONS	% OF TOTAL STATIONS	INSTALLED CAPACITY (MW)	% OF TOTAL INSTALLED CAPACITY
≥95%	149	70.95	33943.37	72.65
>90 to 95	23	10.95	5044.20	10.80
>85 to 90	15	7.14	3595.95	7.70
>80 to 85	6	2.86	1305.00	2.79
< 80	17	8.10	2834.00	6.07
Total	**210**	**100.00**	**46722.52**	**100.00**

Operating availability of 23 nos. HE stations (10.96% of total HE Stations) was below 85% (4139 MW) due to planned maintenance (capital overhauling, R&MU works, annual maintenance etc.) carried out for long duration and forced outages (turbine vibration, repair of runner/underwater parts, fire at cable gallery etc.) in these HE Stations.

Region-wise planned maintenance, forced outages and operating availability of H.E. units for 2021-22 is indicated below in **Table S-12.**

TABLE S-12

AVAILABILITY OF UNITS - REGION-WISE
PERIOD: 2021-22

SL. No.	REGION	NO.OF UNITS	INSTALLED CAPACITY (MW)	PLANNED MAINTENANCE (%)	FORCED OUTAGE (%)	OPERATING AVAILABILITY
1	Northern	256	19576.25	4.24	1.83	93.92
2	Western	101	7392	2.59	3.93	93.47
3	Southern	246	11739.5	3.04	2.31	94.64
4	Eastern	86	5987.75	4.16	0.40	95.43
5	North Eastern	38	2027.0	1.46	16.27	82.28
	All India	**727**	**46722.50**	**3.45**	**2.88**	**93.67**

On analyzing various types of planned shutdowns, it may be concluded that:

Generating units installed in Northern Region accounted for maximum non-availability due to planned maintenance (4.24%) whereas generating units installed in North Eastern Region accounted for the least non-availability due to planned maintenance (1.46%) as indicated in **Table S-12** above**.**

3.4 General Overview

General overview indicating generation, planned maintenance (PM), forced outage (FO) and operating availability (OP.AV.) of H.E. Stations during the past 10 years is given below:

OVERVIEW

YEAR	INSTALLED CAPACITY	GENERATION			UNITS ANALYSED		PM	FO	OP.AV
	(MW)	TARGET (MU)	ACTUAL (MU)	VARIA-TION (%)	Nos.	CAP (MW)	%	%	%
2021-22	46722.50	149544	151627.33	1.39	727	46722.50	3.45	2.88	93.67
2020-21	46209.22	140357	150299.52	(+)7.08	720	46209.22	4.06	3.27	92.68
2019-20	45699.20	136932	155769	(+)13.75	712	45699.20	4.12	1.91	93.97
2018-19	45399.22	130000	134894	(+)3.76	710	45399.22	5.85	2.87	91.28
2017-18	45293.42	141400	126122	(-)10.20	712	45293.42	5.54	3.17	91.29
2016-17	44478.42	134000	122378	(-)7.67	695	44478.42	6.43	3.33	90.24
2015-16	42783.42	128000	121377	(-)5.17	676	42783.42	7.21	4.86	87.93
2014-15	41262.42	124267	129244	(+)3.98	659	41262.42	7.21	4.30	88.49
2013-14	40531.41	122263	134848	(+)10.29	653	40531.41	5.97	5.55	88.48
2012-13	39491.40	122045	113720	(-)6.82	634	39491.40	7.56	3.27	89.17
2011-12	38990.40	112050	130510	(+)16.47	620	38990.40	7.43	4.48	88.09
2010-11	37567.40	111352	114257	(+)2.61	609	37567.40	7.23	3.94	88.83
2009-10	36863.40	115468	103916	(-)10.00	589	36203.40	6.19	2.90	90.91

CHAPTER-1

HYDRO-ELECTRIC POTENTIAL AND DEVELOPMENT

CHAPTER-1

HYDRO-ELECTRIC POTENTIAL AND DEVELOPMENT

1.1 Hydro-electric Potential

Reassessment studies of Hydro-electric Potential in various river basins of the country were carried out by Central Electricity Authority during the period 1978-87. As per these studies, total Hydro-electric Power potential in the country was assessed as 84044 MW (at 60% load factor) from a total of 845 number of identified H.E. Schemes which when fully developed would result in an installed capacity of about 148701 MW on the basis of probable average load factor. The total energy potential is assessed as 600 billion units per year. The identified potential of H.E. schemes above 25 MW installed capacity works out to be 145320 MW from a total of 592 H.E. schemes.

As on 31.03.2022, H.E. Schemes having total installed capacity of 41778.9 MW (28.75%) excluding pumped storage stations of capacity of 4745.60 MW have already been developed and the schemes under construction account for capacity of 11083.5 MW (7.63%), (excluding PSS of 1500 MW). As such, about 63.62% identified capacity is yet to be harnessed. Summary of the status of Hydro-electric Potential development in the country is indicated in **Tables 1.1, and 1.2** respectively as well as shown in **Exhibits 1.1 and 1.2.**

TABLE 1.1

REGION-WISE/STATE-WISE STATUS OF HYDRO-ELECTRIC CAPACITY
(In terms of Installed Capacity-above 25 MW as on 31.03.2022)

Region/ State	Identified Capacity as per reassessment study (MW)		Capacity Developed		Capacity Under construction		Capacity yet to be developed	
	Total (MW)	Above 25 MW	(MW)	(%)	(MW)	(%)	(MW)	(%)
NORTHERN								
Jammu & Kashmir	14146	13543	3360.0	29.05	2559.5	22.13	5647.5	48.82
Ladhak	2377	2046	89.0	4.35	0.0	0.00	1957.0	95.65
Himachal Pradesh	18820	18540	10065.0	54.49	2190.0	11.86	6215.0	33.65
Punjab	971	971	1096.3	100	206.0	21.22	0.0	0.00
Haryana	64	64	0.0	0	0.0	0.00	0.0	0.00
Rajasthan	496	483	411.0	85.09	0.0	0.00	0.0	0.00
Uttarakhand	18175	17998	3855.4	21.42	1391.0	7.73	12751.7	70.85
Uttar Pradesh	723	664	501.6	75.54	0.0	0.00	162.4	24.46
Sub Total(NR)	**53395**	**52263**	**19378.3**	**37.08**	**6346.5**	**12.14**	**26538.3**	**50.78**
WESTERN								
Madhya Pradesh	2243	1970	2235.0	100	400.00	20.30	0.0	0.00
Chhattisgarh	2242	2202	120.0	5.45	0.00	0.00	2082.0	94.55
Gujarat	619	590	550.0	100	0.00	0.00	0.0	0.00
Maharashtra	3769	3314	2647.0	79.87	0.00	0.00	667.0	20.13

Region/ State	Identified Capacity as per reassessment study (MW)		Capacity Developed		Capacity Under construction		Capacity yet to be developed	
	Total (MW)	Above 25 MW	(MW)	(%)	(MW)	(%)	(MW)	(%)
Goa	55	55	0.0	0.00	0.00	0.00	55.0	100.00
Sub Total (WR)	**8928**	**8131**	**5552.0**	**68.28**	**400.00**	**4.92**	**2179.0**	**26.80**
SOUTHERN								
Andhra Pradesh	2366	2341	1610.0	49.37	960.0	29.44	691.0	21.19
Telangana	2058	2019	800.0	72.79	0.0	0.00	299.0	27.21
Karnataka	6602	6459	3689.2	57.12	0.0	0.00	2769.8	42.88
Kerala	3514	3378	1856.5	54.96	100.0	2.96	1421.5	42.08
Tamil Nadu	1918	1693	1778.2	100	0.0	0.00	0.0	0.00
Sub Total (SR)	**16458**	**15890**	**9733.9**	**61.26**	**1060.0**	**6.67**	**5096.1**	**32.07**
EASTERN								
Jharkhand	753	582	210.0	36.08	0.0	0.00	372.0	63.92
Bihar	70	40	0.0	0.00	0.0	0.00	0.0	0.00
Odisha	2999	2981	2154.6	72.28	0.0	0.00	826.5	27.72
West Bengal	2841	2829	441.2	15.60	120.0	4.24	2267.8	80.16
Sikkim	4286	4248	2282.0	53.72	1037	24.42	929.0	21.87
Sub Total (ER)	**10949**	**10680**	**5087.8**	**47.64**	**1157**	**10.83**	**4435.3**	**41.53**
NORTH EASTERN								
Meghalaya	2394	2298	322.0	14.01	0.0	0.00	1976.0	85.99
Tripura	15	0	0.0	0.00	0.0	0.00	0.0	0.00
Manipur	1784	1761	105.0	5.96	0.0	0.00	1656.0	94.04
Assam	680	65	350.0	53.85	120.0	18.46	180.0	27.69
Nagaland	1574	1452	75.0	5.17	0.0	0.00	1377.0	94.83
Arunachal Pradesh	50328	50064	1115.0	2.23	2000.0	3.99	46949.0	93.78
Mizoram	2196	2131	60.0	2.82	0.0	0.00	2071.0	97.18
Sub Total (NER)	**58971**	**58356**	**2027.0**	**3.47**	**2120.0**	**3.63**	**54209.0**	**92.89**
ALL INDIA	**148701**	**145320**	**41778.9**	**28.75**	**11083.5**	**7.63**	**92457.6**	**63.62**

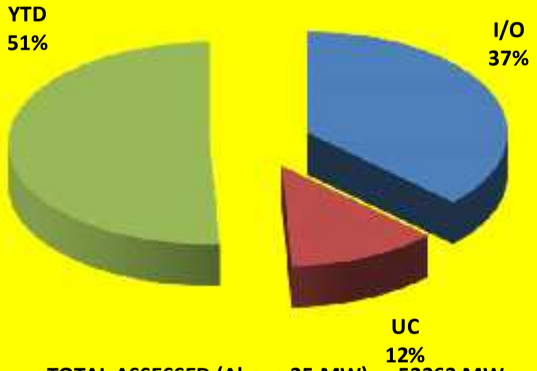
Note:- In addition to above 8 PSS (4745.6 MW) are under operation, 2 PSS (1500 MW) are under active construction, 1 PSS (80 MW) on which construction is held up and 2 PSS (2200 MW) is Concurred by CEA , 17 PSS (16770 MW) are under S&I, 1 PSS of I.C. 660 MW is under Held up and 14 PSS (8855 MW) are under PFR/PIR/DPR list.

REGION-WISE STATUS OF HYDRO-ELECTRIC CAPACITY AS ON 31.03.2022

EXHIBIT 1.1

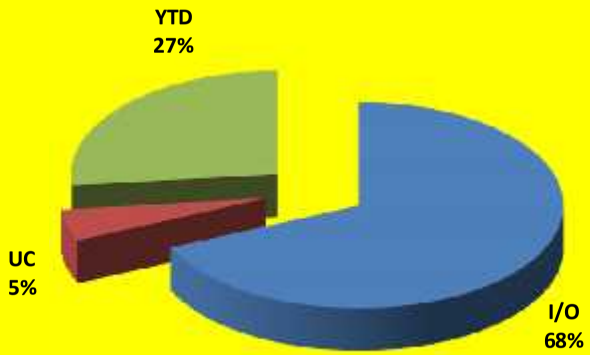
I/O=In Operation UC=Under Construction YTD= Yet to be Developed

NORTHERN REGION



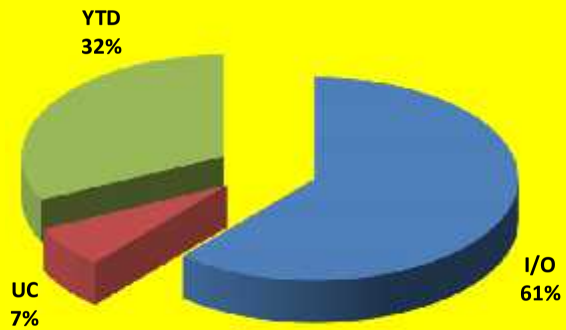
TOTAL ASSESSED (Above 25 MW) : - 52263 MW

WESTERN REGION



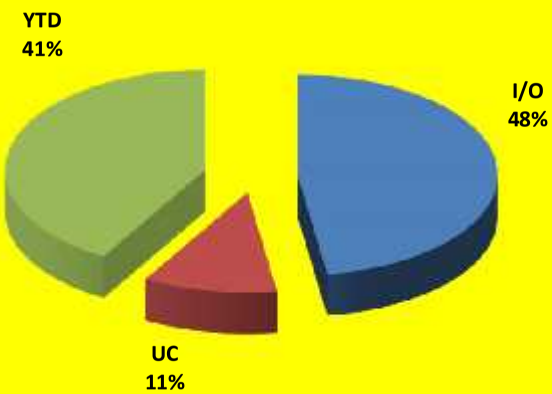
TOTAL ASSESSED (Above 25 MW) : - 8131 MW

SOUTHERN REGION



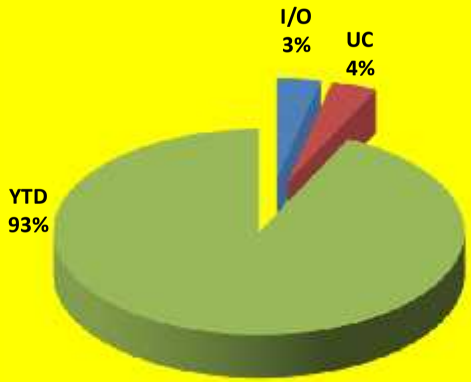
TOTAL ASSESSED (Above 25 MW): - 15890 M

EASTERN REGION



TOTAL ASSESSED (Above 25 MW) : - 10680 MW

NORTH EASTERN



TOTAL ASSESSED (Above 25 MW : - 58356 MW

ALL INDIA

TOTAL ASSESSED (Above 25 MW) : - 145320 MW

EXHIBIT 1.2

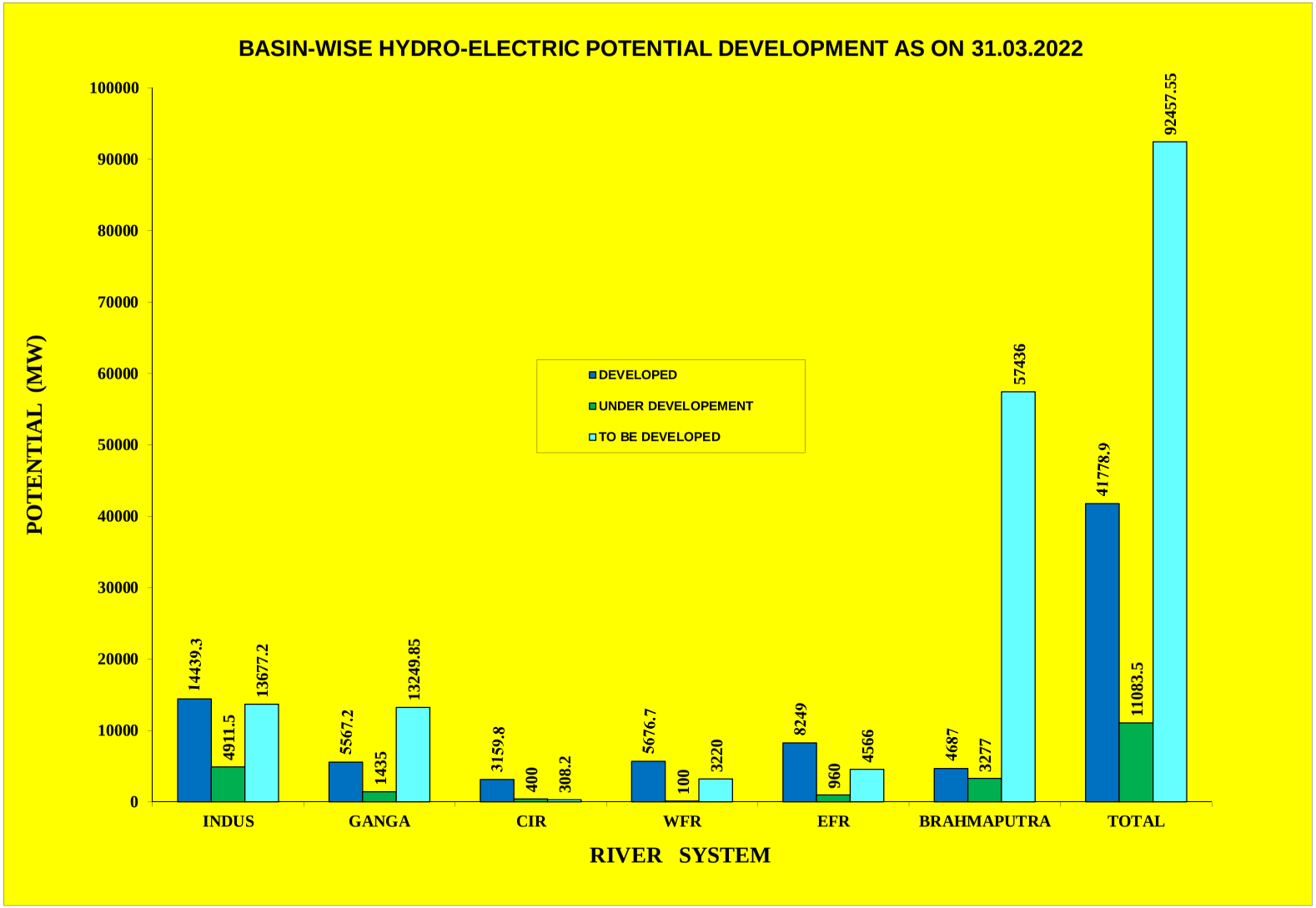

BASIN-WISE HYDRO-ELECTRIC POTENTIAL DEVELOPMENT AS ON 31.03.2022
POTENTIAL (MW)
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
DEVELOPED
UNDER DEVELOPEMENT
TO BE DEVELOPED
14439.3
4911.5
13677.2
5567.2
1435
13249.85
3159.8
400
308.2
5676.7
100
3220
8249
960
4566
4687
3277
57436
41778.9
11083.5
92457.55
INDUS
GANGA
CIR
WFR
EFR
BRAHMAPUTRA
TOTAL
RIVER SYSTEM

TABLE 1.2

STATUS OF H.E. POTENTIAL DEVELOPMENT - BASIN-WISE

(In terms of Installed Capacity-above 25 MW as on 31.03.2022)

River Basin	Identified Capacity as per Reassessment Study (MW)		Capacity Developed		Capacity Under Construction		Capacity Yet to be Developed	
	Total	Above 25	(MW)	(%)	(MW)	(%)	(MW)	(%)
Indus	33832	33028	14439.3	43.72	4911.5	14.87	13677.2	41.41
Ganga	20711	20252	5567.2	27.49	1435	7.09	13249.85	65.42
Central Indian River System	4152	3868	3159.8	81.69	400	10.34	308.2	7.97
West Flowing Rivers System	9430	8997	5676.7	63.10	100.0	1.11	3220.3	35.79
East Flowing Rivers System	14511	13775	8249.0	59.88	960.0	6.97	4566.1	33.15
Brahmaputra	66065	65400	4687.0	7.17	3277	5.01	57436.0	87.82
Total	**148701**	**145320**	**41778.9**	**28.75**	**11083.5**	**7.63**	**92457.6**	**63.62**

Note:- In addition to above 8 PSS (4745.6 MW) are under operation, 2 PSS (1500 MW) are under active construction, 1 PSS (80 MW) on which construction is held up and 2 PSS (2200 MW) is Concurred by CEA , 17 PSS (16770 MW) are under S&I, 1 PSS of I.C. 660 MW is under Held up and 14 PSS (8855 MW) are under PFR/PIR/DPR list.

1.2 Growth of Installed Capacity

A small Hydro-Electric Plant (130 KW) established near Darjeeling in 1897 ushered the beginning of hydro-electric power development in the country. Since then, development of hydro-electric power in the country has made rapid strides. The hydel installed capacity which was only 508 MW in 1947 with 12 H.E. Stations, 51 units and the maximum unit size of 22 MW at Bhira H.E. station under Tata, has risen to 46722.50 MW (as on 31.03.2022) from H.E. stations above 25 MW capacity. The maximum unit size now is 250 MW at Koyna Stage-IV under MAHAGENCO, Nathpa Jhakri under SJVNL, Tehri under THDC and Karcham Wangtoo of JSW Energy.

Contribution of electricity generation from Hydro Electric Power Stations has risen from 2.2 BU during 1947 to about 151.6 BU in 2021-22. Hydro generation during 2021-22 was about 1.3 BU (i.e. 0.86%) more than the generation of 150.3 BU during 2020-21.

1.3 Share of Hydro-electric Installed Capacity & Generation

The installed capacity of Hydro-Electric Stations viz-à-viz total capacity, the contribution in generation by hydro-electric plants and trend of hydro capacity & generation over the years are indicated in **Table-1.3** and at **Exhibits 1.3, 1.4 and 1.5**. From **Table 1.3**, it may be observed that the overall share of hydro in terms of installed capacity in the country rose from 37.3% at the end of 1947 to 50.6% during 1962-63. However, thereafter, the share of hydro progressively increased and is presently 11.69% at the end of 2021-22. The generation from hydro stations during the year 2021-22 accounted for 11.54% of the total energy generation in the country.

TABLE 1.3

HYDRO-ELECTRIC CAPACITY & GENERATION VIS-À-VIS TOTAL CAPACITY & GENERATION

Year	Installed Capacity			Generation		
	Total (MW)	Hydro (MW)	Hydro as % of Total	Total (MU)	Hydro (MU)	Hydro as % of Total
1950	1713	560	32.63	5106	2519	49.33
1955-56	2886	1061	36.76	9145	4295	46.97
1960-61	4653	1917	41.20	16937	7837	46.27
1962-63	5801	2936	50.61	22365	11805	52.78
1965-66	9027	4124	45.68	32890	15225	46.29
1968-69	12957	5907	45.59	47434	20723	43.69
1973-74	16664	6966	41.80	66689	28972	43.44
1978-79	26680	10833	40.60	102523	47159	46.00
1979-80	28448	11384	40.02	104627	45478	43.47
1984-85	42585	14460	33.96	156859	53948	34.39
1989-90	63636	18307	28.77	245437	62116	25.31
1991-92	69065	19194	27.79	287028	72757	25.35
1996-97	85795	21658	25.24	395889	68901	17.40
1997-98	89203	21904	24.58	421748	74582	17.68
1998-99	92269	22479	24.10	447464	82923	18.53
1999-00	97837	23857	24.37	481128	80755	16.78
2000-01	101450	25153	24.75	499429	74362	14.89
2001-02	105046	26269	25.01	515066	73759	14.32
2002-03	107877	26767	24.81	531607	63834	12.01
2003-04	112684	29507	26.19	558113	73775	13.22
2004-05	118419	30936	26.12	587416	84495	14.38
2005-06	124287	32326	26.01	624631	101293	16.22
2006-07	132321	34662	26.19	659513	113359	17.19
2007-08	143061	37002	25.86	704469	123424	17.52
2008-09*	147917	36846	24.91	714653	109840	15.37
2009-10*	159398	36863	23.13	763429	103916	13.61
2010-11*	173626	37567	21.64	805532	114257	14.18
2011-12*	199877	38990	19.51	871602	130510	14.97
2012-13*	223344	39491	17.68	907262	113720	12.53
2013-14*	243029	40531	16.68	961552	134848	14.02
2014-15*	267637	41267	15.42	1043665	129244	12.38
2015-16*	302088	42783	14.16	1102578	121377	11.01
2016-17*	326849	44478	13.61	1154524	122378	10.60
2017-18*	344002	45293	13.17	1201528	126123	10.50
2018-19*	356100	45399	12.75	1244930	134894	10.84
2019-20*	370106.46	45699.2	12.34	1244989.43	155769.12	12.51
2020-21*	382151.22	46209.20	12.09	1225842.14	150299.52	12.26
2021-22*	399496.61	46722.50	11.69	1313453.87	151627.33	11.54

* Capacity above 25 MW only has been considered.

EXHIBIT 1.3

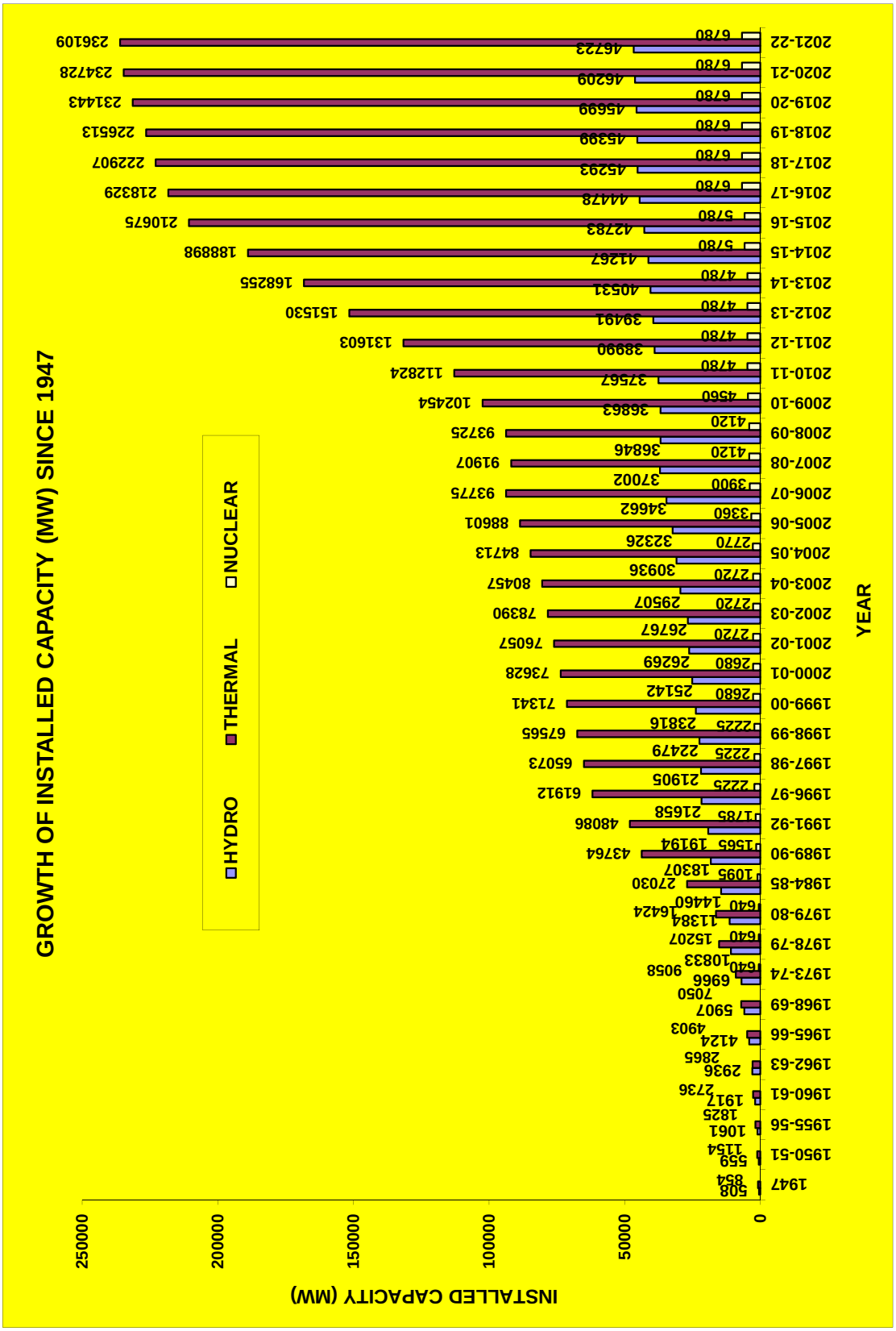
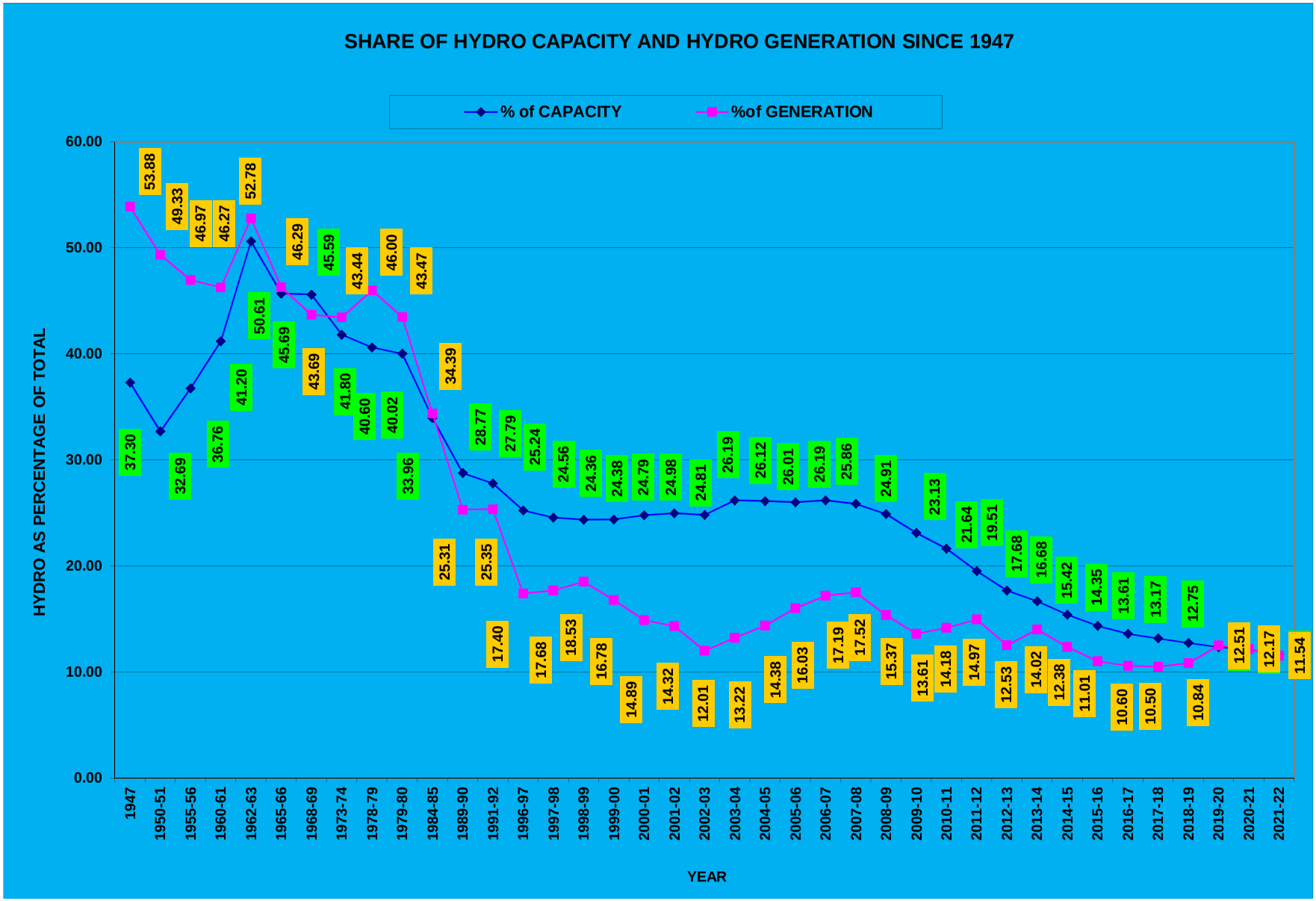

GROWTH OF INSTALLED CAPACITY (MW) SINCE 1947
HYDRO
THERMAL
NUCLEAR
INSTALLED CAPACITY (MW)
YEAR
250000
200000
150000
100000
50000
0
1947 508 854
1950-51 559 1154
1955-56 1061 1825
1960-61 1917 2736
1962-63 2936 2865
1965-66 4124 4903
1968-69 5907 7050
1973-74 6640 6966 9058
1978-79 15207 10833
1979-80 11384 16424 14460
1984-85 27030 18307 1095
1989-90 43764 19194 1565
1991-92 48086 21658 1785
1996-97 61912 21905 2225
1997-98 65073 22479 2225
1998-99 67565 23816 2225
1999-00 71341 25142 2680
2000-01 73628 26269 2680
2001-02 76057 26767 2720
2002-03 78390 29507 2720
2003-04 80457 30936 2720
2004.05 84713 32326 2770
2005-06 88601 34662 3360
2006-07 93775 37002 3900
2007-08 91907 36846 4120
2008-09 93725 4120
2009-10 102454 36863 4560
2011-12 131603 38990 4780
2012-13 151530 39491 4780
2013-14 168255 40531 4780
2014-15 188898 41267 5780
2015-16 210675 42783 5780
2016-17 218329 44478 6780
2017-18 222907 45293 6780
2018-19 226513 45399 6780
2019-20 231443 45699 6780
2020-21 234728 46209 6780
2021-22 236109 46723 6780

EXHIBIT 1.4

GROWTH OF HYDRO GENERATION (MU) VIZ-À-VIZ OTHER SOURCES SINCE 1947
HYDRO
THERMAL
NUCLEAR
GENERATION (MU)
YEAR
1200000
1000000
800000
600000
400000
200000
0
1947 2194 1878
1950-51 2519 2587
1955-56 4295 4850
1960-61 7837 9100
1962-63 11805 10560
1965-66 15225 17665
1968-69 20723 26711
1973-74 28972 35320 23971 47159
1978-79 27770 52594
1979-80 28760 56274 45478 53948
1984-85 40750 62116 98836
1989-90 46257 72757 178696
1991-92 55240 68901 208747
1996-97 9071 74582 317917
1997-98 100830 82923 337083
1998-99 119220 80755 352619
1999-00 132500 74362 387123
2000-01 169287 37759 408139
2001-02 193200 93834 421987
2002-03 192350 73775 448538
2003-04 177200 84495 466618
2004.05 168450 101293 486076
2005-06 173130 113359 506025
2006-07 186070 123424 527547
2007-08 165770 109840 558990
2008-09 147130 590101
2009-10 186360 103916 640876
2010-11 262660 114257 665008
2011-12 322870 130510 708806
2012-13 328660 113720 134848 760676
2013-14 342280 792477
2014-15 361020 129244 878320
2015-16 374140 121327 943788
2016-17 379160 122328 994230
2017-18 383460 126123 1037059
2018-19 378120 134894 1072224
2019-20 464720 155769 1042748
2020-21 430290 150300 1032514
2021-22 471120 151627 1114714

EXHIBIT-1.5


SHARE OF HYDRO CAPACITY AND HYDRO GENERATION SINCE 1947
% of CAPACITY
%of GENERATION
HYDRO AS PERCENTAGE OF TOTAL
YEAR
60.00
50.00
40.00
30.00
20.00
10.00
0.00
1947
1950-51
1955-56
1960-61
1962-63
1965-66
1968-69
1973-74
1978-79
1979-80
1984-85
1989-90
1991-92
1996-97
1997-98
1998-99
1999-00
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17
2017-18
2018-19
2019-20
2020-21
2021-22
37.30
32.69
36.76
41.20
50.61
45.69
43.69
41.80
40.60
40.02
33.96
28.77
27.79
25.24
24.56
24.36
24.38
24.79
24.98
24.81
26.19
26.12
26.01
26.19
25.86
24.91
23.13
21.64
19.51
17.68
16.68
15.42
14.35
13.61
13.17
12.75
12.51
12.17
11.54
53.88
49.33
46.97
46.27
52.78
46.29
45.59
43.44
46.00
43.47
34.39
25.31
25.35
17.40
17.68
18.53
16.78
14.89
14.32
12.01
13.22
14.38
16.03
17.19
17.52
15.37
13.61
14.18
14.97
12.53
14.02
12.38
11.01
10.60
10.50
10.84

1.4 Monitored Hydro Installed Capacity

For generation performance, the monitored hydro-electric installed capacity in the country as on 31.03.2022 was 46722.50 MW (above 25 MW capacity). Region-wise summary of the hydel installed capacity is given in **Table 1.4**. Region-wise, type-wise and construction-wise categorization of stations is given in **Annex-1.1** while Sector-wise/Utility-wise and Station-wise/State-wise details of installed capacity are given in **Annex 1.2 to 1.4**.

TABLE 1.4

REGION-WISE SUMMARY OF HYDRO-ELECTRIC INSTALLED CAPACITY (Above 25 MW capacity as on 31.03.2022)

S.No.	Region	No. of Units	Installed Capacity (MW)
1.	Northern	256	19576.25
2.	Western	101	7392
3.	Southern	246	11739.5
4.	Eastern	86	5987.75
5.	North-Eastern	38	2027.0
Total		**727**	**46722.50**

Capacity-wise grouping of H.E. Stations as on 31.03.2022 is given in **Annex- 1.5**. It is observed that 106 stations with installed capacity above 100 MW constitute more than 50.50% of the overall hydro capacity.

7 H.E. Generating units having installed capacity of 393 MW were added during the year 2021-22. Details of these units are given in **Annex-1.6**.

Share of hydro installed capacity and hydro generation viz-a-viz total installed capacity and total generation in the country as on 31.03.2022 was 11.69% and 11.54% respectively. These details are indicated in **Exhibits 1.6 and 1.7.** Sector-wise distribution of hydro installed capacity (MW) in Central, Private and State Sectors was 33.53%, 8.41% and 58.06% respectively. Sector-wise distribution of hydro generation (MU) in Central, Private and State sectors was 38.53%, 9.51% and 51.96% respectively. These details are illustrated in **Exhibits 1.8 & 1.9**.

1.5 Hydro Generating Units : Indigenous and imported

As on 31.03.2022, there were 727 hydro generating units in operation at 210 stations comprising of indigenous and imported units as per details given in **Table 1.5** below. The domestic supplier, BHEL, has a share of about 42.69% of total capacity for both turbines & generators whereas other domestic suppliers together have a meagre share of about 6.88% of total capacity.

Among the imported turbines and generators, Japan, UK and Canada are the top three suppliers of turbines and generators in term of numbers but capacity-wise, Japan, Canada and USSR are the top three suppliers.

TABLE 1.5

HYDRO GENERATING UNITS INDIGENOUS/IMPORTED FROM VARIOUS COUNTRIES AS ON 31-03-2022

Name of the Country	Turbines supplied				Generators supplied			
	Units		Capacity		Units		Capacity	
	No.	% of Total	MW	% of Total	No.	% of Total	MW	% of Total
A-Indigenous								
BHEL	310	42.69	20030.30	42.87	310	42.54	20030.30	42.87
Others	54	6.88	3395.50	7.27	54	7.02	3394	7.26
Sub Total	**364**	**49.57**	**23425.80**	**50.14**	**364**	**50.07**	**23424.30**	**50.13**
B-Imported								
USA	9	1.24	351.00	0.75	6	0.83	543.15	1.16
U.K.	63	8.67	1242.10	2.66	63	8.67	1676.90	3.59
France	31	4.26	2179.20	4.66	15	2.06	1726	3.69
Canada	44	6.05	3132.00	6.70	44	6.05	3132	6.70
USSR	26	3.58	2804.00	6.00	26	3.58	2804	6.00
Switzerland	21	2.89	790.20	1.69	21	2.89	219	0.47
Japan	76	10.45	6398.20	13.69	76	10.45	5822.20	12.46
Other	93	12.79	6400	13.70	112	15.41	7374.95	15.78
Sub Total	**363**	**49.93**	**23296.70**	**49.86**	**363**	**49.93**	**23298.20**	**49.87**
Total	**727**	**100**	**46722.50**	**100**	**727**	**100**	**46722.50**	**100**

EXHIBIT-1.6

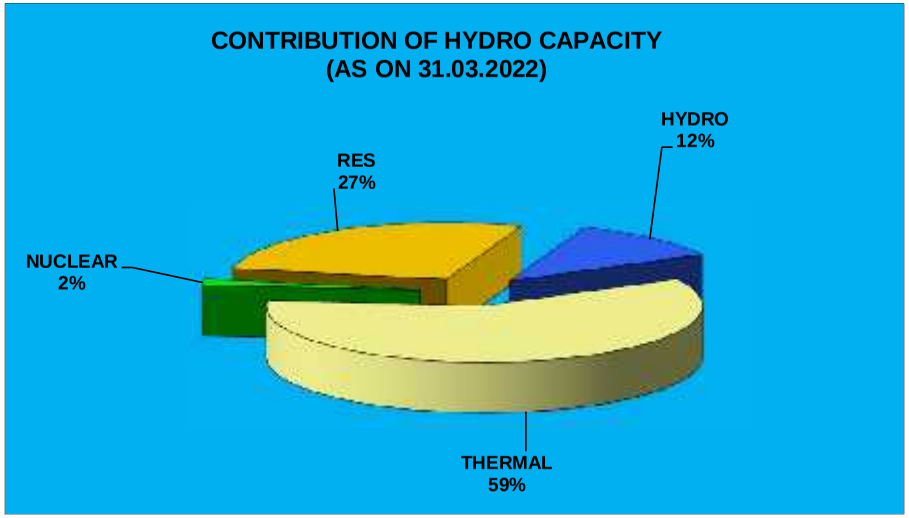


EXHIBIT-1.7

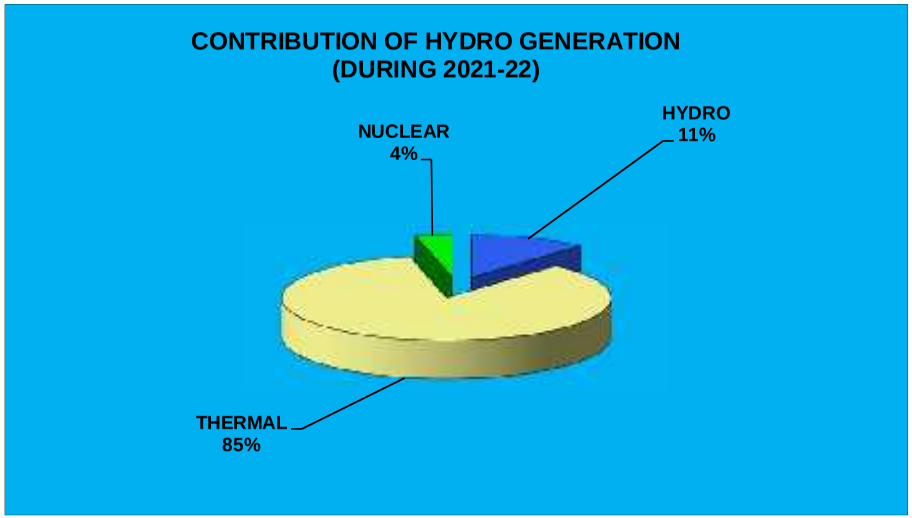


EXHIBIT-1.8

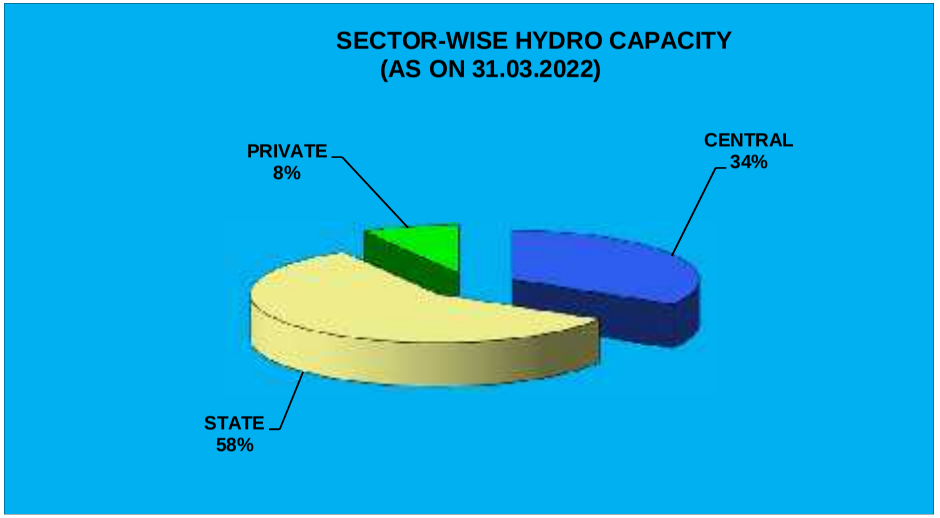
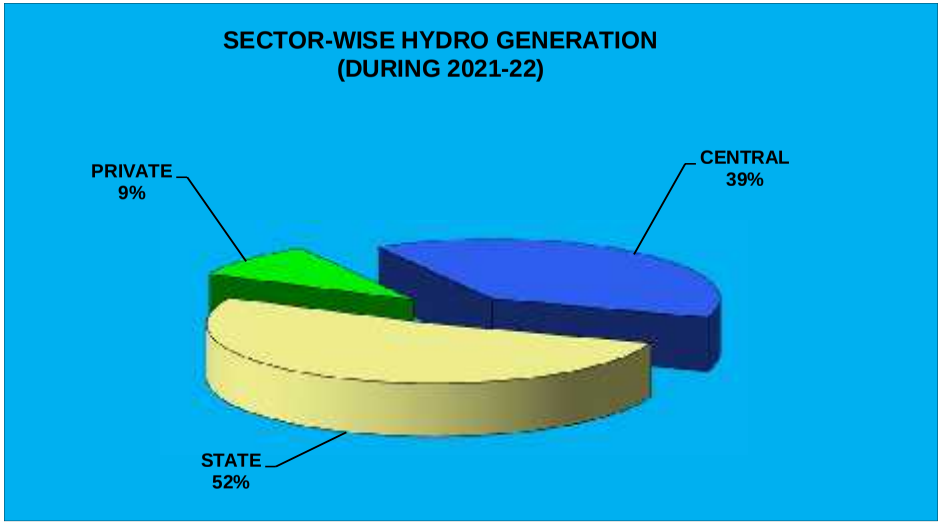


EXHIBIT-1.9



REGION-WISE / SECTOR-WISE INSTALLED CAPACITY OF H.E. STATIONS IN THE COUNTRY

(ABOVE 25 MW CAPACITY)

(As on 31.03.2022)

REGION	DESIGN ENERGY (MU)	CONVENTIONAL HE STATIONS			PUMPED STORAGE SCHEMES (PSS)			CONVENTIONAL + PUMPED STORAGE SCHEMES (PSS)		
		NO. OF STATIONS	NO. OF UNITS	INSTALLED CAPACITY (MW)	NO. OF STATIONS	NO. OF UNITS	INSTALLED CAPACITY (MW)	NO. OF STATIONS	TOTAL UNITS	TOTAL INSTALLED CAPACITY (MW)
NORTHERN	76490.50	75	256	19576	0	0	0.00	75	256	19576.25
WESTERN	16607.21	24	88	5552.00	4	13	1840.00	28	101	7392.00
SOUTHERN	33900.85	67	229	9734.00	3	17	2006	70	246	11739.60
EASTERN	20204.86	23	82	5088	1	4	900.00	24	86	5987.75
NORTH EASTERN	9412.73	14	38	2027.00	0	0	0.00	14	38	2027.00
TOTAL	**156616.15**	**203**	**693**	**41977**	**8**	**34**	**4745.6**	**210***	**727**	**46722.6**

*** Total number of HE stations are 210 as NJ Sagar HE Station (Sothern Region) is having one conventional unit and remaining seven units are PSS**

NOTE:

Note: Following two Hydro Stations have conventional as well as PSS capacity:

Sl. No.	Station	State/Region	Installed Capacity (MW)	
			Conventional	PSS
1	N J Sagar	Telangana/ Southern	1X110 =110	7X100.8=705.60

SECTOR-WISE INSTALLED CAPACITY OF H.E. STATIONS IN THE COUNTRY
(ABOVE 25 MW CAPACITY)

SECTOR	NO. OF UTILITIES	NO. OF STATION	NO. OF UNITS	INSTALLED CAPACITY (MW)
CENTRAL	8	42	163	15664.70
STATE	23	146	504	27126.80
PRIVATE	17	22	60	3931.00
TOTAL	**48**	**210**	**727**	**46722.50**

Categorisation of HE Stations (Installed Capacity)

1. Operation-wise

(As on 31.03.2022)

Sector	RoR		RoR (P)		Storage (S)						Total*	
					S(P)		S(MPP)		PSS			
	No.	MW	No.	MW	No.	MW	No.	MW	No.	MW	No.	MW
Central	8	2115.50	19	7263.00	6	1725.00	9	4561.20	0	0.00	42	15664.70
State	15	892.15	50	7590.00	32	6479.65	43	7569.40	7	4595.60	147	27126.80
Private	5	892.00	13	2592.00	3	297.00	0	0.00	1	150.00	22	3931.00
Total (Nos./ MW Capacity)*	**28**	**3899.65**	**82**	**17445.00**	**41**	**8501.65**	**52**	**12130.60**	**8**	**4745.60**	**210***	**46722.50**
% of Total	**14**	**8.77**	**41**	**39.22**	**20.5**	**19.11**	**26**	**27.27**	**4**	**10.67**	**100**	**100**

2. Power House Construction-wise

Sector	Surface		Underground		Total	
	No.	MW	No.	MW	No.	MW
Central	29	9566.5	13	6098.2	**42**	**15664.7**
State	124	17954.8	23	9172	**147**	**27126.8**
Private	13	1448	9	2483	**22**	**3931**
Total (Nos./MW Capacity)*	**166**	**28969.30**	**45**	**17753.20**	**210***	**46722.50**
% of Total	**79.05**	**62.00**	**21.43**	**38.00**	**100**	**100**

* Total number of HE Stations are 210 as NJ Sagar HE Station (Southern Region) is having one Conventional unit.

Abbreviations:

RoR - Run-of-River type

RoR(P) – Run-of-River with Pondage

S(P) – Storage (Conventional) for Power Generation purpose only

S(MPP) – Storage (Conventional) for Multipurpose Project

PSS – Pumped Storage Scheme

SECTOR-WISE/UTILITY-WISE INSTALLED CAPACITY OF H.E. STATIONS IN THE COUNTRY
(ABOVE 25 MW CAPACITY)

(As on 31.03.2022)

Sl. No.	NAME OF THE SECTOR/ UTILITY	NO. OF STATIONS	NO. OF UNITS	INSTALLED CAPACITY (MW)	DESIGN ENERGY (MU)
	CENTRAL SECTOR				
1	BBMB	6	28	2938.30	9515.00
2	NHPC	20	70	5451.20	24680.34
3	SJVNL	2	12	1912.02	8490.08
4	NTPC	1	4	800.00	3054.79
5	THDC	2	8	1400.00	3952.00
6	NHDC	2	16	1520.00	3146.57
7	DVC	2	5	143.20	374.00
8	NEEPCO	7	20	1500.00	7397.04
	SUB-TOTAL CENTRAL	**42**	**163**	**15664.72**	**60609.82**
	PRIVATE SECTOR				
1	MPCL	1	2	86	370.93
2	EPPL	1	2	100	403.00
3	GBHPPL	1	2	70	291.73
4	ADHPL	1	2	192	678.18
5	HBPCL	2	7	1345	5344.06
6	JPPVL	1	4	400	1774.42
7	AHPC	1	4	330	1396.84
8	IAEPL	1	3	36	157.82
9	TPCL	4	15	447	1220.00
10	GIPL	1	2	110	537.81
11	DEPL	1	2	96	459.02
12	DLHP	1	1	34	50.00
13	SKPPPL	1	2	96	431.00
14	SEPL	1	2	97	425.05
15	RENEW POWER PVT LTD.	1	3	99	473.00
16	MBPCL	1	2	113	434.00
17	HSPPL	1	2	100	524.00
18	GMR	1	3	180	769.39
	SUB-TOTAL PRIVATE	**22**	**60**	**3931.00**	**15740.25**

	STATE SECTOR				
1	HPSEBL	4	12	372.00	1691.62
2	HPPCL	3	8	406.00	955.03
3	JKSPDCL	4	12	1110.00	4833.30
4	PSPCL	8	25	1051.00	4207.00
5	RRVUNL	4	11	411.00	1046.00
6	UPJVNL	4	15	501.60	1707.00
7	UJVNL	10	34	1252.15	4848.10
8	GSECL	2	8	540.00	1598.00
9	SSNNL	2	11	1450.00	3848.00
10	MPPGCL	8	23	875.00	2561.64
11	CSPGC	1	3	120.00	245.00
12	MAHAGENCO	8	24	2406.00	3938.00
13	APGENCO	8	34	1796.75	5738.00
14	TSGENCO	7	36	2405.60	5045.85
15	KPCL	14	66	3617.20	12981.00
16	KSEB	14	47	1856.50	6458.00
17	TANGEDCO	27	69	2178.20	4348.00
18	JUUNL	2	2	130.00	149.00
19	OHPC	6	31	2039.80	5676.00
20	WBSEDCL	3	12	986.00	1610.00
21	TUL	1	6	1200.00	5214.00
22	APGCL	1	2	100.00	390.00
23	MePGCL	5	13	322.00	1177.69
	SUB-TOTAL STATE	**146**	**504**	**27126.80**	**80266.23**
	TOTAL	**210**	**727**	**46722.50**	**156616.30**

State-wise/Station-wise Installed Capacity of H.E. Stations in the Country

(Above 25 MW Capacity)

As on 31.03.2022

Sl No.	Utilities/Stations	No. of Stations	No. of Units	Type of Project	No. of Units X Capacity(MW)	Capacity (MW)	Design Energy (MU)	Year of Commissioning
	Conventional H E Stations							
	Northern Region							
	BBMB							
	HIMACHAL PRADESH							
1	Bhakra Left	1	5	MP	(1X108+4X126)	612.00	3924.00	1960 (108 MW) 1961 (486 MW)
2	Bhakra Right	1	5	MP	(5X157)	785.00		1966 (314 MW) 1967 (314 MW) 1968 (157 MW)
3	Dehar	1	6	R(P)	(6X165)	990.00	3110.00	1977 (165 MW) 1978 (165 MW)
4	Pong	1	6	MP	(6X66)	396.00	1123.00	1978 (198 MW) 1979 (66 MW) 1982 (66 MW) 1983 (66 MW)
	Sub-Total BBMB (HP)	**4**	**22**			**2783.00**	**8157.00**	
	NHPC							
5	Baira Siul	1	3	R(P)	(3X60)	180.00	779.28	1980 (132 MW) 1981 (66 MW)
6	Chamera-I	1	3	S	(3X180)	540.00	1664.56	1994 (540 MW)
7	Chamera-II	1	3	R(P)	(3X100)	300.00	1499.89	2003 (200 MW) 2004 (100 MW)
8	Chamera-III	1	3	R(P)	(3X77)	231.00	1108.00	2012 (231 MW)
9	Parbati-III	1	4	R(P)	(4X130)	520.00	1977.23	2014 (520 MW)
	Sub-Total HP	**5**	**16**			**1771.00**	**7028.96**	
	SJVNL							
10	Nathpa Jhakri	1	6	R(P)	(6X250)	1500.00	6612.00	2003 (500 MW) 2004 (1000 MW)
11	Rampur	1	6	R	(6X68.67)	412.00	1878.08	2014 (412 MW)
	Total SJVNL	**2**	**12**			**1912.00**	**8490.08**	
	NTPC LTD.							
12	Koldam	1	4	S	(4X200)	800.00	3054.79	2015 (800 MW)
	Total NTPC LTD.	**1**	**4**			**800.00**	**3054.79**	
	Total Central Sector-HP	**12**	**54**			**7266.00**	**26730.83**	
	HPSEBL							
13	Bassi	1	4	R(P)	(4X16.5)	66.00	346.77	1970 (33 MW) 1971 (16.5 MW)
14	Giri Bata	1	2	R(P)	(2X30)	60.00	240.00	1978 (60 MW)
15	Larji'	1	3	R(P)	(3X42)	126.00	586.85	2006 (126 MW)
16	Sanjay	1	3	R(P)	(3X40)	120.00	518.00	1989 (120 MW)
	Total HPSEBL	**4**	**12**			**372.00**	**1691.62**	
	HPPCL							
17	Integrated Kashang	1	3	R (P)	(3X65)	195	245.80	2016 (130 MW)
18	Sainj	1	2	R(P)	(2X50)	100	323.23	2017 (100 MW)
19	Sawara Kuddu	1	3	R	(3X37)	111	386.00	2020 (111 MW)
	Total HPPCL	**3**	**8**			**406.00**	**955.03**	
	PSPCL							
20	Shanan	1	5	R(P)	(1X50)+(4X15)	110.00	585.00	1932 (60 MW) 1982 (50 MW)
	Sub Total PSPCL-HP	**1**	**5**			**110.00**	**585.00**	
	Total State Sector	**8**	**25**			**888.00**	**3231.65**	
	Private Sector							
	MPCL							

Sl No.	Utilities/Stations	No. of Stations	Units	Type of Project	Capacity(MW)	(MW)	Energy (MU)	Year of Commissioning
	Conventional H E Stations							
21	Malana	1	2	R(P)	(2X43)	86.00	370.93	2001 (86 MW)
	Total MPCL	**1**	**2**			**86.00**	**370.93**	
	GBHPPL							
22	Budhil	1	2	R(P)	(2X35)	70.00	291.73	2012 (70 MW)
	Total GBHPPL	**1**	**2**			**70.00**	**291.73**	
	EPPL							
23	Malana-II	1	2	R(P)	(2X50)	100.00	403.00	2011 (100 MW)
	Total EPPL	**1**	**2**			**100.00**	**403.00**	
	IA Energy							
24	Chanju-I	1	3	R(P)	(3X12)	36.00	157.82	2017 (12 MW)
	Total IA Energy	**1**	**3**			**36.00**	**157.82**	
25	Allain Duhangan	1	2	R(P)	(2X96)	192.00	678.18	2010 (192 MW)
	Total ADHPL	**1**	**2**			**192.00**	**678.18**	
	HBPCL							
26	Baspa	1	3	R(P)	(3X100)	300.00	1213.00	2003 (300 MW)
27	Karcham Wangtoo	1	4	R(P)	(4X261.25)	1045.00	4131.06	2011 (1000 MW)
	Total HBPCL	**2**	**7**			**1345.00**	**5344.06**	
	HSPPL							
28	Sorang	1	2	R	(2X50)	100.00	524.00	2021 (100 MW)
	Total HSPPL	**1**	**2**			**100.00**	**524.00**	
	GMR							
29	Bajoli Holi	1	3	R	(3X60)	180.00	769.39	Mar 2022 (180)
	Total GMR	**1**	**3**			**180.00**	**769.39**	
	Total PVT	**9**	**23**			**2109.00**	**8539.11**	
	Total Himachal Pradesh	**29**	**102**			**10263.00**	**38501.59**	
	JAMMU & KASHMIR							
	JKSPDC							
30	Baglihar-I	1	3	R(P)	(3X150)	450.00	2643.00	2008 (450 MW)
31	Baglihar-II	1	3	R(P)	(3X150)	450.00	1302.30	2015 (450 MW)
32	Lower Jhelum	1	3	R(P)	(3X35)	105.00	533.00	1978 (35 MW) 1979 (70 MW)
33	Upper Sindh-II	1	3	R(P)	(3X35)	105.00	355.00	2000 (35 MW) 2001 (35 MW) 2002 (35 MW)
	Total JKSPDC	**4**	**12**			**1110.00**	**4833.30**	
	NHPC							
34	Dulhasti	1	3	R(P)	(3X130)	390.00	1907.00	2007 (390 MW)
35	Salal-I&II	1	6	R	(3X115)	690.00	3082.00	1987 (345 MW) 1993 (115 MW) 1994 (115 MW) 1995 (115 MW)
36	Uri-I	1	4	R	(4X120)	480.00	2587.38	1996 (120 MW) 1997 (360 MW)
37	Uri-II	1	4	R	(4X60)	240.00	1124.00	2013 (180 MW)
38	Sewa-II	1	3	R(P)	(3X40)	120.00	533.52	2010 (120 MW)
39	Keshanganga	1	3	R(P)	(3X110)	330.00	1705.62	2018 (330 MW)
	Sub-Total NHPC	**6**	**23**			**2250.00**	**10939.52**	
	Total Jammu & Kashmir	**10**	**35**			**3360.00**	**15772.82**	
	LADAKH							
	NHPC							
40	Chutak	1	4	R	(4X11)	44.00	213.00	2012 (33 MW) 2013 (11 MW)
41	Nimoo Bazgo	1	3	R(P)	(3X15)	45.00	239.00	2013 (45 MW)
	Sub-Total NHPC	**2**	**7**			**89.00**	**452.00**	

Sl No.	Utilities/Stations	No. of Stations	Units	Type of Project	Capacity(MW)	(MW)	Energy (MU)	Year of Commissioning
	Conventional H E Stations							
	Total Ladakh	**2**	**7**			**89.00**	**452.00**	
	PUNJAB							
	PSPCL							
42	Anandpur Sahib-I	1	2	R	(2X33.5)	67.00	909.00	1985 (67 MW)
43	Anandpur Sahib-I	1	2	R	(2X33.5)	67.00		1985 (67 MW)
44	Mukerian-I	1	3	R	(3X15)	45.00	1206.00	1983 (45 MW)
45	Mukerian-II	1	3	R	(3X15)	45.00		1988 (30 MW) 1989 (15 MW)
46	Mukerian-III	1	3	R	(3X19.5)	58.50		1989 (58.50 MW)
47	Mukerian-IV	1	3	R	(3X19.5)	58.50		1989 (58.50 MW)
48	Ranjit Sagar	1	4	S	(4X150)	600.00	1507.00	2000 (600 MW)
	Total PSPCL	**7**	**20**			**941.00**	**3622.00**	
	BBMB							
49	Ganguwal	1	3	R	(2X24.2)+(1X 29.25)	77.65	1358	1955 (48.4 MW) 1962 (29.25 MW)
50	Kotla	1	3	R	(2X24.2)+(1X 29.25)	77.65		1956 (48.4 MW) 1961 (29.25 MW)
	Sub-Total BBMB (Punjab)	**2**	**6**			**155.30**	**1358.00**	
	Total Punjab	**9**	**26**			**1096.30**	**4980.00**	
	Rajasthan							
	RRVUNL							
51	Jawahar Sagar	1	3	R(P)	(3X33)	99.00	298.00	1973 (99 MW)
52	Mahi Bajaj-I	1	2	MP	(2X25)	50.00	289.00	1986 (50 MW)
53	Mahi Bajaj-II	1	2	R(P)	(2X45)	90.00		1989 (90 MW)
54	R P Sagar	1	4	MP	(4X43)	172.00	459.00	1968 (129 MW) 1969 (43 MW)
	Total RRVUNL	**4**	**11**			**411.00**	**1046.00**	
	Total Rajasthan	**4**	**11**			**411.00**	**1046.00**	
	UTTARAKHAND							
	NHPC							
55	Dhauli Ganga	1	4	R(P)	(4X70)	280.00	1134.69	2005 (280 MW)
56	Tanakpur	1	3	R	(3X31.4)	94.20	452.19	1992 (94.2 MW)
	Sub-Total NHPC	**2**	**7**			**374.20**	**1586.88**	
	THDC							
57	Tehri St-I	1	4	MP	(4X250)	1000.00	2797.00	2006 (500 MW) 2007 (500 MW)
58	Koteshwar	1	4	R(P)	(4X100)	400.00	1155.00	2011 (200 MW) 2012 (200 MW)
	Total THDC	**2**	**8**			**1400.00**	**3952.00**	
	Sub Total Central	**4**	**15**			**1774.20**	**5538.88**	
	State Sector							
	UJVNL							
59	Chibro (Yamuna)	1	4	R(P)	(4X60)	240.00	750.00	1975 (180 MW) 1976 (60 MW)
60	Chilla	1	4	R	(4X36)	144.00	725.00	1980 (108 MW) 1981 (36 MW)
61	Dhakrani	1	3	R	(3X11.25)	33.75	169.00	1965 (11.25 MW) 1966 (11.25 MW) 1970 (11.25 MW)
62	Dhalipur	1	3	R	(3X17)	51.00	192.00	1965 (17 MW) 1966 (17 MW) 1970 (17 MW)
63	Khatima	1	3	R	(3X13.8)	41.40	208.00	1955 (13.8 MW) 1956 (27.6 MW)
64	Khodri	1	4	R(P)	(4X30)	120.00	345.00	1984 (120 MW)
65	Kulhal	1	3	R	(3X10)	30.00	164.00	1975 (30 MW)

Sl No.	Utilities/Stations	No. of Stations	Units	Type of Project	Capacity(MW)	(MW)	Energy (MU)	Year of Commissioning
	Conventional H E Stations							
66	Maneri Bhali-I	1	3	R(P)	(3X30)	90.00	395.00	1984 (90 MW)
67	Maneri Bhali-II	1	4	R(P)	(4X76)	304.00	1566.10	2008 (304 MW)
68	Ramganga	1	3	MP	(3X66)	198.00	334.00	1975 (66 MW) 1976 (66 MW) 1977 (66 MW)
	Total UJVNL	**10**	**34**			**1252.15**	**4848.10**	
	Private Sector							
	AHPC							
69	Shrinagar	1	4	R(P)	(4X82.50)	330.00	1396.84	2015 (330 MW)
.	**JPPVL**							
70	Vishnu Prayag	1	4	R	(4X100)	400.00	1774.42	2006 (400 MW)
	L&T							
71	Singoli Bhatwari	1	3	R	(3X33)	99.00	473.00	2020 (33 MW)
	Sub Total Private	**3**	**11**			**829.00**	**3644.26**	
	Total Uttarakhand	**17**	**60**			**3855.35**	**14031.24**	
	UPJVNL							
	UTTAR PRADESH							
72	Khara	1	3	R(P)	(3X24)	72.00	385.00	1992 (72 MW)
73	Matatila	1	3	MP	(3X10.2)	30.60	123.00	1965 (30.6 MW)
74	Obra	1	3	MP	(3X33)	99.00	279.00	1970 (66 MW) 1971 (33 MW)
75	Rihand	1	6	MP	(6X50)	300.00	920.00	1962 (250 MW) 1966 (50 MW)
	Total UPJVNL	**4**	**15**			**501.60**	**1707.00**	
	Total Northern Region	**75**	**256**			**19576.25**	**76490.65**	
	Western Region							
	MADHYA PRADESH							
	NHDC							
76	Indira Sagar	1	8	MP	(8X125)	1000.00	1980.00	2004 (875 MW) 2005 (125 MW)
77	Omkareshwar	1	8	MP	(8X65)	520.00	1166.57	2007 (520 MW)
	Sub-Total NHDC	**2**	**16**			**1520.00**	**3146.57**	
	Total Central	**2**	**16**			**1520.00**	**3146.57**	
	MPPGCL							
78	Bansagar Tons-I	1	3	R(P)	(3X105)	315.00	900.00	1991 (105 MW) 1992 (210 MW)
79	Bansagar Tons-III	1	2	R	(2X15)	30.00	113.00	2002 (30 MW)
80	Bansagar Tons-II	1	3	MP	(3X20)	60.00	143.00	2000 (20 MW) 2001 (20 MW) 2002 (20 MW)
81	Bargi	1	2	MP	(2X45)	90.00	508.08	1988 (90 MW)
82	Gandhi Sagar	1	5	MP	(5X23)	115.00	420.48	1960 (69 MW) 1963 (23 MW) 1966 (23 MW)
83	Madhikhera	1	3	MP	(3X20)	60.00	74.12	2006 (40 MW) 2007 (20 MW)
84	Rajghat	1	3	MP	(3X15)	45.00	87.60	1999 (45 MW)
	Sub-Total MPPGCL	**7**	**21**			**715.00**	**2246.28**	
	Total Madhya Pradesh	**9**	**37**			**2235.00**	**5392.85**	

Sl No.	Utilities/Stations	No. of Stations	Units	Type of Project	Capacity(MW)	(MW)	Energy (MU)	Year of Commissioning
	Conventional H E Stations							
	MAHARASHTRA							
	MAHAGENCO							
85	Bhira Tail Race	1	2	R(P)	(2X40)	80.00	75.00	1987 (40 MW) 1988 (40 MW)
86	Koyna DPH	1	2	S	(2X18)	36.00	146.00	1980 (18 MW) 1981 (18 MW)
87	Koyna-I&II	1	8	S	(4X70)+(4X80)	600.00	3030.00	1962 (140 MW) 1963 (140 MW) 1966 (240 MW) 1967 (80 MW)
88	Koyna-III	1	4	R(P)	(4X80)	320.00		1975 (160 MW) 1977 (80 MW) 1978 (80 MW)
89	Koyna-IV	1	4	S	(4X250)	1000.00		1999 (500 MW) 2000 (500 MW)
90	Tillari	1	1	R(P)	(1X60)	60.00	133.00	1986 (60 MW)
91	Vaitarna	1	1	S	(1X60)	60.00	144.00	1976 (60 MW)
	Sub-Total MAHAGENCO	**7**	**22**			**2156.00**	**3528.00**	
	MPPGCL							
92	Pench	1	2	MP	(2X80)	160.00	315.36	1986 (80 MW) 1987 (80 MW)
	Sub-Total MPPGCL	**1**	**2**			**160.00**	**315.36**	
	Total State SECTOR	**8**	**24**			**2316.00**	**3843.36**	
	Private Sector							
	Dodson-Lindblom Hydro Power Pvt. Ltd.(DLHP)							
93	Bhandardhara St-II	1	1	R(P)	(1X34)	34.00	50.00	1996 (34 MW)
	Sub-Total DLHP	**1**	**1**			**34.00**	**50.00**	
	Tata Power Company							
94	Bhira	1	6	S	(6X25)	150.00	775.00	1927 (125 MW) 1949 (25 MW)
95	Bhivpuri	1	5	S	3X24) + (2X1.5	75.00	220.00	1997 (3 MW) 1998 (48 MW) 1999 (24 MW)
96	Khopoli	1	3	S	(3X24)	72.00	225.00	2001 (24 MW) 2002 (24 MW) 2003 (24 MW)
	Sub-Total TPCL	**3**	**14**			**297.00**	**1220.00**	
	Total Pvt. (Maharashtra)	**4**	**15**			**331.00**	**1270.00**	
	Total Maharashtra	**12**	**39**			**2647.00**	**5113.36**	
	CHHATISGARG							
	CSPGCL							
	State Sector							
97	Hasdeobango	1	3	MP	(3X40)	120.00	245.00	1994 (80 MW) 1995 (40 MW)
	Total CSPGCL	**1**	**3**			**120.00**	**245.00**	
	Total Chhatisgarh	**1**	**3**			**120.00**	**245.00**	
	GUJARAT							
	State Sector							
	GSECL							
96	Ukai	1	4	MP	(4X75)	300.00	1080.00	1974 (150 MW)

Sl No.	Utilities/Stations	No. of Stations	Units	Type of Project	Capacity(MW)	(MW)	Energy (MU)	Year of Commissioning
	Conventional H E Stations							
	Sub-Total GSECL	**1**	**4**			**300.00**	**1080.00**	
	SSNNL							
98	Sardar Sarovar CHPH	1	5	R(P)	(5X50)	250.00	213.00	2004 (250 MW)
	Sub-Total SSNNL	**1**	**5**			**250.00**	**213.00**	
	Total Gujarat	**2**	**9**			**550.00**	**1293.00**	
	Total Western Region	**24**	**88**			**5552.00**	**12044.21**	
	Southern Region							
	ANDHRA PRADESH							
	APGENCO							
	State Sector							
99	Lower Sileru	1	4	S	(4X115)	460.00	1070.00	1976 (230 MW) 1977 (115 MW) 1978 (115 MW)
100	N J Sagar RBC & EXT.	1	3	MP	(3X30)	90.00	156.00	1990 (30 MW) 1992 (60 MW)
101	Srisailam	1	7	MP	(7X110)	770.00	2900.00	1982 (220 MW) 1983 (110 MW) 1984 (110 MW) 1986 (220 MW)
102	Upper Sileru-I&II	1	4	S	(4X60)	240.00	529.00	1994 (60 MW) 1995 (60 MW)
103	N J Sagar TPD	1	2	R(P)	(2X25)	50.00	177.00	2017 (50 MW)
	Total APGENCO	**5**	**20**			**1610.00**	**4832.00**	
	Total Andhra Pradesh	**5**	**20**			**1610.00**	**4832.00**	
	TELANGANA							
	TSGENCO							
	State Sector							
105	Priyadarshni Jurala	1	6	R(P)	(6X39)	234.00	404.00	2008 (78 MW) 2009 (39 MW) 2010 (78 MW) 2011 (39 MW)
106	Pochampad	1	4	MP	(4X9)	36.00	147.00	1987-1988, 2010
107	N J Sagar	1	1	MP	(1X110)	110.00		1978 (110 MW)
108	N J Sagar LBC	1	2	R	(2X30)	60.00	104.00	1983 (60 MW)
109	Lower Jurala	1	6	R(P)	(6X40)	240.00	534.43	2015 (80 MW) 2016 (160 MW)
110	Pulinchinthala	1	4	R(P)	(4X30)	120.00	219.42	2016 (60 MW) 2017 (60 MW)
	Total TSGENCO	**6**	**23**			**800.00**	**1408.85**	
	Total Telangana	**6**	**23**			**800.00**	**1408.85**	
	KARNATAKA							
	KPCL							
	State Sector							

Sl No.	Utilities/Stations	No. of Stations	Units	Type of Project	Capacity(MW)	(MW)	Energy (MU)	Year of Commissioning
	Conventional H E Stations							
111	Almatti	1	6	MP	(5X55)+(1X15)	290.00	483.00	2004 (70 MW) 2005 (220 MW)
112	Gerusoppa(Sharavathy Tail Race)	1	4	R(P)	(4X60)	240.00	622.00	2001 (180 MW) 2002 (60 MW)
113	Ghat Prabha	1	2	MP	(2X16)	32.00	131.00	1992 (32 MW)
114	Mahatma Gandhi (Jog)	1	8	S	(X21.6)+(4X13.	139.20	118.00	1949 (26.4 MW) 1950 (13.2 MW) 1952 (65 MW) 2001 (13.2 MW) 2002 (21.6 MW)
115	Kadra	1	3	S	(3X50)	150.00	570.00	1997 (50 MW) 1999 (100 MW)
116	Kalinadi (Nagjhari)	1	6	S	(6X150)	900.00	3385.00	1979 (135 MW) 1980 (135 MW) 1981 (135 MW) 1982 (135 MW) 1983 (135 MW)
117	Kalinadi (Supa)	1	2	S	(2X50)	100.00	542.00	1985 (100 MW)
118	Kodasali	1	3	S	(3X40)	120.00	512.00	1998 (40 MW) 1999 (80 MW)
119	Lingnamakki	1	2	S	(2X27.5)	55.00	254.00	1979 (27.5 MW) 1980 (27.5 MW)
120	Munirabad	1	3	MP	(2X9)+(1X10)	28.00	66.00	1962 (18 MW) 1965 (10 MW)
121	Sharavathy	1	10	S	(10X103.5)	1035.00	4932.00	1964 (103.5 MW) 1965 (103.5 MW) 1967 (207 MW) 1968 (311 MW) 1971 (103.5 MW) 1976 (103.5 MW) 1977 (103.5 MW)
122	Sivasamundrum	1	10	R(P)	(4X6)+(6X3)	42.00	183.00	1922 (3 MW) 1923 (3 MW) 1924 (9 MW) 1925 (3 MW)
123	Varahi	1	4	R(P)	(4X115)	460.00	1060.00	1989 (115 MW) 1990 (115 MW) 2009 (230 MW)
124	Bhadra	1	3	MP	(2x12)+(1x2)	26.00	123.00	1965 (26 MW)
	Total KPCL	**14**	**66**			**3617.20**	**12981.00**	
	APGENCO							
125	T B Dam	1	4	MP	(4X9)	36.00	236.00	1957 (18 MW) 1964 (18 MW)
126	Hampi	1	4	MP	(4X9)	36.00		1958 (18 MW) 1964 (18 MW)
	Sub-Total APGENCO	**2**	**8**			**72.00**	**236.00**	
	Total Karnataka	**16**	**74**			**3689.20**	**13217.00**	
	KERALA							
	KSEB							
	State Sector							
127	Idamalayar	1	2	MP	(2X37.5)	75.00	380.00	1987 (75 MW)

Sl No.	Utilities/Stations	No. of Stations	Units	Type of Project	Capacity(MW)	(MW)	Energy (MU)	Year of Commissioning
	Conventional H E Stations							
128	Idukki	1	6	MP	(6X130)	780.00	2398.00	1976 (390 MW) 1985 (130 MW) 1986 (260 MW)
129	Kakkad	1	2	R(P)	(2X25)	50.00	262.00	1999 (50 MW)
130	Kuttiyadi	1	3	MP	(3X25)	75.00	323.00	1972 (75 MW)
131	Kuttiyadi Extn.	1	1	MP	(1X50)	50.00		2001 (50 MW)
132	Kuttiyadi Additional Extn.	1	2	MP	(2X50)	100.00		2010 (100 MW)
133	Lower Periyar	1	3	R(P)	(3X60)	180.00	493.00	1997 (180 MW)
134	Nariamangalam	1	3	S	(3X15)	45.00	237.00	1961 (30 MW) 1963 (15 MW)
135	Pallivasal	1	6	S	(3X5)+(3X7.5)	37.50	284.00	1948 (7.5 MW) 1949 (7.5 MW) 1951 (7.5 MW) 2001 (15 MW)
136	Panniar	1	2	S	(2X15)	30.00	158.00	1963 (15 MW) 2001 (15 MW)
137	Poringalkuttu	1	4	S	(4X8)	32.00	170.00	1957 (8 MW) 1958 (8 MW) 1959 (8 MW) 1960 (8 MW)
138	Sabirigiri	1	6	S	(6X50)	300.00	1338.00	1960 (150 MW) 1967 (150 MW)
139	Sengulam	1	4	S	(4X12)	48.00	182.00	1954 (24 MW) 2001 (24 MW)
140	Sholayar	1	3	S	(3X18)	54.00	233.00	1956 (18 MW) 1968 (36 MW)
	Total KSEB	**14**	**47**			**1856.50**	**6458.00**	
	Total Kerala	**14**	**47**			**1856.50**	**6458.00**	
	TAMILNADU							
	TANGEDCO							
141	Aliyar	1	1	MP	(1X60)	60.00	175.00	1970 (60 MW)
142	Bhavani Kattalai Barrage-I	1	2	R(P)	(2X15)	30.00	90.00	2006 (30 MW)
143	Bhavani Kattalai Barrage-II	1	2	R(P)	(2X15)	30.00	100.00	2013 (30 MW)
144	Bhavani Kattalai Barrage-III	1	2	R(P)	(2X15)	30.00	80.00	2012 (15 MW) 2013 (15 MW)
145	Kodayar-I	1	1	MP	(1X60)	60.00	165.00	1970 (60 MW)
146	Kodayar-I	1	1	MP	(1X40)	40.00		1971 (40 MW)
147	Kundah-I	1	3	S	(3X20)	60.00	1387.00	1960 (40 MW) 1964 (20 MW)
148	Kundah-II	1	5	S	(5X35)	175.00		1960 (35 MW) 1961 (105 MW) 1964 (35 MW)
149	Kundah-III	1	3	S	(3X60)	180.00		1965 (120 MW) 1978 (60 MW)
150	Kundah-IV	1	2	S	(2X50)	100.00		1966 (50 MW) 1978 (50 MW)
151	Kundah-V	1	2	S	(2X20)	40.00		1964 (20 MW) 1988 (20 MW)
152	Lower Mettur-I	1	2	R(P)	(2X15)	30.00		1988 (30 MW)

Sl No.	Utilities/Stations	No. of Stations	Units	Type of Project	Capacity(MW)	(MW)	Energy (MU)	Year of Commissioning
	Conventional H E Stations							
153	Lower Mettur-II	1	2	R(P)	(2X15)	30.00	252.00	1988 (30 MW)
154	Lower Mettur-III	1	2	R(P)	(2X15)	30.00		1987 (15 MW) 1988 (15 MW)
155	Lower Mettur-IV	1	2	R(P)	(2X15)	30.00		1989 (15 MW) 1988 (15 MW)
156	Mettur Dam	1	4	MP	(4X12.5)	50.00	541.00	1937 (25 MW) 1938 (12.5 MW) 1946 (12.5 MW)
157	Mettur Tunnel	1	4	MP	(4X50)	200.00		1965 (50 MW) 1966 (150 MW)
158	Moyar	1	3	S	(3X12)	36.00	115.00	1952 (24 MW) 1953 (12 MW)
159	Papanasam	1	4	MP	(4X8)	32.00	105.00	1944 (16 MW) 1945 (8 MW) 1951 (8 MW)
160	Parson's Valley	1	1	S	(1X30)	30.00	53.00	2000 (30 MW)
161	Periyar	1	4	MP	(3X42)+(1X35)	161.00	409.00	1958 (35 MW) 1959 (70 MW) 1965 (35 MW)
162	Pykara	1	6	S	(3X7)+(2X13.6)+(1X11)	59.20	274.00	1932 (14 MW) 1933 (7 MW) 1939 (11 MW) 1954 (27.2 MW)
163	Pykara Ultimate	1	3	S	(3X50)	150.00	30.00	2005 (150 MW)
164	Sarakarpathy	1	1	R(P)	(1X30)	30.00	162.00	1966 (30 MW)
165	Sholayar-I	1	2	S	(2X35)	70.00	254.00	1971 (70 MW)
166	Suruliyar	1	1	S	(1X35)	35.00	79.00	1978 (35 MW)
	Total TANGEDCO	**26**	**65**			**1778.20**	**4271.00**	
	Total Tamilnadu	**26**	**65**			**1778.20**	**4271.00**	
	Total Southern Region	**67**	**229**			**9733.90**	**30186.85**	
	Eastern Region							
	WEST BENGAL							
	DVC							
167	Maithon	1	3	MP	1X23.2)+(2X20	63.20	137.00	1957 (20 MW) 1958 (43.2 MW)
	Sub-Total DVC	**1**	**3**			**63.20**	**137.00**	
	NHPC							
168	Teesta Low Dam-III	1	4	R(P)	(4X33)	132.00	594.00	2013 (132 MW)
169	Teesta Low Dam-IV	1	4	R(P)	(4X40)	160.00	719.67	2016 (120 MW)
	Sub Total NHPC	**2**	**8**			**292.00**	**1313.67**	
	Sub-Total Central	**3**	**11**			**355.20**	**1450.67**	
	WBSEDCL							
170	Jaldhaka	1	4	R(P)	(4X9)	36.00	165.00	1967 (18 MW) 1972 (9 MW)
171	Rammam	1	4	R	(4X12.5)	50.00	210.00	1995 (25 MW) 1996 (25 MW)
	Sub-Total WBSEDCL	**2**	**8**			**86.00**	**375.00**	
	Total West Bengal	**5**	**19**			**441.20**	**1825.67**	
	SIKKIM							
	NHPC							
172	Rangit	1	3	R(P)	(3X20)	60.00	338.61	2000 (60 MW)
173	Teesta-V	1	3	R(P)	(3X170)	510.00	2572.70	2008 (510 MW)
	Sub-Total NHPC	**2**	**6**			**570.00**	**2911.31**	
	State Sector							
	Teesta Urja Ltd.							
174	Teesta-III	1	6	R(P)	(6X200)	1200.00	5214.00	2017 (1200 MW)

Sl No.	Utilities/Stations	No. of Stations	Units	Type of Project	Capacity(MW)	(MW)	Energy (MU)	Year of Commissioning
	Conventional H E Stations							
	Sub-Total TUL	**1**	**6**			**1200.00**	**5214.00**	
	Private							
	GIPL (Gati Infra Pvt. Ltd.)							
175	Chujachen	1	2	R(P)	(2*55)	110.00	537.81	2013 (110 MW)
	Sneha Kinetic Power Projects Pvt. Ltd.(SKPPPL)							
176	Dikchu	1	2	R(P)	(2*48)	96.00	431.00	2017 (96 MW)
	Shiga Energy Pvt. Ltd.(SEPL)							
177	Tashiding	1	2	R(P)	(2*48.50)	97.00	425.05	2017 (97 MW)
	DANS Energy Pvt. Ltd. (DEPL)							
178	Jorethang Loop	1	2	R(P)	(2*48)	96.00	459.02	2015 (96 MW)
	MBPC							
179	Rongnichu	1	2	R	(2X56.5)	113.00	434.00	2021 (113 MW)
	Sub-Total Private	**5**	**10**			**512.00**	**2286.88**	
	Total Sikkim	**8**	**22**			**2282.00**	**10412.19**	
	JAHARKHAND							
180	Panchet	1	2	MP	(2X40)	80.00	237.00	1959 (40 MW)
	Sub-Total DVC	**1**	**2**			**80.00**	**237.00**	
	JUUNL							
181	Subernrekha-I	1	1	MP	(1X65)	65.00	149.00	1977 (65 MW)
182	Subernrekha-II	1	1	R(P)	(1X65)	65.00		1980 (65 MW)
	Total JUUNL	**2**	**2**			**130.00**	**149.00**	
	Total Jharkhand	**3**	**4**			**210.00**	**386.00**	
	ODISHA							
	OHPC							
183	Balimela	1	8	MP	(6X60)+(2X75)	510.00	1183.00	1973 (60 MW) 1974 (120 MW) 1975 (60 MW) 1976 (60 MW)
184	Hirakud (Burla)	1	7	MP	(2X43.65)+(1X37.5)+(2X49.5)+ (2X32)	287.80	684.00	1956 (32 MW) 1957 (81.5 MW)
185	Hirakud (Chiplima)	1	3	R(P)	(3X24)	72.00	490.00	1962 (48 MW) 1964 (24 MW)
186	Rengali	1	5	MP	(5X50)	250.00	525.00	1985 (50 MW) 1986 (50 MW) 1989 (50 MW)
187	Upper Indravati	1	4	MP	(4X150)	600.00	1962.00	1999 (300 MW) 2000 (150 MW) 2001 (150 MW)
188	Upper Kolab	1	4	MP	(4X80)	320.00	832.00	1988 (160 MW) 1990 (80 MW)
	Total OHPC	**6**	**31**			**2039.80**	**5676.00**	
	APGENCO							
186	Machkund	1	6	S	3X17)+(3X21.25	114.75	670.00	1955 (34 MW) 1956 (17 MW) 1959 (63.75 MW)
	Sub-Total APGENCO	**1**	**6**			**114.75**	**670**	
	Total Odisha	**7**	**37**			**2154.55**	**6346**	
	Total Eastern Region	**23**	**82**			**5087.75**	**18969.86**	
	North Eastern Region							
	ARUNACHAL PRADESH							
	NEEPCO							
187	Ranganadi	1	3	R(P)	(3X135)	405.00	1509.66	2002 (405 MW)
188	Pare	1	2	R (P)	(2X55)	110.00	506.42	2018 (110 MW)
189	Kameng	1	4	R (P)	(3X150)	600.00	3353.00	2020 (300 MW)
	Sub-Total NEEPCO Ar.P	**3**	**9**			**1115.00**	**5369.08**	
	Total Arunachal Pradesh	**3**	**9**			**1115.00**	**5369.08**	
	ASSAM							
	NEEPCO							

Sl No.	Utilities/Stations	No. of Stations	Units	Type of Project	Capacity(MW)	(MW)	Energy (MU)	Year of Commissioning
	Conventional H E Stations							
190	Kopoli	1	4	S	(4X50)	200.00	1186.14	1988 (100 MW) 1996 (50 MW) 1997 (50 MW)
191	Khondong	1	2	S	(2X25)	50.00	363.95	1984 (50 MW)
	Sub-Total NEEPCO Assam	**2**	**6**			**250.00**	**1550.09**	
	APGCL							
192	Karbi Langpi	1	2	R(P)	(2X50)	100.00	390.00	2007 (100 MW)
	Sub-Total APGCL	**1**	**2**			**100.00**	**390.00**	
	Total Assam	**3**	**8**			**350.00**	**1940.09**	
	MIZORAM							
	NEEPCO							
193	Tuirial	1	2	S	(2X30)	60.00	250.63	2017 (60 MW)
	Total NEEPCO Mizoram	**1**	**2**			**60.00**	**250.63**	
	Total Mizoram	**1**	**2**			**60.00**	**250.63**	
	NAGALAND							
	NEEPCO							
194	Doyang	1	3	S	(3X25)	75.00	227.24	2000 (75 MW)
	Total-NEEPCO Nagaland	**1**	**3**			**75.00**	**227.24**	
	Total Nagaland	**1**	**3**			**75.000**	**227.240**	
	MANIPUR							
	NHPC							
195	Loktak	1	3	MP	(3X35)	105.00	448.00	1983 (105 MW)
	Sub-Total NHPC	**1**	**3**			**105.00**	**448.00**	
	Total Manipur	**1**	**3**			**105.000**	**448.000**	
	MEGHALAYA							
	MePGCL							
196	Kyrdemkulai	1	2	R(P)	(2X30)	60.00	118.00	1979 (60 MW)
197	Umiam St. I	1	4	S	(4X9)	36.00	128.00	1965 (36 MW)
198	New Umetru	1	2	R(P)	(2X20)	40.00	235.00	2017 (20 MW)
199	Umiam St. IV	1	2	R(P)	(2X30)	60.00	324.00	1992 (60 MW)
200	Myntdu St-I	1	3	R(P)	(3X42)	126.00	372.69	2011 (84 MW) 2013 (42 MW)
	Total MePGCL	**5**	**13**			**322.00**	**1177.69**	
	Total Mehghalaya	**5**	**13**			**322.00**	**1177.69**	
	Total NE Region	**14**	**38**			**2027.00**	**9412.73**	
	Total	**203**	**693**			**41976.90**	**147104.30**	
	Pumped Storage Schemes							
	Western Region							
	GUJARAT							
	State Sector							
	GSECL							
1	Kadana	1	4	PSS	(4X60)	240.00	518.00	1990 (120 MW) 1998 (120 MW)
	SSNNL							
2	Sardar Sarovar RBPH	1	6	PSS	(6X200)	1200.00	3635.00	2005 (800 MW) 2006 (400 MW)
	Total Gujarat	**2**	**10**			**1440.00**	**4153.00**	
	MAHARASHTRA							
	State Sector							
	MAHAGENCO							
3	Ghatgarh	1	2	PSS	(2X125)	250.00	410.00	2008 (250 MW)
	Private Sector							

Sl.No.	Utilities/Stations	No. of Stations	Units	Type of Project	Capacity(MW)	(MW)	Energy (MU)	Year of Commissioning
	Conventional H E Stations							
	Tata Power Company							
4	Bhira	1	1	PSS	(1X150)	150.00		1927 (125 MW) 1949 (25 MW)
	Sub-Total Maharashtra	**2**	**3**			**400.00**	**410.00**	
	Total Western Region	**4**	**13**			**1840.00**	**4563.00**	
	Southern Region							
	TELANGANA							
	State Sector							
	TSGENCO							
5	N J Sagar	1	7	PSS	(7X100.8)	705.60	2237.00	1980 (100.8 MW) 1981 (100.8 MW) 1982 (100.8 MW) 1983 (100.8 MW) 1984 (100.8 MW) 1985 (202 MW)
6	Srisailam LBPG	1	6	PSS	(6X150)	900.00	1400.00	2001 (300 MW) 2002 (450 MW) 2003 (150 MW)
	Sub-Total TELANGANA	**2**	**13**			**1605.60**	**3637.00**	
	TAMIL NADU							
7	Kadamparai	1	4	PSS	(4X100)	400.00	77.00	1987 (100 MW) 1988 (200 MW) 1989 (100 MW)
	Sub-Total TAMIL NADU	**1**	**4**			**400.00**	**77.00**	
	Total Southern Region	**3**	**17**			**2005.60**	**3714.00**	
	Eastern Region							
	JHARKHAND							
	Central Sector							
8	Panchet	1	1	PSS	(1X40)	40.00		1991 (40 MW0
	WEST BENGAL							
	State Sector							
	WBSEDCL							
9	Purulia	1	4	PSS	(4X225)	900.00	1235.00	2007
	Sub-Total	**1**	**4**			**900.00**	**1235.00**	
	Total- PSS	**8**	**34**			**4745.60**	**9512.00**	
	Total (Conventional+PSS)	**210**	**727**			**46722.50**	**156616.30**	

NOTE: Following Hydro Stations have conventional as well as PSS capacity:

Sl. No.	Station	State/Region	Installed Capacity (MW)	
			Conventional	PSS
1	N J Sagar	Telangana/ Southern	1X110 =110	7X100.8=705.60

CAPACITY-WISE GROUPING OF HYDRO-ELECTRIC STATIONS

As on 31.03.2022

STATION CAPACITY	NUMBER OF STATIONS		NUMBER OF UNITS		TOTAL CAPACITY	
RANGE (MW)	**No**	**%**	**No**	**%**	**MW**	**%**
> 25 - 100	106	50.50	279	38.40	6236.1	13.30
>100 - 500	77	36.60	295	40.60	18253.7	39.10
>500 - 1000	23	11.00	125	17.20	17297.60	37.00
>1000	4	1.90	28	3.80	4935.00	10.60
TOTAL	**210**	**100**	**727**	**100**	**46722.4**	**100**

HYDRO GENERATING UNITS ADDED DURING 2021-22

SL. NO.	NAME OF THE STATION	UTILITY	STATE	UNIT NO.	CAPACITY (MW)	DATE OF COMMISSIONING
PRIVATE SECTOR						
1	Rongnichu	MBPC	Sikkim	1.00	56.50	2021
				1.00	56.50	
2	Sorang	HSPPL	Himachal Pradesh	1.00	50.00	2021
				1.00	50.00	
3	Bajoli Holi	GMR	Himachal Pradesh	1.00	60.00	March, 2022
				1.00	60.00	
				1.00	60.00	
ALL INDIA TOTAL					**393**	

CHAPTER-2

GENERATION PERFORMANCE

CHAPTER-2

GENERATION PERFORMANCE

2.1 Generation from hydro-electric power stations (above 25 MW capacity) in the country during 2021-22 was 151.62 BU against the target of 149.54 BU which was 1.39% more than the target. The generation during 2021-22 was .88 % higher than the generation in 2020-21 i.e. 150.29 BU.

2.2 The month-wise and cumulative generation from hydro stations in the country viz-a-viz targets have been shown at **Exhibit-2.1** and are given in **Table 2.1** below.

TABLE 2.1

MONTH-WISE & CUMULATIVE GENERATION VIS-À-VIS TARGET IN MU
PERIOD: 2021-22

Month	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
Target	10402	13266	15341	17622	19342	17642	12757	9505	8548	8062	7796	9261
Gen.	8266	11752	16008	18745	20270	17765	15535	9706	8066	7497	7433	10584
Cum. Tar	10402	23668	39009	56631	75973	93615	106372	115877	124425	132487	140283	149544
Cum. Gen.	8266	20018	36026	54771	75041	92807	108341	118047	126113	133610	141043	151627

2.3 Utility-wise/ Sector-wise Performance of H.E. Stations

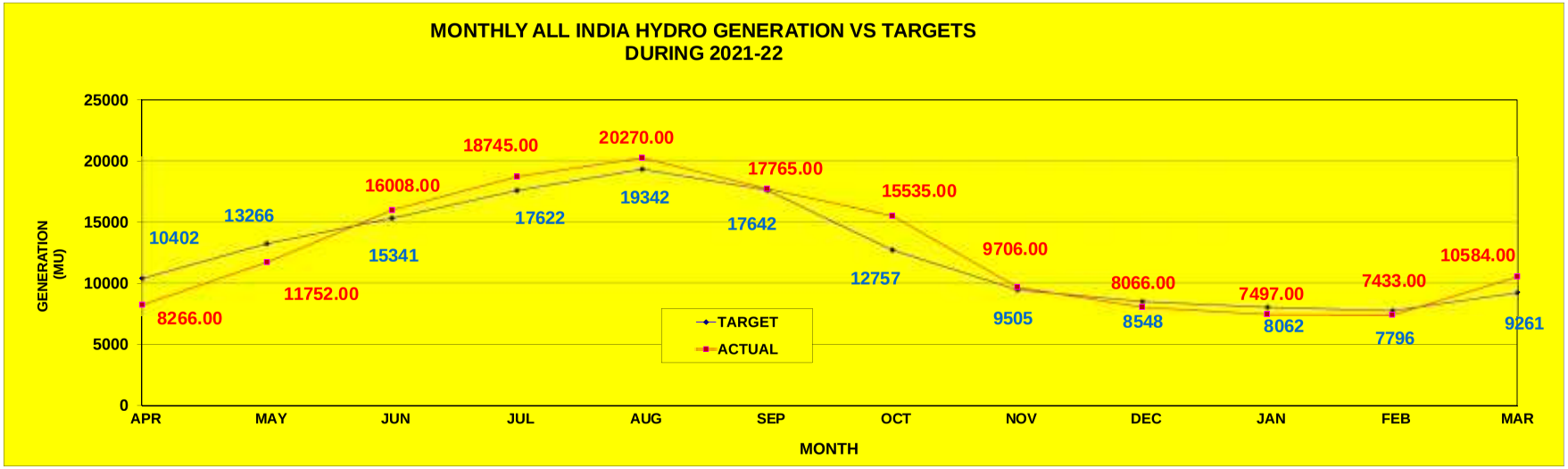
The utility-wise/ sector-wise target of energy generation viz-a-viz actual generation and surplus /shortfall in respect of Hydro-electric stations during 2021-22 & 2020-21 are given below in **Table 2.2.**

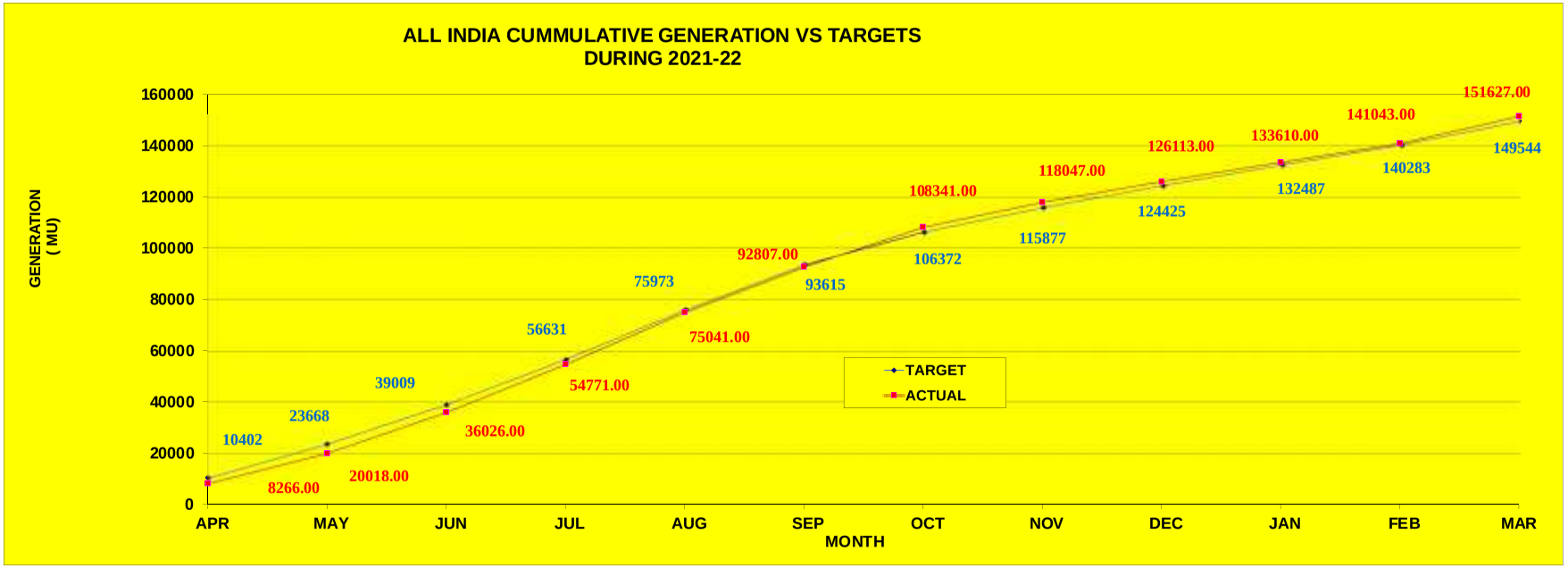
TABLE 2.2

UTILITY-WISE PERFORMANCE OF HYDRO ELECTRIC STATIONS
(2021-22 VIS-A-VIS 2020-21)

Utilities	Installed Capacity (MW) (As on 31.03.2022)	Generation					
		Target (MU)		Actual (MU)		Surplus (+)/ Shortfall (-) in %	
		2021-22	2020-21	2021-22	2020-21	2021-22	2020-21
CENTRAL SECTOR							
BBMB	2938.3	9650	9600	9794.82	11478	1.50	19.56
NHPC LTD	5451.2	26000	24542	24382.6	24084.69	-6.22	-1.86
SJVN LTD	1912.02	9111	8678	9048.61	9094.35	-0.68	4.80
NTPC LTD	800	3100	3482	3120.14	3221.41	0.65	-7.48
THDC LTD	1400	4160	4160	4288.75	4261.72	3.09	2.45

EXHIBIT- 2.1


MONTHLY ALL INDIA HYDRO GENERATION VS TARGETS
DURING 2021-22
GENERATION (MU)
25000
20000
15000
10000
5000
0
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
MONTH
TARGET
ACTUAL
10402
13266
15341
17622
19342
17642
12757
9505
8548
8062
7796
9261
8266.00
11752.00
16008.00
18745.00
20270.00
17765.00
15535.00
9706.00
8066.00
7497.00
7433.00
10584.00


ALL INDIA CUMMULATIVE GENERATION VS TARGETS
DURING 2021-22
GENERATION (MU)
160000
140000
120000
100000
80000
60000
40000
20000
0
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
MONTH
TARGET
ACTUAL
10402
23668
39009
56631
75973
93615
106372
115877
124425
132487
140283
149544
8266.00
20018.00
36026.00
54771.00
75041.00
92807.00
108341.00
118047.00
126113.00
133610.00
141043.00
151627.00

Utilities	Installed Capacity (MW) (As on 31.03.2020)	Generation					
		Target (MU)		Actual (MU)		Surplus (+)/ Shortfall (-) in %	
		2021-22	2020-21	2021-22	2020-21	2021-22	2020-21
NHDC	1520	3900	2700	2645.41	4236.17	-32.17	56.90
DVC	143.2	215	206	466.89	365.47	117.16	77.41
NEEPCO LTD	1500	4908	4472	4674.39	3881.89	-4.76	-13.20
TOTAL CENTRAL	**15664.72**	**61044**	**57840**	**58421.61**	**60623.7**	**-4.30**	**4.81**
PRIVATE SECTOR							
MPCL	86.00	344	157	314.96	334.88	-8.44	113.30
EPPL	100.00	367	367	345.66	370.47	-5.81	0.95
ADHPL	192.00	676	692	637.44	640.53	-5.70	-7.44
GBHPPL	70.00	270	260	251.37	275.95	-6.90	6.13
JSW ENERGY	1345.00	5431	5407	5563.8	5672.61	2.45	4.91
IAEPL	36.00	158	273	146.54	159.35	-7.25	-41.63
AHPC LTD	330.00	1310	1310	1421.89	1438	8.54	9.77
JPVL	400.00	1590	1438	1801.24	1778.42	13.29	23.67
DLHP	34.00	36	36	33.94	34.29	-5.72	-4.75
GIPL	110.00	500	500	514.21	488.37	2.84	-2.33
TPCL	447.00	1470	1470	1589.99	1524.7	8.16	3.72
DEPL	96.00	408	408	424.69	399.92	4.09	-1.98
SEPL	97.00	421	421	453.07	369.75	7.62	-12.17
SNEHA KINETIC	96.00	460	460	481.45	458.95	4.66	-0.23
NTPGPL	0.00	0	344	0	0	0	0
HSPPL	100.00	39	0	57.18	0	46.62	0
L&T	99.00	293	145	80.44	0	-72.55	-100.00
GMR	180	273	39	0	0	-100.00	-100.00
MBPC	113.00	256	22	295.43	0	15.40	-100.00
TOTAL PRIVATE	**3931.00**	**14302**	**13749**	**14413.3**	**13946.19**	**0.78**	**1.43**
STATE SECTOR							
JKSPDCL	1110	4887	4915	5116.09	4940.83	4.69	0.53
HPPCL	406	821	805	649.55	437.76	-20.88	-45.62
HPSEBL	372	1603	1602	1768.66	1564.35	10.33	-2.35
BVPC	0	0	272	0	0		-100.00
RRVUNL	411	370	340	481.84	469.63	30.23	38.13
PSPCL	1051	3969	3805	3007.86	3951	-24.22	3.84
UPJVNL	501.6	1519	1115	1402.68	1572.35	-7.66	41.02
UJVNL	1252.15	4612	4410	4987.18	4487.97	8.13	1.77

Utilities	Installed Capacity (MW) (As on 31.03.2020)	Generation					
		Target (MU)		Actual (MU)		Surplus (+)/ Shortfall (-) in %	
		2021-22	2020-21	2021-22	2020-21	2021-22	2020-21
SSNNL	1450	2832	3200	1748.01	3245.24	-38.28	1.41
GSECL	540	889	754	873.5	988.12	-1.74	31.05
MAHAGENCO	2406	4109	3755	4078.97	3574.57	-0.73	-4.81
MPPGCL	875	2526	2092	2345.79	2656.06	-7.13	26.96
CSPGCL	120	280	250	404.13	419.19	44.33	67.68
APGENCO	1796.75	3636	3174	4037.32	4129.94	11.04	30.12
TSGENCO	2405.6	4018	3211	5626.63	3645.38	40.04	13.53
KPCL	3617.2	12409	11468	13731.48	12403.59	10.66	8.16
KSEBL	1856.5	6505	5900	9317.44	6628.39	43.24	12.35
TANGEDCO	2178.2	4483	4040	5212.07	5212.71	16.26	29.03
JUUNL	130	110	110	302.49	50	174.99	-54.55
OHPC	2039.80	5959	5372	4512.12	6193.91	-24.28	15.30
TUL	1200	5652	5300	6315.53	6043.98	11.74	14.04
WBSEDCL	986	1578	1578	1630.14	1759.64	3.30	11.51
APGCL	100	380	380	401.12	203.03	5.56	-46.57
MePGCL	322	1051	920	841.82	1151.99	-19.90	25.22
TOTAL STATE	**27126.80**	**74198**	**68768**	**78792.42**	**75729.63**	**6.19**	**10.12**
TOTAL ALL INDIA	**46722.52**	**149544**	**140357**	**151627.33**	**150299.5**	**1.39**	**7.08**

During the year 2021-22, overall hydro generation was more than the target in respect of BBMB, THDC & DVC in Central Sector and JSW Energy, AHPCL, JPVL, GIPL, TPCL, SEPL, DEPL, HSPPL, MBPC and SNEHA KINETIC in Private Sector. As regards, generation by State Electricity Boards/Corporations / Departments, hydro generation was more than the target in respect of JKSPDCL, HPSEBL, PSPCL, UJVNL, CSPGCL, APGENCO, TSGENCO, KPCL, KBSEBL, TANGEDCO, TUL, and WBSEDCL.

2.4 Region-wise Performance of H.E. Stations

Region-wise generation performance of hydroelectric stations during 2021-22 is indicated in **Table 2.3.**

TABLE 2.3

GENERATION PERFORMANCE – REGION-WISE
(2021-22)

S. No.	Region	Installed Capacity as on 31.03.2022 (MW)	Generation During 2021-22		
			Target (MU)	Actual (MU)	Shortfall (-)/ Surplus (+) Over Target (%)
1	Northern	19576.25	75684.00	73866.02	-2.40
2	Western	7392	16042.00	13719.74	-14.48
3	Southern	11739.5	30439.00	37206.43	22.23
4	Eastern	5987.75	20540.00	20462.33	-0.38
5	North-Eastern	2027.0	6839.00	6372.81	-6.82
	Total (All India)	**46722.50**	**149544.00**	**151627.33**	**1.39**

- Hydel generation during 2021-22 has exceeded the target in Southern Region whereas it was lower than the target in Northern, Western, Eastern Region & North-Eastern Region of the country primarily on account of lower inflows/rainfall in project catchment area**.**
- Hydel generation during 2021-22 was 151627.33 MU against the target of 149544 MU viz higher in generation by 2083.33 MU (9%). However, actual hydel generation during 2021-22 is more than previous year generation of 150299.52 MU by 0.88%.

Region-wise generation targets viz-a-viz achievements are indicated at **Exhibit-2.2**.

2.5 Sector-wise generation performance during the year 2021-22 viz-a-viz targets is given in **Table 2.4**.

Generation from H.E. Stations under Central Sector, State Sector & Private Sector has been more than the target.

TABLE 2.4

SECTOR-WISE GENERATION PERFORMANCE
PERIOD: 2021-22

Sl. No.	Sector	Installed Capacity as on 31.03.2022 (MW)	Generation		
			Target (MU)	Actual (MU)	Shortfall (-) Surplus (+) Over Target (%)
1	Central	15664.72	61044.00	58421.61	-4.30
2	State	27126.80	74198.00	78792.42	6.19
3	Private	3931	14302	14413.3	0.78
	Total	**46722.52**	**149544**	**151627.33**	**1.39**

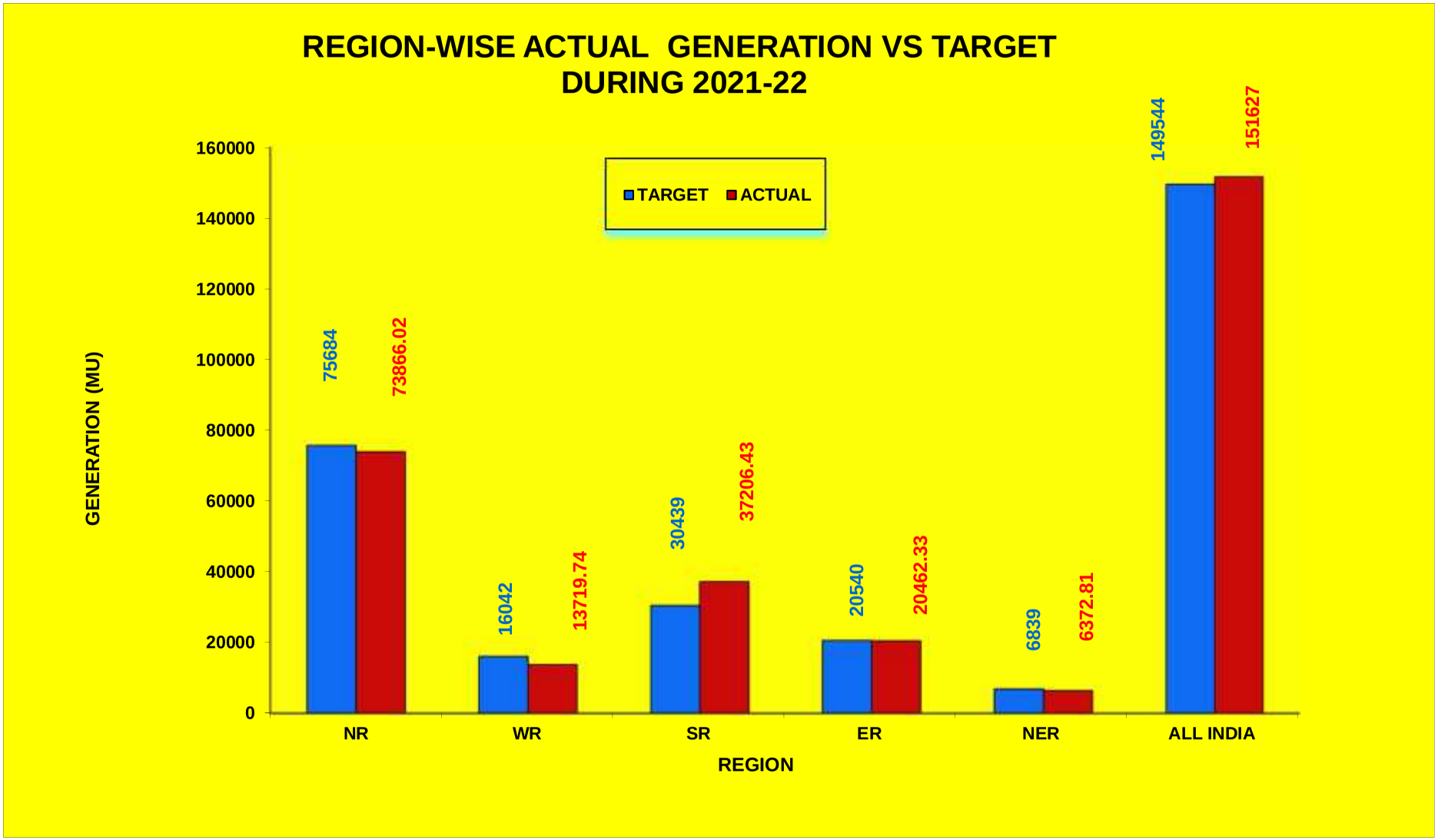
2.6 Details of actual generation during 2021-22 for all the hydro stations (above 25 MW capacity) in the country are given in **Annex 2.1**. It is observed that 109 Nos. of stations have exceeded the target level of generation while the generation has been less than targets in case of 101 stations. List of stations where generation exceeded the target during 2021-22 is given in **Table 2.5.**

TABLE 2.5

H.E. STATIONS ACHIEVING HIGHER GENERATION VIS-A-VIS TARGET
PERIOD: 2021-22

S. No.	Actual Generation as % of Target	Hydro Electric Stations		
		No. of Stations	% of total No. of Stations	Name of the Station
1	150 & above	16	7.6	N.J.Sagar RBC, N.J.Sagar TPD, Jog, Munirabad, Idukki, Lower Periyar, Sabarigiri, Kodayar I&II, Periyar, Sholayar I, N.J.Sagar LBC, Pulichinthala, Panchet, Subernarekha I&II, Maithon, Khandong
2	140 - 150	7	3.3	Sorang, Hasdeo Bango, Poringalkuthu, Bhadra, N.J.Sagar PSS, Pochampad, Srisailam LB

EXHIBIT-2.2


REGION-WISE ACTUAL GENERATION VS TARGET
DURING 2021-22
TARGET
ACTUAL
GENERATION (MU)
160000
140000
120000
100000
80000
60000
40000
20000
0
75684
73866.02
16042
13719.74
30439
37206.43
20540
20462.33
6839
6372.81
149544
151627
NR
WR
SR
ER
NER
ALL INDIA
REGION

3	130 - 140	9	4.2	Mahi Bajaj I & II, Dhalipur (Y.St.I), Srisailam RB, Supa DPH, Shivasamudram, T.B.Dam & Hampi, Kakkad, Mettur Tunnel, Papanasam
4	120 - 130	10	4.7	Sainj, Giri Bata, Sanjay, Ganguwal , Kotla, Koyna St.I&II, Kalinadi, Bhawani K Barrage-III, Mettur Dam, Rammam II
5	110 - 120	24	11.4	Kashang I, Tanakpur, Khodri (Y.St.II), Maneri Bhali-I, Vishnu Prayag, Ukai, Bansagar Tons-I, Madhikheda, Bhira Tail Race, Koyna St.III, Kodasali, Kuttiadi & Kuttiady Addl., Panniar, Sengulam, Sholayar, Bhawani K Barrage-II, Kundah I-V, Lower Mettur I-IV, Sarkarpathy, Rengali, Machkund, Teesta III, Rongnichu, Jaldhaka I
6	100 - 110	43	20.47	Dehar, Rampur, Kol Dam, Bassi, Shanan, Baspa-II, Karcham Wangtoo, Uri, Uri –II, Baglihar, Baglihar II, Lower Jhelum, Nimoo Bazgo, Khara, Obra, Dhauliganga, Tehri, Koteshwar, Chibro (Y.St.II), Chilla, Khatima, Kulhal (Y.St.IV), Maneri Bhali-II, Srinagar, Bansagar Tons-II, Tillari, Khopoli, Gerusoppa, Ghatprabha, Sharavathy, Varahi, Idamalayar, Pallivasal, Bhawani K Barrage-I, Pykara Ultimate, Hirakud I&II, Jorethang Loop, Tashiding, Chuzachen HEP, Dikchu, Karbi Langpi

H.E. Stations where generation was lower than the target have been listed in **Table 2.6** below:

TABLE 2.6

H.E. STATIONS HAVING SHORTFALL IN GENERATION VIS-A-VIS TARGETS PERIOD: 2021-22

S. No.	Actual Generation as % of Target	Hydro Electric Stations		
		No. of Stations	% of total No. of Stations	Name of the Station
1	90 -100	33	15.71	Bhakra L&R, Pong, Baira Siul, Chamera-II, Chamera-III, Naptha Jhakri, Larji, Allain Duhangan, Malana-II, Budhil, Chanju I, Malana, Dulhasti, Salal-I, Jawahar Sagar, Dhakrani (Y.St.I), Ram Ganga, Bargi, Koyna DPH, Koyna IV, Bhandardhara – II, Bhivpuri, Kadra, Neriamangalam, Moyar, Lower Jurala, Priyadarshni Jurala, Rangit, Teesta-V, Purulia PSS, Kameng, Pare,

				Ranganadi, Loktak (Manipur)
2	80-90	15	7.14	Kishenganga, Upper Sindh II, Chutak, Mukerian I – IV, Rihand, Sardar Sarovar CHPH, Rajghat, Vaitarna, Pench, Almatti Dam, Lingnamakki, Parson's Valley, Kyrdemkulai, Myntdu, New Umtru
3	70 -80	10	4.76	Chamera-I , Parbati III, Ranjit Sagar, Matatilla, Upper sileru I & II, Lower Sileru, Kadamparai PSS, Balimela, Umium St.IV, Tuirial
4	60 -70	4	1.9	Kadana PSS, Indira Sagar, Omkareshwar, Umium St.I,
5	50 -60	5	2.3	Sewa-II, A.P.Sahib I & II, Gandhi Sagar, Upper Indravati, Upper Kolab
6	40 -50	4	1.9	Sardar Sarovar RBPH, Bansagar Tons-III, Bhira, Doyang
7	30 -40	1	0.47	Suruliyar
8	10 -30	3	1.4	Singoli Bhatwari, Ghatghar PSS, Aliyar
9	0 -10	5	2.3	Parbati II, Swara Kuddu, Bajoli Holi, Naitwar Mori, Pykara

The Utilities showing excess/shortfall in generation over the target are indicated in **Exhibit- 2.3**.

2.7 Hydro Generation is a function of availability of Water and that of Generating units. Rainfall is the primary source of water, which is highly variable in time and space. However, there could be no direct comparison between the rainfall and the energy generation during these years of data due to different installed capacities. While the rainfall has definite impact on the level of generation, it could also be impacted by the duration of forced and planned outages especially in the case of ROR projects. Region-wise Hydel generation during last five years is given below in **Table 2.7**

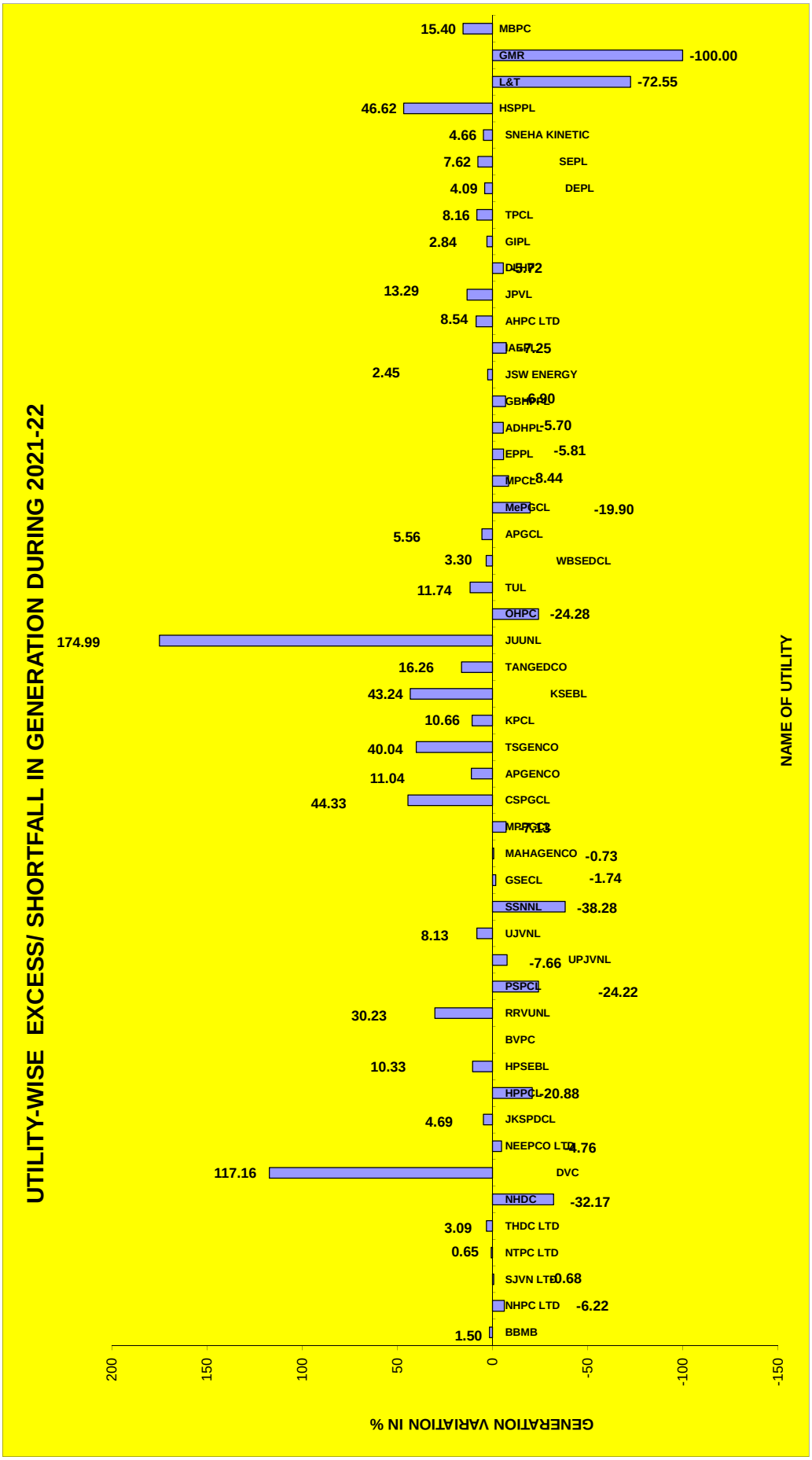
TABLE-2.7

REGION-WISE HYDEL GENERATION AND RAINFALL DURING 2016-17 TO 2021-22

Region	Installed Capacity as on 31.03.2022 (MW)	Generation (BU)					
		2016-17	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**
Northern	19576.25	71.76	74.73	72.40	80.55	75.23	73.86
Western	7392.00	17.18	9.18	9.76	17.81	16.67	13.71
Southern	11739.5	17.04	19.02	28.81	31.75	31.35	37.20
Eastern	5987.75	11.75	17.52	18.90	20.82	21.17	20.46
North Eastern	2027	4.65	5.67	5.02	48.20	58.58	63.72
Total	**46722.50**	**122.38**	**126.12**	**134.90**	**155.76**	**150.29**	**151.62**
Rainfall		**2016-17 (mm)**	**2017-18 (mm)**	**2018-19 (mm)**	**2019-20 (mm)**	**2020-21 (mm)**	**2021-22 (mm)**
All-India		1083.1	1127.1	1020.8	968.3		

It can be observed from the above table that maximum hydro generation of 155.7 BU was achieved during the year 2019-20 as compared previous four years mainly due to better rainfall in the catchment areas of hydro power stations besides increase in installed capacity.

EXHIBIT 2.3


UTILITY-WISE EXCESS/ SHORTFALL IN GENERATION DURING 2021-22
NAME OF UTILITY
GENERATION VARIATION IN %
200
150
100
50
0
-50
-100
-150
MBPC 15.40
GMR -100.00
L&T -72.55
HSPPL 46.62
SNEHA KINETIC 4.66
SEPL 7.62
DEPL 4.09
TPCL 8.16
GIPL 2.84
DHPL -5.72
JPVL 13.29
AHPC LTD 8.54
AEPL -7.25
JSW ENERGY 2.45
GBHPPL -6.90
ADHPL -5.70
EPPL -5.81
MPCL -8.44
MePGCL -19.90
APGCL 5.56
WBSEDCL 3.30
TUL 11.74
OHPC -24.28
JUUNL 174.99
TANGEDCO 16.26
KSEBL 43.24
KPCL 10.66
TSGENCO 40.04
APGENCO 11.04
CSPGCL 44.33
MPPGCL -7.13
MAHAGENCO -0.73
GSECL -1.74
SSNNL -38.28
UJVNL 8.13
UPJVNL -7.66
PSPCL -24.22
RRVUNL 30.23
BVPC
HPSEBL 10.33
HPPCL -20.88
JKSPDCL 4.69
NEEPCO LTD -4.76
DVC 117.16
NHDC -32.17
THDC LTD 3.09
NTPC LTD 0.65
SJVN LTD -0.68
NHPC LTD -6.22
BBMB 1.50

Annex - 2.1

REGION/SECTOR/STATION-WISE ACTUAL GENERATION VIS-A-VIS TARGET OF H.E.STATIONS (I. C. ABOVE 25 MW) IN THE COUNTRY DURING THE YEAR CURRENT YEAR 2021-2022

REGION/ UTILITY/ STATION	INSTALLED CAPACITY AS ON 31.03.2022 (MW)	DESIGN ENERGY (MU)	2021-2022		
			TARGET	ACTUAL	% OF ACTUAL OVER TARGET
NORTHERN REGION					
HIMACHAL PRADESH					
CENTRAL SECTOR					
BBMB					
Bhakra L&R	1397.00	3924.00	4550.00	4357.67	95.77
Dehar	990.00	3110.00	2950.00	3109.73	105.41
Pong	396.00	1123.00	1150.00	1103.65	95.97
Total BBMB-HP	**2783.00**	**8157.00**	**8650.00**	**8571.05**	**99.09**
NHPC					
Baira Siul	180.00	779.28	650.00	587.23	90.34
Chamera-I	540.00	1664.56	2460.00	1899.27	77.21
Chamera-II	300.00	1499.89	1450.00	1358.68	93.70
Chamera-III	231.00	1108.00	1050.00	1004.26	95.64
Parbati III	520.00	1977.23	810.00	613.34	75.72
Parbati II*			450.00	0.00	0.00
Total NHPC -HP	**1771.00**	**7028.96**	**6870.00**	**5462.78**	**79.52**
SJVN					
Naptha Jhakri	1500.00	6612.00	7104.00	7067.40	99.48
Rampur	412.02	1878.08	1977.00	1981.21	100.21
Total SJVN	**1912.02**	**8490.08**	**9111.00**	**9048.61**	**99.32**
NTPC					
Kol Dam	800.00	3054.79	3100.00	3120.14	100.65
Total NTPC	**800.00**	**3054.79**	**3100.00**	**3120.14**	**100.65**
Total Central-HP	**7266.02**	**26730.83**	**27731.00**	**26202.58**	**94.49**
STATE SECTOR					
HPPCL					
Kashang I	65.00	245.80	185.00	209.41	113.19
Kashang II & III	130.00				
Sainj	100.00	323.23	340.00	418.83	123.19
Swara Kuddu	111.00	386.00	296.00	21.31	7.20
Total HPPCL	**406.00**	**955.03**	**821.00**	**649.55**	**79.12**
HPSEB LTD					
Bassi	66.00	346.77	304.00	317.35	104.39
Giri Bata	60.00	240.00	180.00	227.63	126.46
Larji	126.00	586.85	619.00	580.87	93.84
Sanjay	120.00	518.00	500.00	642.81	128.56
Total HPSEB LTD	**372.00**	**1691.62**	**1603.00**	**1768.66**	**110.33**
Beas Valley Power. Corp. Ltd. (BVPC)					
Uhl-III*	0.00				
Total BVPC					
PSPCL					
Shanan	110.00	585.00	502.00	521.90	103.96
Total PSPCL-HP	**110.00**	**585.00**	**502.00**	**521.90**	**103.96**
Total State Sector-HP	**888.00**	**3231.65**	**2926.00**	**2940.11**	**100.48**
PRIVATE					
Allain Duhangan Power Power Ltd.					
Allain Duhangan	192.00	678.18	676.00	637.44	94.30
Everest Power Private Ltd.					
Malana-II	100.00	403.00	367.00	345.66	94.19
HBPCL					
Baspa-II	300.00	1213.00	1300.00	1320.35	101.57
Karcham Wangtoo	1045.00	4131.06	4131.00	4243.45	102.72
Total HBPCL	**1345.00**	**5344.06**	**5431.00**	**5563.80**	**102.45**
GBHPPL					
Budhil	70.00	291.73	270.00	251.37	93.10

REGION/SECTOR/STATION-WISE ACTUAL GENERATION VIS-A-VIS TARGET OF H.E.STATIONS (I. C. ABOVE 25 MW) IN THE COUNTRY DURING THE YEAR CURRENT YEAR 2021-2022

REGION/ UTILITY/ STATION	INSTALLED CAPACITY AS ON 31.03.2022 (MW)	DESIGN ENERGY (MU)	2021-2022		
			TARGET	ACTUAL	% OF ACTUAL OVER TARGET
IA Energy Pvt. Ltd.					
Chanju I	36.00	157.82	158.00	146.54	92.75
Malana Power Company Ltd.					
Malana	86.00	370.93	344.00	314.96	91.56
NSL Tidond Power Generation Pvt. Ltd.					
Tidong*			0.00	0.00	
Himachal Sorang Power Limited (HSPL)					
Sorang	100	524	39.00	57.18	146.62
GMR					
Bajoli Holi	180		273.00	0.00	0.00
Total Private-HP	**2109**	**7769.72**	**7558**	**7317**	**96.81**
Total H.P.	**10263.02**	**37732.20**	**38215.00**	**36459.64**	**95.41**
JAMMU & KASHMIR					
CENTRAL SECTOR					
NHPC					
Dulhasti	390.00	1907.00	2260.00	2216.13	98.06
Salal-I	345.00	3082.00	3600.00	3485.52	96.82
Salal-II	345.00				
Sewa-II	120.00	533.52	125.00	62.89	50.31
Uri	480.00	2587.38	2950.00	3037.45	102.96
Uri -II	240.00	1124.00	1570.00	1649.52	105.06
Kishenganga	330.00	1705.62	1685.00	1506.42	89.40
Total NHPC -J&K	**2250.00**	**10939.52**	**12190.00**	**11957.93**	**98.10**
Total Central Sector - J&K	**2250.00**	**10939.52**	**12190.00**	**11957.93**	**98.10**
STATE SECTOR					
JKSPDC					
Baglihar	450.00	2643.00	2536.00	2676.88	105.56
Baglihar II	450.00	1302.30	1450.00	1561.02	107.66
Lower Jhelum	105.00	533.00	591.00	622.96	105.41
Upper Sindh II	105.00	355.00	310.00	255.23	82.33
Total JKSPDC	**1110.00**	**4833.30**	**4887.00**	**5116.09**	**104.69**
Total State Sector-J&K	**1110.00**	**4833.30**	**4887.00**	**5116.09**	**104.69**
Total Jammu & Kashmir	**3360.00**	**15772.82**	**17077.00**	**17074.02**	**99.98**
LADHAK					
CENTRAL SECTOR					
NHPC					
Chutak	44.00	213.00	209.00	170.54	81.60
Nimoo Bazgo	45.00	239.00	235.00	235.44	100.19
Total Central Sector-Ladhak	**89.00**	**452.00**	**444.00**	**405.98**	**91.44**
Total Ladhak	**89.00**	**452.00**	**444.00**	**405.98**	**91.44**
PUNJAB					
CENTRAL SECTOR					
BBMB					
Ganguwal	77.65	1358.00	500.00	609.88	121.98
Kotla	77.65		500.00	613.89	122.78
Total BBMB-Punjab	**155.30**	**1358.00**	**1000.00**	**1223.77**	**122.38**
STATE SECTOR					
PSPCL					
A.P.Sahib I & II	134.00	909.00	709.00	396.28	55.89
Mukerian I - IV	207.00	1206.00	1120.00	926.69	82.74
Ranjit Sagar	600.00	1507.00	1638.00	1162.99	71.00
Total PSPCL	**941**	**3622**	**3467**	**2486**	**71.70**
Total State Sector-Punjab	**941.00**	**3622.00**	**3467.00**	**2485.96**	**71.70**
Total Punjab	**1096.30**	**4980.00**	**4467.00**	**3709.73**	**83.05**
RAJASTHAN					
STATE SECTOR					
RRVUNL					
Jawahar Sagar	99.00	298.00	230.00	210.67	91.60
Mahi Bajaj I & II	140.00	289.00	140.00	187.84	134.17
R.P. Sagar	172.00	459.00	0.00	83.33	
Total RRVUNL	**411.00**	**1046.00**	**370.00**	**481.84**	**130.23**
Total State sector-Rajasthan	**411.00**	**1046.00**	**370.00**	**481.84**	**130.23**

REGION/SECTOR/STATION-WISE ACTUAL GENERATION VIS-A-VIS TARGET OF H.E.STATIONS (I. C. ABOVE 25 MW) IN THE COUNTRY DURING THE YEAR CURRENT YEAR 2021-2022

REGION/ UTILITY/ STATION	INSTALLED CAPACITY AS ON 31.03.2022 (MW)	DESIGN ENERGY (MU)	2021-2022		
			TARGET	ACTUAL	% OF ACTUAL OVER TARGET
Total Rajasthan	**411.00**	**1046.00**	**370.00**	**481.84**	**130.23**
UTTAR PRADESH					
STATE SECTOR					
UPJVNL					
Khara	72.00	385.00	334.00	357.57	107.06
Matatilla	30.60	123.00	120.00	87.04	72.53
Obra	99.00	279.00	300.00	311.58	103.86
Rihand	300.00	920.00	765.00	646.49	84.51
Total UPJVNL	**501.60**	**1707.00**	**1519.00**	**1402.68**	**92.34**
Total State Sector-UP	**501.60**	**1707.00**	**1519.00**	**1402.68**	**92.34**
Total Uttar Pradesh	**501.60**	**1707.00**	**1519.00**	**1402.68**	**92.34**
UTTARAKHAND					
CENTRAL SECTOR					
NHPC					
Dhauliganga	280.00	1134.69	1175.00	1212.42	103.18
Tanakpur	94.20	452.19	452.00	540.21	119.52
Total NHPC-UK	**374**	**1586.88**	**1627**	**1753**	**107.72**
NTPC					
Tapovan Vishnugad	**0.00**		0.00	0.00	
Total NTPC-UK	**0**		**0**	**0**	
THDC LTD					
Tehri	1000.00	2797.00	3000.00	3098.11	103.27
Koteshwar	400.00	1155.00	1160.00	1190.64	102.64
Total THDC LTD	**1400.00**	**3952.00**	**4160.00**	**4288.75**	**103.09**
SJVN					
Naitwar Mori	0.00		30.00		0.00
Total SJVN					
Total Central Sector - UK	**1774.20**	**5538.88**	**5787.00**	**6041.38**	**104.40**
STATE SECTOR					
UJVNL					
Chibro (Y.St.II)	240.00	750.00	850.00	903.86	106.34
Chilla	144.00	725.00	750.00	799.36	106.58
Dhakrani (Y.St.I)	33.75	169.00	160.00	155.64	97.28
Dhalipur (Y.St.I)	51.00	192.00	185.00	246.78	133.39
Khatima	41.40	208.00	224.00	229.75	102.57
Khodri (Y.St.II)	120.00	345.00	363.00	430.84	118.69
Kulhal (Y.St.IV)	30.00	164.00	150.00	160.08	106.72
Maneri Bhali-I	90.00	395.00	360.00	398.98	110.83
Maneri Bhali-II	304.00	1566.10	1320.00	1412.53	107.01
Ram Ganga	198.00	334.00	250.00	249.36	99.74
Vyasi	0.00				
Total UJVNL	**1252.15**	**4848.10**	**4612.00**	**4987.18**	**108.13**
Total State Sector-Uttarakhand	**1252.15**	**4848.10**	**4612.00**	**4987.18**	**108.13**
PRIVATE SECTOR					
AHPC LTD					
Srinagar	330.00	1396.84	1310.00	1421.89	108.54
Jaiprakash Power Venture Ltd.					
Vishnu Prayag	400.00	1774.42	1590.00	1801.24	113.29
L&T					
Singoli Bhatwari	99.00	473	293.00	80.44	27.45
Total Private Sector - UK	**829.00**	**3644.26**	**3193.00**	**3303.57**	**103.46**
Total Uttarakhand	**3855.35**	**14031.24**	**13592.00**	**14332.13**	**105.45**
Total N. REGION	**19576.27**	**75721.26**	**75684.00**	**73866.02**	**97.60**
WESTERN REGION					
CHHATISGARH					
STATE SECTOR					
CSPGC					
Hasdeo Bango	120.00	274.00	280.00	404.13	144.33
Total CSPGC	**120.00**	**274.00**	**280.00**	**404.13**	**144.33**
Total State Sector-Chhatisgarh	**120.00**	**274.00**	**280.00**	**404.13**	**144.33**
Total Chhatisgarh	**120.00**	**274.00**	**280.00**	**404.13**	**144.33**
GUJARAT					
STATE SECTOR					
GSECL					

REGION/SECTOR/STATION-WISE ACTUAL GENERATION VIS-A-VIS TARGET OF H.E.STATIONS (I. C. ABOVE 25 MW) IN THE COUNTRY DURING THE YEAR CURRENT YEAR 2021-2022

REGION/ UTILITY/ STATION	INSTALLED CAPACITY AS ON 31.03.2022 (MW)	DESIGN ENERGY (MU)	2021-2022		
			TARGET	ACTUAL	% OF ACTUAL OVER TARGET
Kadana PSS	240.00	518.00	329.00	218.26	66.34
Ukai	300.00	1080.00	560.00	655.24	117.01
Total GSECL	**540.00**	**1598.00**	**889.00**	**873.50**	**98.26**
SSNNL					
Sardar Sarovar CHPH	250.00	213.00	970.00	824.27	84.98
Sardar Sarovar RBPH	1200.00	3635.00	1862.00	923.74	49.61
Total SSNNL	**1450.00**	**3848.00**	**2832.00**	**1748.01**	**61.72**
Total State Sector -Gujarat	**1990.00**	**5446.00**	**3721.00**	**2621.51**	**70.45**
Total Gujarat	**1990.00**	**5446.00**	**3721.00**	**2621.51**	**70.45**
MADHYA PRADESH					
CENTRAL					
NHDC					
Indira Sagar	1000.00	1980.00	2565.00	1717.17	66.95
Omkareshwar	520.00	1166.57	1335.00	928.24	69.53
Total NHDC	**1520.00**	**3146.57**	**3900.00**	**2645.41**	**67.83**
Total Central Sector-MP			**3900**	**2645**	**67.83**
STATE SECTOR					
MPPGCL					
Bansagar Tons-I	315.00	900.00	980.00	1121.45	114.43
Bansagar Tons-II	30.00	113.00	81.00	85.43	105.47
Bansagar Tons-III	60.00	143.00	110.00	49.86	45.33
Bargi	90.00	508.08	420.00	382.35	91.04
Gandhi Sagar	115.00	420.48	380.00	211.68	55.71
Madhikheda	60.00	74.12	105.00	116.50	110.95
Rajghat	45.00	87.60	88.00	74.04	84.14
Total MPPGPCL	**715.00**	**2246.28**	**2164.00**	**2041.31**	**94.33**
Total State-MP	**715.00**	**2246.28**	**2164.00**	**2041.31**	**94.33**
SMHPCL(PVT.)					
Maheshwar*			0.00	0.00	
Total M.P.	**2235.00**	**5392.85**	**6064**	**4687**	**77.29**
MAHARASHTRA					
STATE SECTOR					
MAHAGENCO					
Bhira Tail Race	80.00	75.00	85.00	100.97	118.79
Ghatghar PSS	250.00	146.00	386.00	93.52	24.23
Koyna DPH	36.00	410.00	136.00	132.46	97.40
Koyna St.I&II	600.00	3030.00	1025.00	1259.39	122.87
Koyna St.III	320.00		568.00	673.90	118.64
Koyna IV	1000.00		1655.00	1573.37	95.07
Tillari	60.00	133.00	110.00	116.72	106.11
Vaitarna	60.00	144.00	144.00	128.64	89.33
Total MAHAGENCO	**2406.00**	**3938.00**	**4109**	**4079**	**99.27**
MPPGPCL					
Pench	160.00	315.36	362.00	304.48	84.11
Total MPPGPCL-Maha.	**160.00**	**315.36**	**362.00**	**304.48**	**84.11**
Total State Sector-Maha.	**2566.00**	**4253.36**	**4471.00**	**4383.45**	**98.04**
PRIVATE SECTOR					
Dodson-Lindblom Hydro Power Pvt. Ltd. (DLHPPL)					
Bhandardhara - II	34.00	50.00	36.00	33.94	94.28
Total DLHP	**34.00**	**50.00**	**36.00**	**33.94**	**94.28**
Tata Power Company Ltd.					
Bhira	150.00	775.00	900.00	397.19	44.13
Bhira PSS	150.00		0.00	627.39	
Bhivpuri	75.00	220.00	285.00	272.27	95.53
Khopoli	72.00	225.00	285.00	293.14	102.86
Total TPCL	**447.00**	**1220.00**	**1470.00**	**1589.99**	**108.16**
Total Private Sector-Maharashtra	**481.00**	**1270.00**	**1506.00**	**1623.93**	**107.83**
Total Maharashtra	**3047.00**	**5523.36**	**5977.00**	**6007.38**	**100.51**
Total Western	**7392.00**	**16636.21**	**16042**	**13720**	**85.52**
SOUTHERN REGION					
ANDHRA PRADESH					
STATE SECTOR					
APGENCO					
N.J.Sagar TPD	50.00	177.00	90.00	137.59	152.88
N.J.Sagar RBC	90.00	156.00	128.00	279.08	218.03

REGION/SECTOR/STATION-WISE ACTUAL GENERATION VIS-A-VIS TARGET OF H.E.STATIONS (I. C. ABOVE 25 MW) IN THE COUNTRY DURING THE YEAR CURRENT YEAR 2021-2022

REGION/ UTILITY/ STATION	INSTALLED CAPACITY AS ON 31.03.2022 (MW)	DESIGN ENERGY (MU)	2021-2022		
			TARGET	ACTUAL	% OF ACTUAL OVER TARGET
Srisailam RB	770.00	2900.00	1047.00	1438.92	137.43
Upper sileru I & II	240.00	529.00	472.00	362.01	76.70
Lower Sileru	460.00	1070.00	1131.00	896.23	79.24
Total APGENCO	**1610.00**	**4832.00**	**2868.00**	**3113.83**	**108.57**
Total State Sector-AP	**1610.00**	**4832.00**	**2868.00**	**3113.83**	**108.57**
Total Andhra Pradesh	**1610.00**	**4832.00**	**2868.00**	**3113.83**	**108.57**
KARNATAKA					
STATE SECTOR					
KPCL					
Almatti Dam	290.00	483.00	590.00	499.58	84.67
Bhadra	26.00	123.00	50.00	72.30	144.60
Gerusoppa	240.00	622.00	531.00	543.26	102.31
Ghatprabha	32.00	131.00	92.00	94.97	103.23
Jog	139.20	118.00	258.00	554.33	214.86
Kadra	150.00	570.00	412.00	402.14	97.61
Kalinadi	900.00	3385.00	2984.00	3686.96	123.56
Supa DPH	100.00	542.00	462.00	609.78	131.99
Kodasali	120.00	512.00	380.00	425.56	111.99
Lingnamakki	55.00	254.00	333.00	277.88	83.45
Munirabad	28.00	66.00	82.00	132.06	161.05
Sharavathy	1035.00	4932.00	4967.00	4994.34	100.55
Shivasamudram	42.00	183.00	225.00	301.01	133.78
Varahi	460.00	1060.00	1043.00	1137.31	109.04
Total KPCL	**3617.20**	**12981.00**	**12409.00**	**13731.48**	**110.66**
APGENCO					
T.B.Dam & Hampi	72.00	236.00	156.00	204.98	131.40
Total APGENCO-Karnataka	**72.00**	**236.00**	**156.00**	**204.98**	**131.40**
Total State Sector-Karnataka	**3689.20**	**13217.00**	**12565.00**	**13936.46**	**110.91**
Total Karnataka	**3689.20**	**13217.00**	**12565.00**	**13936.46**	**110.91**
KERALA					
STATE SECTOR					
KSEB Ltd.					
Idamalayar	75.00	380.00	362.00	377.02	104.15
Idukki	780.00	2398.00	2242.00	3709.85	165.47
Kakkad	50.00	262.00	206.00	272.56	132.31
Kuttiadi & Kuttiady Addl.	225.00	323.00	671.00	746.70	111.28
Lower Periyar	180.00	493.00	530.00	811.91	153.19
Neriamangalam	45.00	237.00	341.00	312.39	91.61
Pallivasal	37.50	284.00	160.00	162.33	101.46
Pallivasal New					
Panniar	30.00	158.00	176.00	210.66	119.69
Poringalkuthu	32.00	170.00	156.00	220.41	141.29
Sabarigiri	300.00	1338.00	1269.00	2047.45	161.34
Sengulam	48.00	182.00	157.00	183.64	116.97
Sholayar	54.00	233.00	235.00	262.52	111.71
Thottiyar					
Total KSEB LTD.	**1856.50**	**6458.00**	**6505.00**	**9317.44**	**143.24**
Total State Sector-Kerala	**1856.50**	**6458.00**	**6505.00**	**9317.44**	**143.24**
Total Kerala	**1856.50**	**6458.00**	**6505.00**	**9317.44**	**143.24**
TAMIL NADU					
STATE SECTOR					
TANGEDCO					
Aliyar	60.00	175.00	133.00	22.64	17.02
Bhawani K Barrage-III	30.00	90.00	51.00	63.50	124.51
Bhawani K Barrage-II	30.00	100.00	70.00	78.73	112.47
Bhawani K Barrage-I	30.00	80.00	71.00	76.07	107.14
Kadamparai PSS	400.00	77.00	378.00	265.63	70.27
Kodayar I&II	100.00	165.00	120.00	246.35	205.29
Kundah I-V	555.00	1387.00	1405.00	1652.80	117.64
Lower Mettur I-IV	120.00	252.00	245.00	291.10	118.82
Mettur Dam	50.00	541.00	110.00	135.34	123.04
Mettur Tunnel	200.00		300.00	392.49	130.83
Moyar	36.00	115.00	110.00	104.47	94.97

REGION/SECTOR/STATION-WISE ACTUAL GENERATION VIS-A-VIS TARGET OF H.E.STATIONS (I. C. ABOVE 25 MW) IN THE COUNTRY DURING THE YEAR CURRENT YEAR 2021-2022

REGION/ UTILITY/ STATION	INSTALLED CAPACITY AS ON 31.03.2022 (MW)	DESIGN ENERGY (MU)	2021-2022		
			TARGET	ACTUAL	% OF ACTUAL OVER TARGET
Papanasam	32.00	105.00	118.00	163.37	138.45
Parson's Valley	30.00	53.00	50.00	41.13	82.26
Periyar	161.00	409.00	490.00	779.16	159.01
Pykara	59.20	274.00	38.00	0.12	0.32
Pykara Ultimate	150.00	30.00	319.00	322.37	101.06
Sarkarpathy	30.00	162.00	121.00	143.41	118.52
Sholayar I	70.00	254.00	254.00	400.15	157.54
Suruliyar	35.00	79.00	100.00	33.24	33.24
Total TANGEDCO	**2178.20**	**4348.00**	**4483.00**	**5212.07**	**116.26**
Total State Sector-TN	**2178.20**	**4348.00**	**4483.00**	**5212.07**	**116.26**
Total Tamilnadu	**2178.20**	**4348.00**	**4483.00**	**5212.07**	**116.26**
TELANGANA					
STATE SECTOR					
TSGENCO					
Lower Jurala	240.00	534.43	370.00	369.90	99.97
N.J.Sagar PSS	815.60	2237.00	1535.00	2262.45	147.39
N.J.Sagar LBC	60.00	104.00	97.00	148.30	152.89
Pochampad	36.00	147.00	75.00	110.79	147.72
Priyadarshni Jurala	234.00	404.00	354.00	343.95	97.16
Pulichinthala	120.00	219.42	170.00	315.16	185.39
Srisailam LB	900.00	1400.00	1417.00	2076.08	146.51
Total TSGENCO	**2405.60**	**5045.85**	**4018.00**	**5626.63**	**140.04**
Total State Sector-Telangana	**2405.60**	**5045.85**	**4018.00**	**5626.63**	**140.04**
Total Telangana	**2405.60**	**5045.85**	**4018.00**	**5626.63**	**140.04**
Total Southern	**11739.50**	**33900.85**	**30439.00**	**37206.43**	**122.23**
EASTERN REGION					
JHARKHAND					
CENTRAL SECTOR					
DVC					
Panchet	80.00	237.00	108.00	245.47	227.29
Total DVC	**80.00**	**237.00**	**108.00**	**245.47**	**227.29**
Total Central Sector-Jharkhand	**80.00**	**237.00**	**108.00**	**245.47**	**227.29**
STATE SECTOR					
JUUNL					
Subernarekha I&II	130.00	149.00	110.00	302.49	274.99
Total Jharkhand	**130.00**	**149.00**	**110**	**302**	**274.99**
Total State Sector-Jharkhand	**130.00**	**149.00**	**110**	**302**	**274.99**
Total Jharkhand	**210.00**	**386.00**	**218**	**548**	**251.36**
ODISHA					
STATE SECTOR					
OHPC					
Balimela	510.00	1183.00	1400.00	1062.04	75.86
Hirakud I&II	359.80	1174.00	945.00	975.84	103.26
Rengali	250.00	525.00	782.00	866.39	110.79
Upper Indravati	600.00	1962.00	2066.00	1156.65	55.98
Upper Kolab	320.00	832.00	766.00	451.20	58.90
Total OHPC	**2039.80**	**5676.00**	**5959.00**	**4512.12**	**75.72**
APGENCO					
Machkund	114.75	670.00	612.00	718.51	117.40
Total APGENCO-Odisha	**114.75**	**670.00**	**612.00**	**718.51**	**117.40**
Total State Sector-Odisha	**2154.55**	**6346.00**	**6571.00**	**5230.63**	**79.60**
Total Odisha	**2154.55**	**6346.00**	**6571.00**	**5230.63**	**79.60**
SIKKIM					
CENTRAL SECTOR					
NHPC					
Rangit	60.00	338.61	345.00	337.70	97.88
Teesta-V	510.00	2572.70	2754.00	2671.82	97.02
Total NHPC	**570.00**	**2911.31**	**3099.00**	**3009.52**	**97.11**
Total Central Sector-Sikkim	**570.00**	**2911.31**	**3099.00**	**3009.52**	**97.11**
STATE SECTOR					
Teesta Urja Ltd. (TUL)					

REGION/SECTOR/STATION-WISE ACTUAL GENERATION VIS-A-VIS TARGET OF H.E.STATIONS (I. C. ABOVE 25 MW) IN THE COUNTRY DURING THE YEAR CURRENT YEAR 2021-2022

REGION/ UTILITY/ STATION	INSTALLED CAPACITY AS ON 31.03.2022 (MW)	DESIGN ENERGY (MU)	2021-2022		
			TARGET	ACTUAL	% OF ACTUAL OVER TARGET
Teesta III	1200.00	5214.00	5652.00	6315.53	111.74
Total TUL	**1200.00**	**5214.00**	**5652.00**	**6315.53**	**111.74**
Total State Sector-Sikkim	**1200.00**	**5214.00**	**5652.00**	**6315.53**	**111.74**
PRIVATE SECTOR					
DANS Energy Pvt. Ltd. (DEPL)					
Jorethang Loop	96.00	459.00	408.00	424.69	104.09
Shiga Energy Pvt. Ltd.(SEPL)					
Tashiding	97.00	425.05	421.00	453.07	107.62
Gati Infrastructure Pvt. Ltd. (GIPL)					
Chuzachen HEP	110.00	537.81	500.00	514.21	102.84
Sneha Kinetic					
Dikchu	96.00	431.00	460.00	481.45	104.66
MBPC					
Rongnichu	113.00	434.00	256.00	295.43	115.40
Total Private-Sikkim	**512.00**	**2286.86**	**2045**	**2169**	**106.06**
Total Sikkim	**2282.00**	**10412.17**	**10796.00**	**11493.90**	**106.46**
WEST BENGAL					
CENTRAL SECTOR					
NHPC					
Teesta Low Dam-III	132.00	594.00	550.00	601.51	109.37
Teesta Low Dam-IV	160.00	719.67	720.00	736.77	102.33
Total NHPC	**292.00**	**1313.67**	**1270.00**	**1338.28**	**105.38**
DVC					
Maithon	63.20	137.00	107.00	221.42	206.93
Total DVC-WB	**63.20**	**137.00**	**107.00**	**221.42**	**206.93**
Total Central Sector-WB	**355.20**	**1450.67**	**1377.00**	**1559.70**	**113.27**
STATE SECTOR					
WBSEDCL					
Jaldhaka I	36.00	165.00	158.00	178.11	112.73
Purulia PSS	900.00	1235.00	1200.00	1183.71	98.64
Rammam II	50.00	210.00	220.00	268.32	121.96
Total WBSEDCL	**986.00**	**1610.00**	**1578.00**	**1630.14**	**103.30**
Total State Sector -WB	**986.00**	**1610.00**	**1578.00**	**1630.14**	**103.30**
Total West Bengal	**1341.20**	**3060.67**	**2955.00**	**3189.84**	**107.95**
Total Eastern	**5987.75**	**20204.84**	**20540.00**	**20462.33**	**99.62**
NORTH EASTERN REGION					
ARUNACHAL PRADESH					
CENTRAL SECTOR					
NHPC					
Lower Subansiri					
Total NHPC-Ar. Pradesh					
NEEPCO					
Kameng	600.00	3353.00	2600.00	2576.38	99.09
Pare	110.00	506.42	460.00	430.57	93.60
Ranganadi	405.00	1509.66	1270.00	1154.33	90.89
Total NEEPCO-Arunachal Pradesh	**1115.00**	**5369.08**	**4330.00**	**4161**	**96.10**
Total Central Sector-Arunachal Pradesh			**4330.00**	**4161.28**	**96.10**
Total Arunachal Pradesh	**1115.00**	**5369.08**	**4330.00**	**4161.28**	**96.10**
ASSAM					
CENTRAL SECTOR					
NEEPCO					
Kopili	200.00	1186.14	0.00	0.00	
Khandong	50.00	363.95	176.00	275.12	156.32
Total NEEPCO-Aassm	**250.00**	**1550.09**	**176.00**	**275.12**	**156.32**
Total Central Sector-Assam	**250.00**	**1550.09**	**176.00**	**275.12**	**156.32**
STATE SECTOR					
APGCL					
Karbi Langpi	100.00	390.00	380.00	401.12	105.56
Total APGCL	**100.00**	**390.00**	**380.00**	**401.12**	**105.56**

REGION/SECTOR/STATION-WISE ACTUAL GENERATION VIS-A-VIS TARGET OF H.E.STATIONS (I. C. ABOVE 25 MW) IN THE COUNTRY DURING THE YEAR CURRENT YEAR 2021-2022

REGION/ UTILITY/ STATION	INSTALLED CAPACITY AS ON 31.03.2022 (MW)	DESIGN ENERGY (MU)	2021-2022		
			TARGET	ACTUAL	% OF ACTUAL OVER TARGET
Total State Sector-Assam	**100.00**	**390.00**	**380.00**	**401.12**	**105.56**
Total Assam	**350.00**	**1940.09**	**556.00**	**676.24**	**121.63**
NAGALAND					
CENTRAL SECTOR					
NEEPCO					
Doyang	75.00	227.24	221.00	100.55	45.50
Total NEEPCO-Nagaland	**75.00**	**227.24**	**221.00**	**100.55**	**45.50**
Total Central Sector-Nagaland	**75.00**	**227.24**	**221.00**	**100.55**	**45.50**
Total Nagaland	**75.00**	**227.24**	**221.00**	**100.55**	**45.50**
MANIPUR					
CENTRAL SECTOR					
NHPC					
Loktak (Manipur)	105.00	448.00	500.00	455.48	91.10
Total NHPC-Manipur	**105.00**	**448.00**	**500.00**	**455.48**	**91.10**
Total Central Sector-Manipur	**105.00**	**448.00**	**500.00**	**455.48**	**91.10**
Total Manipur	**105.00**	**448.00**	**500.00**	**455.48**	**91.10**
MEGHALAYA					
STATE SECTOR					
MePGCL					
Kyrdemkulai	60.00	118.00	126.00	110.21	87.47
Myntdu	126.00	128.00	461.00	380.37	82.51
New Umtru	40.00	235.00	184.00	160.81	87.40
Umium St.I	36.00	324.00	106.00	64.91	61.24
Umium St.IV	60.00	372.69	174.00	125.52	72.14
Total MePGCL	**322.00**	**1177.69**	**1051.00**	**841.82**	**80.10**
Total State Sector-Meghalaya	**322.00**	**1177.69**	**1051.00**	**841.82**	**80.10**
Total Meghalaya	**322.00**	**1177.69**	**1051.00**	**841.82**	**80.10**
MIZORAM					
CENTRAL SECTOR					
Tuirial	60.00	250.63	181.00	137.44	75.93
Total NEEPCO-Mizoram	**60.00**	**250.63**	**181.00**	**137.44**	**75.93**
Total Central Sector-Mizoram	**60.00**	**250.63**	**181.00**	**137.44**	**75.93**
Total Mizoram	**60.00**	**250.63**	**181.00**	**137.44**	**75.93**
Total N.Eastern	**2027.00**	**9412.73**	**6839.00**	**6372.81**	**93.18**
Total All India	**46722.52**	**155875.89**	**149544**	**151627.33**	**101.39**
IMPORT FROM BHUTAN			**8765.50**	**8765.50**	**100.00**

CHAPTER-3

MAJOR RESERVOIR BASED HE STATIONS

CHAPTER – 3

MAJOR RESERVOIR/ STORAGE BASED H.E. STATIONS

3.1 Introduction

Some of the hydro-electric schemes are provided with storage reservoirs. The excess water during monsoon period after generation is stored in these reservoirs which are utilized to augment flows during non-monsoon period. The regulated discharges from reservoirs are utilized for power generation, irrigation and other purposes. Reservoir based schemes are of two types i.e. single purpose and multipurpose. Single purpose schemes are operated in the interest of power generation while the mmultipurpose storage schemes are operated for more than one purpose with irrigation, water supply, flood control, pisciculture, navigation, etc. as primary objectives and power generation as incidental. Reservoir based schemes afford greater utilization of the available inflows approaching to long term average inflows resulting in greater firm power benefits. These schemes are the source of flexible generation and can be operated as base load or peaking station depending upon the requirement of the Grid System.

3.2 Major Reservoir Based Stations

CEA is presently monitoring 44 H.E. Stations of aggregate installed capacity of 18277.65 MW in the country on 37 major reservoirs as listed below:

S. No.	H.E. Stations	Installed Capacity (MW)	Utility	State	Reservoirs	
					Name	Multipurpose (MP)/ Storage (S) for Power Only
	Northern Region					
1	Bhakra (L)	612	BBMB	Himachal Pradesh	Bhakra	MP
2	Bhakra (R)	785	BBMB			
3	Pong	396	BBMB		Pong	MP
4	Chamera-I	540	NHPC	Himachal Pradesh	Chamera	S
5	Ranjit Sagar	600	PSPCL	Punjab	Ranjit Sagar	MP
6	Tehri	1000	THDC	Uttarakhand	Tehri	MP
7	Ram Ganga	198	UJVNL	Uttarakhand	Ram Ganga	MP
8	Rihand	300	UPJVNL	Uttar Pradesh	Rihand	MP
9	RP Sagar	172	RRVUNL	Rajasthan	RP Sagar	MP
Sub-Total (NR)		**4603**				

S. No.	H.E. Stations	Installed Capacity (MW)	Utility	State	Reservoirs	
					Name	Multipurpose (MP)/ Storage for Power Only
	Western Region					
10	Ukai	300	GSECL	Gujarat	Ukai	MP
11	Sardar Sarovar (RBPH)	1200	SSNNL	Gujarat	Sardar Sarovar	MP
12	Gandhi Sagar	115	MPPGCL	Madhya Pradesh	Gandhi Sagar	MP
13	Bansagar-III	30	MPPGCL	Madhya Pradesh	Bansagar	MP
14	Indira Sagar	1000	NHDC	Madhya Pradesh	Indira Sagar	MP
15	Koyna-I&II	600	MAHAGENCO	Maharashtra	Koyna	MP
16	Koyna-IV	1000	MAHAGENCO	Maharashtra		
17	Koyna DPH	36	MAHAGENCO	Maharashtra		
18	Pench	160	MPPGCL	Maharashtra	Pench	MP
19	Bhira	150	TPCL	Maharashtra	Bhira	MP
20	Bhira PSS	150				
Sub-Total (WR)		**4741**				
	Southern Region					
21	Upper Sileru	240	APGENCO	Andhra Pradesh	Sileru	S
22	Lower Sileru	460	APGENCO	Andhra Pradesh		
23	Srisailam RB	770	APGENCO	Andhra Pradesh	Srisailam	MP
24	NJ Sagar + NJ Sagar PSS	815.6	TSGENCO	Telangana	Nagarjuna Sagar	MP
25	Sharavathy	1035	KPCL	Karnataka	Sharavathy	S
26	Kalinadi (Nagjhari)	900	KPCL	Karnataka	Supa	S
27	Supa DPH	100	KPCL	Karnataka		
28	Almatti	290	KPCL	Karnataka	Almatti	MP
29	Varahi	460	KPCL	Karnataka	Varahi	S
30	Idukki	780	KSEB	Kerala	Idukki	MP
31	Sabarigiri	300	KSEB	Kerala	Sabarigiri	MP
32	Pallivasal	37.5	KSEB	Kerala	Madupetty	S
33	Idamalayar	75	KSEB	Kerala	Idamalayar	MP
34	Mettur Dam	50	TANGEDCO	Tamil Nadu	Mettur	MP

S. No.	H.E. Stations	Installed Capacity (MW)	Utility	State	Reservoirs	
					Name	Multipurpose (MP)/ Storage for Power Only
35	Mettur Tunnel	200	TANGEDCO	Tamil Nadu	Mettur	MP
36	Periyar	161	TANGEDCO	Tamil Nadu	Periyar	MP
Sub-Total (SR)		**6674.10**				
	Eastern and North Eastern Region					
37	Machkund	114.75	APGENCO	Odisha	Machkund	MP
38	Hirakud I (Burla)	287.8	OHPC	Odisha	Hirakud	MP
39	Hirakud II (Chiplima)	72				
40	Balimela	510	OHPC	Odisha	Balimela	MP
41	Indravati	600	OHPC	Odisha	Indravati	MP
42	Upper Kolab	320	OHPC	Odisha	Upper Kolab	MP
43	Rengali	250	OHPC	Odisha	Rengali	MP
44	Loktak	105	NHPC	Manipur	Loktak	MP
Sub-Total (ER/NER)		**2259.55**				
Total (All India)		**18277.65**				

Salient details of 37 Nos. Major reservoirs are indicated in **Annex-3.1**. These stations constitute about 39.11% (31.04% Multipurpose & 8.07% Storage for power only) of the total hydel installed capacity and generated about 30.09% (23.49% Multipurpose & 6.6% Storage for power only) of the total Hydel generation during 2021-22 as briefly indicated in **Table-3.1.**

TABLE - 3.1

CONTRIBUTION BY IMPORTANT RESERVOIR (STORAGE) BASED H.E. STATIONS

S. No.	Description	Major Reservoir Based Stations		Other Stations	Total
		Multipurpose (MP)	Storage for Power only		
1.	Installed Capacity (MW)	14505	3772.5	28444.85	46722.50
	Percentage of Total (%)	31.04	8.07	60.88	100
2.	Energy Generation (MU)	35619.98	10061	105946.35	151627.33
	Percentage of Total (%)	23.49	6.6	69.87	100

EXHIBIT-3.1

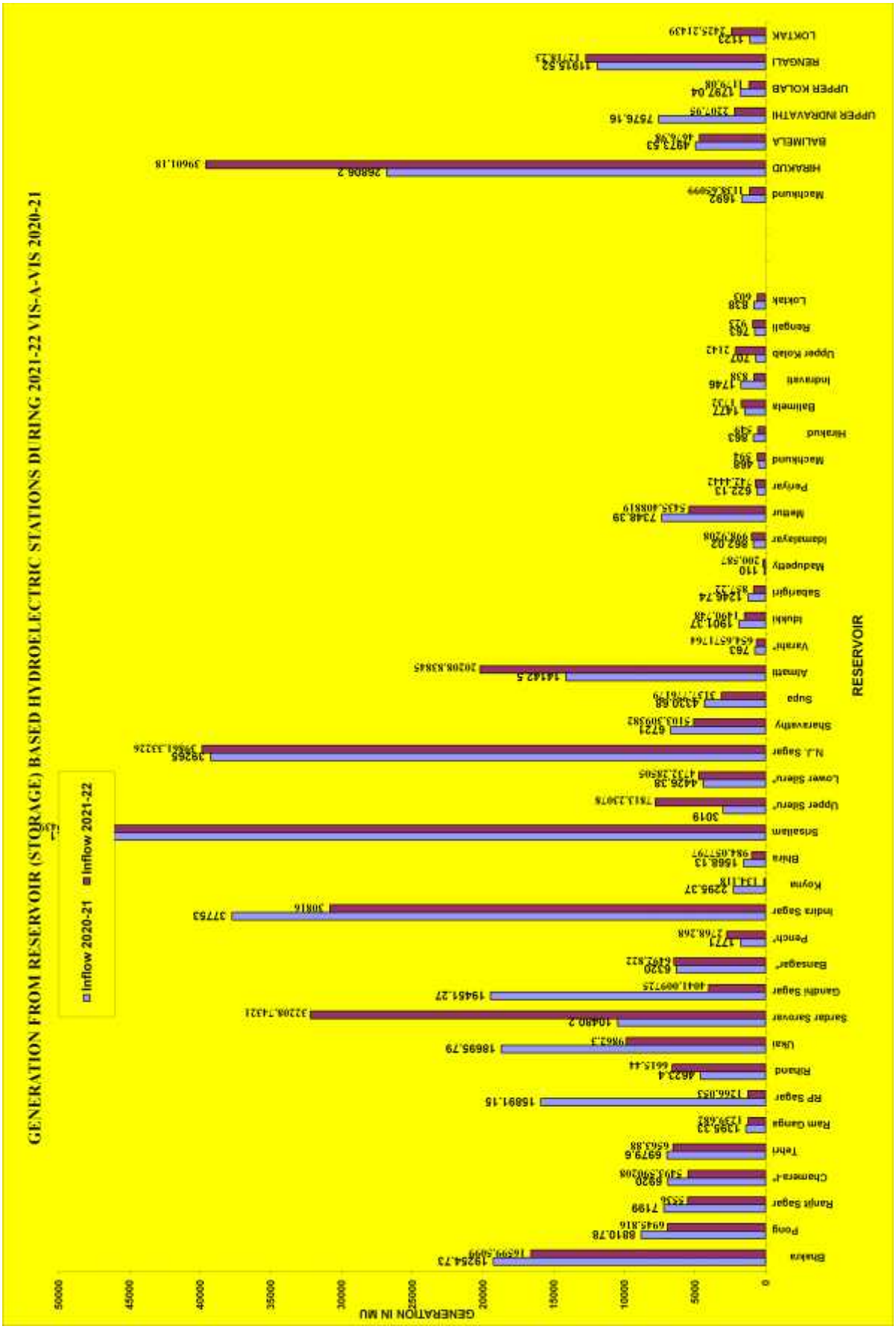
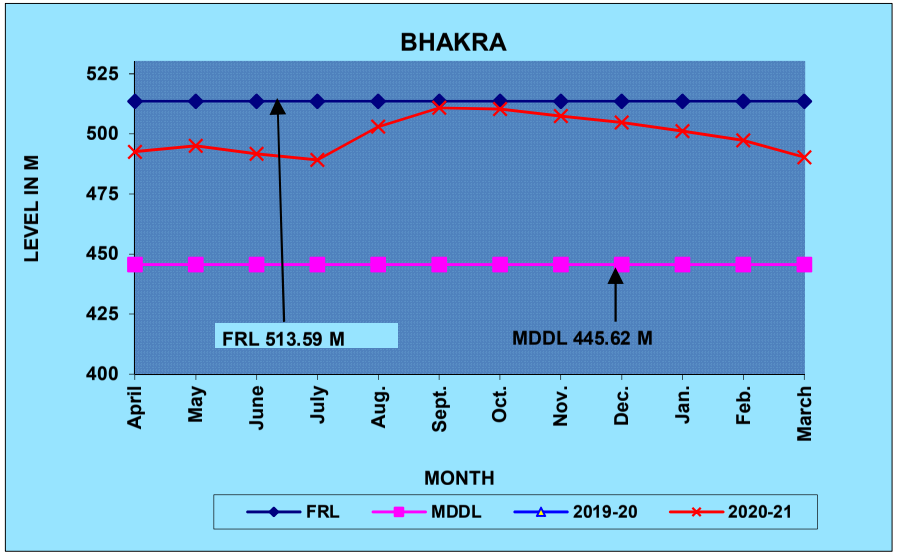
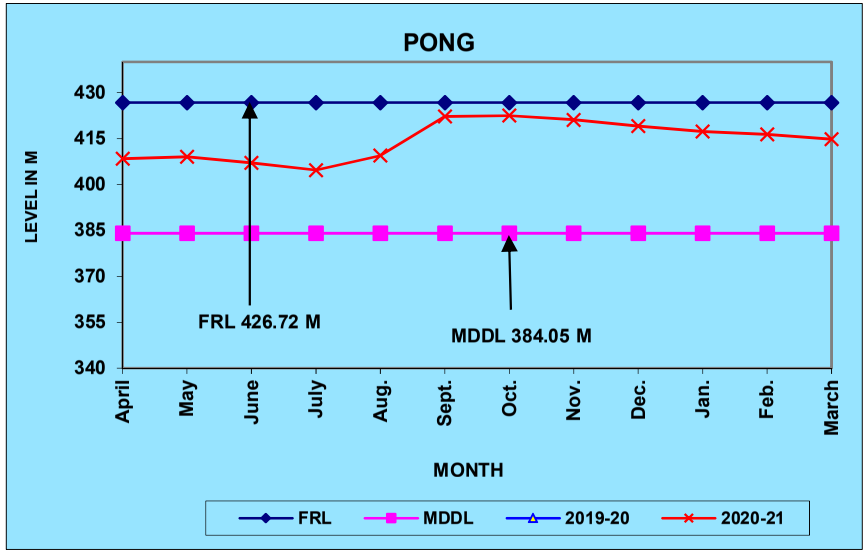
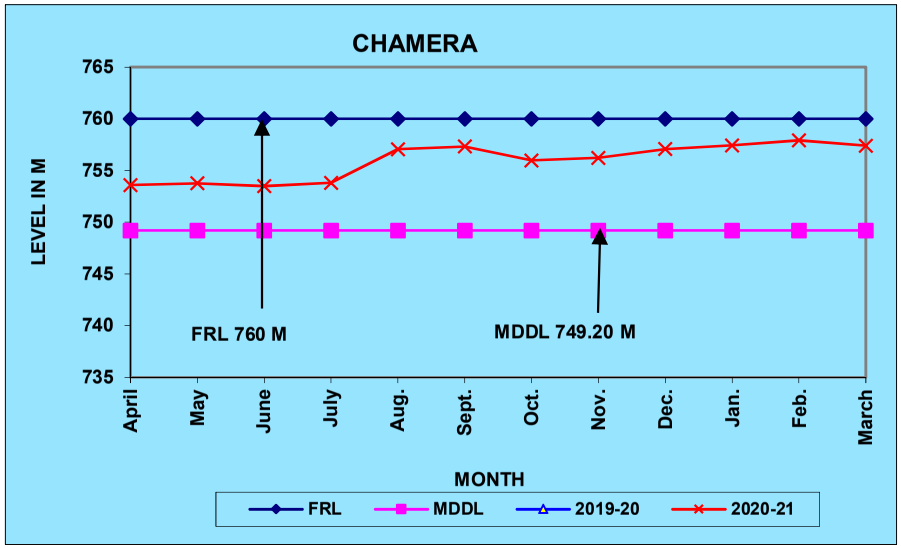

GENERATION FROM RESERVOIR (STORAGE) BASED HYDROELECTRIC STATIONS DURING 2021-22 VIS-A-VIS 2020-21
Inflow 2020-21
Inflow 2021-22
GENERATION IN MU
RESERVOIR
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Bhakra
Pong
Ranjit Sagar
Chamera-I
Tehri
Ram Ganga
RP Sagar
Rihand
Ukai
Sardar Sarovar
Gandhi Sagar
Bansagar-I
Pench
Indira Sagar
Koyna
Bhira
Srisailam
Upper Sileru
Lower Sileru
N.J. Sagar
Sharavathy
Supa
Almatti
Varahi
Idukki
Sabarigiri
Madupetty
Idamalayar
Mettur
Periyar
Machkund
Hirakud
Balimela
Indravati
Upper Kolab
Rengali
Loktak
Machkund
HIRAKUD
BALIMELA
UPPER INDRAVATHI
UPPER KOLAB
RENGALI
LOKTAK

EXHIBIT 3.2

MONTH-WISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS







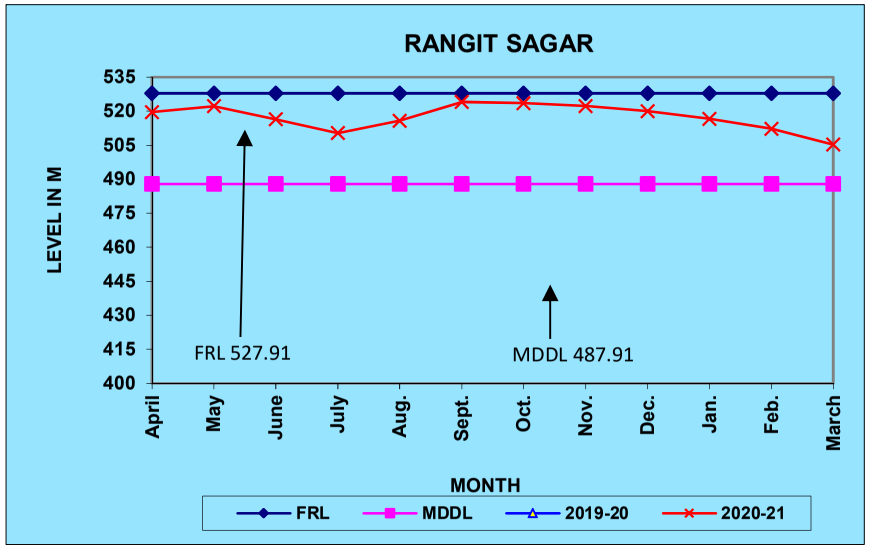
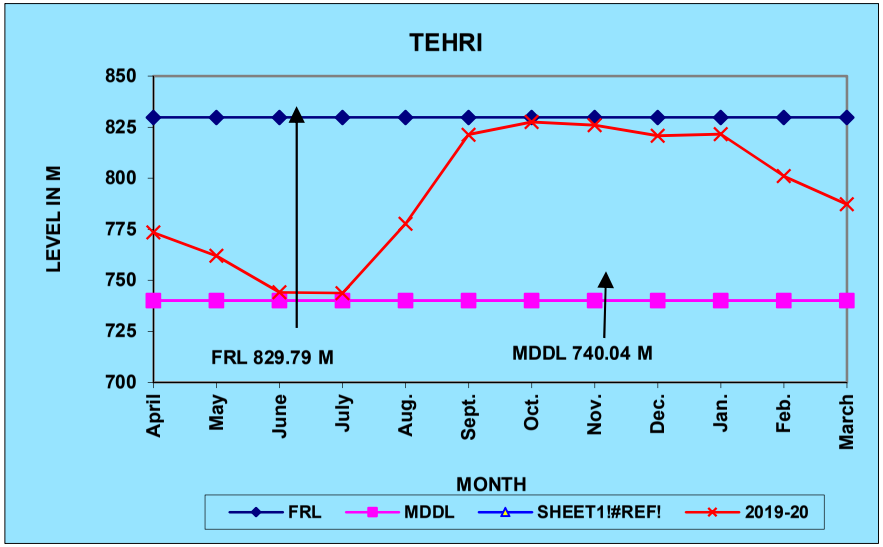
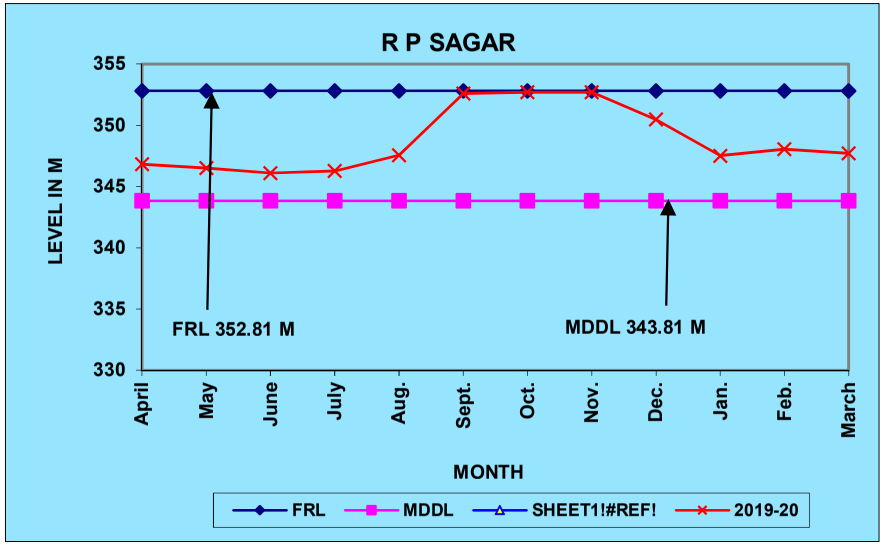
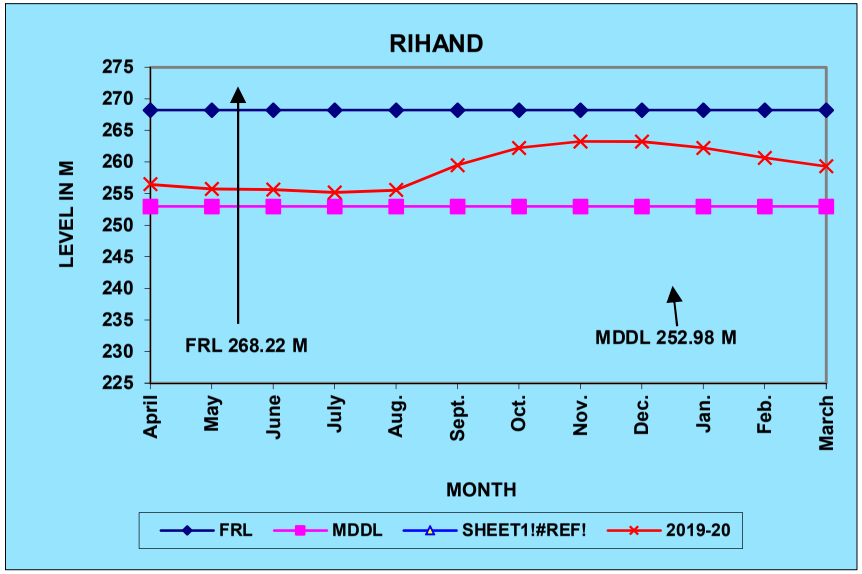


EXHIBIT 3.3

MONTH-WISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS







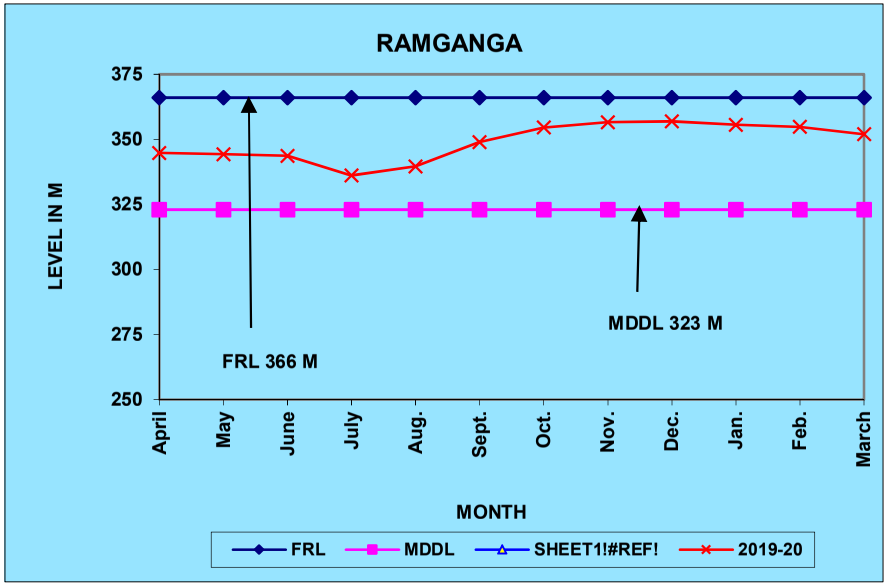
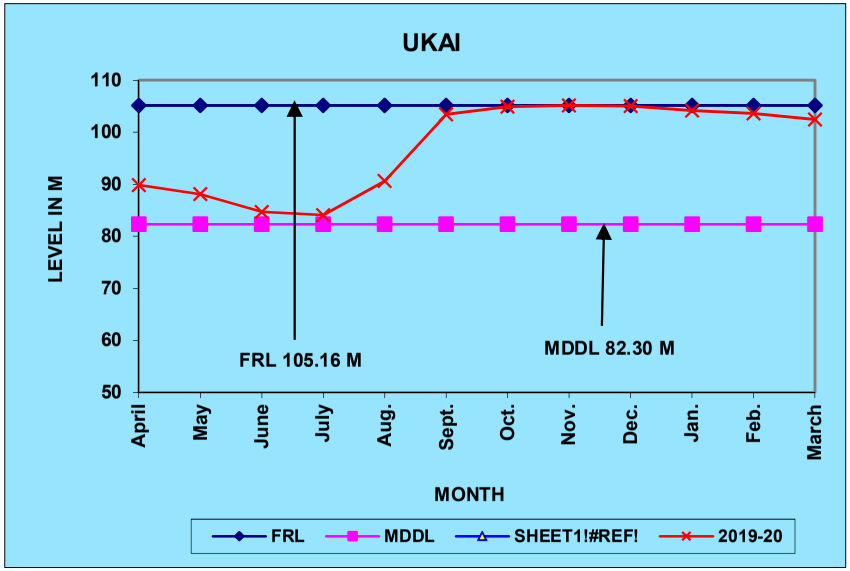
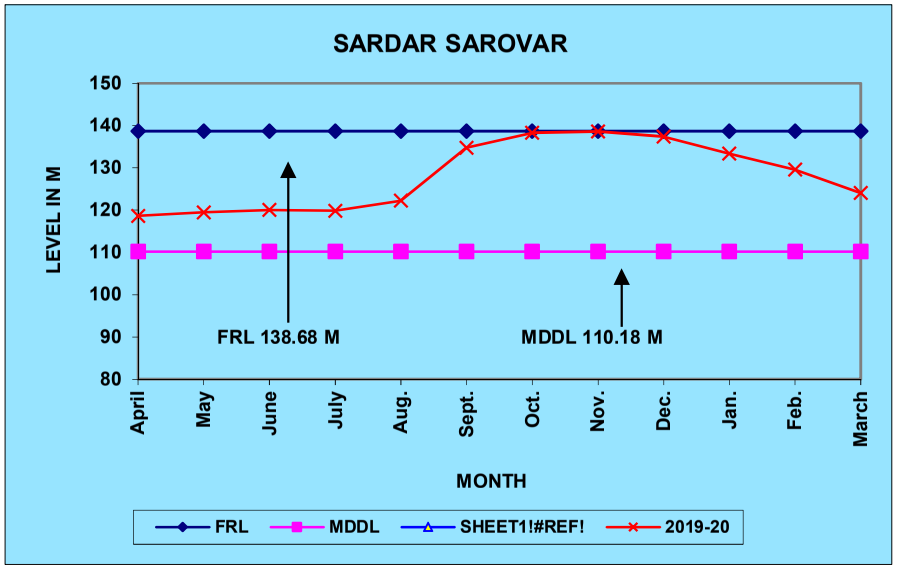
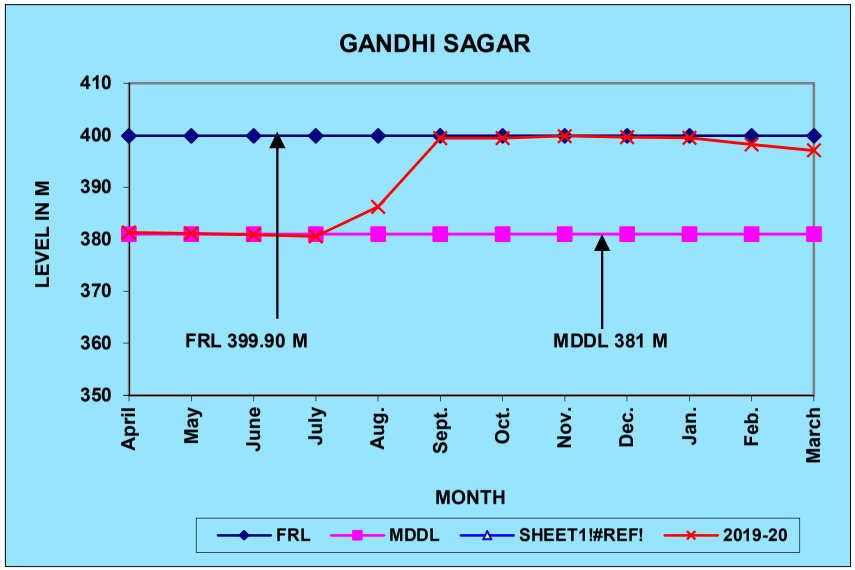


EXHIBIT 3.4

MONTH-WISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS







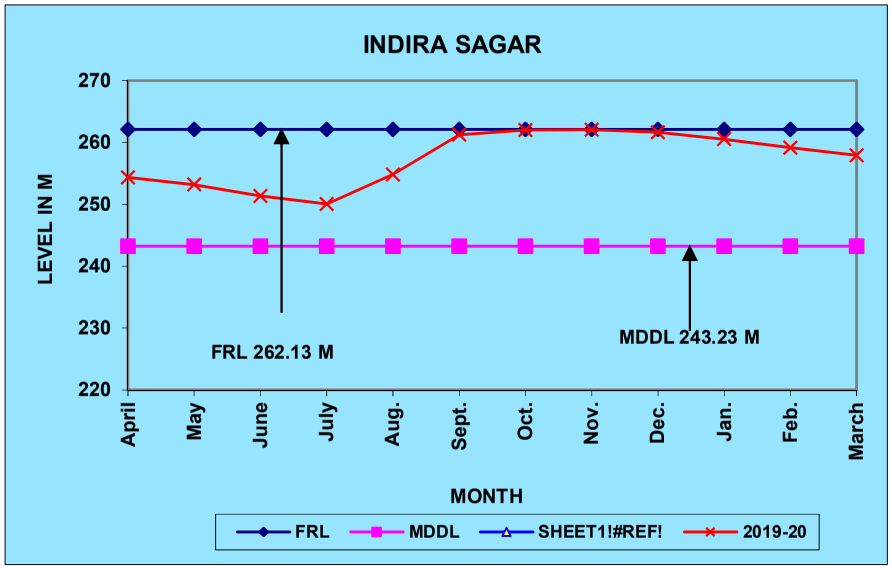
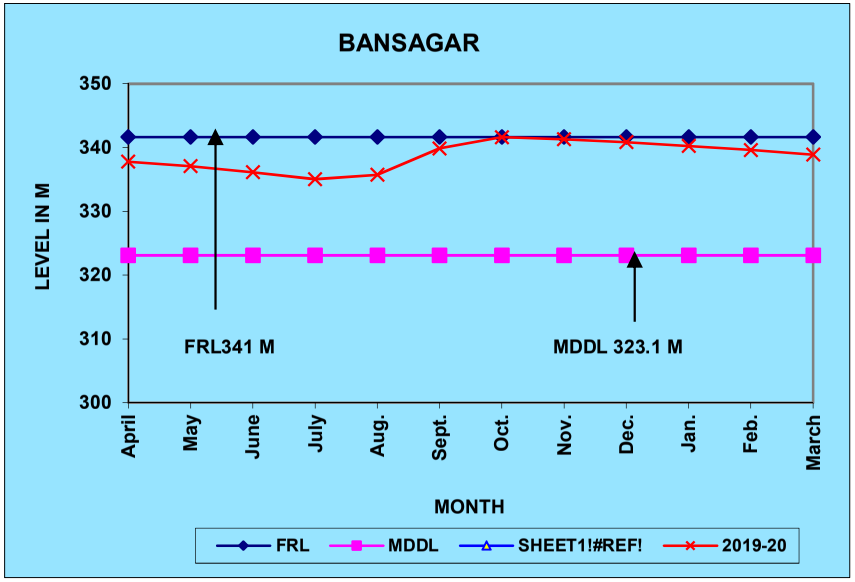
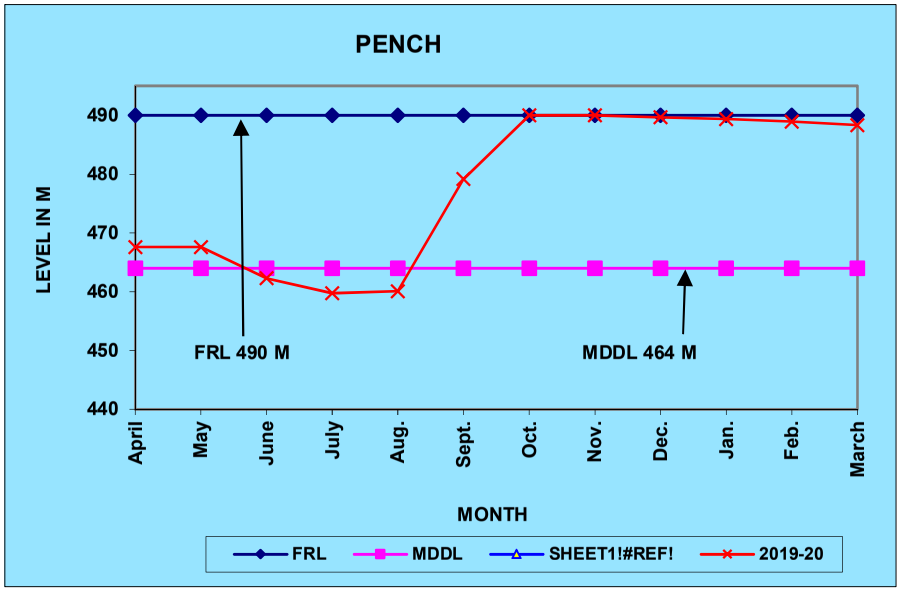
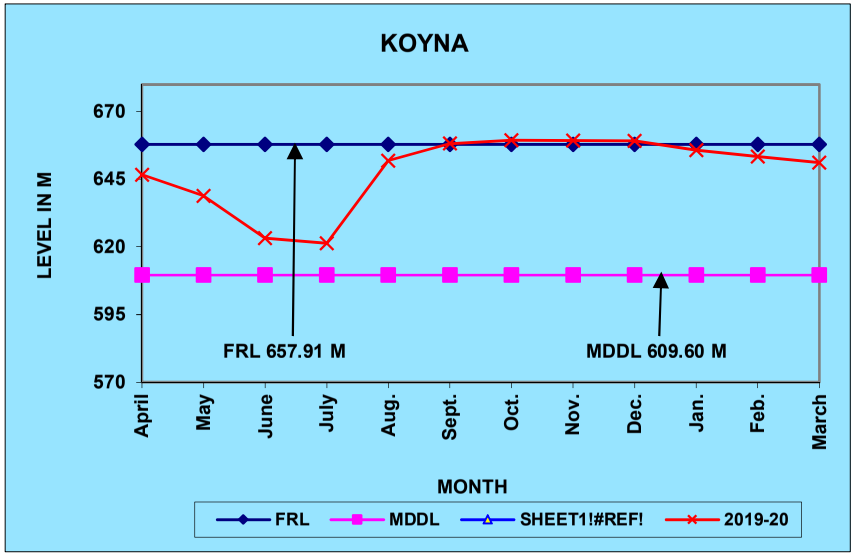


EXHIBIT 3.5

MONTH-WISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS







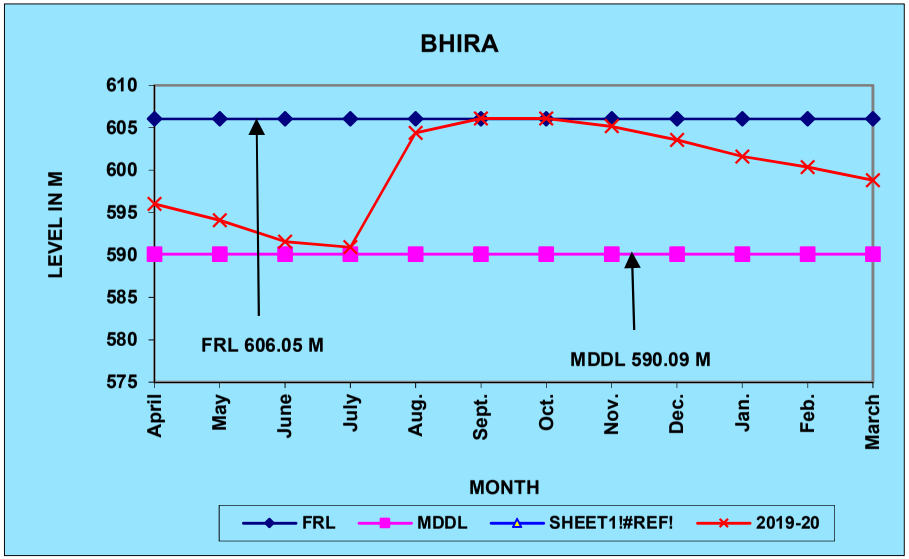
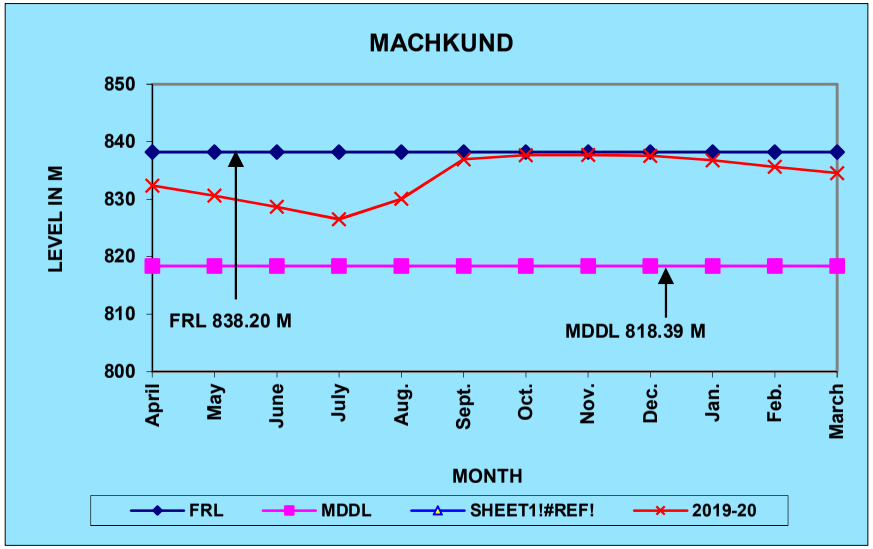
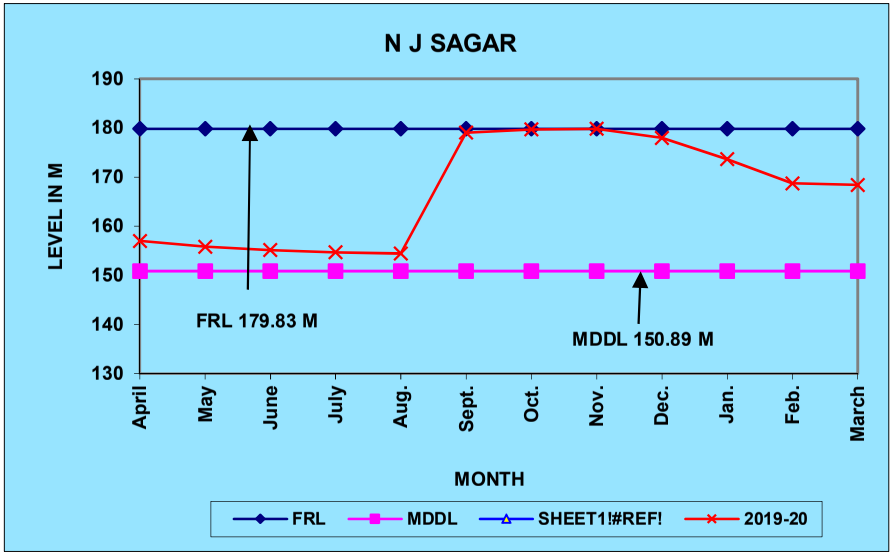
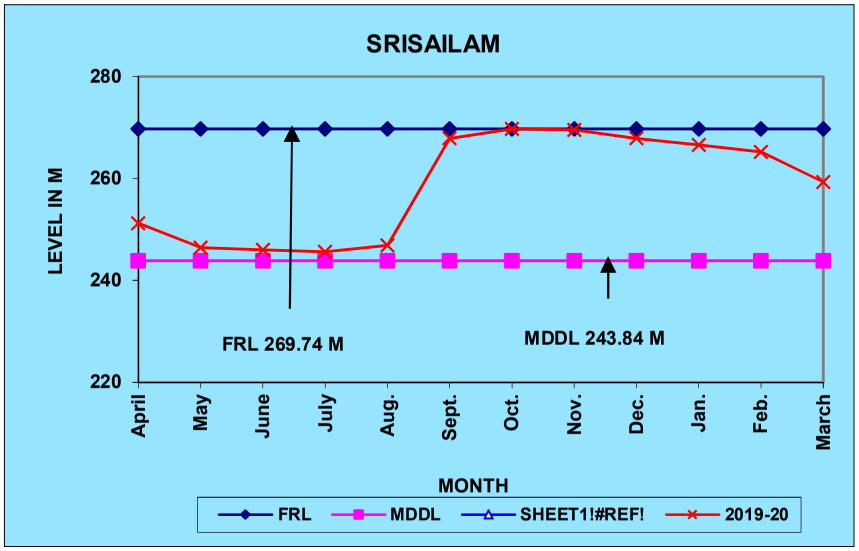


EXHIBIT 3.6

MONTH-WISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS







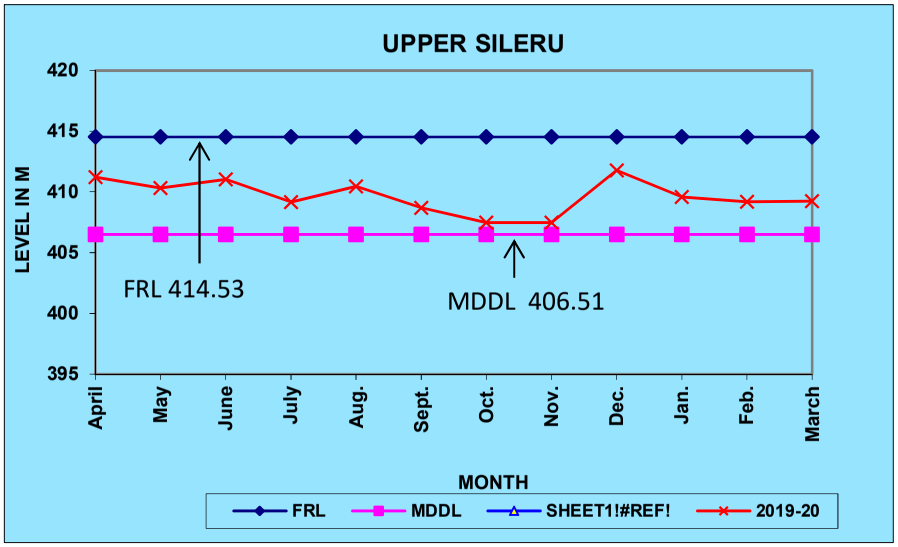
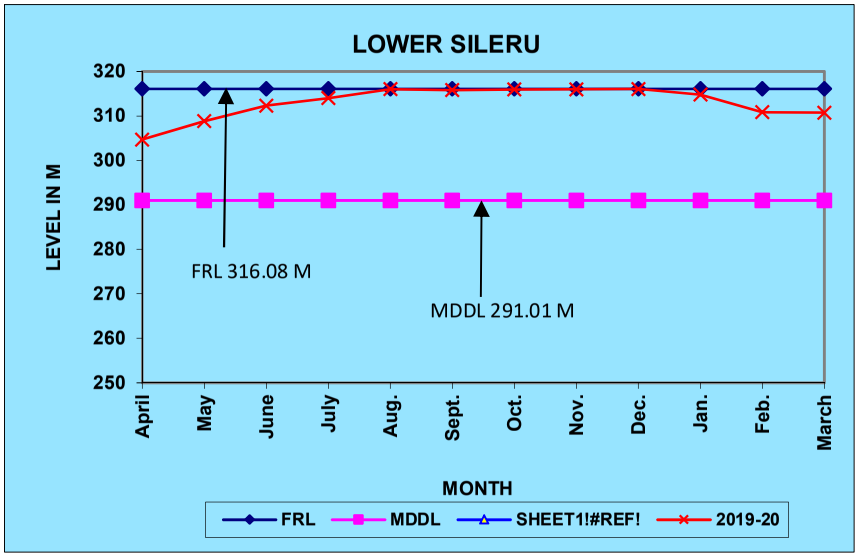
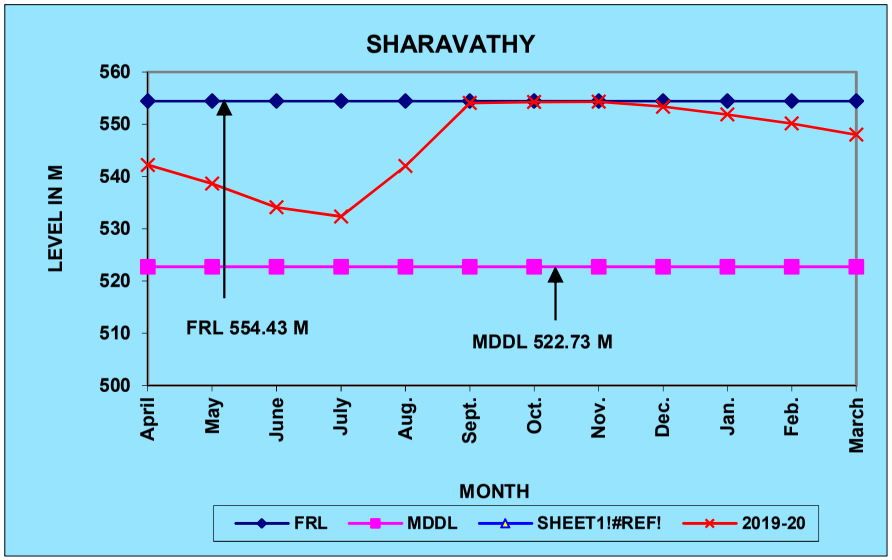
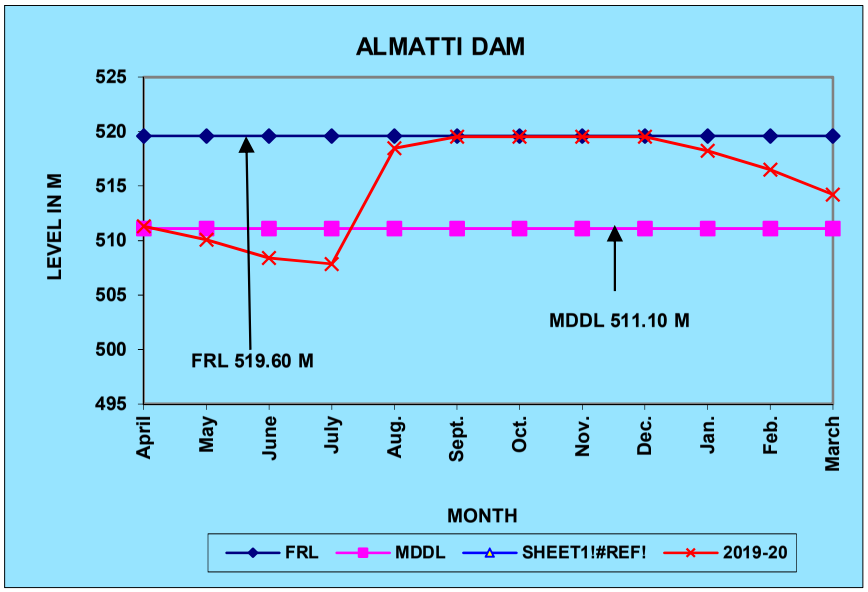


EXHIBIT 3.7

MONTH-WISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS







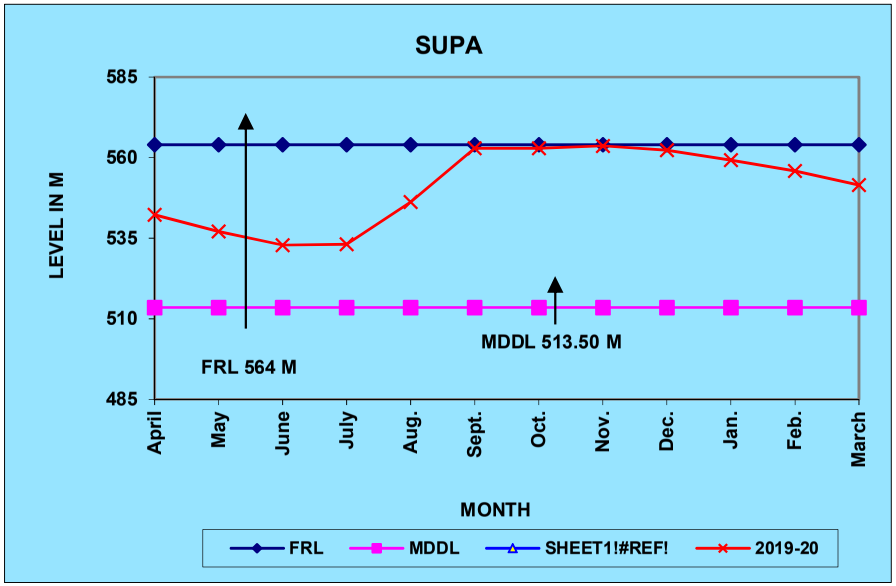
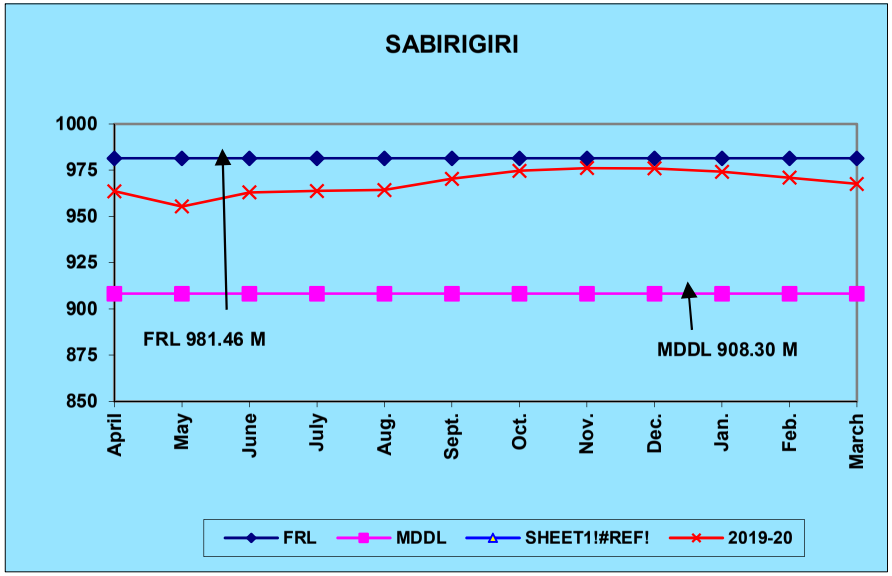
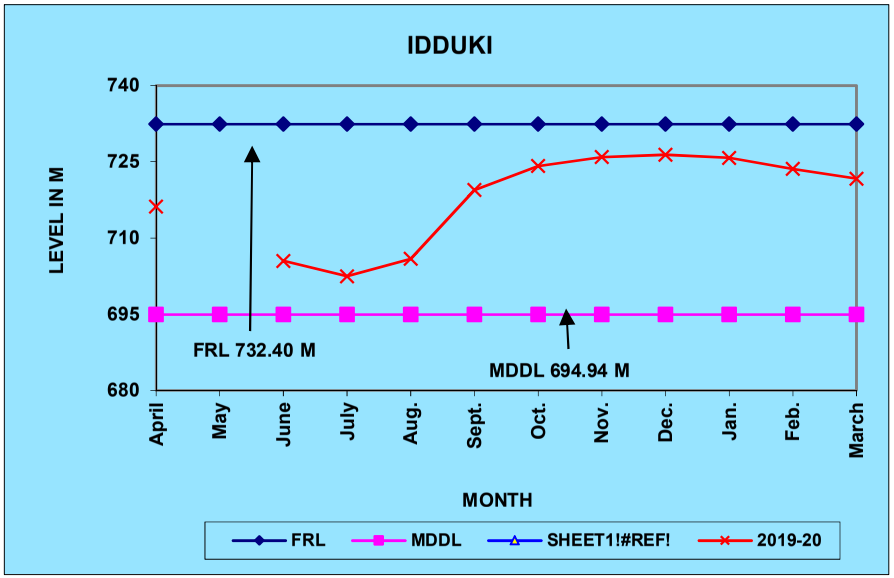
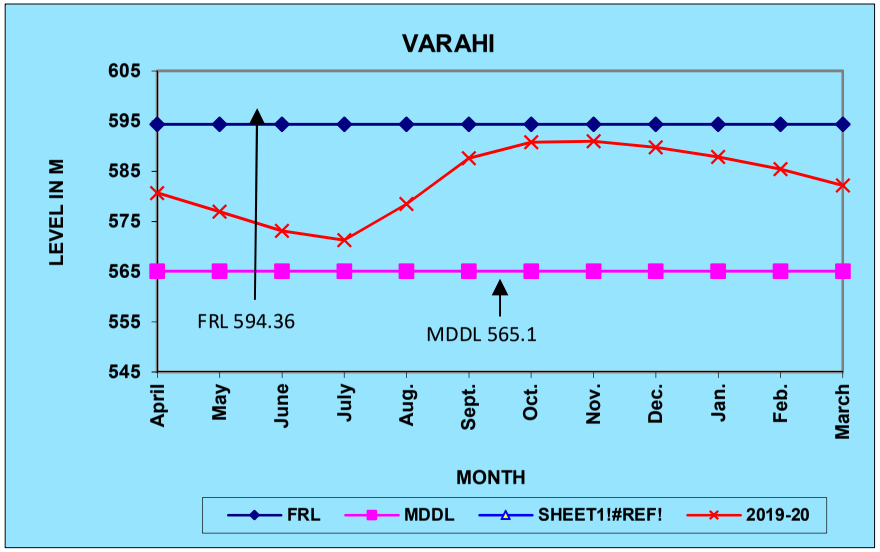


EXHIBIT 3.8

MONTH-WISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS







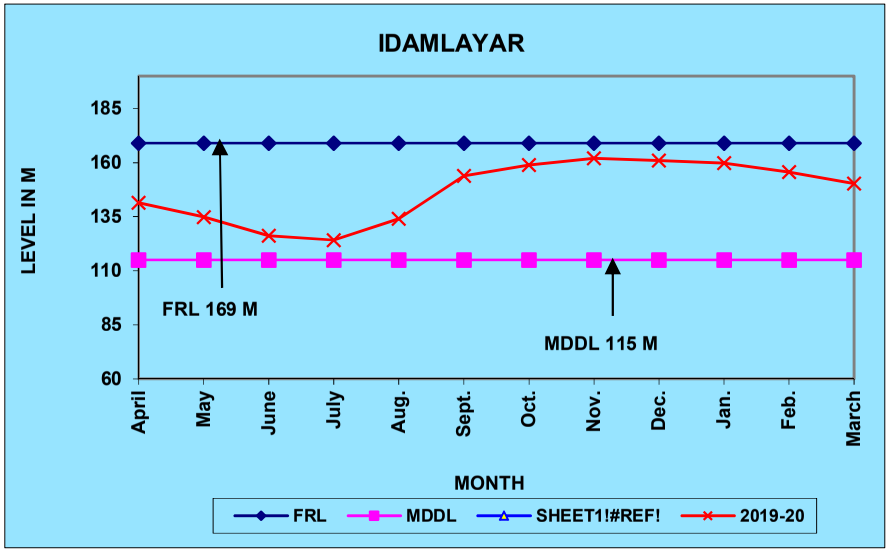
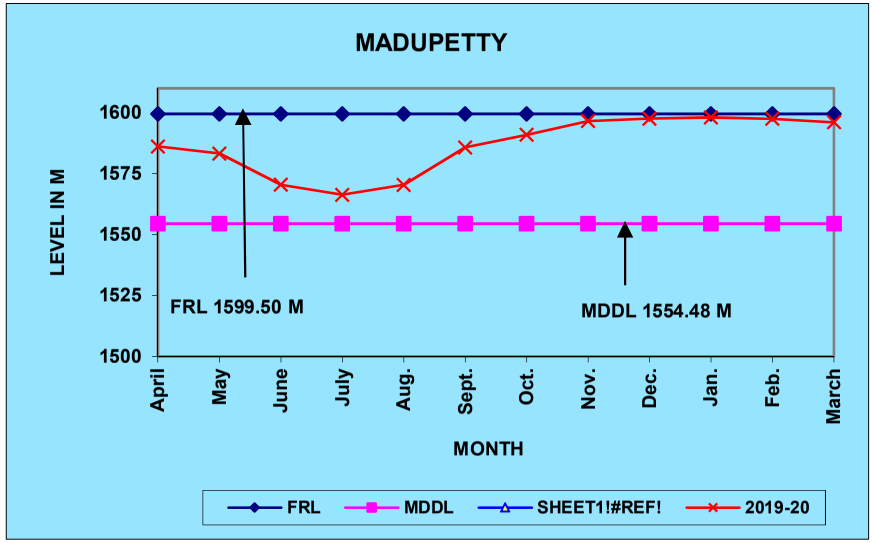
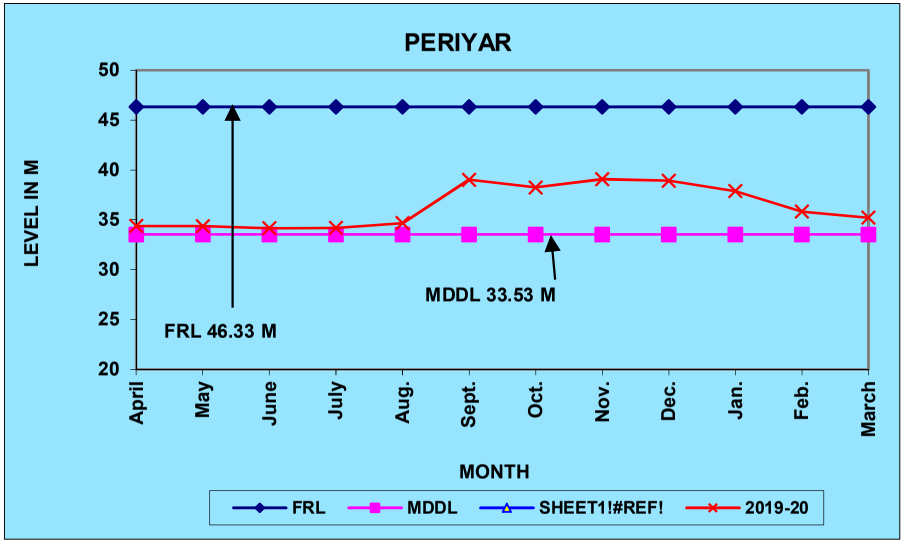
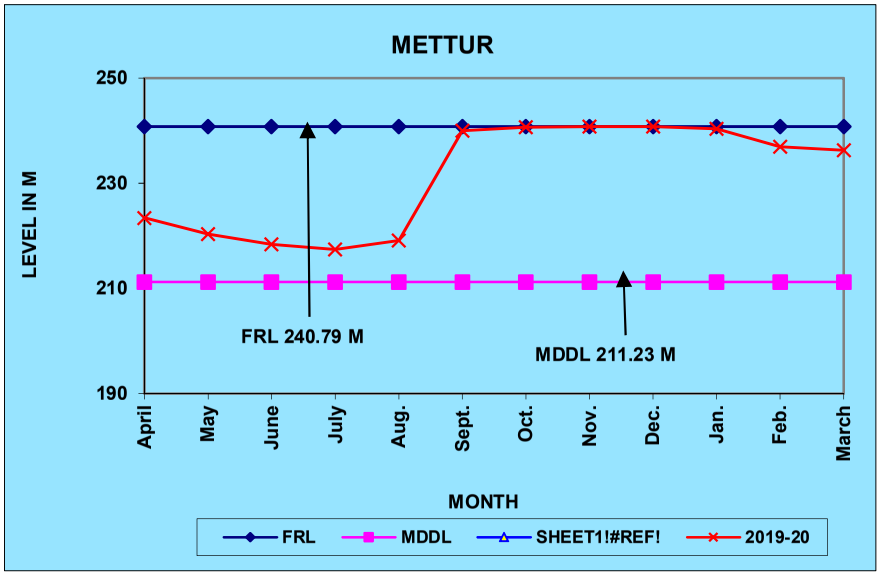


EXHIBIT 3.9

MONTH-WISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS







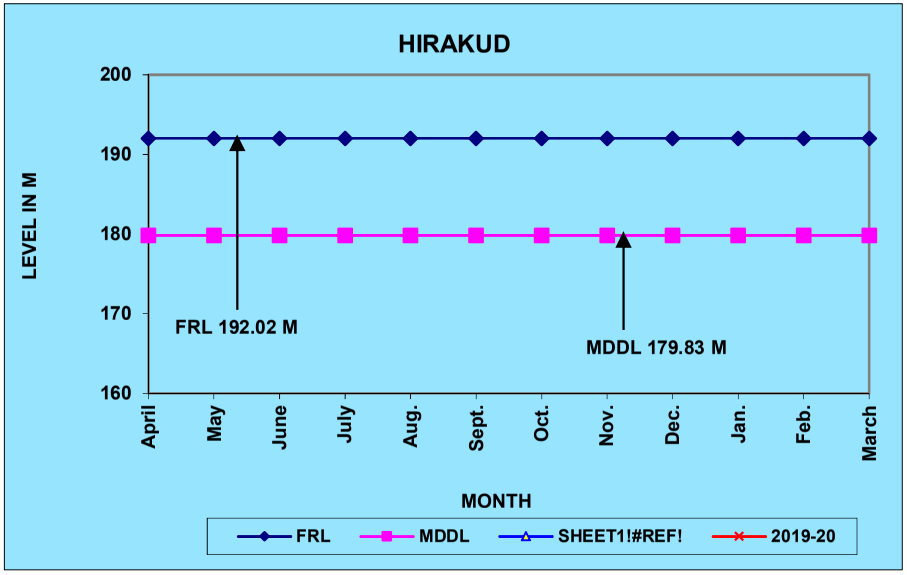
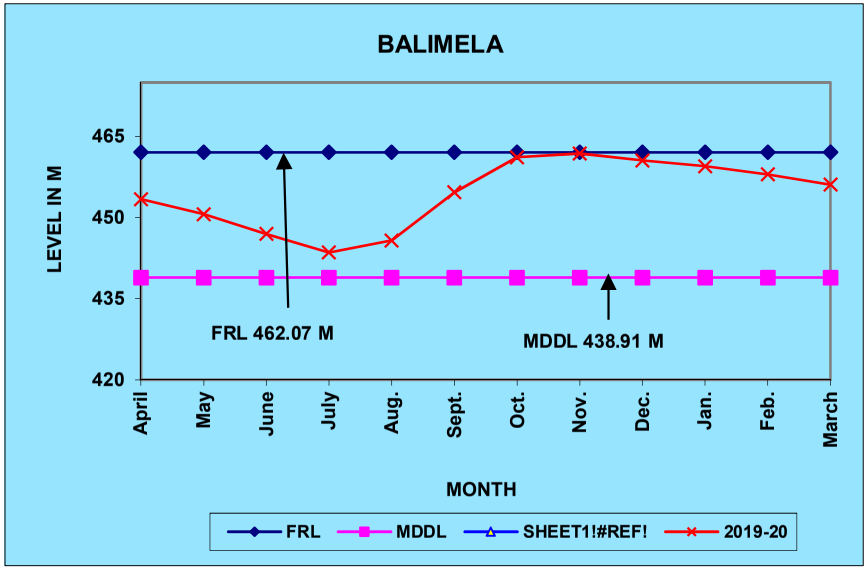
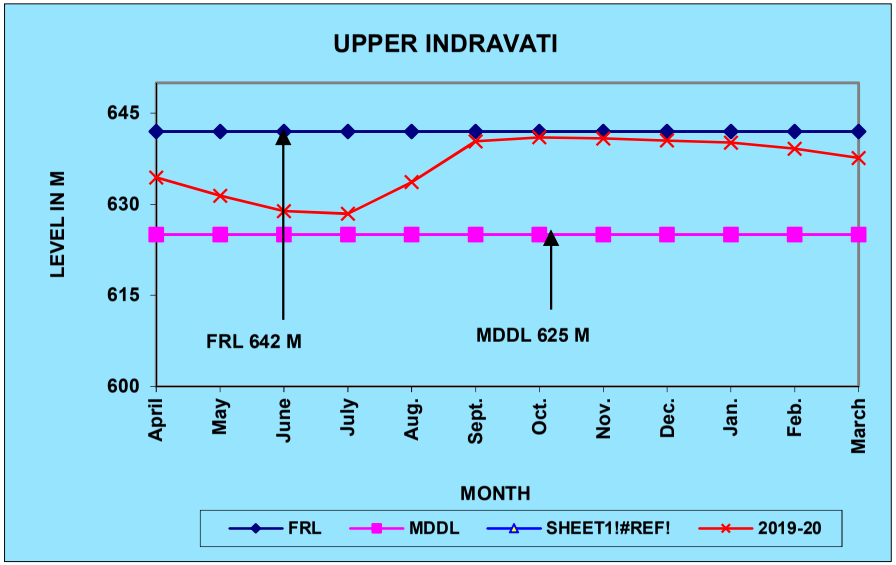
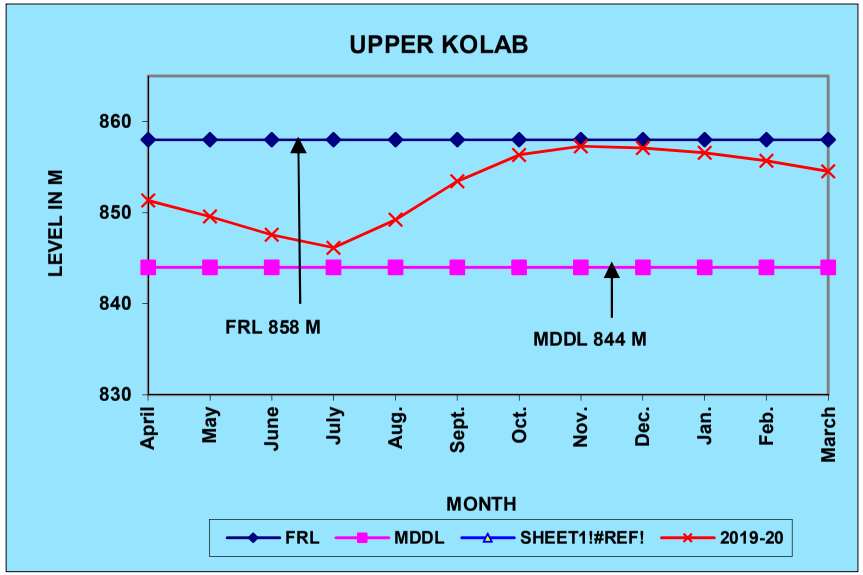


EXHIBIT 3.10

MONTH-WISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS







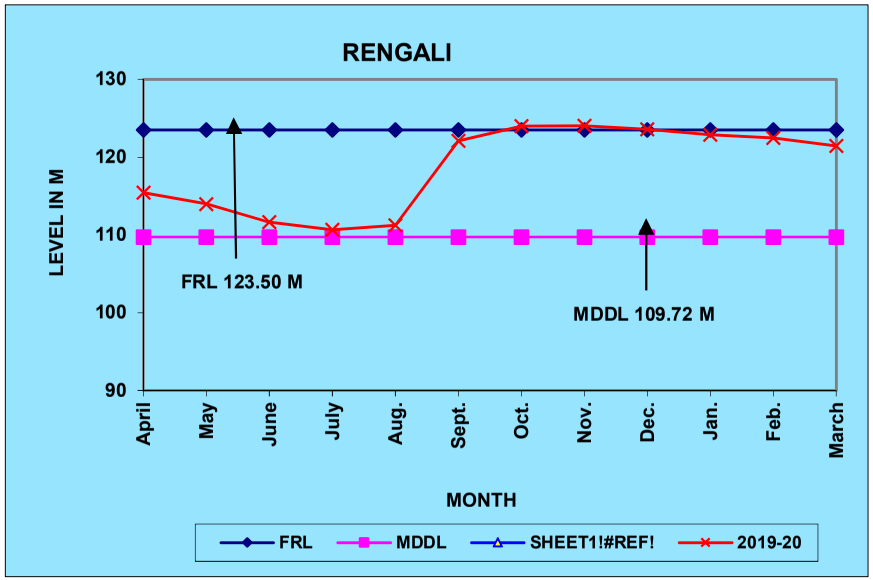
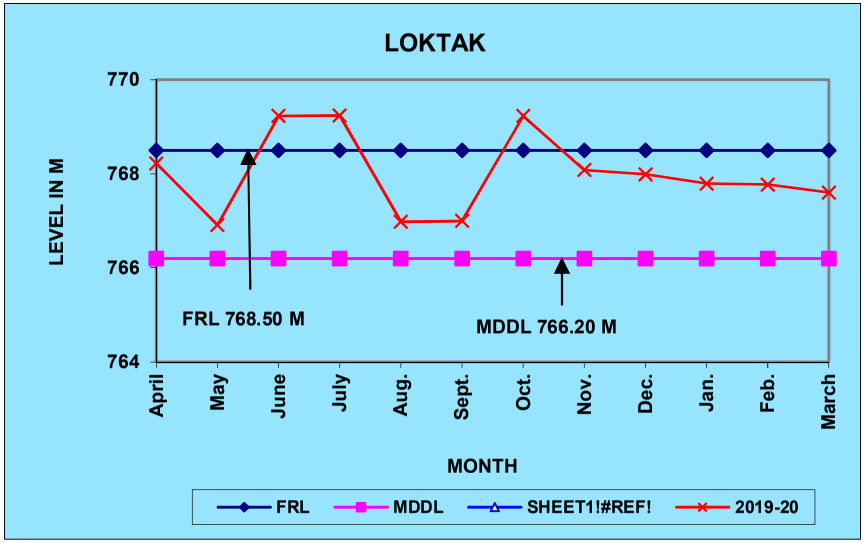


EXHIBIT 3.11

MONTH-WISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS



3.3 Inflows

Inflows to the reservoirs are primarily dependent on rainfall during monsoon in the catchment area of the reservoirs. However, in case of the hydro projects in Himalayan Region including Bhakra, Pong, Ranjit Sagar and Tehri projects etc., snow melt in the catchment area during summer also contributes to their inflows. The inflows into the reservoirs during 2021-22 vis-à-vis 2020-21 are given at **Exhibit 3.1**. Inflows into the reservoirs and generation during the year 2021-22 vis-à-vis 2020-21 and 10 years average is given below at **Table-3.2.**

TABLE 3.2

HYDRO RESERVOIRS (STORAGE TYPE) - INFLOW & ENERGY GENERATION

S. No.	STATION	Inflows				Generation			
		10 years Average (MCM)	2020-21 (MCM)	2021-22 (MCM)	2021-22 Inflow as % of 2020-21 inflow	10 years Average (MU)	2020-21 (MU)	2021-22 (MU)	2021-22 generation as compared to 2020-21 (%)
1	2	3	4	5	6= (5/4*100)	7	8	9	10= (9/8*100)
Northern Region									
1	Bhakra	17369	16600	15347	108	5467	5436	4358	80
2	Pong	8843	6946	7396	94	1579	1776	1104	62
3	RanjitSagar	6298	5536	5036	110	1715	1499	1163	78
4	Chamera-I*	6156	5494	5197	106	2474	2265	1899	84
5	Tehri	7378	6564	7241	91	3283	3040	3098	102
6	Ram Ganga	3359	1240	26320	5	277	261	249	96
7	RP Sagar	4127	1266	0	0	353	10	83	827
8	Rihand	5119	6615	5184	128	547	791	646	82
Sub Total (NR)		**58649**	**58649**	**50260**	**45400**	**111**	**15695**	**15078**	**84**
Western Region									
9	Ukai	7229	9862	9911	100	522	651	655	101
10	Sardar Sarovar	28585	32209	13837	233	2497	3245	1748	54
11	Gandhi Sagar	4220	4041	4182	97	270	148	212	143
12	Bansagar*	4677	6493	4453	146	83	136	135	100
13	Pench*	987	2768	848	327	316	415	304	73
14	Indira Sagar	22922	30816	3047	1011	2536	2794	1717	61
15	Koyna	3535	134	160	84	1146	3173	3639	115
16	Bhira	907	984	893	110	626	945	1025	108
Sub Total (WR)		**73062**	**87307**	**37331**	**234**	**7996**	**11506**	**9436**	**82**

	Southern Region								
S. No.	STATION	Inflows				Generation			
		10 years Average (MCM)	2020-21 (MCM)	2021-22 (MCM)	2021-22 Inflow as % of 2020-21 inflow	10 years Average (MU)	2020-21 (MU)	2021-22 (MU)	2021-22 generation as compared to 2020-21 (%)
1	2	3	4	5	6= (5/4*100)	7	8	9	10= (9/8*100)
17	Srisailam	18783	46722	31499	148	935	1157	1439	116
18	Upper Sileru*	2199	7813	1533	510	462	620	362	103
19	Lower Sileru*	3255	4732	1997	237	1089	1293	896	66
20	N.J. Sagar	81411	39861	25738	155	79	210	417	86
21	Sharavathy	4520	5103	4914	104	4384	4583	4994	112
22	Supa	2668	3138	3113	101	438	444	610	132
23	Almatti	12367	20209	694	2911	450	644	500	98
24	Varahi*	491	655	646	101	1028	1093	1137	108
25	Idukki	1581	1491	2723	55	2223	2530	3710	72
26	Sabarigiri	874	857	1367	63	1210	1228	2047	91
27	Madupetty	216	201	117	172	197	134	162	106
28	Idamalayar	1124	999	1433	70	304	290	377	90
29	Mettur	5156	5435	6903	79	288	471	528	110
30	Periyar	576	742	1024	73	395	548	779	92
Sub Total (SR)		**135221**	**137959**	**83701**	**165**	**13482**	**15244**	**17958**	**118**
Eastern Region									
31	Machkund	1255	1139	1081	105	564	666	719	108
32	Hirakud	25715	39601	20631	192	845	953	976	102
33	Balimela	3530	4677	3016	155	1223	1656	1062	64
34	Indravati	3209	2208	1402	158	1936	1757	1157	66
35	Upper Kolab	1981	1179	910	130	717	813	451	56
36	Rengali	9628	12718	14087	90	693	1015	866	85
Sub Total (ER)		**45318**	**61522**	**41127**	**150**	**5978**	**6860**	**5231**	**76**
North Eastern Region									
37	Loktak	2522	2425	1159	209	580	622	455	73
Sub Total (NER)		**2242**	**2425**	**1159**	**209**	**580**	**580**	**622**	**455**
Total (All India)		**314492**	**339473**	**235039**	**144**	**43731**	**49310**	**45681**	**93**

* Only 4 years average inflows available.

3.4 Reservoir Levels

The maximum reservoir level attained during the year depends on the depleted reservoir level in the preceding year, besides the inflows during the current year. Water level touched FRL at Chamera, Bansagar, Koyna, Bhira, Lower Sileru, Almatti, Sabirigiri, Madupetty, Idamalayar, Mettur, Periyar, Rengali and Loktak reservoirs during 2017-18. Month-wise maximum levels of major reservoirs during 2021-22 vis-à-vis 2020-21 are indicated at **Exhibits 3.2** to **Exhibits 3.11**.

3.5 Generation

Generation from reservoir (storage) based H.E. Stations during the year, apart from priorities of releases for other purposes like irrigation, drinking water etc., depends on various factors such as water level of the reservoir at the end of the preceding year, inflows during the year, draw down level by the end of the year, availability of generating units etc. In 19 Nos. out of 44 Nos. reservoir based hydel stations, annual generation during the year 2021-22 was more than the annual generation targets. Generation from 44 H.E. Stations on 37 major reservoirs during the year 2020-21 has been 45681 MU, showing decrease by 9.3 % over the 2020-21 generation of 49310 MU. Station-wise generation of reservoir stations during the year 2021-22 as compared to that of last year 2020-21 is shown in **Table 3.2** above. The reservoir based stations have been grouped in terms of percentage achievement of generation over targets in **Table 3.3** below:

TABLE 3.3

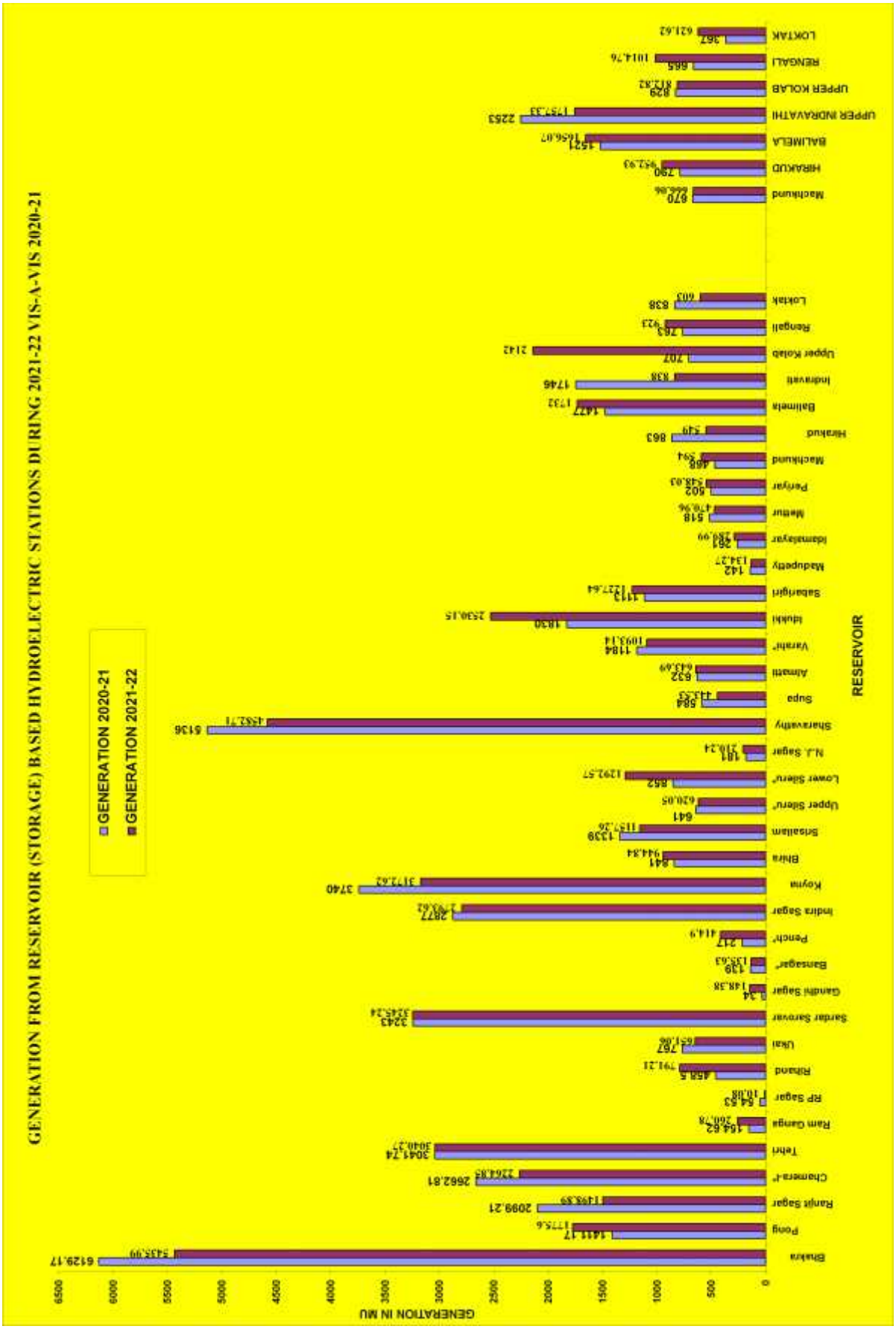
GENERATION PERFORMANCE OF MAJOR RESERVOIR BASED STATIONS

S. No.	% of Actual Generation over Target	Reservoir based Stations		
		No.	% of total Reservoir based Stations	Name
1	120 & Above	10	22.72	Ranjit Sagar, Gandhi Sagar, Srisailam RB, NJ Sagar, Kalinadi, Idukki, Sabarigiri, Pallivasal, Idamalayar, Periyar.
2	110 - 120	2	4.54	Koyna-I&II, Mettur Dam
3	100 - 110	7	15.90	Tehri, Ukai, Bhira , Sharavathy, Varahi, Machkund, Hirakud I

4	Below 100	18	40.90	Bhakra, Pong, Chamera-I, Ranjit Sagar, Ram Ganga, Rihand, Sardar Sarovar (RBPH), Bansagar-III, Indira Sagar, Pench, Upper Sileru, Lower Sileru, Almatti, Balimela, Indravati, Upper Kolab, Rengali, Loktak

Generation of major reservoir based H.E. stations during 2021-22 as compared to the generation during last year i.e. 2020-21 is also depicted at **Exhibit-3.12**.

EXHIBIT-3.12


GENERATION FROM RESERVOIR (STORAGE) BASED HYDROELECTRIC STATIONS DURING 2021-22 VIS-A-VIS 2020-21
GENERATION 2020-21
GENERATION 2021-22
GENERATION IN MU
RESERVOIR
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
Bhakra
5435.99
6129.17
Pong
1411.17
1775.6
Ranjit Sagar
1493.39
2099.21
Chamera-I
2264.83
2662.81
Tehri
3041.74
3040.27
Ram Ganga
164.62
260.78
RP Sagar
64.53
110.08
Rihand
455.5
791.21
Uri-I
767
651.06
Sardar Sarovar
3243
3245.24
Gandhi Sagar
34
148.38
Bansagar-I
139
135.63
Pench
217
414.9
Indira Sagar
2877
2793.62
Koyna
3172.62
3740
Bhira
841
944.34
Srisailam
1339
1157.26
Upper Sileru
641
620.05
Lower Sileru
852
1291.57
N.J. Sagar
101
210.24
Sharavathy
4552.71
6136
Supa
584
712.53
Almatti
632
643.49
Varahi
1184
1093.14
Idukki
1830
2530.15
Sabarigiri
1113
1277.64
Maduppetty
142
134.27
Idamalayar
264
280.99
Mettur
518
470.96
Periyar
502
548.03
Machkund
468
594
Hirakud
549
863
Balimela
1427
1732
Indravati
838
1746
Upper Kolab
707
2142
Rengali
763
923
Loktak
603
838
Machkund
670
666.66
HIRAKUD
790
942.93
BALIMELA
1521
1656.07
UPPER INDRAVATHI
1737.33
2253
UPPER KOLAB
829
812.82
RENGALI
665
1014.76
LOKTAK
362
621.62

SALIENT DETAILS OF IMPORTANT RESERVOIRS AND ASSOCIATED H.E. STATIONS

S. No	NAME OF RESERVOIR AND ASSOCIATED HE STATIONS	INSTALLED CAPACITY AS ON 31.03.2021	ANNUAL DESIGN ENERGY	FULL RESER-VOIR LEVEL	MINIMUM DRAW DOWN LEVEL	RESERVOIR CAPACITY AT FRL		ENERGY CONTENT AT FRL	LEVELS ATTAINED DURING 2020-21			
						GROSS :	LIVE		Max.	DATE	Min	DATE
		(MW)	(MU)	(M)	(M)	(MCM)	(MCM)	(MU)	(M)		(M)	
NORTHERN REGION												
1	Bhakra	1379.00	3924	513.59	445.62	8321	6516	1729.00	506.80	09.09.2020	468.45	31.03.2021
a	Bhakra Left	594.00	3924									
b	Bhakra Right	785.00										
2	Pong	396.00	1123	426.72	384.05	8053	6946	1084.00	424.45	01.10.18	389.82	28.06.18
3	Chamera	540.00	1664.56	760.00	749.20		87		759.96	20.07.2020	751.21	20.02.2021
4	Ranjit Sagar	600.00	1507	527.91	487.91	3292	2191	390.00	516.16	16 & 17.09.20	493.12	28.01.21
5	Tehri	1000.00	2797	829.79	740.04	3540	2615	1291.49	827.84	16.10.2020	744.44	24.06.2020
6	Ramganga	198.00	334	366	323	2503.96	2109.25	480.80	359.16	13.11.2020	342.14	31.03.2021
7	Rana Pratap Sagar	172.00	459	352.81	343.83	2901	1569	175.66	281.59	01.10.2020	270.09	01.07.2020
8	Rihand	300.00	920	268.22	252.98	10605	5723	1177.00	264.57	12.10.2020	256.00	17.06.2020
	Sub-Total NR	**4585.00**	**12728.56**				**27756.25**					
WESTERN REGION												
9	Ukai	300.00	1080	105.16	82.30	8515	6615	813.00	105.16	01.10.2020	97.07	30.06.2020
10	Sardar Sarovar	1200.00	3635	138.68	110.18	9460	5760	1817.553	138.68	17.09.2020	119.29	08.04.2020
11	Gandhi Sagar	115.00	420	399.90	381.00	7743	6911	725.00	399.53	04.10.20	394.00	31.01.21
12	Bansagar	60.00	143	341.64	323.10		4934		341.52	01.10.2020	335.17	31.03.2021
13	Pench	160.00	315	490.00	464.00		1045		489.99	12.10.2020	486.16	12.06.2020
14	Indira Sagar	1000.00	1980	262.13	243.23	12237	9706	1316.12	262.13	08.10.2020	248.56	05.07.2020
15	Koyna	1636.00	3030	657.91	609.60	2797	2677	3126.00	659.43	30.09.2020	634.06	01.07.2020
a	Koyna-I & II	600.00	3030									
c	Koyna-I & II	1000										
d	Koyna DPH	36										
16	Bhira	300	775	606.05	590.09	523	522	619	606.12	01.09.2020	591.71	03.07.2020
	Sub-Total WR	**4771.00**	**11378.84**				**38170.33**					
SOUTHERN REGION												
17	Upper Sileru	240.00	529	414.53	406.51		88		413.73	16.08.2020	407.97	17.04.2020
18	Lower Sileru	460.00	1070	316.08	291.01		365		316.07	10.10.2020	304.89	04.04.2020
19	Srisailam	770.00	2900	269.74	243.84	8723	7166	1548.00	269.74	01.11.2020	247.16	26.06.2020
20	Nagarjuna Sagar	815.60	2237	179.83	150.89	11560	6538	1398.00	179.88	27.9.20, 27.10.20,	161.52	20.07.2020
21	Sharavathy	1035.00	4932	554.43	522.73	5310	4297	4394.00	553.56	2020 & 18.10.2	534.80	01.07.2020
22	SUPA	955.00	3927	564.00	513.50	4178	3758	3927.00	558.93	29.09.2020, 30.09.2020	527.56003	03.07.2020
23	Almatti	290.00	483	519.60	511.10	2631.50	2628.00	175.30	519.60	31.08.2020,01.09.2020,01.	509.40	04.06.2020

SALIENT DETAILS OF IMPORTANT RESERVOIRS AND ASSOCIATED H.E. STATIONS

S. No	NAME OF RESERVOIR AND ASSOCIATED HE STATIONS	INSTALLED CAPACITY AS ON 31.03.2021	ANNUAL DESIGN ENERGY	FULL RESER-VOIR LEVEL	MINIMUM DRAW DOWN LEVEL	RESERVOIR CAPACITY AT FRL		ENERGY CONTENT AT FRL	LEVELS ATTAINED DURING 2020-21			
						GROSS :	LIVE		Max.	DATE	Min	DATE
		(MW)	(MU)	(M)	(M)	(MCM)	(MCM)	(MU)	(M)		(M)	
24	Varahi	460.00	1060	594.36	565.10		881.50		589.20	17th to 20th	571.74	13.06.2020
25	Idukki	780.00	2398	732.40	694.94	1996	1459	2146.00	731.20	26.10.2020	709.71	02.07.2020
26	Sabirigiri	300.00	1338	981.46	908.30	454	447	764.00	979.03	23.10.2020	938.07	11.06.2020
27	Madupetty	37.50	284	1599.50	1554.48		55.32	77.40	1598.30	11.12.2020	1567.60	30.06.2020
28	Idamalayar	75.00	380	169.00	115.00		1017.80	254.45	164.74	20.10.2020	128.41	29.06.2020
29	Mettur	250.00	541	240.79	211.23	2708.80	2645.20	204.00	106.78	25.12.2020	64.00	01.08.2020
30	Periyar	161.00	409	46.33	33.53	443	299	216	41.75	13.08.2020	34.19	01.07.2020
	Sub-Total SR	**6629.10**	**22488.00**				**31645**					
EASTERN REGION												
31	Machkund	114.75	670	838.20	818.39	970	893	552.00	838.06	01.10.2020	828.79	13.06.2020
32	Hirakud	347.50	1174	192.02	179.83	4823	4709	372.00	192.01	01.10.2020	182.76	10.07.2020
33	Balimela	510.00	1183	462.07	438.91	3929	2676	898.00	458.39	24.10.2020	444.77	03.08.2020
34	Upper Indravati	600.00	1962	642.00	625.00	2300	1485.50	1213.14	638.38	20.10.2020	630.58	03.08.2020
35	Upper Kolab	320.00	832	858.00	844.00	1215	935.00	540	851.37	27.09.2020	847.57	04.08.2020
36	Rengali	250.00	525	123.50	109.72	3548	3167.81	275	123.9	02.09.2020	111.2	19.06.2020
	Sub-Total ER	**2142.25**	**6346.00**				**13866**					
NORTH EASTERN REGION												
37	Loktak	105	448	768.50	766.20	435.91	396.44	250	769.29	30.09.2020	766.01	14.04.2020
	Sub-Total NER	**105**	**448**				396.44					
	Total All India	**18232.35**	**53389.40**				**111834.35**					

CHAPTER-4

PLANNED MAINTENANCE OF HE UNITS

CHAPTER-4

PLANNED MAINTENANCE OF HE UNITS

4.1 For the purpose of studies and analysis of performance in respect of availability of H.E. Stations, outage data of 727 generating units installed in 210 Hydro Electric Stations was made available by various organizations. The studies indicate that a total of 218275 hours were utilized for carrying out various types of planned maintenance works to facilitate healthy running of generating units. Details of long duration planned outages (50 hours and above) are given in **Annex-4.1**.

4.2 It is observed that capital maintenance was carried out for 37 generating units whereas annual maintenance was carried out for 128 generating units. Analysis of various types of planned maintenance indicates that while most of the planned outages were for periodic maintenance, many of these outages were for carrying out certain repairs/modification works also. Details of duration of periodic planned maintenance of generator, turbine, auxiliary equipments and civil structures etc. are indicated below in **Table 4.1**.

TABLE 4.1

DURATION OF PERIODIC PLANNED MAINTENANCE
PERIOD: 2021-22

S.NO	Type of Maintenance	No. of Units	Duration (Hours)	
			Max. for any unit	Average
1	ANNUAL MAINTENANCE	128	8760	649.76
2	AUXILIARY SYSTEM	2	4.94	4.53
3	CAPITAL/3 YEARLY MTCE.	37	8760	795.93
4	GENERATOR	21	751.27	89.13
5	INSPECTION /MTCE	2	28.73	16.96
6	MONTHLY MAINTENANCE	20	29.65	37.18
7	OTHER EQUIPMENT	6	684.42	146.46
8	RENOVATION/MODERNISATION	9	8760	2821.34
9	ROUTINE MAINTENANCE	9	8.83	3.5
10	TURBINE	21	75.82	15.41
11	MISCELLANEOUS	51	8760	732.21

4.3 There were a total of 666 outages due to Planned Maintenance during the Year 2021-22, out of which about 26.73% were of duration up to 24 hours, while 28.23 % of the planned outages were of duration more than 10 days. Details giving duration pattern of planned maintenance is indicated in **Table 4.2** and illustrated in **Exhibit 4.1**.

TABLE 4.2

DURATION PATTERN OF PLANNED OUTAGE
PERIOD: 2021-22

Sl. No.	Duration	Number of Outage	Maintenance % to total number of Outages
1	more than 10 days	188	28.23
2	Less than 6 hour	165	24.77
3	6 to 24 hours	178	26.73
4	1 to 10 days	135	20.27
	Total No. of Outages	**666**	**100**

4.4 Planned Maintenance age-wise

Planned maintenance carried out for different age groups of hydro generating units during the year 2021-22 is indicated in **Table 4.3**.

TABLE 4.3

PLANNED MAINTENANCE AGE-WISE
PERIOD: 2021-22

Sl. No.	Year of Commissioning	No. of Units	Installed Capacity (MW)	Planned Outages (Hours)	Non-Availability Per Unit (Hours)
1	2021-22	7	393	127	18
2	2020-21	8	510.00	0	0
3	2019-20	2	300.00	0	0
4	2018-19	3	140.00	0	0
5	2017-18	16	795.00	7824	489
6	2016-17	18	1659.00	3312	184
7	2015-16	17	1516.00	4272	251

8	2010-11 to 2014-15	63	4437.02	37896	602
9	2005-06 to 2009-10	66	7077.00	30480	462
10	2000-01 to 2004-05	74	6741.80	38448	520
11	1989-90 to 1999-2000	86	5769.70	34464	401
12	1978-79 to 1988-89	124	7259.10	71448	576
13	1967-68 to 1977-78	81	5279.75	76872	949
14	Up to 1966-67	162	4724.85	119520	738
	Total	**727**	**46722.52**	**218275**	**300**

It is seen that the average non-availability of units due to planned maintenance is relatively higher in case of older units commissioned from 1967-68 to 1977-78 (949 hrs. /unit).

4.5 Analysis based on Planned Maintenance of different types of Turbines

The details regarding non-availability of generating units due to planned maintenance for different types of turbines are indicated in **Table 4.4** given below.

TABLE 4.4

PLANNED MAINTENANCE-TURBINE TYPE-WISE
PERIOD: 2021-22

Sl. No.	Type of Turbine	No. of Units	Installed Capacity (MW)	Planned Outages (Hours)	Non-Availability Per Unit (Hours)
1	BULB	26	684.00	4689	180
2	FRANCIS	419	32820.57	112263	268
3	KAPLAN	133	4399.05	41631	313
4	PELTON	149	8818.90	59691	401
	Total	**727**	**46722.52**	**218275**	**300**

The average non-availability due to planned maintenance was maximum for Pelton turbine at 401 hrs. /unit followed by Kaplan units at 313 hrs. /unit, while it was minimum for Bulb units at 180 hrs. /unit.

4.6 Analysis based on Make of Generating Units

About 49.57% of the installed capacity of Hydro has been sourced from indigenous suppliers with BHEL alone accounting for about 42.69% of the capacity. The remaining

49.93 % has been imported from various countries like Japan, Canada, UK and France etc. The non-availability due to planned maintenance has been analyzed for generating units both indigenous and imported based on their make/supplier. The details are given below in **Table 4.5**:

TABLE 4.5

PLANNED MAINTENANCE-SUPPLIER-WISE
PERIOD: 2021-22

S. No	Name of Supplier/ Country of Make	No. of Units		Installed Capacity (MW)	Non-Availability due to		
		No.	% of total	MW	% of total	Total Hours	Hours/ Unit
A- Indigenous							
1	BHEL	310	42.69	20030.30	42.87	122444	395
2	Others	54	6.88	3395.50	7.27	15316	178
	SUB TOTAL	**364**	**49.57**	**23425.80**	**50.14**	**137760**	**348**
B- Imported							
3	USA	9	1.24	351.00	0.75	4648	245
4	U.K.	63	8.67	1242.10	2.66	8916	144
5	France	31	4.26	2179.20	4.66	781	71
6	Canada	44	6.05	3132.00	6.70	11813	311
7	USSR	26	3.58	2804.00	6.00	10023	386
8	Switzerland	21	2.89	790.20	1.69	8879	277
9	Japan	76	10.45	6398.20	13.69	24451	330
10	Other	93	12.79	6400	13.70	11003	159
	Sub Total	**363**	**49.93**	**23296.70**	**49.86**	**80514**	**243**
	Total	**727**	**100**	**46722.50**	**100**	**218275**	**300**

It is observed that during the year 2021-22, average non-availability due to planned maintenance of the units supplied by BHEL was 395 hrs. /unit.

Among the imported generating units, the average non-availability due to planned maintenance was the least for units supplied by france (71 hrs. /unit) and was maximum for units supplied by USSR (386 hrs. /unit).

4.7 Planned Maintenance – Region-wise

Region-wise non-availability of units due to planned maintenance in respect of various hydro power stations is indicated below in **Table 4.6**

TABLE 4.6

REGION-WISE PLANNED MAINTENANCE
PERIOD: 2021-22

S.No	Region	No. of Units	Installed Capacity (MW)	% Non-availability due to Planned Maintenance
1	Northern	256	19576.25	4.24
2	Western	101	7392	2.59
3	Southern	246	11739.5	3.04
4	Eastern	86	5987.75	4.16
5	North Eastern	38	2027.0	1.46
	All India	**727**	**46722.50**	**3.45**

The non-availability of generating unit due to planned maintenance was least in North Eastern Region (1.46%) followed by Western Region at 2.59 %, whereas it was maximum in North Region (4.24 %) followed by Eastern Region (4.16%).

The average non-availability of hydro electric units due to planned maintenance during the year 2021-22 was 3.45% as compared to 4.06% during the year 2020-21.

4.8 Planned Maintenance – Station-wise

The number of H.E. Stations falling under various ranges of non-availability due to planned maintenance during the year 2021-22 vis-à-vis 2020-21 is summarized below in **Table 4.7.**

TABLE 4.7

NON-AVAILABILITY OF HE STATIONS DUE TO PLANNED OUTAGES (2021-22 VIS-A-VIS 2020-21)

% Non-Availability due to planned maintenance	2021-22				2020-21			
	Stations		Capacity		Stations		Capacity	
	No.	% of Total	MW	% of Total	No.	% of Total	MW	% of Total
≤ 5	165	78.57	37515.57	80.29	158	76.33	34696.37	75.09
>5 to 10	23	10.95	3814.95	8.17	27	12.08	6465.20	13.99
>10 to 15	12	5.71	3594.20	7.69	9	4.35	1530.15	3.31
>15 to 20	4	1.90	1087.80	2.33	4	1.93	1550.00	3.35
>20 to 25	1	0.48	30.00	0.06	1	0.48	304.00	0.66
>25 to 30	1	0.48	50.00	0.11	5	2.42	938.50	2.03
above 30	4	1.90	630.00	1.35	5	2.42	725.00	1.57
Total	**210**	**100**	**46722.52**	**100**	**209**	**100**	**46209.22**	**100**

It could be seen from above that 165 nos. (78.57% of total) hydro-electric stations had non-availability factor less than or equal to 5% due to planned maintenance during 2021-22 as compared to 158 nos. (76.33% of total) during 2020-21.

Non-availability due to planned maintenance was more than 30% at 4 nos. (1.90% of total) H.E. Stations during 2021-22 and which was 5 nos. (2.42% of total) in 2020-21 The details of these stations for 2021-22 is given below in **Table 4.8.**

TABLE 4.8

H.E. STATIONS HAVING HIGH PLANNED MAINTENANCE FOR THE PERIOD: (2021-22)

Sl. No	Name of Station/Utility	Capacity (MW)	N.A. due to P.M.* (%)	Reasons
1	BANSAGAR TONS-I HPS / MPPGCL	315.0	33.333	CAPITAL/3 YEARLY MTCE.
2	NARIAMANGLAM HPS / KSEB	52.650000000000006	33.333	ANNUAL MAINTENANCE
3	PYKARA ULTMATE HPS / TANGEDCO	150.0	33.333	ANNUAL MAINTENANCE
4	SEWA-II HPS / NHPC	120.0	89.492	SURGE SHAFT

*** N.A.** -Non availability, **P.M.-** Planned Maintenance

33% of stations had operational availability lower than 95% on account of planned maintenance alone against the normative design/plan annual availability of 95% total during the entire station life. These utilities need to improve their O&M practices to bring down their total outages i.e. planned & forced to less than 5% as per best practices.

It is observed from above that stations may be having high planned maintenance outages on account of ageing, O&M management issues, etc. Further, those stations which are having continuously high planned maintenance outages over past few years may be requiring major repair & maintenance works or Renovation & Modernisation (R&M) works for improving the availability, reliability & security of the plant besides providing life extension where the assets have outlived their useful life.

4.9 Planned Maintenance – Utility-wise/Sector-wise

Performance of hydro-electric units under various utilities in Central Sector, State Sector, and Private Sector with respect to non-availability due to planned maintenance is indicated in **Table 4.9**.

In case of Central Sector, non-availability due to planned maintenance was maximum under NHPC (929 hrs. /unit).

In case of State Sector, non-availability due to planned maintenance was maximum under OHPC (669 hrs. /unit).

In case of Private Sector, non-availability due to planned maintenance was maximum under ADHPL (650 hrs. /unit).

It is also observed that the average duration of planned maintenance in respect of H.E. Stations in Central Sector, State Sector and Private Sector is 545 hrs. /Unit, 248 hrs. /Unit and 76 hrs. /Unit respectively.

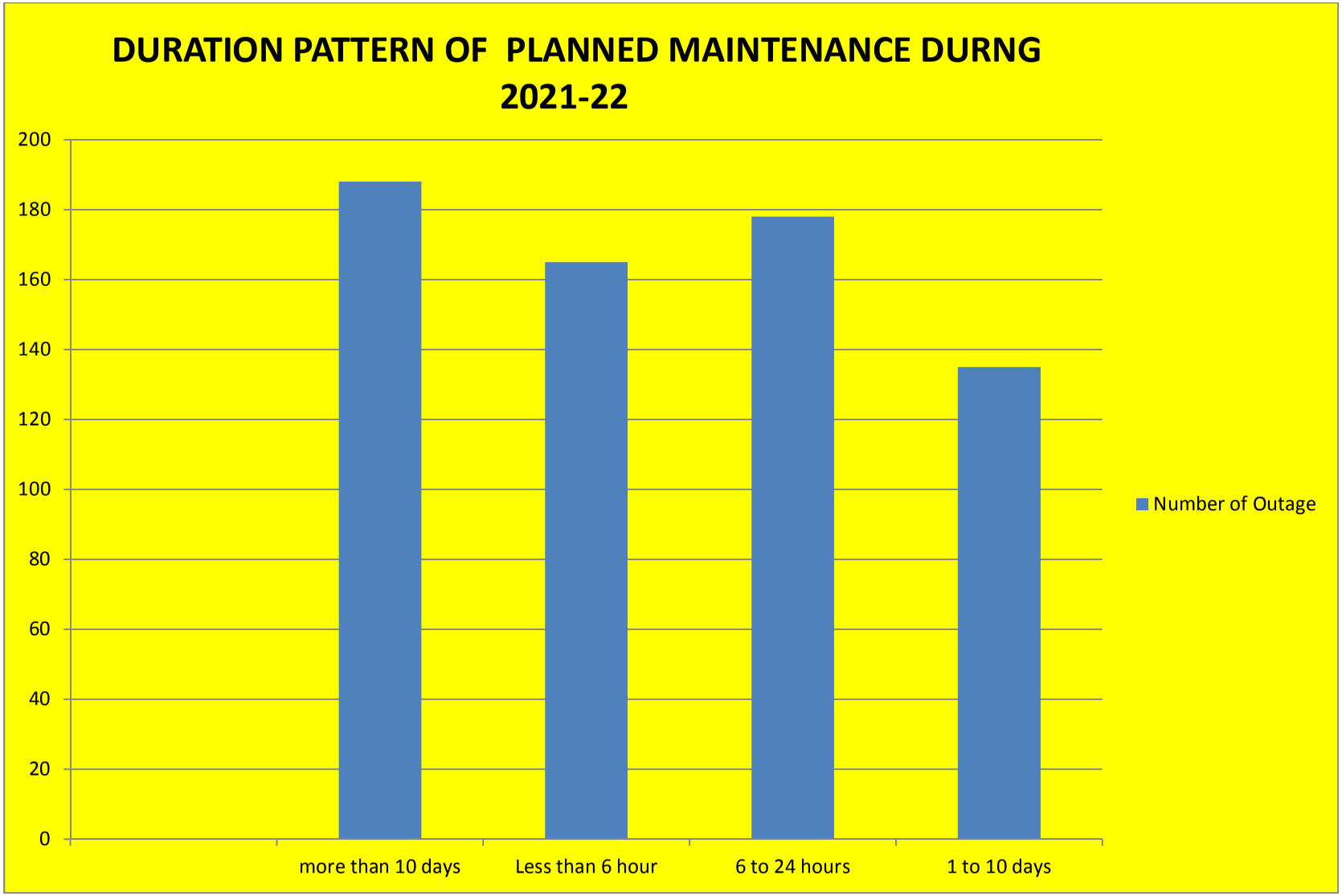
TABLE 4.9

SECTOR-WISE/ UTILITY-WISE PERFORMANCE PLANNED MAINTENANCE PERIOD: 2021-22

Sl. No.	Organization	No. of Units	Installed Capacity (MW)	Planned Maintenance (Hours)	Planned Maintenance per Unit (Hours)
(A)	**Central Sector**				
1	BBMB	28	2938.30	9213	329
2	DVC	5	143.20	781	156
3	NEEPCO.	20	1500.00	3974	199
4	NHDC	16	1520.00	5765	360
5	NHPC	70	5451.20	65039	929
6	NTPC Ltd.	4	800.00	457	114

7	SJVNL	12	1912.02	2739	228
8	THDC	8	1400.00	802	100
	Sub Total (CS)	**163**	**15664.72**	**88771**	**545**
(B)	**Private Sector**				
1	ADHPL	2	192.00	1301	650
2	AHPC (GVK)	4	330.00	0	0
3	DEPL	2	96.00	1215	608
4	DLHP	1	34.00	0	0
5	E.P.P.L.	2	100.00	8	4
6	GBHPPL	2	70.00	0	0
7	GIPL	2	110.00	455	228
8	GMR BHHPL	3	180.00	0	0
9	HBPCL	7	1300.00	2026	289
10	HSPCL	2	100.00	0	0
11	IAEPL	3	36.00	0	0
12	JPPVL	4	400.00	151	38
13	L&T	3	99.00	0	0
14	MBPC	2	113.00	127	63
15	MPCL	2	86.00	354	177
16	SEPL	2	97.00	222	111
17	SKPPPL	2	96.00	0	0
18	TATA MAH.	15	447.00	6	0
Sub Total (Pvt.)		**60**	**3931.00**	**4555**	**76**
(C)	**State Sector**				
1	APGCL	2	100.00	0	0
2	APGENCO	34	1796.75	0	0
3	CSPGCL	3	120.00	0	0
4	GSECL	8	540.00	0	0
5	HPPCL	8	406.00	540	68
6	HPSEB	12	372.00	4908	409
7	JKSPDC	12	1110.00	2202	183
8	JUUNL	2	130.00	0	0
9	KPCL	66	3617.20	16582	251
10	KSEB	47	1856.50	25278	538
11	MAHAGENCO	24	2406.00	893	37
12	MeECL	13	322.00	0	0
13	MPPGCL	23	875.00	12607	548
14	OHPC	31	2039.80	20731	669
15	PSPCL	25	1051.00	2671	107
16	RRVUNL	11	411.00	0	0
17	SSNNL	11	1450.00	3682	335

18	TANGEDCO	69	2178.20	23692	343
19	TSGENCO	36	2405.60	0	0
20	TUL	6	1200.00	1701	284
21	UJVNL	34	1252.15	9461	278
22	UPJVNL	15	501.60	0	0
23	WBSEDCL	12	986.00	0	0
Sub Total (State)		**504**	**27126.80**	**124949**	**248**
All India		**727**	**46722.52**	**218275**	**300**


DURATION PATTERN OF PLANNED MAINTENANCE DURNG 2021-22
200
180
160
140
120
100
80
60
40
20
0
more than 10 days
Less than 6 hour
6 to 24 hours
1 to 10 days
Number of Outage

CENTRAL ELECTRICITY AUTHORITY
Hydro WING
Hydro Project Planning & Investigation Division

Annex-4.1

DETAILS OF LONG DURATION PLANNED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2021-22

(OUTAGE DURATION 50 HOURS AND ABOVE)

S.No	STATION	UNIT	CAPACITY(MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
Eastern							
OHPC							
1	BALIMELA HPS	1	60.0	04/01/2021	03/31/2022	8,760.00	RENOVATION/MODERNISATION
GIPL							
2	CHUZACHEN HPS	1	55.0	02/01/2022	02/12/2022	265.87	ANNUAL MAINTENANCE
		2	55.0	02/05/2022	02/13/2022	186.47	ANNUAL MAINTENANCE
OHPC							
3	HIRAKUD HPS	5	43.65	04/01/2021	01/09/2022	6,793.48	RENOVATION/MODERNISATION
		6	43.65	04/01/2021	11/02/2021	5,178.00	RENOVATION/MODERNISATION
DEPL							
4	JORETHANG LOOP	1	48.0	04/01/2021	05/21/2021	1,215.15	ANNUAL MAINTENANCE
DVC							
5	MAITHON HPS	3	20.0	04/01/2021	05/03/2021	781.33	ANNUAL MAINTENANCE
NHPC							
6	RANGIT HPS	1	20.0	02/11/2022	03/05/2022	540.20	ANNUAL MAINTENANCE
		2	20.0	02/11/2022	02/13/2022	66.50	MISCELLANEOUS PLANNED
		2	20.0	01/17/2022	02/08/2022	547.50	ANNUAL MAINTENANCE
		3	20.0	12/21/2021	01/14/2022	568.10	ANNUAL MAINTENANCE
		3	20.0	02/11/2022	02/13/2022	56.87	MISCELLANEOUS PLANNED
SEPL							
7	TASHIDING HPS	1	48.5	03/21/2022	03/25/2022	111.17	ANNUAL MAINTENANCE
		2	48.5	03/21/2022	03/25/2022	111.17	MONTHLY MAINTENANCE
TUL							
8	TEESTA-III HPS	1	200.0	12/23/2021	12/31/2021	198.62	ANNUAL MAINTENANCE
		2	200.0	11/20/2021	11/30/2021	242.88	ANNUAL MAINTENANCE
		3	200.0	01/04/2022	01/13/2022	233.67	ANNUAL MAINTENANCE
		4	200.0	02/16/2022	03/05/2022	400.42	GENERATOR TRANSFORMER
		4	200.0	12/02/2021	12/06/2021	95.10	ANNUAL MAINTENANCE
		5	200.0	12/07/2021	12/20/2021	322.32	ANNUAL MAINTENANCE
		5	200.0	03/08/2022	03/12/2022	92.93	MISCELLANEOUS PLANNED
NHPC							
9	TEESTA LOW DAM-III	1	33.0	03/02/2022	03/17/2022	364.97	ANNUAL MAINTENANCE
		2	33.0	01/05/2022	01/21/2022	383.82	ANNUAL MAINTENANCE

S.No	STATION	UNIT	CAPACITY(MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		3	33.0	02/12/2022	02/28/2022	407.15	ANNUAL MAINTENANCE
		4	33.0	01/24/2022	02/09/2022	385.98	ANNUAL MAINTENANCE
10	TEESTA LOW DAM-IV	1	40.0	07/01/2021	07/04/2021	96.00	TESTING/CHECKING
		1	40.0	10/16/2021	10/22/2021	145.45	SWITCHING EQUIPMENT
		2	40.0	02/17/2022	03/06/2022	417.52	ANNUAL MAINTENANCE
		3	40.0	01/27/2022	02/14/2022	450.70	ANNUAL MAINTENANCE
		4	40.0	01/05/2022	01/23/2022	449.35	ANNUAL MAINTENANCE
11	TEESTA V HPS	1	170.0	02/22/2022	03/06/2022	284.46	ANNUAL MAINTENANCE
		2	170.0	02/02/2022	02/19/2022	402.44	ANNUAL MAINTENANCE
		3	170.0	01/19/2022	01/28/2022	238.36	ANNUAL MAINTENANCE
North Eastern							
NEEPCO.							
12	DOYANG HPS	1	25.0	04/05/2021	05/03/2021	690.08	ANNUAL MAINTENANCE
		2	25.0	02/08/2022	02/25/2022	409.48	ANNUAL MAINTENANCE
		2	25.0	05/05/2021	05/19/2021	347.60	ANNUAL MAINTENANCE
		3	25.0	01/06/2022	02/04/2022	707.00	ANNUAL MAINTENANCE
13	KAMENG HPS	1	150.0	12/17/2021	12/19/2021	63.87	INSPECTION /MTCE
		2	150.0	12/17/2021	12/19/2021	61.77	INSPECTION /MTCE
		3	150.0	12/17/2021	12/19/2021	63.47	INSPECTION /MTCE
NHPC							
14	LOKTAK HPS	1	35.0	03/02/2022	03/12/2022	258.60	ANNUAL MAINTENANCE
		2	35.0	02/01/2022	02/11/2022	261.62	ANNUAL MAINTENANCE
		2	35.0	08/31/2021	09/04/2021	76.63	PENSTOCK PRESSURE SHAFT
		3	35.0	02/15/2022	02/24/2022	235.72	ANNUAL MAINTENANCE
NEEPCO.							
15	PARE	1	55.0	01/19/2022	02/04/2022	384.00	ANNUAL MAINTENANCE
		2	55.0	02/14/2022	02/19/2022	141.02	ANNUAL MAINTENANCE
16	RANGANADI HPS	1	135.0	12/03/2021	12/12/2021	221.92	ANNUAL MAINTENANCE
		2	135.0	01/03/2022	01/11/2022	197.00	ANNUAL MAINTENANCE
17	TUIRIAL HPS	1	30.0	04/16/2021	04/29/2021	336.00	ANNUAL MAINTENANCE
		2	30.0	05/04/2021	05/18/2021	350.87	ANNUAL MAINTENANCE
Northern							
ADHPL							
18	ALLAIN DUHANGAN	1	96.0	12/01/2021	12/24/2021	548.75	ANNUAL MAINTENANCE
		2	96.0	04/08/2021	04/15/2021	165.12	MISC. SHORT DURATION
		2	96.0	01/03/2022	01/21/2022	440.05	ANNUAL MAINTENANCE
JKSPDC							
19	BAGLIHAR HPS	2	150.0	11/22/2021	02/22/2022	2,201.83	ANNUAL MAINTENANCE
NHPC							

S.No	STATION	UNIT	CAPACITY(MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
20	BAIRA SIUL HPS	1	60.0	06/06/2021	06/20/2021	357.17	TURBINE INSPECTION MISC
		1	60.0	05/29/2021	06/05/2021	192.00	TURBINE INSPECTION MISC
		1	60.0	01/03/2022	01/07/2022	113.77	DRAFT TUBE
		2	60.0	01/03/2022	01/07/2022	120.00	DRAFT TUBE
		2	60.0	01/08/2022	02/07/2022	740.40	ANNUAL MAINTENANCE
		3	60.0	04/01/2021	08/27/2021	3,562.00	RENOVATION/MODERNISATION
		3	60.0	01/03/2022	01/07/2022	113.52	DRAFT TUBE
HBPCL							
21	BASPA HPS	1	100.0	01/06/2022	01/14/2022	193.50	ANNUAL MAINTENANCE
		1	100.0	02/09/2022	02/12/2022	72.00	GOVERNOR SYSTEM
		2	100.0	03/07/2022	03/16/2022	218.00	ANNUAL MAINTENANCE
		3	100.0	01/19/2022	01/28/2022	217.50	ANNUAL MAINTENANCE
BBMB							
22	BHAKRA LEFT HPS	3	126.0	04/01/2021	11/09/2021	5,352.00	UPRATING
		5	126.0	04/10/2021	05/01/2021	493.00	ANNUAL MAINTENANCE
23	BHAKRA RIGHT HPS	9	157.0	05/08/2021	05/27/2021	461.15	ANNUAL MAINTENANCE
NHPC							
24	CHAMERA-I HPS	1	180.0	12/01/2021	01/15/2022	1,086.77	R AND M / REFURBISHMENT
		2	180.0	12/01/2021	01/14/2022	1,075.30	ANNUAL MAINTENANCE
		3	180.0	12/01/2021	01/20/2022	1,205.00	R AND M / REFURBISHMENT
25	CHAMERA-II HPS	1	100.0	02/06/2022	03/10/2022	776.20	CAPITAL MAINTENANCE
		2	100.0	01/17/2022	02/01/2022	352.37	ANNUAL MAINTENANCE
		3	100.0	11/22/2021	12/07/2021	367.68	ANNUAL MAINTENANCE
26	CHAMERA-III HPS	2	77.0	08/25/2021	09/04/2021	251.75	GENERATOR TRANSFORMER
		2	77.0	01/21/2022	02/09/2022	464.37	CAPITAL MAINTENANCE
		3	77.0	02/11/2022	02/22/2022	268.85	ANNUAL MAINTENANCE
27	CHUTAK HPS	1	11.0	11/17/2021	01/10/2022	1,296.72	ANNUAL MAINTENANCE
		2	11.0	11/15/2021	12/23/2021	909.38	ANNUAL MAINTENANCE
		3	11.0	01/02/2022	01/29/2022	647.38	ANNUAL MAINTENANCE
		4	11.0	01/23/2022	02/15/2022	563.30	ANNUAL MAINTENANCE
BBMB							
28	DEHAR HPS	1	165.0	05/03/2021	05/20/2021	425.48	ANNUAL MAINTENANCE
UJVNL							
29	DHAKRANI HPS	1	11.25	01/11/2022	03/31/2022	1,896.92	ANNUAL MAINTENANCE
		3	11.25	01/25/2022	02/22/2022	662.67	ANNUAL MAINTENANCE
30	DHALIPUR HPS	3	17.0	11/15/2021	12/03/2021	443.92	ANNUAL MAINTENANCE
NHPC							
31	DHAULI GANGA HPS	2	70.0	02/15/2022	03/11/2022	575.30	ANNUAL MAINTENANCE
		4	70.0	01/14/2022	02/04/2022	525.47	ANNUAL MAINTENANCE

S.No	STATION	UNIT	CAPACITY(MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
32	DULHASTI HPS	1	130.0	02/02/2022	02/16/2022	345.13	ANNUAL MAINTENANCE
		2	130.0	03/06/2022	03/13/2022	171.65	ANNUAL MAINTENANCE
		3	130.0	02/18/2022	03/03/2022	313.43	ANNUAL MAINTENANCE
		3	130.0	07/31/2021	08/04/2021	88.30	TURBINE INSPECTION MISC
BBMB							
33	GANGUWAL HPS	2	24.2	11/16/2021	11/20/2021	98.08	QUATERLY MAINTENANCE
		3	24.2	11/08/2021	11/12/2021	93.92	QUATERLY MAINTENANCE
HPSEB							
34	GIRI BATA HPS	1	30.0	11/22/2021	11/30/2021	206.92	ANNUAL MAINTENANCE
		1	30.0	12/01/2021	01/09/2022	955.00	ANNUAL MAINTENANCE
		2	30.0	06/08/2021	06/11/2021	81.00	INSPECTION /MTCE
		2	30.0	04/01/2021	04/25/2021	597.00	ANNUAL MAINTENANCE
NHPC							
35	KISHANGANGA HPS	1	110.0	02/09/2022	02/18/2022	226.62	ANNUAL MAINTENANCE
		1	110.0	04/01/2021	06/07/2021	1,609.18	ANNUAL MAINTENANCE
		2	110.0	06/02/2021	07/08/2021	886.24	STATOR WINDING
		2	110.0	01/28/2022	02/07/2022	219.58	EXTENDED ANNUAL
		2	110.0	08/21/2021	08/23/2021	50.03	MISCELLANEOUS PLANNED
		2	110.0	01/04/2022	01/28/2022	587.06	ANNUAL MAINTENANCE
		3	110.0	12/15/2021	12/29/2021	343.81	ANNUAL MAINTENANCE
NTPC Ltd.							
36	KOLDAM	1	200.0	02/17/2022	02/21/2022	93.00	ANNUAL MAINTENANCE
		2	200.0	02/26/2022	03/02/2022	93.25	ANNUAL MAINTENANCE
		3	200.0	01/31/2022	02/06/2022	142.57	BOILER OVERHAUL/ ANNUAL
		4	200.0	02/08/2022	02/13/2022	128.17	ANNUAL MAINTENANCE
BBMB							
37	KOTLA HPS	3	24.2	11/08/2021	11/12/2021	93.67	QUATERLY MAINTENANCE
UJVNL							
38	KULHAL HPS	1	10.0	12/26/2021	12/31/2021	143.92	MISCELLANEOUS PLANNED
		3	10.0	12/01/2021	12/22/2021	527.92	MISCELLANEOUS PLANNED
MPCL							
39	MALANA HPS	2	43.0	02/24/2022	03/10/2022	353.50	ANNUAL MAINTENANCE
UJVNL							
40	MANERI BHALI-II HPS	1	76.0	03/01/2022	03/31/2022	743.92	ANNUAL MAINTENANCE
		3	76.0	01/13/2022	02/19/2022	900.00	ANNUAL MAINTENANCE
		4	76.0	11/12/2021	01/06/2022	1,333.67	ANNUAL MAINTENANCE
SJVNL							
41	NATHPA JHAKRI HPS	1	250.0	02/18/2022	02/25/2022	174.08	ANNUAL MAINTENANCE
		2	250.0	01/28/2022	02/03/2022	167.53	ANNUAL MAINTENANCE
		3	250.0	01/15/2022	01/24/2022	240.00	ANNUAL MAINTENANCE

S.No	STATION	UNIT	CAPACITY(MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		3	250.0	01/08/2022	01/11/2022	72.22	ANNUAL MAINTENANCE
		4	250.0	01/19/2022	01/22/2022	90.20	ANNUAL MAINTENANCE
		4	250.0	01/04/2022	01/12/2022	206.28	ANNUAL MAINTENANCE
		5	250.0	02/11/2022	02/13/2022	60.15	ANNUAL MAINTENANCE
		5	250.0	02/26/2022	03/05/2022	183.57	ANNUAL MAINTENANCE
		6	250.0	02/08/2022	02/15/2022	184.03	ANNUAL MAINTENANCE
NHPC							
42	NIMMO BAZGO HPS	1	15.0	11/18/2021	12/10/2021	538.88	ANNUAL MAINTENANCE
		2	15.0	12/14/2021	01/07/2022	567.25	ANNUAL MAINTENANCE
		3	15.0	01/10/2022	01/25/2022	372.75	ANNUAL MAINTENANCE
43	PARBATI-III HPS	1	130.0	12/01/2021	01/06/2022	871.08	ANNUAL MAINTENANCE
		2	130.0	12/27/2021	01/15/2022	464.73	ANNUAL MAINTENANCE
		3	130.0	01/24/2022	03/04/2022	943.47	ANNUAL MAINTENANCE
		3	130.0	09/29/2021	10/05/2021	147.22	MISCELLANEOUS PLANNED
		4	130.0	01/31/2022	03/17/2022	1,081.35	ANNUAL MAINTENANCE
BBMB							
44	PONG HPS	5	66.0	04/01/2021	07/01/2021	2,196.08	ANNUAL MAINTENANCE
UJVNL							
45	RAMGANGA HPS	2	66.0	06/17/2021	10/12/2021	2,808.25	ANNUAL MAINTENANCE
SJVNL							
46	RAMPUR HPS	1	68.67	01/09/2022	01/11/2022	65.98	ANNUAL MAINTENANCE
		1	68.67	02/26/2022	03/08/2022	252.22	ANNUAL MAINTENANCE
		2	68.67	01/04/2022	01/12/2022	196.23	ANNUAL MAINTENANCE
		3	68.67	02/08/2022	02/16/2022	187.00	ANNUAL MAINTENANCE
		4	68.67	01/28/2022	02/03/2022	160.77	ANNUAL MAINTENANCE
		4	68.67	02/11/2022	02/13/2022	59.00	ANNUAL MAINTENANCE
		5	68.67	01/15/2022	01/22/2022	173.75	ANNUAL MAINTENANCE
		6	68.67	02/18/2022	02/24/2022	155.78	ANNUAL MAINTENANCE
PSPCL							
47	RANJIT SAGAR HPS	1	150.0	10/25/2021	12/29/2021	1,568.17	ANNUAL MAINTENANCE
		1	150.0	04/16/2021	04/29/2021	329.08	MISC. SHORT DURATION
		2	150.0	05/19/2021	05/29/2021	247.58	MISC. SHORT DURATION
		2	150.0	02/21/2022	03/10/2022	418.85	GENERATOR TRANSFORMER
		4	150.0	02/17/2022	02/21/2022	91.75	ANNUAL MAINTENANCE
HPPCL							
48	SAINJ HPS	1	50.0	02/18/2022	02/26/2022	196.65	ANNUAL MAINTENANCE
		2	50.0	02/28/2022	03/14/2022	343.52	ANNUAL MAINTENANCE
NHPC							
49	SALAL HPS	1	115.0	11/16/2021	11/29/2021	315.70	ANNUAL MAINTENANCE

S.No	STATION	UNIT	CAPACITY(MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		3	115.0	01/12/2022	03/05/2022	1,255.77	CAPITAL MAINTENANCE
		5	115.0	03/07/2022	03/21/2022	341.23	ANNUAL MAINTENANCE
		6	115.0	11/24/2021	12/11/2021	414.80	ANNUAL MAINTENANCE
HPSEB							
50	SANJAY HPS	1	40.0	04/01/2021	04/28/2021	665.00	RENOVATION/MODERNISATION
		1	40.0	12/17/2021	02/02/2022	1,138.43	ANNUAL MAINTENANCE
		2	40.0	10/28/2021	12/17/2021	1,212.36	ANNUAL MAINTENANCE
NHPC							
51	SEWA-II HPS	1	40.0	02/22/2022	03/22/2022	673.70	STATOR WINDING
		1	40.0	04/01/2021	02/21/2022	7,837.78	SURGE SHAFT HRT MTc.
		2	40.0	04/01/2021	02/21/2022	7,841.37	SURGE SHAFT HRT MTc.
		2	40.0	02/22/2022	02/27/2022	129.75	GENERATOR
		3	40.0	04/01/2021	02/21/2022	7,839.33	SURGE SHAFT HRT MTc.
		3	40.0	02/21/2022	03/01/2022	187.33	GENERATOR
52	TANAKPUR HPS	1	31.4	04/01/2021	04/23/2021	542.12	ANNUAL MAINTENANCE
		1	31.4	02/25/2022	03/25/2022	680.75	ANNUAL MAINTENANCE
		2	31.4	01/20/2022	02/21/2022	775.58	ANNUAL MAINTENANCE
		2	31.4	04/01/2021	04/08/2021	168.85	ANNUAL MAINTENANCE
		3	31.4	12/21/2021	01/16/2022	626.73	ANNUAL MAINTENANCE
		3	31.4	04/01/2021	04/03/2021	57.02	CAPITAL MAINTENANCE
THDC							
53	TEHRI ST-1 HPS	1	250.0	04/01/2021	04/12/2021	286.00	ANNUAL MAINTENANCE
		4	250.0	04/13/2021	05/04/2021	514.00	ANNUAL MAINTENANCE
NHPC							
54	URI-I HPS	1	120.0	01/08/2022	01/20/2022	300.02	CAPITAL MAINTENANCE
		2	120.0	12/20/2021	01/06/2022	412.95	CAPITAL MAINTENANCE
		3	120.0	11/22/2021	12/08/2021	393.15	ANNUAL MAINTENANCE
		4	120.0	12/10/2021	12/18/2021	198.97	ANNUAL MAINTENANCE
		4	120.0	11/29/2021	12/08/2021	210.88	MISCELLANEOUS PLANNED
55	URI-II HPS	1	60.0	11/22/2021	12/04/2021	286.62	ANNUAL MAINTENANCE
		1	60.0	12/28/2021	01/03/2022	154.35	MISCELLANEOUS PLANNED
		2	60.0	01/07/2022	01/19/2022	291.12	ANNUAL MAINTENANCE
		3	60.0	12/05/2021	12/20/2021	360.65	CAPITAL MAINTENANCE
		4	60.0	12/21/2021	12/31/2021	241.10	ANNUAL MAINTENANCE
JPPVL							
56	VISHNU PRAYAG HPS	1	100.0	03/01/2022	03/03/2022	54.68	ANNUAL MAINTENANCE
Southern							
KPCL							
57	ALMATTI DPH HPS	2	55.0	04/12/2021	06/20/2021	1,656.08	ANNUAL MAINTENANCE

S.No	STATION	UNIT	CAPACITY(MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		2	55.0	03/03/2022	03/31/2022	684.42	GENERATOR TRANSFORMER
		3	55.0	03/14/2022	03/17/2022	78.00	GENERATOR
		3	55.0	04/07/2021	06/20/2021	1,774.08	ANNUAL MAINTENANCE
		3	55.0	03/21/2022	03/31/2022	251.00	GENERATOR
		4	55.0	04/05/2021	06/20/2021	1,819.00	ANNUAL MAINTENANCE
		4	55.0	03/07/2022	03/12/2022	115.82	CAPITAL MAINTENANCE
		4	55.0	03/29/2022	03/31/2022	58.17	GENERATOR
		5	55.0	03/01/2022	03/03/2022	50.42	ANNUAL MAINTENANCE
		5	55.0	06/01/2021	06/20/2021	466.33	ANNUAL MAINTENANCE
		6	55.0	04/07/2021	06/10/2021	1,532.58	ANNUAL MAINTENANCE
TANGEDCO							
58	BHAWANI BARRAGE-II	1	15.0	01/28/2022	03/16/2022	1,116.50	OVERHAULING WORKS
		2	15.0	12/08/2021	01/11/2022	816.92	MISCELLANEOUS PLANNED
59	BHAWANI BARRAGE-III	1	15.0	11/01/2021	11/05/2021	97.08	MISCELLANEOUS PLANNED
KPCL							
60	GERUSUPPA HPS	1	60.0	11/10/2021	11/25/2021	369.17	ANNUAL MAINTENANCE
		2	60.0	12/20/2021	12/27/2021	171.22	RENOVATION/MODERNISATION
		3	60.0	12/27/2021	01/03/2022	168.84	RENOVATION/MODERNISATION
		4	60.0	11/29/2021	12/13/2021	345.18	ANNUAL MAINTENANCE
KSEB							
61	IDAMALAYAR HPS	1	37.5	07/13/2021	07/16/2021	75.82	RUNNER INSPECTION
		1	37.5	11/23/2021	12/22/2021	685.92	ANNUAL MAINTENANCE
		2	37.5	06/29/2021	07/27/2021	677.53	ANNUAL MAINTENANCE
62	IDUKKI HPS	1	130.0	07/16/2021	07/20/2021	104.55	ANNUAL MAINTENANCE
		1	130.0	08/24/2021	09/24/2021	756.53	ANNUAL MAINTENANCE
		1	130.0	11/24/2021	11/28/2021	87.67	RUNNER INSPECTION /REPAIR
		2	130.0	01/19/2022	02/11/2022	560.22	ANNUAL MAINTENANCE
		3	130.0	10/24/2021	10/28/2021	109.75	BEARING OIL TOPPING
		3	130.0	06/10/2021	07/14/2021	826.12	ANNUAL MAINTENANCE
		3	130.0	10/06/2021	10/23/2021	428.43	BEARING OIL TOPPING
		4	130.0	12/27/2021	01/17/2022	511.47	ANNUAL MAINTENANCE
		5	130.0	02/15/2022	03/04/2022	424.62	ANNUAL MAINTENANCE
		6	130.0	04/01/2021	04/28/2021	663.78	TESTING/CHECKING
		6	130.0	05/06/2021	05/13/2021	175.80	MISCELLANEOUS PLANNED
		6	130.0	12/01/2021	12/22/2021	511.37	ANNUAL MAINTENANCE
KPCL							
63	JOG HPS	1	13.2	01/04/2022	01/13/2022	217.75	SURGE SHAFT HRT MTc.
		1	13.2	08/23/2021	08/25/2021	58.33	INSPECTION OF GENERATING

S.No	STATION	UNIT	CAPACITY(MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		3	13.2	01/04/2022	01/18/2022	337.35	SURGE SHAFT HRT MTc.
		4	13.2	01/04/2022	01/18/2022	337.26	SURGE SHAFT HRT MTc.
		5	21.6	04/01/2021	07/16/2021	2,560.63	R AND M / REFURBISHMENT
		7	21.6	07/31/2021	08/18/2021	438.00	ANNUAL MAINTENANCE
		8	21.6	08/15/2021	08/17/2021	67.50	ANNUAL MAINTENANCE
TANGEDCO							
64	KADAMPARI HPS	2	100.0	04/16/2021	07/13/2021	2,123.75	ANNUAL MAINTENANCE
KPCL							
65	KADRA HPS	2	50.0	05/04/2021	05/15/2021	276.83	ANNUAL MAINTENANCE
66	KODASALI HPS	1	40.0	09/06/2021	09/09/2021	67.42	RENOVATION/MODERNISATION
		1	40.0	06/02/2021	06/15/2021	317.00	ANNUAL MAINTENANCE
		2	40.0	01/19/2022	01/24/2022	127.33	PENSTOCK PRESSURE SHAFT
		3	40.0	02/14/2022	03/12/2022	623.37	ANNUAL MAINTENANCE
		3	40.0	05/24/2021	05/31/2021	172.92	TURBINE INSPECTION MISC
TANGEDCO							
67	KUNDAH-I HPS	1	20.0	04/17/2021	05/21/2021	820.25	OVERHAULING WORKS
		2	20.0	04/20/2021	05/11/2021	513.50	MONTHLY MAINTENANCE
68	KUNDAH-II HPS	4	35.0	09/27/2021	09/29/2021	56.33	MONTHLY MAINTENANCE
KSEB							
69	KUTTIYADI ADDL EXTN	1	50.0	03/05/2022	03/09/2022	109.60	PENSTOCK PRESSURE SHAFT
		1	50.0	12/01/2021	01/01/2022	752.33	ANNUAL MAINTENANCE
		2	50.0	03/05/2022	03/09/2022	109.10	PENSTOCK PRESSURE SHAFT
		2	50.0	04/03/2021	05/01/2021	683.60	ANNUAL MAINTENANCE
70	KUTTIYADI EXTN HPS	4	50.0	05/05/2021	06/04/2021	731.05	ANNUAL MAINTENANCE
		4	50.0	01/24/2022	03/23/2022	1,401.88	ANNUAL MAINTENANCE
71	KUTTIYADI HPS	1	25.0	01/26/2022	01/30/2022	113.08	SCHEDULED CAPITAL
		1	25.0	03/11/2022	03/16/2022	136.67	OVERHAULING WORKS
		1	25.0	11/01/2021	11/26/2021	605.40	ANNUAL MAINTENANCE
		2	25.0	01/02/2022	01/22/2022	489.33	ANNUAL MAINTENANCE
		2	25.0	03/11/2022	03/16/2022	136.80	OVERHAULING WORKS
		2	25.0	01/26/2022	01/30/2022	113.37	SCHEDULED CAPITAL
		3	25.0	01/26/2022	01/30/2022	113.25	SCHEDULED CAPITAL
		3	25.0	03/11/2022	03/16/2022	136.70	OVERHAULING WORKS
TANGEDCO							
72	LOWER METTUR-III	5	15.0	04/16/2021	05/05/2021	452.67	ANNUAL MAINTENANCE
		5	15.0	03/02/2022	03/21/2022	469.00	ANNUAL MAINTENANCE
		6	15.0	04/16/2021	05/05/2021	453.17	ANNUAL MAINTENANCE
73	LOWER METTUR-IV	7	15.0	02/14/2022	03/06/2022	490.00	ANNUAL MAINTENANCE
		7	15.0	04/01/2021	04/14/2021	329.00	ANNUAL MAINTENANCE

S.No	STATION	UNIT	CAPACITY(MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		8	15.0	03/07/2022	03/26/2022	461.00	ANNUAL MAINTENANCE
74	METTUR DAM HPS	2	12.5	07/03/2021	08/03/2021	751.27	INSPECTION /MTCE
75	MOYAR HPS	1	12.0	03/24/2022	03/28/2022	96.50	MONTHLY MAINTENANCE
		2	12.0	03/24/2022	03/28/2022	96.58	MONTHLY MAINTENANCE
		3	12.0	03/24/2022	03/28/2022	96.25	MONTHLY MAINTENANCE
		3	12.0	09/26/2021	10/22/2021	628.33	OVERHAULING WORKS
KSEB							
76	NARIAMANGLAM HPS	1	17.55	04/01/2021	03/31/2022	8,760.00	ANNUAL MAINTENANCE
TANGEDCO							
77	PAPANASAM HPS	3	8.0	04/01/2021	04/29/2021	675.83	ANNUAL MAINTENANCE
		4	8.0	04/22/2021	05/27/2021	837.58	ANNUAL MAINTENANCE
78	PERIYAR HPS	2	42.0	05/01/2021	05/13/2021	305.33	MISCELLANEOUS PLANNED
		3	42.0	05/04/2021	05/25/2021	510.67	MISCELLANEOUS PLANNED
		4	35.0	04/10/2021	05/22/2021	1,016.00	ANNUAL MAINTENANCE
79	PYKARA ULTMATE HPS	2	50.0	04/01/2021	03/31/2022	8,760.00	ANNUAL MAINTENANCE
KSEB							
80	SABARIGIRI HPS	1	50.0	02/07/2022	02/23/2022	394.78	ANNUAL MAINTENANCE
		2	50.0	09/01/2021	10/23/2021	1,255.62	ANNUAL MAINTENANCE
		2	50.0	02/04/2022	02/10/2022	158.38	MAIN GENERTATOR
		3	50.0	12/14/2021	01/03/2022	499.67	ANNUAL MAINTENANCE
		5	50.0	01/10/2022	02/02/2022	564.67	ANNUAL MAINTENANCE
TANGEDCO							
81	SARKARPATHY HPS	1	30.0	06/02/2021	07/09/2021	900.17	MONTHLY MAINTENANCE
82	SURULIYAR HPS	1	35.0	07/01/2021	07/30/2021	719.92	MISCELLANEOUS PLANNED
KPCL							
83	VARAHI HPS	1	115.0	11/09/2021	12/11/2021	775.43	ANNUAL MAINTENANCE
		3	115.0	01/05/2022	01/17/2022	298.15	ANNUAL MAINTENANCE
Western							
MPPGCL							
84	BANSAGAR-II HPS	1	15.0	12/20/2021	12/24/2021	108.32	ANNUAL MAINTENANCE
		2	15.0	04/01/2021	09/03/2021	3,735.68	ANNUAL MAINTENANCE
85	BANSAGAR TONS-I	3	105.0	04/01/2021	03/31/2022	8,760.00	CAPITAL MAINTENANCE
NHDC							
86	INDIRA SAGAR HPS	3	125.0	04/01/2021	04/16/2021	354.67	ANNUAL MAINTENANCE
		4	125.0	04/16/2021	05/25/2021	949.53	ANNUAL MAINTENANCE
		5	125.0	03/01/2022	03/11/2022	257.90	ANNUAL MAINTENANCE
		5	125.0	05/01/2021	05/13/2021	300.87	ANNUAL MAINTENANCE
		6	125.0	05/17/2021	05/29/2021	287.67	ANNUAL MAINTENANCE
		7	125.0	05/31/2021	06/11/2021	260.28	ANNUAL MAINTENANCE

S.No	STATION	UNIT	CAPACITY(MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		7	125.0	03/13/2022	03/24/2022	275.57	ANNUAL MAINTENANCE
		8	125.0	01/21/2022	01/24/2022	81.37	MISC. SHORT DURATION
		8	125.0	06/12/2021	06/30/2021	439.97	ANNUAL MAINTENANCE
MAHAGENCO							
87	KOYNA-I&II HPS	5	80.0	03/02/2022	03/06/2022	113.33	CAPITAL MAINTENANCE
NHDC							
88	OMKARESHWAR HPS	1	65.0	04/02/2021	04/16/2021	337.13	ANNUAL MAINTENANCE
		2	65.0	05/01/2021	05/08/2021	176.10	ANNUAL MAINTENANCE
		2	65.0	06/23/2021	06/29/2021	152.13	ANNUAL MAINTENANCE
		3	65.0	05/27/2021	06/09/2021	320.38	ANNUAL MAINTENANCE
		4	65.0	04/16/2021	04/29/2021	312.45	ANNUAL MAINTENANCE
		5	65.0	05/18/2021	05/26/2021	200.15	ANNUAL MAINTENANCE
		5	65.0	06/10/2021	06/15/2021	128.37	ANNUAL MAINTENANCE
		6	65.0	06/16/2021	06/22/2021	152.82	ANNUAL MAINTENANCE
		6	65.0	05/10/2021	05/17/2021	176.52	ANNUAL MAINTENANCE
		7	65.0	03/15/2022	03/26/2022	273.75	ANNUAL MAINTENANCE
		8	65.0	03/02/2022	03/14/2022	290.75	ANNUAL MAINTENANCE
SSNNL							
89	S SAROVAR CHPH HPS	1	50.0	04/01/2021	08/16/2021	3,306.07	CAPITAL MAINTENANCE
90	S SAROVAR RBPH HPS	6	200.0	04/01/2021	04/16/2021	366.50	ANNUAL MAINTENANCE
MAHAGENCO							
91	VAITARNA HPS	1	60.0	11/07/2021	12/04/2021	670.17	ANNUAL MAINTENANCE
		1	60.0	12/05/2021	12/09/2021	109.88	ANNUAL MAINTENANCE

CHAPTER-5

FORCED OUTAGES
OF
HE UNITS

CHAPTER-5

FORCED OUTAGES OF HE UNITS

5.1 Forced outages of generating units are due to various problems in generating equipments, auxiliary systems, civil structures. Based on the analysis carried out for 727 hydro generating units installed in 210 Hydro Electric Power Stations, non-availability of hydro-electric units in the country due to forced outages during the year 2021-22 (excluding miscellaneous outages) was 2.88% as compared to 3.27% during 2020-21.

Unit-wise details of forced outages of duration 24 hours and above are given in **Annex- 5.1**.

During 2021-22, the generator and turbine faults accounted for 28.58% and 41.64% of the forced outages respectively whereas other equipment & civil structure faults accounted for 2.28% & 27.51% respectively of the forced outages. The summary of forced outages caused due to breakdown of generator, turbine and other equipment during 2021-22 vis-à-vis 2020-21 is given in **Table 5.1** below.

TABLE 5.1

EQUIPMENT/SYSTEM-WISE FORCED OUTAGES
(2021-22 VIS-A-VIS 2020-21)

Sl. No.	Equipment	Forced Outage (Hours)		% of total Forced Outage		Increase/ Decrease viz-z-viz 2020-21
		2021-22	2020-21	2021-22	2020-21	
1	Generator	44588.94	29383.71	28.58	16.92	-51.75
2	Turbine	64968.00	77437.71	41.64	44.60	16.10
3	Civil	42932.26	45016.77	27.51	25.92	4.63
4	Other	3551.99	21805.83	2.28	12.56	83.71
	Total	**156041.19**	**173644.02**	**100.00**	**100.00**	**10.14**

It is observed that forced outages in 2021-22 vis-a-vis 2020-21 have decreased on account of turbine and other equipment whereas the same have decreased on account of generator and civil structures.

5.2 FORCED OUTAGE DUE TO GENERATOR COMPONENTS

5.2.1 The major source of forced outage during 2021-22 includes Stator (51.62 %), followed by Rotor Fault (18.46 %), Excitation System (10.2 %) and Protection system (7.32 %) which together accounted for more than the 88% of the forced outages due to generator components.

The details of forced outages due to various generator faults and associated systems under different categories based on their size are given in **Table 5.2** below:

TABLE 5.2

FORCED OUTAGE HOURS DUE TO BREAKDOWN OF GENERATOR COMPONENTS (PERIOD: 2021-22)

Sl. No.	Components of Generator	Unit size up to 50 MW		Unit size above 50 MW & up to 100 MW		Unit size above 100 MW		Total	
1	AUTOMATIC VOLTAGE REGULATOR	0	0	608.35	6.08	0	0	**608.35**	**1.36**
2	BRAKE AND JACKS	3.23	0.01	1	0.01	74.63	0.91	**78.87**	**0.18**
3	EXCITATION SYSTEM	120.6	0.46	16.77	0.17	4409.57	53.96	**4546.94**	**10.2**
4	GENERATOR COOLING SYSTEM	14.13	0.05	0.85	0.01	30.6	0.37	**45.59**	**0.1**
5	LOWER GUIDE BEARING	30.42	0.12	2.88	0.03	732.57	8.96	**765.87**	**1.72**
6	MISCELLANEOUS GENERATOR	580.95	2.2	1397.01	13.96	109.86	1.34	**2087.81**	**4.68**
7	PROTECTION SYSTEM	703.69	2.66	41.87	0.42	2519.77	30.84	**3265.32**	**7.32**
8	ROTOR	142.25	0.54	7929.75	79.26	159.67	1.95	**8231.67**	**18.46**
9	STATOR	**23000.62**	**87.08**	0.77	0.01	16.85	0.21	**23018.23**	**51.62**
10	THRUST BEARING	1761.7	6.67	1.28	0.01	5.93	0.07	**1768.91**	**3.97**
11	UPPER GUIDE BEARING	55.63	0.21	1.38	0.01	111.96	1.37	**168.98**	**0.38**
12	VIBRATION/SOUND/ ALIGNMENT	0	0	2.4	0.02	0	0	**2.4**	**0.01**
	Total	**26413.22**	**100**	**10004.31**	**100**	**8171.42**	**100**	**44588.94**	**100**

From the Table 5.2, it is observed that Stator fault (87.08) constitute the major reason for forced outage in respect unit size up to 50 MW the major contributors of forced outage in respect unit size above 50 MW.

5.3 FORCED OUTAGE DUE TO TURBINE COMPONENTS

5.3.1 Faults in Miscellaneous Turbine Components parts (44.90%), Other Faults (37.056%) and Runner/underwater parts (13.59%) are the major reasons of forced outages on account of turbine components.

The details of forced outages due to various turbine faults and associated systems under different categories based on their size are given in **Table 5.3** below:

TABLE 5.3

FORCED OUTAGE HOURS DUE TO BREAKDOWN OF TURBINE COMPONENTS PERIOD: 2021-22

Sl. No.	Components of Turbine	Unit size up to 50 MW		Unit size above 50 MW & up to 100 MW		Unit size above 100 MW		Total	
1	GOVERNOR SYSTEM	99.05	0.16	4.70	1.67	18.38	0.72	**122.13**	**0.19**
2	MISCELLANEOUS TURBINE COMPONENTS	**28503.03**	**45.87**	113.60	40.41	556.65	21.84	**29173.29**	**44.90**
3	OTHERS	24064.35	38.73	0.00	0.00	11.30	0.44	**24075.65**	**37.06**
4	BEARING	84.32	0.14	14.35	5.10	139.85	5.49	**238.52**	**0.37**
5	GUIDE VANES	2.25	0.00	0.00	0.00	813.10	31.90	**815.35**	**1.26**
6	RUNNER/UNDERWATER PARTS	8760.00	14.10	70.71	25.16	0.90	0.04	**8831.61**	**13.59**
7	SHAFT VIBRATION/ALIGNMENT/S	573.51	0.92	69.18	24.61	1003.38	39.37	**1646.08**	**2.53**
8	MAIN INLET VALVE	51.62	0.08	8.55	3.04	5.20	0.20	**65.37**	**0.10**
	Total	**62138.13**	**100**	**281.10**	**100**	**2548.77**	**100**	**64968.00**	**100**

From the Table 5.3, it is observed that Miscellaneous turbine components (45.87%) constitute the major reason for forced outage in respect unit size up to 50 MW while Shaft vibrations/alignment constitute the major contributor of forced outage in respect of unit size above 50 MW.

5.4 ANALYSIS BASED ON TYPE OF TURBINE

The analysis of forced outages due to turbine components as per type of turbines is given in **Table 5.4** below:

TABLE 5.4

FORCED OUTAGES-TURBINE TYPE-WISE
PERIOD: 2021-22

S. No.	Type of Turbine	Number of Units	Installed Capacity MW	Forced Outage Hours	Avg. Forced Outage Hours per Unit
1	Bulb	26	684.00	0	0
2	Francis	419	32820.57	54981.33	131.22
3	Kaplan	133	4399.05	163.80	1.23
4	Pelton	149	8818.90	9822.86	69.55
	TOTAL	**727**	**46722.52**	**64968.00**	**89.36**

Forced outage rate was observed to be the highest in case of Francis turbines (131.22 hrs./unit) followed by Pelton turbines (69.55 hrs./unit) and Kaplan turbines (1.23 hrs./unit.

5.5 ANALYSIS BASED ON MAKE OF UNITS

The comparative performance of generating units of different makes is indicated in **Table 5.5**. The outage figures in the table relate to faults in turbine and generator only.

TABLE 5.5

FORCED OUTAGES DUE TO FAULT IN TURBINE & GENERATOR (SUPPLIER-WISE) PERIOD: 2021-22

S. No.	Name of Supplier/ Country of Make	No. of Units	Installed Capacity (MW)	Total No. of Forced Outages Hours)	Average Forced Outages due to Generating Units (Hours/Unit)	Performance Ranking in Term of Lowest Average Outage Hours/Unit
A-Indigenous						
1	BHEL	310	20030.30	72012.95	232.30	5
2	Others*	54	3395.50	35388.64	411.50	9
	SUB TOTAL	**364**	**23425.80**	**107401.59**	**271.22**	
B-Imported						
3	USA	9	351.00	5537.61	291.45	6
4	U.K.	63	1242.10	18776.09	302.84	7
5	France	31	2179.20	567.86	51.62	3
6	Canada	44	3132.00	401.68	10.57	1
7	USSR	26	2804.00	506.92	19.50	2
8	Switzerland	21	790.20	10045.31	313.92	8
9	Japan	76	6398.20	8251.73	111.51	4
10	Other	93	6400	30792.44	446.27	10
	SUB-TOTAL	**363**	**23296.70**	**74879.64**	**226.22**	
	TOTAL	**727**	**46722.50**	**182281.23**	**250.73**	

* Indigenous supplier like Andriz India, B Fouress Bangalore, Atstom India, VA Tech India, etc.

It is observed that Performance Ranking in Term of Lowest Average Outage Hours/Unit is best with Imported by country such as USSR, France & Canada.

5.6 ANALYSIS AGE-WISE

Details of forced outages of generating units commissioned during different years are indicated in **Table 5.6**. Forced outages caused by equipment failure i.e. the fault relating to generator, turbine, and auxiliary system equipments have been taken into account for the purpose of computation.

TABLE - 5.6

FORCED OUTAGES DUE TO EQUIPMENT BREAKDOWN (AGE-WISE) PERIOD: 2021-22

S. No.	Year of Commissioning	No. of Units	Installed Capacity (MW)	Forced Outage (Hours)	Average Annual Non-availability per Unit (Hours)
1	2021-22	7	393	50.23	7.18
2	2020-21	8	510	6.30	0.79
3	2019-20	2	300.00	0.00	0.0
4	2018-19	3	140.00	4.28	1.43
5	2017-18	16	795.00	2801.67	175.10
6	2016-17	18	1,659.00	457.63	25.42
7	2015-16	17	1,516.00	532.38	31.32
8	2010-11 to 2014-15	63	4,437.00	1217.83	19.33
9	2005-06 to 2009-10	66	7,077.00	9875.94	149.64
10	2000-01 to 2004-05	74	6,741.80	9828.11	132.81
11	1989-90 to 1999-2000	86	5,769.70	28775.03	334.59
12	1978-79 to 1988-89	124	7,259.10	24620.16	198.55
13	1967-68 to 1977-78	81	5,279.75	23706.8	292.68
14	Up to 1966-67	162	4,724.85	62182.2	383.84
	Total	**727**	**46722.50**	**182281.23**	**250.73**

It is observed that the per unit forced outage rate was relatively higher in older units and was maximum in the case of units commissioned in Up to 1966-67 (383.84 hrs./unit).

5.7 REGION-WISE PERFORMANCE

The region-wise summary of performance of the hydel generating units is indicated in **Table 5.7**. For the purpose of computation, all types of forced outages/tripping due to faults in generator, turbine, auxiliary system & other equipments and civil structure faults (excluding misc.) have been included.

TABLE 5.7

FORCED OUTAGES – REGION-WISE
PERIOD: 2021-22

S.No	Region	No. of Units	Installed Capacity (MW)	% Non-availability due to Forced Outages
1	Northern	256	19576.25	1.83
2	Western	101	7392	3.93
3	Southern	246	11739.5	2.31
4	Eastern	86	5987.75	0.40
5	North Eastern	38	2027.0	16.27
	All India	**727**	**46722.50**	**2.88**

Performance of hydro generating equipment installed in Eastern Region was the best as the non-availability due to forced outages was least (0.40%). The average non-availability of the units in the North Eastern Region (16.27) and in the Western Region (3.93%) was observed to be on the higher side.

5.8 FORCED OUTAGE – UTILITY-WISE

The forced outages of hydro electric units under various Central Sector Utilities, Private Sector and State Power Generation Corporations are indicated in **Table 5.8**.

All types of forced outages/tripping due to problems in generating units, auxiliary equipments and civil structure have been taken into account for the analysis.

Table 5.8

FORCED OUTAGES- BOARD /CORPORATION WISE
PERIOD: 2021-22

S. No.	Organization	No. of Units	Installed Capacity (MW)	Forced Outage (Hours)	Average Annual Forced Outage/Unit (Hours)
Central Sector					
1	BBMB	28	2938.30	365.67	13.06
2	DVC	5	143.20	567.86	113.57
3	NEEPCO.	20	1500.00	45263.01	2263.15
4	NHDC	16	1520.00	0.00	0.00
5	NHPC	70	5451.20	2077.40	29.68
6	NTPC LTD.	4	800.00	56.75	14.19
7	SJVNL	12	1912.02	194.83	16.24
8	THDC	8	1400.00	0.00	0.00
	Sub Total	**163**	**15664.72**	**48525.53**	**297.70**

State Sector					
1	APGCL	2	100.00	0.00	0.00
2	APGENCO	34	1796.75	60.03	1.77
3	CSPGCL	3	120.00	0.00	0.00
4	GSECL	8	540.00	0.00	0.00
5	HPPCL	8	406.00	159.86	19.98
7	HPSEB	12	372.00	139.87	11.66
8	JKSPDC	12	1110.00	0.00	0.00
9	JUUNL	2	130.00	0.00	0.00
10	KPCL	66	3617.20	10491.61	158.96
11	KSEB	47	1856.50	955.44	20.33
12	MAHAGENCO	24	2406.00	6744.77	281.03
13	MePGCL	13	322.00	8760.00	673.85
14	MPPGCL	23	875.00	19037.15	827.70
15	OHPC	31	2039.80	0.00	0.00
16	PSPCL	25	1051.00	0.00	0.00
17	RRVUNL	11	411.00	32824.35	2984.03
18	SSNNL	11	1450.00	4.25	0.39
19	TANGEDCO	69	2178.20	30604.25	443.54
20	TSGENCO	36	2405.60	7807.30	216.87
21	TUL	6	1200.00	1359.17	226.53
22	UJVNL	34	1252.15	2453.25	72.15
23	UPJVNL	15	501.60	0.00	0.00
24	WBSEDCL	12	986.00	0.00	0.00
	Sub Total	**504**	**27126.80**	**121401.31**	**240.88**
Private Sector					
1	ADHPL	2	192.00	129.90	64.95
2	AHPC (GVK)	4	330.00	203.50	50.88
3	DEPL	2	96.00	15.25	7.62
4	DLHP	1	34.00	0.00	0.00
5	E.P.P.L.	2	100.00	49.32	24.66
6	GBHPPL	2	70.00	2231.71	1115.86
7	GIPL	2	110.00	7.67	3.83
8	GMR BHHPL	3	180.00	0.00	0.00

9	HBPCL	7	1345.00	36.00	5.14
10	HSPCL	2	100.00	1.38	0.69
11	IAEPL	3	36.00	0.00	0.00
12	JPPVL	4	400.00	376.20	94.05
13	L&T	3	99.00	0.00	0.00
14	MBPC	2	113.00	48.85	24.42
12	MPCL	2	86.00	0.00	0.00
13	SEPL	2	97.00	263.25	131.62
14	SKPPPL	2	96.00	0.00	0.00
15	TATA MAH.	15	447.00	8991.38	599.43
	Sub Total	**60**	**3931.00**	**12354.40**	**205.91**
	All India Total	**727**	**46722.52**	**182281.23**	**250.73**

It is observed that utility-wise, per unit forced outages for generating units was maximum in respect of hydro-electric stations under RRVUNL (2984 hrs./unit). On the other hand, the hydro generating units of THDC, NHDC, APGCL, GSECL, CSPGCL, JKSPDC, JUUNL, PSPCL, OHPC, UPJVNL, WBSEDCL, DLHP, GMR BHHPL, IAEPL,L&T, MPCL, SKPPL. have reported nil forced outage operation.

5.9 DURATION OF FORCED OUTAGES

There were total 996 forced outages/tripping during the year 2021-22. Duration of individual outage varied widely from a few minutes to the maximum of full year.

The duration pattern of forced outages is indicated in **Table 5.9** and **Exhibit 5.1**. It could be seen that about 71.08% of the total forced shutdown were of duration less than 6 hours while 14.36% of outages were of duration varying from 6 to 24 hours and only 5.22% of shutdowns persisted for more than 10 days.

TABLE 5.9

DURATION PATTERN OF FORCED OUTAGES
PERIOD: 2021-22

S. No.	Duration of Hours	Number of Outages	% of Total of Outages
1	More than 10 days	52	5.22
2	Less than 6 hour	708	71.08
3	6 to 24 hours	143	14.36
4	1 to 10 days	93	9.34
	Total No. of Outages	**996**	**100**

5.10 FORCED OUTAGES - STATION-WISE

The number of H.E. Stations falling under various ranges of non-availability due to forced outages during the year 2021-22 vis-à-Vis 2020-21 is summarized below in **Table 5.10.**

TABLE 5.10

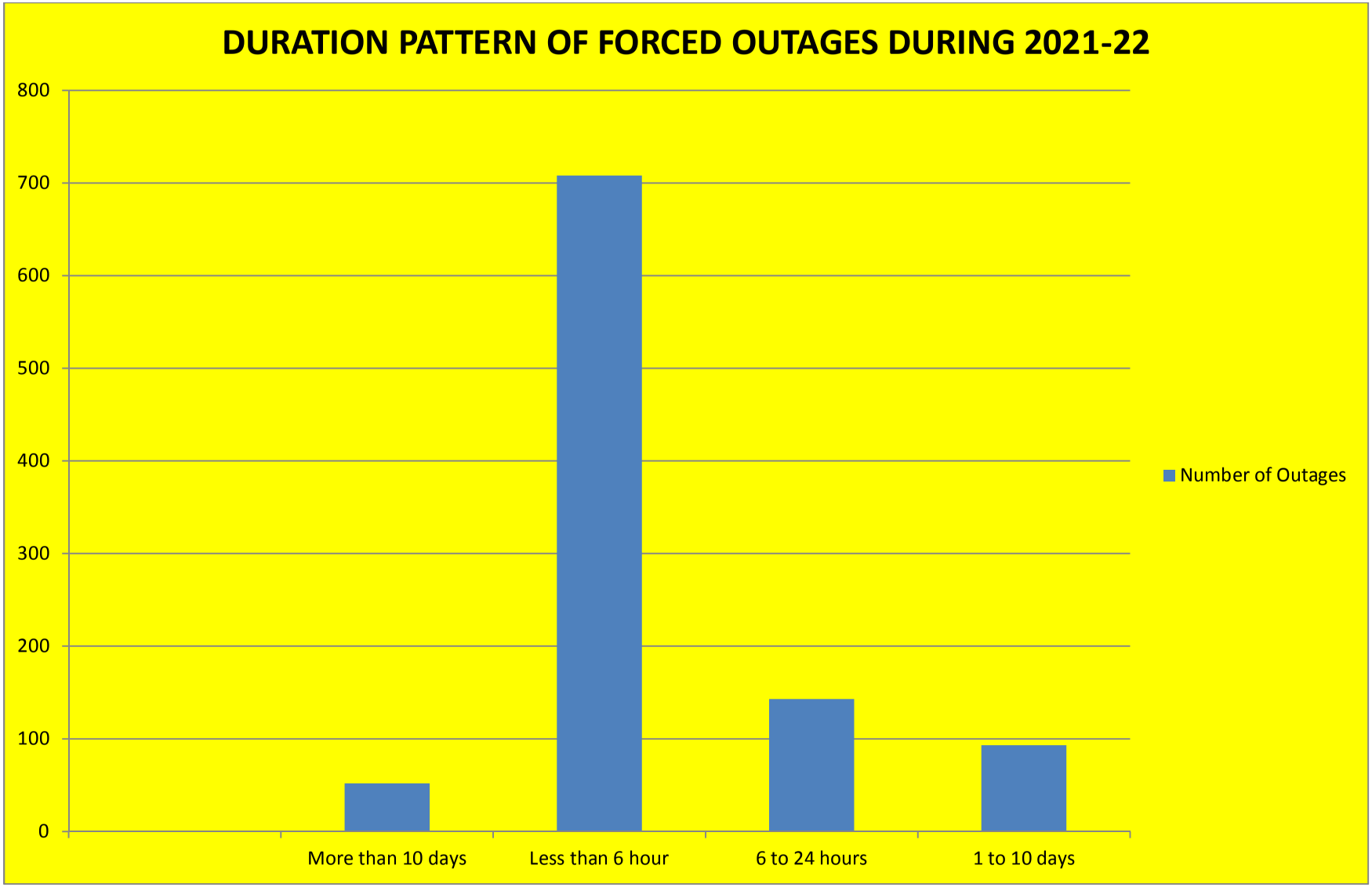
NON-AVAILABILITY OF HE STATIONS DUE TO FORCED OUTAGES (2021-22 VIS-A-VIS 2020-21)

% Non-Availability due to Forced Outages	2021-22				2020-21			
	Stations		Capacity		Stations		Stations	
	No.	% of Total	MW	% of Total	No.	% of Total	MW	% of Total
0	128	60.95	22,682.25	48.55	124	59.90	21588.70	46.72
>0 to 1	17	8.10	6,944.95	14.86	14	5.80	4101.30	8.88
>1 to 2	3	1.43	606.00	1.30	3	1.45	975	2.11
>2 to 3	0	0.00	0.00	0.00	1	0.48	75	0.16
>3 to 4	2	0.95	150.00	0.32	4	1.93	1212.20	2.62
>4 to 5	2	0.95	155.30	0.33	4	1.93	1004	2.17
>5	58	27.62	16,184.02	34.64	59	28.50	17253.02	37.34
Total	**210**	**100**	**46722.52**	**100**	**209**	**100**	**46209.22**	**100**

It could be seen from above that there was no forced outage at 128 nos. (60.95% of total) hydro-electric stations during 2021-22 as compared to 124 nos. (59.90% of total) hydro-electric stations during 2020-21.

27.62% of stations had operational availability lower than 95% on account of forced outages alone against the normative design/planned annual availability of 95% during the entire station life. These utilities need to improve their O&M practices to bring down their total outages i.e. planned & forced to less than 5% as per best practices.

It is observed from above that stations may be having high forced outages on account of ageing, O&M management issues, etc. Further, those stations which are having continuously high planned maintenance/forced outages over past few years may be requiring major repair and maintenance works or Renovation & Modernization (R&M) works for improving the availability, reliability & security of the plant besides providing life extension where the assets have outlived their useful life.


DURATION PATTERN OF FORCED OUTAGES DURING 2021-22
800
700
600
500
400
300
200
100
0
More than 10 days
Less than 6 hour
6 to 24 hours
1 to 10 days
Number of Outages

CENTRAL ELECTRICITY AUTHORITY
Hydro WING
Hydro Project Planning & Investigation Division

Annexure 5.1

DETAILS OF LONG DURATION FORCED OUTAGE IN HYDRO-ELECTRIC UNITS DURING: 2021-22

(OUTAGE DURATION 24 HOURS AND ABOVE)

S.NO	STATION	UNIT	CAPACITY(MW)	DATE OD OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
Northern							
ADHPL							
1	ALLAIN DUHANGAN HPS	1	96.0	11/18/21, 9:45 AM	11/19/21, 5:59 PM	32.23	NEEDLE PROBLEM
NHPC							
2	BAIRA SIUL HPS	3	60.0	9/3/21, 12:32 PM	9/4/21, 9:43 PM	33.18	GENERATOR DIFFERENTIALPROTECTION
		3	60.0	9/10/21, 5:30 PM	9/19/21, 3:06 PM	213.60	TURBINE MISC. PROBLEM
GBHPPL							
3	BUDHIL HPS	1	35.0	12/29/21, 7:25 PM	3/16/22, 4:00 PM	1844.59	ABNORMAL SOUND
		2	35.0	12/29/21, 7:25 PM	1/14/22, 10:32 PM	387.12	A.V.R. FAILURE
NHPC							
4	CHUTAK HPS	4	11.0	7/28/21, 7:23 PM	7/30/21, 10:20 AM	38.95	TURBINE SHAFT SEAL WORK/REPLACMEENT
UJVNL							
5	DHAKRANI HPS	2	11.25	5/6/21, 12:00 AM	6/25/21, 9:30 PM	1221.50	MISCELLANEOUS
NHPC							
6	DHAULI GANGA HPS	1	70.0	11/29/21, 5:08 PM	11/30/21, 7:31 PM	26.38	MISCELLANEOUS ELECTRICAL WORKS
HPSEB							
7	GIRI BATA HPS	1	30.0	6/5/21, 9:00 AM	6/6/21, 5:00 PM	32.00	LEAKAGE OIL VENT PIPE
		2	30.0	5/8/21, 9:00 AM	5/11/21, 5:00 PM	80.00	L.T.SUPPLY FAILURE.
NHPC							
8	KISHANGANGA HPS	1	110.0	8/8/21, 9:00 PM	8/9/21, 9:07 PM	24.11	NEEDLE PROBLEM
		2	110.0	5/30/21, 7:10 AM	6/1/21, 11:59 PM	64.82	GENERATOR DIFFERENTIALPROTECTION
		2	110.0	11/4/21, 5:45 PM	11/5/21, 7:09 PM	25.40	ROTOR EARTH FAULT
NTPC Ltd.							
9	KOLDAM	4	200.0	6/27/21, 5:40 AM	6/29/21, 2:25 PM	56.75	GENEARTOR MISC.
E.P.P.L.							
10	MALANA-II HPS	1	50.0	2/6/22, 4:29 PM	2/8/22, 4:15 PM	47.77	BREAKER/ISOLATOR PROBLEM
UJVNL							
11	MANERI BHALI-II HPS	4	76.0	8/28/21, 10:30 AM	8/29/21, 2:00 PM	27.50	MISCELLANEOUS

S.NO	STATION	UNIT	CAPACITY(MW)	DATE OD OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		4	76.0	11/8/21, 9:00 AM	11/9/21, 10:30 AM	25.50	VIBRATIONS
SJVNL							
12	NATHPA JHAKRI HPS	3	250.0	2/4/22, 6:51 AM	2/6/22, 4:23 PM	57.53	GENERATOR DIFFERENTIALPROTECTION
		4	250.0	2/5/22, 5:00 AM	2/6/22, 5:48 PM	36.80	MIV LEAKAGE
BBMB							
13	PONG HPS	2	66.0	7/29/21, 3:00 PM	7/30/21, 8:20 PM	29.33	COMPRESSED AIR SYSTEM PROBLEM
		3	66.0	7/29/21, 3:00 PM	8/3/21, 4:40 PM	121.67	COMPRESSED AIR SYSTEM PROBLEM
		5	66.0	7/29/21, 3:00 PM	8/1/21, 11:59 PM	81.00	COMPRESSED AIR SYSTEM PROBLEM
		6	66.0	7/29/21, 3:00 PM	8/1/21, 11:59 PM	81.00	COMPRESSED AIR SYSTEM PROBLEM
UJVNL							
14	RAMGANGA HPS	2	66.0	10/19/21, 12:05 PM	10/28/21, 8:45 PM	224.67	MISCELLANEOUS
		2	66.0	11/6/21, 12:00 PM	12/15/21, 3:40 PM	939.67	MISCELLANEOUS
SJVNL							
15	RAMPUR HPS	3	68.67	10/7/21, 4:58 PM	10/10/21, 6:01 PM	73.05	GEN./TR.BREAKER /AIR LEAK ABCB/MOCB OIL LEAK
RRVUNL							
16	R P SAGAR HPS	1	43.0	4/1/21, 12:00 AM	12/29/21, 4:21 PM	6544.35	FLOODING OF POWER HOUSE
		2	43.0	4/1/21, 12:00 AM	3/31/22, 11:59 PM	8760.00	GENERATOR STATOR DAMAGED
		3	43.0	4/1/21, 12:00 AM	3/31/22, 11:59 PM	8760.00	FLOODING OF POWER HOUSE
		4	43.0	4/1/21, 12:00 AM	3/31/22, 11:59 PM	8760.00	FLOODING OF POWER HOUSE
HPPCL							
17	SAWRA KUDDU HPS	2	37.0	3/10/22, 12:00 AM	3/16/22, 3:51 PM	159.86	TURBINE SHAFT SEAL LEAK/BOLTS BROKEN
AHPC (GVK)							
18	SHRINAGAR HPS	1	82.5	6/15/21, 7:45 AM	6/22/21, 10:00 PM	182.25	DESILTING CHAMBER PROBLEM
NHPC							
19	TANAKPUR HPS	2	31.4	7/21/21, 12:38 AM	7/22/21, 11:42 PM	47.07	TURBINE SHAFT SEAL LEAK/BOLTS BROKEN
JPPVL							
20	VISHNU PRAYAG HPS	2	100.0	3/13/22, 10:14 PM	3/16/22, 6:32 PM	68.30	PENSTOCK LEAKAGE
		3	100.0	10/30/21, 12:00 AM	11/11/21, 5:21 PM	305.35	BREAKER/ISOLATOR PROBLEM
Western							
TATA MAH.							
21	BHIRA PSS HPS	1	150.0	6/20/21, 5:25 AM	6/29/21, 6:25 PM	229.01	PENSTOCK EXP. JOINT PROBLEM
MPPGCL							
22	GANDHI SAGAR HPS	1	23.0	3/2/22, 12:00 AM	3/7/22, 11:20 PM	143.34	GEN. TRNASFORMER WINDING TEMP.HIGH

S.NO	STATION	UNIT	CAPACITY(MW)	DATE OD OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		2	23.0	4/1/21, 12:00 AM	3/31/22, 11:59 PM	8760.00	POWER HOUSE FLOODED
		3	23.0	4/1/21, 12:00 AM	3/31/22, 11:59 PM	8760.00	POWER HOUSE FLOODED
MAHAGENCO							
23	GHATGHAR PSS HPS	1	125.0	9/1/21, 8:50 PM	9/3/21, 2:10 AM	29.33	MISCELLANEOUS
		1	125.0	10/2/21, 4:30 PM	10/4/21, 1:40 AM	33.17	OIL LEAKAGE PROBLEM OPU/SUM/SYSTEM
		1	125.0	10/7/21, 1:34 AM	10/10/21, 12:15 PM	82.68	TURBINE BEARING OIL LEAKAGE
		1	125.0	11/10/21, 11:56 PM	2/12/22, 8:00 PM	2252.07	STATIC EXCITATION EQUIPMENT PROBLEM
		2	125.0	8/1/21, 5:20 AM	8/4/21, 12:30 PM	79.17	MISCELLANEOUS
		2	125.0	11/10/21, 11:56 PM	1/15/22, 8:15 PM	1580.32	STATIC EXCITATION EQUIPMENT PROBLEM
		2	125.0	1/19/22, 12:05 PM	1/21/22, 4:25 PM	52.33	A.V.R. FAILURE
		2	125.0	2/17/22, 9:55 PM	3/10/22, 8:35 PM	502.67	STATIC EXCITATION EQUIPMENT PROBLEM
TATA MAH.							
24	KHOPOLI HPS	2	24.0	4/1/21, 12:00 AM	3/31/22, 11:59 PM	8760.00	NEEDLE PROBLEM
MAHAGENCO							
25	KOYNA-III HPS	3	80.0	4/1/21, 12:00 AM	5/29/21, 3:20 PM	1407.33	GENERATOR EARTH FAULT
MPPGCL							
26	PENCH HPS	1	80.0	9/12/21, 12:00 AM	9/20/21, 8:14 PM	212.23	GENERATOR ON FIRE
		1	80.0	10/9/21, 12:00 AM	11/25/21, 10:50 AM	1138.84	GENEARTOR MISC.
MAHAGENCO							
27	VAITARNA HPS	1	60.0	2/22/22, 12:00 AM	3/19/22, 7:55 AM	607.92	AVR PROBLEM/TRIPPED
Southern							
TANGEDCO							
28	BHAWANI BARRAGE-II HPS	2	15.0	8/22/21, 8:06 PM	8/27/21, 8:15 PM	120.15	LUB.OIL SYSTEM PROBLEM
KPCL							
29	GERUSUPPA HPS	3	60.0	5/1/21, 5:50 AM	6/11/21, 12:00 AM	978.17	GENEATOR TRANSFORMER /BUSHING OIL LEAKAGE
KSEB							
30	IDUKKI HPS	6	130.0	6/7/21, 8:55 AM	6/10/21, 11:33 AM	74.63	BRAKING SYSTEM PROBLEM
		6	130.0	6/13/21, 7:48 AM	6/14/21, 5:41 PM	33.88	GOVERNING SYSTEM PROBLEM
KPCL							
31	JOG HPS	2	13.2	4/1/21, 12:00 AM	3/31/22, 11:59 PM	8760.00	STATOR COIL BURNT
		3	13.2	4/5/21, 5:10 PM	4/7/21, 12:40 PM	43.50	A.V.R. FAILURE
		4	13.2	4/16/21, 9:05 AM	4/19/21, 9:25 AM	72.33	NEEDLE PROBLEM
		6	21.6	8/16/21, 5:40 PM	8/17/21, 8:50 PM	27.17	NEEDLE PROBLEM

S.NO	STATION	UNIT	CAPACITY(MW)	DATE OD OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		8	21.6	4/1/21, 12:00 AM	4/12/21, 4:18 PM	280.30	STATOR COIL BURNT
		8	21.6	7/22/21, 10:50 AM	7/23/21, 7:05 PM	32.25	NEEDLE PROBLEM
TANGEDCO							
32	KADAMPARI HPS	1	100.0	4/2/21, 12:00 AM	10/18/21, 1:05 AM	4777.08	ROTOR EARTH FAULT
		1	100.0	12/17/21, 4:15 PM	3/31/22, 11:55 PM	2503.67	ROTOR MISC. FAULTS
		2	100.0	9/21/21, 12:05 AM	10/18/21, 1:05 AM	649.00	ROTOR MISC. FAULTS
		3	100.0	4/1/21, 12:00 AM	3/31/22, 11:59 PM	8760.00	RSD/LOW SCHEDULE
KPCL							
33	KADRA HPS	1	50.0	5/24/21, 8:30 AM	5/27/21, 7:05 PM	82.58	GEN./TR.BREAKER
		3	50.0	6/28/21, 10:30 AM	7/1/21, 7:40 PM	81.17	EHT/ISOLATOR PROBLEMS/MAINT.CHECK
TANGEDCO							
34	KODAYAR-I HPS	1	60.0	4/28/21, 11:09 AM	6/8/21, 12:00 AM	972.85	ROTOR/ ROTOR EARTH FAULT
		1	60.0	3/14/22, 9:50 AM	3/17/22, 8:32 AM	70.71	RUNNER
35	KODAYAR-II HPS	2	40.0	8/29/21, 10:45 PM	3/22/22, 4:55 PM	4914.17	STATOR
36	KUNDAH-I HPS	1	20.0	11/28/21, 8:35 AM	11/29/21, 8:35 PM	36.00	MISCELLANEOUS
		3	20.0	6/8/21, 7:40 PM	6/10/21, 4:45 PM	45.08	COOLING TOWER PROBLEM
KSEB							
37	KUTTIYADI ADDL EXTN	1	50.0	11/10/21, 8:00 AM	11/12/21, 5:47 PM	57.78	ROTOR MISC. FAULTS
38	KUTTIYADI EXTN HPS	4	50.0	7/7/21, 12:00 AM	7/8/21, 3:21 PM	39.35	ELECTRICAL SYSTEM/PANELS/CONTRACTOR/JUMP
39	KUTTIYADI HPS	2	25.0	9/20/21, 8:06 AM	9/21/21, 8:02 PM	35.93	STATOR
TANGEDCO							
40	METTUR TUNNEL HPS	4	50.0	8/13/21, 6:02 AM	8/24/21, 7:45 PM	277.70	GEN.PROTECTION RELAY OPERATION
		4	50.0	11/19/21, 8:50 AM	11/28/21, 10:03 PM	229.22	STATOR EARTH FAULT
41	MOYAR HPS	1	12.0	5/7/21, 4:55 PM	5/11/21, 9:05 AM	88.17	LEAKAGE OIL VENT PIPE
		1	12.0	6/1/21, 4:55 PM	6/3/21, 1:00 PM	44.08	SPARKING ACROSS SLIP RING/BRUSHES
		1	12.0	2/1/22, 12:00 AM	2/12/22, 8:00 PM	284.00	THRUST BEARING TEMP. HIGH
		2	12.0	2/13/22, 1:25 AM	2/15/22, 6:50 PM	65.42	ROTOR MISC. FAULTS
		3	12.0	6/10/21, 12:00 PM	6/12/21, 1:50 PM	49.83	MISCELLANEOUS
		3	12.0	10/25/21, 1:10 AM	11/3/21, 3:20 PM	230.17	VIBRATIONS
		3	12.0	12/1/21, 12:00 AM	1/30/22, 11:55 PM	1463.92	THRUST BEARING TEMP. HIGH
TSGENCO							
42	NAGARJUN SGR HPS	2	100.8	9/1/21, 12:00 AM	9/3/21, 9:07 PM	69.12	TURBINE SHAFT SEAL WORK/REPLACMEENT

S.NO	STATION	UNIT	CAPACITY(MW)	DATE OD OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		3	100.8	10/2/21, 10:28 PM	10/11/21, 5:06 PM	210.63	GEN. TRANSORMER PROTECTION RELAY OPERATION PROBLEM
		4	100.8	1/20/22, 8:30 AM	2/9/22, 7:38 PM	491.13	GENEATOR TRANSFORMER OIL PROBLEMS/TOPPING
		8	100.8	10/11/21, 4:01 AM	10/18/21, 9:13 PM	185.20	GENERATOR TRANSFORMER BUCHOLTZ
43	PRIYADARSHNI JURALA HPS	5	39.0	4/1/21, 12:00 AM	9/30/21, 12:59 PM	4380.98	REVERSE POWER RELAY OPERATION
KSEB							
44	SABARIGIRI HPS	2	50.0	10/24/21, 4:09 AM	11/7/21, 10:36 AM	342.45	GENERATOR DIFFERENTIALPROTECTION
		6	50.0	4/1/21, 12:00 AM	4/3/21, 5:35 PM	65.58	GENERATOR DIFFERENTIALPROTECTION
TSGENCO							
45	SRISAILAM LB HPS	3	150.0	4/1/21, 12:00 AM	5/17/21, 7:48 PM	1123.80	GENERATOR NEGATIVE PHASE SEQUENCE
		6	150.0	12/26/21, 12:00 AM	2/16/22, 6:23 PM	1266.38	GEN.PROTECTION RELAY OPERATION
TANGEDCO							
46	SURULIYAR HPS	1	35.0	9/4/21, 5:55 PM	3/31/22, 11:55 PM	4998.00	PENSTOCK REPAIR WORKS
Eastern							
DVC							
47	MAITHON HPS	1	20.0	7/1/21, 3:40 AM	7/2/21, 11:04 AM	31.40	GOVERNING SYSTEM PROBLEM
		2	23.2	6/26/21, 1:00 PM	6/29/21, 9:55 AM	68.92	EXCT. FAIL/LOSS OF EXCITATION /MISC. PROB.
		2	23.2	10/30/21, 6:00 PM	11/3/21, 6:17 PM	96.28	GEN./TR.BREAKER
		2	23.2	1/20/22, 9:40 AM	1/25/22, 12:55 PM	123.25	GEN./TR.BREAKER
		3	20.0	11/8/21, 11:15 AM	11/14/21, 5:05 PM	149.83	GOVERNING SYSTEM PROBLEM
NHPC							
48	RANGIT HPS	1	20.0	4/20/21, 6:30 PM	4/22/21, 6:54 PM	48.40	MAL-FUNCTION OF RELAY
		1	20.0	4/30/21, 6:30 PM	5/1/21, 11:59 PM	29.50	EXCITATION PROBLEM
		2	20.0	4/14/21, 6:31 PM	4/15/21, 11:59 PM	29.48	MAIN INLET VALVE PROBLEM
		2	20.0	8/27/21, 9:41 AM	8/29/21, 4:58 PM	55.28	UGB COOLING SYSTEM PROBLEM
		3	20.0	11/9/21, 5:55 PM	11/10/21, 10:12 PM	28.28	TURBINE BEARING PADS DAMAGED
SEPL							
49	TASHIDING HPS	1	48.5	5/27/21, 12:55 AM	5/28/21, 10:00 AM	33.08	DAM RESIDUAL WORKS
		1	48.5	6/17/21, 7:30 PM	6/19/21, 11:45 AM	40.25	DAM RESIDUAL WORKS
		1	48.5	6/25/21, 4:55 AM	6/26/21, 6:10 PM	37.25	LINE BREAKER FAULT
		2	48.5	5/27/21, 12:55 AM	5/28/21, 10:00 AM	33.08	DAM RESIDUAL WORKS
		2	48.5	6/17/21, 7:20 PM	6/19/21, 12:20 PM	41.00	DAM RESIDUAL WORKS
		2	48.5	6/25/21, 4:55 AM	6/26/21, 6:00 PM	37.08	BREAKER/ISOLATOR PROBLEM

S.NO	STATION	UNIT	CAPACITY(MW)	DATE OD OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
TUL							
50	TEESTA-III HPS	3	200.0	4/21/21, 3:00 PM	4/24/21, 6:30 PM	75.50	UPPER GUIDE BEARING MISC.
		4	200.0	10/11/21, 9:31 PM	11/7/21, 3:29 PM	641.98	GENERATOR TRANSFORMER
		6	200.0	4/1/21, 12:00 AM	4/16/21, 4:55 PM	376.92	MAIN DISC SEAL PROBLEM/REPLACEMENT
		6	200.0	1/15/22, 9:29 AM	1/24/22, 8:02 PM	226.55	BREAKER/ISOLATOR PROBLEM
NHPC							
51	TEESTA LOW DAM-III HPS	2	33.0	8/18/21, 12:02 AM	8/19/21, 10:57 AM	34.92	TURBINE SHAFT SEAL WORK/REPLACMEENT
52	TEESTA LOW DAM-IV HPS	1	40.0	6/29/21, 7:14 AM	6/30/21, 11:59 PM	40.77	MAL-FUNCTION OF RELAY
53	TEESTA V HPS	3	170.0	5/17/21, 6:08 PM	5/20/21, 12:27 AM	54.32	GEN.TR.BREAKER MECH.PROBLEM
North Eastern							
NEEPCO.							
54	DOYANG HPS	3	25.0	2/5/22, 6:08 PM	2/7/22, 5:23 PM	47.25	COOLING WATER SYSTEM PROBLEM/PIPES REPLACE
55	KAMENG HPS	1	150.0	4/1/21, 12:00 AM	4/18/21, 1:10 PM	421.17	LGB TEMPRATURE HIGH
		1	150.0	7/29/21, 8:05 AM	8/31/21, 2:48 AM	786.72	GUIDE VANES
		1	150.0	9/24/21, 2:51 PM	9/25/21, 3:54 PM	25.05	MISCELLANEOUS
		2	150.0	4/1/21, 12:00 AM	4/8/21, 10:22 PM	190.37	LOWER GUIDE BEARING MISC.
		2	150.0	5/12/21, 10:35 PM	6/20/21, 5:15 PM	930.67	TURBINE VIBRATION
		2	150.0	6/20/21, 5:59 PM	6/23/21, 8:57 PM	74.97	LGB TEMPRATURE HIGH
		2	150.0	6/28/21, 7:58 PM	6/30/21, 4:26 PM	44.47	LGB TEMPRATURE HIGH
		3	150.0	4/1/21, 12:00 AM	5/14/21, 2:03 PM	1046.05	PENSTOCK REPAIR WORKS
		3	150.0	6/18/21, 8:32 AM	6/19/21, 6:22 PM	33.83	GENERATOR TRANSFORMER
		3	150.0	8/19/21, 12:00 AM	9/29/21, 6:44 PM	1002.73	MISCELLANEOUS
		3	150.0	10/18/21, 8:06 AM	11/14/21, 7:19 PM	659.22	MISCELLANEOUS
		3	150.0	3/7/22, 12:00 AM	3/21/22, 7:30 PM	355.50	MISCELLANEOUS
		4	150.0	4/1/21, 12:00 AM	5/12/21, 7:08 PM	1003.13	PENSTOCK REPAIR WORKS
		4	150.0	5/17/21, 3:46 PM	5/18/21, 6:37 PM	26.85	STATOR EARTH FAULT
		4	150.0	6/27/21, 12:00 AM	7/1/21, 6:11 PM	114.18	ROTOR EARTH FAULT
		4	150.0	9/20/21, 12:00 AM	1/15/22, 3:32 PM	2823.53	MISCELLANEOUS
56	KHONDONG HPS	2	25.0	11/22/21, 5:00 PM	11/23/21, 6:27 PM	25.45	ABNORMAL SOUND
57	KOPILI HPS	1	50.0	4/1/21, 12:00 AM	3/31/22, 11:59 PM	8760.00	PENSTOCK LEAKAGE
		2	50.0	4/1/21, 12:00 AM	3/31/22, 11:59 PM	8760.00	PENSTOCK LEAKAGE
		3	50.0	4/1/21, 12:00 AM	3/31/22, 11:59 PM	8760.00	PENSTOCK LEAKAGE

S.NO	STATION	UNIT	CAPACITY(MW)	DATE OD OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		4	50.0	4/1/21, 12:00 AM	3/31/22, 11:59 PM	8760.00	PENSTOCK LEAKAGE
MeECL							
58	KYRDEMKULAI HPS	2	30.0	4/1/21, 12:00 AM	3/31/22, 11:59 PM	8760.00	RUNNER LABYRING DAMAGED
NHPC							
59	LOKTAK HPS	3	35.0	10/14/21, 1:20 PM	10/15/21, 5:21 PM	28.02	TURBINE SHAFT SEAL LEAK/BOLTS BROKEN
		3	35.0	3/6/22, 4:00 PM	3/9/22, 9:35 PM	77.58	GOVERN.SYSTEM TROUB/EQPT. FAIL/EHG FAULT
NEEPCO.							
60	RANGANADI HPS	1	135.0	3/22/22, 12:00 AM	3/29/22, 2:15 PM	182.25	MISCELLANEOUS
		3	135.0	4/5/21, 10:30 AM	4/6/21, 1:00 PM	26.50	GEN. COOLING SYSTEM MISC. / INSPECTION

CHAPTER-6

OPERATING AVAILABILITY OF HE UNITS

CHAPTER-6

OPERATING AVAILABILITY OF HE UNITS

6.1 Based on the analysis of data received from the utilities regarding planned maintenance undertaken and forced outages at 727 Hydro Generating units of 210 HE Stations comprising of 46722.52 MW, operating availability of various units and stations has been computed. During the year 2021-22, the average operating availability of hydro generating units on all India basis was 93.67% as compared to 92.68% during 2020-21.

The station-wise/unit-wise non-availability due to Planned Maintenance (P.M) and Forced Outages (F.O) and overall operating availability of various H.E. Stations in the country is indicated in **Annex-6.1**. The station-wise details are also graphically depicted in **Exhibits from 6.1 to 6.14**.

6.2 The number of H.E. Stations falling under various ranges of operating availability during the year 2021-22 is summarized below in **Table 6.1.**

TABLE 6.1

OPERATING AVAILABILITY OF H.E. STATIONS (PERIOD: 2021-22)

Operating Availability (%)	No. of Stations	% of total Stations	Installed Capacity (MW)	% of total Installed Capacity
>=95%	149	70.95	33943.37	72.65
>=90 to 95	23	10.95	5044.20	10.80
>=85 to 90	15	7.14	3595.95	7.70
>=80 to 85	6	2.86	1305.00	2.79
<80	17	8.10	2834.00	6.07
Total	**210**	**100.00**	**46722.52**	**100.00**

6.3 OPERATING AVAILABILITY – REGION-WISE

Region-wise operating availability of hydro-electric units during 2021-22 is indicated in **Table 6.2**.

TABLE 6.2

AVAILABILITY OF UNITS - REGION-WISE
PERIOD: 2021-22

Sl. No.	Region	No. of Units	Installed Capacity (MW)	Planned Maintenance	Forced Outage %	Operating Availability (%)
1	Northern	256	19576.25	4.24	1.83	93.92
2	Western	101	7392	2.59	3.93	93.47
3	Southern	246	11739.5	3.04	2.31	94.64
4	Eastern	86	5987.75	4.16	0.40	95.43
5	N- Eastern	38	2027.0	1.46	16.27	82.28
	All India	**727**	**46722.50**	**3.45**	**2.88**	**93.67**

It is seen that the operating availability of hydel generating units during 2021-22 was the highest (95.43%) in Eastern Region due to relatively lower forced outages. The operating availability was the lowest in case of units in North-Eastern Region (82.28%) due to high planned maintenance and forced outages.

6.4 OPERATING AVAILABILITY: AGE-WISE

The average operating availability during 2021-22 of hydro units commissioned in various years has been indicated in **Table 6.3**. It is observed that units commissioned during 2020-21 have achieved the operating availability of more than 92%. Operating availability was more than 90% for all the other years.

TABLE - 6.3

OPERATING AVAILABILITY – AGE-WISE
PERIOD: 2021-22

Sl. No.	Year of Commissioning	No. of Units	Installed Capacity (MW)	Operating Availability (%)
1	2021-22	7	393	99.23
2	2020-21	8	510	99.97
3	2019-20	2	300.00	100.00
4	2018-19	3	140.00	100.00
5	2017-18	16	795.00	85.86
6	2016-17	18	1659.00	96.14
7	2015-16	17	1516.00	98.25
8	2010-11 to 2014-15	63	4437.00	92.07
9	2005-06 to 2009-10	66	7077.00	93.56
10	2000-01 to 2004-05	74	6741.80	94.48
11	1989-90 to 1999-2000	86	5769.70	90.47
12	1978-79 to 1988-89	124	7259.10	90.05
13	1967-68 to 1977-78	81	5279.75	86.37
	Total	**727**	**46722.52**	**93.67**

6.5 OPERATING AVAILABILITY – UTILITY-WISE

Sector-wise/State & Private Power Generating Corporation-wise operating availability of HE units is indicated in **Table 6.4**.

It was observed that the operating availability of generating units of Private Sector was the highest (96.53%) followed by State Sector (94.42%) and Central Sector (90.38%).

TABLE 6.4

SECTOR-WISE OPERATING AVAILABILITY OF UTILITIES FOR PERIOD: 2021-22

S. No.	Organization	No. of Units	Installed Capacity	Planned Maintenance	Forced Outage	Operating Availability per Unit
			(MW)	(%)	(%)	(%)
Central						
1	BBMB	28	2938.30	3.76	0.15	96.09
2	DVC	5	143.20	1.78	1.30	96.92
3	NEEPCO.	20	1500.00	2.27	25.84	71.90
4	NHDC	16	1520.00	4.11	0.00	95.89
5	NHPC	70	5451.20	10.61	0.34	89.05
6	NTPC Ltd.	4	800.00	1.30	0.16	98.53
7	SJVNL	12	1912.02	2.61	0.19	97.21
8	THDC	8	1400.00	1.14	0.00	98.86
Sub Total (CS)		**163**	**15664.72**	**6.22**	**3.40**	**90.38**
State						
1	APGCL	2	100.00	0.00	0.00	100.00
2	APGENCO	34	1796.75	0.00	0.02	99.98
3	CSPGCL	3	120.00	0.00	0.00	100.00
4	GSECL	8	540.00	0.00	0.00	100.00
5	HPPCL	8	406.00	0.77	0.23	99.00
6	HPSEB	12	372.00	4.67	0.13	95.20
7	JKSPDC	12	1110.00	2.09	0.00	97.91
8	JUUNL	2	130.00	0.00	0.00	100.00
9	KPCL	66	3617.20	2.87	1.81	95.32
10	KSEB	47	1856.50	6.14	0.23	93.63
11	MAHAGENCO	24	2406.00	0.42	3.21	96.37
12	MeECL	13	322.00	0.00	7.69	92.31
13	MPPGCL	23	875.00	6.26	9.45	84.29
14	OHPC	31	2039.80	7.63	0.00	92.37

S. No.	Organization	No. of Units	Installed Capacity	Planned Maintenance	Forced Outage	Operating Availability per Unit
			(MW)	(%)	(%)	(%)
15	PSPCL	25	1051.00	1.22	0.00	98.78
16	RRVUNL	11	411.00	0.00	34.06	65.94
17	SSNNL	11	1450.00	3.82	0.00	96.17
18	TANGEDCO	69	2178.20	3.92	5.06	91.02
19	TSGENCO	36	2405.60	0.00	2.48	97.52
20	TUL	6	1200.00	3.24	2.59	94.18
21	UJVNL	34	1252.15	3.18	0.82	96.00
22	UPJVNL	15	501.60	0.00	0.00	100.00
23	WBSEDCL	12	986.00	0.00	0.00	100.00
Sub Total (State)		**504**	**27126.80**	**2.83**	**2.75**	**94.42**
Private						
1	ADHPL	2	192.00	7.42	0.74	91.83
2	AHPC (GVK)	4	330.00	0.00	0.58	99.42
3	DEPL	2	96.00	6.94	0.09	92.98
4	DLHP	1	34.00	0.00	0.00	100.00
5	E.P.P.L.	2	100.00	0.05	0.28	99.67
6	GBHPPL	2	70.00	0.00	12.74	87.26
7	GIPL	2	110.00	2.60	0.04	97.36
8	GMR BHHPL	3	180.00	0.00	0.00	100.00
9	HBPCL	7	1345.00	1.17	0.06	98.78
10	HSPCL	2	100.00	0.00	0.02	99.98
11	IAEPL	3	36.00	0.00	0.00	100.00
12	JPPVL	4	400.00	0.43	1.07	98.49
13	L&T	3	99.00	0.00	0.00	100.00
14	MBPC	2	113.00	0.95	0.37	98.68
15	MPCL	2	86.00	2.02	0.00	97.98
16	SEPL	2	97.00	1.27	1.50	97.23
17	SKPPPL	2	96.00	0.00	0.00	100.00
18	TATA MAH.	15	447.00	0.00	6.84	93.15
Sub Total (Pvt.)		**60**	**3931.00**	**0.93**	**2.54**	**96.53**
Grand Total		**727**	**46722.52**	**3.45**	**2.88**	**93.67**

6.6 OPERATING AVAILABILITY BELOW 90%- STATION-WISE

It is observed that 11 nos. of stations had operating availability below 90% continuously for last 3 years. The details of these stations is given below in **Table 6.5.** As normative availability factor for entire useful life of station considered during planning stage is 95%, the stations/utilities having lower operating availability factor need to improve their O&M practices to bring down the outages as per best practices.

TABLE-6.5

OPERATING AVAILABILITY OF H. E. STATIONS CONTINUOUSLY LESS THAN 90% DURING LAST THREE YEARS (2019-20 To 2021-22)

Sl. No.	Name of the Stations	Name of the Utility	Installed Capacity (MW)	Operating Availability (%)		
				2019-20	2020-21	2021-22
1	BAIRA SIUL HPS	NHPC	180.00	54.21	65.44	78.45
2	BALIMELA HPS	OHPC	510.00	86.92	87.50	87.50
3	GHATGHAR PSS HPS	MAHAGENCO	250.00	76.84	52.11	73.23
4	GIRI BATA HPS	HPSEB	60.00	83.65	73.05	88.83
5	HIRAKUD HPS	OHPC	275.50	67.56	71.43	80.48
6	IDUKKI HPS	KSEB	780.00	81.78	80.23	88.94
7	KADAMPARI HPS	TANGEDCO	400.00	75.00	32.93	46.31
8	KISHANGANGA HPS	NHPC	330.00	68.90	70.70	83.94
9	KODAYAR-I HPS	TANGEDCO	60.00	83.76	83.71	88.09
10	KYRDEMKULAI HPS	MeECL	60.00	50.00	50.00	50.00
11	PARBATI-III HPS	NHPC	520.00	82.33	85.35	89.89

EXHIBIT 6.1

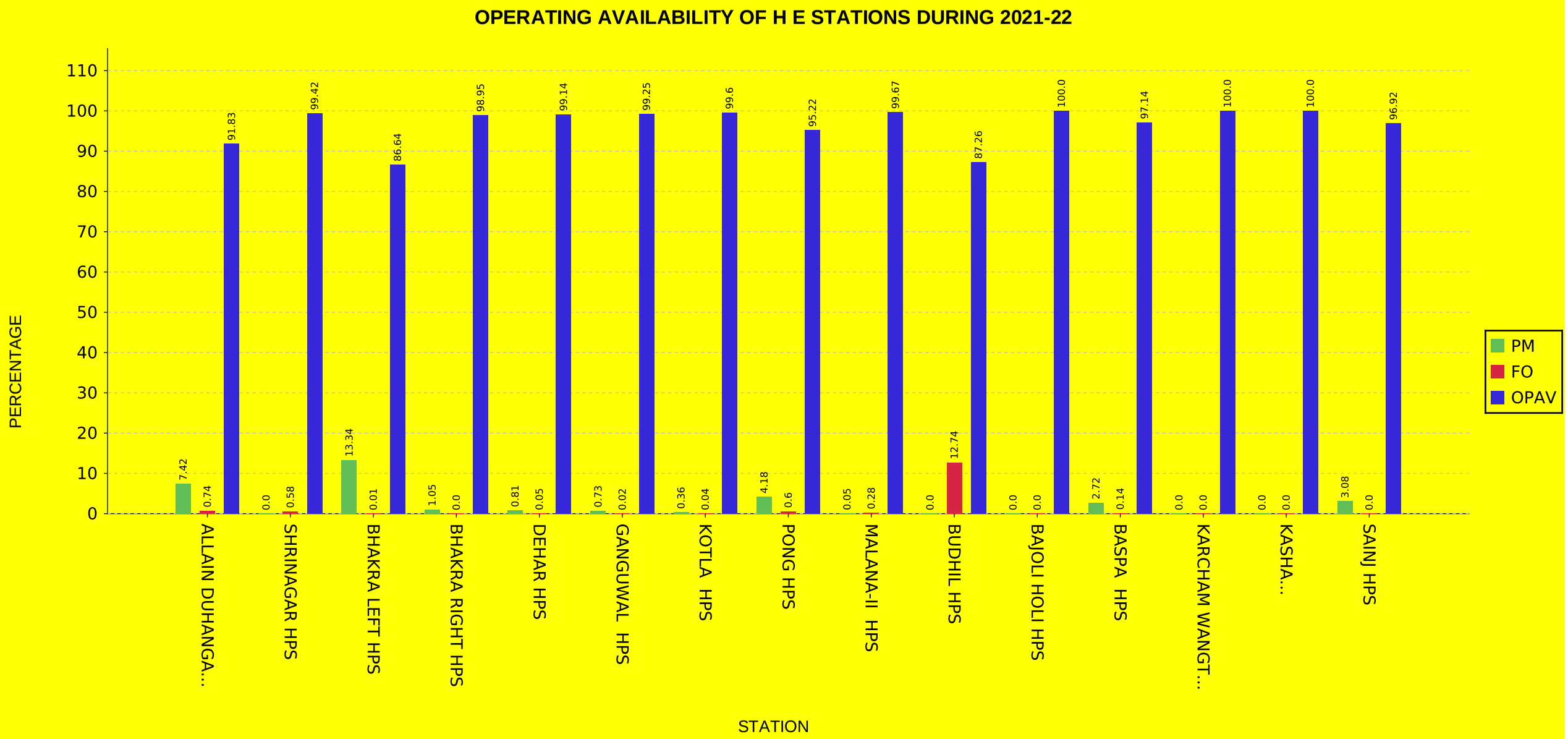

OPERATING AVAILABILITY OF H E STATIONS DURING 2021-22
PERCENTAGE
0
10
20
30
40
50
60
70
80
90
100
110
7.42
0.74
91.83
0.0
0.58
99.42
13.34
0.01
86.64
1.05
0.0
98.95
0.81
0.05
99.14
0.73
0.02
99.25
0.36
0.04
99.6
4.18
0.6
95.22
0.05
0.28
99.67
0.0
12.74
87.26
0.0
0.0
100.0
2.72
0.14
97.14
0.0
0.0
100.0
0.0
0.0
100.0
3.08
0.0
96.92
ALLAIN DUHANGA...
SHRINAGAR HPS
BHAKRA LEFT HPS
BHAKRA RIGHT HPS
DEHAR HPS
GANGUWAL HPS
KOTLA HPS
PONG HPS
MALANA-II HPS
BUDHIL HPS
BAJOLI HOLI HPS
BASPA HPS
KARCHAM WANGT...
KASHA...
SAINJ HPS
STATION
PM
FO
OPAV

EXHIBIT 6.2

OPERATING AVAILABILITY OF H E STATIONS DURING 2021-22

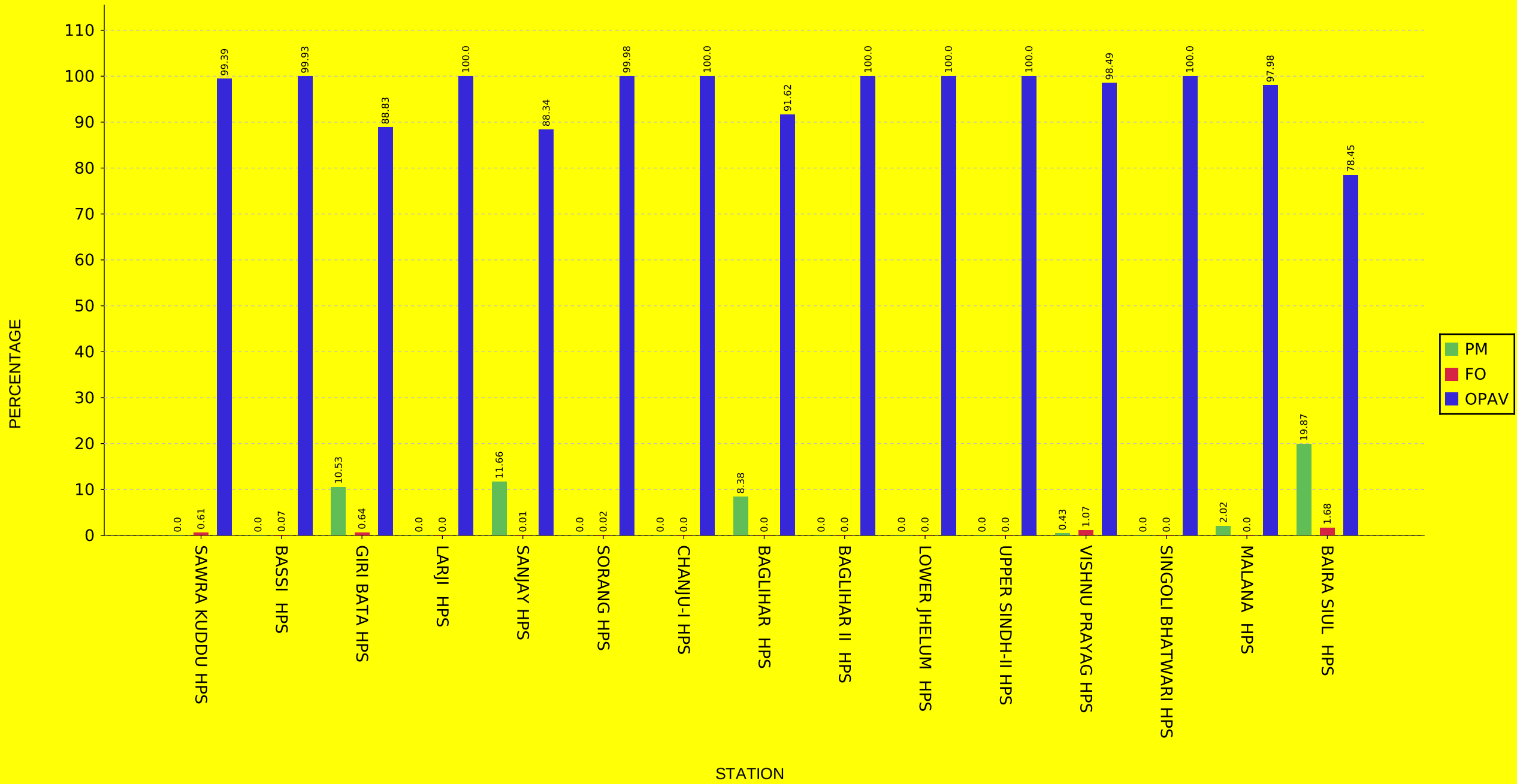


EXHIBIT 6.3

OPERATING AVAILABILITY OF H E STATIONS DURING 2021-22

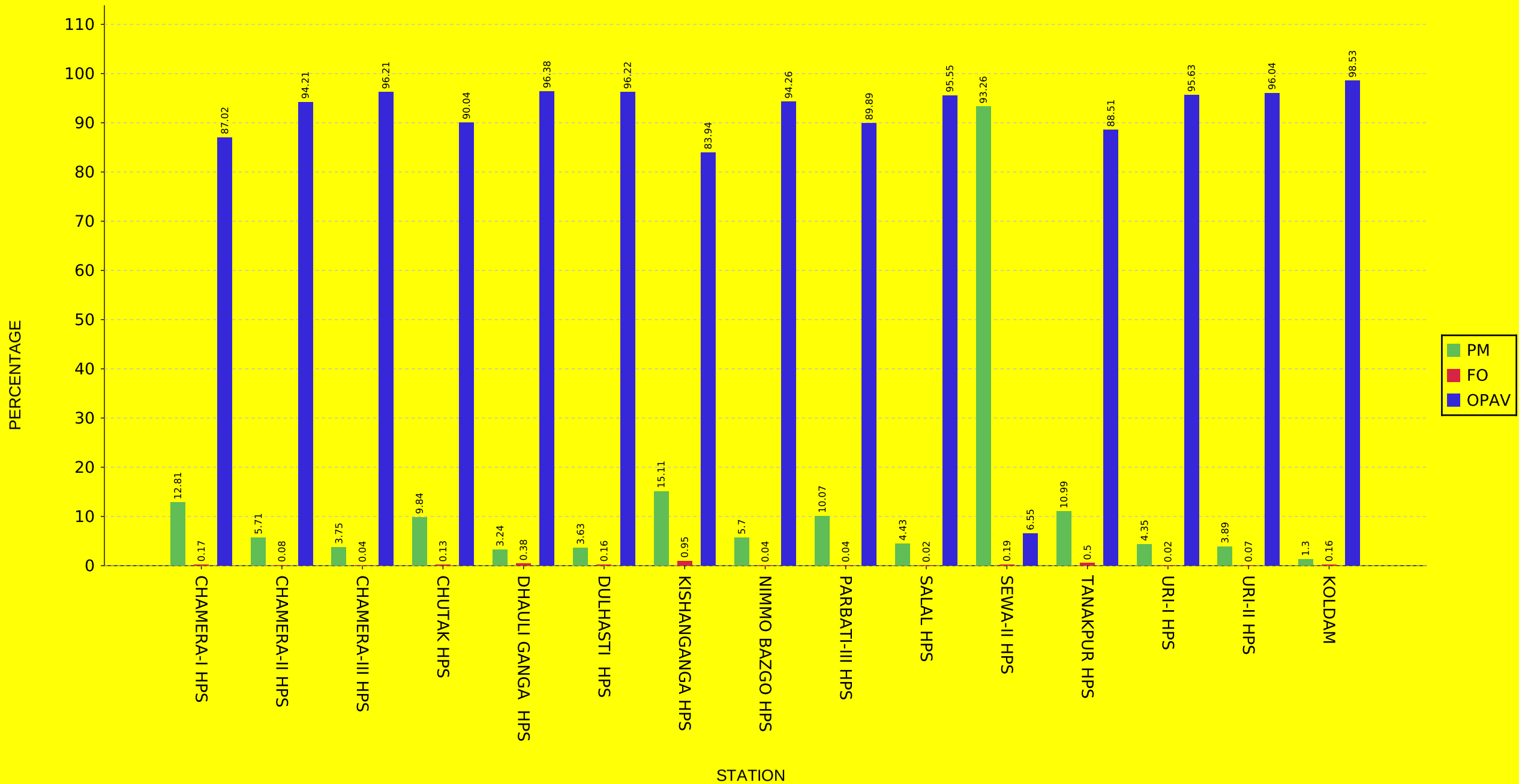


EXHIBIT 6.4

OPERATING AVAILABILITY OF H E STATIONS DURING 2021-22

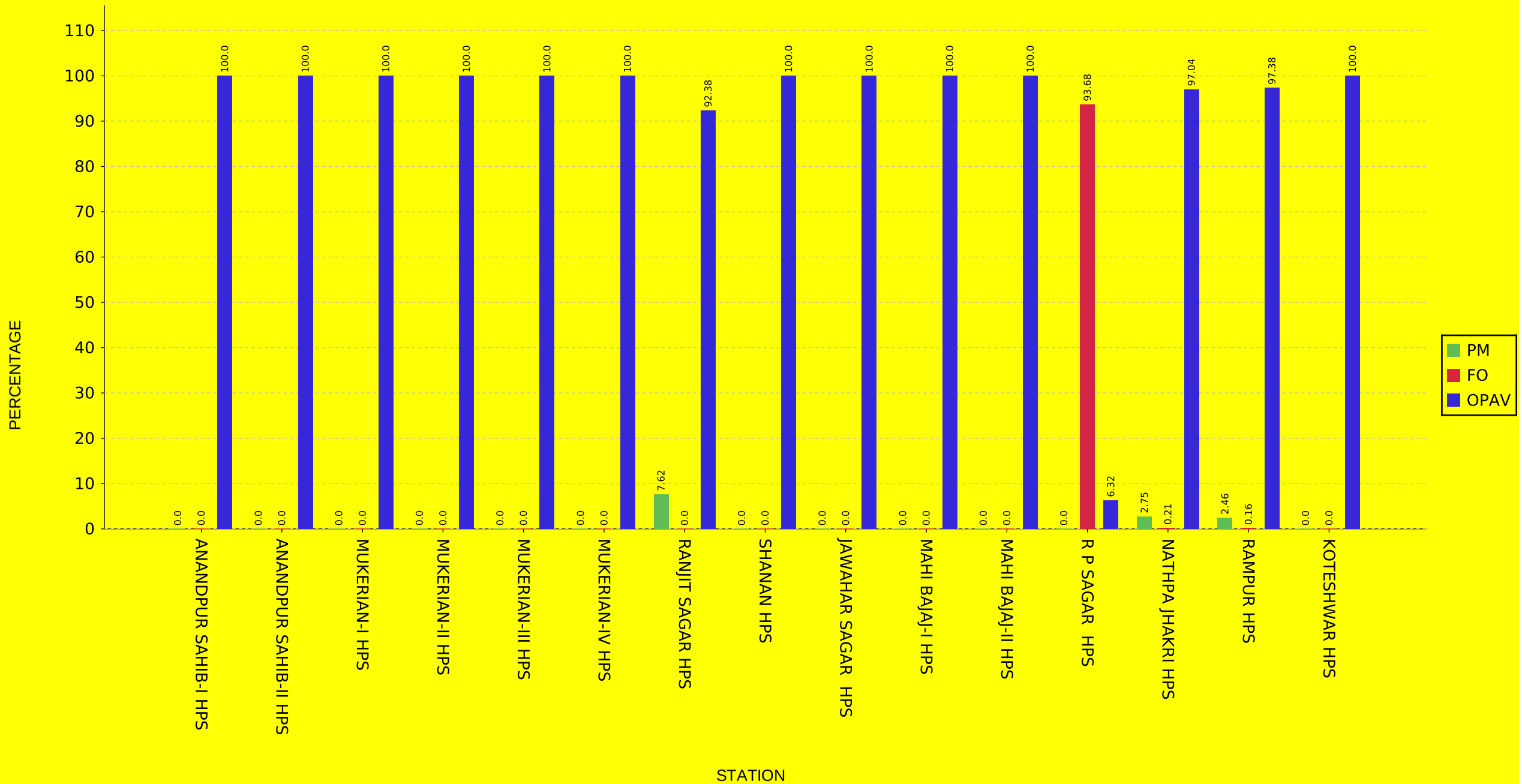


EXHIBIT 6.5

OPERATING AVAILABILITY OF H E STATIONS DURING 2021-22

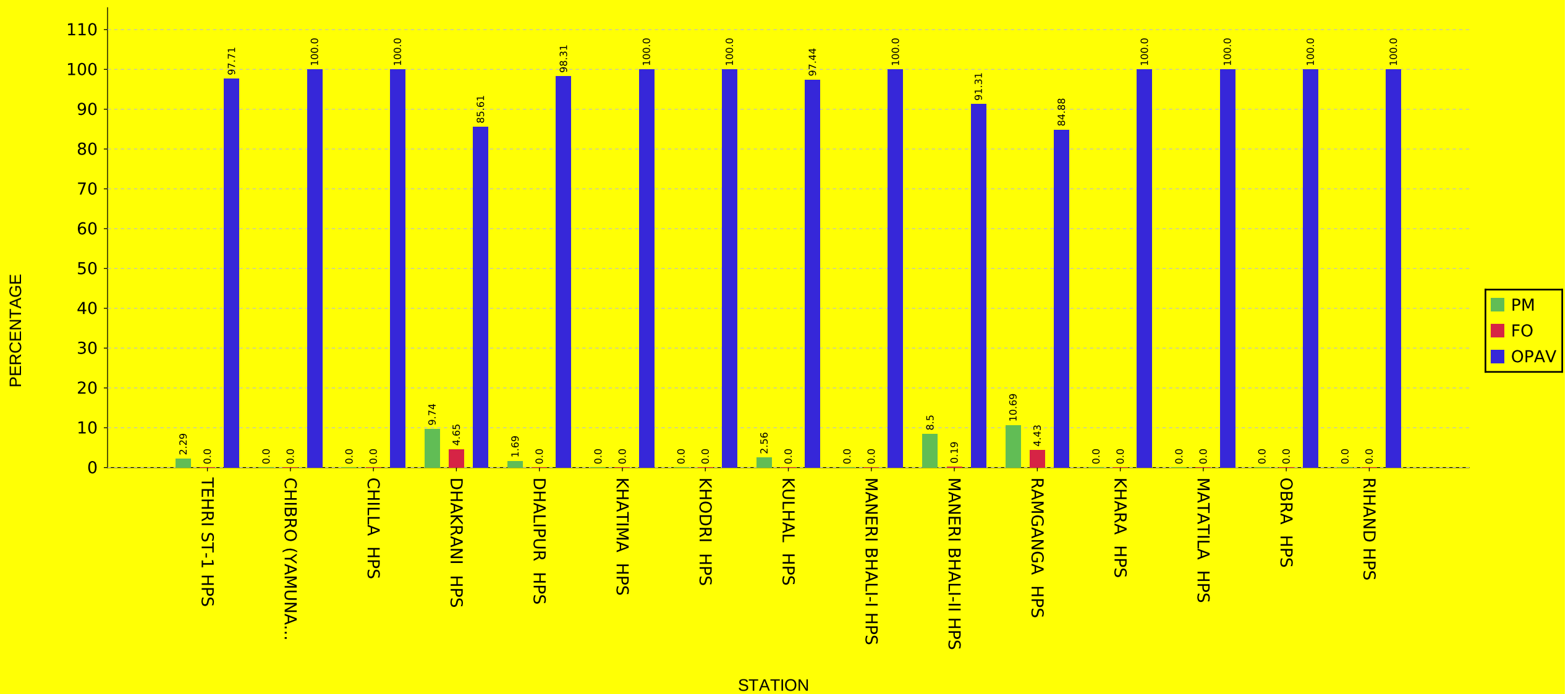


EXHIBIT 6.6

OPERATING AVAILABILITY OF H E STATIONS DURING 2021-22

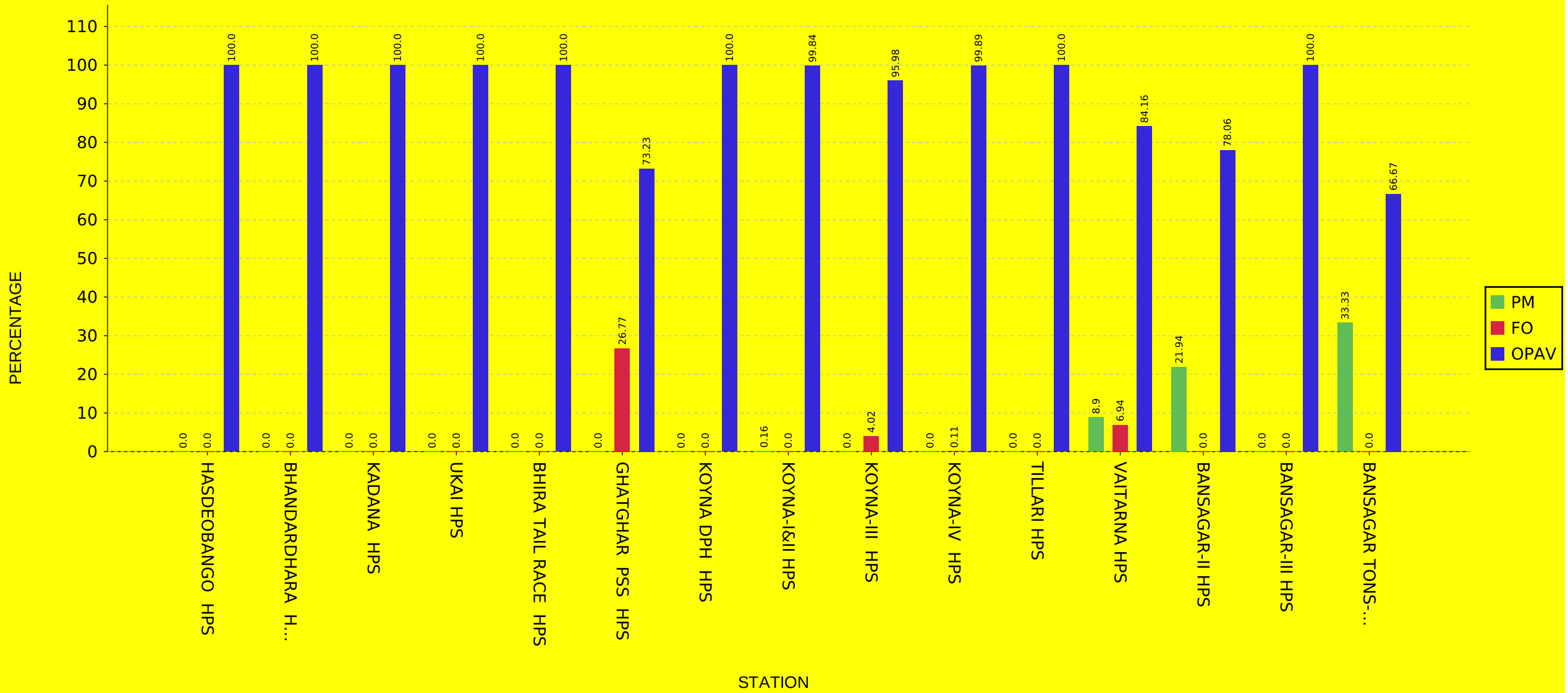


EXHIBIT 6.7

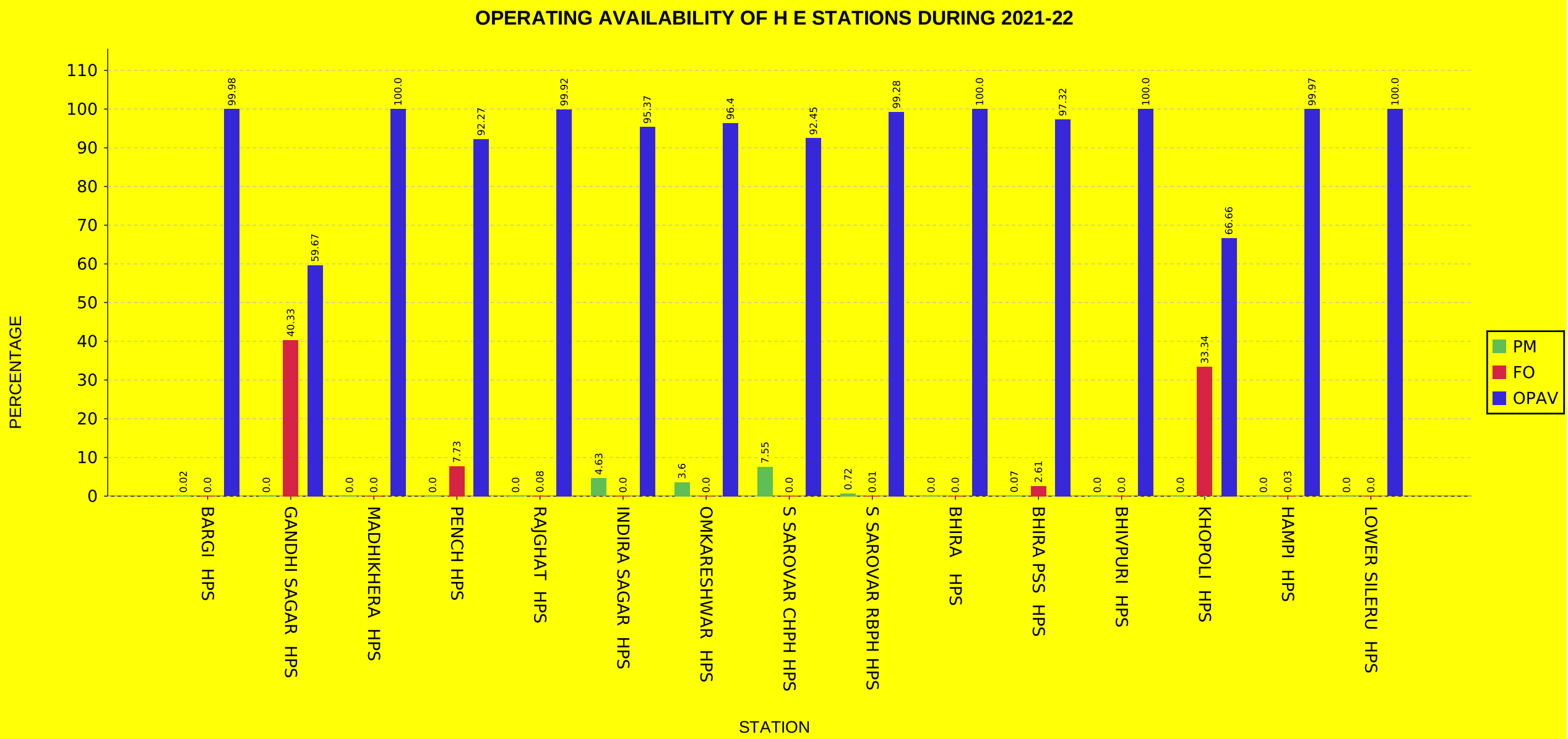

OPERATING AVAILABILITY OF H E STATIONS DURING 2021-22
PERCENTAGE
0
10
20
30
40
50
60
70
80
90
100
110
BARGI HPS
GANDHI SAGAR HPS
MADHIKHERA HPS
PENCH HPS
RAJGHAT HPS
INDIRA SAGAR HPS
OMKARESHWAR HPS
S SAROVAR CHPH HPS
S SAROVAR RBPH HPS
BHIRA HPS
BHIRA PSS HPS
BHIVPURI HPS
KHOPOLI HPS
HAMPI HPS
LOWER SILERU HPS
STATION
PM
FO
OPAV
0.02
0.0
99.98
0.0
40.33
59.67
0.0
0.0
100.0
0.0
7.73
92.27
0.0
0.08
99.92
4.63
0.0
95.37
3.6
0.0
96.4
7.55
0.0
92.45
0.72
0.01
99.28
0.0
0.0
100.0
0.07
2.61
97.32
0.0
0.0
100.0
0.0
33.34
66.66
0.0
0.03
99.97
0.0
0.0
100.0

EXHIBIT 6.8

OPERATING AVAILABILITY OF H E STATIONS DURING 2021-22

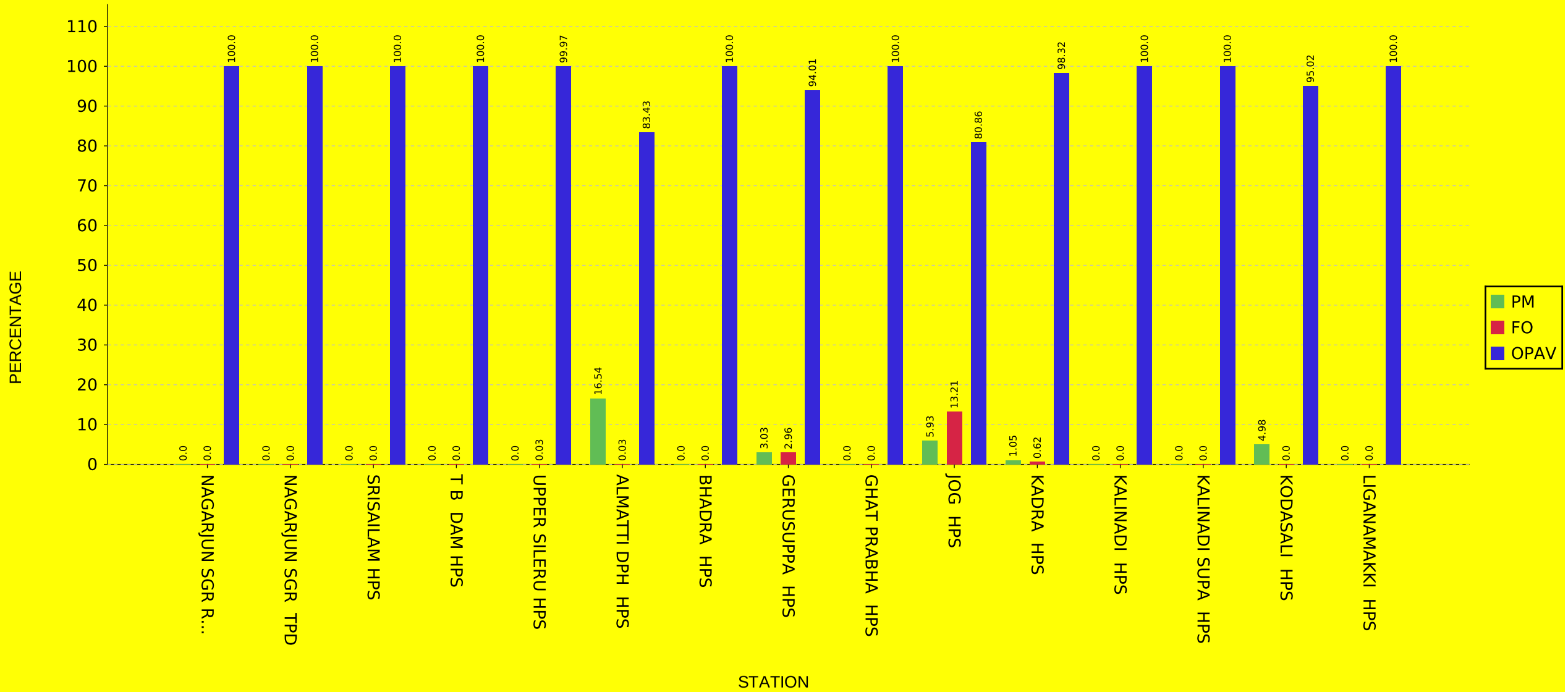


EXHIBIT 6.9

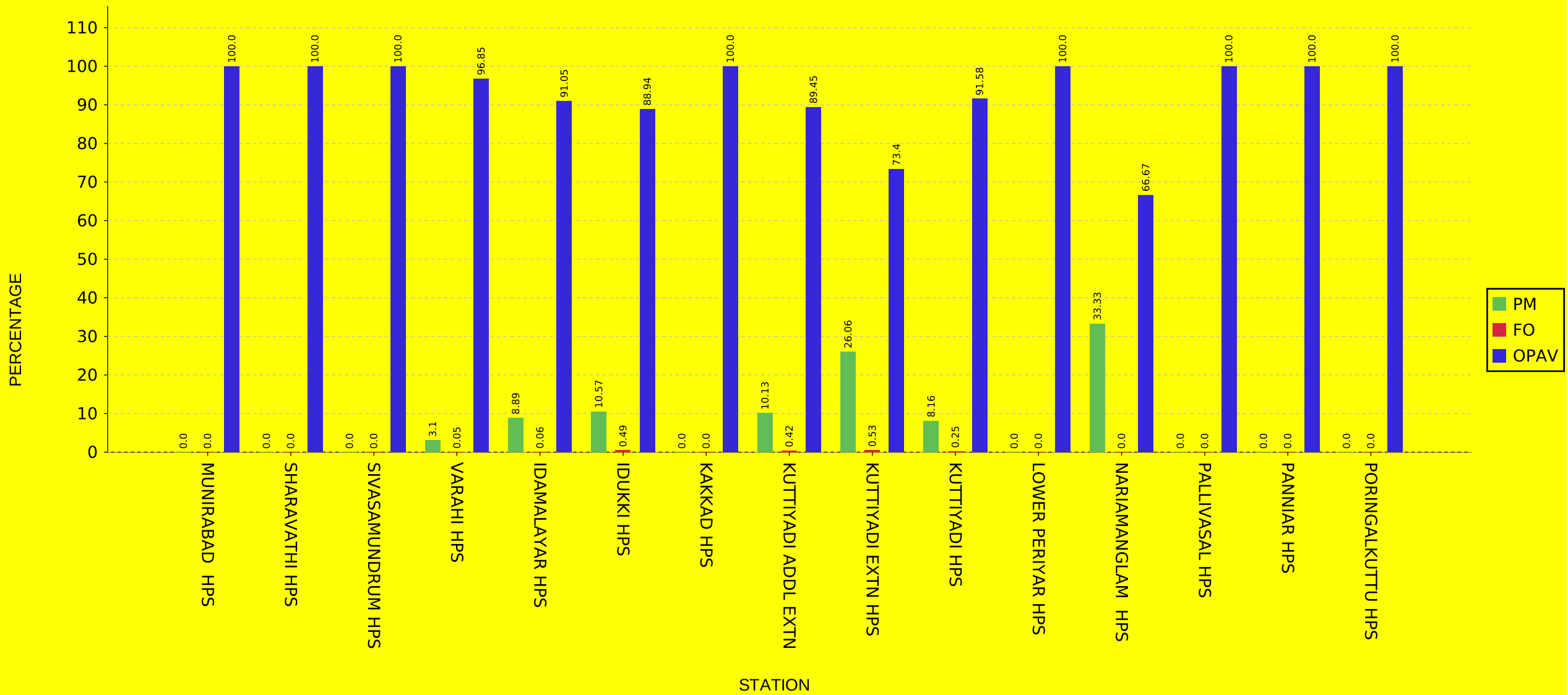

OPERATING AVAILABILITY OF H E STATIONS DURING 2021-22
PERCENTAGE
STATION
PM
FO
OPAV
MUNIRABAD HPS
SHARAVATHI HPS
SIVASAMUNDRUM HPS
VARAHI HPS
IDAMALAYAR HPS
IDUKKI HPS
KAKKAD HPS
KUTTIYADI ADDL EXTN
KUTTIYADI EXTN HPS
KUTTIYADI HPS
LOWER PERIYAR HPS
NARIAMANGLAM HPS
PALLIVASAL HPS
PANNIAR HPS
PORINGALKUTTU HPS
0.0 0.0 100.0
0.0 0.0 100.0
0.0 0.0 100.0
3.1 0.05 96.85
8.89 0.06 91.05
10.57 0.49 88.94
0.0 0.0 100.0
10.13 0.42 89.45
26.06 0.53 73.4
8.16 0.25 91.58
0.0 0.0 100.0
33.33 0.0 66.67
0.0 0.0 100.0
0.0 0.0 100.0
0.0 0.0 100.0

EXHIBIT 6.10

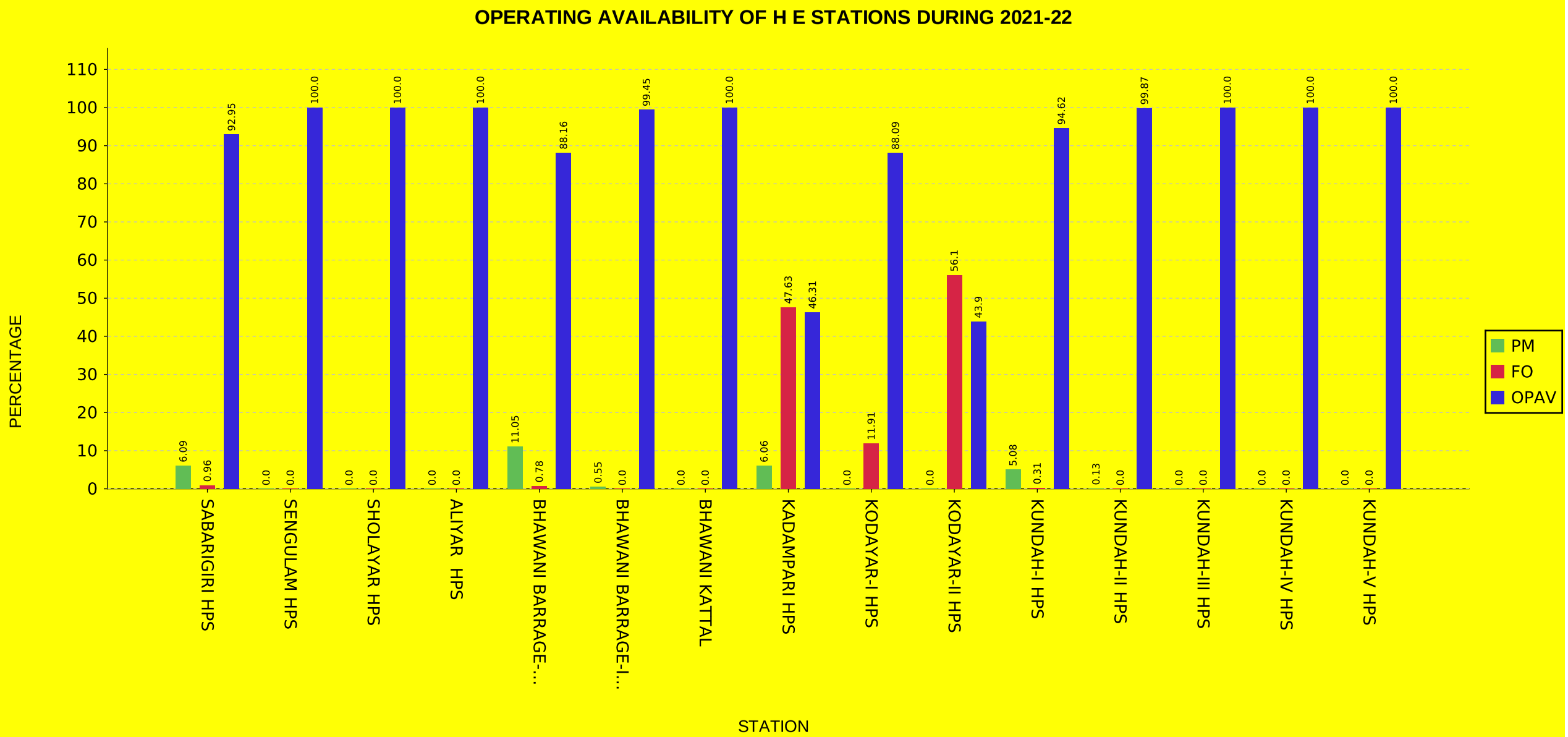

OPERATING AVAILABILITY OF H E STATIONS DURING 2021-22
PERCENTAGE
0
10
20
30
40
50
60
70
80
90
100
110
6.09
0.99
92.95
0.0
0.0
100.0
0.0
0.0
100.0
0.0
0.0
100.0
11.05
0.78
88.16
0.55
0.0
99.45
0.0
0.0
100.0
6.06
47.63
46.31
0.0
11.91
88.09
0.0
56.1
43.9
5.08
0.31
94.62
0.13
0.0
99.87
0.0
0.0
100.0
0.0
0.0
100.0
0.0
0.0
100.0
SABARIGIRI HPS
SENGULAM HPS
SHOLAYAR HPS
ALIYAR HPS
BHAWANI BARRAGE-...
BHAWANI BARRAGE-I...
BHAWANI KATTAL
KADAMPARI HPS
KODAYAR-I HPS
KODAYAR-II HPS
KUNDAH-I HPS
KUNDAH-II HPS
KUNDAH-III HPS
KUNDAH-IV HPS
KUNDAH-V HPS
STATION
PM
FO
OPAV

EXHIBIT 6.11

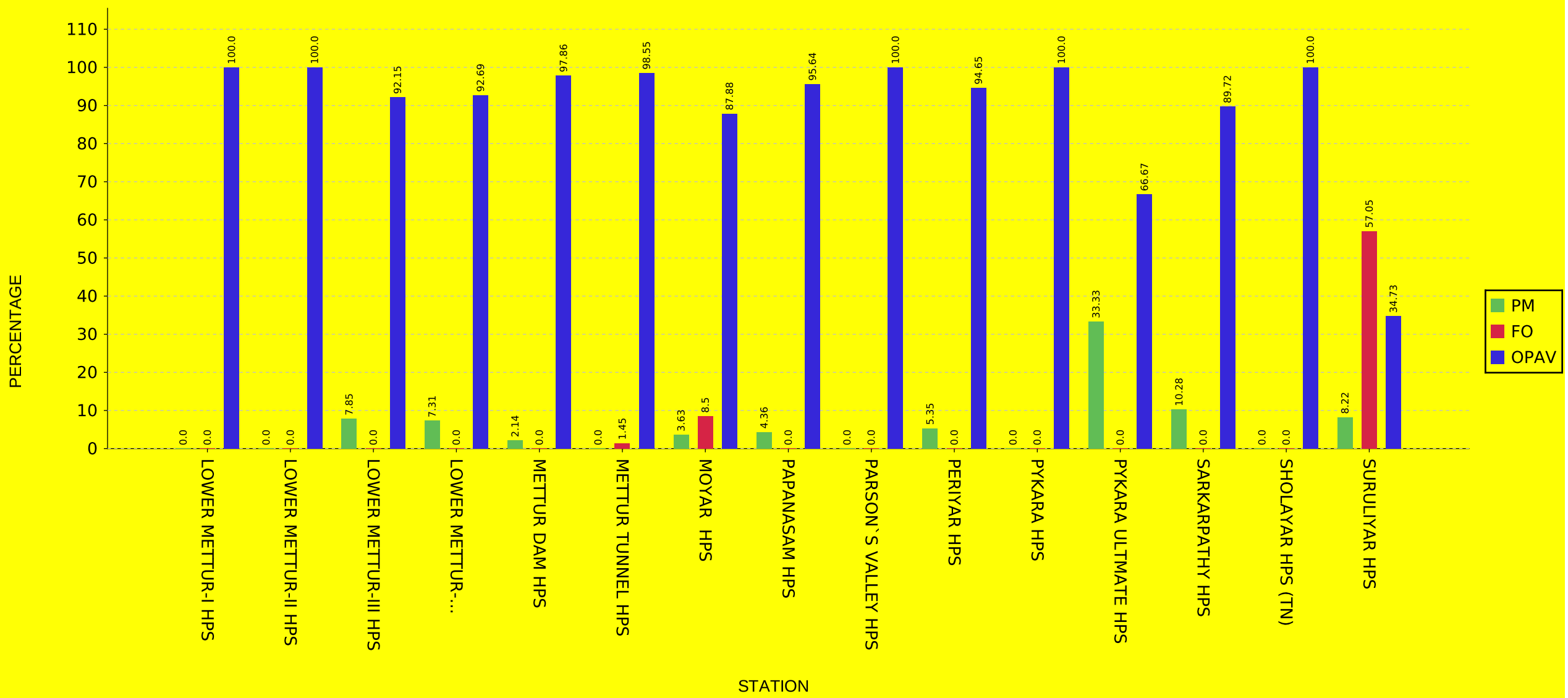

OPERATING AVAILABILITY OF H E STATIONS DURING 2021-22
PERCENTAGE
STATION
PM
FO
OPAV
LOWER METTUR-I HPS
LOWER METTUR-II HPS
LOWER METTUR-III HPS
LOWER METTUR-...
METTUR DAM HPS
METTUR TUNNEL HPS
MOYAR HPS
PAPANASAM HPS
PARSON`S VALLEY HPS
PERIYAR HPS
PYKARA HPS
PYKARA ULTMATE HPS
SARKARPATHY HPS
SHOLAYAR HPS (TN)
SURULIYAR HPS
0.0 0.0 100.0
0.0 0.0 100.0
7.85 0.0 92.15
7.31 0.0 92.69
2.14 0.0 97.86
0.0 1.45 98.55
3.63 8.5 87.88
4.36 0.0 95.64
0.0 0.0 100.0
5.35 0.0 94.65
0.0 0.0 100.0
33.33 0.0 66.67
10.28 0.0 89.72
0.0 0.0 100.0
8.22 57.05 34.73

EXHIBIT 6.12

OPERATING AVAILABILITY OF H E STATIONS DURING 2021-22

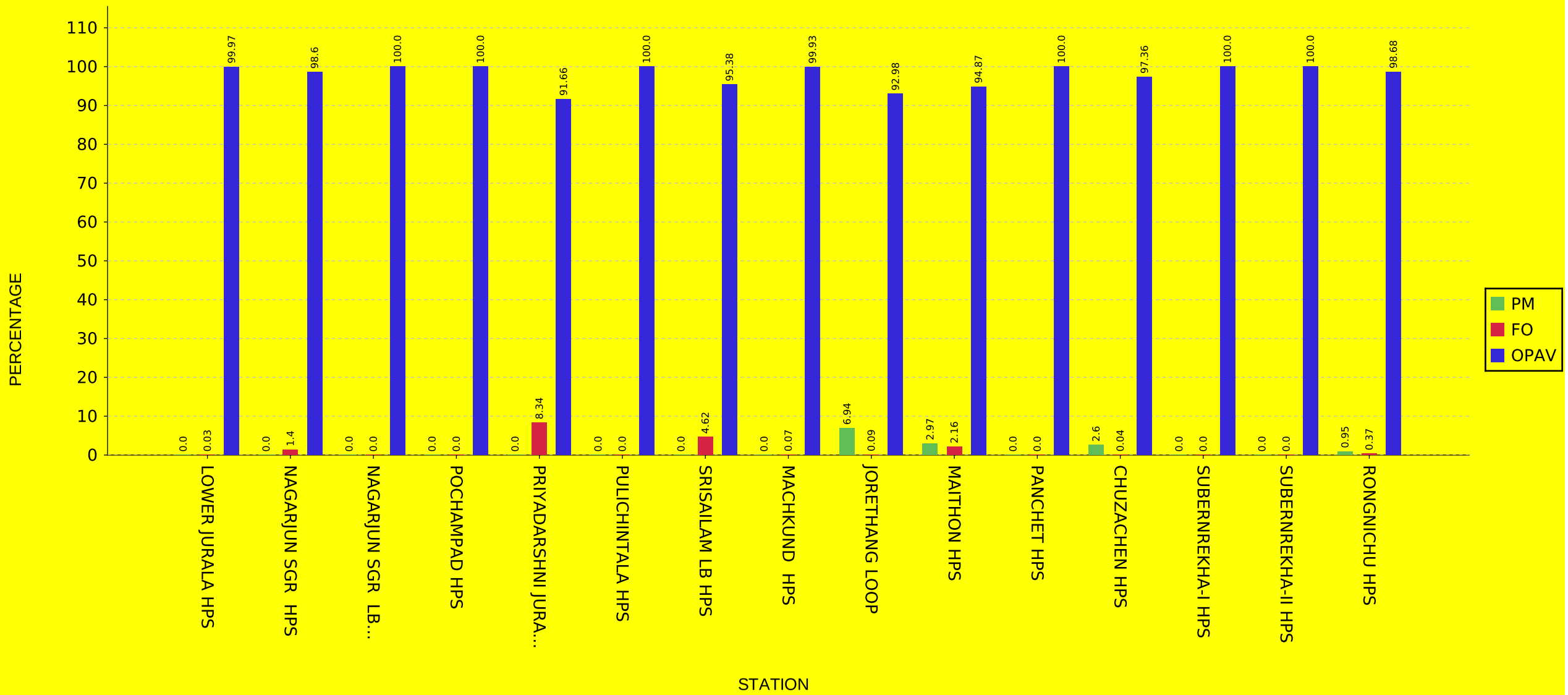
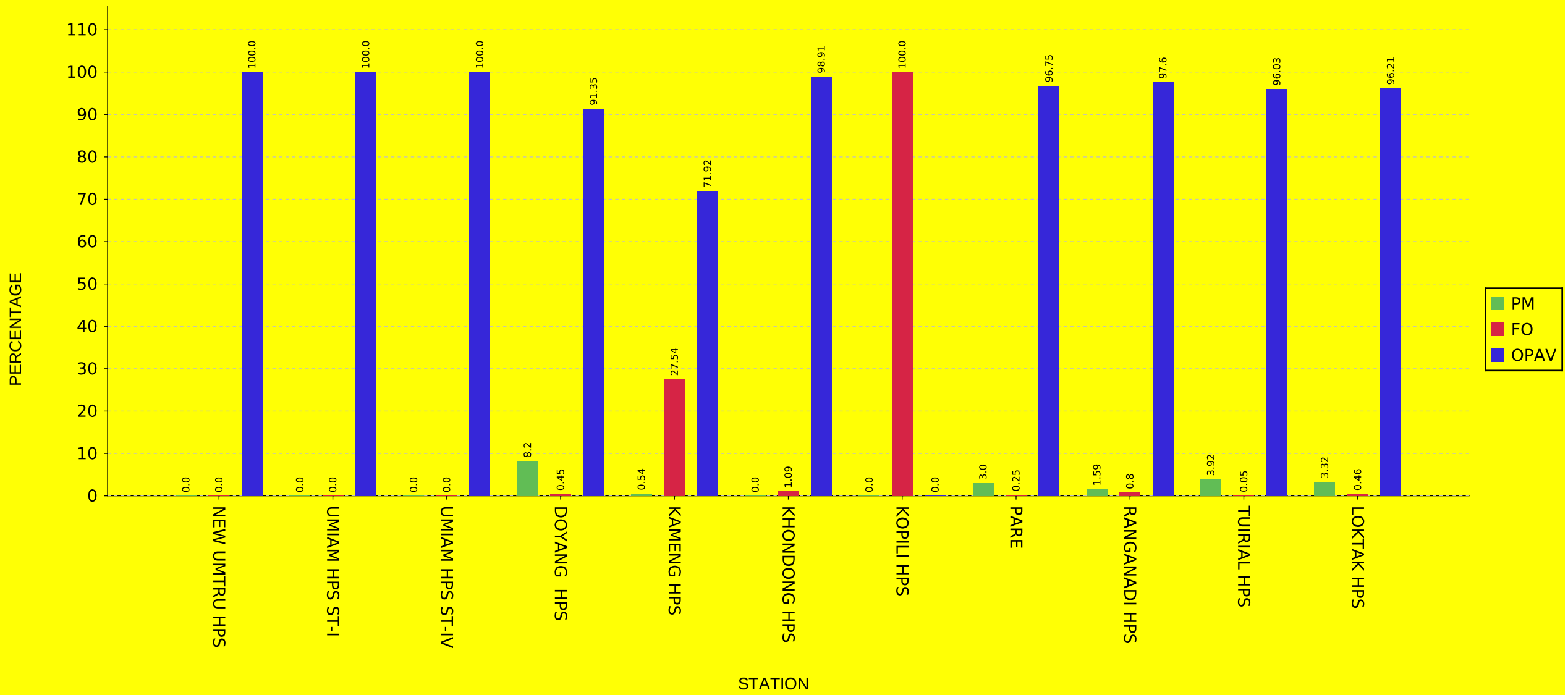


EXHIBIT 6.13

OPERATING AVAILABILITY OF H E STATIONS DURING 2021-22

EXHIBIT 6.14

OPERATING AVAILABILITY OF H E STATIONS DURING 2021-22



CENTRAL ELECTRICITY AUTHORITY
Hydro WING
Hydro Project Planning & Investigation Division

Annex 6.1

OPERAING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2021-22						
S.No.	**STATION / CORPORATION**	**UNIT No.**	**INSTALLED CAPAPCITY (MW)**	**PLANNED MAINTENANCE (P.M) (%)**	**FORCED OUTAGE (F.O) (%)**	**OPERATING AVAILABILITY (100-FO-PM)**
	Northern					
	ADHPL					
1	**ALLAIN DUHANGAN HPS**	1	96.00	7.30	1.23	91.47
		2	96.00	7.55	0.25	92.20
	TOTAL		**192.00**	**7.42**	**0.74**	**91.83**
	AHPC (GVK)					
2	**SHRINAGAR HPS**	1	82.50	0.00	2.08	97.92
		2	82.50	0.00	0.00	100.00
		3	82.50	0.00	0.24	99.76
		4	82.50	0.00	0.00	100.00
	TOTAL		**330.00**	**0.00**	**0.58**	**99.42**
	BBMB					
3	**BHAKRA LEFT HPS**	1	108.00	0.00	0.03	99.97
		2	126.00	0.00	0.02	99.98
		3	126.00	61.10	0.00	38.90
		4	126.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		5	126.00	5.63	0.03	94.35
	TOTAL		**612.00**	**13.34**	**0.01**	**86.64**
4	**BHAKRA RIGHT HPS**	6	157.00	0.00	0.00	100.00
		7	157.00	0.00	0.00	100.00
		8	157.00	0.00	0.00	100.00
		9	157.00	5.26	0.00	94.74
		10	157.00	0.00	0.00	100.00
	TOTAL		**785.00**	**1.05**	**0.00**	**98.95**
5	**DEHAR HPS**	1	165.00	4.86	0.00	95.14
		2	165.00	0.00	0.00	100.00
		3	165.00	0.00	0.01	99.99
		4	165.00	0.00	0.00	100.00
		5	165.00	0.00	0.28	99.72
		6	165.00	0.00	0.02	99.98
	TOTAL		**990.00**	**0.81**	**0.05**	**99.14**
6	**GANGUWAL HPS**	1	29.25	0.00	0.00	100.00
		2	24.20	1.12	0.02	98.86
		3	24.20	1.07	0.03	98.90

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
	TOTAL		**77.65**	**0.73**	**0.02**	**99.25**
7	**KOTLA HPS**	1	29.25	0.00	0.02	99.98
		2	24.20	0.00	0.01	99.99
		3	24.20	1.07	0.11	98.82
	TOTAL		**77.65**	**0.36**	**0.04**	**99.60**
8	**PONG HPS**	1	66.00	0.00	0.02	99.98
		2	66.00	0.00	0.33	99.67
		3	66.00	0.00	1.39	98.61
		4	66.00	0.00	0.00	100.00
		5	66.00	25.07	0.92	74.01
		6	66.00	0.00	0.94	99.06
	TOTAL		**396.00**	**4.18**	**0.60**	**95.22**
	E.P.P.L.					
9	**MALANA-II HPS**	1	50.00	0.02	0.55	99.43
		2	50.00	0.07	0.02	99.91
	TOTAL		**100.00**	**0.05**	**0.28**	**99.67**
	GBHPPL					
10	**BUDHIL HPS**	1	35.00	0.00	21.06	78.94
		2	35.00	0.00	4.42	95.58

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
	TOTAL		**70.00**	**0.00**	**12.74**	**87.26**
	GMR BHHPL					
11	**BAJOLI HOLI HPS**	1	60.00	0.00	0.00	100.00
		2	60.00	0.00	0.00	100.00
		3	60.00	0.00	0.00	100.00
	TOTAL		**180.00**	**0.00**	**0.00**	**100.00**
	HBPCL					
12	**BASPA HPS**	1	100.00	3.03	0.13	96.84
		2	100.00	2.65	0.16	97.19
		3	100.00	2.48	0.13	97.39
	TOTAL		**300.00**	**2.72**	**0.14**	**97.14**
13	**KARCHAM WANGTOO HPS**	1	261.25	0.00	0.00	100.00
		2	261.25	0.00	0.00	100.00
		3	261.25	0.00	0.00	100.00
		4	261.25	0.00	0.00	100.00
	TOTAL		**1045.00**	**0.00**	**0.00**	**100.00**
	HPPCL					
14	**KASHANG INTEGRATED HEP**	1	65.00	0.00	0.00	100.00
		2	65.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		3	65.00	0.00	0.00	100.00
	TOTAL		**195.00**	**0.00**	**0.00**	**100.00**
15	**SAINJ HPS**	1	50.00	2.24	0.00	97.76
		2	50.00	3.92	0.00	96.08
	TOTAL		**100.00**	**3.08**	**0.00**	**96.92**
16	**SAWRA KUDDU HPS**	1	37.00	0.00	0.00	100.00
		2	37.00	0.00	1.82	98.18
		3	37.00	0.00	0.00	100.00
	TOTAL		**111.00**	**0.00**	**0.61**	**99.39**
	HPSEB					
17	**BASSI HPS**	1	16.50	0.00	0.00	100.00
		2	16.50	0.00	0.11	99.89
		3	16.50	0.00	0.18	99.82
		4	16.50	0.00	0.00	100.00
	TOTAL		**66.00**	**0.00**	**0.07**	**99.93**
18	**GIRI BATA HPS**	1	30.00	13.32	0.37	86.31
		2	30.00	7.74	0.91	91.35
	TOTAL		**60.00**	**10.53**	**0.64**	**88.83**
19	**LARJI HPS**	1	42.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		2	42.00	0.00	0.00	100.00
		3	42.00	0.00	0.00	100.00
	TOTAL		**126.00**	**0.00**	**0.00**	**100.00**
20	**SANJAY HPS**	1	40.00	21.13	0.00	78.87
		2	40.00	13.84	0.01	86.15
		3	40.00	0.00	0.02	99.98
	TOTAL		**120.00**	**11.66**	**0.01**	**88.34**
	HSPCL					
21	**SORANG HPS**	1	50.00	0.00	0.00	100.00
		2	50.00	0.00	0.03	99.97
	TOTAL		**100.00**	**0.00**	**0.02**	**99.98**
	IAEPL					
22	**CHANJU-I HPS**	1	12.00	0.00	0.00	100.00
		2	12.00	0.00	0.00	100.00
		3	12.00	0.00	0.00	100.00
	TOTAL		**36.00**	**0.00**	**0.00**	**100.00**
	JKSPDC					
23	**BAGLIHAR HPS**	1	150.00	0.00	0.00	100.00
		2	150.00	25.14	0.00	74.86

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		3	150.00	0.00	0.00	100.00
	TOTAL		**450.00**	**8.38**	**0.00**	**91.62**
24	**BAGLIHAR II HPS**	1	150.00	0.00	0.00	100.00
		2	150.00	0.00	0.00	100.00
		3	150.00	0.00	0.00	100.00
	TOTAL		**450.00**	**0.00**	**0.00**	**100.00**
25	**LOWER JHELUM HPS**	1	35.00	0.00	0.00	100.00
		2	35.00	0.00	0.00	100.00
		3	35.00	0.00	0.00	100.00
	TOTAL		**105.00**	**0.00**	**0.00**	**100.00**
26	**UPPER SINDH-II HPS**	3	35.00	0.00	0.00	100.00
		4	35.00	0.00	0.00	100.00
		5	35.00	0.00	0.00	100.00
	TOTAL		**105.00**	**0.00**	**0.00**	**100.00**
	JPPVL					
27	**VISHNU PRAYAG HPS**	1	100.00	0.76	0.00	99.24
		2	100.00	0.38	0.79	98.83
		3	100.00	0.15	3.50	96.35
		4	100.00	0.44	0.00	99.56

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
	TOTAL		**400.00**	**0.43**	**1.07**	**98.49**
	L&T					
28	**SINGOLI BHATWARI HPS**	1	33.00	0.00	0.00	100.00
		2	33.00	0.00	0.00	100.00
		3	33.00	0.00	0.00	100.00
	TOTAL		**99.00**	**0.00**	**0.00**	**100.00**
	MPCL					
29	**MALANA HPS**	1	43.00	0.00	0.00	100.00
		2	43.00	4.04	0.00	95.96
	TOTAL		**86.00**	**2.02**	**0.00**	**97.98**
	NHPC					
30	**BAIRA SIUL HPS**	1	60.00	7.84	0.74	91.42
		2	60.00	9.82	0.68	89.50
		3	60.00	41.96	3.61	54.43
	TOTAL		**180.00**	**19.87**	**1.68**	**78.45**
31	**CHAMERA-I HPS**	1	180.00	12.41	0.34	87.25
		2	180.00	12.28	0.13	87.59
		3	180.00	13.76	0.03	86.21
	TOTAL		**540.00**	**12.81**	**0.17**	**87.02**

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
32	**CHAMERA-II HPS**	1	100.00	8.86	0.06	91.08
		2	100.00	4.04	0.08	95.88
		3	100.00	4.22	0.10	95.68
	TOTAL		**300.00**	**5.71**	**0.08**	**94.21**
33	**CHAMERA-III HPS**	1	77.00	0.00	0.05	99.95
		2	77.00	8.19	0.04	91.77
		3	77.00	3.07	0.02	96.91
	TOTAL		**231.00**	**3.75**	**0.04**	**96.21**
34	**CHUTAK HPS**	1	11.00	14.89	0.00	85.11
		2	11.00	10.47	0.00	89.53
		3	11.00	7.48	0.00	92.52
		4	11.00	6.52	0.50	92.98
	TOTAL		**44.00**	**9.84**	**0.13**	**90.04**
35	**DHAULI GANGA HPS**	1	70.00	0.01	0.42	99.57
		2	70.00	6.71	0.30	92.99
		3	70.00	0.25	0.44	99.32
		4	70.00	6.00	0.37	93.63
	TOTAL		**280.00**	**3.24**	**0.38**	**96.38**

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
36	DULHASTI HPS	1	130.00	4.05	0.04	95.90
		2	130.00	1.96	0.09	97.95
		3	130.00	4.86	0.35	94.79
	TOTAL		**390.00**	**3.63**	**0.16**	**96.22**
37	KISHANGANGA HPS	1	110.00	21.01	1.03	77.96
		2	110.00	20.05	1.66	78.29
		3	110.00	4.28	0.16	95.56
	TOTAL		**330.00**	**15.11**	**0.95**	**83.94**
38	NIMMO BAZGO HPS	1	15.00	6.18	0.06	93.76
		2	15.00	6.55	0.02	93.43
		3	15.00	4.36	0.04	95.59
	TOTAL		**45.00**	**5.70**	**0.04**	**94.26**
39	PARBATI-III HPS	1	130.00	9.94	0.06	89.99
		2	130.00	5.31	0.06	94.63
		3	130.00	12.67	0.01	87.32
		4	130.00	12.34	0.02	87.63
	TOTAL		**520.00**	**10.07**	**0.04**	**89.89**
40	SALAL HPS	1	115.00	3.60	0.00	96.40

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		2	115.00	0.00	0.00	100.00
		3	115.00	14.34	0.01	85.66
		4	115.00	0.00	0.13	99.87
		5	115.00	3.90	0.00	96.10
		6	115.00	4.74	0.00	95.26
	TOTAL		**690.00**	**4.43**	**0.02**	**95.55**
41	**SEWA-II HPS**	1	40.00	97.16	0.00	2.84
		2	40.00	90.99	0.53	8.47
		3	40.00	91.63	0.04	8.34
	TOTAL		**120.00**	**93.26**	**0.19**	**6.55**
42	**TANAKPUR HPS**	1	31.40	13.98	0.45	85.56
		2	31.40	11.18	0.89	87.93
		3	31.40	7.81	0.14	92.05
	TOTAL		**94.20**	**10.99**	**0.50**	**88.51**
43	**URI-I HPS**	1	120.00	3.42	0.00	96.57
		2	120.00	4.81	0.01	95.18
		3	120.00	4.49	0.01	95.50
		4	120.00	4.68	0.04	95.28

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
	TOTAL		**480.00**	**4.35**	**0.02**	**95.63**
44	**URI-II HPS**	1	60.00	5.06	0.02	94.92
		2	60.00	3.35	0.13	96.52
		3	60.00	4.27	0.02	95.71
		4	60.00	2.88	0.11	97.01
	TOTAL		**240.00**	**3.89**	**0.07**	**96.04**
	NTPC Ltd.					
45	**KOLDAM**	1	200.00	1.06	0.00	98.94
		2	200.00	1.06	0.00	98.94
		3	200.00	1.63	0.00	98.37
		4	200.00	1.46	0.65	97.89
	TOTAL		**800.00**	**1.30**	**0.16**	**98.53**
	PSPCL					
46	**ANANDPUR SAHIB-I HPS**	1	33.50	0.00	0.00	100.00
		2	33.50	0.00	0.00	100.00
	TOTAL		**67.00**	**0.00**	**0.00**	**100.00**
47	**ANANDPUR SAHIB-II HPS**	3	33.50	0.00	0.00	100.00
		4	33.50	0.00	0.00	100.00
	TOTAL		**67.00**	**0.00**	**0.00**	**100.00**

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
48	MUKERIAN-I HPS	1	15.00	0.00	0.00	100.00
		2	15.00	0.00	0.00	100.00
		3	15.00	0.00	0.00	100.00
	TOTAL		**45.00**	**0.00**	**0.00**	**100.00**
49	MUKERIAN-II HPS	4	15.00	0.00	0.00	100.00
		5	15.00	0.00	0.00	100.00
		6	15.00	0.00	0.00	100.00
	TOTAL		**45.00**	**0.00**	**0.00**	**100.00**
50	MUKERIAN-III HPS	7	19.50	0.00	0.00	100.00
		8	19.50	0.00	0.00	100.00
		9	19.50	0.00	0.00	100.00
	TOTAL		**58.50**	**0.00**	**0.00**	**100.00**
51	MUKERIAN-IV HPS	10	19.50	0.00	0.00	100.00
		11	19.50	0.00	0.00	100.00
		12	19.50	0.00	0.00	100.00
	TOTAL		**58.50**	**0.00**	**0.00**	**100.00**
52	RANJIT SAGAR HPS	1	150.00	21.66	0.00	78.34
		2	150.00	7.78	0.00	92.22

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		3	150.00	0.00	0.00	100.00
		4	150.00	1.05	0.00	98.95
	TOTAL		**600.00**	**7.62**	**0.00**	**92.38**
53	**SHANAN HPS**	1	15.00	0.00	0.00	100.00
		2	15.00	0.00	0.00	100.00
		3	15.00	0.00	0.00	100.00
		4	15.00	0.00	0.00	100.00
		5	50.00	0.00	0.00	100.00
	TOTAL		**110.00**	**0.00**	**0.00**	**100.00**
	RRVUNL					
54	**JAWAHAR SAGAR HPS**	1	33.00	0.00	0.00	100.00
		2	33.00	0.00	0.00	100.00
		3	33.00	0.00	0.00	100.00
	TOTAL		**99.00**	**0.00**	**0.00**	**100.00**
55	**MAHI BAJAJ-I HPS**	1	25.00	0.00	0.00	100.00
		2	25.00	0.00	0.00	100.00
	TOTAL		**50.00**	**0.00**	**0.00**	**100.00**
56	**MAHI BAJAJ-II HPS**	3	45.00	0.00	0.00	100.00
		4	45.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
	TOTAL		**90.00**	**0.00**	**0.00**	**100.00**
57	**R P SAGAR HPS**	1	43.00	0.00	74.71	25.29
		2	43.00	0.00	100.00	0.00
		3	43.00	0.00	100.00	0.00
		4	43.00	0.00	100.00	0.00
	TOTAL		**172.00**	**0.00**	**93.68**	**6.32**
	SJVNL					
58	**NATHPA JHAKRI HPS**	1	250.00	1.99	0.01	98.00
		2	250.00	2.43	0.04	97.53
		3	250.00	3.82	0.71	95.47
		4	250.00	3.38	0.49	96.13
		5	250.00	2.78	0.00	97.22
		6	250.00	2.10	0.00	97.90
	TOTAL		**1500.00**	**2.75**	**0.21**	**97.04**
59	**RAMPUR HPS**	1	68.67	3.63	0.02	96.35
		2	68.67	2.24	0.01	97.75
		3	68.67	2.13	0.86	97.00
		4	68.67	2.51	0.03	97.46

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		5	68.67	1.98	0.06	97.96
		6	68.67	2.26	0.00	97.74
	TOTAL		**412.02**	**2.46**	**0.16**	**97.38**
	THDC					
60	**KOTESHWAR HPS**	1	100.00	0.00	0.00	100.00
		2	100.00	0.00	0.00	100.00
		3	100.00	0.00	0.00	100.00
		4	100.00	0.00	0.00	100.00
	TOTAL		**400.00**	**0.00**	**0.00**	**100.00**
61	**TEHRI ST-1 HPS**	1	250.00	3.29	0.00	96.71
		2	250.00	0.00	0.00	100.00
		3	250.00	0.00	0.00	100.00
		4	250.00	5.87	0.00	94.13
	TOTAL		**1000.00**	**2.29**	**0.00**	**97.71**
	UJVNL					
62	**CHIBRO (YAMUNA) HPS**	1	60.00	0.00	0.00	100.00
		2	60.00	0.00	0.00	100.00
		3	60.00	0.00	0.00	100.00
		4	60.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
	TOTAL		**240.00**	**0.00**	**0.00**	**100.00**
63	**CHILLA HPS**	1	36.00	0.00	0.00	100.00
		2	36.00	0.00	0.00	100.00
		3	36.00	0.00	0.00	100.00
		4	36.00	0.00	0.00	100.00
	TOTAL		**144.00**	**0.00**	**0.00**	**100.00**
64	**DHAKRANI HPS**	1	11.25	21.65	0.00	78.35
		2	11.25	0.00	13.94	86.06
		3	11.25	7.56	0.00	92.44
	TOTAL		**33.75**	**9.74**	**4.65**	**85.61**
65	**DHALIPUR HPS**	1	17.00	0.00	0.00	100.00
		2	17.00	0.00	0.00	100.00
		3	17.00	5.07	0.00	94.93
	TOTAL		**51.00**	**1.69**	**0.00**	**98.31**
66	**KHATIMA HPS**	1	13.80	0.00	0.00	100.00
		2	13.80	0.00	0.00	100.00
		3	13.80	0.00	0.00	100.00
	TOTAL		**41.40**	**0.00**	**0.00**	**100.00**

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
67	KHODRI HPS	1	30.00	0.00	0.00	100.00
		2	30.00	0.00	0.00	100.00
		3	30.00	0.00	0.00	100.00
		4	30.00	0.00	0.00	100.00
	TOTAL		**120.00**	**0.00**	**0.00**	**100.00**
68	KULHAL HPS	1	10.00	1.64	0.00	98.36
		2	10.00	0.00	0.00	100.00
		3	10.00	6.03	0.00	93.97
	TOTAL		**30.00**	**2.56**	**0.00**	**97.44**
69	MANERI BHALI-I HPS	1	30.00	0.00	0.00	100.00
		2	30.00	0.00	0.00	100.00
		3	30.00	0.00	0.00	100.00
	TOTAL		**90.00**	**0.00**	**0.00**	**100.00**
70	MANERI BHALI-II HPS	1	76.00	8.49	0.16	91.34
		2	76.00	0.00	0.00	100.00
		3	76.00	10.27	0.00	89.73
		4	76.00	15.22	0.61	84.17
	TOTAL		**304.00**	**8.50**	**0.19**	**91.31**

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
71	RAMGANGA HPS	1	66.00	0.00	0.00	100.00
		2	66.00	32.06	13.29	54.65
		3	66.00	0.00	0.00	100.00
	TOTAL		**198.00**	**10.69**	**4.43**	**84.88**
	UPJVNL					
72	KHARA HPS	1	24.00	0.00	0.00	100.00
		2	24.00	0.00	0.00	100.00
		3	24.00	0.00	0.00	100.00
	TOTAL		**72.00**	**0.00**	**0.00**	**100.00**
73	MATATILA HPS	1	10.20	0.00	0.00	100.00
		2	10.20	0.00	0.00	100.00
		3	10.20	0.00	0.00	100.00
	TOTAL		**30.60**	**0.00**	**0.00**	**100.00**
74	OBRA HPS	1	33.00	0.00	0.00	100.00
		2	33.00	0.00	0.00	100.00
		3	33.00	0.00	0.00	100.00
	TOTAL		**99.00**	**0.00**	**0.00**	**100.00**
75	RIHAND HPS	1	50.00	0.00	0.00	100.00
		2	50.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		3	50.00	0.00	0.00	100.00
		4	50.00	0.00	0.00	100.00
		5	50.00	0.00	0.00	100.00
		6	50.00	0.00	0.00	100.00
	TOTAL		**300.00**	**0.00**	**0.00**	**100.00**
	Western					
	CSPGCL					
76	**HASDEOBANGO HPS**	1	40.00	0.00	0.00	100.00
		2	40.00	0.00	0.00	100.00
		3	40.00	0.00	0.00	100.00
	TOTAL		**120.00**	**0.00**	**0.00**	**100.00**
	DLHP					
77	**BHANDARDHARA HPS ST-II**	2	34.00	0.00	0.00	100.00
	TOTAL		**34.00**	**0.00**	**0.00**	**100.00**
	GSECL					
78	**KADANA HPS**	1	60.00	0.00	0.00	100.00
		2	60.00	0.00	0.00	100.00
		3	60.00	0.00	0.00	100.00
		4	60.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
	TOTAL		**240.00**	**0.00**	**0.00**	**100.00**
79	**UKAI HPS**	1	75.00	0.00	0.00	100.00
		2	75.00	0.00	0.00	100.00
		3	75.00	0.00	0.00	100.00
		4	75.00	0.00	0.00	100.00
	TOTAL		**300.00**	**0.00**	**0.00**	**100.00**
	MAHAGENCO					
80	**BHIRA TAIL RACE HPS**	1	40.00	0.00	0.00	100.00
		2	40.00	0.00	0.00	100.00
	TOTAL		**80.00**	**0.00**	**0.00**	**100.00**
81	**GHATGHAR PSS HPS**	1	125.00	0.00	27.58	72.42
		2	125.00	0.00	25.96	74.04
	TOTAL		**250.00**	**0.00**	**26.77**	**73.23**
82	**KOYNA DPH HPS**	1	18.00	0.00	0.00	100.00
		2	18.00	0.00	0.00	100.00
	TOTAL		**36.00**	**0.00**	**0.00**	**100.00**
83	**KOYNA-I&II HPS**	1	70.00	0.00	0.00	100.00
		2	70.00	0.00	0.00	100.00
		3	70.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		4	70.00	0.00	0.00	100.00
		5	80.00	1.29	0.00	98.71
		6	80.00	0.00	0.00	100.00
		7	80.00	0.00	0.00	100.00
		8	80.00	0.00	0.00	100.00
	TOTAL		**600.00**	**0.16**	**0.00**	**99.84**
84	**KOYNA-III HPS**	1	80.00	0.00	0.00	100.00
		2	80.00	0.00	0.00	100.00
		3	80.00	0.00	16.07	83.93
		4	80.00	0.00	0.00	100.00
	TOTAL		**320.00**	**0.00**	**4.02**	**95.98**
85	**KOYNA-IV HPS**	1	250.00	0.00	0.00	100.00
		2	250.00	0.00	0.00	100.00
		3	250.00	0.00	0.35	99.65
		4	250.00	0.00	0.10	99.90
	TOTAL		**1000.00**	**0.00**	**0.11**	**99.89**
86	**TILLARI HPS**	1	60.00	0.00	0.00	100.00
	TOTAL		**60.00**	**0.00**	**0.00**	**100.00**

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
87	VAITARNA HPS	1	60.00	8.90	6.94	84.16
	TOTAL		**60.00**	**8.90**	**6.94**	**84.16**
	MPPGCL					
88	BANSAGAR-II HPS	1	15.00	1.24	0.00	98.76
		2	15.00	42.64	0.00	57.36
	TOTAL		**30.00**	**21.94**	**0.00**	**78.06**
89	BANSAGAR-III HPS	1	20.00	0.00	0.00	100.00
		2	20.00	0.00	0.00	100.00
		3	20.00	0.00	0.00	100.00
	TOTAL		**60.00**	**0.00**	**0.00**	**100.00**
90	BANSAGAR TONS-I HPS	1	105.00	0.00	0.00	100.00
		2	105.00	0.00	0.00	100.00
		3	105.00	100.00	0.00	0.00
	TOTAL		**315.00**	**33.33**	**0.00**	**66.67**
91	BARGI HPS	1	45.00	0.00	0.00	100.00
		2	45.00	0.04	0.00	99.96
	TOTAL		**90.00**	**0.02**	**0.00**	**99.98**
92	GANDHI SAGAR HPS	1	23.00	0.00	1.64	98.36
		2	23.00	0.00	100.00	0.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		3	23.00	0.00	100.00	0.00
		4	23.00	0.00	0.00	100.00
		5	23.00	0.00	0.00	100.00
	TOTAL		**115.00**	**0.00**	**40.33**	**59.67**
93	**MADHIKHERA HPS**	1	20.00	0.00	0.00	100.00
		2	20.00	0.00	0.00	100.00
		3	20.00	0.00	0.00	100.00
	TOTAL		**60.00**	**0.00**	**0.00**	**100.00**
94	**PENCH HPS**	1	80.00	0.00	15.42	84.58
		2	80.00	0.00	0.03	99.97
	TOTAL		**160.00**	**0.00**	**7.73**	**92.27**
95	**RAJGHAT HPS**	1	15.00	0.00	0.00	100.00
		2	15.00	0.00	0.23	99.77
		3	15.00	0.00	0.00	100.00
	TOTAL		**45.00**	**0.00**	**0.08**	**99.92**
	NHDC					
96	**INDIRA SAGAR HPS**	1	125.00	0.00	0.00	100.00
		2	125.00	0.14	0.00	99.86
		3	125.00	4.18	0.00	95.82

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		4	125.00	10.84	0.00	89.16
		5	125.00	6.52	0.00	93.48
		6	125.00	3.28	0.00	96.72
		7	125.00	6.12	0.00	93.88
		8	125.00	5.95	0.00	94.05
	TOTAL		**1000.00**	**4.63**	**0.00**	**95.37**
97	**OMKARESHWAR HPS**	1	65.00	3.85	0.00	96.15
		2	65.00	3.75	0.00	96.25
		3	65.00	3.66	0.00	96.34
		4	65.00	3.57	0.00	96.43
		5	65.00	3.75	0.00	96.25
		6	65.00	3.76	0.00	96.24
		7	65.00	3.12	0.00	96.88
		8	65.00	3.32	0.00	96.68
	TOTAL		**520.00**	**3.60**	**0.00**	**96.40**
	SSNNL					
98	**S SAROVAR CHPH HPS**	1	50.00	37.74	0.00	62.26
		2	50.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		3	50.00	0.00	0.00	100.00
		4	50.00	0.00	0.00	100.00
		5	50.00	0.00	0.00	100.00
	TOTAL		**250.00**	**7.55**	**0.00**	**92.45**
99	**S SAROVAR RBPH HPS**	1	200.00	0.11	0.05	99.84
		2	200.00	0.00	0.00	100.00
		3	200.00	0.00	0.00	100.00
		4	200.00	0.00	0.00	100.00
		5	200.00	0.00	0.00	100.00
		6	200.00	4.18	0.00	95.82
	TOTAL		**1200.00**	**0.72**	**0.01**	**99.28**
	TATA MAH.					
100	**BHIRA HPS**	1	25.00	0.00	0.00	100.00
		2	25.00	0.00	0.00	100.00
		3	25.00	0.00	0.00	100.00
		4	25.00	0.00	0.00	100.00
		5	25.00	0.00	0.00	100.00
		6	25.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
	TOTAL		**150.00**	**0.00**	**0.00**	**100.00**
101	**BHIRA PSS HPS**	1	150.00	0.07	2.61	97.32
	TOTAL		**150.00**	**0.07**	**2.61**	**97.32**
102	**BHIVPURI HPS**	1	24.00	0.00	0.00	100.00
		2	24.00	0.00	0.02	99.98
		3	24.00	0.00	0.00	100.00
		4	1.50	0.00	0.00	100.00
		5	1.50	0.00	0.00	100.00
	TOTAL		**75.00**	**0.00**	**0.00**	**100.00**
103	**KHOPOLI HPS**	1	24.00	0.00	0.00	100.00
		2	24.00	0.00	100.00	0.00
		3	24.00	0.00	0.01	99.99
	TOTAL		**72.00**	**0.00**	**33.34**	**66.66**
	Southern					
	APGENCO					
104	**HAMPI HPS**	1	9.00	0.00	0.00	100.00
		2	9.00	0.00	0.00	100.00
		3	9.00	0.00	0.14	99.86
		4	9.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
	TOTAL		**36.00**	**0.00**	**0.03**	**99.97**
105	**LOWER SILERU HPS**	1	115.00	0.00	0.00	100.00
		2	115.00	0.00	0.00	100.00
		3	115.00	0.00	0.00	100.00
		4	115.00	0.00	0.00	100.00
	TOTAL		**460.00**	**0.00**	**0.00**	**100.00**
106	**NAGARJUN SGR RBC HPS**	1	30.00	0.00	0.00	100.00
		2	30.00	0.00	0.00	100.00
		3	30.00	0.00	0.00	100.00
	TOTAL		**90.00**	**0.00**	**0.00**	**100.00**
107	**NAGARJUN SGR TPD**	1	25.00	0.00	0.00	100.00
		2	25.00	0.00	0.00	100.00
	TOTAL		**50.00**	**0.00**	**0.00**	**100.00**
108	**SRISAILAM HPS**	1	110.00	0.00	0.00	100.00
		2	110.00	0.00	0.00	100.00
		3	110.00	0.00	0.00	100.00
		4	110.00	0.00	0.00	100.00
		5	110.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		6	110.00	0.00	0.00	100.00
		7	110.00	0.00	0.00	100.00
	TOTAL		**770.00**	**0.00**	**0.00**	**100.00**
109	**T B DAM HPS**	1	9.00	0.00	0.00	100.00
		2	9.00	0.00	0.00	100.00
		3	9.00	0.00	0.00	100.00
		4	9.00	0.00	0.00	100.00
	TOTAL		**36.00**	**0.00**	**0.00**	**100.00**
110	**UPPER SILERU HPS**	1	60.00	0.00	0.14	99.86
		2	60.00	0.00	0.00	100.00
		3	60.00	0.00	0.00	100.00
		4	60.00	0.00	0.00	100.00
	TOTAL		**240.00**	**0.00**	**0.03**	**99.97**
	KPCL					
111	**ALMATTI DPH HPS**	1	15.00	0.75	0.09	99.16
		2	55.00	27.01	0.05	72.94
		3	55.00	25.20	0.06	74.74
		4	55.00	22.83	0.00	77.17

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		5	55.00	5.90	0.00	94.10
		6	55.00	17.54	0.00	82.46
	TOTAL		**290.00**	**16.54**	**0.03**	**83.43**
112	**BHADRA HPS**	1	2.00	0.00	0.00	100.00
		2	12.00	0.00	0.00	100.00
		3	12.00	0.00	0.00	100.00
	TOTAL		**26.00**	**0.00**	**0.00**	**100.00**
113	**GERUSUPPA HPS**	1	60.00	4.24	0.00	95.76
		2	60.00	1.98	0.13	97.89
		3	60.00	1.95	11.39	86.66
		4	60.00	3.96	0.31	95.72
	TOTAL		**240.00**	**3.03**	**2.96**	**94.01**
114	**GHAT PRABHA HPS**	1	16.00	0.00	0.00	100.00
		2	16.00	0.00	0.00	100.00
	TOTAL		**32.00**	**0.00**	**0.00**	**100.00**
115	**JOG HPS**	1	13.20	3.76	0.00	96.24
		2	13.20	0.00	100.00	0.00
		3	13.20	4.03	0.70	95.27

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		4	13.20	4.10	0.83	95.07
		5	21.60	29.25	0.00	70.75
		6	21.60	0.02	0.32	99.66
		7	21.60	5.32	0.24	94.44
		8	21.60	1.00	3.57	95.44
	TOTAL		**139.20**	**5.93**	**13.21**	**80.86**
116	**KADRA HPS**	1	50.00	0.00	0.94	99.06
		2	50.00	3.16	0.00	96.84
		3	50.00	0.00	0.93	99.07
	TOTAL		**150.00**	**1.05**	**0.62**	**98.32**
117	**KALINADI HPS**	1	150.00	0.00	0.00	100.00
		2	150.00	0.00	0.00	100.00
		3	150.00	0.00	0.00	100.00
		4	150.00	0.00	0.00	100.00
		5	150.00	0.00	0.00	100.00
		6	150.00	0.00	0.00	100.00
	TOTAL		**900.00**	**0.00**	**0.00**	**100.00**
118	**KALINADI SUPA HPS**	1	50.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		2	50.00	0.00	0.00	100.00
	TOTAL		**100.00**	**0.00**	**0.00**	**100.00**
119	**KODASALI HPS**	1	40.00	4.39	0.00	95.61
		2	40.00	1.45	0.00	98.55
		3	40.00	9.09	0.00	90.91
	TOTAL		**120.00**	**4.98**	**0.00**	**95.02**
120	**LIGANAMAKKI HPS**	1	27.50	0.00	0.00	100.00
		2	27.50	0.00	0.00	100.00
	TOTAL		**55.00**	**0.00**	**0.00**	**100.00**
121	**MUNIRABAD HPS**	1	9.00	0.00	0.00	100.00
		2	9.00	0.00	0.00	100.00
		3	10.00	0.00	0.00	100.00
	TOTAL		**28.00**	**0.00**	**0.00**	**100.00**
122	**SHARAVATHI HPS**	1	103.50	0.00	0.00	100.00
		2	103.50	0.00	0.00	100.00
		3	103.50	0.00	0.00	100.00
		4	103.50	0.00	0.00	100.00
		5	103.50	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		6	103.50	0.00	0.00	100.00
		7	103.50	0.00	0.00	100.00
		8	103.50	0.00	0.00	100.00
		9	103.50	0.00	0.00	100.00
		10	103.50	0.00	0.00	100.00
	TOTAL		**1035.00**	**0.00**	**0.00**	**100.00**
123	**SIVASAMUNDRUM HPS**	1	3.00	0.00	0.00	100.00
		2	3.00	0.00	0.00	100.00
		3	3.00	0.00	0.00	100.00
		4	3.00	0.00	0.00	100.00
		5	3.00	0.00	0.00	100.00
		6	3.00	0.00	0.00	100.00
		7	6.00	0.00	0.00	100.00
		8	6.00	0.00	0.00	100.00
		9	6.00	0.00	0.00	100.00
		10	6.00	0.00	0.00	100.00
	TOTAL		**42.00**	**0.00**	**0.00**	**100.00**
124	**VARAHI HPS**	1	115.00	8.85	0.07	91.07

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		2	115.00	0.09	0.12	99.79
		3	115.00	3.42	0.00	96.58
		4	115.00	0.02	0.00	99.98
	TOTAL		**460.00**	**3.10**	**0.05**	**96.85**
	KSEB					
125	**IDAMALAYAR HPS**	1	37.50	9.47	0.11	90.42
		2	37.50	8.32	0.01	91.67
	TOTAL		**75.00**	**8.89**	**0.06**	**91.05**
126	**IDUKKI HPS**	1	130.00	12.10	0.04	87.86
		2	130.00	7.43	0.11	92.46
		3	130.00	16.08	0.08	83.84
		4	130.00	6.41	0.40	93.20
		5	130.00	5.55	0.66	93.79
		6	130.00	15.85	1.63	82.52
	TOTAL		**780.00**	**10.57**	**0.49**	**88.94**
127	**KAKKAD HPS**	1	25.00	0.00	0.00	100.00
		2	25.00	0.00	0.00	100.00
	TOTAL		**50.00**	**0.00**	**0.00**	**100.00**
128	**KUTTIYADI ADDL EXTN**	1	50.00	10.65	0.79	88.56

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		2	50.00	9.61	0.05	90.34
	TOTAL		**100.00**	**10.13**	**0.42**	**89.45**
129	**KUTTIYADI EXTN HPS**	4	50.00	26.06	0.53	73.40
	TOTAL		**50.00**	**26.06**	**0.53**	**73.40**
130	**KUTTIYADI HPS**	1	25.00	10.62	0.00	89.38
		2	25.00	9.54	0.44	90.02
		3	25.00	4.32	0.32	95.36
	TOTAL		**75.00**	**8.16**	**0.25**	**91.58**
131	**LOWER PERIYAR HPS**	1	60.00	0.00	0.00	100.00
		2	60.00	0.00	0.00	100.00
		3	60.00	0.00	0.00	100.00
	TOTAL		**180.00**	**0.00**	**0.00**	**100.00**
132	**NARIAMANGLAM HPS**	1	15.00	100.00	0.00	0.00
		2	15.00	0.00	0.00	100.00
		3	15.00	0.00	0.00	100.00
	TOTAL		**45.00**	**33.33**	**0.00**	**66.67**
133	**PALLIVASAL HPS**	1	5.00	0.00	0.00	100.00
		2	5.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		3	5.00	0.00	0.00	100.00
		4	7.50	0.00	0.00	100.00
		5	7.50	0.00	0.00	100.00
		6	7.50	0.00	0.00	100.00
	TOTAL		**37.50**	**0.00**	**0.00**	**100.00**
134	**PANNIAR HPS**	1	15.00	0.00	0.00	100.00
		2	15.00	0.00	0.00	100.00
	TOTAL		**30.00**	**0.00**	**0.00**	**100.00**
135	**PORINGALKUTTU HPS**	1	8.00	0.00	0.00	100.00
		2	8.00	0.00	0.00	100.00
		3	8.00	0.00	0.00	100.00
		4	8.00	0.00	0.00	100.00
	TOTAL		**32.00**	**0.00**	**0.00**	**100.00**
136	**SABARIGIRI HPS**	1	50.00	5.27	0.17	94.55
		2	50.00	16.99	4.04	78.97
		3	50.00	6.46	0.52	93.02
		4	50.00	0.00	0.00	100.00
		5	50.00	7.21	0.19	92.60

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		6	50.00	0.61	0.81	98.58
	TOTAL		**300.00**	**6.09**	**0.96**	**92.95**
137	**SENGULAM HPS**	1	12.00	0.00	0.00	100.00
		2	12.00	0.00	0.00	100.00
		3	12.00	0.00	0.00	100.00
		4	12.00	0.00	0.00	100.00
	TOTAL		**48.00**	**0.00**	**0.00**	**100.00**
138	**SHOLAYAR HPS**	1	18.00	0.00	0.00	100.00
		2	18.00	0.00	0.00	100.00
		3	18.00	0.00	0.00	100.00
	TOTAL		**54.00**	**0.00**	**0.00**	**100.00**
	TANGEDCO					
139	**ALIYAR HPS**	1	60.00	0.00	0.00	100.00
	TOTAL		**60.00**	**0.00**	**0.00**	**100.00**
140	**BHAWANI BARRAGE-II HPS**	1	15.00	12.78	0.19	87.03
		2	15.00	9.33	1.37	89.29
	TOTAL		**30.00**	**11.05**	**0.78**	**88.16**
141	**BHAWANI BARRAGE-III HPS**	1	15.00	1.11	0.00	98.89
		2	15.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
	TOTAL		**30.00**	**0.55**	**0.00**	**99.45**
142	**BHAWANI KATTAL**	1	15.00	0.00	0.00	100.00
		2	15.00	0.00	0.00	100.00
	TOTAL		**30.00**	**0.00**	**0.00**	**100.00**
143	**KADAMPARI HPS**	1	100.00	0.00	83.11	16.89
		2	100.00	24.24	7.41	68.35
		3	100.00	0.00	100.00	0.00
		4	100.00	0.00	0.00	100.00
	TOTAL		**400.00**	**6.06**	**47.63**	**46.31**
144	**KODAYAR-I HPS**	1	60.00	0.00	11.91	88.09
	TOTAL		**60.00**	**0.00**	**11.91**	**88.09**
145	**KODAYAR-II HPS**	2	40.00	0.00	56.10	43.90
	TOTAL		**40.00**	**0.00**	**56.10**	**43.90**
146	**KUNDAH-I HPS**	1	20.00	9.36	0.41	90.23
		2	20.00	5.86	0.00	94.14
		3	20.00	0.00	0.51	99.49
	TOTAL		**60.00**	**5.08**	**0.31**	**94.62**
147	**KUNDAH-II HPS**	4	35.00	0.64	0.00	99.36
		5	35.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		6	35.00	0.00	0.00	100.00
		7	35.00	0.00	0.00	100.00
		8	35.00	0.00	0.00	100.00
	TOTAL		**175.00**	**0.13**	**0.00**	**99.87**
148	**KUNDAH-III HPS**	9	60.00	0.00	0.00	100.00
		10	60.00	0.00	0.00	100.00
		11	60.00	0.00	0.00	100.00
	TOTAL		**180.00**	**0.00**	**0.00**	**100.00**
149	**KUNDAH-IV HPS**	12	50.00	0.00	0.00	100.00
		13	50.00	0.00	0.00	100.00
	TOTAL		**100.00**	**0.00**	**0.00**	**100.00**
150	**KUNDAH-V HPS**	14	20.00	0.00	0.00	100.00
		15	20.00	0.00	0.00	100.00
	TOTAL		**40.00**	**0.00**	**0.00**	**100.00**
151	**LOWER METTUR-I HPS**	1	15.00	0.00	0.00	100.00
		2	15.00	0.00	0.00	100.00
	TOTAL		**30.00**	**0.00**	**0.00**	**100.00**
152	**LOWER METTUR-II HPS**	3	15.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		4	15.00	0.00	0.00	100.00
	TOTAL		**30.00**	**0.00**	**0.00**	**100.00**
153	**LOWER METTUR-III HPS**	5	15.00	10.52	0.00	89.48
		6	15.00	5.17	0.00	94.83
	TOTAL		**30.00**	**7.85**	**0.00**	**92.15**
154	**LOWER METTUR-IV HPS**	7	15.00	9.35	0.00	90.65
		8	15.00	5.26	0.00	94.74
	TOTAL		**30.00**	**7.31**	**0.00**	**92.69**
155	**METTUR DAM HPS**	1	12.50	0.00	0.00	100.00
		2	12.50	8.58	0.00	91.42
		3	12.50	0.00	0.00	100.00
		4	12.50	0.00	0.00	100.00
	TOTAL		**50.00**	**2.14**	**0.00**	**97.86**
156	**METTUR TUNNEL HPS**	1	50.00	0.00	0.00	100.00
		2	50.00	0.00	0.00	100.00
		3	50.00	0.00	0.00	100.00
		4	50.00	0.00	5.79	94.21
	TOTAL		**200.00**	**0.00**	**1.45**	**98.55**

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
157	MOYAR HPS	1	12.00	1.10	4.75	94.15
		2	12.00	1.10	0.75	98.15
		3	12.00	8.67	20.00	71.33
	TOTAL		**36.00**	**3.63**	**8.50**	**87.88**
158	PAPANASAM HPS	1	8.00	0.04	0.00	99.96
		2	8.00	0.04	0.00	99.96
		3	8.00	7.76	0.00	92.24
		4	8.00	9.61	0.00	90.39
	TOTAL		**32.00**	**4.36**	**0.00**	**95.64**
159	PARSON`S VALLEY HPS	1	30.00	0.00	0.00	100.00
	TOTAL		**30.00**	**0.00**	**0.00**	**100.00**
160	PERIYAR HPS	1	42.00	0.50	0.00	99.50
		2	42.00	3.49	0.00	96.51
		3	42.00	5.83	0.00	94.17
		4	35.00	11.60	0.00	88.40
	TOTAL		**161.00**	**5.35**	**0.00**	**94.65**
161	PYKARA HPS	1	7.00	0.00	0.00	100.00
		2	7.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		3	7.00	0.00	0.00	100.00
		4	13.60	0.00	0.00	100.00
		5	13.60	0.00	0.00	100.00
		6	11.00	0.00	0.00	100.00
	TOTAL		**59.20**	**0.00**	**0.00**	**100.00**
162	**PYKARA ULTMATE HPS**	1	50.00	0.00	0.00	100.00
		2	50.00	100.00	0.00	0.00
		3	50.00	0.00	0.00	100.00
	TOTAL		**150.00**	**33.33**	**0.00**	**66.67**
163	**SARKARPATHY HPS**	1	30.00	10.28	0.00	89.72
	TOTAL		**30.00**	**10.28**	**0.00**	**89.72**
164	**SHOLAYAR HPS (TN)**	1	35.00	0.00	0.00	100.00
		2	35.00	0.00	0.00	100.00
	TOTAL		**70.00**	**0.00**	**0.00**	**100.00**
165	**SURULIYAR HPS**	1	35.00	8.22	57.05	34.73
	TOTAL		**35.00**	**8.22**	**57.05**	**34.73**
	TSGENCO					
166	**LOWER JURALA HPS**	1	40.00	0.00	0.00	100.00
		2	40.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		3	40.00	0.00	0.00	100.00
		4	40.00	0.00	0.00	100.00
		5	40.00	0.00	0.00	100.00
		6	40.00	0.00	0.17	99.83
	TOTAL		**240.00**	**0.00**	**0.03**	**99.97**
167	**NAGARJUN SGR HPS**	1	110.00	0.00	0.00	100.00
		2	100.80	0.00	0.79	99.21
		3	100.80	0.00	2.40	97.60
		4	100.80	0.00	5.61	94.39
		5	100.80	0.00	0.08	99.92
		6	100.80	0.00	0.00	100.00
		7	100.80	0.00	0.00	100.00
		8	100.80	0.00	2.31	97.69
	TOTAL		**815.60**	**0.00**	**1.40**	**98.60**
168	**NAGARJUN SGR LBC HPS**	1	30.00	0.00	0.00	100.00
		2	30.00	0.00	0.00	100.00
	TOTAL		**60.00**	**0.00**	**0.00**	**100.00**
169	**POCHAMPAD HPS**	1	9.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		2	9.00	0.00	0.00	100.00
		3	9.00	0.00	0.00	100.00
		4	9.00	0.00	0.00	100.00
	TOTAL		**36.00**	**0.00**	**0.00**	**100.00**
170	**PRIYADARSHNI JURALA HPS**	1	39.00	0.00	0.00	100.00
		2	39.00	0.00	0.00	100.00
		3	39.00	0.00	0.00	100.00
		4	39.00	0.00	0.00	100.00
		5	39.00	0.00	50.01	49.99
		6	39.00	0.00	0.00	100.00
	TOTAL		**234.00**	**0.00**	**8.34**	**91.66**
171	**PULICHINTALA HPS**	1	30.00	0.00	0.00	100.00
		2	30.00	0.00	0.00	100.00
		3	30.00	0.00	0.00	100.00
		4	30.00	0.00	0.00	100.00
	TOTAL		**120.00**	**0.00**	**0.00**	**100.00**
172	**SRISAILAM LB HPS**	1	150.00	0.00	0.10	99.90
		2	150.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		3	150.00	0.00	12.83	87.17
		4	150.00	0.00	0.00	100.00
		5	150.00	0.00	0.00	100.00
		6	150.00	0.00	14.81	85.19
	TOTAL		**900.00**	**0.00**	**4.62**	**95.38**
	Eastern					
	APGENCO					
173	**MACHKUND HPS**	1	17.00	0.00	0.00	100.00
		2	17.00	0.00	0.00	100.00
		3	17.00	0.00	0.14	99.86
		4	21.25	0.00	0.14	99.86
		5	21.25	0.00	0.00	100.00
		6	21.25	0.00	0.14	99.86
	TOTAL		**114.75**	**0.00**	**0.07**	**99.93**
	DEPL					
174	**JORETHANG LOOP**	1	48.00	13.87	0.08	86.05
		2	48.00	0.00	0.09	99.91
	TOTAL		**96.00**	**6.94**	**0.09**	**92.98**
	DVC					

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
175	MAITHON HPS	1	20.00	0.00	0.67	99.33
		2	23.20	0.00	3.78	96.22
		3	20.00	8.92	2.03	89.05
	TOTAL		**63.20**	**2.97**	**2.16**	**94.87**
176	PANCHET HPS	1	40.00	0.00	0.00	100.00
		2	40.00	0.00	0.00	100.00
	TOTAL		**80.00**	**0.00**	**0.00**	**100.00**
	GIPL					
177	CHUZACHEN HPS	1	55.00	3.06	0.03	96.91
		2	55.00	2.14	0.05	97.80
	TOTAL		**110.00**	**2.60**	**0.04**	**97.36**
	JUUNL					
178	SUBERNREKHA-I HPS	1	65.00	0.00	0.00	100.00
	TOTAL		**65.00**	**0.00**	**0.00**	**100.00**
179	SUBERNREKHA-II HPS	2	65.00	0.00	0.00	100.00
	TOTAL		**65.00**	**0.00**	**0.00**	**100.00**
	MBPC					
180	RONGNICHU HPS	1	56.50	0.36	0.70	98.94
		2	56.50	1.56	0.02	98.42
	TOTAL		**113.00**	**0.95**	**0.37**	**98.68**

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
	NHPC					
181	**RANGIT HPS**	1	20.00	6.39	2.26	91.35
		2	20.00	7.26	2.36	90.38
		3	20.00	7.62	1.32	91.06
	TOTAL		**60.00**	**7.09**	**1.98**	**90.93**
182	**TEESTA LOW DAM-III HPS**	1	33.00	4.64	0.11	95.25
		2	33.00	4.38	0.42	95.20
		3	33.00	4.65	0.01	95.35
		4	33.00	4.41	0.21	95.39
	TOTAL		**132.00**	**4.52**	**0.19**	**95.29**
183	**TEESTA LOW DAM-IV HPS**	1	40.00	2.93	0.50	96.57
		2	40.00	4.77	0.15	95.09
		3	40.00	5.14	0.11	94.75
		4	40.00	5.13	0.14	94.73
	TOTAL		**160.00**	**4.49**	**0.22**	**95.28**
184	**TEESTA V HPS**	1	170.00	3.25	0.02	96.73
		2	170.00	4.59	0.01	95.40
		3	170.00	2.72	0.65	96.63
	TOTAL		**510.00**	**3.52**	**0.23**	**96.25**

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
	OHPC					
185	**BALIMELA HPS**	1	60.00	100.00	0.00	0.00
		2	60.00	0.00	0.00	100.00
		3	60.00	0.00	0.00	100.00
		4	60.00	0.00	0.00	100.00
		5	60.00	0.00	0.00	100.00
		6	60.00	0.00	0.00	100.00
		7	75.00	0.00	0.00	100.00
		8	75.00	0.00	0.00	100.00
	TOTAL		**510.00**	**12.50**	**0.00**	**87.50**
186	**CHIPLIMA HPS**	1	24.00	0.00	0.00	100.00
		2	24.00	0.00	0.00	100.00
		3	24.00	0.00	0.00	100.00
	TOTAL		**72.00**	**0.00**	**0.00**	**100.00**
187	**HIRAKUD HPS**	1	49.50	0.00	0.00	100.00
		2	49.50	0.00	0.00	100.00
		3	32.00	0.00	0.00	100.00
		4	32.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		5	43.65	77.55	0.00	22.45
		6	43.65	59.11	0.00	40.89
		7	37.50	0.00	0.00	100.00
	TOTAL		**287.80**	**19.52**	**0.00**	**80.48**
188	**RENGALI HPS**	1	50.00	0.00	0.00	100.00
		2	50.00	0.00	0.00	100.00
		3	50.00	0.00	0.00	100.00
		4	50.00	0.00	0.00	100.00
		5	50.00	0.00	0.00	100.00
	TOTAL		**250.00**	**0.00**	**0.00**	**100.00**
189	**UPPER INDRAVATI HPS**	1	150.00	0.00	0.00	100.00
		2	150.00	0.00	0.00	100.00
		3	150.00	0.00	0.00	100.00
		4	150.00	0.00	0.00	100.00
	TOTAL		**600.00**	**0.00**	**0.00**	**100.00**
190	**UPPER KOLAB HPS**	1	80.00	0.00	0.00	100.00
		2	80.00	0.00	0.00	100.00
		3	80.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
		4	80.00	0.00	0.00	100.00
	TOTAL		**320.00**	**0.00**	**0.00**	**100.00**
	SEPL					
191	**TASHIDING HPS**	1	48.50	1.27	1.50	97.23
		2	48.50	1.27	1.51	97.22
	TOTAL		**97.00**	**1.27**	**1.50**	**97.23**
	SKPPPL					
192	**DIKCHU HPS**	1	48.00	0.00	0.00	100.00
		2	48.00	0.00	0.00	100.00
	TOTAL		**96.00**	**0.00**	**0.00**	**100.00**
	TUL					
193	**TEESTA-III HPS**	1	200.00	2.58	0.01	97.41
		2	200.00	3.00	0.00	97.00
		3	200.00	2.98	1.24	95.79
		4	200.00	5.93	7.37	86.69
		5	200.00	4.83	0.00	95.17
		6	200.00	0.10	6.89	93.01
	TOTAL		**1200.00**	**3.24**	**2.59**	**94.18**
	WBSEDCL					

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
194	JALDHAKA HPS ST-I	1	9.00	0.00	0.00	100.00
		2	9.00	0.00	0.00	100.00
		3	9.00	0.00	0.00	100.00
		4	9.00	0.00	0.00	100.00
	TOTAL		**36.00**	**0.00**	**0.00**	**100.00**
195	PURULIA PSS HPS	1	225.00	0.00	0.00	100.00
		2	225.00	0.00	0.00	100.00
		3	225.00	0.00	0.00	100.00
		4	225.00	0.00	0.00	100.00
	TOTAL		**900.00**	**0.00**	**0.00**	**100.00**
196	RAMMAM HPS	1	12.50	0.00	0.00	100.00
		2	12.50	0.00	0.00	100.00
		3	12.50	0.00	0.00	100.00
		4	12.50	0.00	0.00	100.00
	TOTAL		**50.00**	**0.00**	**0.00**	**100.00**
	North Eastern					
	APGCL					
197	KARBI LANGPI HPS	1	50.00	0.00	0.00	100.00
		2	50.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
	TOTAL		**100.00**	**0.00**	**0.00**	**100.00**
	MeECL					
198	**KYRDEMKULAI HPS**	1	30.00	0.00	0.00	100.00
		2	30.00	0.00	100.00	0.00
	TOTAL		**60.00**	**0.00**	**50.00**	**50.00**
199	**MYNTDU(LESHKA) St-1 HPS**	1	42.00	0.00	0.00	100.00
		2	42.00	0.00	0.00	100.00
		3	42.00	0.00	0.00	100.00
	TOTAL		**126.00**	**0.00**	**0.00**	**100.00**
200	**NEW UMTRU HPS**	1	20.00	0.00	0.00	100.00
		2	20.00	0.00	0.00	100.00
	TOTAL		**40.00**	**0.00**	**0.00**	**100.00**
201	**UMIAM HPS ST-I**	1	9.00	0.00	0.00	100.00
		2	9.00	0.00	0.00	100.00
		3	9.00	0.00	0.00	100.00
		4	9.00	0.00	0.00	100.00
	TOTAL		**36.00**	**0.00**	**0.00**	**100.00**
202	**UMIAM HPS ST-IV**	7	30.00	0.00	0.00	100.00
		8	30.00	0.00	0.00	100.00

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
	TOTAL		**60.00**	**0.00**	**0.00**	**100.00**
	NEEPCO.					
203	**DOYANG HPS**	1	25.00	7.88	0.08	92.04
		2	25.00	8.64	0.42	90.94
		3	25.00	8.07	0.86	91.07
	TOTAL		**75.00**	**8.20**	**0.45**	**91.35**
204	**KAMENG HPS**	1	150.00	0.73	14.39	84.88
		2	150.00	0.71	14.66	84.64
		3	150.00	0.72	35.52	63.75
		4	150.00	0.00	45.58	54.42
	TOTAL		**600.00**	**0.54**	**27.54**	**71.92**
205	**KHONDONG HPS**	1	25.00	0.00	0.71	99.29
		2	25.00	0.00	1.48	98.52
	TOTAL		**50.00**	**0.00**	**1.09**	**98.91**
206	**KOPILI HPS**	1	50.00	0.00	100.00	0.00
		2	50.00	0.00	100.00	0.00
		3	50.00	0.00	100.00	0.00
		4	50.00	0.00	100.00	0.00
	TOTAL		**200.00**	**0.00**	**100.00**	**0.00**

S.No.	STATION / CORPORATION	UNIT No.	INSTALLED CAPAPCITY (MW)	PLANNED MAINTENANCE (P.M) (%)	FORCED OUTAGE (F.O) (%)	OPERATING AVAILABILITY (100-FO-PM)
207	**PARE**	1	55.00	4.38	0.46	95.15
		2	55.00	1.61	0.04	98.35
	TOTAL		**110.00**	**3.00**	**0.25**	**96.75**
208	**RANGANADI HPS**	1	135.00	2.53	2.11	95.36
		2	135.00	2.25	0.00	97.75
		3	135.00	0.00	0.30	99.70
	TOTAL		**405.00**	**1.59**	**0.80**	**97.60**
209	**TUIRIAL HPS**	1	30.00	3.84	0.02	96.15
		2	30.00	4.01	0.08	95.92
	TOTAL		**60.00**	**3.92**	**0.05**	**96.03**
	NHPC					
210	**LOKTAK HPS**	1	35.00	2.95	0.08	96.97
		2	35.00	3.86	0.05	96.09
		3	35.00	3.16	1.26	95.59
	TOTAL		**105.00**	**3.32**	**0.46**	**96.21**

CHAPTER-7

MISCELLANEOUS OUTAGES OF HE UNITS

CHAPTER-7

MISCELLANEOUS OUTAGES OF HE UNITS

7.1 Non-availability of hydel generating units due to reasons other than planned maintenance and forced outages of unit components, auxiliary and other equipments and civil structures has been defined as **"**Miscellaneous Non-Availability**"**. This may be due to shortage of water, high silt content in the river, electrical grid disturbance, low system demand, disaster/natural calamity, reserve shutdown, transmission constraints & power evacuation problems, high tailrace level, strikes, etc. constitutes the miscellaneous outages. The station-wise details of miscellaneous non-availability during 2021-22 is given at **Annex-7.1** and summarized below in **Table 7.1.**

TABLE 7.1

MISCELLANEOUS OUTAGES
FOR PERIOD: 2021-22

S. No.	Causes of Miscellaneous Outage	Duration of Outage (Hours)	% of Total Outage
	NOT ASSOCIATED WITH THE EQUIPMENT AND CIVIL STRUCTURE		
1	Water Constraint	471,810.30	85.30
2	Grid Constraint	27,968.11	5.06
3	Other Miscellaneous	53,354.20	9.65
	TOTAL	**553,132.61**	**100.00**

7.2 The overall non-availability on account of miscellaneous outages has been estimated as 15.12%. It was highest (53.03%) in case of HE Stations from E.P.P.L followed BBMB (30.64%), SJVNL (15.79%), etc. However, miscellaneous non-availability being beyond the control of utilities, does not have not any impact on the operating availability of HE Stations.

CENTRAL ELECTRICITY AUTHORITY
Hydro WING
Hydro Project Planning & Investigation Division

Annex 7.1

NON-AVAILABILITY OF HYDROELECTRIC UNITS DUE TO REASONS OTHER THAN PLANNED MAINTENANACE AND FORCED OUTAGE DURING 2021-22

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
	Northern			
	ADHPL			
1	**ALLAIN DUHANGAN HPS**	1	96.00	0.00
		2	96.00	0.04
	TOTAL		**192.00**	**0.02**
	AHPC (GVK)			
2	**SHRINAGAR HPS**	1	82.50	0.00
		2	82.50	0.00
		3	82.50	0.00
		4	82.50	0.00
	TOTAL		**330.00**	**0.00**
	BBMB			
3	**BHAKRA LEFT HPS**	1	108.00	2.09
		2	126.00	21.61
		3	126.00	4.55
		4	126.00	21.22

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		5	126.00	3.83
	TOTAL		**612.00**	**10.66**
4	**BHAKRA RIGHT HPS**	10	157.00	18.18
		6	157.00	12.53
		7	157.00	68.54
		8	157.00	15.13
		9	157.00	21.18
	TOTAL		**785.00**	**27.11**
5	**DEHAR HPS**	1	165.00	14.81
		2	165.00	14.76
		3	165.00	41.01
		4	165.00	82.75
		5	165.00	37.94
		6	165.00	8.62
	TOTAL		**990.00**	**33.32**
6	**GANGUWAL HPS**	1	29.25	2.46
		2	24.20	3.58
		3	24.20	8.21
	TOTAL		**77.65**	**4.75**
7	**KOTLA HPS**	1	29.25	3.70

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		2	24.20	3.99
		3	24.20	5.82
	TOTAL		**77.65**	**4.50**
8	**PONG HPS**	1	66.00	20.08
		2	66.00	15.35
		3	66.00	15.00
		4	66.00	14.87
		5	66.00	11.61
		6	66.00	16.36
	TOTAL		**396.00**	**15.54**
	E.P.P.L.			
9	**MALANA-II HPS**	1	50.00	51.13
		2	50.00	54.93
	TOTAL		**100.00**	**53.03**
	GBHPPL			
10	**BUDHIL HPS**	1	35.00	0.00
		2	35.00	0.00
	TOTAL		**70.00**	**0.00**
	GMR BHHPL			
11	**BAJOLI HOLI HPS**	1	60.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		2	60.00	0.00
		3	60.00	0.00
	TOTAL		**180.00**	**0.00**
	HBPCL			
12	**BASPA HPS**	1	100.00	0.00
		2	100.00	0.00
		3	100.00	0.00
	TOTAL		**300.00**	**0.00**
13	**KARCHAM WANGTOO HPS**	1	261.25	0.00
		2	261.25	0.00
		3	261.25	0.00
		4	261.25	0.00
	TOTAL		**1045.00**	**0.00**
	HPPCL			
14	**KASHANG INTEGRATED HEP**	1	65.00	0.00
		2	65.00	100.00
		3	65.00	0.00
	TOTAL		**195.00**	**33.33**
15	**SAINJ HPS**	1	50.00	0.00
		2	50.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
	TOTAL		**100.00**	**0.00**
16	**SAWRA KUDDU HPS**	1	37.00	0.00
		2	37.00	0.00
		3	37.00	0.00
	TOTAL		**111.00**	**0.00**
	HPSEB			
17	**BASSI HPS**	1	16.50	0.00
		2	16.50	0.00
		3	16.50	0.00
		4	16.50	0.00
	TOTAL		**66.00**	**0.00**
18	**GIRI BATA HPS**	1	30.00	0.00
		2	30.00	0.00
	TOTAL		**60.00**	**0.00**
19	**LARJI HPS**	1	42.00	0.00
		2	42.00	0.00
		3	42.00	0.00
	TOTAL		**126.00**	**0.00**
20	**SANJAY HPS**	1	40.00	0.00
		2	40.00	0.27

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		3	40.00	10.73
	TOTAL		**120.00**	**3.67**
	HSPCL			
21	**SORANG HPS**	1	50.00	0.00
		2	50.00	0.00
	TOTAL		**100.00**	**0.00**
	IAEPL			
22	**CHANJU-I HPS**	1	12.00	0.00
		2	12.00	0.00
		3	12.00	0.00
	TOTAL		**36.00**	**0.00**
	JKSPDC			
23	**BAGLIHAR HPS**	1	150.00	0.00
		2	150.00	0.00
		3	150.00	0.00
	TOTAL		**450.00**	**0.00**
24	**BAGLIHAR II HPS**	1	150.00	0.00
		2	150.00	0.00
		3	150.00	100.00
	TOTAL		**450.00**	**33.33**

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
25	**LOWER JHELUM HPS**	1	35.00	0.00
		2	35.00	0.00
		3	35.00	100.00
	TOTAL		**105.00**	**33.33**
26	**UPPER SINDH-II HPS**	3	35.00	0.00
		4	35.00	0.00
		5	35.00	0.00
	TOTAL		**105.00**	**0.00**
	JPPVL			
27	**VISHNU PRAYAG HPS**	1	100.00	0.00
		2	100.00	0.00
		3	100.00	0.00
		4	100.00	0.00
	TOTAL		**400.00**	**0.00**
	L&T			
28	**SINGOLI BHATWARI HPS**	1	33.00	0.00
		2	33.00	0.00
		3	33.00	0.00
	TOTAL		**99.00**	**0.00**
	MPCL			

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
29	**MALANA HPS**	1	43.00	0.00
		2	43.00	0.00
	TOTAL		**86.00**	**0.00**
	NHPC			
30	**BAIRA SIUL HPS**	1	60.00	38.30
		2	60.00	39.22
		3	60.00	27.42
	TOTAL		**180.00**	**34.98**
31	**CHAMERA-I HPS**	1	180.00	48.88
		2	180.00	50.26
		3	180.00	38.35
	TOTAL		**540.00**	**45.83**
32	**CHAMERA-II HPS**	1	100.00	138.99
		2	100.00	36.59
		3	100.00	48.13
	TOTAL		**300.00**	**74.57**
33	**CHAMERA-III HPS**	1	77.00	50.75
		2	77.00	42.23
		3	77.00	41.37
	TOTAL		**231.00**	**44.78**

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
34	**CHUTAK HPS**	1	11.00	35.01
		2	11.00	33.89
		3	11.00	33.97
		4	11.00	37.64
	TOTAL		**44.00**	**35.13**
35	**DHAULI GANGA HPS**	1	70.00	39.64
		2	70.00	42.36
		3	70.00	52.03
		4	70.00	43.06
	TOTAL		**280.00**	**44.27**
36	**DULHASTI HPS**	1	130.00	18.52
		2	130.00	30.43
		3	130.00	34.56
	TOTAL		**390.00**	**27.84**
37	**KISHANGANGA HPS**	1	110.00	33.31
		2	110.00	25.67
		3	110.00	30.90
	TOTAL		**330.00**	**29.96**
38	**NIMMO BAZGO HPS**	1	15.00	24.82
		2	15.00	26.41

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		3	15.00	33.19
	TOTAL		**45.00**	**28.14**
39	**PARBATI-III HPS**	1	130.00	69.75
		2	130.00	73.38
		3	130.00	75.83
		4	130.00	62.64
	TOTAL		**520.00**	**70.40**
40	**SALAL HPS**	1	115.00	33.69
		2	115.00	46.71
		3	115.00	26.77
		4	115.00	38.21
		5	115.00	48.56
		6	115.00	18.98
	TOTAL		**690.00**	**35.48**
41	**SEWA-II HPS**	1	40.00	0.26
		2	40.00	0.42
		3	40.00	0.03
	TOTAL		**120.00**	**0.24**
42	**TANAKPUR HPS**	1	31.40	8.55
		2	31.40	9.92

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		3	31.40	16.15
	TOTAL		**94.20**	**11.54**
43	**URI-I HPS**	1	120.00	1.11
		2	120.00	2.42
		3	120.00	0.42
		4	120.00	1.03
	TOTAL		**480.00**	**1.25**
44	**URI-II HPS**	1	60.00	5.75
		2	60.00	20.82
		3	60.00	13.53
		4	60.00	9.34
	TOTAL		**240.00**	**12.36**
	NTPC Ltd.			
45	**KOLDAM**	1	200.00	0.00
		2	200.00	0.00
		3	200.00	0.00
		4	200.00	0.00
	TOTAL		**800.00**	**0.00**
	PSPCL			
46	**ANANDPUR SAHIB-I HPS**	1	33.50	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		2	33.50	0.00
	TOTAL		**67.00**	**0.00**
47	**ANANDPUR SAHIB-II HPS**	3	33.50	0.00
		4	33.50	0.00
	TOTAL		**67.00**	**0.00**
48	**MUKERIAN-I HPS**	1	15.00	0.00
		2	15.00	0.00
		3	15.00	0.00
	TOTAL		**45.00**	**0.00**
49	**MUKERIAN-II HPS**	4	15.00	0.00
		5	15.00	0.00
		6	15.00	0.00
	TOTAL		**45.00**	**0.00**
50	**MUKERIAN-III HPS**	7	19.50	0.00
		8	19.50	0.00
		9	19.50	0.00
	TOTAL		**58.50**	**0.00**
51	**MUKERIAN-IV HPS**	10	19.50	0.00
		11	19.50	0.00
		12	19.50	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
	TOTAL		**58.50**	**0.00**
52	**RANJIT SAGAR HPS**	1	150.00	0.00
		2	150.00	0.89
		3	150.00	0.00
		4	150.00	0.00
	TOTAL		**600.00**	**0.22**
53	**SHANAN HPS**	1	15.00	0.00
		2	15.00	0.00
		3	15.00	0.00
		4	15.00	0.00
		5	50.00	0.00
	TOTAL		**110.00**	**0.00**
	RRVUNL			
54	**JAWAHAR SAGAR HPS**	1	33.00	0.00
		2	33.00	0.00
		3	33.00	0.00
	TOTAL		**99.00**	**0.00**
55	**MAHI BAJAJ-I HPS**	1	25.00	0.00
		2	25.00	0.00
	TOTAL		**50.00**	**0.00**

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
56	**MAHI BAJAJ-II HPS**	3	45.00	100.00
		4	45.00	0.00
	TOTAL		**90.00**	**50.00**
57	**R P SAGAR HPS**	1	43.00	0.00
		2	43.00	0.00
		3	43.00	0.00
		4	43.00	0.00
	TOTAL		**172.00**	**0.00**
	SJVNL			
58	**NATHPA JHAKRI HPS**	1	250.00	40.35
		2	250.00	141.81
		3	250.00	45.84
		4	250.00	41.94
		5	250.00	49.11
		6	250.00	146.01
	TOTAL		**1500.00**	**77.51**
59	**RAMPUR HPS**	1	68.67	32.27
		2	68.67	46.36
		3	68.67	50.22
		4	68.67	49.65

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		5	68.67	48.79
		6	68.67	33.99
	TOTAL		**412.02**	**43.55**
	THDC			
60	**KOTESHWAR HPS**	1	100.00	0.00
		2	100.00	0.00
		3	100.00	0.00
		4	100.00	0.00
	TOTAL		**400.00**	**0.00**
61	**TEHRI ST-1 HPS**	1	250.00	0.00
		2	250.00	0.00
		3	250.00	0.00
		4	250.00	0.00
	TOTAL		**1000.00**	**0.00**
	UJVNL			
62	**CHIBRO (YAMUNA) HPS**	1	60.00	0.00
		2	60.00	0.00
		3	60.00	0.00
		4	60.00	100.00
	TOTAL		**240.00**	**25.00**

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
63	**CHILLA HPS**	1	36.00	0.00
		2	36.00	0.00
		3	36.00	0.00
		4	36.00	0.00
	TOTAL		**144.00**	**0.00**
64	**DHAKRANI HPS**	1	11.25	0.00
		2	11.25	0.00
		3	11.25	0.00
	TOTAL		**33.75**	**0.00**
65	**DHALIPUR HPS**	1	17.00	0.00
		2	17.00	0.00
		3	17.00	0.00
	TOTAL		**51.00**	**0.00**
66	**KHATIMA HPS**	1	13.80	0.00
		2	13.80	0.00
		3	13.80	0.00
	TOTAL		**41.40**	**0.00**
67	**KHODRI HPS**	1	30.00	24.73
		2	30.00	1.09
		3	30.00	45.20

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		4	30.00	14.52
	TOTAL		**120.00**	**21.38**
68	**KULHAL HPS**	1	10.00	0.00
		2	10.00	10.67
		3	10.00	0.00
	TOTAL		**30.00**	**3.56**
69	**MANERI BHALI-I HPS**	1	30.00	0.00
		2	30.00	0.00
		3	30.00	0.00
	TOTAL		**90.00**	**0.00**
70	**MANERI BHALI-II HPS**	1	76.00	0.00
		2	76.00	0.00
		3	76.00	0.00
		4	76.00	0.00
	TOTAL		**304.00**	**0.00**
71	**RAMGANGA HPS**	1	66.00	0.00
		2	66.00	13.98
		3	66.00	4.97
	TOTAL		**198.00**	**6.32**
	UPJVNL			

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
72	**KHARA HPS**	1	24.00	0.00
		2	24.00	0.00
		3	24.00	0.00
	TOTAL		**72.00**	**0.00**
73	**MATATILA HPS**	1	10.20	0.00
		2	10.20	0.00
		3	10.20	0.00
	TOTAL		**30.60**	**0.00**
74	**OBRA HPS**	1	33.00	0.00
		2	33.00	0.00
		3	33.00	0.00
	TOTAL		**99.00**	**0.00**
75	**RIHAND HPS**	1	50.00	0.00
		2	50.00	0.00
		3	50.00	0.00
		4	50.00	0.00
		5	50.00	0.00
		6	50.00	0.00
	TOTAL		**300.00**	**0.00**
	Western			

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
	CSPGCL			
76	**HASDEOBANGO HPS**	1	40.00	0.00
		2	40.00	0.00
		3	40.00	0.00
	TOTAL		**120.00**	**0.00**
	DLHP			
77	**BHANDARDHARA HPS ST-II**	2	34.00	0.00
	TOTAL		**34.00**	**0.00**
	GSECL			
78	**KADANA HPS**	1	60.00	0.00
		2	60.00	0.00
		3	60.00	0.00
		4	60.00	0.00
	TOTAL		**240.00**	**0.00**
79	**UKAI HPS**	1	75.00	0.00
		2	75.00	0.00
		3	75.00	0.00
		4	75.00	0.00
	TOTAL		**300.00**	**0.00**
	MAHAGENCO			

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
80	**BHIRA TAIL RACE HPS**	1	40.00	0.00
		2	40.00	0.00
	TOTAL		**80.00**	**0.00**
81	**GHATGHAR PSS HPS**	1	125.00	0.00
		2	125.00	0.00
	TOTAL		**250.00**	**0.00**
82	**KOYNA DPH HPS**	1	18.00	0.00
		2	18.00	0.00
	TOTAL		**36.00**	**0.00**
83	**KOYNA-I&II HPS**	1	70.00	0.00
		2	70.00	0.00
		3	70.00	0.00
		4	70.00	0.00
		5	80.00	0.00
		6	80.00	0.00
		7	80.00	0.00
		8	80.00	0.00
	TOTAL		**600.00**	**0.00**
84	**KOYNA-III HPS**	1	80.00	0.00
		2	80.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		3	80.00	0.00
		4	80.00	0.00
	TOTAL		**320.00**	**0.00**
85	**KOYNA-IV HPS**	1	250.00	0.00
		2	250.00	0.00
		3	250.00	0.00
		4	250.00	0.00
	TOTAL		**1000.00**	**0.00**
86	**TILLARI HPS**	1	60.00	0.00
	TOTAL		**60.00**	**0.00**
87	**VAITARNA HPS**	1	60.00	0.00
	TOTAL		**60.00**	**0.00**
	MPPGCL			
88	**BANSAGAR-II HPS**	1	15.00	0.00
		2	15.00	3.71
	TOTAL		**30.00**	**1.86**
89	**BANSAGAR-III HPS**	1	20.00	88.55
		2	20.00	55.34
		3	20.00	55.61
	TOTAL		**60.00**	**66.50**

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
90	**BANSAGAR TONS-I HPS**	1	105.00	0.00
		2	105.00	0.00
		3	105.00	0.00
	TOTAL		**315.00**	**0.00**
91	**BARGI HPS**	1	45.00	0.00
		2	45.00	0.00
	TOTAL		**90.00**	**0.00**
92	**GANDHI SAGAR HPS**	1	23.00	60.04
		2	23.00	0.00
		3	23.00	0.00
		4	23.00	60.11
		5	23.00	59.84
	TOTAL		**115.00**	**36.00**
93	**MADHIKHERA HPS**	1	20.00	0.00
		2	20.00	0.00
		3	20.00	0.00
	TOTAL		**60.00**	**0.00**
94	**PENCH HPS**	1	80.00	0.00
		2	80.00	0.00
	TOTAL		**160.00**	**0.00**

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
95	**RAJGHAT HPS**	1	15.00	13.62
		2	15.00	0.00
		3	15.00	13.34
	TOTAL		**45.00**	**8.99**
	NHDC			
96	**INDIRA SAGAR HPS**	1	125.00	0.00
		2	125.00	0.00
		3	125.00	0.00
		4	125.00	0.00
		5	125.00	0.00
		6	125.00	0.14
		7	125.00	0.00
		8	125.00	0.00
	TOTAL		**1000.00**	**0.02**
97	**OMKARESHWAR HPS**	1	65.00	0.00
		2	65.00	0.00
		3	65.00	0.00
		4	65.00	0.00
		5	65.00	0.00
		6	65.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		7	65.00	0.00
		8	65.00	0.00
	TOTAL		**520.00**	**0.00**
	SSNNL			
98	**S SAROVAR CHPH HPS**	1	50.00	0.00
		2	50.00	0.00
		3	50.00	0.00
		4	50.00	0.00
		5	50.00	0.00
	TOTAL		**250.00**	**0.00**
99	**S SAROVAR RBPH HPS**	1	200.00	0.25
		2	200.00	0.31
		3	200.00	0.13
		4	200.00	0.31
		5	200.00	0.31
		6	200.00	0.00
	TOTAL		**1200.00**	**0.22**
	TATA MAH.			
100	**BHIRA HPS**	1	25.00	0.00
		2	25.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		3	25.00	0.00
		4	25.00	0.00
		5	25.00	0.00
		6	25.00	0.00
	TOTAL		**150.00**	**0.00**
101	**BHIRA PSS HPS**	1	150.00	0.00
	TOTAL		**150.00**	**0.00**
102	**BHIVPURI HPS**	1	24.00	0.00
		2	24.00	0.00
		3	24.00	0.00
		4	1.50	0.00
		5	1.50	0.00
	TOTAL		**75.00**	**0.00**
103	**KHOPOLI HPS**	1	24.00	0.00
		2	24.00	0.00
		3	24.00	0.00
	TOTAL		**72.00**	**0.00**
	Southern			
	APGENCO			
104	**HAMPI HPS**	1	9.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		2	9.00	0.00
		3	9.00	0.00
		4	9.00	0.00
	TOTAL		**36.00**	**0.00**
105	**LOWER SILERU HPS**	1	115.00	0.00
		2	115.00	0.00
		3	115.00	0.00
		4	115.00	0.00
	TOTAL		**460.00**	**0.00**
106	**NAGARJUN SGR RBC HPS**	1	30.00	0.00
		2	30.00	0.00
		3	30.00	0.00
	TOTAL		**90.00**	**0.00**
107	**NAGARJUN SGR TPD**	1	25.00	0.00
		2	25.00	0.00
	TOTAL		**50.00**	**0.00**
108	**SRISAILAM HPS**	1	110.00	0.00
		2	110.00	0.00
		3	110.00	0.00
		4	110.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		5	110.00	0.00
		6	110.00	0.00
		7	110.00	0.00
	TOTAL		**770.00**	**0.00**
109	**T B DAM HPS**	1	9.00	0.00
		2	9.00	0.00
		3	9.00	0.00
		4	9.00	0.00
	TOTAL		**36.00**	**0.00**
110	**UPPER SILERU HPS**	1	60.00	0.00
		2	60.00	0.00
		3	60.00	0.00
		4	60.00	0.00
	TOTAL		**240.00**	**0.00**
	KPCL			
111	**ALMATTI DPH HPS**	1	15.00	0.00
		2	55.00	0.00
		3	55.00	0.00
		4	55.00	0.00
		5	55.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		6	55.00	0.00
	TOTAL		**290.00**	**0.00**
112	**BHADRA HPS**	1	2.00	0.00
		2	12.00	0.00
		3	12.00	0.00
	TOTAL		**26.00**	**0.00**
113	**GERUSUPPA HPS**	1	60.00	0.00
		2	60.00	0.00
		3	60.00	0.00
		4	60.00	0.00
	TOTAL		**240.00**	**0.00**
114	**GHAT PRABHA HPS**	1	16.00	54.30
		2	16.00	53.24
	TOTAL		**32.00**	**53.77**
115	**JOG HPS**	1	13.20	0.00
		2	13.20	0.00
		3	13.20	0.00
		4	13.20	0.00
		5	21.60	0.00
		6	21.60	0.26

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		7	21.60	0.00
		8	21.60	0.00
	TOTAL		**139.20**	**0.03**
116	**KADRA HPS**	1	50.00	65.04
		2	50.00	65.46
		3	50.00	64.35
	TOTAL		**150.00**	**64.95**
117	**KALINADI HPS**	1	150.00	0.00
		2	150.00	0.00
		3	150.00	100.00
		4	150.00	100.00
		5	150.00	0.00
		6	150.00	0.00
	TOTAL		**900.00**	**33.33**
118	**KALINADI SUPA HPS**	1	50.00	0.02
		2	50.00	0.02
	TOTAL		**100.00**	**0.02**
119	**KODASALI HPS**	1	40.00	37.53
		2	40.00	57.56
		3	40.00	55.76

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
	TOTAL		**120.00**	**50.28**
120	**LIGANAMAKKI HPS**	1	27.50	0.00
		2	27.50	0.00
	TOTAL		**55.00**	**0.00**
121	**MUNIRABAD HPS**	1	9.00	29.97
		2	9.00	34.77
		3	10.00	0.00
	TOTAL		**28.00**	**21.58**
122	**SHARAVATHI HPS**	1	103.50	0.00
		10	103.50	0.00
		2	103.50	0.00
		3	103.50	0.00
		4	103.50	0.00
		5	103.50	0.00
		6	103.50	0.00
		7	103.50	0.00
		8	103.50	0.00
		9	103.50	0.00
	TOTAL		**1035.00**	**0.00**
123	**SIVASAMUNDRUM HPS**	1	3.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		10	6.00	0.00
		2	3.00	0.00
		3	3.00	0.00
		4	3.00	0.00
		5	3.00	0.00
		6	3.00	0.00
		7	6.00	0.00
		8	6.00	0.00
		9	6.00	0.00
	TOTAL		**42.00**	**0.00**
124	**VARAHI HPS**	1	115.00	8.34
		2	115.00	18.95
		3	115.00	4.54
		4	115.00	8.74
	TOTAL		**460.00**	**10.14**
	KSEB			
125	**IDAMALAYAR HPS**	1	37.50	15.85
		2	37.50	14.51
	TOTAL		**75.00**	**15.18**
126	**IDUKKI HPS**	1	130.00	0.02

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		2	130.00	0.00
		3	130.00	0.00
		4	130.00	0.11
		5	130.00	0.50
		6	130.00	0.40
	TOTAL		**780.00**	**0.17**
127	**KAKKAD HPS**	1	25.00	0.00
		2	25.00	0.00
	TOTAL		**50.00**	**0.00**
128	**KUTTIYADI ADDL EXTN**	1	50.00	0.74
		2	50.00	0.58
	TOTAL		**100.00**	**0.66**
129	**KUTTIYADI EXTN HPS**	4	50.00	0.38
	TOTAL		**50.00**	**0.38**
130	**KUTTIYADI HPS**	1	25.00	0.73
		2	25.00	0.48
		3	25.00	0.46
	TOTAL		**75.00**	**0.56**
131	**LOWER PERIYAR HPS**	1	60.00	0.00
		2	60.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		3	60.00	0.00
	TOTAL		**180.00**	**0.00**
132	**NARIAMANGLAM HPS**	1	15.00	0.00
		2	15.00	0.00
		3	15.00	0.00
	TOTAL		**45.00**	**0.00**
133	**PALLIVASAL HPS**	1	5.00	0.00
		2	5.00	0.00
		3	5.00	0.00
		4	7.50	0.00
		5	7.50	0.00
		6	7.50	0.00
	TOTAL		**37.50**	**0.00**
134	**PANNIAR HPS**	1	15.00	0.00
		2	15.00	0.00
	TOTAL		**30.00**	**0.00**
135	**PORINGALKUTTU HPS**	1	8.00	0.00
		2	8.00	0.00
		3	8.00	0.00
		4	8.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
	TOTAL		**32.00**	**0.00**
136	**SABARIGIRI HPS**	1	50.00	0.09
		2	50.00	0.15
		3	50.00	0.08
		4	50.00	0.00
		5	50.00	0.17
		6	50.00	0.16
	TOTAL		**300.00**	**0.11**
137	**SENGULAM HPS**	1	12.00	0.00
		2	12.00	100.00
		3	12.00	100.00
		4	12.00	100.00
	TOTAL		**48.00**	**75.00**
138	**SHOLAYAR HPS**	1	18.00	0.00
		2	18.00	0.00
		3	18.00	0.00
	TOTAL		**54.00**	**0.00**
	TANGEDCO			
139	**ALIYAR HPS**	1	60.00	0.00
	TOTAL		**60.00**	**0.00**

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
140	**BHAWANI BARRAGE-II HPS**	1	15.00	28.19
		2	15.00	22.34
	TOTAL		**30.00**	**25.26**
141	**BHAWANI BARRAGE-III HPS**	1	15.00	0.00
		2	15.00	0.00
	TOTAL		**30.00**	**0.00**
142	**BHAWANI KATTAL**	1	15.00	0.00
		2	15.00	0.00
	TOTAL		**30.00**	**0.00**
143	**KADAMPARI HPS**	1	100.00	0.00
		2	100.00	0.00
		3	100.00	0.00
		4	100.00	0.00
	TOTAL		**400.00**	**0.00**
144	**KODAYAR-I HPS**	1	60.00	0.00
	TOTAL		**60.00**	**0.00**
145	**KODAYAR-II HPS**	2	40.00	0.00
	TOTAL		**40.00**	**0.00**
146	**KUNDAH-I HPS**	1	20.00	0.00
		2	20.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		3	20.00	0.00
	TOTAL		**60.00**	**0.00**
147	**KUNDAH-II HPS**	4	35.00	0.00
		5	35.00	0.00
		6	35.00	0.00
		7	35.00	0.00
		8	35.00	0.00
	TOTAL		**175.00**	**0.00**
148	**KUNDAH-III HPS**	10	60.00	0.00
		11	60.00	0.00
		9	60.00	0.00
	TOTAL		**180.00**	**0.00**
149	**KUNDAH-IV HPS**	12	50.00	0.00
		13	50.00	0.00
	TOTAL		**100.00**	**0.00**
150	**KUNDAH-V HPS**	14	20.00	0.00
		15	20.00	0.00
	TOTAL		**40.00**	**0.00**
151	**LOWER METTUR-I HPS**	1	15.00	0.00
		2	15.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
	TOTAL		**30.00**	**0.00**
152	**LOWER METTUR-II HPS**	3	15.00	0.00
		4	15.00	0.00
	TOTAL		**30.00**	**0.00**
153	**LOWER METTUR-III HPS**	5	15.00	0.00
		6	15.00	0.00
	TOTAL		**30.00**	**0.00**
154	**LOWER METTUR-IV HPS**	7	15.00	0.00
		8	15.00	0.00
	TOTAL		**30.00**	**0.00**
155	**METTUR DAM HPS**	1	12.50	38.33
		2	12.50	65.80
		3	12.50	45.24
		4	12.50	32.58
	TOTAL		**50.00**	**45.49**
156	**METTUR TUNNEL HPS**	1	50.00	24.38
		2	50.00	30.99
		3	50.00	41.19
		4	50.00	20.64
	TOTAL		**200.00**	**29.30**

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
157	**MOYAR HPS**	1	12.00	0.00
		2	12.00	0.00
		3	12.00	0.00
	TOTAL		**36.00**	**0.00**
158	**PAPANASAM HPS**	1	8.00	0.00
		2	8.00	0.00
		3	8.00	0.00
		4	8.00	0.00
	TOTAL		**32.00**	**0.00**
159	**PARSON`S VALLEY HPS**	1	30.00	0.00
	TOTAL		**30.00**	**0.00**
160	**PERIYAR HPS**	1	42.00	0.00
		2	42.00	0.00
		3	42.00	0.00
		4	35.00	0.00
	TOTAL		**161.00**	**0.00**
161	**PYKARA HPS**	1	7.00	0.00
		2	7.00	0.00
		3	7.00	0.00
		4	13.60	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		5	13.60	0.00
		6	11.00	0.00
	TOTAL		**59.20**	**0.00**
162	**PYKARA ULTMATE HPS**	1	50.00	0.00
		2	50.00	0.00
		3	50.00	0.00
	TOTAL		**150.00**	**0.00**
163	**SARKARPATHY HPS**	1	30.00	0.00
	TOTAL		**30.00**	**0.00**
164	**SHOLAYAR HPS (TN)**	1	35.00	0.00
		2	35.00	0.00
	TOTAL		**70.00**	**0.00**
165	**SURULIYAR HPS**	1	35.00	0.00
	TOTAL		**35.00**	**0.00**
	TSGENCO			
166	**LOWER JURALA HPS**	1	40.00	41.64
		2	40.00	31.64
		3	40.00	40.54
		4	40.00	33.70
		5	40.00	68.22

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		6	40.00	55.89
	TOTAL		**240.00**	**45.27**
167	**NAGARJUN SGR HPS**	1	110.00	23.83
		2	100.80	37.07
		3	100.80	15.26
		4	100.80	21.31
		5	100.80	11.78
		6	100.80	23.01
		7	100.80	28.69
		8	100.80	44.76
	TOTAL		**815.60**	**25.71**
168	**NAGARJUN SGR LBC HPS**	1	30.00	50.96
		2	30.00	40.27
	TOTAL		**60.00**	**45.62**
169	**POCHAMPAD HPS**	1	9.00	44.38
		2	9.00	44.67
		3	9.00	50.13
		4	9.00	51.23
	TOTAL		**36.00**	**47.60**
170	**PRIYADARSHNI JURALA HPS**	1	39.00	29.04

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		2	39.00	34.25
		3	39.00	35.89
		4	39.00	33.15
		5	39.00	0.00
		6	39.00	43.01
	TOTAL		**234.00**	**29.22**
171	**PULICHINTALA HPS**	1	30.00	44.38
		2	30.00	44.93
		3	30.00	17.26
		4	30.00	33.42
	TOTAL		**120.00**	**35.00**
172	**SRISAILAM LB HPS**	1	150.00	23.23
		2	150.00	23.01
		3	150.00	18.63
		4	150.00	100.00
		5	150.00	26.57
		6	150.00	37.28
	TOTAL		**900.00**	**38.12**
	Eastern			
	APGENCO			

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
173	**MACHKUND HPS**	1	17.00	0.00
		2	17.00	0.00
		3	17.00	0.00
		4	21.25	0.00
		5	21.25	0.00
		6	21.25	0.00
	TOTAL		**114.75**	**0.00**
	DEPL			
174	**JORETHANG LOOP**	1	48.00	1.23
		2	48.00	0.93
	TOTAL		**96.00**	**1.08**
	DVC			
175	**MAITHON HPS**	1	20.00	43.78
		2	23.20	7.66
		3	20.00	16.02
	TOTAL		**63.20**	**22.49**
176	**PANCHET HPS**	1	40.00	0.00
		2	40.00	0.00
	TOTAL		**80.00**	**0.00**
	GIPL			

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
177	**CHUZACHEN HPS**	1	55.00	44.42
		2	55.00	44.67
	TOTAL		**110.00**	**44.55**
	JUUNL			
178	**SUBERNREKHA-I HPS**	1	65.00	0.00
	TOTAL		**65.00**	**0.00**
179	**SUBERNREKHA-II HPS**	2	65.00	0.00
	TOTAL		**65.00**	**0.00**
	MBPC			
180	**RONGNICHU HPS**	1	56.50	13.88
		2	56.50	14.40
	TOTAL		**113.00**	**14.14**
	NHPC			
181	**RANGIT HPS**	1	20.00	27.59
		2	20.00	19.45
		3	20.00	26.49
	TOTAL		**60.00**	**24.51**
182	**TEESTA LOW DAM-III HPS**	1	33.00	46.24
		2	33.00	35.90
		3	33.00	46.28

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		4	33.00	32.69
	TOTAL		**132.00**	**40.28**
183	**TEESTA LOW DAM-IV HPS**	1	40.00	43.89
		2	40.00	37.00
		3	40.00	31.30
		4	40.00	41.72
	TOTAL		**160.00**	**38.48**
184	**TEESTA V HPS**	1	170.00	33.59
		2	170.00	45.53
		3	170.00	32.16
	TOTAL		**510.00**	**37.09**
	OHPC			
185	**BALIMELA HPS**	1	60.00	0.00
		2	60.00	0.00
		3	60.00	0.00
		4	60.00	0.00
		5	60.00	0.00
		6	60.00	0.00
		7	75.00	0.00
		8	75.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
	TOTAL		**510.00**	**0.00**
186	**CHIPLIMA HPS**	1	24.00	0.00
		2	24.00	0.00
		3	24.00	0.00
	TOTAL		**72.00**	**0.00**
187	**HIRAKUD HPS**	1	49.50	0.00
		2	49.50	0.00
		3	32.00	0.00
		4	32.00	0.00
		5	43.65	0.00
		6	43.65	0.00
		7	37.50	0.00
	TOTAL		**287.80**	**0.00**
188	**RENGALI HPS**	1	50.00	0.00
		2	50.00	0.00
		3	50.00	0.00
		4	50.00	0.00
		5	50.00	0.00
	TOTAL		**250.00**	**0.00**
189	**UPPER INDRAVATI HPS**	1	150.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		2	150.00	0.00
		3	150.00	0.00
		4	150.00	0.00
	TOTAL		**600.00**	**0.00**
190	**UPPER KOLAB HPS**	1	80.00	0.00
		2	80.00	0.00
		3	80.00	0.00
		4	80.00	0.00
	TOTAL		**320.00**	**0.00**
	SEPL			
191	**TASHIDING HPS**	1	48.50	0.00
		2	48.50	0.00
	TOTAL		**97.00**	**0.00**
	SKPPPL			
192	**DIKCHU HPS**	1	48.00	0.00
		2	48.00	0.00
	TOTAL		**96.00**	**0.00**
	TUL			
193	**TEESTA-III HPS**	1	200.00	0.21
		2	200.00	0.26

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		3	200.00	0.24
		4	200.00	0.21
		5	200.00	0.21
		6	200.00	0.20
	TOTAL		**1200.00**	**0.22**
	WBSEDCL			
194	**JALDHAKA HPS ST-I**	1	9.00	0.00
		2	9.00	0.00
		3	9.00	0.00
		4	9.00	0.00
	TOTAL		**36.00**	**0.00**
195	**PURULIA PSS HPS**	1	225.00	0.00
		2	225.00	0.00
		3	225.00	0.00
		4	225.00	0.00
	TOTAL		**900.00**	**0.00**
196	**RAMMAM HPS**	1	12.50	0.00
		2	12.50	0.00
		3	12.50	0.00
		4	12.50	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
	TOTAL		**50.00**	**0.00**
	North Eastern			
	APGCL			
197	**KARBI LANGPI HPS**	1	50.00	0.00
		2	50.00	0.00
	TOTAL		**100.00**	**0.00**
	MeECL			
198	**KYRDEMKULAI HPS**	1	30.00	0.00
		2	30.00	0.00
	TOTAL		**60.00**	**0.00**
199	**MYNTDU(LESHKA) St-1 HPS**	1	42.00	0.00
		2	42.00	0.00
		3	42.00	0.00
	TOTAL		**126.00**	**0.00**
200	**NEW UMTRU HPS**	1	20.00	0.00
		2	20.00	0.00
	TOTAL		**40.00**	**0.00**
201	**UMIAM HPS ST-I**	1	9.00	0.00
		2	9.00	0.00
		3	9.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		4	9.00	0.00
	TOTAL		**36.00**	**0.00**
202	**UMIAM HPS ST-IV**	7	30.00	0.00
		8	30.00	0.00
	TOTAL		**60.00**	**0.00**
	NEEPCO.			
203	**DOYANG HPS**	1	25.00	13.39
		2	25.00	9.92
		3	25.00	5.34
	TOTAL		**75.00**	**9.55**
204	**KAMENG HPS**	1	150.00	0.00
		2	150.00	0.08
		3	150.00	0.05
		4	150.00	0.00
	TOTAL		**600.00**	**0.03**
205	**KHONDONG HPS**	1	25.00	0.45
		2	25.00	0.02
	TOTAL		**50.00**	**0.23**
206	**KOPILI HPS**	1	50.00	0.00
		2	50.00	0.00

SL.No.	UTILITY/STATION	UNIT No.	INSTALLED CAPAPCITY (MW)	MISCELLANEOUS NON-AVAILABILITY (%)
		3	50.00	0.00
		4	50.00	0.00
	TOTAL		**200.00**	**0.00**
207	**PARE**	1	55.00	0.00
		2	55.00	0.00
	TOTAL		**110.00**	**0.00**
208	**RANGANADI HPS**	1	135.00	0.74
		2	135.00	1.10
		3	135.00	0.55
	TOTAL		**405.00**	**0.80**
209	**TUIRIAL HPS**	1	30.00	5.60
		2	30.00	6.94
	TOTAL		**60.00**	**6.27**
	NHPC			
210	**LOKTAK HPS**	1	35.00	51.06
		2	35.00	53.52
		3	35.00	48.96
	TOTAL		**105.00**	**51.18**

CHAPTER-8

GENERATION PROGRAMME FOR THE YEAR 2019-20

CHAPTER 8

GENERATION PROGRAMME FOR THE YEAR 2022-23

8.1 As on 31.03.2022, 210 HE Stations (of more than 25 MW capacity) having total installed capacity of 46722.50 MW are being monitored in the country. With the addition of new hydro units during 2022-23, the anticipated installed capacity of H.E. Stations in the country is likely to be 46850.17 MW by 31st March, 2023. The overall Generation Programme for H.E. stations for the year 2022-23 has been fixed at 158667 MU comprising 150661 MU from HE Stations in India and 8000 MU import from Bhutan, which is 1340.5 MU less than actual generation during 2021-22 (i.e.159120.5 MU comprising 151627.33 MU from HE Stations in India and 7493.20 MU import from Bhutan).

8.2 Region-wise summary of likely installed capacity as on 31.03.2023, Generation targets for 2022-23 and the hydro generation during 2021-22 are given in **Table 7.1** below:

TABLE 8.1

REGION-WISE LIKELY INSTALLED CAPACITY OF HE STATIONS AND HYDRO GENERATION PROGRAMME DURING 2022-23

Sl. No.	Region	Likely Hydro Installed Capacity (as on 31.03.2023) (MW)	Hydro Generation Programme for 2022-23 (MU)	Hydro Generation during 2021-22 (MU)	
				Programme	Actual
1.	Northern	19696.27	76249	75684.00	73866.02
2.	Western	7392	15461	16042.00	13719.74
3.	Southern	11747.15	30511	30439.00	37206.43
4.	Eastern	5987.75	20104	20540.00	20462.33
5.	North-Eastern	2027	8342	6839.00	6372.81
Sub total		**46850.17**	**150667**	**149544**	**151627.33**
6.	Import – from Bhutan		8000	8236	7493.20
Total(Including Import from Bhutan)			**158667**	**157780**	**159120.5**

8.3 While finalizing the Generation Programme for 2022-23 during last quarter of 2021-22, it was anticipated that 8 nos. H.E. units having installed capacity of 1860 MW would be added during the year 2022-23 and last quarter of 2021-22. Unit-wise details of these units are given in **Annex-8.1**.

8.4 Sector-wise and Utility-wise details of likely installed Capacity as on 31.03.2023, targets and actual generation during 2021-22, generation target for 2022-23 are given in **Annex-8.2**.

Annex-8.1

Generation from Hydro Electric Projects likely to be commissioned in 2022-23 and during last quarter of 2021-22

S. No.	Name of Hydro Power Project	Unit No.	Present Likely date of commissioning as per CEA/Utility	I.C (MW)	Generation Target 2021-22	Generation Target 2022-23	Present Capacity Addition Programme during
Central Sector							
1	Lower Subansiri (NHPC-Arunachal Pradesh)	1 & 2	Unit-1 & 2 (Aug 22)	500	0	1205	2022-23
2	Parbati-II (NHPC-Himachal Pradesh)	1 to 4	U- 1 to 4 (Mar 2023)	800	450	320	2022-23
3	Naitwar Mori	1&2	U- 1 &2 (Jun, 2022)	60	30	23	2022-23
	Sub Total (Central Sector)			**1360**	**480**	**1548**	
State Sector							
1	Vyasi (UJVNL-Uttarakhand	1&2	U- 1 & 2 (Mar, 2022)	120	0	353	2021-22
2	Pallivasal (KSEBL-Kerala)	1&2	U- 1& 2 (Dec 2022)	60	0	30	2022-23
3	Thottiyar (KSEBL-Kerala)	1&2	U- 1& 2 (Dec 2022)	40	0	15	2022-23
	Sub Total (State Sector)			**220**	**0**	**398**	

	Private Sector						
1	Bajoli Holi (GMR-HP)	1 to 3	U- 1 to 3 (Dec 2021)	180	273	500	2021-22
2	Tindong (Statkraft-HP)	1&2	U- 1& 2 (Oct 2022)	100	0	50	2022-23
	Sub Total (Private Sector)			**280**	**273**	**550**	
Grand Total				**1860**	**753**	**2496**	

SECTOR-WISE PERFORMANCE OF HYDROELECTRIC STATIONS DURING 2021-2022 & TARGETS FOR 2022-2023

SECTOR/ UTILITY	Likely Hydro Installed Capacity as on 31.03.2023	Generation during 2021-2022 (MU)		Generation Programme for 2022-23 (MU)
		Targets	Actual	
A. CENTRAL SECTOR				
BBMB	2938.3	9650	9794.82	9650.00
NHPC Ltd	5451.2	26000	24382.6	25663.00
SJVN Ltd	1912.02	9111	9048.61	8888.14
NTPC Ltd	800	3100	3120.14	3099.90
THDC Ltd	1400.00	4160	4288.75	4162.00
NHDC Ltd.	1520.00	3900	2645.41	3265.00
DVC	143.20	215	466.89	290.00
NEEPCO Ltd.	1500.00	4908	4674.39	6356.00
Sub Total	**15664.72**	**61044**	**58421.61**	**61374.04**
B. STATE ELECTRICITY BOARDS/CORPORATIONS				
JKSPDCL	1110	4887	5116.09	4866
HPPCL	406	821	649.55	772
HPSEBL	372	1603	1768.66	1628
BVPC	0	0	0	0
RRVUNL	411	370	481.84	480
PSPCL	1051	3969	3007.86	3780
UPJVNL	501.6	1519	1402.68	1519
UJVNL	1372.15	4612	4987.18	5035
SSNNL	1450	2832	1748.01	3099
GSECL	540	889	873.5	965
MAHAGENCO	2406	4109	4078.97	3963
MPPGCL	875	2526	2345.79	2389
CSPGCL	120	280	404.13	274
APGENCO	1796.75	3636	4037.32	3600
TSGENCO	2405.6	4018	5626.63	3852
KPCL	3617.2	12409	13731.48	12337
KSEBL	1864.15	6505	9317.44	7414
TANGEDCO	2178.2	4483	5212.07	3913
JUUNL	130	110	302.49	110
OHPC	2039.80	5959	4512.12	5363
TUL	1200	5652	6315.53	5652
WBSEDCL	986	1578	1630.14	1550
APGCL	100	380	401.12	380
MePGCL	322	1051	841.82	1106
Sub Total	**27254.45**	**74198**	**78792.42**	**74047**

SECTOR/ UTILITY	Likely Hydro Installed Capacity as on 31.03.2023	Generation during 2021-2022 (MU)		Generation Programme for 2022-23 (MU)
		Targets	Actual	
C. PRIVATE SECTOR				
MPCL	86.00	344	314.96	336.00
EPPL	100.00	367	345.66	348.00
ADHPL	192.00	676	637.44	658.00
GBHPPL	70.00	270	251.37	293.00
JSW ENERGY	1345.00	5431	5563.8	5431.00
IAEPL	36.00	158	146.54	158.00
AHPC LTD	330.00	1310	1421.89	500.00
JPVL	400.00	1590	1801.24	392.00
DLHP	34.00	36	33.94	50.00
GIPL	110.00	500	514.21	1310.00
TPCL	447.00	1470	1589.99	1590.00
DEPL	96.00	408	424.69	402.00
SEPL	97.00	421	453.07	36.00
SNEHA KINETIC	96.00	460	481.45	537.00
NTPGPL	0.00	0	0	1470.00
HSPPL	100.00	39	57.18	412.00
L&T	99.00	293	80.44	421.00
GMR	180	273	0	460.00
MBPC	113.00	256	295.43	442.00
Sub Total	**3931.00**	**14302**	**14413.3**	**15246.00**
Total All India	**46850.17**	**149544**	**151627.33**	**150667**
Import from Bhutan		**8236**	**7493.20**	**8000**
Total Hydro generation including import from Bhutan		**157780.00**	**159120.53**	**158667**

CHAPTER-9

RENOVATION & MODERNISATION OF HYDRO-ELECTRIC STATIONS

CHAPTER – 9

9. RENOVATION & MODERNISATION OF HYDRO ELECTRIC POWER PROJECTS

9.1 R&M Phase-I Programme

Recognising the benefits of the R&M programme, Govt. of India set up a National Committee in 1987 to formulate strategy on R&M of hydro power projects. Based on the recommendations of the National Committee and subsequent reviews, a programme for Renovation, Modernization and Uprating of Hydro Power Stations was formulated by Central Electricity Authority in which 55 schemes were identified with an aggregate capacity of 9653 MW. The total cost of these schemes was estimated as Rs.1493 Crores with expected benefit of 2531 MW.

9.2 R&M Phase-II Programme

As per the hydro policy of Govt. of India declared in 1998, Renovation & Modernization of Hydro Power Plants was accorded priority. Accordingly, 67 hydro R&M schemes having an aggregate capacity of 10318 MW were identified to be undertaken under Phase-II programme till the end of X Plan to accrue a benefit of 3685 MW at an estimated cost of Rs. 2161 Crores.

9.3 National Perspective Plan

CEA formu lated the National Perspective Plan for hydro power stations in the year 2000 and incorporated R&M proposals under Phase-II programme alongwith the left out schemes as recommended in Phase-I programme of National Committee. The left out schemes were those which were either under implementation or were yet to be implemented. This Perspective Plan was for IX, X and XI Plan with 117 schemes having an aggregate installed capacity of 19370 MW with benefit of 7755MW at an estimated cost of Rs.4654 Crores.

9.3.1 Achievements during VIII, IX, X, XI and XII Plan

Under the hydro R&M programme, 104 (21 in Central Sector and 83 in State Sector) hydro electric schemes (13 upto the VIII Plan, 20 in the IX Plan, 32 in the X Plan,18 in the XI Plan and 21 in XII Plan) with an installed capacity of 20,611 MW at a cost of Rs. 3,138 Crores have been completed by the end of the XII Plan (i.e. by 31.03.2017) & have accrued a benefit of 3,636 MW through Life Extension, Uprating and Restoration. The state-wise list of hydro R&M schemes completed during the VIII, IX, X, XI & XII Plan is given at Annex. I, II, III, IV & V respectively.

9.3.2 Programme during the period 2017-22

The Renovation & Modernization (R&M), Uprating and Life Extension works at 22 Hydro Electric Plants (HEPs) with an aggregate installed capacity of 4847.8 MW was programmed for completion during 2017-22 with its break-up as 3729.60 MW through R&M at 12 HEPs, 433.2 MW through Life Extension at 7 HEPs and 685 MW through Life Extension & Uprating at 3 HEPs. The 3 HEPs where both Life Extension & Uprating were envisaged, the aggregate installed capacity of 685 MW after completion of R&M works would get uprated to 801.2 MW resulting in additional benefit of installed capacity of 116.2 MW. As such, the revised aggregate capacity of these 22 projects on completion of R&M works would be 4964 MW.

Out of these 22 schemes, fourteen (14) schemes with an aggregate installed capacity of about 2023.20 MW have been completed till March, 2022. The benefits accrued include 334.2 MW (6 schemes) through Life Extension and 171.2 MW (2 schemes) through LE & Uprating. The State-wise list of hydro R&M schemes completed as

well as those which were programmed but could not be completed during 2017-22 is given at Annex-VI.

9.3.3 Programme during the period 2022-27

The Renovation, Modernization, Uprating and Life Extension works at 77 Hydro Electric Plants (HEPs) with an aggregate installed capacity of 13192.60 MW is programmed for completion during 2022-27 with its break-up as 3218.15 MW through R&M at 15 HEPs, 8183.45 MW through Life Extension at 51 HEPs and 1791 MW through Life Extension and Uprating at 11 HEPs. The 11 HEPs where both Life Extension & Uprating are envisaged, the aggregate installed capacity of 1791 MW shall get uprated after completion of R&M works to 2017.5 MW resulting in additional benefit of installed capacity of 226.5 MW. As such, the revised aggregate installed capacity after completion of RMU&LE works of these 77 projects would be 13419.10 MW. The State-wise list of hydro R&M schemes expected for completion during 2022-27 is given at Annex-VII.

9.3.4 Programme during the period 2027-32

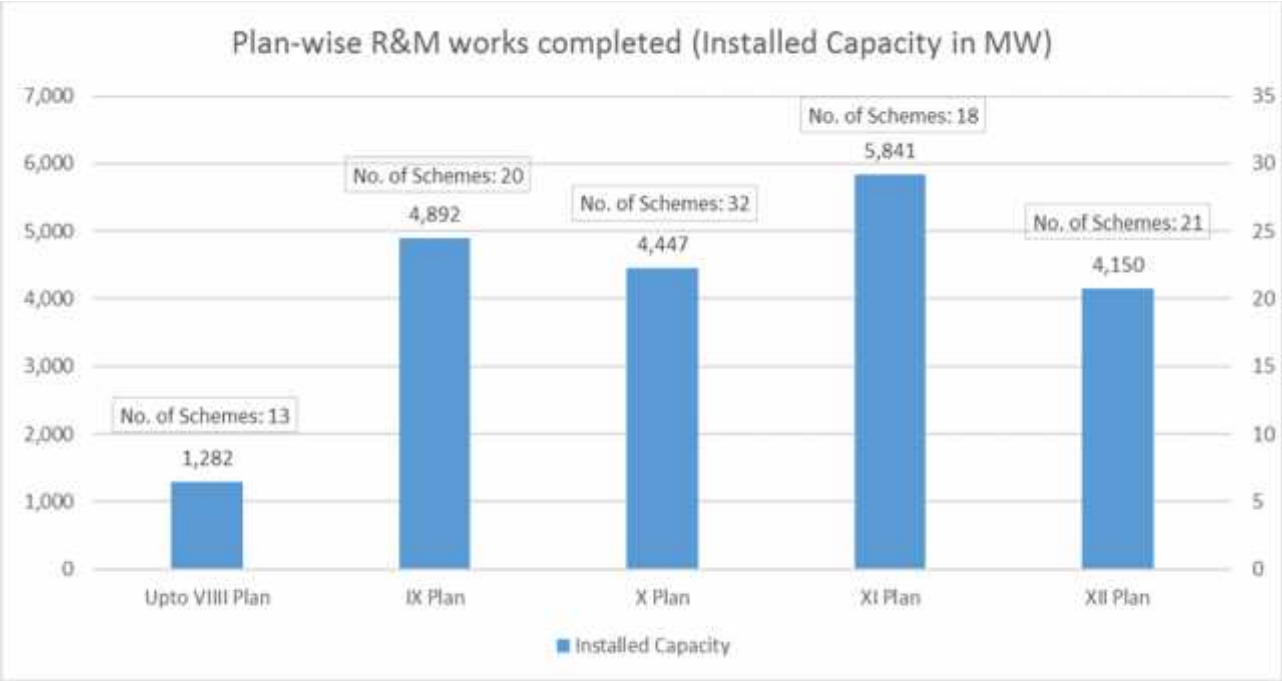
The Renovation, Modernization, Uprating and Life Extension works at 5 Hydro Electric Plants (HEPs) with an aggregate installed capacity of 1339.20 MW is programmed for completion during 2027-32 through Life Extension. The State-wise list of hydro R&M schemes expected for completion during 2027-32 is given at Annex-VIII.

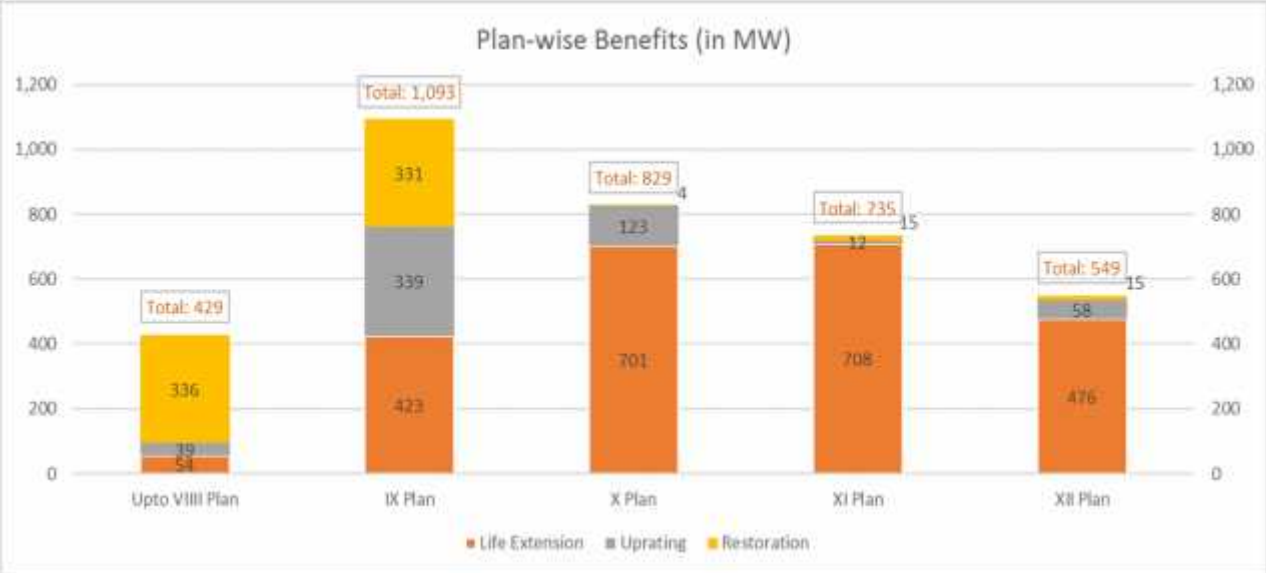
Plan-wise summary of R&M of H.E. Projects starting from VIII Plan is given below:

9.4 Summary of R&M of Hydro Electric Projects (As on 31.03.2022)

I <u>Hydro R&M schemes completed up to XII Plan</u>

Sl. No.	Plan Period	No. of Projects			Installed Capacity (MW)	Actual Expenditure (Rs. in Crs)	Benefit (MW)
		Central Sector	State Sector	Total			
1.	Upto VIII Plan Schemes	2	11	13	1282.00	127.37	429.00 [39.00(U) + 54.00LE+ 336.00(Res.)]
2.	IX Plan Schemes	8	12	20	4892.10	570.16	1093.03 [339.00(U)+ 423.00(LE) + 331.03(Res.)]
3.	X Plan Schemes	5	27	32	4446.60	1029.24	829.08 [123.40(U) + 701.25 (LE) + 4.43(Res.)]
4.	XI Plan Schemes	4	14	18	5841.20	294.84	735 [12 (U) + 708 (LE) + 15 (Res.)]
5.	XII Plan Schemes	2	19	21	4149.60	1115.97	549.40 [58 (U)+ 476.40 (LE)+15(Res.)]
6.	Total	21	83	104	20611.50	3137.58	3635.51





II Programme & Completion of R&M works during 2017-22

Sl. No.	Category	No. of Projects			Capacity covered under RMU&LE (MW)	Estimated Cost (Rs. in Crs.)	Benefit (MW)
		Central Sector	State Sector	Total			
1.	Programmed	7	15	22	4847.8	1977.62	1234.4 [1118.2(LE) +116.2(U)]
2.	Completed	5	9	14	2023.2	814.37 (Actual Cost)	505.4 [479.2(LE) + 26.2(U)]
3.	Programmed during 2017-22 but delayed and now Programmed during 2022-27	2	6	8	2824.6	833.68	729.0 [639(LE) +90(U)

III Programme of R&M works during 2022-27

Sl. No.	Category	No. of Projects			Capacity covered under RMU&LE (MW)	Benefit (MW)
		Central Sector	State Sector	Total		
1.	Programmed	8	69	77	13192.60	10200.95 [9974.45(LE)+226.5(U)]
2.	Under Implementation	3	23	26	5485.15	3047.5 [2868 (LE)+ 179.5(U)]
3.	Under Tendering	1	8	9	956.75	968.75 [956.75LE)+ 12(U)]
4.	Under DPR Preparation/ Finalisation/ Approval	3	8	11	2220.2	1751.2 1745.2(LE)+ 6(U)]
5.	Under RLA Studies	1	30	31	4530.5	4433.5 [4404.5(LE)+ 29(U)]

IV Programme of R&M works during 2027-32

Sl. No.	Category	No. of Projects			Capacity covered under RMU&LE (MW)	Benefit (MW)
		Central Sector	State Sector	Total		
1.	Programmed	3	2	5	1339.20	1339.20 [1339.20 (LE)]
2.	Under Implementation	0	0	0	0	0
3.	Under Tendering	0	0	0	0	0
4.	Under DPR Preparation/Finalisation/Approval	0	0	0	0	0
5.	Under RLA Studies	3	2	5	1339.20	1339.20 [1339.20 (LE)]

Abbreviations:
MW – Mega Watt;
Res. – Restoration;
U – Uprating;
LE – Life Extension
RLA- Residual Life Assessment

9.5 Achievement during the year 2021-22

R&M works of the following 6 Schemes having with an aggregate installed capacity of about 685 MW have been completed during the year 2021-22 and have achieved benefit of 282.8 MW through Life Extension and 12.2 MW through Uprating:

S. No.	Name of Schemes	Capacity under R&M (in MW)	Cost (in Rs. Crores)	Benefit	Utility/Agency
1	Chenani,	5x4.66	21.84	23.30 (LE)	J&KSPDC
2	Ganderbal, (Unit-3)	1x4.5	3.26	4.5 (LE)	J&KSPDC
3	Dehar Power House, (Unit-3)	1x165	18.67	-	BBMB
4	Baira Siul	3x60	295.69	180 (LE)	NHPC
5	Ukai	3x75 (U-1,2,&4)	7.30	-	GSECL
6	Hirakud-I	2x37.5 (U5&6)	101.83	75.00 (LE) + 12.2 (U)	OHPC

9.6 Programme for the year 2022-23

For the year 2022-23, it is programmed to complete following 16 schemes having an installed capacity of 3695.95 MW. On completion of these schemes, there will be a benefit of about 1470 MW through Life Extension and 90 MW through uprating.

S. No.	Name of Schemes	Capacity under R&M (in MW)	Cost (in Rs. Crores)	Utility/Agency
1.	Bhabha Power House	3x40	90.14	HPSEB
2.	Bhakra LB	5x108	489.77	BBMB
3.	Ranjit Sagar Dam	4x150	82.16	PSPCL
4.	UBDC St.I & St.II	3x15+ 3x15.45	23.55	PSPCL
5.	Anandpur Sahib Hydel Project	4x33.5	31.65	PSPCL
6.	Mukerian St.I, St.II, St.III & St.IV	3x15, 3x15, 3x19.5& 3x19.5	194.29	PSPCL
7.	Shanan HEP	1x50+ 4x15	37.81	PSPCL
8.	Tiloth	3x30	384.66	UJVNL
9.	Dhalipur	3x17	152.65	UJVNL
10.	Rihand	6x50	132.20	UPJVNL
11.	Obra	3x33	58.80	UPJVNL
12.	Kadana PSS	4x60	5.44	GSECL
13.	Nagarjuna Sagar Ph-II	1x110+7x100.8	22.17	TSGENCO
14.	Munirabad Dam Power House	2x9 + 1x10	4.60	KPCL
15.	Kadra Dam Power House	3x50	44.47	KPCL
16.	Kodasalli Dam Power House	3x40	50.60	KPCL

Annex- I

State-wise List of Hydro RMU&LE schemes completed upto the VIII Plan

Sl. No.	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost (Rs. in Crs.)	Actual Exp. (Rs. in Crs.)	Benefits (MW)	Category	Year of Completion
Himachal Pradesh								
1	Bairasiul, NHPC	CS	3x60	25.98	25.98	18 (U)	RM&U	1991-92
2	Giri, HPSEB	SS	2x30	9.85	7.90	6 (U)	RM&U	1995-96
Punjab								
3	UBDC-I, PSPCL	SS	3x15	11.00	8.00	11 (Res)	R&M+Res.	1991-92
Uttar Pradesh								
4	Rihand, UPJVNL	SS	6x50	1.43	1.43	100(Res.)	R&M+Res.	1995-96
Karnataka								
5	Nagjhari, U-2, KPCL	SS	1x135	11.97	11.32	15 (U)	RM&U	1995-96
6	Shivasamudram, VVNL	SS	6x3 + 4x6	8.00	8.00	18 (LE)	RM&LE	N.A.
Kerala								
7	Sholayar, KSEB	SS	3x18	7.58	7.58	-	R&M	1996-97
Tamil Nadu								
8	Kadamparai (Units 3&4), TANGEDCO	SS	2x100	23.17	33.69	200(Res.)	R&M+Res.	1993-95
9	Kundah III (Units 1&2), TANGEDCO	SS	2x60	5.45	3.20	-	R&M	1991-92
10	Moyar, TANGEDCO	SS	3x12	1.62	1.30	36.00 (LE)	RM&LE	1990-91
11	Sholayar-I, TANGEDCO	SS	2x35	1.40	0.85	-	R&M	1994-95
Meghalaya								
12	Khandong, U-1, NEEPCO	CS	1x25	0.62	0.62	25 (Res)	R&M+Res.	1991-92
Tripura								
13	Gumti, TPGL	SS	3x5	17.50	17.50	-	R&M	1994-95
Total			**1282**	**125.57**	**127.37**	**429 [39 (U) + 54(LE) + 336(Res)]**		

Abbreviations: R&M – Renovation & Modernisation;. U – Uprating; LE – Life Extension; Res – Restoration; MW – Mega Watt; CS-Central Sector: SS- State Sector

Annex-II
(Sheet 1/2)

State-wise List of Hydro RMU&LE schemes completed in the IX Plan

Sl. No.	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
Himachal Pradesh								
1	Bhakra RB BBMB	CS	5x132	88.45	90.68	125.00 (U)	RM&U	2000-01
2	Dehra U-2 BBMB	CS	1x165	10.74	10.74	25.00 (Res.)	R&M+Res.	1998-99
3	Bairasiul, NHPC	CS	3x66	18.45	18.45	-	R&M	2000-01
4	Bassi, HPSEB	SS	4x15	5.35	4.34	-	R&M	2000-01
Jammu & Kashmir								
5	Salal St.I, NHPC	CS	3x115	51.50	51.50	-	R&M	2000-01
6	Chenani, J&KSPDC	SS	5x4.66	11.00	11.00	0.93 (Res)	R&M+Res.	2000-01
Punjab								
7	Ganguwal, U-2 BBMB	CS	1x24.2	18.90	15.00	22.00 (LE)+ 2.20 (Res)	RM&LE+Res	1997-98
8	Kotla, U-3, BBMB	CS	1x24.2	18.90	16.90	22.00 (LE)+ 2.20 (Res)	RM&LE+Res	1998-99
9	Ganguwal U-3, BBMB	CS	1x24.2	25.00	43.40	22.00 (LE)+ 2.20 (Res)	RM&LE+Res	2000-01
10	Kotla U-2, BBMB	CS	1x24.2	25.00		22.00 (LE)+ 2.20 (Res)	RM&LE+Res	2001-02
Uttarakhand								
11	Chilla U-1, 3& 4, UJVNL	SS	3x36	4.25	4.11	-	R&M	1998-99
12	Tiloth, UJVNL	SS	3x30	8.02	5.51	6.00 (U)	RM&U	1998-99
Andhra Pradesh								
13	Lower Sileru, APGENCO	SS	4x115	13.35	9.30	24.00 (Res)	R&M+Res.	2001-02
14	Srisailam RB, APGENCO	SS	7x110	16.32	11.40	-	R&M	2001-02
Karnataka								
15	Sharavathy, U-1 to 8, KPCL	SS	8x89.1	65.00	63.49	115.20 (U) +178.20 (Res)	RM&U+Res	1997-98
16	Sharavathy, U-9&10, KPCL	SS	2x89.1	17.96	14.68	28.80(U) +19.10 (Res)	RM&U+Res	1997-98

Annex-II
(Sheet 2/ 2)

Sl. No	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
Orissa								
17	Hirakud-I, U1&2, OHPC	SS	2x37.5	95.10	95.10	24.00(U) +75.00(LE)	RMU&LE	1997-98
Gujarat								
18	Ukai,U-1&3, GSECL	SS	2x75	24.99	24.99	75.00 (Res.)	R&M+Res.	1997-98
Maharashtra								
19	Koyna I&II, MSPGCL	SS	4x65+ 4x75	74.91	74.91	40.00(U) + 260.00(LE)	RM&U of St-I & II & LE of St-I	1999-2000
20	Koyna III, U-10, 11 &12, MSPGCL	SS	3x80	4.65	4.65	-	R&M	1997-98
Total			**4892.10**	**597.84**	**570.16**	**1093.03 [339.0(U) + 423.0(LE) + 331.03(Res.)]**		

Abbreviations: R&M – Renovation & Modernisation;. U – Uprating; LE – Life Extension;
Res – Restoration; MW – Mega Watt; CS-Central Sector: SS- State Sector

Annex- III
(Sheet 1/ 3)

State-wise List of Hydro RMU&LE schemes completed in the X Plan

Sl. No.	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
Himachal Pradesh								
1	Pong, BBMB	CS	6x60	17.70	17.79	36.00(U)	RM&U	2003-04
Punjab								
2	Ganguwal,U-1, BBMB	CS	1x29.25	51.28	81.99	25.89 (LE) +2.10	RM&LE+Res.	2006-07
2	Kotla, U-1, BBMB	CS	1x29.25	51.28		2.33 (Res.)	RM&LE+Res.	2006-07
4	Shanan Ph.A, PSPCL	SS	4x15+ 1x50	11.35	10.93	-	R&M	2003-04
5	Shanan, Ph.B, PSPCL	SS	4x15+ 1x50 $	35.95	13.34	60.00(LE)	RM&LE(LE for 15 MW units+R&M for 50 MW unit	2006-07
6	Anandpur Sahib, PSPCL	SS	4x33.5	3.68	1.04	-	R&M	2006-07
7	UBDC I&II, PSPCL	SS	3x15+ 3x15.45	7.89	2.44	45.00 (LE)	RM&LE(LE for 3x15MW&R &M for 3x15.45 MW	2006-07
8	Mukerian St.I, PSPCL	SS	3x15	6.04	4.38	-	R&M	2006-07
Uttarakhand								
9	Chibro, UJVNL	SS	4x60	10.45	10.52	-	R&M	2006-07
Karnataka								
10	Nagjhari, U-1&3,KPCL	SS	2x135	26.12	21.62	30 (U)	RM&U	2002-03
11	Supa PH, KPCL	SS	2x50	2.64	2.47	-	R&M	2002-03
12	Mahatma Gandhi, VVNL	SS	4x12+ 4x18	44.66	43.13	19.20 (U) +120.00 (LE)	RMU&LE	2002-03
13	Munirabad, VVNL	SS	2x9+ 1x10.3	3.64	3.53	28.30 (LE)	RM&LE	2002-03

Annex- III
(Sheet 2/3)

Sl. No	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost	Actual Exp	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
14	Mani Dam, KPCL	SS	2x4.5	1.00	1.00	-	R&M	2002-03
15	Shivasamudram, VVNL	SS	6x3+ 4x6	68.38	73.17	42.00 (LE)	RM&LE	2004-05
16	Bhadra, Ph.II, KPCL	SS	1x2	3.30	2.51	2.00 (LE)	RM&LE	2005-06
17	Varahi, KPCL	SS	2x115	2.57	2.66	-	R&M	2006-07
18	Sharavathy, Ph.A, KPCL	SS	10x103.5	5.22	3.52	-	R&M	2006-07
Kerala								
19	Neriamanga-lam KSEB	SS	3x15	58.00	53.05	9.00 (U) +45.00(LE)	RMU&LE	2006-07
20	Pallivasal, KSEB	SS	3x5+ 3x7.5	94.00	371.71	37.50 (LE)	RM&LE	2002-03
21	Sengulam, KSEB	SS	4x12	114.00		48.00 (LE)	RM&LE	2002-03
22	Panniar, KSEB	SS	2x15	62.00		30.00 (LE)	RM&LE	2002-03
Tamilnadu								
23	Pykara, TANGEDCO	SS	3x6.65+1x11 +2x14	26.06	20.147	58.95(LE)	RM&LE	2004-05
24	Papanasam, TANGEDCO	SS	4x7	27.05	22.61	4.00 (U) + 28.00 (LE)	RMU&LE	2005-06
Orissa								
25	Hirakud-I (Sw.yard), OHPC	SS		9.85	15.88	-	R&M	2006-07
26	Hirakud-I,U-3&4, OHPC	SS	2x24	126.14	108.86	16.00(U)+ 48.00(LE)	RMU&LE	2005-06
West Bengal								
27	Maithon, U-2, DVC	CS	1x20	42.08	36.94	3.20(U)+ 20.00(LE)	RMU&LE	2004-05
Maharastra								
28	Bhira Tail Race, MSPGCL	SS	2x40	1.60	0.70	-	R&M	2003-04
29	Tillari, MSPGCL	SS	1x60	4.50	4.24	6.0 (U)	RM&U	2004-05

Annex- III
(Sheet 3/3)

Sl. No	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost	Actual Exp	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
30	Koyna Gen. Complex, MSPGCL	SS	4x70+4x 80+4x80	12.00	11.50	-	R&M	2004-05
Meghalaya								
31	Umium St.I, MePGCL	SS	4x9	81.88	84.21	36(LE)	RM&LE	2002-03
32	Khandong, NEEPCO	CS	2x25	4.00	3.35	-	R&M	2003-04
Total			**4446.60**	**1016.31**	**1029.24**	**829.08 [123.40(U) +701.25(LE) + 4.43(Res.)]**		

$ - Installed Capacity of Shanan, Ph.B, at Sl. No. 5 not included in the total, as the same has been accounted for at Sl. No. 4.

Abbreviations: R&M – Renovation & Modernisation;. U – Uprating; LE – Life Extension; Res – Restoration; MW – Mega Watt; CS-Central Sector: SS- State Sector

Annex- IV
(Sheets 1 of 2)

State-wise List of Hydro RMU&LE schemes completed in the XI Plan

Sl. No	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost	Actual Exp	Benefits (MW)	Category	Year of Completion
				(Rs . in crs)				
Himachal Pradesh								
1	Dehar Ph. A BBMB	CS	6x165	11.00	6.94	-	R&M	2010-11
2	Dehar Ph. B BBMB	CS	6x165	49.00	24.45	330(LE)	RM&LE	2009-10
Uttarakhand								
3	Tanakpur, NHPC	CS	3x31.4	10.77	11.95	-	R&M	2007-08
4	Khodri Ph.A, UJVNL	SS	4x30	5.25	6.39	-	R&M	2008-09
5	Chilla Ph.A, UJVNL	SS	4x36	23.55	21.24	-	R&M	2008-09
Andhra Pradesh								
6	Upper Sileru, APGENCO	SS	4x60	4.20	3.34	-	R&M	2009-10
Karnataka								
7	Nagjhari, U1 to 6, KPCL	SS	5x150 + 1x135	14.75	15.31	-	R&M	2009-10
8	Sharavathy Ph.B, KPCL	SS	10x103.5	20.50	11.14	-	R&M	2009-10
9	Supa, KPCL	SS	2x50	3.45	4.90	-	R&M	2009-10
10	Bhadra, KPCL	SS	2x12	1.44	0.85	-	R&M	2009-10
11	Lingnamakki, KPCL	SS	2x27.5	3.81	2.62	-	R&M	2010-11
Tamil Nadu								
12	Mettur Dam, TANGEDCO	SS	4x10	30.17	24.16	10 (U) + 40 (LE)	RMU&LE	2007-08
Maharashtra								
13	Koyna St.I&II, MSPGCL	SS	4x70 + 4x80	87.50	81.82	-	R&M	2008-09

Annex- IV
(Sheets 2 of 2)

Sl. No	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost	Actual Exp	Benefits (MW)	Category	Year of Completion
				(Rs . in crs)				
14	Vaitarna, MSPGCL	SS	1x60	16.00	0.14	-	R&M	2009-10
15	Koyna Dam PH, MSPGCL	SS	2x18	5.78	0.25	-	R&M	2009-10
16	Koyna St.III, MSPGCL	SS	4x80	16.65	5.79	320 (LE)	RM&LE	2011-12
Manipur								
17	Loktak, NHPC	CS	3x30 derated	18.55	17.88	15.00 (Res.)	R&M + Res.	2011-12
Meghalaya								
18	Umium St.II, MePGCL	SS	2x9	90.46	55.67	2(U)+18.00(LE)	RMU&LE	2011-12
Total			**5841.2**	**412.83**	**294.84**	**735 [12.00(U) +708.00 (LE)+15.00 (Res)]**		

Abbreviations: R&M – Renovation & Modernisation;. U – Uprating; LE – Life Extension;
Res – Restoration; MW – Mega Watt; CS-Central Sector: SS- State Sector

Annex- V
(Sheet 1 of 2)

State-wise list of Hydro RMU&LE schemes completed in the XII Plan

Sl. No	Project, Agency	CS/ SS	Inst. Cap. (No.x.MW)	Est. Cost	Actual Exp	Benefits (MW)	Capacity after RMU&LE (MW)	Category	Year of Completion
				(Rs . in Crs)					
Himachal Pradesh									
1	Bassi, HPSEB	SS	4x15	124.25	158.26	6.0(U)+ 60(LE)	66	RMU&LE	2013-14
Jammu & Kashmir									
2	Lower Jhelum, J&KSPDC	SS	3x35	101.3	96.10	15.00(Res)	105	R&M+ Res.	2014-15
3	Sumbal Sindh, J&KSPDC	SS	2x11.3	25.00	24.59	-	22.6	R&M	2016-17
Uttarakhand									
4	Pathri, UJVNL	SS	3x6.8	113.25	108.3	20.40(LE)	20.4	RM&LE	2014-15
5	Khatima, UJVNL	SS	3x13.8	256.77	118.83	41.40 (LE)	41.4	RM&LE	2016-17
Uttar Pradesh									
6	Matatila, UPJVNL	SS	3x10.2	10.29	7.21	30.6 (LE)	30.6	RM&LE	2015-16
Andhra Pradesh									
7	Lower Sileru, APGENCO	SS	4x115	8.75	6.77	-	460	R&M	2013-14
8	Srisailam RB, APGENCO	SS	7x110	16.70	17.60	-	770	R&M	2015-16
Telangana									
9	Nagarjuna Sagar Ph-I works, TSGENCO	SS	1x110+ 7x100.8	33.35	13.90	-	815.6	R&M	2012-13
Karnataka									
10	Supa, KPCL	SS	2x50	3.45	3.88	-	100	R&M	2014-15
11	Nagjhari,U-1 to 6, KPCL	SS	1x135 (U-6)	69.21	64.49	15 (U)	150	RM&U	2015-16
12	Sharavathy Genarating Station (Ph B), KPCL	SS	10x103.5	20.00	29.27	-	1035	R&M	2016-17
Kerala									
13	Idamalayar, KSEB	SS	2x37.5	14.50	13.22	-	75	R&M	2012-13

Annex- V
(Sheet 2 of 2)

Sl. No	Project, Agency	CS/ SS	Inst. Cap. (No.x.MW)	Est. Cost	Actual Exp	Benefits (MW)	Capacity after RMU&LE	Category	Year of Completion
				(Rs . in Crs)					
14	Sabarigiri, U-4 KSEB	SS	1x55	52.20	50.41	5(U)	60	RM&U	2014-15
15	Poringalkuthu, KSEB	SS	4x8	88.63	51.90	4 (U)+ 32.00 (LE)	36	RMU&LE	2015-16
Tamil Nadu									
16	Periyar, TANGEDCO	SS	4x35	161.18	133.68	28.00(U)+ 140(LE)	168	RMU&LE	2015-16
Odisha									
17	Rengali Unit-1 OHPC	SS	1x50	47.50	36.76	50(LE)	50	RM&LE	2012-13
18	Rengali Unit-2 OHPC	SS	1x50	25.20	20.73	50(LE)	50	RM&LE	2013-14
West Bengal									
19	Jaldhaka St.I, WBSEDCL	SS	3x9	88.62	79.97	27 (LE)	27	RM&LE	2016-17
Assam									
20	Khandong, NEEPCO	CS	1x25	25.05	29.18	25(LE)	25	RM&LE	2014-15
21	Kopili, NEEPCO	CS	2x50	50.22	50.92	-	100	R&M	2014-15
Total			**4149.60**	**1335.42**	**1115.97**	**549.40 [58(U)+ 476.40 (LE) + 15 (Res)]**	**4207.6**		

Annex- VI
(Sheet 1 of 2)

State-wise list of Hydro RMU&LE schemes programmed for completion and achievement during 2017-22

Sl. No	Name of Project, Agency, Inst. Cap. (No. x MW)	CS/ SS	Capacity Covered Under RMU&LE (No.x MW)	Est. Cost (Rs. in Crs.)	Actual Exp. (Rs. in Crs.)	Benefits (MW)	Capacity after RMU&LE (MW)	Category	Year of Completion	
									Original	Anticipated
A. COMPLETED SCHEMES IN 2017-22										
Jammu & Kashmir (UT)										
1	Salal, NHPC (6x115)	CS	5x115	58.01	51.08	-	575	R&M	Completed in 2019-20	
2	Chenani, J&KSPDC (5x4.66)	SS	5x4.66	34.28	21.84	23.30 (LE)	23.3	RM&LE	Completed in 2021-22	
3	Ganderbal, (Unit-3) J&KSPDC (2x3+2x4.5)	SS	1x4.5	18.00	3.26	4.5 (LE)	4.5	RM&LE	Completed in 2021-22	
Himachal Pradesh										
4	Ganguwal, BBMB (1x29.25+2x24.2) & Kotla, BBMB (1x29.25+2x24.2)	CS	1x24.2 (U-2) 1x24.2 (U-3)	14.19	9.58	48.4 (LE)	48.4	RM&LE	Completed in 2017-18	
5	Dehar Power House (Unit-6), BBMB (6x165)	CS	1x165	19.87	16.00	-	165	R&M	Completed in 2017-18	
6	Dehar Power House (Unit-3), BBMB (6x165)	CS	1x165	23.00	18.67	-	165	R&M	Completed in 2021-22	
7	Baira Siul, NHPC (3x60)	CS	3x60	341.41	295.69	180 (LE)	180	RM&LE	Completed in 2021-22	
Gujarat										
8	Ukai, GSECL (4x75)	SS	3x75 (U-1,2,&4)	7.30	7.30	-	225	R&M	Completed in 2021-22	
Karnataka										
9	Bhadra River Bed units, KPCL (2x12)	SS	2x12	23.55	20.12	-	24	R&M	Completed in 2019-20	
Tamil Nadu										
10	Sholayar-I, TANGEDCO (2x35)	SS	2x35	90.44	66.94	70 (LE) + 14(U)	84	RMU&LE	Completed in 2019-20	
Kerala										
11	Sholayar, KSEB (3x18)	SS	3x18	199.55	84.26	54 (LE)	54	RM&LE	Completed in 2020-21	
12	Idukki 1st stage, KSEB (3x130)	SS	3x130	89.90	65.76	-	390	R&M	Completed in 2020-21	
Odisha										
13	Hirakud-I OHPCL (2x37.5)	SS	2x37.5 (U5&6)	158.77	101.83	75.00 (LE) + 12.2 (U)	87.2	RMU&LE	Completed in 2021-22	
14	Hirakud-II (Chiplima), OHPCL (3x24)	SS	1x24 (U-3)	65.67	52.04	24.00 (LE)	24	RM&LE	Completed in 2019-20	
Sub Total (A)			**2023.20**	**1143.94**	**814.37**	**505.4 [479.2(LE) + 26.2(U)**	**2049.40**			

Annex- VI

(Sheet 2 of 2)

Sl. No	Name of Project, Agency Inst. Cap. (No. x MW)	CS/ SS	Capacity Covered Under RMU&LE (No.x MW)	Est. Cost	Actual Exp.	Benefits (MW)	Capacity after RMU&LE (MW)	Category	Year of Completion	
				(Rs. in Crs.)					Original	Anticipated
B. PROGRAMMED FOR COMPLETION DURING 2017-22 BUT DELAYED AND NOW PROGRAMMED FOR COMPLETION DURING 2022-27										
Himachal Pradesh										
15	Bhakra LB, BBMB (5x108)	CS	5x108	489.77	552.75	540.00(LE)+ 90.00 (U)	630	RMU&LE	2016-17	2021-22
16	Bhakra RB, BBMB (5x157)	CS	5x157	20.80	-	-	785	R&M	2021-22	2021-22
Punjab										
17	Mukerian St.I, St.II, St.III & St.IV, PSPCL (3x15, 3x15, 3x19.5&3x19.5)	SS	3x15, 3x15, 3x19.5& 3x19.5	194.29	63.67	-	207	R&M	2019-20	2021-22
18	Shanan HEP, PSPCL (1x50+4x15)	SS	1x50+ 4x15	37.81	20.21	-	110	R&M	2019-20	2021-22
Uttar Pradesh										
19	Obra, UPJVNL (3x33)	SS	3x33	58.80	44.87	99 (LE)	99	RM&LE	2017-18	2021-22
Gujarat										
20	Kadana PSS, GSECL (4x60)	SS	4x60	5.44	3.73	-	240	R&M	2021-22	2021-22
Telangana										
21	Nagarjuna Sagar Ph-II works, TSGENCO (1x110+7x100.8)	SS	1x110+7x100 .8	22.17	14.34	-	815.6	R&M	2018-19	2021-22
Karnataka										
22	Munirabad Dam Power House, KPCL (2x9 + 1x10)	SS	2x9 + 1x10	4.60	2.20	-	28	R&M	2018-19	2021-22
Sub Total (B)			**2824.60**	**833.68**	**701.77**	**729.0 [639(LE) +90(U)**	**2914.60**			
Total (A+B)			**4847.80**	**1977.62**	**1516.14**	**1234.4 [1118.2(LE) +116.2(U)]**	**4964.00**			

@ This cost includes Scheme I only i.e. Rehabilitation of damaged/burnt equipments.

Abbreviations: R&M – Renovation & Modernisation;. U – Uprating; LE – Life Extension; Res – Restoration; MW – Mega Watt; CS-Central Sector: SS- State Sector

State-wise List of Hydro RMU&LE schemes programmed for completion during 2022-27

Sl. No	Name of Project, Agency Inst. Cap. (No.X MW)	CS/ SS	Capacity Covered Under RMU&LE (No.x MW)	Est. Cost (Rs. in Crs.)	Actual Exp. (Rs. in Crs.)	Benefits (MW)	Capacity after RMU&LE	Category	Completion Target
A. Ongoing Schemes – Under Implementation									
Himachal Pradesh									
1	Pong Power House, BBMB (6x66)	CS	6x66	142.25	-	396 (LE) + 54 (U)	450	RMU&LE	2026-27
2	Bhabha Power House, HPSEB	SS	3x40	90.14	43.01	120 (LE)	120	RM&LE	2022-23
3	Bhakra LB, BBMB (5x108)	CS	5x108	489.77	552.75	540.00(LE)+ 90.00 (U)	630	RMU&LE	2022-23
Punjab									
4	Ranjit Sagar Dam, PSPCL (4x150)	SS	4x150	82.16	7.45	-	600	R&M	2022-23
5	UBDC St.I & St.II, PSPCL (3x15+3x15.45)	SS	3x15+ 3x15.45	23.55	5.66	-	91.35	R&M	2022-23
6	Anandpur Sahib Hydel Project, PSPCL (4x33.5)	SS	4x33.5	31.65	0.88	-	134	R&M	2022-23
7	Mukerian St.I, St.II, St.III & St.IV, PSPCL (3x15, 3x15, 3x19.5&3x19.5)	SS	3x15, 3x15, 3x19.5& 3x19.5	194.29	63.67	-	207	R&M	2022-23
8	Shanan HEP, PSPCL (1x50+4x15)	SS	1x50+ 4x15	37.81	20.21	-	110	R&M	2022-23
Uttarakhand									
9	Chilla Ph B UJVNL (4x36)	SS	4x36	490.56	-	144(LE)+ 12(U)	156	RMU&LE	2024-25
10	Tiloth, UJVNL (3x30)	SS	3x30	384.66	153.21	90 (LE)	90	RM&LE	2022-23
11	Dhalipur, UJVNL (3x17)	SS	3x17	152.65	61.76	51 (LE)	51	RM&LE	2022-23
Uttar Pradesh									
12	Rihand, UPJVNL (6x50)	SS	6x50	132.20	109.17	300 (LE)	300	RM&LE	2022-23
13	Obra, UPJVNL (3x33)	SS	3x33	58.8	44.87	99 (LE)	99	RM&LE	2022-23
Gujarat									
14	Kadana PSS, GSECL (4x60)	SS	4x60	5.44	3.73	-	240	R&M	2022-23
Telangana									
15	Nagarjuna Sagar Left Canal Power House, TSGENCO (2x30.6)	SS	2x30.6	30.99	2.00	-	61.2	R&M	2022-27
16	Nagarjuna Sagar Ph-II works, TSGENCO (1x110+7x100.8)	SS	1x110+7x100.8	22.17	14.34	-	815.6	R&M	2022-23
Andhra Pradesh									
17	Upper Sileru Power House, APGENCO (4x60)	SS	4x60	-	-	-	240	R&M	2025-27
18	Nagarjunasagar Right Canal Power House, APGENCO (3x30)	SS	3x30	-	-	-	90	R&M	2025-27
Karnataka									
19	Nagjhari (Unit-1 to 3) KPCL (3x150)	SS	3x150 (U-1 to 3)	222.00	13.108	450 (LE)	450	RM&LE	2023-24
20	Shivasamudram, KPCL (6x3+4x6)	SS	6x3+4x6	169.18	14.01	42 (LE)	42	RM&LE	2023-24
21	Munirabad Dam Power House, KPCL (2x9 + 1x10)	SS	2x9 + 1x10	4.60	2.20	-	28	R&M	2022-23

Sl. No	Name of Project, Agency Inst. Cap. (No.X MW)	CS/ SS	Capacity Covered Under RMU&LE (No.x MW)	Est. Cost (Rs. in Crs.)	Actual Exp. (Rs. in Crs.)	Benefits (MW)	Capacity after RMU&LE	Category	Year of Completion
Tamil Nadu									
22	Moyar PH, TANGEDCO (3x12)	SS	3x12	67.05	-	36(LE)+ 6(U)	42	RMU&LE	2022-27
23	Kodayar PH-I, TANGEDCO	SS	1x60	88.48	-	60 (LE)+ 10 (U)	70	RMU&LE	2023-24
Kerala									
24	Kuttiyadi, KSEB (3x25)	SS	3x25	377.41	0.625	75.00 (LE) + 7.5 (U)	82.5	RMU&LE	2023-24
Odisha									
25	Balimela, OHPCL (6x60)	SS	6x60	382.91	86.27	360(LE)	360	RM&LE	2023-24
Manipur									
26	Loktak, NHPC (3x35)	CS	3x35	273.59	30.77	105 (LE)	105	RM&LE	2023-24
Sub Total(A)			**5485.15**	**3954.31**	**1229.69**	**3047.5 [2868 (LE)+ 179.5(U)]**	**5664.65**		
B. Ongoing Schemes – Under Tendering									
Himachal Pradesh									
27	Giri, HPSEB (2x30)	SS	2x30	139.80	-	60.00 (LE)	60	RM&LE	2024-25
Uttarakhand									
28	Ramganaga, UJVNL (3x66)	SS	3x66	455.20	-	198(LE)	198	RM&LE	2022-27
29	Dhakrani, UJVNL (3x11.25)	SS	3x11.25	137.31	4.91	33.75 (LE)	33.75	RM&LE	2025-26
Karnataka									
30	Kadra Dam Power House, KPCL (3x50)	SS	3x50	44.47	1.72	150 (LE)	150	RM&LE	2022-23
31	Kodasalli Dam Power House, KPCL (3x40)	SS	3x40	50.60	1.72	120 (LE)	120	RM&LE	2022-23
32	Gerusoppa Dam Power House (Sharavathy Tail Race), KPCL (4x60)	SS	4x60	59.66	2.21	240 (LE)	240	RM&LE	2023-24
33	Linganamakki Dam Power House, KPCL (2x27.5)	SS	2x27.5	56.20	1.85	55 (LE)	55	RM&LE	2023-24
Jharkhand									
34	Panchet U-1, DVC (2x40)	CS	1x40 (U-1)	121.85	2.19	40(LE) + 6(U)	46	RMU&LE	2023-24
Meghalaya									
35	Umium St.III, (Kyrdemkulai) MePGCL (2x30)	SS	2x30	408.00	1.20	60(LE) + 6(U)	66	RMU&LE	2022-27
Sub Total(B)			**956.75**	**1473.09**	**15.80**	**968.75 [956.75 (LE)+ 12(U)]**	**968.75**		
C. Ongoing Schemes – Under DPR Preparation/ Finalisation/ Approval									
Uttarakhand									
36	Kulhal, UJVNL (3x10)	SS	3x10	115.24	-	30(LE)	30	RM&LE	2022-27
Madhya Pradesh									
37	Gandhi Sagar, MPPGCL	SS	5x23	329.64	4.97	115 (LE)	115	RM&LE	2026-27
38	Pench, MPPGCL (2x80)	SS	2x80	13.36	0.36	-	160	R&M	2024-25
39	Bansagar Ton-I, MPPGCL (3x105)	SS	3x105	92.95	10.34	-	315	R&M	2025-26
Karnataka									
40	Supa Dam Power House, KPCL (2x50)	SS	2x50	47.91	2.2	100 (LE)	100	RM&LE	2023-24
41	Sharavathy Generating	SS	10x103.5	196.56	11.07	1035 (LE)	1035	RM&LE	2023-24
42	MGHE, KPCL (4x21.6+4x13.2)	SS	4x21.6+ 4x13.2	97.00	7.75	139.2 (LE)	139.2	RM&LE	2023-24

Sl. No	Name of Project, Agency Inst. Cap. (No.X MW)	CS/ SS	Capacity Covered Under RMU&LE (No.x MW)	Est. Cost	Actual Exp.	Benefits (MW)	Capacity after RMU&LE	Category	Year of Completion
				(Rs. in Crs.)					
Tamil Nadu									
43	Kodayar PH-II, TANGEDCO (1x40)	SS	1x40	-	-	40.0(LE)+ 6(U)	46	RMU&LE	2026-27
West Bengal									
44	Maithon, DVC (2x20+1x23.2)	CS	2x20 (U-1&3)	109.29	7.76	40.00 (LE)	40	RM&LE	2024-25
Assam									
45	Khandong Power Station,	CS	2x23	189.81	8.03	46 (LE)	46	RM&LE	2024-25
46	Kopili Power Station, NEEPCO (4x50)	CS	4x50	1117.07	436.46	200(LE)	200	RM&LE	2023-24
Sub Total(C)			**2220.20**	**2308.83**	**488.94**	**1751.2 1745.2(LE)+ 6(U)]**	**2226.20**		
D. Ongoing Schemes – Under RLA Studies									
Jammu & Kashmir (UT)									
47	Salal Stage-I, (Unit 1,2 &3) NHPC (6x115)	CS	3x115	-	-	345 (LE)	345	RM&LE	2022-27
Madhya Pradesh									
48	Bargi, MPPGCL (2x45)	SS	2x45	21.63	2.42	-	90	R&M	2025-26
Maharashtra									
49	Vaitarna, MSPGCL (1x60)	SS	1x60	-	-	60 (LE)	60	RM&LE	2022-27
50	Koyna Dam foot (Right Bank), MSPGCL (2x20)	SS	2x20	-	-	40 (LE)	40	RM&LE	2022-27
51	Koyna St-3, MSPGCL (4x80)	SS	4x80	-	-	320 (LE)	320	RM&LE	2022-27
52	Tillari, MSPGCL (1x60)	SS	1x60	-	-	60 (LE)	60	RM&LE	2022-27
53	Bhira Tail race, MSPGCL (2x40)	SS	2x40	-	-	80 (LE)	80	RM&LE	2022-27
Andhra Pradesh									
54	Machkund St.I & St.II,	SS	3x17+ 3x23	500.00	-	120 (LE) +9 (U)	129	RMU&LE	2025-27
55	Tungabhadra Dam, APGENCO	SS	4x9	175.00	-	36 (LE)	36	RM&LE	2025-26
56	Hampi Canal PH, APGENCO	SS	4x9	175.00	-	36 (LE)	36	RM&LE	2025-26
57	Lower Sileru, APGENCO	SS	4x115	350.00	1.80	460(LE)	460	RM&LE	2025-27
Tamil Nadu									
58	Kundah-I, TANGEDCO (3x20)	SS	3x20	-	-	60 (LE)	60	RM&LE	2022-27
59	Kundah-II, TANGEDCO (5x35)	SS	5x35	-	-	175 (LE)	175	RM&LE	2022-27
60	Kundah-III, TANGEDCO (3x60)	SS	3x60	-	-	180 (LE)	180	RM&LE	2022-27
61	Kundah-IV, TANGEDCO (2x50)	SS	2x50	-	-	100 (LE)	100	RM&LE	2022-27
62	Kundah-V, TANGEDCO (2x20)	SS	2x20	-	-	40 (LE)	40	RM&LE	2022-27
63	Mettur Tunnel, TANGEDCO (4x50)	SS	4x50	-	-	200 (LE)	200	RM&LE	2022-27
64	Sarkarpathy, TANGEDCO (1x30)	SS	1x30	-	-	30 (LE)	30	RM&LE	2022-27
65	Sholayar-II, TANGEDCO (1x25)	SS	1x25	-	-	25 (LE)	25	RM&LE	2022-27
66	Suruliyar, TANGEDCO (1x35)	SS	1x35	-	-	35 (LE)	35	RM&LE	2022-27

Annex- VII
(Sheet 4 of 4)

Sl. No	Name of Project, Agency Inst. Cap. (No.X MW)	CS/ SS	Capacity Covered Under RMU&LE (No.x MW)	Est. Cost (Rs. in Crs.)	Actual Exp. (Rs. in Crs.)	Benefits (MW)	Capacity after RMU&LE	Category	Year of Completion
67	Kadamparai, PH TANGEDCO (4x100)	SS	4x100	-	-	400 (LE)	400	RM&LE	2022-27
68	Aliyar, TANGEDCO (1x60)	SS	1x60	-	-	60 (LE)	60	RM&LE	2022-27
Kerala									
69	Idukki 2nd stage, KSEB	SS	3x130	-	-	390 (LE)	390	RM&LE	2022-27
70	Sabarigiri, KSEB (Unit-1,2,3, 5 & 6) (4x55+	SS	4x55+ 1x60	155.9	-	280 (LE) + 20 (U)	300	RMU&LE	2022-27
71	Idamalayar, KSEB (2x37.5)	SS	2x37.5	-	-	75 (LE)	75	RM&LE	2022-27
72	Porigalkathu, KSEB (4x9)	SS	4x9	-	-	-	36	R&M	2022-27
Odisha									
73	Hirakud-I (Burla), OHPC Unit 7 (1x37.5 MW)	SS	1x37.5	-	-	37.5 (LE)	37.5	RM&LE	2022-27
74	Rengali, OHPC	SS	5x50	-	-	250 (LE)	250	RM&LE	2022-27
75	Upper Kolab, OHPC (4x80)	SS	4x80	-	-	320 (LE)	320	RM&LE	2022-27
Jharkhand									
76	Subernrekha, JUUNL	SS	2x65	-	-	130(LE)	130	RM&LE	2022-27
Meghalaya									
77	Umiam-umtru Stage-IV,	SS	2x30	-	-	60(LE)	60	RM&LE	2022-27
Sub Total(D)			**4530.50**	**1355.90**	**1.80**	**4433.5 [4404.5(LE)+ 29(U)]**	**4559.50**		
Total (A+B+C+D)			**13192.60**	**9092.13**	**1736.23**	**10200.95 [9974.45(LE)+ 226.5(U)]**	**13419.10**		

Abbreviations: R&M – Renovation & Modernisation;. U – Uprating; LE – Life Extension; Res – Restoration; MW – Mega Watt; CS-Central Sector: SS- State Sector

Annex- VIII
(Sheet 1 of 1)

State-wise List of Hydro RMU&LE schemes programmed for completion during 2027-32

Sl. No	Name of Project, Agency Inst. Cap. (No.X MW)	CS/ SS	Capacity Covered Under RMU&LE (No.x MW)	Est. Cost (Rs. in Crs.)	Actual Exp. (Rs. in Crs.)	Benefits (MW)	Capacity after RMU&LE	Category	Completion Target
A. Ongoing Schemes – Under RLA Studies									
Jammu & Kashmir (UT)									
1	Tanakpur, NHPC 3x31.4 MW	CS	3x31.4	-	-	94.2 (LE)	94.2	RM&LE	2027-32
2	Chamera-I, NHPC 3x180 MW	CS	3x180	-	-	540 (LE)	540	RM&LE	2027-32
3	Salal Stage-II, (Unit 4,5 &6) NHPC (6x115)	CS	3x115	-	-	345 (LE)	345	RM&LE	2027-32
Uttarakhand									
4	Chibro, UJVNL (4x60)	SS	4x60	184.88	-	240 (LE)	240	RM&LE	2027-32
5	Khodri, UJVNL (4x30)	SS	4x30	169.63	-	120 (LE)	120	RM&LE	2027-32
Total (A)			**1339.20**	**354.51**	**0.00**	**1339.2 [1339.2(LE)+ 0(U)]**	**1339.20**		

Abbreviations: R&M – Renovation & Modernisation;. U – Uprating; LE – Life Extension; Res – Restoration;
MW – Mega Watt; CS-Central Sector: SS- State Sector

CHAPTER-10

DEFINITIONS AND ABBREVIATIONS

CHAPTER-10

DEFINITIONS AND ABBREVIATIONS

10.1 DEFINITIONS

The definitions of different performance indices and other terms referred to in this review are as under:

a) Capacity: Capacity in MW is the Installed or Uprated/Derated capacity of the unit.

b) Forced Outage Non-Availability (FO) (%)

$$= \frac{(Cf1 \times hf1 + Cf2 \times hf2 \ldots\ldots\ldots\ldots\ldots\ldots + Cfn \times hfn) \times 100}{C \times H}$$

Where Cf1, Cf2 …… Cfn are the capacities in MW of the generating units of the station on forced outage and hf1,hf2……hfn are the duration of each outage in hours during the year. C is the total installed capacity of the station in MW and H is the total period in hours during the year.

c) Planned Maintenance Non-Availability (PM) (%)

$$= \frac{(Cp1 \times hp1 + Cp2 \times hp2 + \ldots\ldots\ldots\ldots\ldots\ldots + Cpn \times hpn) \times 100}{C \times H}$$

Where Cp1, Cp2 …… Cfn are the capacities in MW of the generating units of the station on planned shutdown and hp1, hp2 …… are the duration of each shutdown in hours during the year. C is the total installed capacity of the station in MW and H is the total period in hours during the year.

d) Operating availability (OA) (%) = (100-FO-PM)

e) Miscellaneous Non-Availability: Non-Availability of generating units due to one or more of the following factors:

- Low reservoir level/poor inflow
- Transmission line faults/constraints
- Excess weeding/silting
- No/reduced system demand
- Too high tail water level
- No irrigation demand
- Grid disturbance/failure
- Reserve shutdown/spinning reserve

f) **Design Energy:** The quantum of energy which could be generated in a 90% dependable year with 95% availability of installed capacity of the generating station.

g) **Targeted Energy:** Estimated energy generation during the year based on the likely rainfall data, storage position of the reservoirs and past records of energy generation etc.

h) **Full Reservoir Level (FRL):** The maximum level up to which the water could normally be stored in the reservoir for conservation and regulation for power generation.

i) **Minimum Draw Down Level (MDDL):** The minimum level up to which the reservoir could be depleted under normal operating conditions.

j) **Types of H.E. Scheme:** The H.E. Schemes have been classified into following four categories:

- Run-of-River without pondage
- Run-of River with pondage
- Storage Schemes
  - Purely power
  - Multipurpose projects
- Pumped Storage Schemes

10.2 Abbreviations

MW	Mega Watt	(10^6 Watts)
KWH	Kilo Watt hour (1 unit)	(10^3 Watts-hrs)
MU	Million Units	(10^6 Units**)**
MCM	Million Cubic Meters	(10^6 Cu.M.)
FRL	Full Reservoir Level	
MDDL	Minimum Draw Down Level	
HRT	Head Race Tunnel	
F.O.	Forced Outage	
P.M.	Planned Maintenance	

Abbreviations of Agencies

Northern Region			
1	Himachal Pradesh	ADHPL	Allain Duhangan Hydro Power Limited
		BVPC Limited	Beas Valley Power. Corp. Ltd. (BVPC)
		EPPL	Everest Power Private Limited
		GBHPPL	Greenko Budhil Hydro Power Pvt. Limited
		HBPCL	Himachal Baspa Power Company Limited
		HPPCL	Himachal Pradesh Power Corporation Limited
		HPSEB Limited	Himachal Pradesh State Electricity Board Limited
		HSPCL	Himachal Sorang Power Private Limited
		IAEPL	IA Hydro Energy Pvt Ltd
		JSW	JSW Energy Ltd.
		GMR BHHPL	GMR Bajoli Holi Hydro Power Private Limited
		MPCL	Malana Power Company Limited
		NTPGPL	Tidong Power Generation Private Limited
		NHPC Limited	National Hydro Power Corporation Limited
		NTPC Limited	National Thermal Power Corporation Limited
		SJVN Limited	Satluj Jal Vidyut Nigam Limited
2	Jammu & Kashmir	JKSPDC	J&K State Power Development Corporation.
3	Punjab	BBMB	Bhakra Beas Management Board
		PSPCL	Punjab State Power Corporation Limited
4	Rajasthan	RRVUNL	Rajasthan Rajya Vidyut Utpadan Nigam Limited
5	Uttar Pradesh	UPJVNL	Uttar Pradesh Jal Vidyut Nigam Limited
6	Uttarakhand	THDC	Tehri Hydro Development Corporation
		UJVNL	Uttarakhand Jal Vidyut Nigam Limited
		JPPVL	Jaiprakash Power Pvt. Venture Limited
		AHPC	Alaknanda Hydro Power Company
Western Region			
1	Gujarat	GSECL	Gujarat State Electricity Corporation Limited
		SSNNL	Sardar Sarovar Narmada Nigam Limited
2	Madhya Pradesh	MPPGCL	Madhya Pradesh Power Generation Co. Limited
		NHDC	Narmada Hydroelectric Development Co. Limited
3	Chhatisgarh	CSPGCL	Chhatisgarh State Power Generation Co. Limited
4	Maharashtra	DLHPPL	Dodson-Lindblom Hydro Power Private Limited

		MSPGCL	Maharashtra State Power Generating Co. Limited
		TPCL	Tata Power Company Limited
Southern Region			
1	Andhra Pradesh	APGENCO	Andhra Pradesh Power Generation Corporation Ltd.
2	Karnataka	KPCL	Karnataka Power Corporation Limited
3	Kerala	KSEBL	Kerala State Electricity Board Limited
4	Telangana	TSGENCO	Telangana State Power Generation Corporation Ltd.
5	Tamil Nadu	TANGEDCO	Tamil Nadu Generation & Distribution Co. Limited
Eastern Region			
1	Jharkhand	JUUNL	Jharkhand Urja Utpadan Nigam Limited
		DVC	Damodar Valley Corporation
2	Odisha	OHPC	Odisha Hydro Power Corporation
3	Sikkim	GIPL	Gati Infrastructure Pvt. Limited
		DEPL	Dans Energy Private Limited
		TUL	Teesta Urja Limited
		SKPPPL	Sneha Kinetic Power Projects Pvt. Limited
		SEPL	Shiga Energy Pvt. Limited
4	West Bengal	WBSEDCL	West Bengal State Electricity Distribution Co. Limited
North Eastern Region			
1	Assam	APGCL	Assam Power Generation Co. Limited
		NEEPCO	North Eastern Electric Power Corporation Limited
2	Meghalaya	MePGCL	Meghalaya Power Generation Corporation Limited