SUMMARY

2007-08

SUMMARY

1.0 General

This review covers the performance of Hydro-Electric Stations having installed capacity of more than 3 MW. As on 31st March, 2008 there were 830 H.E. generating units installed in 279 Hydro-Electric Stations with an aggregate installed capacity of 37002.10 MW in operation. Out of these units, performance of 641 units (77%) installed in 208 H.E.Stations with a total capacity of 31033.00 MW (84%),for which data was received, has been analyzed in this Review. Performance of 31 important Reservoir based schemes has also been discussed separately in Chapter-3.

This review also covers programme for renovation & modernization and uprating of HE Stations in the country. Information in respect of renovation & modernization, uprating and life extension of HE stations in the country (as on 31.03.2008),programme for the year of 2007-08, achievements during the year 2007-08 and programme for the year 2008-09 have been given in Chapter-8.

Regionwise summary of the existing HE Stations in operation with installed capacity above 3 MW as on 31.3.08 in the country vis-à-vis that on 31.3.07 is given below in Table (S-I).

TABLE S - 1
REGIONWISE SUMMARY OF HYDRO-ELECTRIC STATIONS
(2007-08 VIS-A-VIS 2006-07)

Region	No of Station as on		No of Units as on		Capacity(MW) as on	
	31.03.08	31.03.07	31.03.08	31.03.07	31.03.08	31.03.07
Northern	**85**	84	**257**	253	**13305.90**	13001.90
Western	**51**	50	**138**	130	**7397.80**	6877.80
Southern	**96**	93	**293**	288	**11106.35**	11034.35
Eastern	**30**	27	**94**	85	**3989.35**	2429.35
North Eastern	**17**	17	**48**	48	**1202.70**	1202.70
All India	**279**	**271**	**830**	**804**	**37002.10**	**34546.10**

2.0 Generation Performance

The generation from the hydro electric power Stations in the country during 2007-08 was 123424.12 MU which was 12.80% more than target of 109450 MU.

2.1 Sector wise / State wise Performance of H.E. STATIONS

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

TABLE S–2
UTILITY WISE PERFORMANCE OF HYDRO ELECTRIC POWER STATIONS
(2007–08 VIS–A–VIS 2006–07)

Energy Generation (MU)

Utilities	Target		Actual		Surplus(+)/ Shortfall(–)in %	
	2007–08	2006–07	2007–08	2006–07	2007–08	2006–07
I CENTRAL						
BBMB	**10150**	10800	**10959.91**	10064	**8.00**	–6.82
NHPC	**14089**	13679	**14811.11**	13049	**5.10**	–4.61
SJVNL	**6400**	6400	**6404.58**	6001	**0.10**	–6.23
THDC	**2773**	1384	**2663.54**	890	**–3.90**	–35.69
DVC	**320**	300	**451.30**	357	**41.00**	19.00
NHDC	**3058**	2698	**3425.44**	2606	**12.00**	–3.41
NEEPCO	**3000**	3287	**3090.71**	2100	**3.00**	–36.11
SUB TOTAL	**39790**	38548	**41806.59**	35067	**5.10**	–9.03
II PRIVATE						
JHPL	**1213**	1213	**1280.84**	1315	**5.60**	8.41
JPVL	**1775**	600	**1871.04**	978	**5.40**	63.00
MPCL	**350**	352	**336.31**	323	**–3.90**	–8.24
TATA HYDRO	**1510**	1400	**1489.10**	2137	**–1.40**	52.64
DLHP	**96**	35	**119.55**	50	**24.50**	42.86
HEGL (MP)	**40**	30	**0.00**	40	**0.00**	33.33
HEGL (AP)	**0**	0	**0**	0	**0**	–
BPCL	**218.00**	141	**206.10**	143	**–5.50**	1.42
MPC	**40**	34	**53.71**	54	**34.30**	58.82
EDCL	**24**	24	**28.61**	4	**19.20**	–83.33
CUL	**35**	–	**38.83**	43	**10.94**	–
IEL	**60**	–	**62.95**	48	**4.92**	–
SUB TOTAL	**5361**	3829	**5487.04**	5135	**2.40**	34.11
III STATE ELECT.BOARDS/DEPARTMENTS						
HPGC	**275**	310	**269.50**	256	**–2.00**	–17.42
HPSEB	**1887**	1810	**1806.27**	1378	**–4.30**	–23.87
JKPDC	**1066**	930	**883.26**	979	**–17.10**	5.27
PSEB	**3840**	3658	**4602.52**	4396	**19.90**	20.17
RRVUNL	**1190**	658	**1399.63**	1116	**17.60**	69.60
UPJVNL	**1470**	1567	**922.94**	1417	**–37.20**	–9.57
UJVNL	**3403**	3492	**3556.35**	3272	**4.50**	–6.30
SSNNL	**4390**	2789	**4434.72**	3601	**1.00**	29.11
GSECL	**966**	966	**1237.77**	1269	**28.10**	31.37
MPGCL	**2788**	2481	**2744.06**	3052	**–1.60**	23.01
CSEB	**353.00**	320	**262.65**	388	**–25.60**	21.25
MAHAGENCO	**3861**	3809	**4627.46**	5051	**19.90**	32.61
NVDA	**14**	---	**0.00**	----	**0.00**	----
APGENCO	**8163**	7702	**9872.46**	9822	**20.90**	27.53
KPCL	**11952**	10301	**14496.61**	14241	**21.30**	38.25
KSEB	**6749**	6292	**8322.75**	7502	**23.30**	19.23
TNEB	**4491**	4250	**6432.83**	6284	**43.20**	47.86
BSHPC	**71**	62	**57.83**	67	**–18.50**	8.06

JSEB	**150**	105	**210.83**	209	**40.60**	99.05
OHPC	**5664**	5495	**7874.84**	7204	**39.00**	31.10
WBSEB	**344**	390	**755.96**	413	**119.80**	5.90
E&PD(SIKKIM)	**46**	57	**48.33**	35	**5.10**	-38.60
A & N ISLAND	**8**	-	**8.37**	9	**4.62**	----
APGCL	**396**	-	**495.21**	--	**25.05**	--
MeSEB	**571**	569	**665.46**	395	**16.50**	-30.58
DoP TRIPURA	**50**	60	**36.02**	46	**-28.00**	-23.33
DoPARUNACHAL PR.	**21**	20	**12.31**	8	**-41.40**	-60.00
DoP NAGALAND	**120**	60	**93.55**	0	**-28.00**	-100.00
SUB TOTAL	**64299**	58623	**76130.49**	73157	**18.40**	24.79
ALL INDIA	**109450**	**101000**	**123424.12**	**113359**	**12.80**	**12.24**

It is observed that during the year 2007-08,overall hydro generation was more than the target in respect of stations of BBMB, NHPC, SJVNL, NHDC, DVC and NEEPCO in Central Sector and DLHP, JHPL, JPVL, EDCL, CUL, IEL and MPC in Private Sector. As regarding generation by State Electricity Boards/Corporations/Departments hydro generation was more than the target in respect of stations of PSEB, RRVUNL, SSNNL,UJVNL,GSECL,MAHAGENCO, APGENCO, KPCL, KSEB, TNEB, JSEB, OHPC,E&PD(SIKKIM),A&N ISLANDS,APGCL,MeSEB and WBSEB and there was shortfall in respect of stations of J&KPDC, HPGC, HPSEB, UPJVNL, MPGCL, CSEB, BSHPC, DoP Tripura, DoP Arunachal Pradesh and DoP Nagaland.

The generation during 2007-08 has exceeded the targets in all the five regions namely Northern, Western, Southern, Eastern and North East Regions .

2.2 SECTORWISE PERFORMANCE OF H.E. STATIONS

Sector wise generation performance of H. E. Stations during 2007-08 is given in Table S-3.It would be seen that there was no short fall in generation as compared to target.

TABLE S - 3
SECTORWISE PERFORMANCE OF HYDRO ELECTRIC POWER STATIONS
(2007-08 VIS-A-VIS 2006-07)

Sector/Board/ Corporation	**Energy Generation (MU)**					
	Target		**Actual**		**Surplus(+)/Deficit(+)**	
	2007-08	**2006-07**	**2007-08**	**2006-07**	**2007-08**	**2006-07**
Central	39790	38548	41806.59	35067	(+)05.10	(-)09.03
State	64299	58623	76130.49	73156	(+)18.40	(+)24.79
Private	5361	3829	5487.04	5136	(+)02.40	(+)34.11
Total	**109450**	**101000**	**123424.12**	**113359**	**(+)12.80**	**(+)12.23**

3. Outage Analysis

Outage data of 208 H.E.Stations covering 641 units and having an aggregate installed capacity of 31033.00 MW was made available by various utilities for the purpose of this Review. Region wise details of these 208 power stations are given below (Table S-4)

TABLE S – 4
REGIONWISE SUMMARY OF HE STATIONS ANALYSED
(2007–08 VIS–A–VIS 2006–07)

Region	No of Stations		No of Units		Capacity(MW)	
	2007–08	2006–07	2007–08	2006–07	2007–08	2006–07
Northern	**64**	69	**196**	210	**12074.95**	12134.05
Western	**36**	43	**98**	114	**5037.80**	5534.80
Southern	**80**	83	**254**	254	**10756.15**	10889.90
Eastern	**17**	24	**63**	76	**2118.90**	2412.10
North Eastern	**11**	10	**30**	30	**1045.20**	1045.20
All India	**208**	229	**641**	684	**31033.00**	32016.05

Outage data of H.E. Stations of following Utilities was not received for the year 2007–08:–

- UPJVNL, Sardar Sarovar Nigam Ltd, Kadana HE station (G.E.B), Jharkhand SEB, DVC, DoP Nagaland, Tripura & Arunachal Pradesh & Bhoruka Power Corporation Ltd, and Private sector in A.P.

3.1 Planned Maintenance

The number of H.E.Stations falling under various ranges of non–availability due to planned maintenance during the year 2007–08 is summarized below (Table S–5)

TABLE S – 5
NON–AVAILABILITY OF HE STATIONS DUE TO PLANNED OUTAGES
(2007–08 VIS–A–VIS 2006–07)

% Non availability due to planned maintenance	2007–08		2006–07	
	No of Stations	Capacity(MW)	No of Stations	Capacity (MW)
0	**32**	**1985.90**	34	2514.90
Up to 5	**98**	**13173.75**	96	11960.95
>5 to 10	**50**	**11312.75**	52	8175.70
>10 to 15	**16**	**2512.40**	26	6255.80
>15 to 20	**7**	**1814.00**	10	1910.50
>20 to 25	**0**	**0.00**	7	992.90
>25 to 30	**1**	**110.00**	1	77.65
above 30	**4**	**124.20**	3	127.65
Total	**208**	**31033.00**	229	32016.05

It could be seen from above that no planned maintenance was carried out at 32 hydro electric stations during 2007–08 as compared to 34 hydro stations during 2006–07.

Non–availability due to planned maintenance was more than 30% at four H.E. Stations during 2007–08. Details given at Table S–6.

TABLE S – 6
H.E. STATIONS HAVING HIGH PLANNED MAINTENANCE
PERIOD: (2007–08)

Sl. No	Name of Station	Capacity(MW)	P.M.N.A*(%)
1	Shimshapura	17.20	37.13
2	Hirakud–II	72.00	32.54
3	Jaldhaka–I	27.00	38.56
4	Jaldhaka–II	8.00	32.66

- **P.M.N.A** –Non availability due to Planned Maintenance

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 is given in Table S - 7.

TABLE S - 7
AVERAGE DURATION OF VARIOUS TYPES OF PLANNED MAINTENANCE
PERIOD: (2007-08)

Sl. No	Type of Planned maintenance	Average duration at any unit (Hrs)
1	Capital	586.13
2	Annual	525.65
3	Half Yearly	79.08
4	Quarterly	74.04
5	Monthly	101.72
6	Routine	78.10
7	Renovation & Modernisation	977.25

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.

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

- Generating units installed in Eastern Region accounted for Maximum non-availability due to planned maintenance (8.84%) whereas generating units installed in Western Region accounted for the least non-availability due to planned maintenance (2.99%) as indicated in Table 6.2.

Summary of planned maintenance carried out on various equipments like generators, turbine and other equipments during 2007-08 vis-à-vis 2006-07 is given below(Table S-8)

TABLE S - 8
DURATION OF PLANNED MAINTENANCE FOR GENERATOR,TURBINE & OTHER EQUIPMENTS.
(2007-08 VIS-A-VIS 2006-07)

S.No	Equipments	Duration			
		Maximum Hours		Average Hours	
		2007-08	2006-07	2007-08	2006-07
1	Generator	**719.98**	1320.00	**46.73**	116.84
2	Turbine	**2208.00**	994.00	**104.46**	87.60
3	Other Equipment	**1416.00**	577.37	**57.98**	48.37
4	Civil Structure	**1464.00**	1488.00	**132.29**	152.80

It could be seen that the average hours utilized for carrying out various repairs was more for turbine and other equipments during 2007-08 as compared to 2006-07.

3.2 Forced Outages

The summary of forced outages caused due to break-down of generator, turbine and other equipments during 2007-08 vis-à-vis 2006-07 is given below (Table S - 9.)

TABLE S - 9
FORCED OUTAGES DUE TO GENERATOR, TURBINE & OTHER EQUIP. FAULTS
(2007-08 VIS-A-VIS 2006-07)

Sl. No.	Equipment	Forced Outage (Hours)		% of total Forced Outage	
		2007-08	2006-07	2007-08	2006-07
1	Generator	**49121.12**	75048.83	**11.98**	15.54
2	Turbine	**62233.32**	74951.52	**15.18**	15.52
3	Other Equipments	**33304.13**	37356.10	**8.12**	7.74
4	Civil Structure	**22182.75**	19954.02	**5.41**	4.13
5	Others	**243185.18**	275537.57	**59.31**	57.07
	Total	**410026.50**	482848.04	**100.00**	100.00

Utility wise performance in respect of forced outages of H.E. Units for 2007-08 vis-à-vis 2006-07 is indicated below (Table S-10).

TABLE S-10
UTILITY WISE FORCED OUTAGES
(2007-08 VIS-A-VIS 2006-07)

Organisation	Number of units		Installed Capacity (MW)		Total Forced Outage (Hours)		Forced Outage per unit (Hours)	
	07-08	06-07	07-08	06-07	07-08	06-07	07-08	06-07
STATE BOARDS/ CORPORATIONS	**516**	541	**19498.00**	19261.85	**330448.22**	356999.87	**640.40**	659.89
BBMB	**28**	28	**2866.30**	2866.30	**10313.48**	18970.08	**368.34**	677.50
NHPC	**35**	32	**3137.20**	2747.20	**10282.13**	15055.60	**293.78**	470.49
NEEPCO	**13**	13	**755.00**	755.00	**39855.68**	42341.33	**3065.82**	3257.03
THDC	**4**	4	**1000.00**	1000.00	**235.33**	953.02	**58.83**	238.25
SJVNL	**6**	6	**1500.00**	1500.00	**1170.28**	10941.05	**195.05**	1823.51
NHDC	**8**	8	**1000.00**	1000.00	**24.00**	1131.58	**3.00**	141.45
DVC	**NA**	7	**NA**	147.20	**NA**	6800.45	**NA**	971.49
SSNNL	**NA**	11	**NA**	1450.00	**NA**	5904.44	**NA**	536.77
PVT.SECTOR	**31**	34	**1276.50**	1288.50	**17697.37**	12067.08	**570.88**	354.91
TOTAL	**641**	684	**31033.00**	32016.05	**410026.50**	471164.51	**639.67**	688.84

It is seen that the average forced outage per unit in hours was 639.67 during 2007-08 as compared to 688.84 in 2006-07.

3.2 General Overview

General overview indicating generation, planned maintenance (PM), forced outage (FO)and operating availability (Op.Av.)of H.E. stations during the past seven years is given below:

OVERVIEW

YEAR	INSTALLED CAPACITY	GENERATION (MU)		VARIA-TION	UNITS ANALYSED		PM	FO	OP.AV	AVERAGE PLF
	(MW)	TARGET	ACTUAL	%	No.	CAP.(MW)	%	%	%	%
2007-08	37002.10	109450	123424	+12.80	641	31033.00	5.66	2.34	92.00	38.1
2006-07	34546.10	101000	113359	+12.24	684	32016.05	7.03	3.65	89.32	37.4
2005-06	32182.25	91480	101293	+10.73	639	30897.30	7.45	3.31	89.24	35.9
2004-05	30446.30	84000	84495	+0.59	636	29574.30	7.94	2.21	89.85	31.7
2003-04	29405.15	83050	73775	-11.17	598	26846.50	6.94	2.30	90.76	28.6
2002-03	26793.50	82814	63834	-22.92	472	21921.40	8.33	2.62	89.05	27.2
2001-02	26131.50	83241	73940	-11.20	507	23942.60	7.47	3.21	89.32	32.3
2000-01	25004.25	83907	74481	-11.23	406	19667.15	8.23	3.58	88.20	34.0