

जल विद्युत गृहों के कार्य निष्पादन का पुनर्विलोकन

REVIEW OF PERFORMANCE OF HYDRO POWER STATIONS 2012-13

भारत सरकार विद्युत
मंत्रालय



Government of India
Ministry of Power

केन्द्रीय
विद्युत
प्राधिकरण



CENTRAL
ELECTRICITY
AUTHORITY

विद्युत अधिनियम, 2003 की धारा 73 (आई) व (जे) के तहत के0वि0प्रा0 के सांविधिक दायित्व का निर्वहन करते हुए प्रकाशित
(PUBLISHED IN FULFILLMENT OF CEA'S OBLIGATION UNDER SECTION 73 (i) & (j) OF THE ELECTRICITY ACT, 2003)

FUNCTIONS AND DUTIES OF CEA AS PER ELECTRICITY ACT-2003

- 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 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 provides 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.

केन्द्रीय विद्युत प्राधिकरण
CENTRAL ELECTRICITY AUTHORITY

जल विद्युत केन्द्रों के कार्य निष्पादन का पुनर्विलोकन
REVIEW OF PERFORMANCE OF
HYDRO POWER STATIONS 2012-13



जल विद्युत आयोजना एवं अन्वेषण प्रभाग
HYDRO PLANNING & INVESTIGATION DIVISION

नई दिल्ली
NEW DELHI
नवम्बर, 2013
NOVEMBER-2013

विद्युत अधिनियम, 2003 की धारा 73 (आई) व (जे) के तहत के0वि0प्रा0 के सांविधिक दायित्व का निर्वहन करते हुए प्रकाशित
IN FULFILLMENT OF CEA'S OBLIGATION UNDER SECTION 73 (i) & (j) OF THE ELECTRICITY ACT, 2003



प्राक्कथन

जल विद्युत शक्ति हमारे देश में पिछले 100 वर्षों से नवीनीकरण ऊर्जा का सबसे विश्वसनीय स्रोत रहा है। जल विद्युत शक्ति केन्द्रों की उपलब्धता में सतत सुधार के उद्देश्य से केन्द्रीय विद्युत प्राधिकरण (के.वि.प्रा.) केन्द्रीय पी. एस. यू., राज्य विद्युत बोर्डों और राज्य व निजी क्षेत्र में विद्युत यूटिलिटीयों के निकट सहयोग से उनके वार्षिक निष्पादन की समीक्षा के लिए अध्ययन करता है।

‘वर्ष 2012-13 के दौरान जल विद्युत शक्ति केन्द्रों के निष्पादन की समीक्षा संबंधी रिपोर्ट’ विद्युत अधिनियम, 2003 के खंड 73 (आई) और (जे) के तहत सांविधिक दायित्व को आंशिक रूप से पूरा करने में केन्द्रीय विद्युत प्राधिकरण द्वारा किए गए ऐसे प्रकाशनों की श्रृंखला में 26वीं हैं। इस रिपोर्ट में 39491.40 मेगावाट की कुल प्रतिस्थापित क्षमता वाले 182 जल विद्युत केन्द्रों की 634 जल विद्युत इकाइयों के निष्पादन के व्यापक विश्लेषण का प्रावधान है, जिसके लिए केन्द्रीय, राज्य और निजी क्षेत्रों में उत्पादन यूटिलिटीयों द्वारा आउटेज संबंधी आंकड़े उपलब्ध कराए गए हैं।

प्रचालन उपलब्धता संबंधी सूचना पर्याप्त और विश्वसनीय विद्युत आपूर्ति सुनिश्चित करने में काफी महत्वपूर्ण है। अध्ययनों के अनुसार वर्ष 2012-13 के दौरान जल विद्युत केन्द्रों की औसत प्रचालन उपलब्धता 89.17% थी। प्रणोदित और योजनाबद्ध आउटेज के कारण जल विद्युत इकाइयों की औसत गैर-उपलब्धता क्रमशः 3.27% और 7.56% थी। वर्ष 2012-13 के दौरान जल विद्युत केन्द्रों से उत्पादन 113.720 बिलियन यूनिट था, जो 122.045 बिलियन यूनिट के उत्पादन लक्ष्य से 6.82% कम था।

मुझे विश्वास है कि यह समीक्षा विद्युत केन्द्र प्राधिकारियों को उपयुक्त प्रचालन एवं रखरखाव की (ओ. एंड एम.) नीति तैयार करके जल विद्युत संयंत्रों की उपलब्धता में और सुधार लाने में उपयोगी मार्गदर्शन प्रदान करेगा। प्रणोदित कामबंदी के कारणों का भी व्यापक विश्लेषण करने की आवश्यकता है। विनिर्माताओं / ओ. एंड एम. एजेंसियों द्वारा उचित उपाय करने की भी आवश्यकता है ताकि इनकी पुनरावृत्ति को कम किया जा सके तथा प्रचालन उपलब्धता में सुधार किया जा सके।

समीक्षा के लिए आउटेज आंकड़े/सूचना उपलब्ध कराने के लिए मैं सभी उत्पादन यूटिलिटीयों का हार्दिक धन्यवाद करता हूँ। मैं इस रिपोर्ट के लिए अपेक्षित निविष्टि आंकड़ों का विश्लेषण करने में सूचना प्रौद्योगिकी प्रभाग द्वारा प्रदान किए गए सहयोग के लिए उनको धन्यवाद देता हूँ।

नई दिल्ली
नवम्बर, 2013


(के0 एन0 गर्ग)
सदस्य (जल विद्युत), के0 वि0 प्रा0



FOREWORD

Hydro Electric Power has been the most reliable source of renewable energy for the last over 100 years in our country. In the quest for continuous improvement in availability of Hydro Power Stations, Central Electricity Authority (CEA) carries out studies to review their annual performance in close co-operation with Central PSUs, State Electricity Boards and Power Utilities in State and Private Sector.

The report on 'Review of Performance of Hydro Power Stations during the year 2012-13' is twenty sixth in the series of such publication by Central Electricity Authority in partial fulfillment of the statutory obligations under Section 73(i)&(j) of the Electricity Act, 2003. The report provides exhaustive analysis of performance of 634 hydro electric units installed at 182 hydro electric stations having total installed capacity of 39491.40 MW for which outage data has been provided by generation utilities in State, Central and Private sectors.

The information on operation availability is of vital importance in ensuring adequate and reliable power supply. According to the studies, the average operating availability of hydroelectric stations during the year 2012-13 was 89.17%. The average non-availability of hydro units due to forced and planned outages was 3.27% and 7.56% respectively. The generation from hydro stations during 2012-13 was 113.720 Billion Units which was 6.82% less than the generation target of 122.045 Billion Units.

I am confident that the review would provide useful guidance to power station authorities in making further improvement in the availability of hydel plants by chalking out suitable O&M strategies. There is also a need to undertake detailed analysis of the reasons of forced outages and to devise measures by the manufactures/O&M agencies so as to minimise the recurrence of the same and to improve the operating availability.

I wish to express my sincere thanks to all the generating utilities for providing outage data/information for the review. I would also like to put on record the co-operation extended by Information Technology Division in undertaking the analysis of the input data required for this report.

NEW DELHI
November, 2013


(K. N. Garg)
Member (Hydro), CEA



प्रस्तावना

किसी भी देश के विकास के लिए विद्युत शक्ति महत्वपूर्ण बुनियादी आधारों में से एक है। हमारे देश में 100 वर्षों से भी अधिक समय से जल विद्युत सबसे विश्वसनीय नवीकरणीय ऊर्जा का स्रोत रहा है। दिनांक 31.03.2013 को 223344 मेगावाट की कुल प्रतिष्ठापित उर्जा उत्पादन क्षमता में से 39491.40 मेगावाट (17.68%) (25 मेगावाट से ज्यादा स्टेशन प्रतिष्ठापित क्षमता) की जल विद्युत क्षमता है।

केन्द्रीय विद्युत प्राधिकरण (के. वि. प्रा.) उत्पादन निष्पादन के कड़े प्रबोधन, ब्रेक डाउन के कारणों का विश्लेषण, नवीनीकरण तथा आधुनिकीकरण कार्यों आदि के विश्लेषण द्वारा उर्जा उत्पादक यूटिलिटीज के सहयोग से जल विद्युत केन्द्रों के निष्पादन में सुधार के लिए संगठित प्रयास कर रहा है। यह स्पष्ट है कि विद्यमान विद्युत केन्द्रों को विद्युत की कमी को कम करने के लिए तथा विश्वसनीय आपूर्ति करने के लिए अपने निष्पादन तथा उपलब्धता में सुधार अवश्य करना चाहिए।

यह वार्षिक पुनर्वलोकन वर्ष 2012-13 के दौरान देश में जल विद्युत केन्द्रों के कार्य निष्पादन का विश्लेषण करता है तथा 182 जल विद्युत केन्द्रों पर 634 यूनिटों के निष्पादन का विस्तृत विश्लेषण करता है। कोई भी एक सूचकांक जल विद्युत केन्द्रों के कार्य निष्पादन के लिए पर्याप्त रूप से मापक यूनिट प्रदान नहीं कर सकता। जल विद्युत केन्द्रों के निष्पादन को योजनाबद्ध अनुरक्षण, गैर-निर्धारित पूर्ण / आंशिक कामबंदी, अंतर्प्रवाह की वास्तविक प्रवृत्ति आदि जैसे घटक प्रभावित करते हैं। अनुरक्षण में अद्यतन पद्धति अपनाने की आवश्यकता है ताकि परिहार्य कामबन्दियों का निराकरण किया जा सके।

आर. एम. एंड यू. विषय से संबंधित अध्याय आर.एम.एंड यू. के लाभों का विस्तार से उल्लेख करता है तथा उर्जा उत्पादक यूटिलिटीज को अपने प्रचालाधीन पुरानी यूनिटों में इस प्रकार के कार्य को हाथ में लेने की संभावनाओं को तलाशने में प्रोत्साहित करेगा।

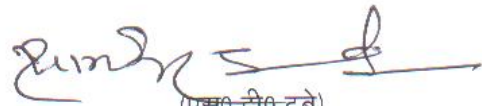
इस प्रकाशन का अध्ययन के.वि.प्रा.के जल विद्युत आयोजन एवं अन्वेषण प्रभाग (एच.पी.एण्ड आई.) प्रभाग के निदेशक श्री जानकी प्रसाद के संपूर्ण मार्गदर्शन में किया गया है।

मैं सभी विद्युत राज्य बोर्डों, सरकारी/ निजी क्षेत्र के उपक्रमों और विद्युत केंद्र के अधिकारियों को हमें जरूरी आंकड़े उपलब्ध कराने के लिए बहुत धन्यवाद देना चाहता हूँ।

मैं सभी उर्जा उत्पादक यूटिलिटीज से दृढ़तापूर्वक अनुरोध करूंगा कि जल विद्युत केन्द्रों के संबंध में माहवार निष्पादन तथा आउटेज आंकड़े तुरंत तथा नियमित रूप से प्रस्तुत करते रहें ताकि भविष्य में भी निष्पादन पुनर्वलोकनों का विश्लेषण समय से प्रकाशन हो सके।

के.वि.प्रा. इस रिपोर्ट की विषयवस्तु तथा प्रस्तुतिकरण में सुधार के लिए संयुक्त प्रयास कर रहा है। इस संबंध में रचनात्मक सुझावों का स्वागत है तथा यह सराहनीय होंगे।

नई दिल्ली
नवम्बर, 2013


(एस० डी० दुबे)
मुख्य अभियन्ता (एच० पी० एण्ड आई), के० वि० प्रा०



PREFACE

Electric power is one of the most important infrastructure requirement for the development of any country. Hydel Power has been the most reliable source of renewable energy for the last more than 100 years in our country. As on 31.03.2013, out of a total installed generating capacity of 223344 MW, hydro capacity was 39491.40 MW (17.68%) (Above 25 MW station installed capacity).

Central Electricity Authority (CEA) is making concerted efforts for improving the performance of Hydro Power Stations in cooperation with the generating utilities through close monitoring of generation performance, analysis of causes for break downs, Renovation & Modernization works etc. It is imperative that the existing power stations must improve their performance and availability to reduce power shortage and deliver reliable supply.

This Annual Review provides an analysis of performance of Hydro Power Stations in the country during the year 2012-13 and provides an exhaustive analysis of performance of 634 units at 182 H.E. Stations. No single operating index can adequately provide a measuring unit for performance of Hydro Power Stations. The factors that influence the performance of hydro power stations are planned maintenance, unscheduled total/partial outages, pattern of actual inflows, etc. There is a need to adopt state-of-the-art practices in maintenance so that avoidable outages could be obviated.

The chapter on RM&U enumerates the advantages of RM&U and would motivate generating utilities to explore the possibilities of undertaking such works on older units under operation with them.

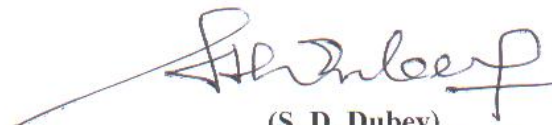
Studies for this publication have been carried out in Hydro Planning & Investigation (HP&I) Division of CEA under the overall guidance of Shri Janki Prasad, Director (HP&I).

I wish to express my sincere thanks to various State Electricity Boards, Public Sector/Private Sector Enterprises and Power Station Authorities for furnishing the necessary data.

I would strongly urge all generating utilities to readily and regularly continue to furnish month-wise performance & outage data in respect of all Hydro Electric Power Stations for analysis & timely publishing of performance reviews in future also.

CEA has been making concerted efforts to improve the contents and presentation of the report. Constructive suggestions in this regard are welcome and will be appreciated.

NEW DELHI
November, 2013


(S. D. Dubey)
Chief Engineer (HP&I), CEA

आभार

मैं निम्नलिखित अधिकारियों का जल विद्युत गृहों के कार्य का निष्पादन पुनर्विलोकन 2012-13 के प्रकाशन में सहयोग के लिए धन्यवाद देता हूँ।

मुख्य अभियन्ता (जल विद्युत निष्पादन प्रबोधन प्रभाग), के० वि० प्रा० को वर्ष 2012-13 के दौरान यूनितों के प्रचालन के लिए टरबाइन तथा जेनरेटर निर्माताओं के विवरण समय पर उपलब्ध कराने के लिये धन्यवाद देता हूँ।

मुख्य अभियन्ता (एच०ई०एंड आर०एम० प्रभाग), के० वि० प्रा० का जल विद्युत यूनितों के नवीनीकरण एवं आधुनिकीकरण एवं उन्नयन पर अध्याय तैयार करने के लिए धन्यवाद देता हूँ।

मैं सदस्य (जल विद्युत), के० वि० प्रा० तथा मुख्य अभियन्ता (एच.पी.एण्ड आई.) का इस पुनर्विलोकन के निर्माण में उनके अमूल्य सूझावों तथा मार्ग निर्देशन के लिये आभारी हूँ।

मैं सर्वश्री बलवान कुमार, उप निदेशक, भीम देव नेगी, वरिष्ठ अभियन्ता, एस जे वी एन एल व अन्य अधिकारियों तथा कर्मचारियों का भी इस पुनर्विलोकन के प्रकाशन में सहयोग के लिये धन्यवाद देता हूँ।



(जानकी प्रसाद)

निदेशक (एच०पी० एण्ड आई०), के० वि० प्रा०

ACKNOWLEDGEMENTS

I express my sincere thanks to the following officers in bringing out this Review of Performance of HE Stations 2012-13.

Chief Engineer (HPM), CEA for timely supplying the details of turbine and generator manufacturers, date of commissioning and type of turbine etc. for the units commissioned during the year 2012-13.

Chief Engineer (HE&RM), CEA for preparing the chapter on Renovation Modernisation & Uprating of Hydro generating units.

I am grateful to Member (Hydro), CEA and Chief Engineer (HP&I), CEA, for their valuable suggestions and guidance in preparation of this Review.

I also express my thanks to S/Shri Balwan Kumar, Deputy Director, Bhim Dev Negi, Sr. Engineer, SJVNL and other officers/officials for their assistance in making it possible to bring out this Review.



(Janki Prasad)
Director (HP&I), CEA

CONTENTS

SLNO	PARTICULARS	PAGE NO
1.	Summary	i
2. Chapter 1 Exhibits Annexure	Hydro power potential and development	1
3. Chapter 2 Exhibits Annexure	Generation Performance	33
4. Chapter 3 Exhibits Annexure	Major Reservoir Based HE Schemes	45
5. Chapter 4 Exhibits Annexure	Planned Maintenance of HE Units	66
6. Chapter 5 Exhibits Annexure	Forced Outage of HE Units	93
7. Chapter 6 Exhibits Annexure	Operating Availability of HE Units	127
8. Chapter 7 Annexure	Generation Programme for the year 2013-14	173
9. Chapter 8 Annexure	Renovation & Modernisation of Hydroelectric Power Stations	181
10. Chapter 9	Definitions and Abbreviations	199

LIST OF EXHIBITS

Exhibit No.	Description	Page No.
1.1	Region-wise Hydro Electric Capacity as on 31.03.2013	5
1.2	Basin-wise Hydro Potential Development as on 31.03.2013	6
1.3	Growth of Installed Capacity since 1947	9
1.4	Growth of Hydro Generation Vis-À-Vis other Sources since 1947	10
1.5	Trend of Hydro Capacity and Generation since 1947	11
1.6	Contribution of Hydro Capacity as on 31.03.2013	13
1.7	Contribution of Hydro Generation as on 31.03.2013	13
1.8	Sector-wise Hydro Capacity as on 31.03.2013	13
1.9	Sector-wise Hydro Generation during 2012-13	13
2.1	Monthly All India Hydro Generation vs. Targets during 2012-13	33
2.2	Region-wise Actual Generation vs. Targets during 2012-13	36
2.3	Utility-wise Excess/ Shortfall in Generation during 2012-13	37
3.1	Inflows into Major Reservoirs during 2011-12 vis-à-vis 2012-13	51
3.2	Month wise Maximum Levels of Important Reservoirs	52
3.3	Month wise Maximum Level of Important Reservoirs	53
3.4	Month wise Maximum Levels of Important Reservoirs	54
3.5	Month wise Maximum Levels of Important Reservoirs	55
3.6	Month wise Maximum Levels of Important Reservoirs	56
3.7	Month wise Maximum Levels of Important Reservoirs	57
3.8	Month wise Maximum Levels of Important Reservoirs	58
3.9	Month wise Maximum Levels of Important Reservoirs	59
3.10	Generation from Reservoirs Based Hydroelectric Stations during 2011-12 vis-a-vis 2012-13	60

4.1	Duration Pattern of Planned Maintenance during 2012-13	74
5.1	Duration Pattern of Forced Outages during 2012-13	106
6.1	Operating Availability of H.E.Stations during 2012-13	134
6.2	Operating Availability of H.E.Stations during 2012-13 (Contd)	135
6.3	Operating Availability of H.E.Stations during 2012-13 (Contd)	136
6.4	Operating Availability of H.E.Stations during 2012-13 (Contd)	137
6.5	Operating Availability of H.E.Stations during 2012-13 (Contd)	138
6.6	Operating Availability of H.E.Stations during 2012-13 (Contd)	139
6.7	Operating Availability of H.E.Stations during 2012-13(Contd)	140
6.8	Operating Availability of H.E.Stations during 2012-13 (Contd)	141
6.9	Operating Availability of H.E.Stations during 2012-13 (Contd)	142
6.10	Operating Availability of H.E.Stations during 2012-13 (Contd)	143
6.11	Operating Availability of H.E.Stations during 2012-13 (Contd)	144
6.12	Operating Availability of H.E.Stations during 2012-13(Contd)	145
6.13	Operating Availability of H.E.Stations during 2012-13 (Contd)	146
6.14	Operating Availability of H.E.Stations during 2012-13 (Contd)	147

LIST OF ANNEXURES

Annex No.	Description	Page No.
1.1	Region wise Installed Capacity of HE Stations (above 25 MW Capacity) as on 31.03.2013	19
1.2	Sector-wise/Utilities-wise Installed Capacity of HE Station (above 25 MW Capacity) as on 31.03.2013	20
1.3	Station-wise Installed Capacity of HE Stations (above 25 MW Capacity) as on 31.03.2013	21
1.4	Capacity-wise Grouping of Hydroelectric Stations as on 31.03.2013	29
1.5	Hydro Generating units added during 2012-13	30
2.1	Generation Performance of HE Stations during 2012-13	38
3.1	Salient Data of Important reservoirs and Associated H.E.Stations	61
4.1	Details of long duration Planned Maintenance in Hydroelectric Outage duration 50 hours and above	75
5.1	Details of long duration Forced Outages in Hydro-Electric units Outage duration 24 hours and above	107
6.1	Operating availability of Hydroelectric units during 2012-13	148
7.1	Hydroelectric Generating units likely to be added during 2013-14	176
7.2	Sector-wise Performance of Hydroelectric Stations during 2012-13 & Targets for 2013-14	178
8.1	State-wise List of Hydro RM&U Schemes completed up to VIIIth Plan	187
8.2	State-wise List of Hydro RM&U Schemes completed in the IXth Plan	188
8.3	State-wise List of Hydro RM&U Schemes completed in the Xth Plan	190
8.4	State-wise List of Hydro RM&U Schemes completed in the XIth Plan	193
8.5	State-wise List of Hydro RM&U Schemes completed in the XIIth Plan	194
8.6	State-wise List of Hydro RM&U Schemes programmed for Completion in the XIIIth Plan	198

SUMMARY

SUMMARY

1.0 General

1.1 This review covers the performance of Hydro-Electric Stations having installed capacity of more than 25 MW. As on 31st March, 2013 there were 634 H.E. generating units installed in 182 Hydro-Electric Stations with an aggregate installed capacity of 39491.40 MW in operation. Performance of 31 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 31.3.2013 in the country vis-à-vis that on 31.3.2012 is given below in **Table S-1**.

TABLE S-1

**REGIONWISE SUMMARY OF HYDRO-ELECTRIC STATIONS
(2012-13 VIS-A-VIS 2011-12)**

Region	No of Stations as on		No of Units as on		Capacity (MW) as on	
	31.03.13	31.03.12	31.03.13	31.03.12	31.03.13	31.03.12
Northern	61	57	206	197	15523.25	15178.25
Western	28	28	101	101	7392.00	7392.00
Southern	67	66	240	239	11387.45	11372.45
Eastern	16	16	58	55	3946.70	3847.70
N-Eastern	10	10	29	28	1242.00	1200.00
All India	182	177	634	620	39491.40	38990.40

1.3 The generation from the hydro electric power Stations in the country during 2012-13 was 113720.29 MU (excluding import from Bhutan) which was 6.82% less than target of 122045 MU.

1.4 The report also contains outage data of 182 H.E. Stations covering 634 units and having an aggregate installed capacity of 39491.40 MW which was made available by various utilities for the purpose of this Review. For outage data analysis during 2012-13, hydro stations above 25 MW installed capacity have been considered.

1.5 The performance review also analyses yearwise generation, planned maintenance, forced outages, operating availability and average PLF (%) for the last 13 years (viz 2000-01 to 2012-13)

1.6 This review 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 31.03.2013), for the year of 2012-13, achievements during the year 2012-13 and programme for the year 2013-14 are also included in the report.

The report has been divided into nine chapters. The outline of the report is as under:

Chapter No.	Particulars
Chapter 1	Hydro Power Potential and Development
Chapter 2	Generation Performance
Chapter 3	Major Reservoir Based H.E. Schemes
Chapter 4	Planned Maintenance of H.E. Units
Chapter 5	Forced Outage of H.E. Units
Chapter 6	Operating Availability of H.E. Units
Chapter 7	Generation Programme for the year 2013-14
Chapter 8	Renovation & Modernisation of Hydro Electric Power Projects
Chapter 9	Definitions and Abbreviations

2.0 Generation Performance

The generation from the hydro electric power Stations in the country during 2012-13 was 113720.29 MU (excluding import from Bhutan) which was 6.82% less than target of 122045 MU.

2.1 Utility 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 below in **Table S-2**.

TABLE S-2

UTILITY WISE PERFORMANCE OF HYDRO ELECTRIC POWER STATIONS (2012-13 VIS-A-VIS 2011-12)

Utilities	Target		Actual		(Energy Generation (MU) Surplus (+)/ Shortfall (-) in %	
	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12
CENTRAL SECTOR						
BBMB	10023	10023	10944.67	12459.46	9.20	24.31
NHPC	19117	17104	18893.49	18684.10	-1.17	9.24
SJVNL	6500	6500	6777.78	7610.32	4.27	17.08
THDC	3942	3235	4266.06	4591.30	8.22	41.93
NHDC	3384	3165	4203.92	4662.37	24.23	47.31
DVC	256	125	199.33	296.12	-22.14	136.90
NEEPCO	2698	2627	2377.74	2378.09	-11.87	-9.48
SUB TOTAL	45920	42779	477662.99	50681.76	3.80	18.47
PRIVATE SECTOR						
JPVL	7414	4225	7173.82	6092.81	-3.24	44.21
MPCL	350	350	333.15	376.06	-4.81	7.45

TATA	1450	1450	1450.03	1531.07	0.00	5.59
DLHP	55	58	95.98	116.69	74.51	101.19
EPPL	400	208	312.50	73.38	-21.87	-64.72
ADPL	750	678	681.32	616.01	-9.16	-9.14
LGPPL	277	57	156.79	-	-43.40	-
SMHPCL	-	290	-	-	-	-
CHUZACHEN	-	13	-	-	-	-
SUB TOTAL	10696	7329	10203.59	8806.02	-4.60	20.15
STATE SECTOR						
JKSPDC	3423	3292	3700	3595.07	8.09	9.21
HPSEB LTD.	1708	1555	1460.22	1657.30	-14.51	6.58
RRVUNL	545	307	845.34	821.57	55.11	167.61
PSPCL	3852	3745	3925.85	4626.85	1.92	23.55
UPJVNL	885	885	1577.92	1403.67	78.30	58.61
UJVNL	4604	4621	4677.87	5129.97	1.60	11.01
SSNNL	3141	3028	3698.29	4229.33	17.74	39.67
GSECL	616	616	880.02	729.62	42.86	18.44
MAHAGENCO	3874	3830	4011.46	4590.68	3.55	19.86
MPPGCL	2389	2033	3023.79	3073.72	26.57	51.19
CSPGC	250	175	301.51	314.11	20.60	79.49
APGENCO	8187	7983	3456.75	6371.05	-57.78	-20.19
KPCL	12205	11222	10169.78	14257.68	-16.68	27.05
KSEB	6909	6593	4650.08	7807.98	-32.70	18.43
TANGEDCO	5061	4695	2868.00	5201.22	-43.33	10.78
JSEB	160	100	141.98	270.05	-11.26	170.05
OHPC	5497	5183	4373.80	4987.33	-20.43	-3.78
WBSEDCL	1069	1022	1138.12	1077.89	6.47	5.47
APGCL	425	415	343.04	460.94	-19.28	11.07
MeECL	629	642	609.89	415.71	-3.04	-35.25
SUB TOTAL	65429	61942	55853.71	71021.74	-14.63	14.66
ALL INDIA	122045	112050	113720.29	130509.52	-6.82	16.47

It is observed that during the year 2012-13, overall hydro generation was more than the target in respect of BBMB, SJVNL, THDC and NHDC in Central Sector and DLHP and TATA in Private Sector. As regards generation by State Electricity Boards/Corporations /Departments, hydro generation was more than the target in respect of JKSPDC, RRVUNL, PSPCL, UPJVNL, UJVNL, SSNNL, GSECL, MAHAGENCO, MPPGCL, CSPGC and WBSEDCL.

2.2 Sector wise Performance of H.E. Stations

Sector wise generation performance of H.E.Stations during 2012-13 is given in **Table S-3**. It would be seen that there was excess generation as compared to target in Central Sector and less generation in State & Private Sectors.

TABLE S-3

SECTOR WISE PERFORMANCE OF HYDRO ELECTRIC POWER STATIONS (2012-13 VIS-A-VIS 2011-12)

Sector/Board/Corporation	Energy Generation (MU)					
	Target		Actual		Surplus(+)/ Deficit(-)in %	
	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12
Central	45920	42779	47662.99	50681.76	3.80	18.47
State	65429	61942	55853.71	71021.74	-14.63	14.66
Private	10969	7329	10203.59	8806.02	-4.60	20.15
Total	122045	112050	113720.29	130509.52	-6.82	16.47

3.0 Outage Analysis

Outage data of 182 H.E. Stations covering 634 units and having an aggregate installed capacity of 39491.40 MW was made available by various utilities for the purpose of this Review. For outage data analysis during 2012-13, hydro stations above 25 MW installed capacity have been considered. Region wise details of these 182 hydro power stations are given below in **Table S-4**.

TABLE S-4

REGION WISE SUMMARY OF HE STATIONS ANALYSED (2012-13 VIS-A-VIS 2011-12)

Region	No of Stations		No of Units		Capacity(MW)as on	
	2012-13	2011-12	2012-13	2011-12	31.03.13	31.03.12
Northern	61	57	206	197	15523.25	15178.25
Western	28	28	101	101	7392.00	7392.00
Southern	67	66	240	239	11387.45	11372.45
Eastern	16	16	58	55	3946.70	3847.70
North Eastern	10	10	29	28	1242.00	1200.00
All India	182	177	634	620	39491.40	38990.40

3.1 Planned Maintenance

The number of H.E.Stations falling under various ranges of non-availability due to planned maintenance during the year 2012-13 is summarized below in **Table S-5**.

TABLE S-5

**NON-AVAILABILITY OF HE STATIONS DUE TO PLANNED OUTAGES
(2012-13 VIS-A-VIS 2011-12)**

% Non availability due to planned maintenance	2012-13		2011-12	
	Nos of Stations	Capacity (MW) As on 31.03.13	Nos of Stations	Capacity (MW) As on 31.03.12
0	23	5441.20	25	5774.00
Up to 5	67	14744.70	62	13642.20
>5 to 10	44	9028.85	43	11031.50
>10 to 15	19	4277.45	16	3065.10
>15 to 20	5	1330.00	11	1483.40
>20 to 25	7	1930.00	6	1296.00
>25 to 30	3	214.00	6	1511.00
above 30	14	2525.20	8	1187.20
Total	182	39491.40	177	38990.40

It could be seen from above that no planned maintenance was carried out at 23 hydro electric stations during 2012-13 as compared to 25 hydro electric stations during 2011-12.

Non-availability due to planned maintenance was more than 30% at 14 H.E. Stations during 2012-13. Details of which are given below in **Table S-6**.

TABLE S-6

**H.E. STATIONS HAVING HIGH PLANNED MAINTENANCE
FOR THE PERIOD: (2012-13)**

Sl. No	Name of Station	Capacity(MW)	P.M.N.A*(%)
1	BHAWANI KATTALAI	30	51.58
2	RIHAND HPS	300	51.12
3	BHADRA HPS	39.20	48.85
4	SARKARPATHY HPS	30	45.98
5	SUBERNREKHA-I HPS	130	45.03
6	BHAKRA-L HPS	540	42.22
7	BASSI HPS	60	41.35
8	KUNDAH-IV HPS	100	40.05
9	SRISAILAM LB HPS	900	39.06
10	JALDHAKA ST-I HPS	27	38.70
11	SHANAN HPS	110	35.63
12	UPPER SINDH-II HPS	105	33.82
13	SANJAY HPS	120	33.54
14	JAWAHAR SAGAR HPS	99	33.09

* 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 are given in **Table S-7**.

TABLE S-7
AVERAGE DURATION OF VARIOUS TYPES OF PLANNED MAINTENANCE
PERIOD: (2012-13)

Sl. No	Type of Planned maintenance	Average duration at any unit (Hrs)
1	Capital	986.39
2	Annual	795.07
3	Half Yearly	0.00
4	Quarterly	26.43
5	Monthly	128.99
6	Routine	141.48
7	Renovation & Modernisation	884.03
8	Up rating	0.00
9	Civil Structure	137.68
10	Turbine	172.33
11	Generator	63.03
12	Other Equipments	134.75
13	Miscellaneous	282.56

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.

Summary of planned maintenance carried out on various equipments like generators, turbine and other equipments during 2012-13 vis-à-Vis 2011-12 is given below in **Table S-8**.

TABLE S-8

**DURATION OF PLANNED MAINTENANCE FOR GENERATOR,
TURBINE & OTHER EQUIPMENTS
(2012-13 vis-à-vis 2011-12)**

S. No.	Equipments	Duration			
		Maximum Hours for any unit		Average Hours	
		2012-13	2011-12	2012-13	2011-12
1	Generator	1463.98	517.15	63.03	36.34
2	Turbine	7890.00	5301.22	172.33	123.39
3	Other Equipment	3823.35	2747.00	134.75	79.02
4	Civil Structure	1191.5	4357.77	137.68	138.71

It could be seen that the average hours utilized for carrying out various repairs increased in case of generator, turbine, other equipment and decreased for Civil Structure during 2012-13 as compared to 2011-12.

3.2 Forced Outages

The summary of forced outages caused due to break-down of generator, turbine and other equipments during 2012-13 vis-à-Vis 2011-12 is given below in **Table S-9**.

TABLE S-9

**FORCED OUTAGES DUE TO GENERATOR, TURBINE & OTHER EQUIP. FAULTS
(2012-13 VIS-A-VIS 2011-12)**

Sl. No.	Equipment	Forced Outage (Hours)		% of total Forced Outage	
		2012-13	2011-12	2012-13	2011-12
1	Generator	50538.41	56749.08	15.38	17.65
2	Turbine	47745.02	66786.58	14.53	20.77
3	Other Equipments	46974.58	39125.40	14.30	12.17
4	Civil Structure	7677.45	36075.02	2.34	11.22
5	Others	175625.64	122836.17	53.45	38.20
	Total	328561.09	321572.25	100.00	100.00

Region wise planned maintenance, forced outages and operating availability of H.E. Units for 2012-13 is indicated below in **Table S-10** above.

TABLE S-10

**AVAILABILITY OF UNITS - REGION-WISE
PERIOD: 2012-13**

SL. No.	REGION	NO.OF UNITS	INSTALLED CAPACITY (MW)	PLANNED MAINTENANCE (%)	FORCED OUTAGE (%)	OPERATING AVAILABILITY
1	NORTHERN	206	15523.25	9.07	2.25	88.68
2	WESTERN	101	7392.00	6.17	2.29	91.54
3	SOUTHERN	239	11387.45	7.09	3.85	89.06
4	EASTERN	59	3946.70	6.25	5.12	88.63
5	N. EASTERN	29	1242.00	5.32	10.65	84.03
	ALL INDIA	634	39491.40	7.56	3.27	89.17

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

- Generating units installed in Northern Region accounted for Maximum non-availability due to planned maintenance (9.07%) whereas generating units installed in North Eastern Region accounted for the least non-availability due to planned maintenance (5.32%) as indicated in **Table S-10**.

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 13 years is given below:

OVERVIEW

YEAR	INSTALLED CAPACITY	GENERATION (MU)		VARIATION	UNITS ANALYSED		PM	FO	OP.AV	AVERAGE (PLF)
	(MW)	TARGET	ACTUAL	%	Nos	CAP(MW)	%	%	%	%
2012-13	39491.40	122045	113720	(-)6.82	634	39491.40	7.56	3.27	89.17	32.9
2011-12	38990.40	112050	130510	(+)16.47	620	38990.40	7.43	4.48	88.09	38.1
2010-11	37567.40	111352	114257	(+)2.61	609	37567.40	7.23	3.94	88.83	34.7
2009-10	36863.40	115468	103916	(-)10.00	589	36203.40	6.19	2.90	90.91	32.2
2008-09	36846.40	114841	109840	(-)4.35	572	35312.45	6.38	2.45	91.17	34.0
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

CHAPTER 1

HYDRO POWER POTENTIAL AND DEVELOPMENT

CHAPTER-1

HYDRO-ELECTRIC POWER POTENTIAL AND DEVELOPMENT

1.1 Hydro-electric Potential

Reassessment studies of Hydro Electric Power 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. The hydro potential of 84044 MW at 60% load factor when fully developed would result in an installed capacity of about 150,000 MW on the basis of probable average load factor. The total energy potential is assessed as 600 billion units per year. As on 31.03.2013, H.E. Schemes having total installed capacity of 34705.80 MW (23.88%) excluding pumped storage stations of capacity of 4785.60 MW have already been developed and the schemes under development account for capacity of 12372 MW (8.51%). Region wise/state wise and basin wise summary of the status of Hydro Electric Capacity and Potential development in the country are indicated in **Tables 1.1, and 1.2** respectively as well as shown in **Exhibits 1.1 and 1.2**. It would be observed that about 67.60% in terms of Installed Capacity is yet to be harnessed.

TABLE 1.1
REGIONWISE/STATEWISE STATUS OF HYDRO ELECTRIC CAPACITY
(In terms of Installed Capacity-above 25 MW)

As on 31.03.2013

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	2384.00	17.60	1065.00	7.86	10094.00	74.53
Himachal Pradesh	18820	18540	7594.00	40.96	3732.00	20.13	7214.00	38.91
Punjab	971	971	1206.30	100.00	0.00	0.00	0.00	0.00
Haryana	64	64	0.00	0.00	0.00	0.00	64.00	100.00
Rajasthan	496	483	411.00	85.09	0.00	0.00	72.00	14.91
Uttarakhand	18175	17998	3426.40	19.04	1196.00	6.65	13375.70	74.32
Uttar Pradesh	723	664	501.60	75.54	0.00	0.00	162.40	24.46
Sub Total(NR)	53395	52263	15523.25	29.70	5993.00	11.47	30746.80	58.83
WESTERN								
Madhya Pradesh	2243	1970	2395.00	100.00	400.00	20.30	0.00	0.00
Chhattisgarh	2242	2202	120.00	5.45	0.00	0.00	2082.00	94.55
Gujarat	619	590	550.00	93.22	0.00	0.00	40.00	6.78
Maharashtra	3769	3314	2487.00	75.05	0.00	0.00	827.00	24.95

Goa	55	55	0.00	0.00	0.00	0.00	55.00	100.00
Sub Total(WR)	8928	8131	5552.00	68.28	400.00	4.92	2179.00	26.80
SOUTHERN								
Andhra Pradesh	4424	4360	2177.80	49.95	410.00	9.40	1772.30	40.65
Karnataka	6602	6459	3585.40	55.51	0.00	0.00	2873.60	44.49
Kerala	3514	3378	1881.50	55.70	100.00	2.96	1396.50	41.34
TamilNadu	1918	1693	1737.20	100.00	45.00	2.66	0.00	0.00
Sub Total(SR)	16458	15890	9381.90	59.04	555.00	3.49	5953.20	37.46
EASTERN								
Jharkhand	753	582	233.20	40.07	0.00	0.00	348.80	59.93
Bihar	70	40	0.00	0.00	0.00	0.00	40.00	100.00
Odisha	2999	2981	2027.50	68.01	0.00	0.00	953.50	31.99
West Bengal	2841	2829	176.00	6.22	193.00	6.82	2460.00	86.96
Sikkim	4286	4248	570.00	13.42	2421.00	56.99	1257.00	29.59
Sub Total(ER)	10949	10680	3006.70	28.15	2614.00	24.48	5059.30	47.37
NORTH EASTERN								
Meghalaya	2394	2298	282.00	12.27	40.00	1.74	1976.00	85.99
Tripura	15	0	0.00	0.00	0.00	0.00	0.00	0.00
Manipur	1784	1761	105.00	5.96	0.00	0.00	1656.00	94.04
Assam	680	650	375.00	57.69	0.00	0.00	275.00	42.31
Nagaland	1574	1452	75.00	5.17	0.00	0.00	1377.00	94.83
Arunachal Pd	50328	50064	405.00	0.81	2710.00	5.41	46949.00	93.78
Mizoram	2196	2131	0.00	0.00	60.00	2.82	2071.00	97.18
Sub Total(NER)	58971	58356	1242.00	2.13	2810.00	4.82	54304.00	93.06
ALL INDIA	148701	145320	34705.80	23.88	12372.00	8.51	98242.20	67.60

Note:- In addition to above 4785.60 MW PSS are under operation.

TABLE 1.2

BASINWISE STATUS OF H.E. POTENTIAL DEVELOPMENT-BASINWISE
(In terms of Installed Capacity-above 25 MW)

(AS ON 31.03.2013)

River Basin	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								
Indus	33832	33028	11124.30	33.68	4686.00	14.19	17217.70	52.13
Ganga	20711	20252	4987.20	24.63	1307.00	6.45	13957.60	68.92
Central Indian River System	4152	3868	3147.50	81.37	400.00	10.34	320.50	8.29
West Flowing Rivers System	9430	8997	5660.70	62.92	100.00	1.11	3236.30	35.97

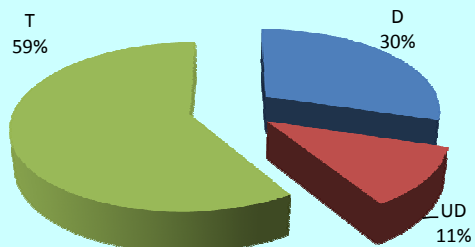
(REGIONWISE STATUS OF HYDRO ELECTRIC CAPACITY AS ON 31.03.2013)

D=DEVELOPED

U= UNDER DEVELOPMENT

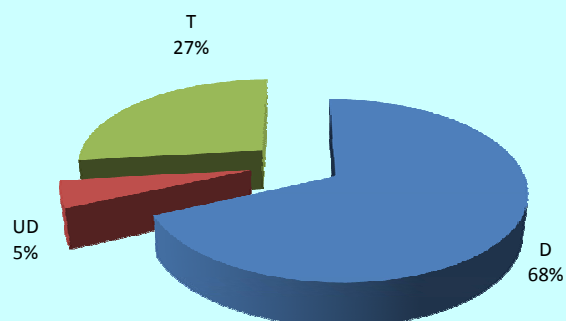
T= YET TO BE DEVELOPED

NORTHERN REGION



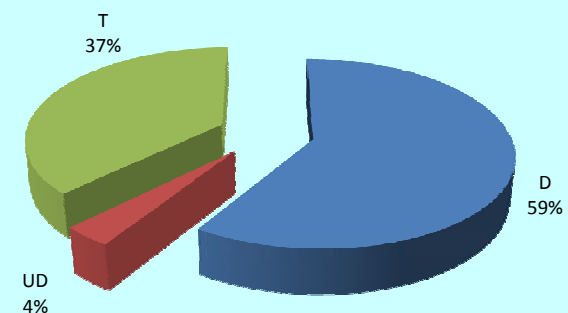
TOTAL ASSESSED(Above 25 MW) : - 52263 MW

WESTERN REGION



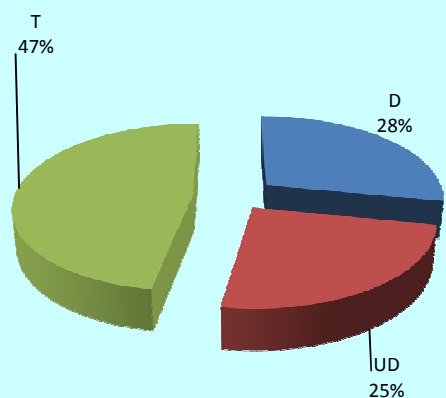
TOTAL ASSESSED (Above 25 MW) : - 8131 MW

SOUTHERN REGION



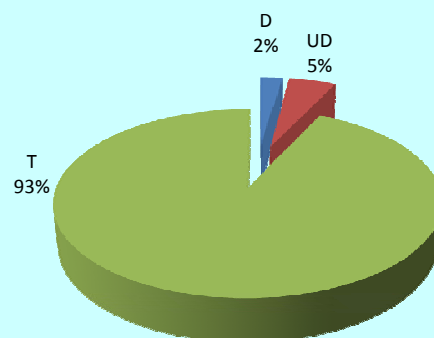
TOTAL ASSESSED (Above 25 MW): - 15890 MW

EASTERN REGION



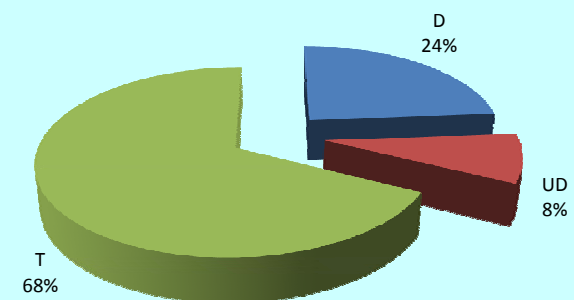
TOTAL ASSESSED (Above 25 MW) : - 10680 MW

NORTH EASTERN

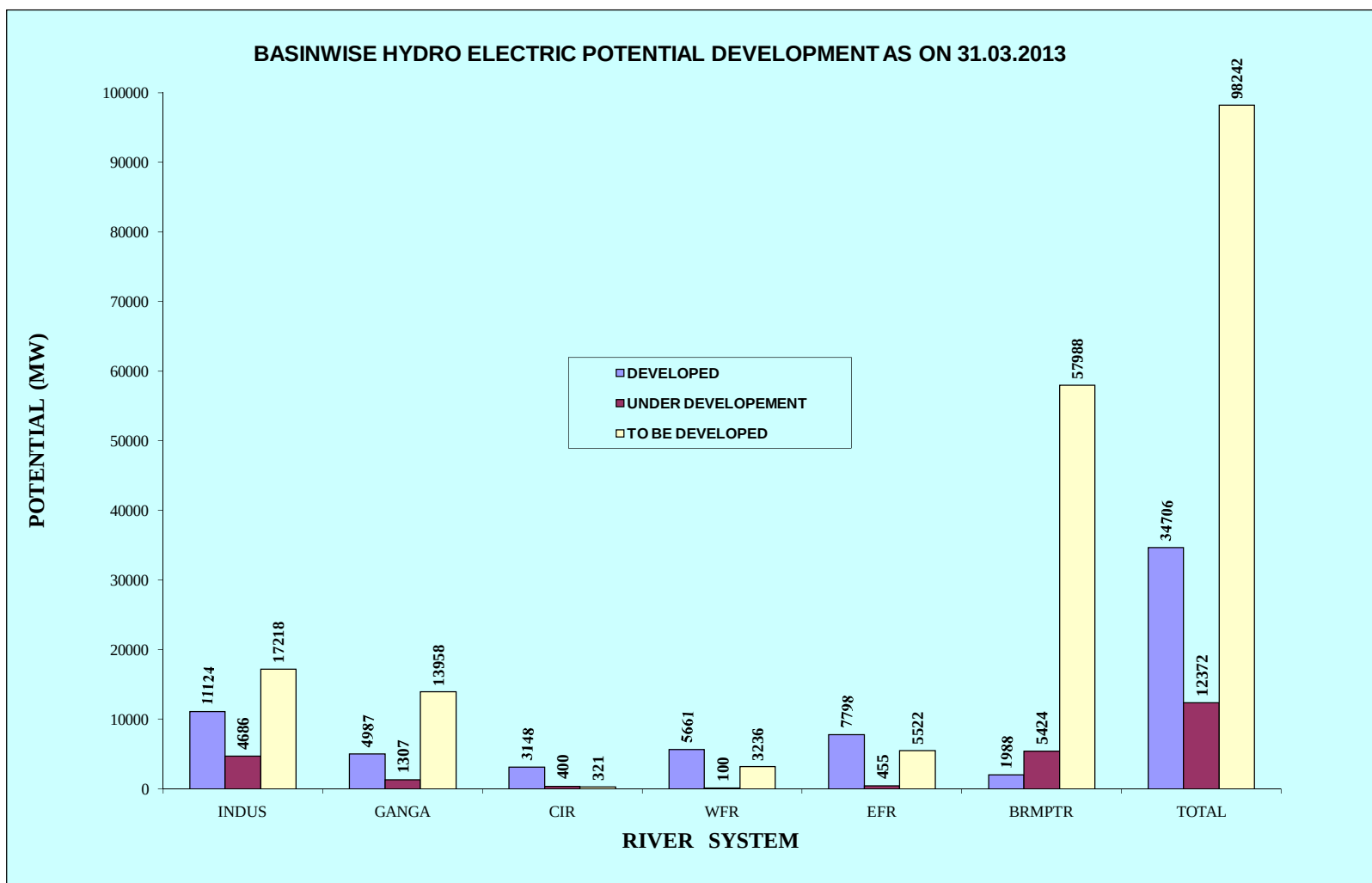


TOTAL ASSESSED (Above 25 MW : - 58356 MW

ALL INDIA



TOTAL ASSESSED (Above 25 MW) : - 145320 MW



East Flowing Rivers System	14511	13775	7798.20	56.61	455.00	3.30	5521.90	40.09
Brahmaputra	66065	65400	1988.00	3.04	5424.00	8.29	57988.00	88.67
Total	148701	145320	34705.80	23.88	12372.00	8.51	98242.20	67.60

Note:- In addition to above 4785.60 MW PSS are under operation.

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.Project under Tata's, has risen to 39491.40 MW (as on 31.03.2013) which does not include station capacity 25 MW and below. The maximum unit size is now 250 MW at Koyna Stage-IV under MAHAGENCO, Nathpa Jhakri under SJVNL, Tehri under THDC and Karcham Wangtoo of JPVL.

Contribution of electricity generation from Hydro Electric Power Stations has risen from 2194 MU during 1947 to about 113720.29 MU in 2012-13. Generation during 2012-13 was 16789.23 MU less than the generation of 130509.52 MU during 2011-12. Conventional Hydro Electric Stations of run-of-river type, single purpose hydro electric stations with storage, multipurpose projects as well as pumped storage projects have been executed through-out the country.

1.3 Share of Hydro-electric Installed Capacity & Generation.

The installed capacity of Hydro-Electric Stations vis-à-vis 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 has been on the decline from 37.30% at the end of 1947 to 17.68% at the end of 2012-13.

TABLE 1.3
HYDRO-ELECTRIC CAPACITY & GENERATION
VIS-A-VIS TOTAL CAPACITY & GENERATION

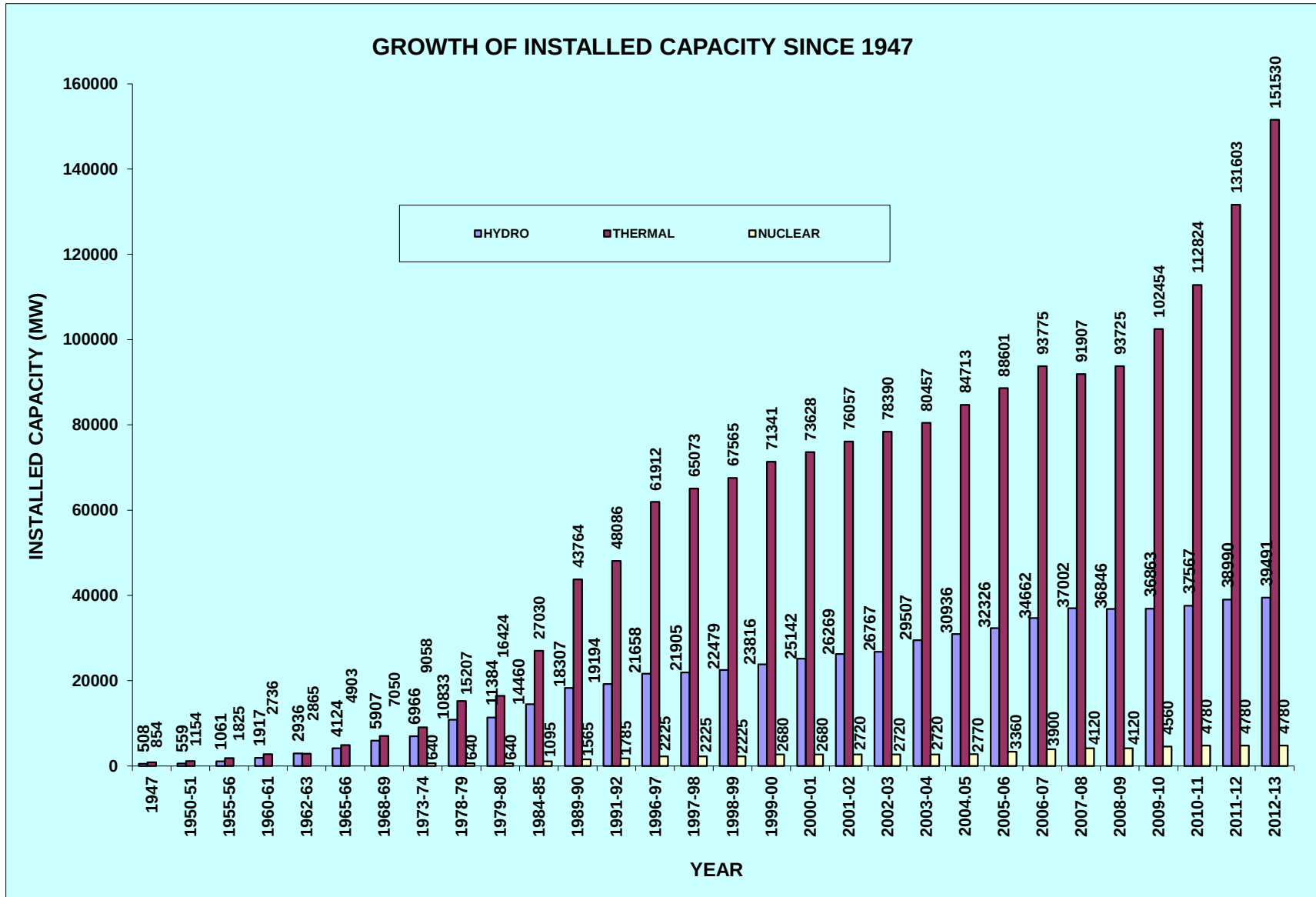
Year	Installed Capacity			Generation		
	Total (MW)	Hydro (MW)	Hydro as % of Total	Total (MU)	Hydro (MU)	Hydro as % of Total
1947	1362	508	37.30	4072	2194	53.88
1950	1713	560	32.63	5106	2519	49.33
1955-56	2886	1061	36.76	9145	4295	46.97
1960-61	4653	1917	41.20	16937	7837	46.27
1962-63	5801	2936	50.61	22365	11805	52.78

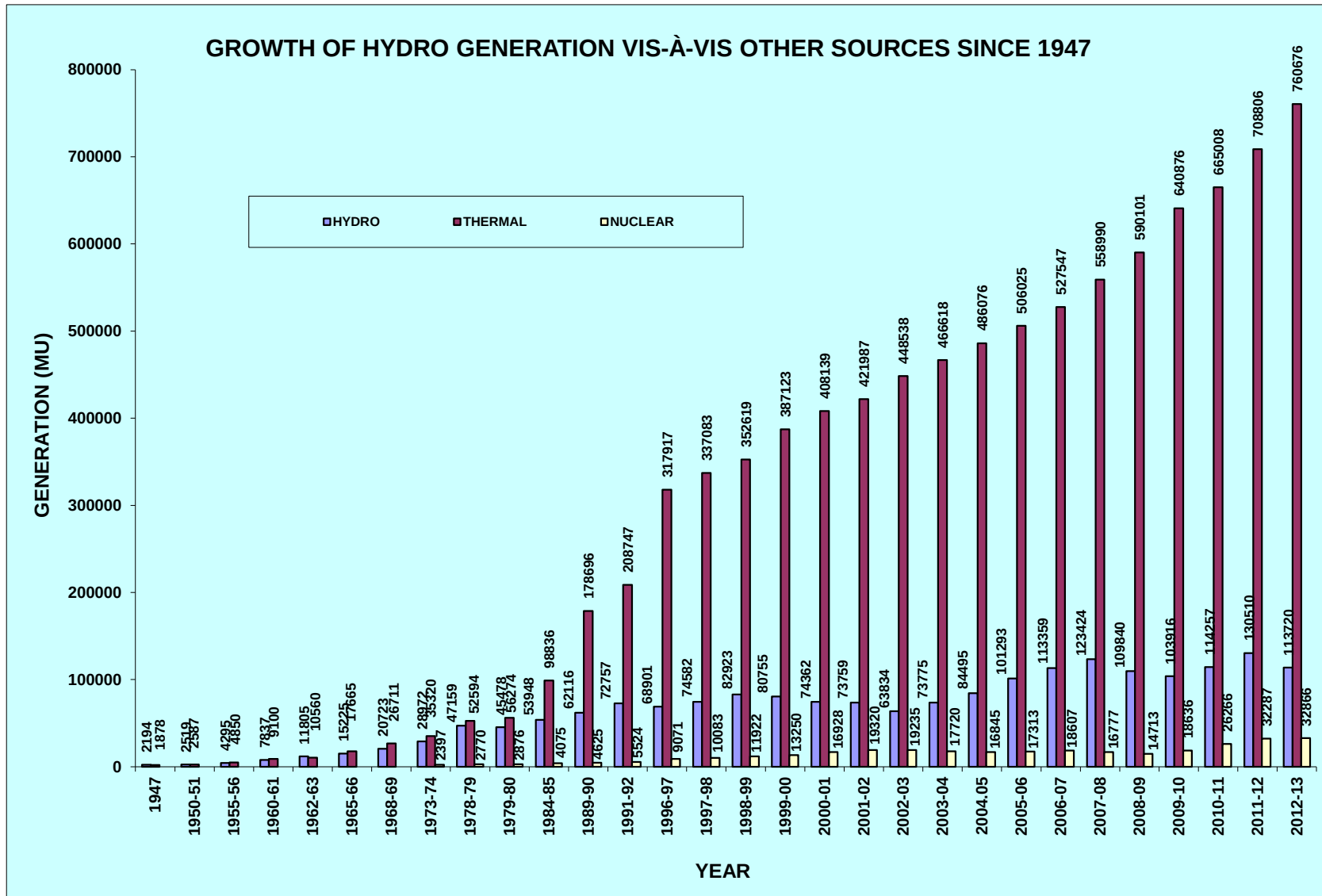
1965-66	9027	4124	45.68	32890	15225	46.29
1968-69	12957	5907	45.59	47434	20723	43.69
1973-74	16664	6966	41.80	66689	28972	43.44
1978-79	26680	10833	40.60	102523	47159	46.00
1979-80	28448	11384	40.02	104627	45478	43.47
1984-85	42585	14460	33.96	156859	53948	34.39
1989-90	63636	18307	28.77	245437	62116	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

*During 2008-09, 2009-10, 2010-11, 2011-12 & 2012-13 the station capacity of HEP above 25 MW has been considered.

1.4 Monitored Hydro Installed Capacity

For generation performance, the monitored hydro-electric installed capacity in the country as on 31st March, 2013 was 39491.40 MW. This includes stations with total station capacity above 25 MW only. Region-wise summary of the hydel installed capacity is indicated in **Table 1.4**. Regionwise, Sector wise/Utility wise and station-wise details of installed capacity are given in **Annex 1.1, 1.2 & 1.3** respectively.





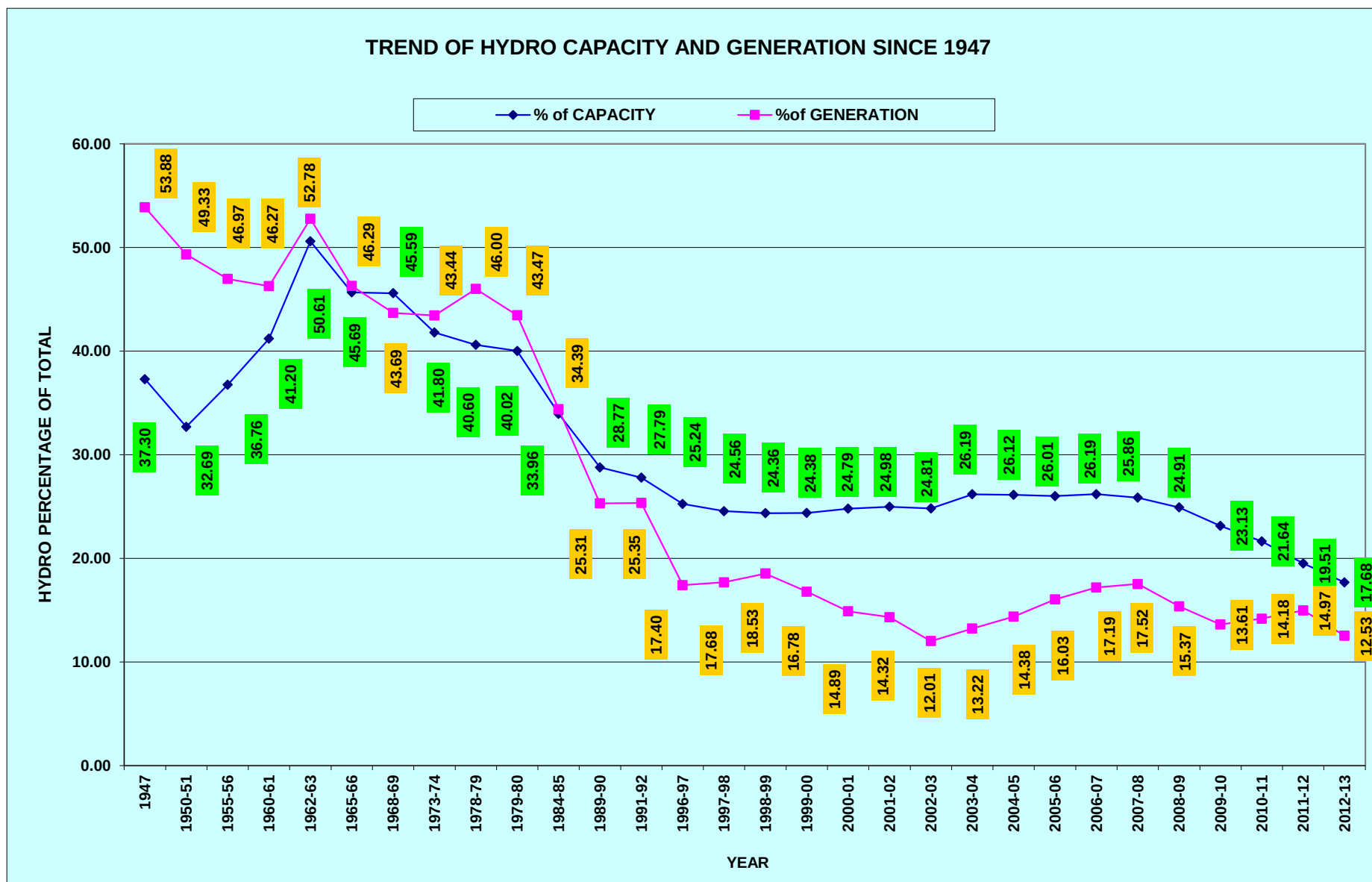


TABLE 1.4

**REGIONWISE SUMMARY OF HYDRO ELECTRIC INSTALLED CAPACITY
(Above 25 MW capacity as on 31.03.2013)**

S.No.	Region	Installed Capacity(MW)
1.	Northern	15523.25
2.	Western	7392.00
3.	Southern	11387.45
4.	Eastern	3946.70
5.	North - Eastern	1242.00
Total		39491.40

Station capacity wise grouping of H.E. Stations as on 31st March,2013 is given in **Annex- 1.4**.

Fourteen H.E. Generating units having installed capacity of 501 MW was added during the year 2012-13. Details of these units are given in **Annex-1.5**.

Share of hydro installed capacity and hydro generation vis-a-vis total installed capacity and total generation in the Country as on 31.03.2013 was 17.68% and 12.53% respectively. These details are indicated in Exhibits 1.6 and 1.7. Sector-wise distribution of hydro installed capacity in Central, Private and State Sectors were 31.21%, 6.66% and 62.13% respectively. Sector wise contribution of hydro generation in central, private and state sectors were 41.91%, 8.97% and 49.44% respectively. These details are illustrated in **Exhibits 1.8 & 1.9**.

1.5.1 Hydro Generating Units : Indigenous and imported

As on 31.03.2013, there were 634 hydro generating units in operation comprising of indigenous and imported units, with total installed capacity of 39491.40 MW (Stations with I.C. more than 25 MW) at 182 stations. The details of 634 hydro units with total installed capacity of 39491.40 MW indigenous and imported turbine and generators are given at table 1.5 below. Among the imported Turbine generator sets, it is observed that Japan, UK and Canada have supplied largest number of sets but capacity-wise, Japan, Canada, Russia and France are the largest suppliers.

TABLE 1.5

**HYDRO GENERATING UNITS INDIGENOUS/IMPORTED
FROM VARIOUS COUNTRIES AS ON 31-03-2013**

Name of Country	Turbines supplied		Generators supplied	
	Numbers	Capacity (MW)	Numbers	Capacity (MW)
A-Indigenous				
BHEL	267	16197.00	264	16077.00
Others	11	459.00	13	577.50
Sub Total	278	16656.00	277	16654.50
B-Imported				

EXHIBIT-1.6

CONTRIBUTION OF HYDRO CAPACITY
(AS ON 31.03.2013)

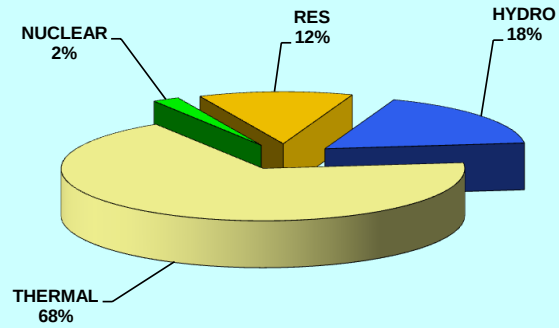


EXHIBIT-1.8

SECTORWISE HYDRO CAPACITY
(AS ON 31.03.2013)

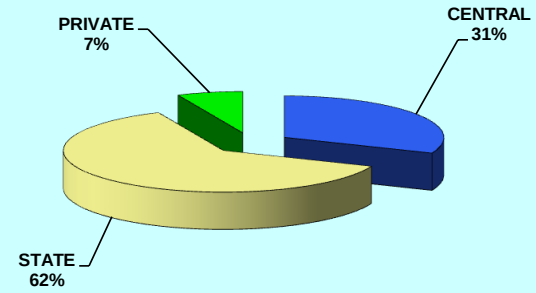


EXHIBIT-1.7

CONTRIBUTION OF HYDRO GENERATION
(DURING 2012-13)

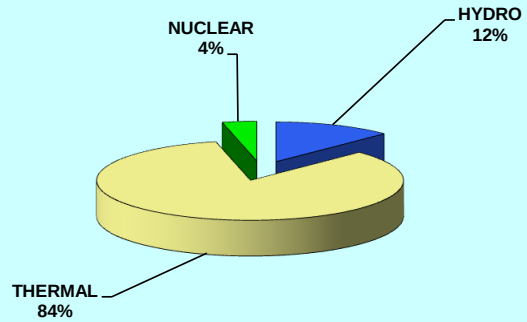
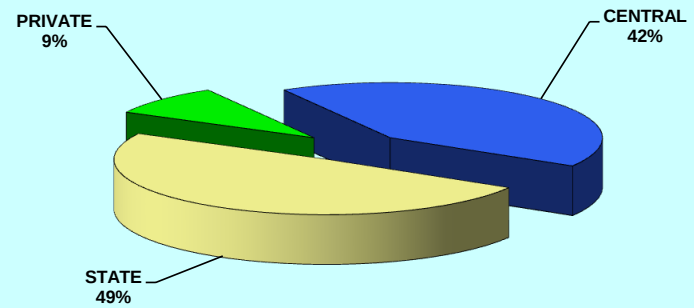


EXHIBIT-1.9

SECTORWISE HYDRO GENERATION
(DURING 2012-13)



CANADA	44	3132.00	44	3132.00
FRANCE	33	2186.40	17	1726.00
JAPAN	77	6544.20	75	6029.40
SWITZERLAND	21	790.20	11	219.00
U.K.	64	1257.10	59	1637.90
U.S.A.	9	351.00	26	543.15
USSR	26	2804.00	26	2804.00
OTHERS	82	5770.50	99	6745.45
SUB-TOTAL	356	22835.40	357	22836.90
TOTAL	634	39491.40	634	39491.40

Details of imported hydro generating sets commissioned during 2012-13 are given below in **Table 1.6**.

TABLE-1.6
IMPORTED GENERATING SETS COMMISSIONED DURING 2012-13

S.NO	STATION	STATE	COUNTRY OF IMPORT	UNIT NO.	CAPACITY (MW)
1	Budhil	Himachal Pradesh	China	1	35
				2	35
2	Bhawani Kattalai Barrage III	TamilNadu	Slovenia	1	15
			TOTAL	4	85

The details of region-wise/utility-wise indigenous and imported turbine and generators are given at **Table 1.7 and 1.8**.

TABLE 1.7
REGIONWISE/UTILITY WISE HYDRO GENERATING UNITS- INDIGENOUS & IMPORTED TURBINES

AS ON 31-3-2013

REGION/STATE/ ORGANISATION	INDIGENOUS				IMPORTED								TOTAL	
	BHEL		OTHERS		UK		JAPAN		USA		OTHERS			
	No.of	Cap.	No.of	Cap.	No.of	Cap.	No.of	Cap.	No.of	Cap.	No.of	Cap.	No.of	Cap.
	Units	MW	Units	MW	Units	MW	Units	MW	Units	MW	Units	MW	Units	MW
<u>NORTHERN REGION</u>														
BBMB	16	1482.80	0	0.00	0	0.00	7	598.50	0	0.00	5	785.00	28	2866.30
NHPC (NR)	19	1146.20	3	231.00	0	0.00	0	0.00	0	0.00	17	1990.00	39	3367.20
UJVNL	25	1126.00	0	0.00	3	41.40	0	0.00	0	0.00	6	84.75	34	1252.15
JKSPDC	6	210.00	0	0.00	0	0.00	0	0.00	0	0.00	3	450.00	9	660.00
PSPCL	21	991.00	0	0.00	0	0.00	0	0.00	0	0.00	4	60.00	25	1051.00
HPSEBL	11	351.00	0	0.00	1	15.00	0	0.00	0	0.00	0	0.00	12	366.00
RRVUNL	4	140.00	0	0.00	0	0.00	0	0.00	0	0.00	7	271.00	11	411.00
UPJVNL	6	171.00	0	0.00	6	300.00	3	30.60	0	0.00	0	0.00	15	501.60
THDC	4	400.00	0	0.00	0	0.00	0	0.00	0	0.00	4	1000.00	8	1400.00
SJVNL	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	6	1500.00	6	1500.00
MPCL	2	86.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	86.00
JPVL	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	11	1700.00	11	1700.00
EPPL	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	100.00	2	100.00
ADHPL	2	192.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	192.00
LGPPL	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	70.00	2	70.00
TOTAL (N.R.)	116	6296.00	3	231.00	10	356.40	10	629.10	0	0.00	67	8010.75	206	15523.25
<u>WESTERN REGION</u>														
CSPGCL	3	120.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	120.00
GSECL	6	420.00	0	0.00	0	0.00	0	0.00	0	0.00	2	120.00	8	540.00
MPPGCL	18	760.00	0	0.00	0	0.00	2	46.00	0	0.00	3	69.00	23	875.00
MAHAGENCO	9	960.00	0	0.00	0	0.00	2	250.00	0	0.00	13	1196.00	24	2406.00
TATA HYDRO	0	0.00	2	3.00	6	150.00	0	0.00	0	0.00	7	294.00	15	447.00
SSNNL	6	450.00	0	0.00	0	0.00	5	1000.00	0	0.00	0	0.00	11	1450.00
NHDC	8	1000.00	0	0.00	0	0.00	0	0.00	0	0.00	8	520.00	16	1520.00
DLHP	1	34.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	34.00
TOTAL (W.R.)	51	3744.00	2	3.00	6	150.00	9	1296.00	0	0.00	33	2199.00	101	7392.00

REGION/STATE/ ORGANISATION	INDIGENOUS				IMPORTED								TOTAL	
	BHEL		OTHERS		UK		JAPAN		USA		OTHERS			
	No.of	Cap.	No.of	Cap.	No.of	Cap.	No.of	Cap.	No.of	Cap.	No.of	Cap.	No.of	Cap.
	Units	MW	Units	MW	Units	MW	Units	MW	Units	MW	Units	MW	Units	MW
<u>SOUTHERN REGION</u>														
APGENCO	16	1263.00	0	0.00	5	150.00	17	1641.60	3	51.00	16	677.75	57	3783.35
TANGEDCO	6	450.00	0	0.00	12	218.00	9	150.00	0	0.00	40	1319.20	67	2137.20
KSEB	10	430.00	0	0.00	11	102.50	5	105.00	6	300.00	16	944.00	48	1881.50
KPCL	30	2224.00	0	0.00	18	181.20	6	455.00	0	0.00	14	725.20	68	3585.40
TOTAL (S.R.)	62	4367.00	0	0.00	46	651.70	37	2351.60	9	351.00	86	3666.15	240	11387.45
<u>EASTERN REGION</u>														
DVC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	143.20	5	143.20
NHPC (ER)	3	60.00	3	99.00	0	0.00	3	510.00	0	0.00	0	0.00	9	669.00
OHPC	9	570.00	0	0.00	2	99.00	7	712.50	0	0.00	13	646.00	31	2027.50
WBSEDCL	4	50.00	0	0.00	0	0.00	5	909.00	0	0.00	2	18.00	11	977.00
JSEB	2	130.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	130.00
TOTAL (E.R.)	18	810.00	3	99.00	2	99.00	15	2131.50	0	0.00	20	807.20	58	3946.70
<u>N-EASTERN REGION</u>														
NHPC (N-ER)	3	105.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	105.00
NEEPCO	13	755.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	13	755.00
APGCL	0	0.00	0	0.00	0	0.00	2	100.00	0	0.00	0	0.00	2	100.00
MeECL	4	120.00	3	126.00	0	0.00	4	36.00	0	0.00	0	0.00	8	282.00
TOTAL (N-E.R.)	20	980.00	3	126.00	0	0.00	6	136.00	0	0.00	0	0.00	29	1242.00
Total (All India)	267	16197.00	11	459.00	64	1257.10	77	6544.20	9	351.00	206	14683.10	634	39491.40

TABLE 1.8
REGIONWISE/UTILITY WISE HYDRO GENERATING UNITS-INDIGENOUS & IMPORTED GENERATORS

AS ON 31-03-2013

REGION/STATE/ ORGANISATION	INDIGENOUS				IMPORTED								TOTAL	
	BHEL		OTHERS		UK		JAPAN		USA		OTHERS			
	No.of Units	Cap. MW	No.of Units	Cap. MW	No.of Units	Cap. MW	No.of Units	Cap. MW	No.of Units	Cap. MW	No.of Units	Cap. MW	No.of Units	Cap. MW
<u>NORTHERN REGION</u>														
BBMB	16	1482.80	0	0.00	5	540.00	2	58.50	0	0.00	5	785.00	28	2866.30
NHPC (NR)	19	1146.20	3	231.00	0	0.00	0	0.00	0	0.00	17	1990.00	39	3367.20
UJVNL	25	1126.00	0	0.00	3	41.40	0	0.00	0	0.00	6	84.75	34	1252.15
JKSPDC	6	210.00	0	0.00	0	0.00	0	0.00	0	0.00	3	450.00	9	660.00
PSPCL	21	991.00	0	0.00	4	60.00	0	0.00	0	0.00	0	0.00	25	1051.00
HPSEBL	11	351.00	0	0.00	1	15.00	0	0.00	0	0.00	0	0.00	12	366.00
RRVUNL	4	140.00	0	0.00	0	0.00	0	0.00	0	0.00	7	271.00	11	411.00
UPJVNL	6	171.00	0	0.00	6	300.00	3	30.60	0	0.00	0	0.00	15	501.60
THDC	4	400.00	0	0.00	0	0.00	0	0.00	0	0.00	4	1000.00	8	1400.00
SJVNL	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	6	1500.00	6	1500.00
MPCL	2	86.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	86.00
JPVL	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	11	1700.00	11	1700.00
EPPL	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	100.00	2	100.00
ADHPL	2	192.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	192.00
LGPPL	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	70.00	2	70.00
TOTAL (N.R.)	116	6296.00	3	231.00	19	956.40	5	89.10	0	0.00	63	7950.75	206	15523.25
<u>WESTERN REGION</u>														
CSPGCL	3	120.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	120.00
GSECL	6	420.00	0	0.00	0	0.00	0	0.00	0	0.00	2	120.00	8	540.00
MPPGCL	18	760.00	0	0.00	0	0.00	2	46.00	0	0.00	3	69.00	23	875.00
MAHAGENCO	9	960.00	0	0.00	0	0.00	2	250.00	0	0.00	13	1261.00	24	2406.00
TATA HYDRO	0	0.00	1	1.50	0	0.00	0	0.00	0	0.00	14	445.50	15	447.00
SSNNL	6	450.00	0	0.00	0	0.00	5	1000.00	0	0.00	0	0.00	11	1450.00
NHDC	8	1000.00	0	0.00	0	0.00	0	0.00	0	0.00	8	520.00	16	1520.00
DLHP	1	34.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	34.00
TOTAL (W.R.)	51	3744.00	1	1.50	0	0.00	9	1296.00	0	0.00	40	2415.50	101	7392.00

REGION/STATE/ ORGANISATION	INDIGENOUS				IMPORTED								TOTAL	
	BHEL		OTHERS		UK		JAPAN		USA		OTHERS			
	No.of Units	Cap. MW	No.of Units	Cap. MW	No.of Units	Cap. MW	No.of Units	Cap. MW	No.of Units	Cap. MW	No.of Units	Cap. MW	No.of Units	Cap. MW
<u>SOUTHERN REGION</u>														
APGENCO	15	1257.00	0	0.00	5	150.00	15	1623.60	6	114.75	16	638.00	57	3783.35
TANGEDCO	6	450.00	0	0.00	18	277.20	9	150.00	0	0.00	34	1260.00	67	2137.20
KSEB	9	405.00	1	25.00	11	102.50	5	105.00	6	300.00	16	944.00	48	1881.50
KPCL	29	2135.00	2	95.00	4	52.80	11	498.20	14	128.40	8	676.00	68	3585.40
TOTAL (S.R.)	59	4247.00	3	120.00	38	582.50	40	2376.80	26	543.15	74	3518.00	240	11387.45
<u>EASTERN REGION</u>														
DVC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	143.20	5	143.20
NHPC (ER)	3	60.00	3	99.00	0	0.00	3	510.00	0	0.00	0	0.00	9	669.00
OHPC	9	570.00	0	0.00	2	99.00	7	712.50	0	0.00	13	646.00	31	2027.50
WBSEDCL	4	50.00	0	0.00	0	0.00	5	909.00	0	0.00	2	18.00	11	977.00
JSEB	2	130.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	130.00
TOTAL (E.R.)	18	810.00	3	99.00	2	99.00	15	2131.50	0	0.00	20	807.20	58	3946.70
<u>N-EASTERN REGION</u>														
NHPC (N-ER)	3	105.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	105.00
NEEPCO	13	755.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	13	755.00
APGCL	0	0.00	0	0.00	0	0.00	2	100.00	0	0.00	0	0.00	2	100.00
MeECL	4	120.00	3	126.00	0	0.00	4	36.00	0	0.00	0	0.00	11	282.00
TOTAL (N-E.R.)	20	980.00	3	126.00	0	0.00	6	136.00	0	0.00	0	0.00	29	1242.00
Total (All India)	264	16077.00	13	577.50	59	1637.90	75	6029.40	26	543.15	197	14691.45	634	39491.40

Annexure-1.1**REGION-WISE INSTALLED CAPACITY OF HE STATIONS
(ABOVE 25MW CAPACITY)**

AS ON 31.03.2013

REGION	NO.OF STATIONS	NO.OF UNITS	CAPACITY (MW)
NORTHERN	61	206	15523.25
WESTERN	28	101	7392.00
SOUTHERN	67	240	11387.45
EASTERN	16	58	3946.70
NORTH EASTERN	10	29	1242.00
ALL INDIA (TOTAL)	182	634	39491.40

**SECTOR/UTILITYWISE INSTALLED CAPACITY OF H.E. STATIONS
(ABOVE 25 MW CAPACITY)**

As on 31-03-2013

SECTOR/UTILITY	NO. OF STATIONS	NO. OF UNITS	CAPACITY (MW)
1 CENTRAL			
BBMB	6	28	2866.30
DVC	2	5	143.20
NEEPCO	4	13	755.00
NHDC	2	16	1520.00
NHPC	16	51	4141.20
SJVNL	1	6	1500.00
THDC	2	8	1400.00
SUB-TOTAL (CENTRAL)	33	127	12325.70
2 PRIVATE			
DLHP	1	1	34.00
JPVL	3	11	1700.00
LGPPL	1	2	70.00
MPCL	1	2	86.00
EPPL	1	2	100.00
TATA MAH.	4	15	447.00
ADHPL	1	2	192.00
SUB-TOTAL (PRIVATE)	12	35	2629.00
3 STATE ELECTRICITY BOARDS/DEPARTMENTS			
APGENCO	14	57	3783.35
APGCL	1	2	100.00
CSPGCL	1	3	120.00
GSECL	2	8	540.00
HPSEB LTD.	4	12	366.00
JKSPDC	3	9	660.00
JSEB	2	2	130.00
KPCL	14	68	3585.40
KSEB	13	48	1881.50
MAHAGENCO	8	24	2406.00
MeECL	4	11	282.00
MPPGCL	8	23	875.00
OHPC	6	31	2027.50
PSPCL	8	25	1051.00
RRVUNL	4	11	411.00
SSNNL	2	11	1450.00
TANGEDCO	26	67	2137.20
UJVNL	10	34	1252.15
UPJVNL	4	15	501.60
WBSEDCL	3	11	977.00
SUB-TOTAL (STATE)	137	472	24536.70
ALL INDIA (TOTAL)	182	634	39491.40

**STATIONWISE INSTALLED CAPACITY OF H.E. STATIONS
(ABOVE 25 MW CAPACITY)**

					As on 31.03.2013
S. NO.	UTILITY/STATIONS	NO. OF UNITS X CAPACITY(MW)	TYPE OF STATION	CAPACITY (MW)	YEAR OF COMMISSIONING
NORTHERN					
BBMB					
HIMACHAL PRADESH					
1	BHAKRA HPS LEFT	(5X108)	S(MP)	540.00	1960-1961
2	BHAKRA HPS RIGHT	(5X157)	S(MP)	785.00	1966-1968
3	DEHAR HPS	(6X165)	R	990.00	1977-1983
4	PONG HPS	(6X66)	S(MP)	396.00	1978-1983
SUB-TOTAL HP				2711.00	
PUNJAB					
1	GANGUWAL HPS	(2X24.2)+(1X29.25)	R	77.65	1955-1962
2	KOTLA HPS	(2X24.2)+(1X29.25)	R	77.65	1956-1961
SUB-TOTAL PUNJAB				155.30	
SU TOTAL BBMB				2866.30	
NHPC					
HIMACHAL PRADESH					
1	BAIRA SIUL HPS	(3X66)	R	198.00	1980-1981
2	CHAMERA- I HPS	(3X180)	R(UG)	540.00	1994
3	CHAMERA- II HPS	(3X100)	R(UG)	300.00	2003-2004
4	CHAMERA- III HPS	(3X77)	R(UG)	231.00	2012
SUB-TOTAL HP				1269.00	
JAMMU AND KASHMIR					
1	DULHASTI HPS	(3X130)	R(UG)	390.00	2007
2	SALAL HPS-I	(3X115)	R	345.00	1987
3	SALAL HPS-II	(3X115)	R	345.00	1993-95
4	URI-I HPS	(4X120)	R(UG)	480.00	1996-1997
5	SEWA-II	(3X40)	R	120.00	2010-11
6	CHUTAK	(4X11)	R	44.00	2012-13
SUB-TOTAL J&K				1724.00	
UTTARAKHAND					
1	DHAULI GANGA HPS	(4X70)	R(UG)	280.00	2005
2	TANAKPUR HPS	(3X31.4)	R	94.20	1992
SUB-TOTAL UTTARAKHAND				374.20	
TOTAL NHPC				3367.20	
SJVNL					
HIMACHAL PRADESH					
1	NATHPA JHAKRI HPS	(6X250)	R(UG)	1500.00	2003-2004
TOTAL SJVNL				1500.00	
THDC					
UTTARAKHAND					
1	TEHRI ST-1 HPS	(4X250)	S(UG)	1000.00	2006-2007
2	KOTESHWAR	(4X100)	S	400.00	2010-12
TOTAL THDC				1400.00	
TOTAL CENTRAL				9133.50	

**STATIONWISE INSTALLED CAPACITY OF H.E. STATIONS
(ABOVE 25 MW CAPACITY)**

					As on 31.03.2013
S. NO.	UTILITY/STATIONS	NO. OF UNITS X CAPACITY(MW)	TYPE OF STATION	CAPACITY (MW)	YEAR OF COMMISSIONING
PRIVATE					
HIMACHAL PRADESH					
MPCL					
1	MALANA HPS	(2X43)	R	86.00	2001
TOTAL MPCL				86.00	
LGPPPL					
1	BUDHIL	(2X35)	R	70.00	2012
TOTAL EPPL				70.00	
EPPL					
1	MALANA-II HPS	(2X50)	R	100.00	2011-12
TOTAL EPPL				100.00	
ADHPL					
1	ALLAIN DUHANGAN	2X96	R	192.00	2010-11
TOTAL ADHPL				192.00	
JPVL					
1	BASPA HPS	(3X100)	R(UG)	300.00	2003
2	KARCHAM WANGTOO	(4X250)	R(UG)	1000.00	2011-12
SUB TOTAL JPVL (HP)				1300.00	
JPVL					
UTTARAKHAND					
1	VISHNU PRAYAG HPS	(4X100)	R(UG)	400.00	2006
SUB TOTAL JPVL (UK)				400.00	
TOTAL JPVL				1700.00	
TOTAL PVT				2148.00	
HPSEBL					
1	BASSI HPS	(4X15)	R	60.00	1970-1981
2	GIRI BATA HPS	(2X30)	R	60.00	1978
3	LARJI HPS	(3X42)	R	126.00	2006
4	SANJAY HPS	(3X40)	R(UG)	120.00	1989
TOTAL HPSEBL				366.00	
JKSPDC					
JAMMU AND KASHMIR					
1	BAGLIHAR HPS	(3X150)	R	450.00	2008
2	LOWER JHELMUM HPS	(3X35)	R	105.00	1978-1979
3	UPPER SINDH-II HPS	(3X35)	R	105.00	2001-2002
TOTAL JKSPDC				660.00	
PSPCL					
PUNJAB					
1	ANANDPUR SAHIB-I HPS	(2X33.5)	R	67.00	1985
2	ANANDPUR SAHIB-II HPS	(2X33.5)	R	67.00	
3	MUKERIAN HPS-I	(3X15)	R	45.00	1983
4	MUKERIAN HPS-II	(3X15)	R	45.00	1988-89
5	MUKERIAN HPS-III	(3X19.5)	R	58.50	1989
6	MUKERIAN HPS-IV	(3X19.5)	R	58.50	1989

**STATIONWISE INSTALLED CAPACITY OF H.E. STATIONS
(ABOVE 25 MW CAPACITY)**

As on 31.03.2013					
S. NO.	UTILITY/STATIONS	NO. OF UNITS X CAPACITY(MW)	TYPE OF STATION	CAPACITY (MW)	YEAR OF COMMISSIONING
7	RANJIT SAGAR HPS	(4X150)	S(MP)	600.00	2000
8	SHANAN HPS	(1X50)+(4X15)	R	110.00	1932-1982
TOTAL PSPCL				1051.00	
RRVUNL					
RAJASTHAN					
1	JAWAHAR SAGAR HPS	(3X33)	S	99.00	1972-1973
2	MAHI BAJAJ HPS-I	(2X25)	R	50.00	1986
3	MAHI BAJAJ HPS-II	(2X45)	R	90.00	1989
4	R P SAGAR HPS	(4X43)	S(MP)	172.00	1968
TOTAL RRVUNL				411.00	
UJVNL					
UTTARAKHAND					
1	CHIBRO (YAMUNA) HPS	(4X60)	R(UG)	240.00	1975-1976
2	CHILLA HPS	(4X36)	R	144.00	1980-1981
3	DHAKRANI HPS	(3X11.25)	R	33.75	1965-1970
4	DHALIPUR HPS	(3X17)	R	51.00	1965-1970
5	KHATIMA HPS	(3X13.8)	R	41.40	1955-1956
6	KHODRI HPS	(4X30)	R(UG)	120.00	1984
7	KULHAL HPS	(3X10)	R	30.00	1975
8	MANERI BHALI - I HPS	(3X30)	R	90.00	1984
9	MANERI BHALI - II HPS	(4X76)	R	304.00	2008
10	RAMGANGA HPS	(3X66)	S(MP)	198.00	1975-1977
TOTAL UJVNL				1252.15	
UPJVNL					
UTTAR PRADESH					
1	KHARA HPS	(3X24)	R	72.00	1992
2	MATATILLA HPS	(3X10.2)	R	30.60	1965
3	OBRA HPS	(3X33)	R	99.00	1970-1971
4	RIHAND HPS	(6X50)	S	300.00	1961-1965
TOTAL UPJVNL				501.60	
TOTAL STATE SECTOR				4241.75	
TOTAL NORTHERN REGION				15523.25	
WESTERN					
NHDC					
MADHYA PRADESH					
1	INDIRA SAGAR HPS	(8X125)	S	1000.00	2004-2005
2	OMKARESHWAR HPS	(8X65)	R	520.00	2007
TOTAL NHDC				1520.00	
TOTAL CENTRAL				1520.00	
DODSON-LINDBLOM HYDRO POWER PVT. LTD. (DLHP)					
MAHARASHTRA					
1	BHANDARDHARA HPS ST-II	(1X34)	R	34.00	1996
TOTAL DLHP				34.00	

**STATIONWISE INSTALLED CAPACITY OF H.E. STATIONS
(ABOVE 25 MW CAPACITY)**

As on 31.03.2013					
S. NO.	UTILITY/STATIONS	NO. OF UNITS X CAPACITY(MW)	TYPE OF STATION	CAPACITY (MW)	YEAR OF COMMISSIONING
TATA POWER COMPANY (PVT.)					
MAHARASHTRA					
1	BHIRA HPS	(6X25)	S	150.00	1927-1949
2	BHIRA PSS HPS	(1X150)	PS	150.00	1995
3	BHIVPURI HPS	(3X24) + (2X1.5)	S	75.00	1997-1999
4	KHOPOLI HPS	(3X24)	S	72.00	2001-2003
TOTAL TATA				447.00	
TOTAL PVT (MAHARASHTRA)				481.00	
CSPGCL					
CHHATTISGARH					
1	HASDEOBANGO HPS	(3X40)	S(MP)	120.00	1994-1995
TOTAL CSPGCL				120.00	
GSECL					
GUJARAT					
1	KADANA PSS HPS	(4X60)	PS	240.00	1990-1998
2	UKAI HPS	(4X75)	S(MP)	300.00	1974-1976
TOTAL GSECL				540.00	
MAHAGENCO					
MAHARASHTRA					
1	BHIRA TAIL RACE HPS	(2X40)	R	80.00	1987-1988
2	GHATGHAR PSS HPS	(2X125)	PS(UG)	250.00	2008
3	KOYNA DPH HPS	(2X18)	S	36.00	1980-1981
4	KOYNA-I&II HPS	(4X70)+(4X80)	S(UG)	600.00	1962-1967
5	KOYNA-III HPS	(4X80)	S(UG)	320.00	1975-1978
6	KOYNA-IV HPS	(4X250)	S(UG)	1000.00	1999-2000
7	TILLARI HPS	(1X60)	S	60.00	1986
8	VAITARNA HPS	(1X60)	S(UG)	60.00	1976
TOTAL MAHAGENCO				2406.00	
MPPGCL					
MADHYA PRADESH					
1	BANSAGAR TONS-1 HPS	(3X105)	S(MP)	315.00	1991-1992
2	BANSAGAR TONS-II HPS	(2X15)	R	30.00	2002
3	BANSAGAR TONS-III HPS	(3X20)	R	60.00	2000-2002
4	BARGI HPS	(2X45)	S(MP)	90.00	1988
5	GANDHI SAGAR HPS	(5X23)	S(MP)	115.00	1960-1966
6	MADHIKHERA HPS	(3X20)	S	60.00	2006-2007
7	PENCH HPS	(2X80)	S(UG)	160.00	1986-1987
8	RAJGHAT HPS	(3X15)	S	45.00	1999
TOTAL MPPGCL				875.00	

**STATIONWISE INSTALLED CAPACITY OF H.E. STATIONS
(ABOVE 25 MW CAPACITY)**

As on 31.03.2013					
S. NO.	UTILITY/STATIONS	NO. OF UNITS X CAPACITY(MW)	TYPE OF STATION	CAPACITY (MW)	YEAR OF COMMISSIONING
SSNNL					
GUJARAT					
1	S SAROVAR CHPH HPS	(5X50)	R	250.00	2004
2	S SAROVAR RBPH HPS	(6X200)	PS	1200.00	2005-2006
TOTAL SSNNL				1450.00	
TOTAL STATE				5391.00	
TOTAL WESTERN REGION				7392.00	
SOUTHERN					
APGENCO					
ANDHRA PRADESH					
1	HAMPI HPS	(4X9)	S(MP)	36.00	1958-1964
2	LOWER SILERU HPS	(4X115)	S	460.00	1976-1978
3	MACHKUND HPS	(3X17)+(3X21.25)	S	114.75	1959
4	NAGARJUN SGR HPS	(1X110)+(7X100.8)	S	815.60	1978-1985
5	NAGARJUN SGR LBC HPS	(2X30)	R	60.00	1983
6	NAGARJUN SGR RBC HPS	(2X30)	R	60.00	1983-1990
7	NAGARJUN SGR RBC EXTN. HPS	(1X30)	R	30.00	
8	POCHAMPAD HPS	(3X9)	S(MP)	27.00	1987-1988
9	PRIYADARSHNI JURALA HPS	(6X39)	R	234.00	2008-2011
10	SRISAILAM HPS	(7X110)	S	770.00	1982-1987
11	SRISAILAM LB HPS	(6X150)	PS(UG)	900.00	2001-2003
12	T B DAM HPS	(4X9)	S	36.00	1957-1964
13	UPPER SILERU HPS -I	(2X60)	S	120.00	1967-1968
14	UPPER SILERU HPS -II	(2X60)	S	120.00	1994-1995
TOTAL APGENCO				3783.35	
KPCL					
KARNATAKA					
1	ALMATTI DPH HPS	(5X55)+(1X15)	S	290.00	2004-2005
2	BHADRA HPS	(2X12)+(1X6)+(1X2)+(1X7.2)	S	39.20	1962-1998
3	GERUSUPPA HPS	(4X60)	R	240.00	2001-2002
4	GHAT PRABHA HPS	(2X16)	S(MP)	32.00	1992
5	JOG HPS	(4X21.6)+(4X13.2)	S	139.20	1949-2002
6	KADRA HPS	(3X50)	S	150.00	1997-1999
7	KALINADI HPS	(3X135)+(3X150)	S	855.00	1979-1984
8	KALINADI SUPA HPS	(2X50)	S	100.00	1985
9	KODASALI HPS	(3X40)	S	120.00	1998-1999
10	LIGANAMAKKI HPS	(2X27.5)	S	55.00	1979-1980
11	MUNIRABAD HPS	(2X9)+(1X10)	S(MP)	28.00	1962-1965
12	SHARAVATHY HPS	(10X103.5)	S	1035.00	1965-1977
13	SIVASAMUNDRUM HPS	(4X6)+(6X3)	R	42.00	1922-1934
14	VARAHI HPS	(4X115)	S(UG)	460.00	1989-2009
TOTAL KPCL				3585.40	

**STATIONWISE INSTALLED CAPACITY OF H.E. STATIONS
(ABOVE 25 MW CAPACITY)**

					As on 31.03.2013
S. NO.	UTILITY/STATIONS	NO. OF UNITS X CAPACITY(MW)	TYPE OF STATION	CAPACITY (MW)	YEAR OF COMMISSIONING
KSEB					
KERALA					
1	IDAMALAYAR HPS	(2X37.5)	S	75.00	1987
2	IDUKKI HPS	(6X130)	S(UG)	780.00	1976-1986
3	KAKKAD HPS	(2X25)	S	50.00	1999
4	KUTTIYADI & K EXTN HPS	(3X25)+(1X50)	S	125.00	1972-2001
5	KUTTIYADI ADDN EXTN HPS	(2X50)	S	100.00	2010
6	LOWER PERIYAR HPS	(3X60)	R	180.00	1997
7	NARIAMANGLAM HPS	(3X15+1x25)	R	70.00	1961-63, 2008-09
8	PALLIVASAL HPS	(3X5)+(3X7.5)	R	37.50	1948-2001
9	PANNIAR HPS	(2X15)	S	30.00	1963-2001
10	PORINGALKUTTU HPS	(4X8)	R	32.00	1957-1960
11	SABARIGIRI HPS	(6X50)	S	300.00	1960-1967
12	SENGULAM HPS	(4X12)	R	48.00	1954-2001
13	SHOLAYAR HPS	(3X18)	S	54.00	1956-1968
TOTAL KSEB				1881.50	
TANGEDCO					
TAMIL NADU					
1	ALIYAR HPS	(1X60)	S	60.00	1970
2	BHAVANI KAT. BARRAGE	(2X15)	R	30.00	2006
3	BHAVANI KAT. BARRAGE III	(1X15)	R	15.00	2012
4	KADAMPARI HPS	(4X100)	PS(UG)	400.00	1987-1989
5	KODAYAR HPS -I	(1X60)	S	60.00	1970
6	KODAYAR HPS -II	(1X40)	R	40.00	1971
7	KUNDAH HPS-I	(3X20)	S	60.00	1960-1964
8	KUNDAH HPS-II	(5X35)	S	175.00	1960-1965
9	KUNDAH HPS-III	(3X60)	S	180.00	1965-1978
10	KUNDAH HPS-IV	(2X50)	S	100.00	1966-1978
11	KUNDAH HPS-V	(2X20)	S	40.00	1964-1988
12	LOWER METTUR HPS-I	(2X15)	R	30.00	1988
13	LOWER METTUR HPS-II	(2X15)	R	30.00	1988
14	LOWER METTUR HPS-III	(2X15)	R	30.00	1987-1988
15	LOWER METTUR HPS-IV	(2X15)	R	30.00	1988-1999
16	METTUR DAM HPS	(4X12.5)	S	50.00	1937-1946
17	METTUR TUNNEL HPS	(4X50)	S	200.00	1965-1966
18	MOYAR HPS	(3X12)	R	36.00	1952-1953
19	PAPANASAM HPS	(4X8)	S	32.00	1944-1951
20	PARSON'S VALLEY HPS	(1X30)	S	30.00	2000
21	PERIYAR HPS	(4X35)	S	140.00	1958-1965
22	PYKARA HPS	(3X7)+(2X13.6)+(1X11)	S	59.20	1932-2005
23	PYKARA ULTMATE HPS	(3X50)	S(UG)	150.00	2005

**STATIONWISE INSTALLED CAPACITY OF H.E. STATIONS
(ABOVE 25 MW CAPACITY)**

					As on 31.03.2013
S. NO.	UTILITY/STATIONS	NO. OF UNITS X CAPACITY(MW)	TYPE OF STATION	CAPACITY (MW)	YEAR OF COMMISSIONING
24	SARKARPATHY HPS	(1X30)	R	30.00	1966
25	SHOLAYAR I&II HPS	(2X35) + (1X25)	S	95.00	1971
26	SURULIYAR HPS	(1X35)	R	35.00	1978
TOTAL TANGEDCO				2137.20	
TOTAL STATE SECTOR				11387.45	
TOTAL SOUTHERN REGION				11387.45	
EASTERN					
DVC					
WEST BENGAL					
1	MAITHON HPS	(1X23.2)+(2X20)	S(UG)	63.20	1957-1958
JHARKHAND					
1	PANCHET HPS	(2X40)	PS	80.00	1959-1990
TOTAL DVC				143.20	
NHPC					
WEST BENGAL					
1	TEESTA LOW DAM III	(3X33)	R	99	2013
SIKKIM					
1	RANGIT HPS	(3X20)	R	60.00	2000
2	TEESTA V HPS	(3X170)	R(UG)	510.00	2008
TOTAL NHPC				669.00	
TOTAL CENTRAL				812.20	
JSEB					
JHARKHAND					
1	SUBERNREKHA HPS-I	(1X65)	S	65.00	1977
2	SUBERNREKHA HPS-II	(1X65)	R	65.00	1980
TOTAL JSEB				130.00	
OHPC					
ODISHA					
1	BALIMELA HPS	(6X60)+(2X75)	S	510.00	1973-1977
2	HIRAKUD HPS(BURLA)	(3X37.5)+(2X49.5)+(2X32)	S	275.50	1956-1990
3	HIRAKUD HPS (CHIPLIMA)	(3X24)	S	72.00	1962-1964
4	RENGALI HPS	(5X50)	S	250.00	1985-1992
5	UPPER INDRAVATI HPS	(4X150)	S	600.00	1999-2001
6	UPPER KOLAB HPS	(4X80)	S	320.00	1988-1993
TOTAL OHPC				2027.50	
WBSEDCL					
WEST BENGAL					
1	JALDHAKA HPS	(3X9)	R	27.00	1967-1972
2	PURULIA PSS HPS	(4X225)	PS	900.00	2007
3	RAMMAM HPS	(4X12.5)	R	50.00	1995-1996
TOTAL WBSEDCL				977.00	
TOTAL STATE				3134.50	
TOTAL EASTERN REGION				3946.70	

**STATIONWISE INSTALLED CAPACITY OF H.E. STATIONS
(ABOVE 25 MW CAPACITY)**

					As on 31.03.2013
S. NO.	UTILITY/STATIONS	NO. OF UNITS X CAPACITY(MW)	TYPE OF STATION	CAPACITY (MW)	YEAR OF COMMISSIONING
NORTH EASTERN					
NEEPCO					
ARUNACHAL PRADESH					
1	RANGANADI HPS	(3X135)	R	405	2002
SUB-TOTAL Ar.P				405	
ASSAM					
1	KOPILI HPS	(4X50)+(1X25)	S	225.00	1988-2003
2	KHONDONG HPS	(2X25)	S	50.00	1984
SUB-TOTAL ASSAM				275.00	
NAGALAND					
1	DOYANG HPS	(3X25)	S	75.00	2000
SUB-TOTAL NAGALAND				75.00	
TOTAL NEEPCO				755.00	
NHPC					
MANIPUR					
1	LOKTAK HPS	(3X35)	S	105.00	1983
TOTAL				105.00	
TOTAL CENTRAL				860.00	
APGCL					
ASSAM					
1	KARBI LANGPI HPS	(2X50)	R	100.00	2007
TOTAL APGCL				100.00	
MeECL					
MEGHALAYA					
1	KYRDEMKULAI HPS	(2X30)	R	60.00	1979
2	UMIAM HPS ST-I	(4X9)	S	36.00	1965
3	UMIAM HPS ST-IV	(2X30)	R	60.00	1992
4	MYNTDU HPS ST-I	(3X42)	R	126.00	2012
TOTAL MeECL				282.00	
TOTAL STATE				382.00	
TOTAL NE REGION				1242.00	
TOTAL ALL INDIA				39491.40	

Note:- Up-rated/Derated Capacities of units have been incorporated.

Abbreviations:-

R- Run of River Type

S- Storage Type

PS- Pumped Storage

UG- Underground

MP- Multipurpose

ANNEXURE 1.4

CAPACITYWISE GROUPING OF HYDRO ELECTRIC STATIONS

AS ON 31.03.2013			
Station Cap. Range (MW)	Number of stations	Number of units	Total capacity (MW)
> 25 - 50	43	123	1553.45
> 50 - 100	51	128	3741.90
>100 - 200	32	113	4549.95
>200 - 300	17	77	4505.50
>300 - 400	11	42	3935.00
>400 - 500	5	18	2255.00
>500 - 600	8	43	4420.00
>600 - 700	0	0	0.00
>700 - 800	3	18	2335.00
>800 - 900	4	24	3470.60
>900 - 1000	5	26	4990.00
>1000 - 1500	3	22	3735.00
Total	182	634	39491.40

HYDRO GENERATING UNITS ADDED DURING 2012-13

Station	State	Unit No.	Capacity (MW)	Date of commissioning
<u>NORTHERN REGION</u>				
<u>CENTRAL SECTOR</u>				
1. Chamera III (NHPC)	HP	1	77	28.06.2012
		2	77	12.06.2012
		3	77	07.06.2012
2. Chutak (NHPC)	HP	1	11	22.11.2012
		2	11	08.11.2012
		3	11	11.11.2012
		4	11	28.01.2013
3. Teesta Low Dam III (NHPC)	WB	1	33	30.01.2013
		2	33	20.01.2013
		3	33	24.02.2013
SUB TOTAL(CENTRAL SECTOR)			374	
<u>PRIVATE SECTOR</u>				
1. Budhil (LGPPPL)	HP	1	35	30.05.2012
		2	35	26.05.2012
SUB TOTAL(PVT. SECTOR)			70	
<u>STATE SECTOR</u>				
1.Bhawani Kattalai Barrage III (TANGEDCO)	Tamil Nadu	1	15	08.12.2012
2. Myntdu (Leshka) (MeECL)	Meghalaya	3	42	07.03.2013
SUB TOTAL(STATE SECTOR)			57	
ALL INDIA TOTAL			501	

CHAPTER 2

GENERATION PERFORMANCE

CHAPTER 2

GENERATION PERFORMANCE

2.1 Generation from hydro electric power stations (above 25 MW Installed Capacity) in the country during 2012-13 was 113720.29 MU, against the target of 122045 MU which was 6.82% less than the target.

2.2 Region-wise generation performance of hydro electric stations during 2012-13 is indicated in **Table 2.1**.

TABLE 2.1
GENERATION PERFORMANCE – REGIONWISE
(2012-13)

S. No.	Region	Installed Capacity as on 31.03.2013 (MW)	Generation During 2012-13		
			Target (MU)	Actual (MU)	Shortfall(-)/ Surplus (+) Over Target (%)
1	Northern	15523.25	60243	62549.87	3.83
2	Western	7392.00	15159	17665.00	16.53
3	Southern	11387.45	32362	21144.61	(-)34.66
4	Eastern	3946.70	10081	8449.73	(-)16.18
5	North-eastern	1242.00	4200	3911.08	(-)6.88
	Total(All India)	39491.40	122045	113720.29	(-)6.82

Generation during 2012-13 has exceeded the target in Northern and Western Region whereas it was less than the target in Southern, Eastern and North-Eastern Region of the country.

Hydel generation during 2012-13 was 113720.29 MU against the target of 122045 MU viz deficit in generation by 8324.71 MU (6.82%). Actual generation of 113720.29 MU was also less than previous year generation of 130509.52 MU by 12.86%. Hydel generation was more than the generation target in Northern and Western by 3.83% and 16.53% respectively. Whereas Hydel generation was less than target in Southern, Eastern and North Eastern Region by 34.66%, 16.18% and 6.88% respectively. There was less generation as compared to the target of HE Stations of MPCL, EPPL, JPVL, ADHPL & LGPPL in private sector, HPSEBL, APGENCO, KPCL, KSEB, TANGEDCO, JSEB, OHPC, APGCL & MeECL in state sector and NHPC, DVC & NEEPCO in central sector

Month wise generation performance and cumulative generation performance vis-a-vis targets have been shown at Exhibit-2.1 and are given in **Table 2.2** below.

TABLE 2.2
MONTHWISE & CUMULATIVE GENERATION VIS-À-VIS TARGET IN MU
PERIOD: 2012-13

MONTH	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
TARGET	8368	10461	10986	13424	15818	14022	10822	8310	7592	7388	6857	7997
GEN.	8101	10019	11377	11922	14090	14487	9234	6830	6567	6452	5870	8772
CUM. TARGET	8368	18829	29815	43239	59057	73079	83901	92211	99803	107191	114048	122045
CUM. GEN.	8101	18120	29497	41418	55508	69995	79229	86059	92626	99079	104948	113720

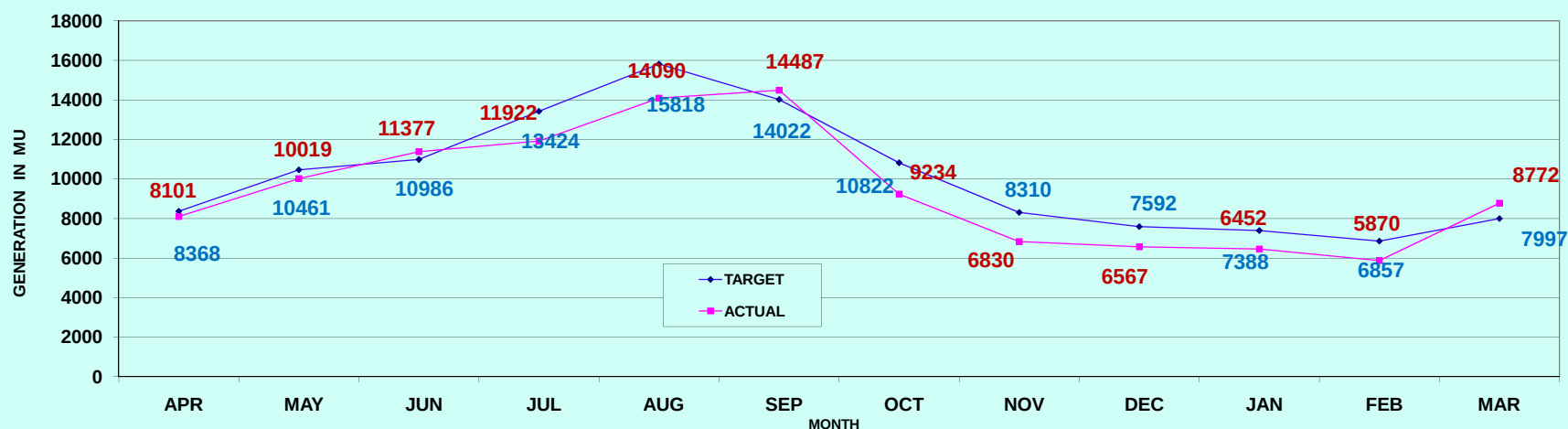
2.3 Sector wise generation performance during the year 2012-13 Vis-à-vis targets is given in **Table 2.3**. Generation from H.E. Stations under Central sector was more than the target by 3.80%, State and Private Sector was less than the target by 14.63% and 4.60% respectively.

TABLE 2.3
SECTORWISE GENERATION PERFORMANCE
PERIOD: 2012-13

Sl. No.	Sector	Installed Capacity as on 31.03.13 (MW)	Generation		
			Target (MU)	Actual (MU)	Shortfall(-) Surplus(+) Over Target (%)
1	Central	12325.70	45920	47662.99	3.80
2	State	24536.70	65429	55853.71	(-)14.63
3	Private	2629.00	10696	10203.59	(-)4.60
	Total	39491.40	122045	113720.29	(-)6.82

2.4 Generation performance of 31 major reservoir based H.E. Stations vis-à-vis other schemes is given in **Table 2.4**. It could be observed that the 31 major reservoir based Hydro Stations have generated 11.53% less than the targets. Generation from other Stations was also 3.39% less than the targets.

MONTHLY ALL INDIA HYDRO GENERATION VS TARGETS
DURING 2012-13



ALL INDIA CUMMULATIVE GENERATION VS TARGETS
DURING 2012-13

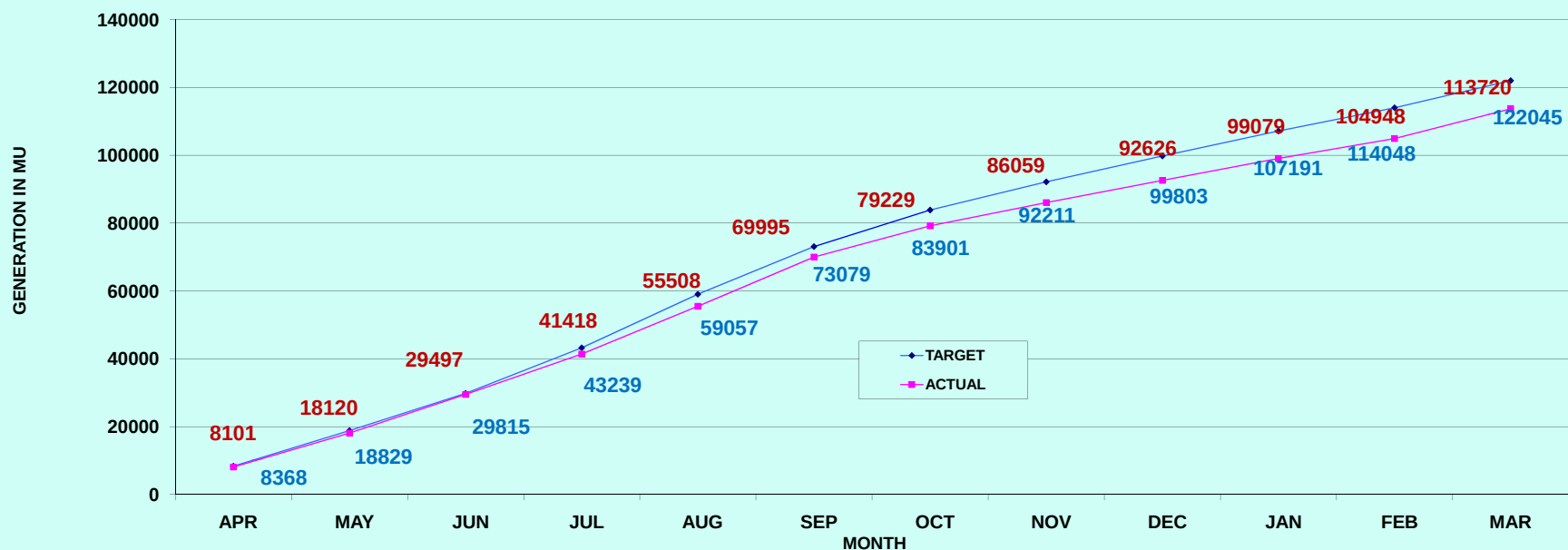


TABLE 2.4
RESERVOIR BASED STATIONS GENERATION PERFORMANCE VIS-À-VIS
OTHER HE STATIONS
PERIOD: 2012-13

S. No.	Type of Scheme	Installed Capacity as on 31.03.2013 (MW)	Generation in 2012-13		
			Target (MU)	Actual (MU)	Shortfall (-) / Surplus (+) Over target (%)
1.	Reservoir Based Schemes (31 Nos.)	19227.85	51470	45536.66	(-)11.53
2.	Other schemes	20263.55	70575	68183.63	(-)3.39
	Total	39491.40	122045	113720.29	(-)6.82

2.5 Details of actual generation during 2011-12 for all the hydro stations (Above 25 MW capacities) in the country are given in **Annex 2.1**. List of stations where generation exceeded the targets during 2011-12 is given in **Table 2.5**.

TABLE 2.5
H.E. STATIONS ACHIEVING HIGHER GENERATION VIS-A-VIS TARGETS
PERIOD: 2012-13

S. No.	Actual Generation % of Generation Target	Hydro Electro Stations
1	150 & above	Pong, R.P.Sagar, Jawahar Sagar, Rihand, Obra, Kadana PSS, Madhikhera, Bansagar Tons-I, Bansagar Tons-II, Bansagar Tons-III, Koyna St. I&II, Koyna DPH, Bandardhara-II.
2	140 - 150	Chamera-I, Mahi Bajaj-I&II.
3	130 - 140	Ukai, Indira Sagar, Koyna St.III.
4	120 - 130	Lower Jhelum, Mukerian I-IV, Hasdeo Bango, Loktak.
5	110 - 120	Ganguwal, Kotla, Uri, Tehri, Larji, Khara, Dhalipur, Chibro, Khodri, Sardar Sarovar RBPH, Omkareshwar, Pench, Bhira Tail Race, Khopoli, Machkund, Rengali, Purulia PSS, Khondong.
6	100 - 110	Dehar, Salal I&II, Tanakpur, Dhauliganga, Dulhasti, Nathpa Jhakri, Koteswar, Giri Bata, Baspa II, Baglihar, Matatila, Khatima, Dhakrani, Kulhal, Chilla, Vishnu Prayag, Sardar Sarovar CHPH, Vaitarna, Lower Sileru, Bhavani Kattalai Barrage I, Rammam II.

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

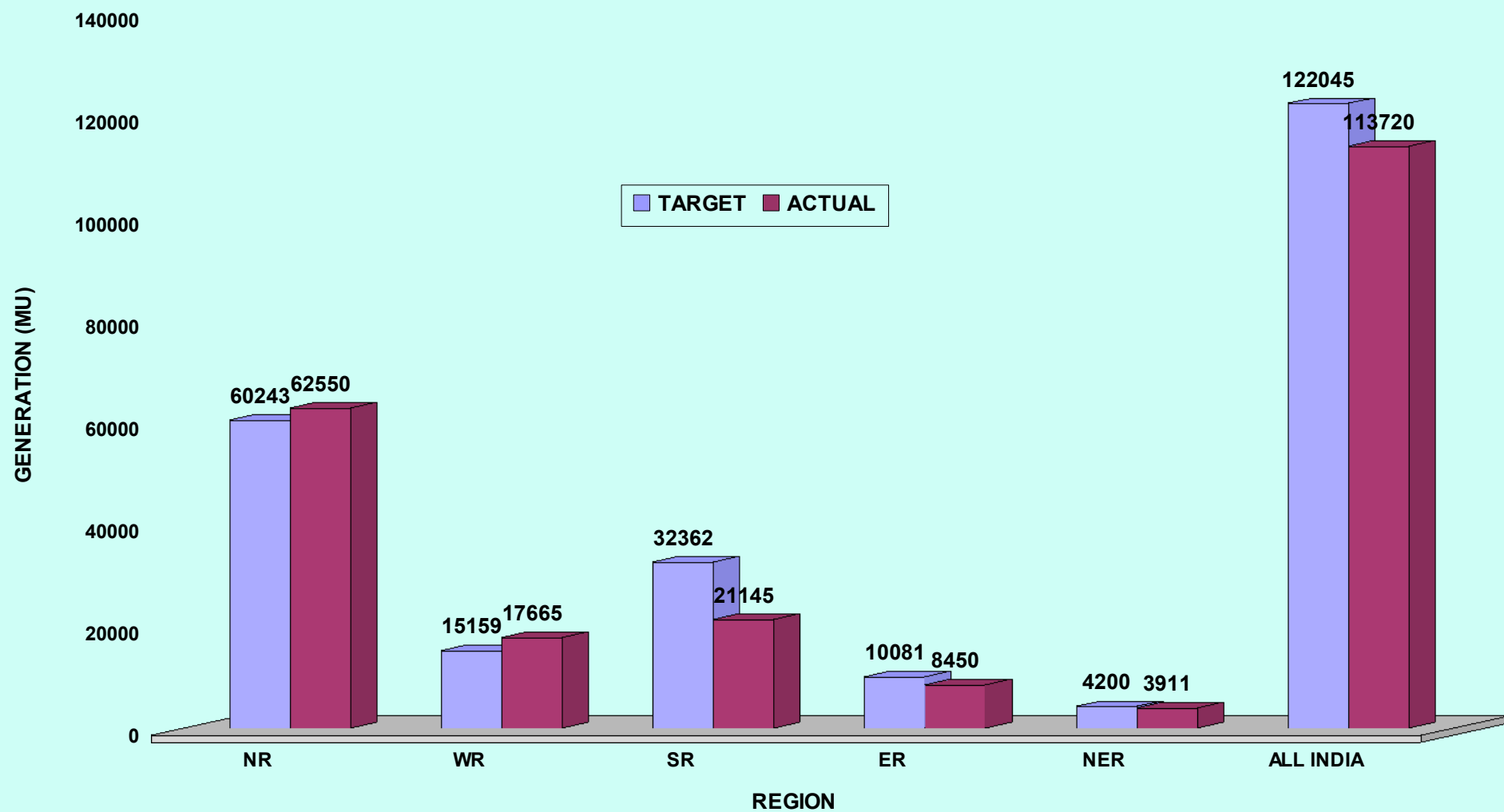
TABLE 2.6

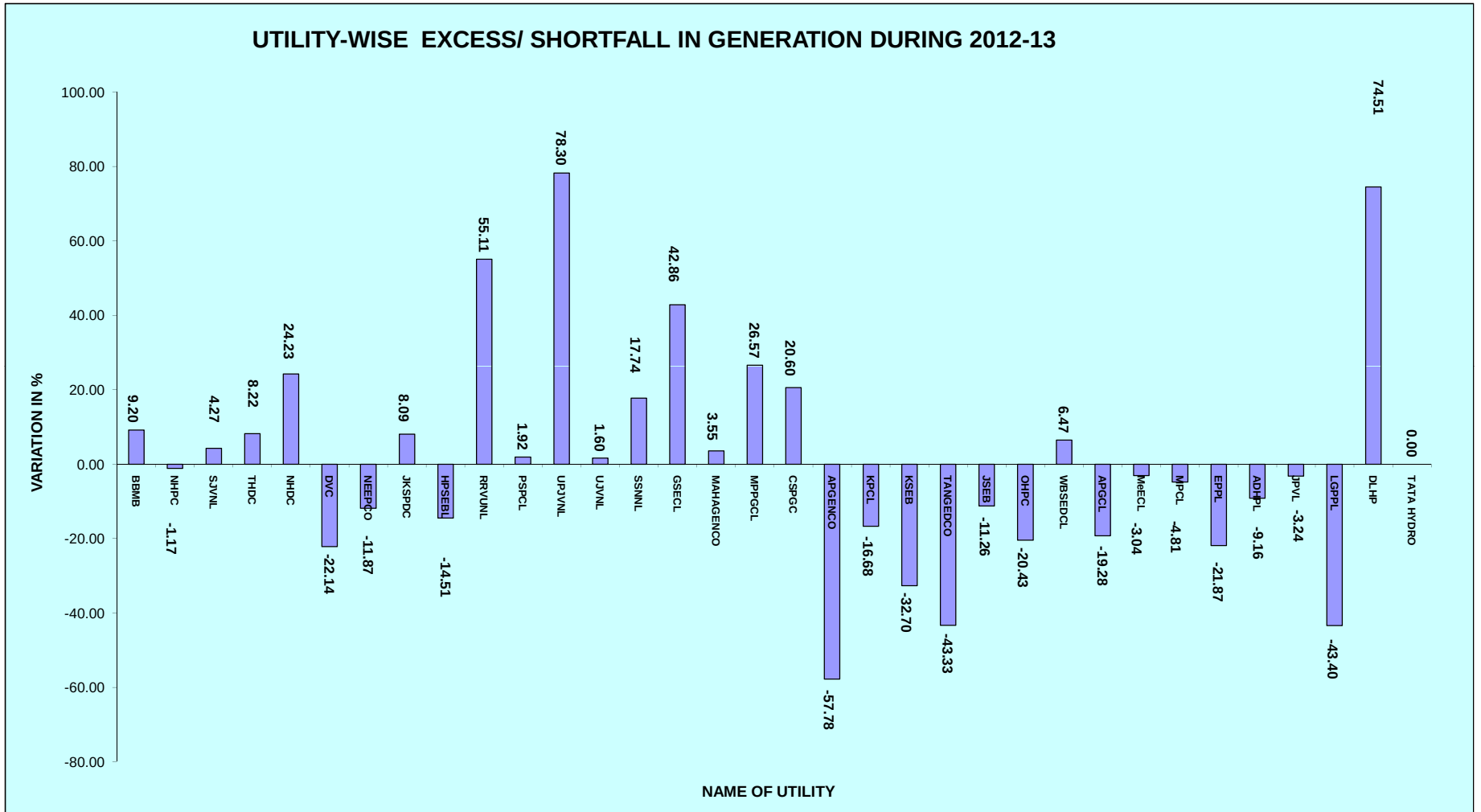
**H.E.STATIONS HAVING SHORTFALL IN GENERATION VIS-A-VIS TARGETS
PERIOD: 2012-13**

S. No.	Actual Generation as % of Generation Target	Hydro Electro Stations
1	90 -100	Bhakra L&R, Baira Siul, Chamera II, Sewa II, Malana, Karcham Wangtoo, Allain Duhangan, Upper Sindh II, Ranjit Sagar, Maneri Bhali I, Bhira & Bhira PSS, Bhivpuri, Sharavathy, Varahi, Sholayar, Hirakud, Rangit, Teesta V, Kyrdemkulai, Umiam St. I, Umiam St. IV, Myntdu, Doyang, Ranganadi.
2	80 -90	Shanan, AP Sahib I & II, Ramganga, Maneri Bhali II, Bargi, Upper Sileru I & II, Gerusoppa, Subernrekha I & II, Upper Indravati, Maithon, Karbi Langpi.
3	70 -80	Bassi, Malana II, Gandhi Sagar, Rajghat, Koyna IV, Ghatghar PSS, TB Dam & Hampi, Kalinadi, Supa DPH, Bhadra, Lingnamakki, Kadra, Almatti, Shivasamudram, Munirabad, Kuttiadi & Kuttiadi Additional Extension, Pallivasal, Poringalkuthu, Kadamparai, Panchet, Jaldhaka, Kopili.
4	60 -70	Chamera III, Sanjay, Tillari, Kodalasali, Idukki, Sabarigiri, Sholayar I&II, Sengulam, Nariamangalam, Idamalayar, Lower Periyar, Kakkad, Pykara, Moyar, Kundah I-V, Parsons Valley, Sarkarpathy, Sholayar I&II, Upper Kolab.
5	50 -60	Budhil, Panniar, Suruliyar, Aliyar, Lower Mettur, Papanasam, Pykara Ultimate.
6	40 -50	Ghatprabha, Jog, Periyar, Kodayar I&II, Balimela.
7	30 -40	Srisailem RB, Priyadarshni Jurala, Mettur Dam & Tunnel.
8	10 -30	Chutak, NJ Sagar PSS, Pochampad, Srisailem LB.
9	0 -10	NJ Sagar RBC, NJ Sagar LBC, Bhavani Kattalai Barrage III, Teesta Low Dam III.

2.6 Region wise generation targets vis-à-vis achievements are indicated at **Exhibit-2.2**. The states/utilities showing excess/short-fall in generation over the targets are indicated in **Exhibit- 2.3**.

REGIONWISE ACTUAL GENERATION VS TARGETS DURING 2012-13





**GENERATION PERFORMANCE OF H.E.STATIONS IN THE COUNTRY
DURING THE YEAR 2012-13**

S. NO.	STATION	NO. OF UNITS* UNIT SIZE (MW)	INSTALLED CAPACITY AS ON 31.03.2013 (MW)	2012-13		ACTUAL AS % OF TARGET
				TARGET (MU)	ACTUAL (MU)	
<u>NORTHERN REGION</u>						
<u>CENTRAL</u>						
<u>BBMB</u>						
1.	Bhakra L	5*108	540.00	4900	4706.79	96.06
2.	Bhakra R	5*157	785.00			
3.	Ganguwal	1*29.25+2.24.2	77.65	500	593.50	118.70
4.	Kotla	1*29.25+2.24.3	77.65	500	599.80	119.96
5.	Dehar	6*165	990.00	3000	3220.51	107.35
6.	Pong	6*66	396.00	1123	1824.07	162.43
Total BBMB			2866.30	10023	10944.67	109.20
<u>NHPC</u>						
1.	Baira Siul	3*66	198.00	762	721.34	94.66
2.	Salal-I	3*115	345.00	3000	3276.61	109.22
3.	Salal-II	3*115	345.00			
4.	Tanakpur	3*31.4	94.20	443	480.83	108.54
5.	Chamera-I	3*180	540.00	1664	2442.37	146.78
6.	Chamera-II	3*100	300.00	1471	1433.29	97.44
7.	Chamera-III	3*77	231.00	1030	716.29	69.54
8.	Uri	4*120	480.00	2587	2966.94	114.69
9.	Uri-II*	-	-	895	-	-
10.	Dhauliganga	4*70	280.00	1081	1136.65	105.15
11.	Dulhasti	3*130	390.00	1870	2043.43	109.27
12.	Sewa-III	3*40	120.00	534	484.27	90.69
13.	Chutak	4*11	44.00	85	14.56	17.13
14.	Nimboo Bazdo*	-	-	42	-	-
15.	Parbati III	-	-	106	-	-
Total NHPC			3367.20	15570	15716.58	100.94
<u>SJVNL</u>						
1.	Nathpa Jhakri	6*250	1500.00	6500	6777.78	104.27
Total SJVNL			1500.00	6500	6777.78	104.27
<u>THDC</u>						
1.	Tehri	4*250	1000.00	2797	3102.00	110.90
2.	Koteshwar	4*100	400.00	1145	1164.06	101.66
Total THDC			1400.00	3942	4266.06	108.22
Total Central			9133.50	36035	37705.09	104.63
<u>HPSEB LTD</u>						
1.	Giri Bata	2*30	60.00	190	197.14	103.76
2.	Bassi	4*15	60.00	330	246.49	74.69
3.	Sanjay	3*40	120.00	580	364.53	62.85
4.	Larji	3*42	126.00	575	652.06	113.40
5.	Uhl III			33		0.00
Total HPSEB LTD			366.00	1708	1460.22	85.49
<u>PRIVATE</u>						
<u>MALANA POWER COMPANY LTD.</u>						
1.	Malana	2*43	86.00	350	333.15	95.19
<u>JAIPRAKASH VENTURE LTD.</u>						
1.	Baspa-II	3*100	300.00	1213	1239.69	102.20
2.	Karcham Wangtoo	4*250	1000.00	4426	4056.75	91.66
Total JPVL			1300.00	5639.00	5296.44	93.93
<u>EVEREST POWER COMPANY LTD.</u>						
1.	Malana-II	2*50	100.00	400	312.50	78.13
<u>ALLAIN DUHANGAN POWER LTD.</u>						
1.	Allain Duhangan	2*96	192.00	750	681.32	90.84
<u>LANCO GREEN POWER PVT. LTD.</u>						
1.	Budhil	2*35	70.00	277	156.79	56.60
Total Private			1748	7416	6780.20	91.43
Total HP			2114.00	9124	8240.42	90.32

**GENERATION PERFORMANCE OF H.E.STATIONS IN THE COUNTRY
DURING THE YEAR 2012-13**

S. NO.	STATION	NO. OF UNITS* UNIT SIZE (MW)	INSTALLED CAPACITY AS ON 31.03.2013 (MW)	2012-13		ACTUAL AS % OF TARGET
				TARGET (MU)	ACTUAL (MU)	
<u>JAMMU & KASHMIR</u>						
<u>JKSPDC</u>						
1.	Lower Jhelum	3*35	105	460	552.34	120.07
2.	Upper Sindh II	3*35	105	320	308.67	96.46
3.	Baglihar	3*150	450	2643	2838.99	107.42
Total JKSPDC			660	3423	3700	108.09
Total J & K			660	3423	3700	108.09
<u>RAJASTHAN</u>						
<u>RRVUNL</u>						
1.	R P Sagar	4*43	172	235	366.03	155.76
2.	Jawahar Sagar	3*33	99	170	275.12	161.84
3.	Mahi Bajaj I	2*25	50	140	204.19	145.85
4.	Mahi Bajaj II	2*45	90			
Total RRVUNL			411	545	845.34	155.11
Total Rajasthan			411	545	845.34	155.11
<u>PUNJAB</u>						
<u>PSPCL</u>						
1.	Shanan	4*15+1*50	110.00	525	436.36	83.12
2.	Mukerian I	3*15	45.00	1100	1420.4	129.13
3.	Mukerian II	3*15	45.00			
4.	Mukerian III	3*19.5	58.50			
5.	Mukerian IV	3*19.5	58.50			
6.	A P Sahib I	2*33.5	67.00	720	639.19	88.78
7.	A P Sahib II	2*33.5	67.00			
8.	Ranjit Sagar	4*150	600.00	1507	1429.9	94.88
Total PSPCL			1051.00	3852	3925.85	101.92
Total Punjab			1051.00	3852	3925.85	101.92
<u>UTTAR PRADESH</u>						
<u>UPJVNL</u>						
1.	Rihand	6*50	300.00	351	771.27	219.74
2.	Obra	3*33	99.00	99	313.72	316.89
3.	Matatilla	3*10.2	30.60	108	118.27	109.51
4.	Khara	3*24	72.00	327	374.66	114.57
Total UPJVNL			501.60	885	1577.92	178.30
Total UP			501.60	885	1577.92	178.30
<u>UTTARAKHAND</u>						
<u>UJVNL</u>						
1.	Khatima	3*13.8	41.40	155	155.00	100.00
2.	Ram Ganga	3*66	198.00	278	246.39	88.63
3.	Dhakrani (Y.St.I)	3*11.25	33.75	139	148.70	106.98
4.	Dhalipur (Y.St.I)	3*17	51.00	206	230.59	111.94
5.	Kulhal (Y.St.IV)	3*10	30.00	144	158.09	109.78
6.	Chibro (Y.St.II)	4*60	240.00	762	873.33	114.61
7.	Chilla	4*36	144.00	799	858.95	107.50
8.	Khodri (Y.St.II)	4*30	120.00	350	398.54	113.87
9.	Maneri Bhali-I	3*30	90.00	471	454.68	96.54
10.	Maneri Bhali-II	4*76	304.00	1300	1153.60	88.74
Total UJVNL			1252.15	4604	4677.87	101.60
<u>PRIVATE</u>						
<u>JPVL</u>						
1.	Vishnu Prayag	4*100	400.00	1775	1877.38	105.77
Total Uttarakhand			1652.15	6379	6555.25	102.76
Total Northern Region			15523.25	60243	62549.87	103.83
<u>WESTERN REGION</u>						
<u>GUJARAT</u>						
<u>SSNNL</u>						
1.	Sardar Sarovar CHPH	5*50	250.00	597	651.97	109.21
2.	Sardar Sarovar RBPH	6*200	1200.00	2544	3046.32	119.75
Total SSNNL			1450.00	3141	3698.29	117.74
<u>GSECL</u>						
1.	Ukai	4*75	300	466	628.45	134.86
2.	Kadana PSS	4*60	240	150	251.57	167.71
Total GSECL			540	616	880.02	142.86
Total Gujarat			1990.00	3757	4578.31	121.86

**GENERATION PERFORMANCE OF H.E.STATIONS IN THE COUNTRY
DURING THE YEAR 2012-13**

S. NO.	STATION	NO. OF UNITS* UNIT SIZE (MW)	INSTALLED	2012-13		ACTUAL AS % OF TARGET
			CAPACITY AS ON 31.03.2013 (MW)	TARGET (MU)	ACTUAL (MU)	
<u>MADHYA PRADESH</u>						
<u>NHDC</u>						
1.	Indira Sagar	8*125	1000.00	2200	2895.96	131.63
2.	Omkareshwar	8*65	520.00	1184	1307.96	110.47
Total NHDC			1520.00	3384	4203.92	124.23
<u>MPPGCL</u>						
1.	Gandhi Sagar	5*23	115.00	350	274.64	78.47
2.	Pench	2*80	160.00	315	351.06	111.45
3.	Bargi	2*45	90.00	470	418.48	89.04
4.	Madhikhera	3*20	60.00	74	114.61	154.88
5.	Bansagar Tons-I	3*105	315.00	900	1500.37	166.71
6.	Bansagar Tons-II	2*15	30.00	113	174.81	154.70
7.	Bansagar Tons-III	3*20	60.00	80	122.00	152.50
8.	Rajghat	3*15	45.00	87	67.82	77.95
Total MPPGCL			875.00	2389	3023.79	126.57
Total M P			2395.00	5773.00	7227.71	125.20
<u>CHHATISGARH</u>						
<u>CSPGC</u>						
1.	Hasdeo Bango		120	250	301.51	120.60
Total CSPGC			120	250	301.51	120.60
Total Chattisgarh			120	250	301.51	120.60
<u>MAHARASHTRA</u>						
<u>MAHAGENCO</u>						
1.	Koyna St.I&II	4*70+4*80	600.00	786	1288.88	163.98
2.	Koyna St.III	4*80	320.00	517	677.38	131.02
3.	Koyna IV	4*250	1000.00	1721	1282.64	74.53
4.	Koyna DPH	2*18	36.00	90	136.15	151.28
5.	Vaitarna & DAM PH.	1*60	60.00	144	149.13	103.56
6.	Tillari	1*60	60.00	115	77.10	67.04
7.	Bhira Tail Race	2*40	80.00	80	95.37	119.21
8.	Ghatghar PSS		250.00	421	304.81	72.40
Total MAHAGENCO			2406.00	3874	4011.46	103.55
<u>DLHP</u>						
1.	Bhandardhara-II	1*34	34	55	95.98	174.51
Total DLHP			34	55	95.98	174.51
<u>TATA HYDRO</u>						
1.	Bhira	6*25	150.00			
2.	Bhira PSS	1*150	150.00	893	855.64	95.82
3.	Bhivpuri	3*24+2*1.5	75.00	307	301.59	98.24
4.	Khopoli	3*24	72.00	250	292.80	117.12
Total Tata			447.00	1450	1450.03	100.00
Total Maharashtra			2887.00	5379	5557.47	103.32
Total Western Region			7392.00	15159	17665.00	116.53
<u>SOUTHERN REGION</u>						
<u>ANDHRA PRADESH</u>						
<u>APGENCO</u>						
1.	Machkund	3*17+3*21.25	114.75	500	565.52	113.10
2.	T.B.Dam	4*9	36.00	180	128.83	71.57
3.	Hampi	4*9	36.00			
4.	Upper sileru I	2*60	120.00	448	401.07	89.52
5.	Upper sileru II	2*60	120.00			
6.	Lower Sileru	4*115	460.00	1070	1119.64	104.64
7.	N.J.Sagar PSS	1*110+7*100.8	815.60	1605	256.10	15.96
8.	N.J.Sagar RBC	3*30	90.00	200	0.00	0.00
9.	N.J.Sagar LBC	2*30	60.00	80	0.00	0.00
10.	Srisaillam	7*110	770.00	1450	514.50	35.48
11.	Pochampad	1*27	27.00	94	16.58	17.64
12.	Srisaillam LB	6*150	900.00	2150	314.24	14.62
13.	Priyadarshni Jurala	6*39	234.00	403	140.27	34.81
14.	Lower Jurala			7		
Total APGENCO			3783.35	8187	3456.75	42.22
Total A P			3783.35	8187	3456.75	42.22

**GENERATION PERFORMANCE OF H.E.STATIONS IN THE COUNTRY
DURING THE YEAR 2012-13**

S. NO.	STATION	NO. OF UNITS* UNIT SIZE (MW)	INSTALLED	2012-13		ACTUAL AS % OF TARGET
			CAPACITY AS ON 31.03.2013 (MW)	TARGET (MU)	ACTUAL (MU)	
<u>KARNATAKA</u>						
<u>KPCL</u>						
1.	Sharavathy	10*103.5	1035.00	5200	4713.70	90.65
2.	Kalinadi	3*135+3*150	855.00	2550	1978.65	77.59
3.	Supa DPH	2*50	100.00	460	334.75	72.77
4.	Bhadra	1*2+2*12+1*7.2+1*6	39.20	67	48.37	72.19
5.	Lingnamakki	2*27.5	55.00	254	201.21	79.22
6.	Varahi	4*115	460.00	1060	1030.19	97.19
7.	Ghatprabha	2*16	32.00	100	49.55	49.55
8.	Kadra	3*50	150.00	350	260.33	74.38
9.	Kodasali	3*40	120.00	330	219.00	66.36
10.	Gerusoppa	4*60	240.00	575	461.24	80.22
11.	Amatti Dam	1*15+5*55	290.00	560	420.84	75.15
12.	Jog	4*13.2+4*21.6	139.20	307	142.33	46.36
13.	Shivasamudram	6*3+4*6	42.00	307	243.37	79.27
14.	Munirabad	2*9+1*10	28.00	85	66.25	77.94
Total KPCL			3585.40	12205	10169.78	83.32
Total Karnataka			3585.40	12205	10169.78	83.32
<u>KERALA</u>						
<u>KSEB</u>						
1.	Idukki	6*130	780.00	2398	1575.05	65.68
2.	Sabarigiri	6*50	300.00	1338	864.73	64.63
3.	Kuttiadi & Extn.	3*25+1*50	125.00			
4.	Kuttiadi Additional Extn.	2*50	100.00	685	513.53	74.97
5.	Sholayar	3*18	54.00	233.00	210	90.21
6.	Sengulam	4*12	48.00	164	107.71	65.68
7.	Nariamangalam & Extn.	3*15+1*25	70.00	350	232.32	66.38
8.	Pallivasal	3*5+3*7.5	37.50	230	176.91	76.92
9.	Poringalkuthu	4*8	32.00	170	131.01	77.06
10.	Panniar	2*15	30.00	160	90.71	56.69
11.	Idamalayar	2*37.5	75.00	366	249.92	68.28
12.	Lower Periyar	3*60	180.00	590.00	356.82	60.48
13.	Kakkad	2*25	50.00	225	141.17	62.74
Total Kerala			1881.50	6909	4650.08	67.30
<u>TAMIL NADU</u>						
<u>TANGEDCO</u>						
1.	Pykara	3*7+1*11+2*13.6	59.20	69	43.26	62.70
2.	Moyar	3*12	36.00	121	78.02	64.48
3.	Kundah I	3*20	60.00	1548	1013.97	65.50
4.	Kundah II	5*35	175.00			
5.	Kundah III	3*60	180.00			
6.	Kundah IV	2*50	100.00			
7.	Kundah V	2*20	40.00			
8.	Parson's Valley	1*30	30.00	49	30.18	61.59
9.	Suruliyar	1*35	35.00	92	49.37	53.66
10.	Aliyar	1*60	60.00	146	80.03	54.82
11.	Mettur Dam	4*12.5	50.00	558	203.46	36.46
12.	Mettur Tunnel	4*50	200.00			
13.	Lower Mettur I	2*15	30.00	306	159.32	52.07
14.	Lower Mettur II	2*15	30.00			
15.	Lower Mettur III	2*15	30.00			
16.	Lower Mettur IV	2*15	30.00			
17.	Periyar	4*35	140.00	409	180.48	44.13
18.	Papanasam	4*8	32.00	117	63.25	54.06
19.	Sarkarpathy	1*30	30.00	125	83.68	66.94
20.	Sholayar I & II	2*35+1*25	95.00	306	201.97	66.00
21.	Kodayar I & II	1*60+1*40	100.00	232	106.42	45.87
22.	Kadamparai PSS	4*100	400.00	430	302.07	70.25
23.	Pykara Ultimate	3*50	150.00	328	195.11	59.48
24.	Bhawani Kattalai Barrage-I	2*15	30.00	75	75.87	101.16
25.	Bhawani Kattalai Barrage-II	-	-	75	1.54	-
26.	Bhawani Kattalai Barrage-III	1*15	15	75	0.00	-
Total TANGEDCO			2137.20	5061	2868.00	56.67
Total Southern Region			11387.45	32362	21144.61	65.34

**GENERATION PERFORMANCE OF H.E.STATIONS IN THE COUNTRY
DURING THE YEAR 2012-13**

S. NO.	STATION	NO. OF UNITS* UNIT SIZE (MW)	INSTALLED CAPACITY AS ON 31.03.2013 (MW)	2012-13		ACTUAL AS % OF TARGET
				TARGET (MU)	ACTUAL (MU)	
<u>EASTERN REGION</u>						
<u>JHARKHAND</u>						
<u>JSEB</u>						
1.	Subernarekha I	1*65	65.00	160	141.98	88.74
2.	Subernarekha II	1*65	65.00			
Total Jharkhand			65.00	160	141.98	88.74
<u>DVC</u>						
1.	Maithon (WB)	2*20+1*23.2	63.20	107	88.66	82.86
2.	Panchet	2*40	80.00	149	110.67	74.28
Total DVC			143.20	256	199.33	77.86
<u>ODISHA</u>						
<u>OHPC</u>						
1.	Balimela	6*60+2*75	510.00	1183	546.72	46.21
2.	Hirakud I (Burla)	2*49.5+2*32+3*37.5	275.50	1000	973.94	97.39
	Hirakud II (Chiplima)	3*24	72.00			
3.	Rengali	5*50	250.00	602	713.15	118.46
4.	Upper Kolab	4*80	320.00	750	451.11	60.15
5.	Upper Indravati	4*150	600.00	1962	1688.88	86.08
Total OHPC			2027.50	5497	4373.80	79.57
Total Odisha			2027.50	5497	4373.80	79.57
<u>WEST BENGAL</u>						
<u>WBSEDCL</u>						
1.	Jaldhaka I	3*9	27.00	160	117.75	73.59
2.	Ramman II	4*12.5	50.00	209	222.86	106.63
3.	Purulia PSS	4*225	900.00	700	797.51	113.93
Total WBSEDCL			977.00	1069	1138.12	106.47
<u>NHPC</u>						
1.	Teesta Low Dam-III	3*33	99.00	255	0.00	0.00
Total W B			1076.00	1324	1138.12	85.96
<u>SIKKIM</u>						
<u>NHPC</u>						
1.	Rangit	3*20	60.00	333	328.10	98.53
2.	Teesta-V	3*170	510.00	2511	2268.40	90.34
Sub total NHPC (Sikkim)			570.00	2844	2596.50	91.30
Total Eastern Region			3881.70	10081	8449.73	83.82
<u>NORTH EASTERN REGION</u>						
<u>CENTRAL SECTOR</u>						
<u>NEEPCO</u>						
1.	Khandong (Assam)	2*25	50	146	164.88	112.93
2.	Kopili (Assam)	4*50+1*25	225	1025	759.58	74.11
3.	Doyang (Nagaland)	3*25	75	227	213.34	93.98
4.	Ranganadi (Arunachal Pradesh)	3*135	405	1300	1239.94	95.38
Total NEEPCO			755	2698	2377.74	88.13
<u>NHPC (NER)</u>						
1.	Loktak (Manipur)		105	448	580.41	129.56
Total NHPC (NER)			105	448	580.41	129.56
Total Central Sector (NER)			860	3146	2958.15	94.03
<u>ASSAM</u>						
<u>APGCL</u>						
1.	Karbi Langpi	2*50	100.00	425	343.04	80.72
Total APGCL			100.00	425	343.04	80.72
Total Assam			100.00	425	343.04	80.72
<u>MEGHALAYA</u>						
<u>MeECL</u>						
1.	Kyrdemkulai	2*30	60.00	131	129.73	99.03
2.	Umium St.I	2*9+2*9	36.00	108	102.89	95.27
3.	Umium St.IV	2*30	60.00	195	187.52	96.16
4.	Myntdu	3*42	126.00	195	189.75	
Total MeECL			282.00	629	609.89	96.96
Total Meghalaya			282.00	629	609.89	96.96
Total North Eastern Region			1242.00	4200	3911.08	93.12
TOTAL ALL INDIA			39426.40	122045	113720.29	93.18
IMPORT FROM BHUTAN				5480	4794.50	87.49
TOTAL ALL INDIA INCLUDING BHUTAN IMPORTS			39426.40	127525	118514.79	92.93

CHAPTER 3

MAJOR RESERVOIR BASED HE SCHEMES

CHAPTER – 3

MAJOR RESERVOIR BASED H.E.SCHEMES

3.1 Introduction

Some of the hydro electric schemes are provided with regulating storage reservoirs. Water during monsoon and/or snowmelt period, is collected in these reservoirs. 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 only for power generation. Multipurpose storage schemes are operated for more than one purpose such as flood control, irrigation, water supply, pisciculture, navigation, tourist attraction and other recreational facilities besides power generation. Reservoir based schemes afford greater utilization of the available inflows approaching to long term average inflows resulting in greater firm power benefits. Reservoir based schemes are ideally suited to provide much needed peaking support to the system.

3.2 Major Reservoir Based Schemes

CEA is presently monitoring 31 reservoirs based H. E. Schemes in the country as listed below.

S. No.	Name of Reservoir	H.E. Stations	Installed Capacity (MW)	State
Northern Region				
1	Bhakra	Bhakra (L)	540.00	Himachal Pradesh
		Bhakra (R)	785.00	Himachal Pradesh
		Kotla	77.65	Punjab
		Ganguwal	77.65	Punjab
2	Pong	Pong	396.00	Himachal Pradesh
3	Ranjit Sagar	Ranjit Sagar	600.00	Punjab
4	Tehri	Tehri	1000.00	Uttarakhand
		Koteshwar	400.00	
5	Ram Ganga	Ram Ganga	198.00	Uttarakhand
6	Rihand	Rihand	300.00	Uttar Pradesh
		Obra	99.00	
7	RP Sagar	RP Sagar	172.00	Rajasthan
		Jawahar Sagar	99.00	
	Sub-Total(NR)		4744.30	
Western Region				
8	Ukai	Ukai	300.00	Gujarat
9	Sardar Sarovar	Sardar Sarovar (RBPH)	1200.00	Gujarat
		Sardar Sarovar (CHPH)	250.00	

10	Gandhi Sagar	Gandhi Sagar	115.00	Madhya Pradesh
11	Indira Sagar	Indira Sagar	1000.00	Madhya Pradesh
12	Koyna	Koyna I-IV and DPH	1956.00	Maharashtra
13	Bhira	Bhira	150.00	Maharashtra
		Bhira PSS	150.00	
	Sub-TOTAL(WR)		5121.00	
Southern Region				
14	Machkund	Machkund	114.75	Andhra Pradesh
15	Srisaillam	Srisaillam RBPH	770.00	Andhra Pradesh
		Srisaillam LBPH	900.00	
16	Nagarjuna Sagar	NJ Sagar PSS	815.60	Andhra Pradesh
		NJ SAGAR RBC & Ext.	90.00	
		NJ SAGAR LBC	60.00	
17	Sharavathy	Sharavathy	1035.00	Karnataka
		Jog	139.20	
		Gerusoppa	240.00	
18	Supa & Kalinadi	Kalinadi	855.00	Karnataka
		Supa DPH	100.00	
19	Almatti Dam	Almatti Dam	290.00	Karnataka
20	Idukki	Idukki	780.00	Kerala
21	Sabarigiri	Sabarigiri	300.00	Kerala
22	Madhupatty	Nariamangalam	37.50	Kerala
		Pallivasal	70.00	
		Sengulam	48.00	
23	Idamalayar	Idamalayar	75.00	Kerala
24	Mettur	Mettur	370.00	Tamil Nadu
25	Periyar	Periyar	140.00	Tamil Nadu
	Sub-Total(SR)		7230.05	
Eastern Region				
26	Hirakud	Burla	275.50	Odisha
		Chiplima	72.00	
27	Balimela	Balimela	510.00	Odisha

28	Upper Indravati	Indravati	600.00	Odisha
29	Upper Kolab	Upper Kolab	320.00	Odisha
30	Rengali	Rengali	250.00	Odisha
31	Loktak	Loktak	105.00	Manipur
	Sub-Total(ER/NER)		2132.50	
	Total(All India)		19227.85	

Salient features of 31 Nos. reservoirs based H.E. Schemes are indicated in **Annex-3.1**. These schemes constitute about 48.69% of the total hydel installed capacity and generated about 40.04% of the total hydel generation during 2012-13 as briefly indicated in **Table-3.1**.

TABLE - 3.1

CONTRIBUTION BY IMPORTANT RESERVOIR BASED H.E. SCHEMES

S. No.	Description	Reservoir Schemes	Other Schemes	Total
1.	Installed Capacity (MW)	19227.85	20263.55	39491.40
2.	Percentage of Total (%)	48.69	51.31	100.00
3.	Energy Generation (MU)	45536.66	68183.63	113720.29
4.	Percentage of Total (%)	40.04	59.96	100.00

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 Bhakra, Pong, Ranjit Sagar and Tehri reservoirs snow melt in the catchment area during summer also contributes to their inflows. The inflows into the reservoirs during 2012-13 vis-à-vis 2011-12 are given at **Exhibit 3.1**. Inflows into the reservoirs and generation during the year 2012-13 vis-a-vis 2011-12 is given below at **Table-3.2**.

TABLE 3.2

RESERVOIR SCHEMES-INFLOW & ENERGY GENERATION

S. No.	SCHEME/ Region	Inflows			Generation		
		2011-12 (MCM)	2012-13 (MCM)	2012-13 Inflow as % of 2011-12 inflow	2011-12 (MU)	2012-13 (MU)	2012-13 generation as compared to 2011-12 (%)
1	2	3	4	5=(4/3*100)	6	7	8=(7/6*100)
	Northern Region						
1	Bhakra	19033.60	16247.24	85.36	7351.68	5900.09	80.25
2	Pong	9842.98	9869.49	100.27	1852.88	1824.07	98.45
3	Ranjit Sagar	7027.91	6172.22	87.82	1927.77	1429.90	74.17

4	Tehri	8694.28	7381.02	84.90	4591.3	4266.06	92.92
5	Ram Ganga	78056.02	16534.19	21.18	416.43	246.39	59.17
6	R.P.Sagar	3474.58	3011.29	86.67	641.08	641.15	100.01
7	Rihand	8533.75	5433.03	63.67	876.89	1084.99	123.73
Sub Total(NR)		134663.12	64648.48	48.01	17658.03	15392.65	87.17
	Western Region						
8	Ukai	8294.38	10838.93	130.68	457.57	628.45	137.35
9	Sardar Sarovar	35701.00	37388.56	104.73	4229.33	3698.29	87.44
10	Gandhi Sagar	5342.30	5051.29	94.55	293.73	274.64	93.50
11	Indira Sagar	31290.00	35298.00	112.81	3286.35	2895.96	88.12
12	Koyna	3959.89	3612.69	91.23	3885.41	3385.05	87.12
13	Bhira	1066.00	853.00	80.02	1008.08	855.64	84.88
Sub Total(WR)		85653.57	93042.47	108.63	13160.47	11738.03	89.19
	Southern Region						
14	Machkund	786.40	2452.10	311.81	485.33	565.52	116.52
15	Srisaillam	8822.25	4680.09	53.05	2600.84	828.74	31.86
16	N.J. Sagar	8673.16	3669.18	42.30	1354.11	256.10	18.91
17	Sharavathy	5637.65	4106.84	72.85	6527.14	5317.27	81.46
18	Supa	3669.79	2472.33	67.37	4225.72	2313.40	54.75
19	Almatti	16194.33	8327.73	51.42	521.15	420.84	80.75
20	Idukki	1851.43	871.99	47.10	3044.41	1575.05	51.74
21	Sabarigiri	875.14	456.08	52.12	1434.25	864.73	60.29
22	Madhupatty	175.54	19.43	11.07	754.49	516.94	68.52
23	Idamalayar	1563.52	755.11	48.30	348.98	249.92	71.61
24	Mettur	6150.46	2227.53	36.22	1027.14	362.78	35.32
25	Periyar	679.18	255.05	37.55	537.47	180.48	33.58
Sub Total(SR)		55078.85	30293.46	55.00	22861.03	13451.77	58.84
	Eastern Region						
26	Hirakud	33436.43	29623.51	88.60	1025.63	973.94	94.96
27	Balimela	2512.36	3894.76	155.02	1047.29	546.72	52.20
28	Upper Indravati	1558.50	2739.76	175.79	1436.86	1688.88	117.54
29	Upper Kolab	748.75	1979.19	264.33	604.24	451.11	74.66
30	Rengali	18991.32	11674.82	61.47	873.31	713.15	81.66

Sub Total(ER)	33124.52	49912.04	87.19	4987.33	4373.80	87.70
	North Eastern Region					
31	Loktak	753.70	1543.03	204.73	523.50	110.87
Sub Total(NER)	753.70	1543.03	204.73	523.50	580.41	110.87
Total (All India)	333396.60	239439.48	71.82	59190.36	45536.66	76.93

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 only at RP Sagar, Indira Sagar, Koyna, Bhira & Bhira PSS, Machkund, Almatti Dam, Hirakud, Rengali and Loktak reservoirs during 2012-13. Month wise maximum levels of major reservoirs during 2012-13 vis-à-vis 2011-12 are indicated at **Exhibits 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8 and 3.9.**

3.5 Generation :

Generation from reservoir based H.E. Stations during the year 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 12 Nos. out of 31 Nos. reservoir based hydel schemes, annual generation during the year 2012-13 was more than the annual generation targets. The reservoir based schemes 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 SCHEMES

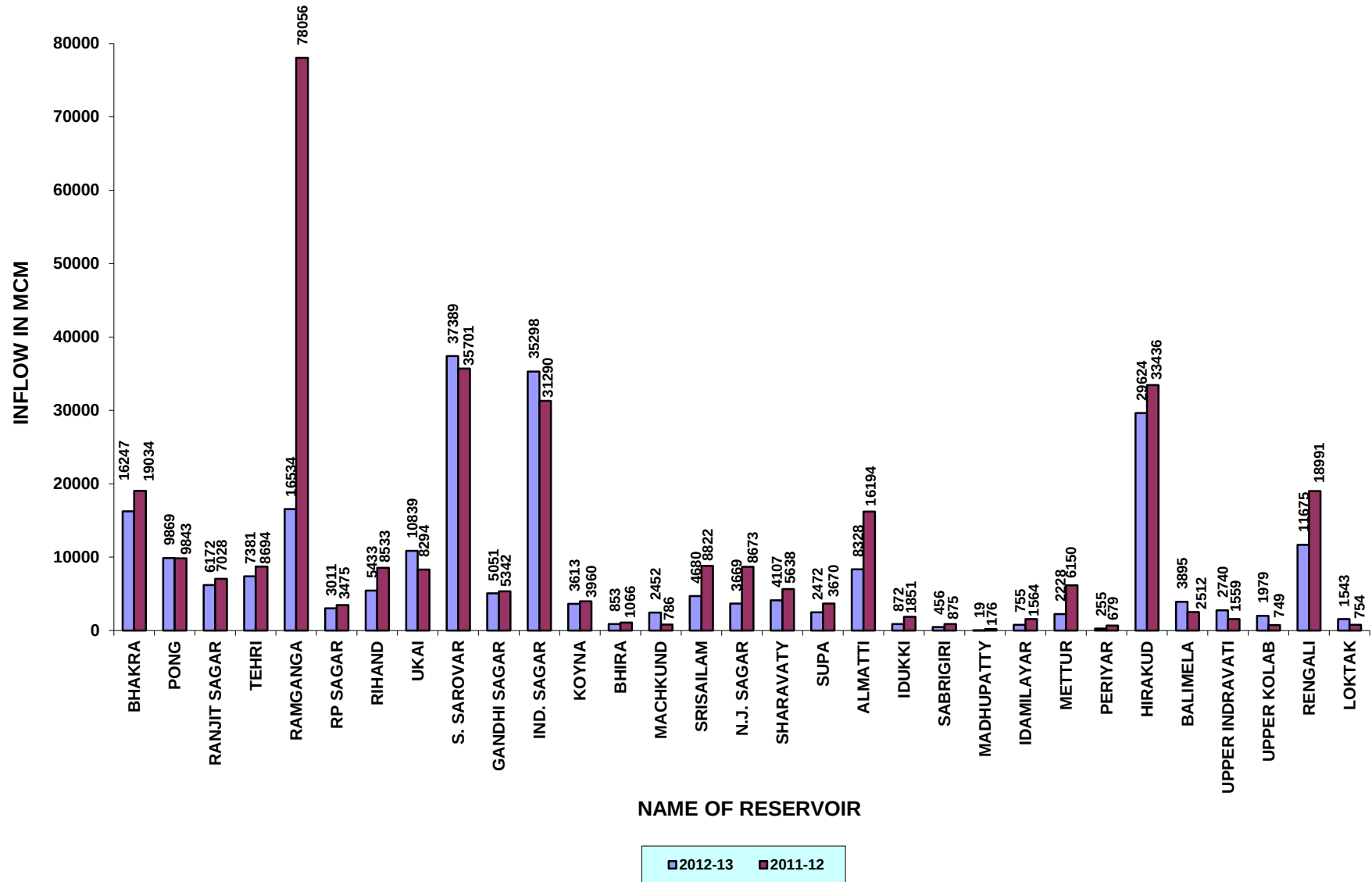
S. No.	% of actual generation over target	Name of the Reservoir Scheme
1	120 & Above	Pong, R P Sagar, Rihand, Ukai, Indira Sagar, Loktak.
2	110 - 120	Sardar Sarovar, Machkund, Rengali.
3	100 - 110	Bhakra, Tehri, Koyna.
4	Below 100	Ranjit Sagar, Ramganga, Gandhi Sagar, Bhira & Bhira PSS, NJ Sagar, Srisaillam, Sharavathy, Supa, Almatti, Idukki, Sabarigiri, Madhupatty, Idamalayar, Mettur, Periyar, Hirakud, Balimela, Upper Indravati, Upper Kolab.

Generation from 31 major reservoir schemes during the year 2012-13 has been 45536.66 MU showing decrease of 23.07% over the 2011-12 generation of 59190.36 MU. Scheme wise generation of reservoir schemes during the year 2012-13 compared to that of last year 2011-12 is shown in **Table 3.2** above.

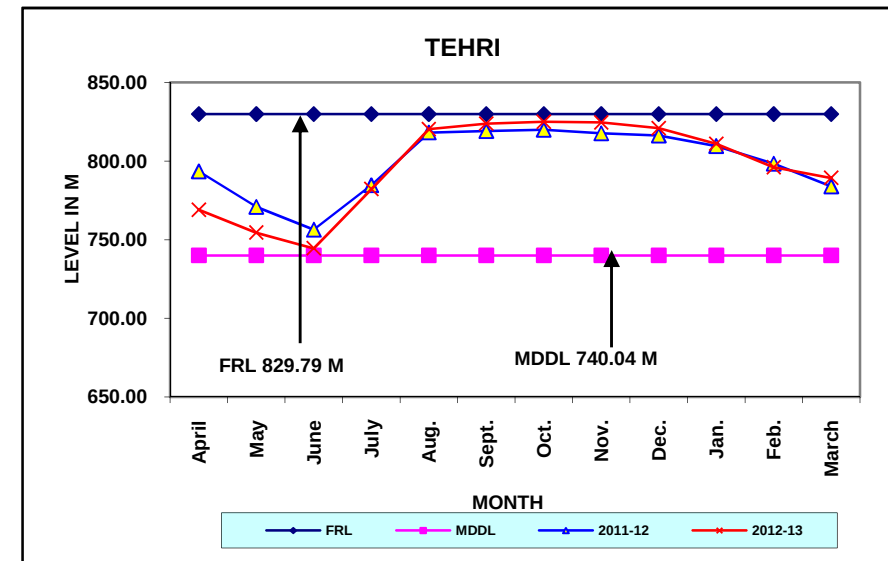
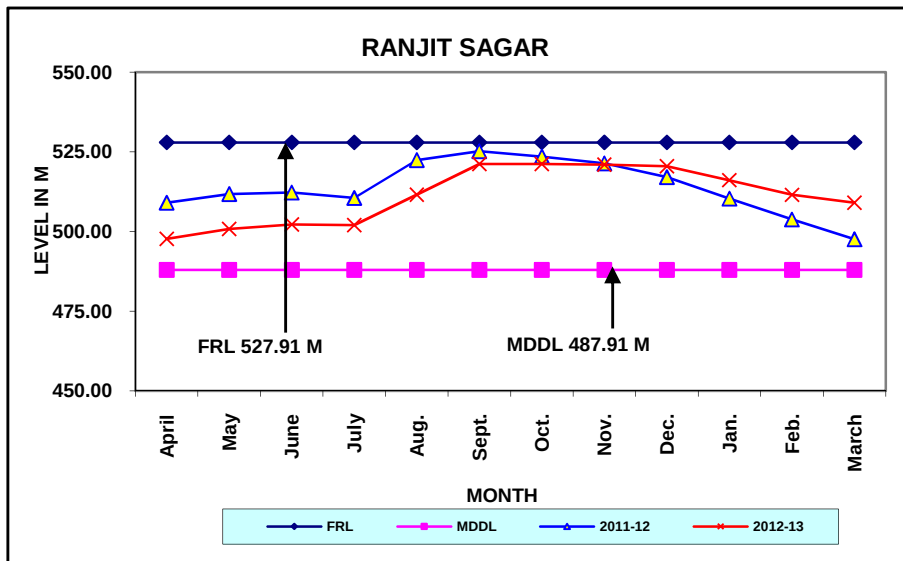
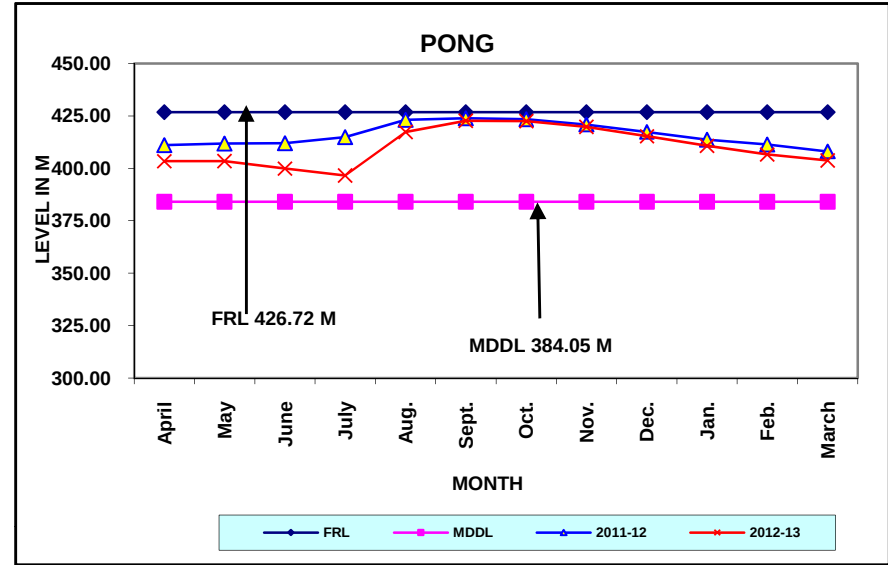
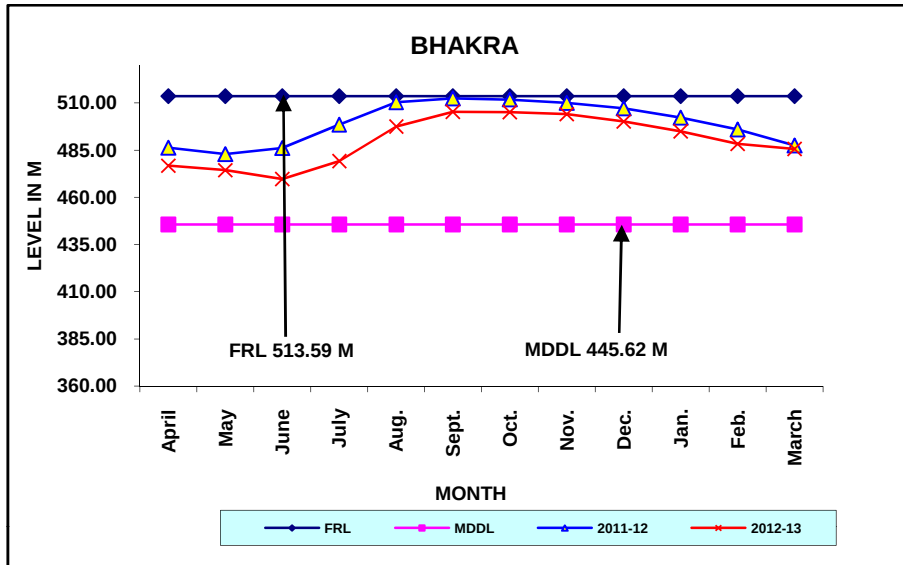
Generation of major reservoir based H.E. Schemes during 2012-13 as compared to the generation during last year i.e. 2011-12 is also depicted at **Exhibit-3.10.**

EXHIBIT 3.1

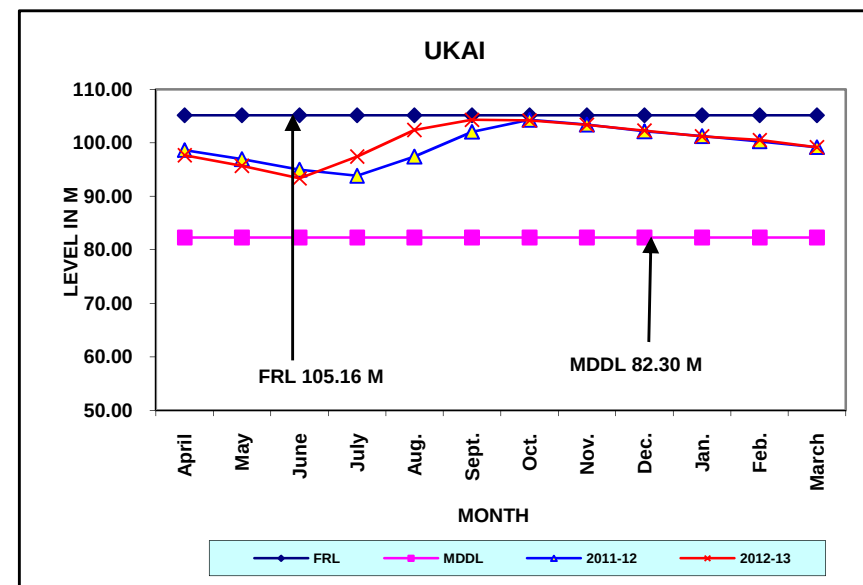
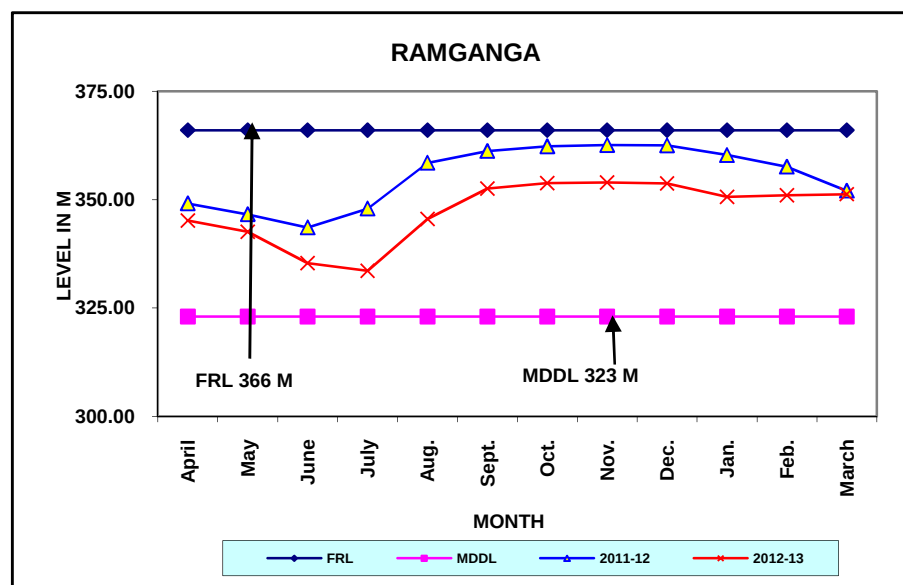
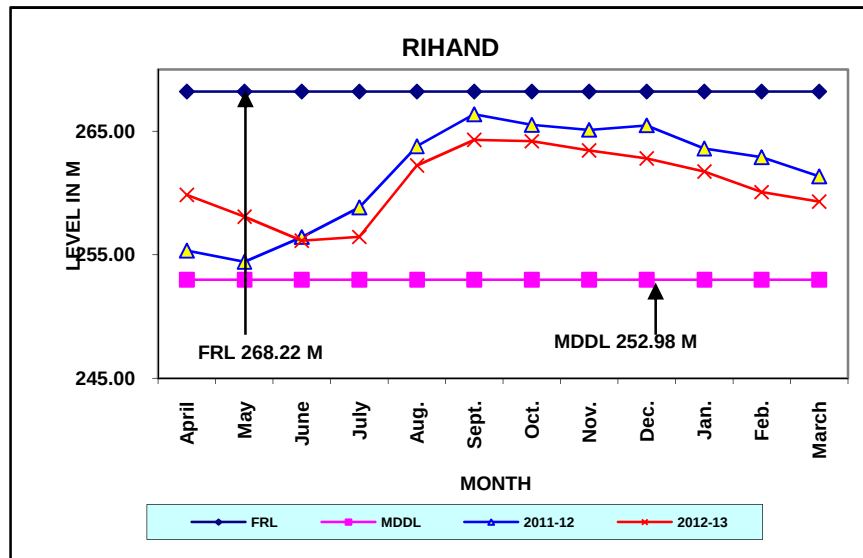
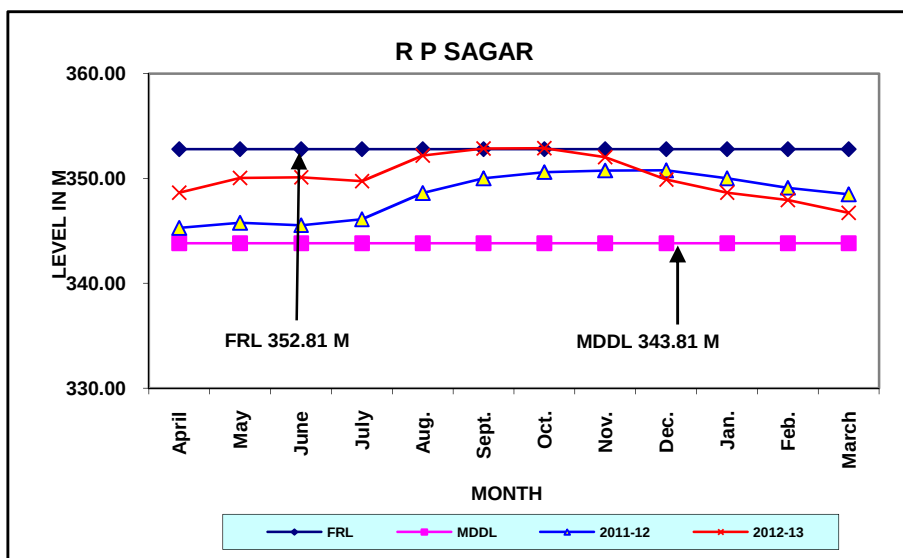
INFLOWS INTO MAJOR RESERVOIRS DURING 2012-13 VIS-A-VIS 2011-12



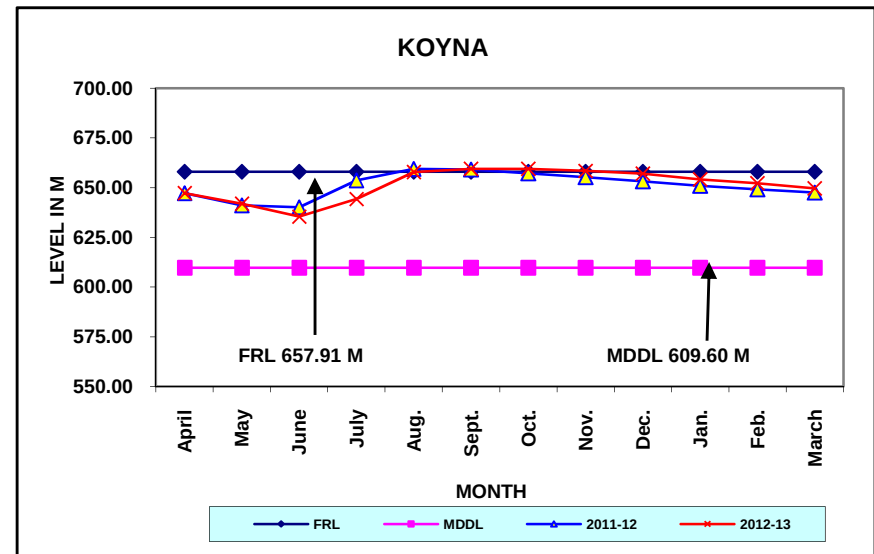
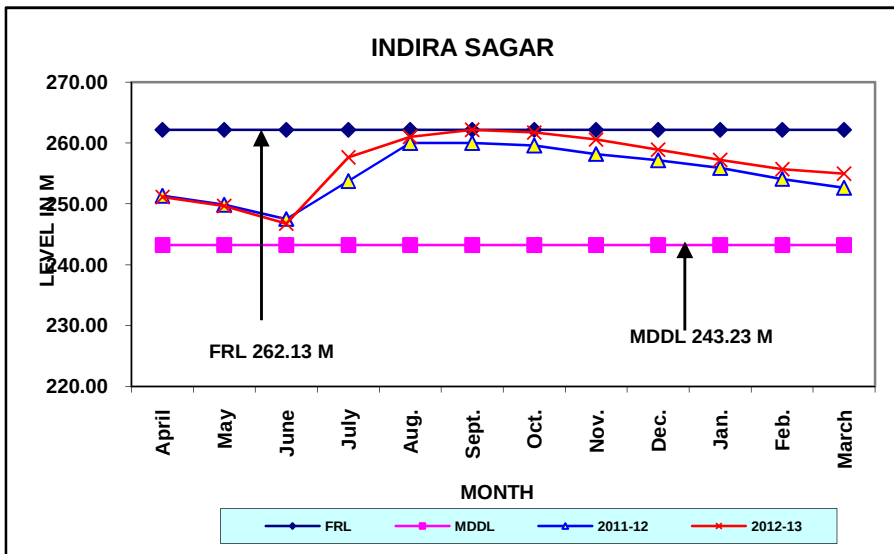
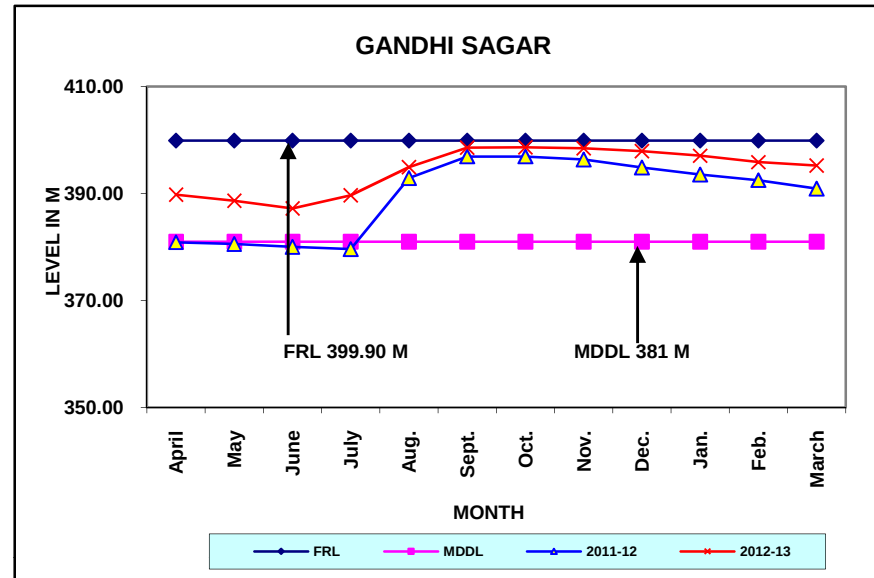
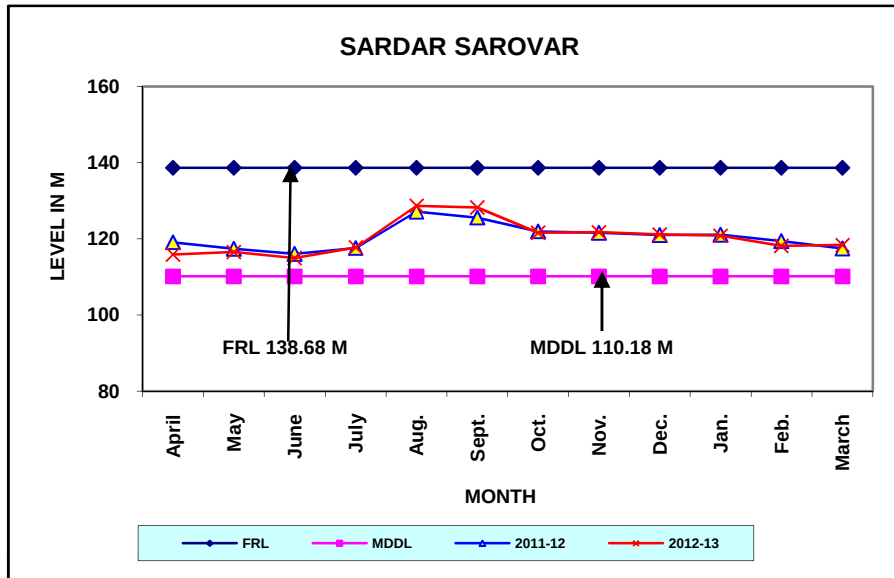
MONTHWISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS



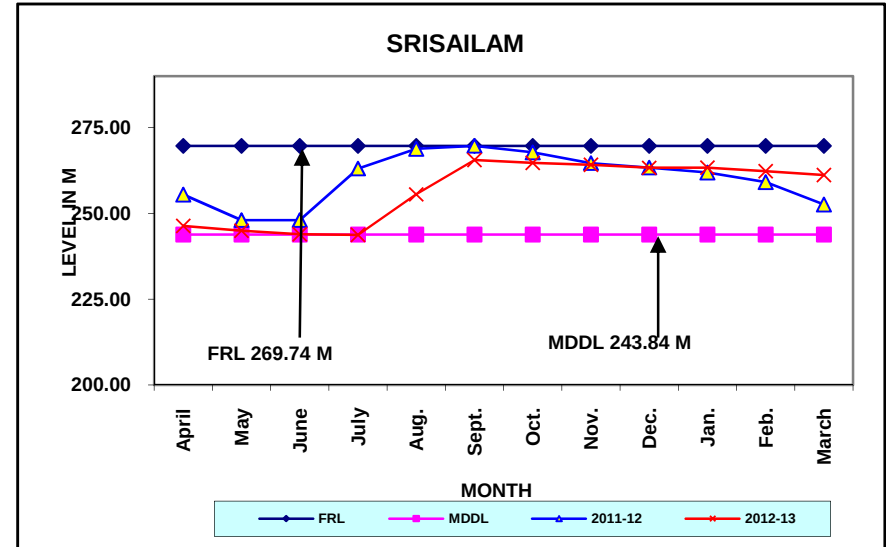
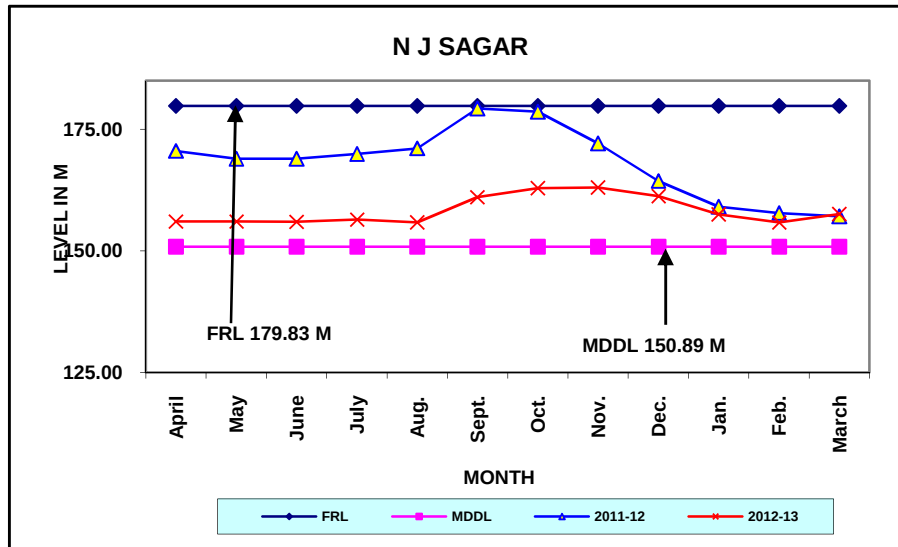
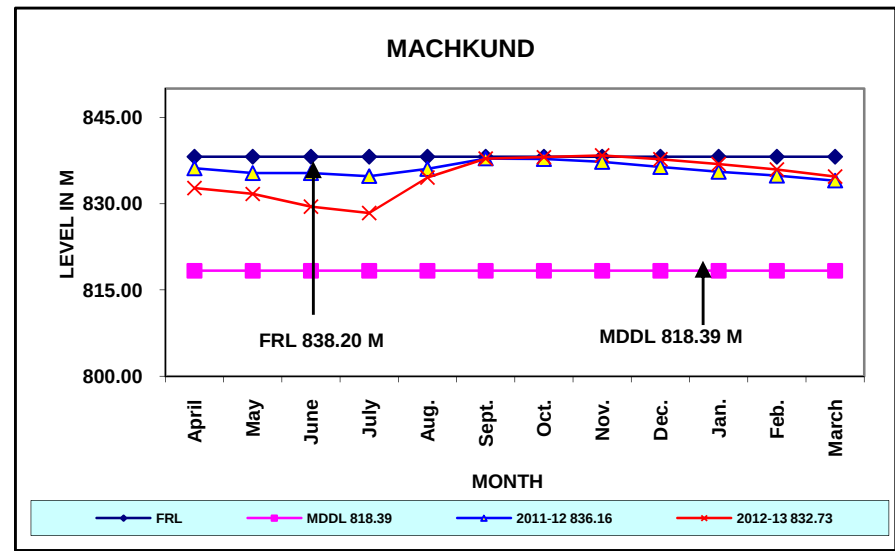
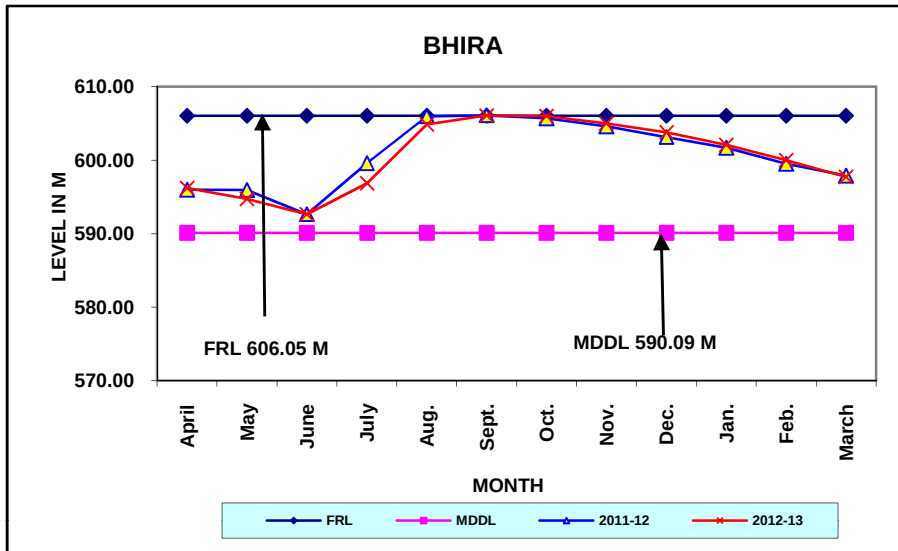
MONTHWISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS



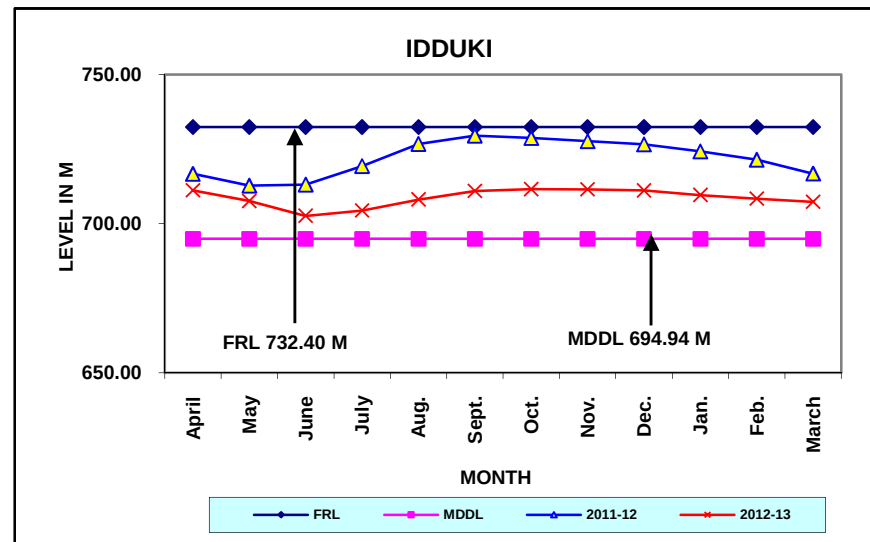
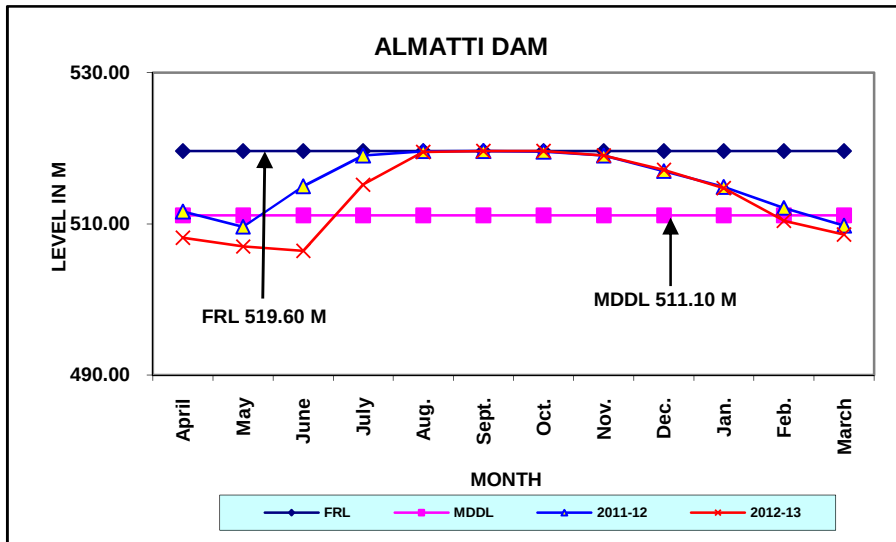
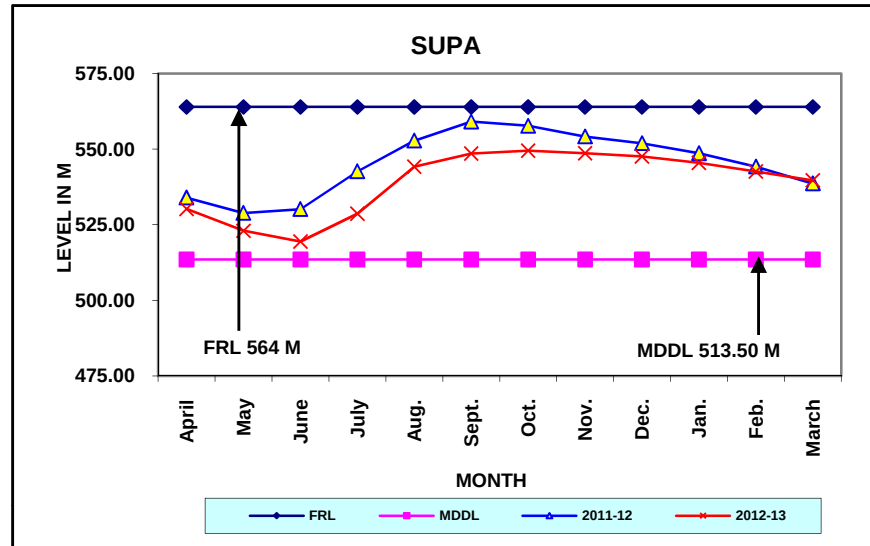
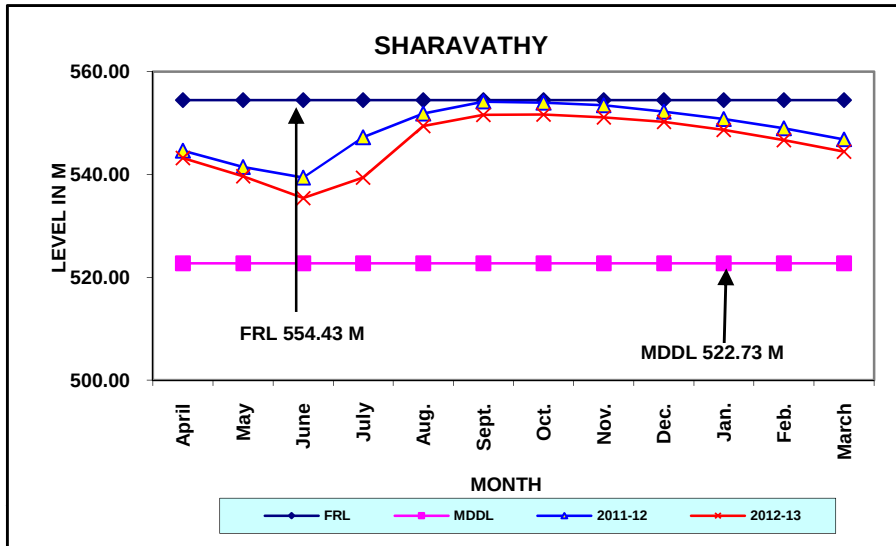
MONTHWISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS



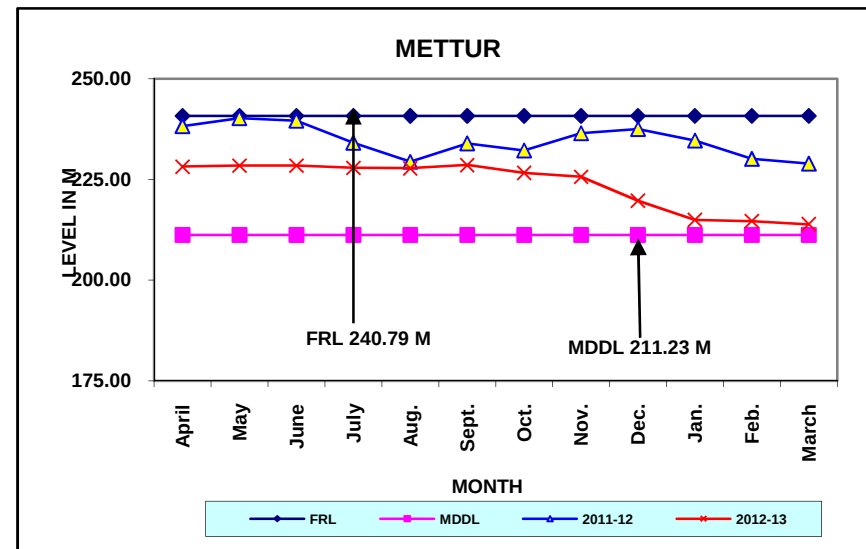
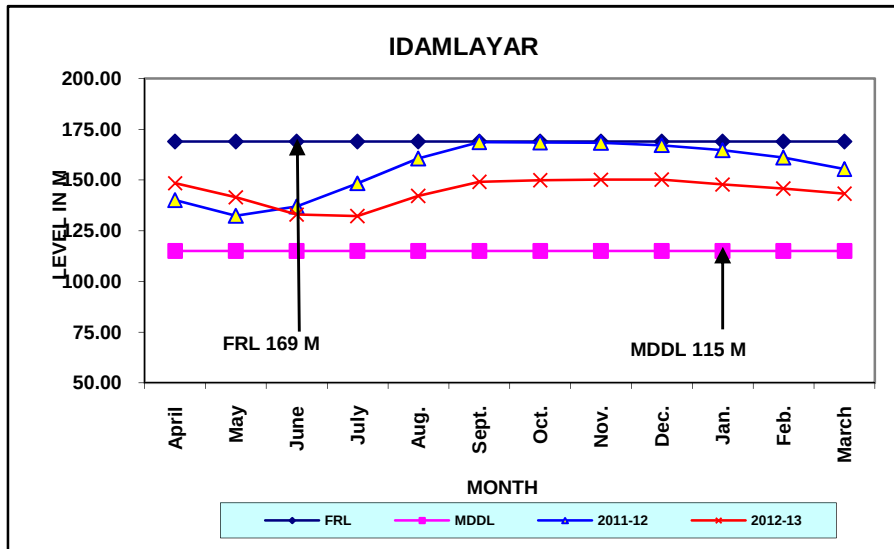
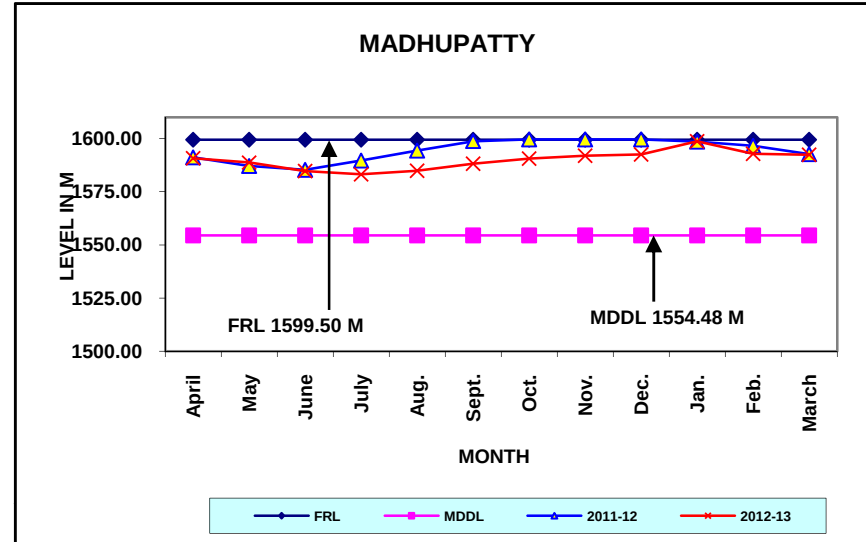
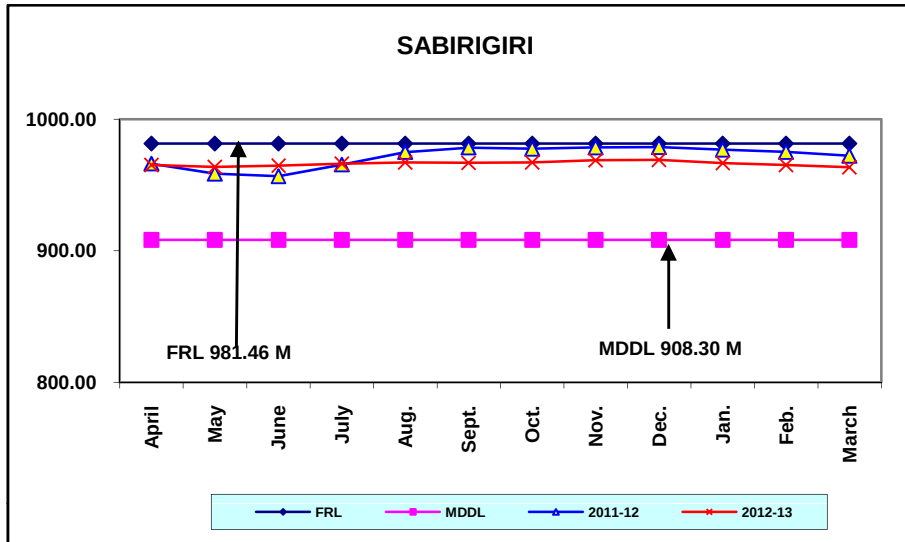
MONTHWISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS



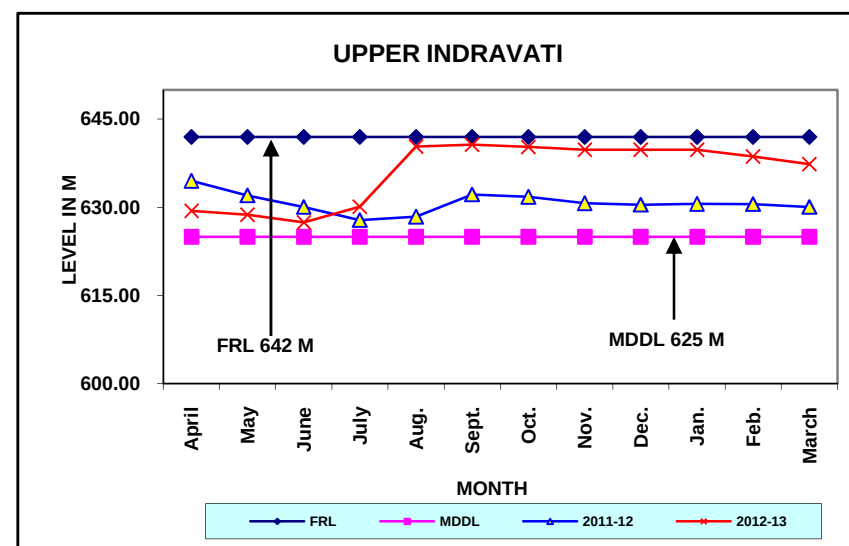
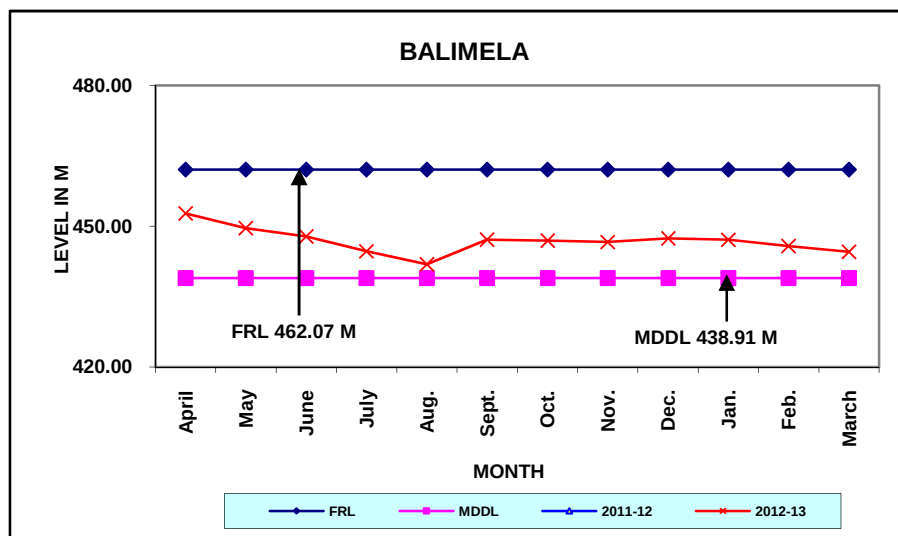
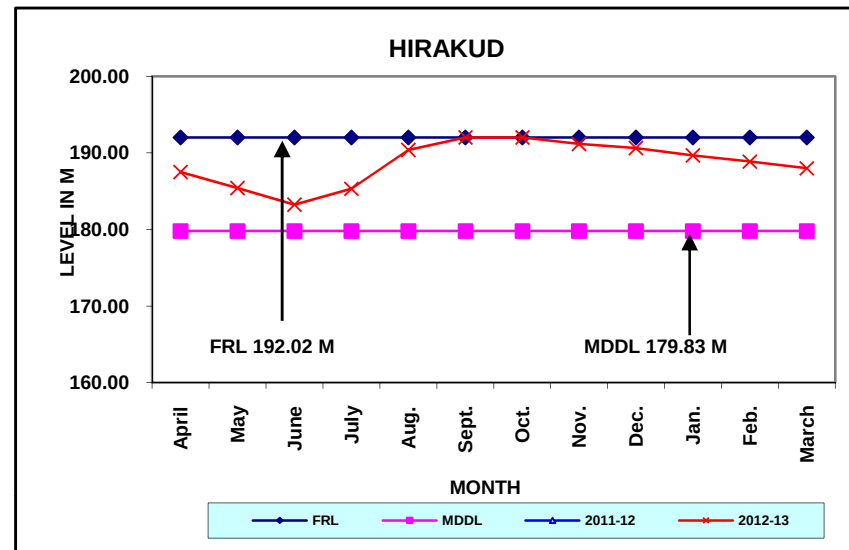
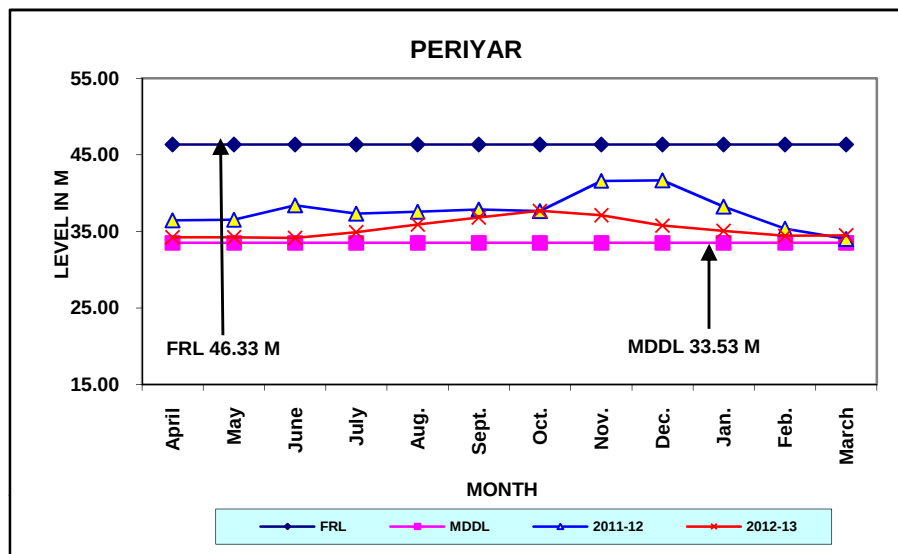
MONTHWISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS



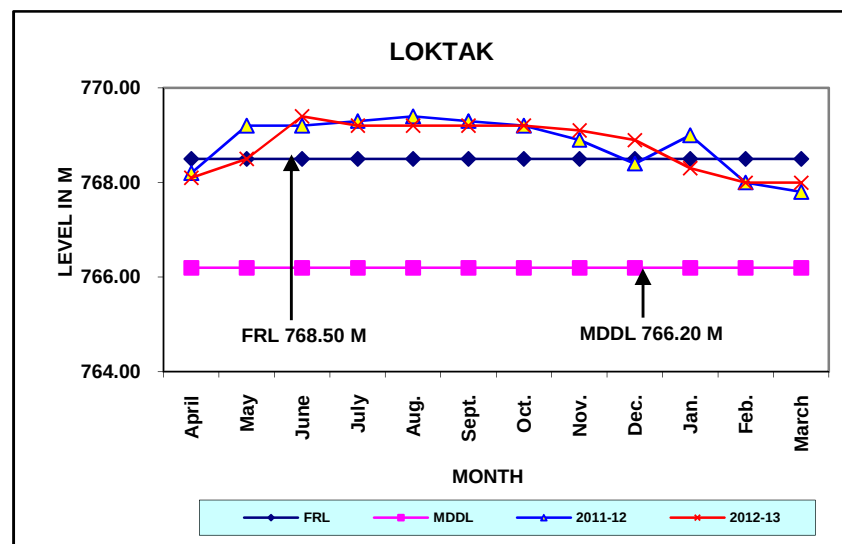
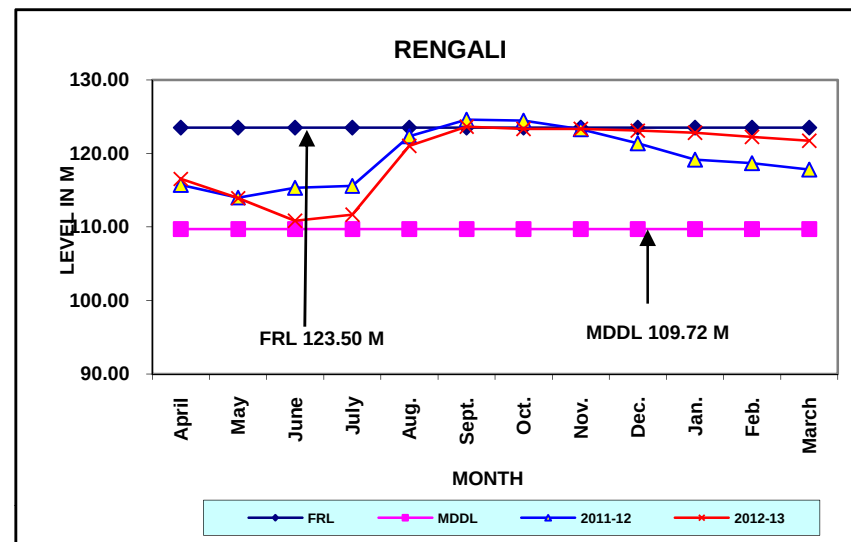
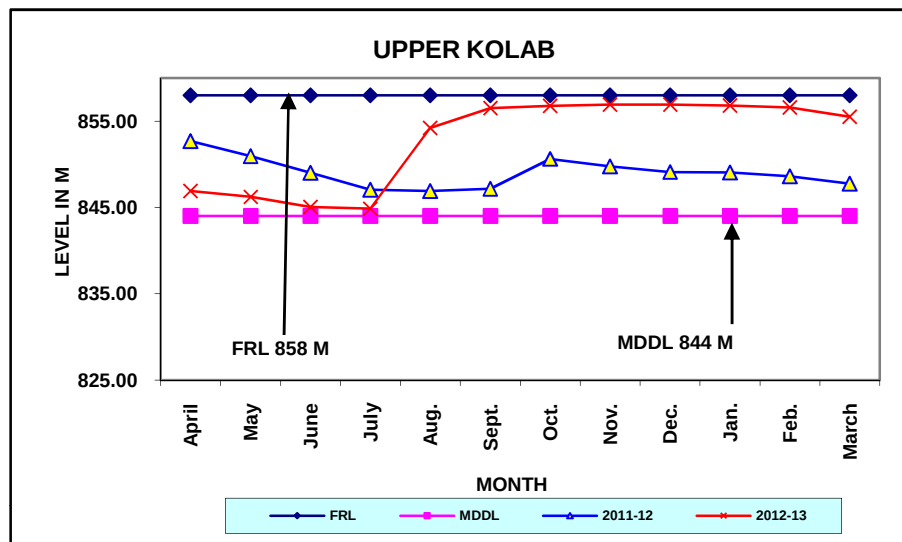
MONTHWISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS



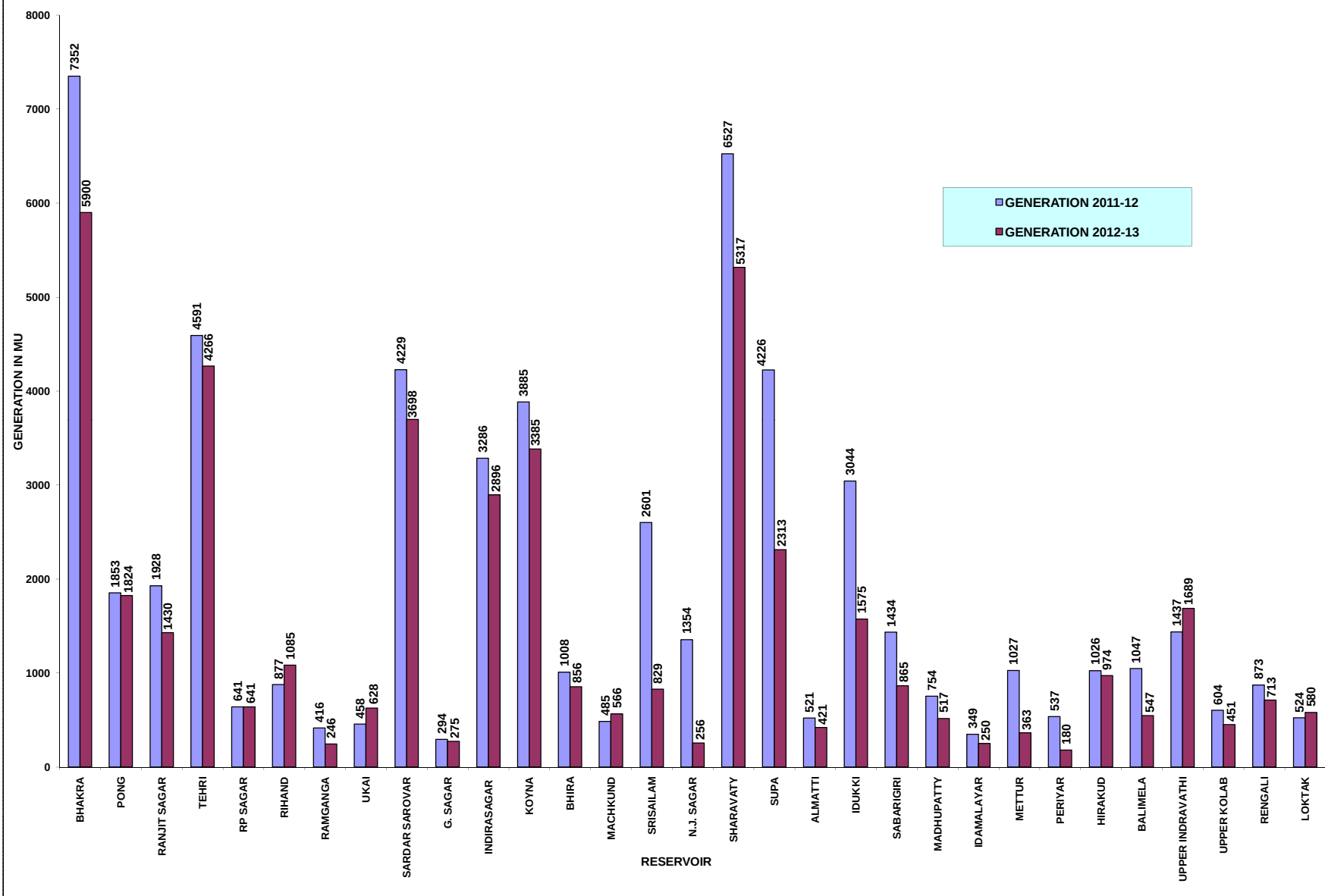
MONTHWISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS



MONTHWISE MAXIMUM LEVEL OF IMPORTANT RESERVOIRS



GENERATION FROM RESERVOIR BASED HYDROELECTRIC STATIONS DURING 2012-13 VIS-A-VIS 2011-12



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

S. No	NAME OF RESERVOIR AND ASSOCIATED H.E. STATIONS	INSTALLED CAPACITY AS ON 31.03.2013	ANNUAL DESIGN ENERGY	FULL RESERVOIR LEVEL	MINIMUM DRAW DOWN LEVEL	RESERVOIR		ENERGY CONTENT AT	LEVELS ATTAINED DURING 2012-13			
						CAP. AT			Max.	DATE	MINIMUM	DATE
						FRL						
						GROSS : LIVE	(MCM)	(MCM)				
NORTHERN REGION												
1	BHAKRA	1480.30	5282	513.59	445.62	8321	6516	1729.00	505.25	25.09.2012	465.59	21.06.2012
	a)BHAKRA LEFT	540.00	3924									
	b)BHAKRA RIGHT	785.00										
	c)GANGUWAL	77.65	1358									
	d)KOTLA	77.65										
2	PONG	396.00	1123	426.72	384.05	8053	6946	1084.00	422.63	28.09.2012	392.25	24.07.2012
3	RANJIT SAGAR	600.00	1507	527.91	487.91	3292	2191	390.00	521.19	02.10.2012	495.65	01.04.2012
4	TEHRI	1400.00	3952	829.79	740.04	3540	2615	1291.49	825.00	09.10.2012	740.45	10.06.2012
	a) TEHRI	1000.00	2797									
	b) KOTESHWAR	400.00	1155									
5	RAM GANGA	198.00	334	366	323	2503.96	2109.25	480.80	353.96	11.11.2012	329.62	30.06.2012
6	RP SAGAR	271.00	757	352.81	343.83	2901	1569	175.66	352.90	01.10.2012	345.68	31.03.2013
	a) RP SAGAR	172.00	459									
	b) JAWAHAR SAGAR	99.00	298									
7	RIHAND	399.00	1199	268.22	252.98	10605	5723	1177.00	264.30	25.09.2012	254.09	19.07.2012
	a)RIHAND	300.00	920									
	b)OBRA	99.00	279									
WESTERN REGION												
8	UKAI	300.00	1080	105.16	82.30	8515	6615	813.00	104.33	25.09.2012	91.51	04.07.2012
9	SARDAR SAROVAR	1450.00	3848	138.68	110.18	9460	5760	1817.553	128.63	09.08.2012	112.89	03.07.2012
	SARDAR SARO(CHPH)	250.00	213									
	SARDAR SARO(RBPH)	1200.00	3635									
10	GANDHI SAGAR	115.00	420	399.90	381.00	7743	6911	725.00	398.63	05.10.2012	386.99	04.07.2012
11	INDIRA SAGAR	1000.00	1980	262.13	243.23	12237	9706	1316.12	262.13	17.09.2012	243.79	09.07.2012
12	KOYNA	1956.00	3176	657.91	609.60	2797	2677	3126.00	659.39	13.10.2012	631.40	02.07.2012
	a)KOYNA-I&II	600.00	3030									
	b)KOYNA-III	320.00										
	c)KOYNA -IV	1000										
	d)KOYNA D.P.H.	36	146									
13	BHIRA	300	775	606.05	590.09	523	522	619	606.10	10.09.2012	590.65	01.07.2012
	a)BHIRA	150	775									
	a)BHIRA-PSS	150										
SOUTHERN REGION												
14	MACHKUND	114.75	670	838.20	818.39	970	893	552.00	838.38	04.11.2012	826.31	19.07.2012
15	SRISAILAM	1670.00	4300	269.74	243.84	8723	7166	1548.00	265.58	17.09.2012	242.23	31.07.2012
	a) SRISAILAM RB	770.00	2900									
	b) SRISAILAM LBPH	900.00	1400									
16	NAGARJUNA SAGAR	965.60	2497	179.83	150.89	11560	6538	1398.00	163.05	14.11.2012	155.37	31.08.2012
	a) NAGARJUNA SAGAR	815.60	2237									
	b) NJ. SAGAR RBC	60.00	156									
	c) NJ. SAGAR RBC EXT.	30.00										
	d) NJ. SAGAR LBC EXT.	60.00	104									

S. No	NAME OF RESERVOIR AND ASSOCIATED H.E. STATIONS	INSTALLED CAPACITY AS ON 31.03.2013	ANNUAL DESIGN ENERGY	FULL RESER-VOIR LEVEL	MINIMUM DRAW DOWN LEVEL	RESERVOIR		ENERGY CONTENT AT	LEVELS ATTAINED DURING 2012-13			
						CAP. AT			Max.	DATE	MINIMUM	DATE
						FRL						
						GROSS :	LIVE	FRL				
		(MW)	(MU)	(M)	(M)	(MCM)	(MCM)	(MU)	(M)	dd.mm.yyyy	(M)	dd.mm.yyyy
17	SHARAVATHY	1414.20	5672	554.43	522.73	5310	4297	4394.00	551.69	08.10.2012	531.89	17.06.2012
	a) SHARAVATHY	1035.00	4932									
	b) JOG	139.20	118									
	c) GERUSUPA	240.00	622									
18	SUPA	955.00	3927	564.00	513.50	4178	3758	3927.00	549.50	12.10.2012	515.42	30.06.2012
	a) KALINADI	855.00	3385									
	b) SUPA DPH	100.00	542									
19	ALMATTI	290.00	483	519.60	511.10	2631.5	2628	175.30	519.60	18.10.2012	505.98	30.06.2012
20	IDUKKI	780.00	2398	732.40	694.94	1996	1459	2146.00	711.65	24.10.2012	700.61	16.06.2012
21	SABARAGIRI	300.00	1338	981.46	908.30	454	447	764.00	968.95	02.12.2012	963.20	17.04.2012
22	MADHUPATTY	155.50	703	1599.50	1554.48		55.32	77.40	1598.70	31.01.2013	1581.30	30.06.2012
	a) PALLIVASAL	37.50	284									
	b) NARIAMANGLAM	70.00	237									
	c)SENGULAM	48.00	182									
23	IDAMALAYAR	75.00	380	169.00	115.00		1017.8	254.45	150.28	27.11.2012	128.56	01.07.2012
24	METTUR	370.00	793	240.79	211.23	2708.8	2645.2	204.00	228.58	18.09.2012	212.57	31.03.2013
	a) LOWER METTUR I-IV	120.00	252									
	b) METTUR DAM & TUNNEL	250.00	541									
25	PERIYAR	140.00	409	46.33	33.53	443	299	216.00	37.71	24.10.2012	33.57	01.04.2012
EASTERN REGION												
26	HIRAKUD	347.50	1174	192.02	179.83	4823	4709	372.00	192.02	10.10.2012	180.98	05.07.2012
	a) BURLA. P.H.	275.50	684									
	b) CHIPLIMA. P.H.	72.00	490									
27	BALIMELA	510.00	1183	462.07	438.91	3929	2676	898.00	459.98	07.12.2012	438.31	16.06.2012
28	UPPER INDRAVATI	600.00	1962	642.00	625.00	2300	1485.50	1213.14	640.69	17.09.2012	626.50	18.06.2012
29	UPPER KOLAB	320.00	832	858.00	844.00	1215	935.00	540.00	856.91	08.11.2012	844.88	31.07.2012
30	RENGALI	250.00	525	123.50	109.72	3548	3167.81	275.00	123.64	25.09.2012	109.52	17.06.2012
NORTH EASTERN REGION												
31	LOKTAK	105	448	768.50	766.20	435.91	396.44	250	769.40	03.06.2012	766.50	30.05.2012

CHAPTER 4

PLANNED MAINTENANCE OF THE UNITS

CHAPTER-4

PLANNED MAINTENANCE OF HE UNITS

4.1 For purpose of studies and analysis of performance in respect of availability of H.E.Stations, outage data of 634 generating units installed in 182 Hydro Electric Stations (39491.40 MW) was made available by various Organizations. The studies indicate that the average non-availability of hydro electric units due to planned maintenance during the year 2012-13 was 7.56% as compared to 7.43% during the previous year. A total of 464016 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 Capital maintenance was carried out on 23 generating units whereas annual maintenance was carried out on 234 generating units out of a total of 634 units analyzed. Analysis of various types of planned maintenance indicates that while most of the planned outages were carried out for periodic maintenance, many of these outages were utilized for carrying out certain repairs/modification works also. The actual duration of periodic maintenance works were quite different for various types of maintenance works. 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: 2012-13

S. No.	TYPE OF MAINTENANCE	NO. OF UNITS	DURATION	
			MAX. HOUR FOR ANY UNIT	AVERAGE HOURS
1	CAPITAL/3 YEARLY MTCE.	23	5054.42	986.39
2	ANNUAL MAINTENANCE	234	7982.50	795.07
3	HALF YEARLY MAINTENANCE	0	0.00	0.00
4	QUARTERLY MAINTENANCE	8	57.83	26.43
5	MONTHLY MAINTENANCE	135	2593.00	128.99
6	ROUTINE MAINTENANCE	28	3121.23	141.48
7	RENOVATION/MODERNISATION	17	3807.23	884.03
8	UPRATING	0	0.00	0.00

9	CIVIL STRUCTURE	86	1191.50	137.68
10	TURBINE	119	7890.00	172.33
11	GENERATOR	50	1463.98	63.03
12	OTHER EQUIPMENTS	89	3823.35	134.75
13	MISCELLANEOUS	174	3440.50	282.56

4.3.1 There were a total of 2495 planned outages during the Year 2012-13, out of which 1682 outages (about 67.41%) were of up to 12 hours of duration, 451 (18.08%) were of duration varying from 12 hours to 10 days and 362 outages (14.51%) 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: 2012-13**

S. No.	DURATION	NUMBER OF OUTAGES	MAINTENANCE % To TOTAL NUMBER OF OUTAGES
1	Less Than 1 Hour	146	5.85
2	1 To 6 Hours	755	30.26
3	6 To 12 Hours	781	31.30
4	12 To 24 Hours	125	5.01
5	1 To 2 Days	108	4.33
6	2 To 5 Days	119	4.77
7	5 To 10 Days	99	3.97
8	10 To 15 Days	67	2.69
9	15 To 20 Days	54	2.16
10	More than 20 Days	241	9.66
	Total No. of Outages	2495	100.00

4.4 Planned Maintenance age-wise

Planned maintenance carried out for different age groups of hydro generating units during the year 2012-13 is indicated in **Table 4.3**. It is seen that the average non-availability of units due to planned maintenance for units commissioned during 2009-10 was nil and was maximum in case of units commissioned during 2002-03 (1453.09 Hrs/unit).

TABLE 4.3
PLANNED MAINTENANCE AGE-WISE
PERIOD: 2012-13

S. NO.	YEAR OF COMMISSIONING	NO. OF UNITS	INSTALLED CAPACITY (MW)	PLANNED OUTAGE (HOURS)	NON AVAILABILITY PER UNIT (HOURS)
1	2012-13	14	501.00	1680	120.00
2	2011-12	11	1423.00	2568	233.45
3	2010-11	11	690.00	2208	200.73
4	2009-10	1	39.00	0	0.00
5	2008-09	8	969.00	1560	195.00
6	2007-08	23	2443.00	11208	487.30
7	2006-07	21	2286.00	23352	1112.00
8	2005-06	13	1340.00	3864	297.23
9	2004-05	13	1115.00	6624	509.54
10	2003-04	18	2690.00	3840	213.33
11	2002-03	11	740.60	15984	1453.09
12	2001-02	20	1092.20	8688	434.40
13	2000-01	13	1129.00	10608	816.00
14	1989-90 To 1999-00	87	5775.70	59808	687.45
15	1978-79 To 1988-89	124	7275.60	80664	650.52
16	1967-68 To 1977-78	82	5300.25	73272	893.56
17	Upto 1966-67	164	4682.05	158088	963.95
	TOTAL	634	39491.40	464016	731.89

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 below in **Table 4.4**.

The planned maintenance required by Bulb turbines was 982.50 Hrs/unit which was maximum amongst all other types of turbine. The planned maintenance required by Francis and Reversible type was 778.67 Hrs/unit, Pelton turbines was 651.69 Hrs/unit followed by Kaplan turbines (640.74 Hrs/unit).

TABLE 4.4

**PLANNED MAINTENANCE-TURBINE TYPE-WISE
PERIOD: 2012-13**

SL. NO.	TYPE OF TURBINE	NUMBER OF UNITS	INSTALLED CAPACITY (MU)	PLANNED OUTAGE (HOURS)	NON-AVAILABILITY PER UNIT (HOURS)
1	BULB	16	399.00	15720	982.50
2	FRANCIS AND REVERSIBLE	369	28632.30	287328	778.67
3	KAPLAN	119	4128.20	76248	640.74
4	PELTON	130	6331.90	84720	651.69
	TOTAL	634	39491.40	464016	731.89

4.6 Analysis Based on Make of Generating Units:

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: - 2012-13**

NAME OF SUPPLIER	NO. OF UNITS	INSTALLED CAPACITY (MW)	NON- AVAILABILITY DUE TO PLANNED MAINTENANCE	
			TOTAL HOURS	HOURS / UNIT
A-Indigenous				
BHEL	267	16197.00	188832	707.24
Others	11	459.00	672	61.09
SUB-TOTAL	278	16656.00	189504	681.67
B-Imported				
U.K.	64	1257.10	55104	861.00
CANADA	44	3132.00	27720	630.00
SWITZERLAND	22	815.20	14640	665.45
JAPAN	77	6544.20	64008	831.27
FRANCE	33	2186.40	28920	876.36

USSR	26	2804.00	14232	547.38
USA	9	351.00	1200	133.33
Other	81	5745.50	68688	848.00
SUB-TOTAL	356	22835.40	274512	771.10
TOTAL	634	39491.4	464016	731.89

Among indigenous manufacturers, BHEL is the main manufacturer/ supplier of major/medium hydro generating units in the country. During the year 2012-13, non-availability due to planned maintenance of the units supplied by BHEL was 707.24 hrs/unit.

Among the imported generating units, non-availability due to planned maintenance was the least for units supplied by USA (133.33 hrs/unit) and was maximum for units supplied by France (876.36 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: 2012-13

S. NO.	REGION	NO. OF UNITS	INSTALLED CAPACITY (MW)	% NON-AVAILABILITY DUE TO PLANNED MAINTENANCE
1	NORTHERN	206	15523.25	9.07
2	WESTERN	101	7392.00	6.17
3	SOUTHERN	239	11387.45	7.09
4	EASTERN	59	3946.70	6.25
5	NORTH EASTERN	29	1242.00	5.32
	ALL INDIA	634	39491.40	7.56

Non-availability of generating unit due to planned maintenance was least in Eastern Region (5.32 %), whereas it was maximum in Northern Region (9.07 %).

4.8 Planned Maintenance - Board/ Corporation wise

Performance of hydro electric units under various utilities i.e. Central Sectors, State Electricity Boards, Corporations and Private Sector with respect to non-availability due to

planned maintenance is indicated in Table 4.7. Among utilities, planned maintenance of the generating units was nil in case of hydro stations under SJVNL, DLHP, MPCL & APGPCL and maximum under JSEB (3948 Hrs/unit).

In case of Central Sector, non-availability due to planned maintenance was maximum under BBMB (906.86 hrs/unit).

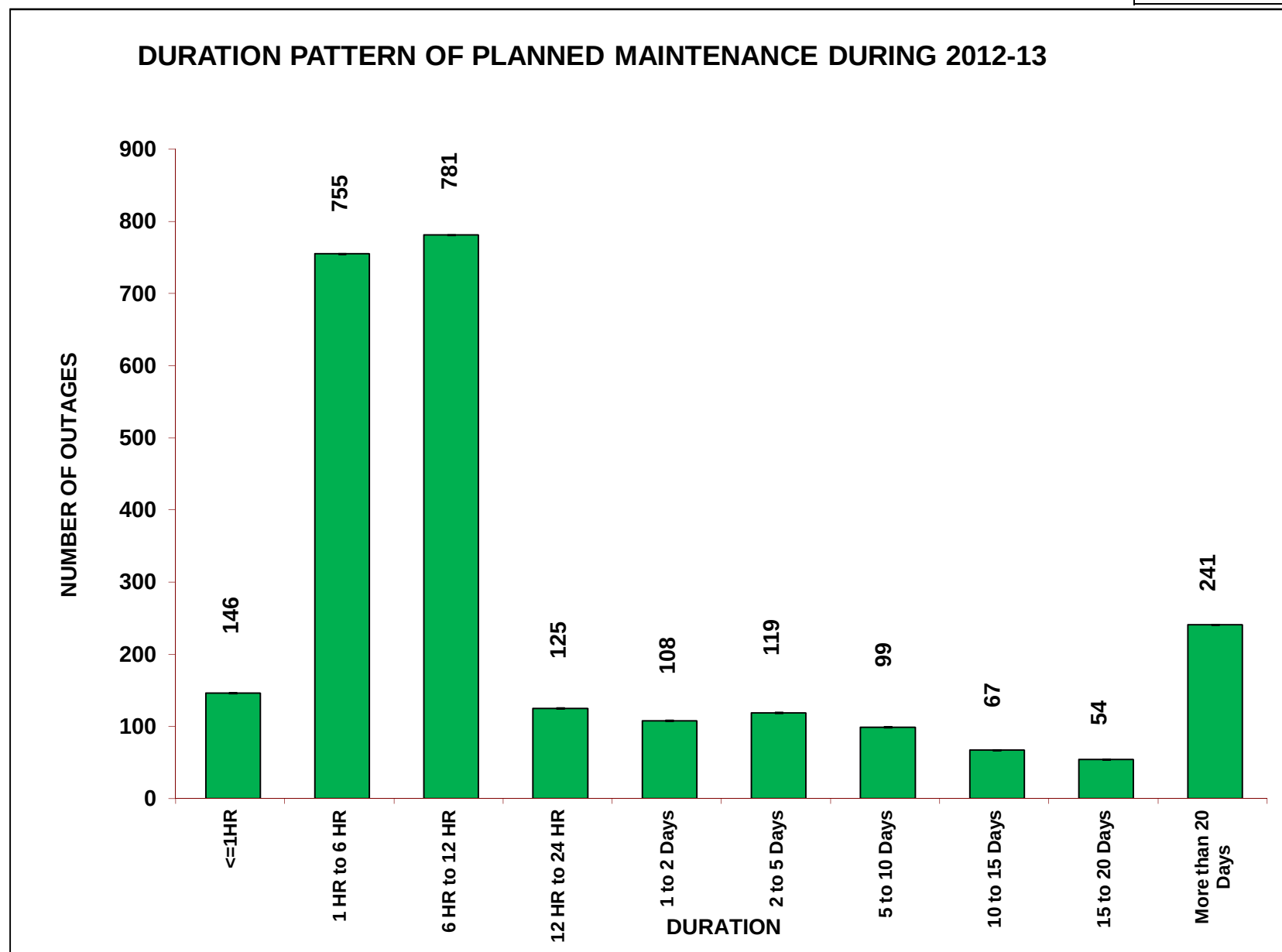
In case of Private Sector, non-availability due to planned maintenance was maximum under EPPL (600 hrs/unit).

Table 4.7

**SECTORWISE/ UTILITYWISE PERFORMANCE PLANNED MAINTENANCE
PERIOD:-2012-13**

Sl. No.	ORGANIZATION	NUMBER OF UNITS	INSTALLED CAPACITY (MW)	PLANNED MAINTENANCE (HOURS)	PLANNED MAINTENANCE PER UNIT (HOURS)
(A)	CENTRAL SECTOR				
1	BBMB	28	2866.30	25392	906.86
2	DVC	5	143.20	120	24.00
3	NEEPCO	13	755.00	9384	721.85
4	NHDC	16	1520.00	4104	256.50
5	NHPC	51	4141.20	27168	532.71
6	SJVNL	6	1500.00	0	0.00
7	THDC	8	1400.00	2184	273.00
	SUB TOTAL (CS)	127	12325.70	68352	538.20
(B)	PRIVATE SECTOR				
1	ADHPL	2	192.00	24	12.00
2	DLHP	1	34.00	0	0.00
3	EPPL	2	100.00	1200	600.00
4	JPVL	11	1700	1392	126.55
5	LGPPPL	2	70.00	1128	564.00
6	MPCL	2	86.00	0	0.00
7	TATA	15	447.00	336	22.40
	SUB TOTAL (PVT)	35	2629.00	4080	116.57
(C)	STATE SECTOR				
1	APGENCO	57	3783.35	21384	375.16
2	APGCL	2	100.00	0	0.00
3	CSPGCL	3	120.00	1152	384.00

4	GSECL	8	540.00	11688	1461.00
5	HPSEB Ltd.	12	366.00	33048	2754.00
6	JKSPDC	9	660.00	9264	1029.33
7	JSEB	2	130.00	7896	3948.00
8	KPCL	68	3585.40	49368	726.00
9	KSEB	48	1881.50	35376	737.00
10	MAHAGENCO	24	2406.00	20040	835.00
11	MeECL	11	282.00	5640	512.73
12	MPPGCL	23	875.00	10536	458.09
13	OHPC	31	2027.50	19944	643.35
14	PSPCL	25	1051.00	18864	754.56
15	RRVUNL	11	411.00	13128	1193.45
16	SSNNL	11	1450.00	3264	296.73
17	TANGEDCO	67	2137.20	56640	845.37
18	UJVNL	34	1252.15	30720	903.53
19	UPJVNL	15	501.60	31608	2107.20
20	WBSEDCL	11	977.00	12024	1093.09
	SUB TOTAL (State)	472	24536.70	391584	829.63
	ALL INDIA	634	39491.40	464016	731.89



**DETAILS OF LONG DURATION PLANNED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 50 HOURS AND ABOVE)**

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
<u>NORTHERN REGION</u>							
<u>BBMB</u>							
1	BHAKRA LEFT H P S	3	108	19/02/2013	31/03/2013	942.67	TURBINE MISC/GOVERNOR
		4	108	06/07/2012	09/07/2012	77.75	PLANNED MAINTENANCE
2	DEHAR H P S	2	165	23/07/2012	27/07/2012	89.05	ROUTINE MAINTENANCE
		3	165	10/07/2012	16/07/2012	141.02	B.F.VALVE
		3	165	02/08/2012	01/12/2012	2913.78	PLANNED MAINTENANCE
		4	165	24/09/2012	27/09/2012	78.75	B.F.VALVE
		4	165	01/04/2012	31/07/2012	2921.7	CAPITAL/3 YEARLY MTCE.
3	GANGUWAL HPS	1	29.25	02/04/2012	04/04/2012	57.75	PLANNED MAINTENANCE
		2	24.2	16/07/2012	20/07/2012	104.92	PLANNED MAINTENANCE
		2	24.2	16/04/2012	20/04/2012	100.67	ANNUAL MAINTENANCE
		3	24.2	22/08/2012	25/08/2012	84	PLANNED MAINTENANCE
4	KOTLA HPS	2	24.2	03/09/2012	05/09/2012	56.48	PLANNED MAINTENANCE
		3	24.2	10/09/2012	17/09/2012	174.92	ANNUAL MAINTENANCE
<u>EPPL</u>							
5	MALANA-II HPS	1	50	01/04/2012	20/05/2012	1189.63	PRESSURE SHAFT/PENSTOCK
<u>HPSEB LTD.</u>							
6	BASSI HPS	1	15	01/04/2012	05/09/2012	3784.33	CAPITAL/3 YEARLY MTCE.
		2	15	01/04/2012	09/07/2012	2389	CAPITAL/3 YEARLY MTCE.
		3	15	01/04/2012	09/07/2012	2389	MONTHLY MAINTENANCE
		3	15	15/09/2012	05/02/2013	3435.83	MISCELLANROUS
		4	15	01/04/2012	09/07/2012	2389	MONTHLY MAINTENANCE
7	GIRI BATA HPS	1	30	01/04/2012	22/04/2012	517	ANNUAL MAINTENANCE
		1	30	17/12/2012	24/01/2013	917.58	MISCELLANROUS
		2	30	01/05/2012	11/06/2012	1000.83	ANNUAL MAINTENANCE
8	LARJI HPS	1	42	12/11/2012	31/03/2013	3326	ANNUAL MAINTENANCE
		1	42	01/04/2012	06/04/2012	137.33	ANNUAL MAINTENANCE
		2	42	01/04/2012	09/07/2012	2389	ANNUAL MAINTENANCE
		3	42	14/01/2013	31/03/2013	1812.25	ANNUAL MAINTENANCE
9	SANJAY HPS	1	40	01/04/2012	09/04/2012	207.42	ANNUAL MAINTENANCE
		1	40	14/02/2013	20/02/2013	151.33	CAPITAL/3 YEARLY MTCE.
		2	40	01/07/2012	23/02/2013	5708.08	ANNUAL MAINTENANCE
		2	40	01/04/2012	26/05/2012	1330.75	ANNUAL MAINTENANCE

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		3	40	01/07/2012	22/07/2012	524.17	ANNUAL MAINTENANCE
		3	40	14/02/2013	20/02/2013	152.5	CAPITAL/3 YEARLY MTCE.
<u>JKSPDC</u>							
10	UPPER SINDH-II HPS	4	35	10/06/2012	15/06/2012	121.45	MISCELLANROUS
<u>JPVL</u>							
11	KARCHAM WANGTOO HPS	2	250	26/08/2012	29/08/2012	78.65	MISCELLANROUS
		4	250	21/12/2012	08/02/2013	1191.5	TRI/TRC/DRAFT TUBE
12	VISHNU PRAYAG HPS	3	100	29/10/2012	31/10/2012	59.83	TURBINE
		4	100	14/10/2012	18/10/2012	88.38	TURBINE
<u>LGPPPL</u>							
13	BUDHIL HPS	1	35	08/08/2012	10/08/2012	50.83	MISCELLANROUS
		1	35	05/12/2012	21/12/2012	407.98	ANNUAL MAINTENANCE
		1	35	06/06/2012	14/06/2012	205.12	MISCELLANROUS
		2	35	05/12/2012	21/12/2012	407.98	ANNUAL MAINTENANCE
<u>NHPC</u>							
14	BAIRA SIUL HPS	1	66	05/12/2012	11/12/2012	159.98	ANNUAL MAINTENANCE
		2	66	29/10/2012	11/11/2012	308.8	PLANNED MAINTENANCE
15	CHAMERA- I HPS	1	180	01/02/2013	08/02/2013	183.25	ANNUAL MAINTENANCE
		2	180	23/12/2012	31/12/2012	203.08	ANNUAL MAINTENANCE
16	CHAMERA- II HPS	1	100	13/02/2013	06/03/2013	518.17	ANNUAL MAINTENANCE
		3	100	24/01/2013	27/01/2013	73.35	PLANNED MAINTENANCE
17	CHAMERA-III HPS	1	77	23/01/2013	29/01/2013	162.33	ANNUAL MAINTENANCE
		3	77	14/12/2012	16/12/2012	58.43	MISCELLANROUS
		3	77	26/10/2012	30/10/2012	95.87	MISCELLANROUS
		3	77	15/10/2012	23/10/2012	198.6	MISCELLANROUS
18	DHAULI GANGA HPS	1	70	01/04/2012	03/04/2012	60.92	TURBINE
		1	70	11/12/2012	29/12/2012	444.23	PLANNED MAINTENANCE
		2	70	04/01/2013	21/01/2013	414.5	PLANNED MAINTENANCE
		3	70	20/02/2013	10/03/2013	434.83	PLANNED MAINTENANCE
		4	70	26/01/2013	11/02/2013	389.25	ANNUAL MAINTENANCE
19	DULHASTI HPS	1	130	02/01/2013	01/03/2013	1414.82	ANNUAL MAINTENANCE
		2	130	15/01/2013	11/03/2013	1340.98	ANNUAL MAINTENANCE
		3	130	15/01/2013	02/03/2013	1119.43	ANNUAL MAINTENANCE
20	SALAL-I HPS	3	115	20/11/2012	22/12/2012	767.02	ANNUAL MAINTENANCE
21	SALAL-II HPS	4	115	19/10/2012	19/02/2013	2964.63	CAPITAL/3 YEARLY MTCE.
		6	115	27/02/2013	24/03/2013	602.33	ANNUAL MAINTENANCE

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
22	SEWA-II HPS	2	40	01/02/2013	18/02/2013	417.78	ANNUAL MAINTENANCE
		3	40	17/12/2012	05/01/2013	458	ANNUAL MAINTENANCE
23	TANAKPUR HPS	2	31.4	20/11/2012	22/12/2012	778.2	ANNUAL MAINTENANCE
		3	31.4	28/12/2012	31/03/2013	2221.5	CAPITAL/3 YEARLY MTCE.
<u>PSPCL</u>							
23	ANANDPUR SAHIB-I HPS	1	33.5	15/11/2012	16/12/2012	734.22	ANNUAL MAINTENANCE
24	ANANDPUR SAHIB-II HPS	4	33.5	01/12/2012	11/12/2012	250.83	ANNUAL MAINTENANCE
25	MUKERIAN-I HPS	1	15	04/04/2012	01/05/2012	657.42	ANNUAL MAINTENANCE
26	MUKERIAN-II HPS	4	15	17/05/2012	19/05/2012	50.13	PLANNED MAINTENANCE
		4	15	25/05/2012	01/06/2012	164.58	PLANNED MAINTENANCE
		5	15	06/04/2012	18/04/2012	304.08	PLANNED MAINTENANCE
27	MUKERIAN-III HPS	8	19.5	04/04/2012	03/05/2012	701.18	PLANNED MAINTENANCE
28	RANJIT SAGAR HPS	1	150	01/04/2012	08/06/2012	1646.88	ANNUAL MAINTENANCE
		2	150	01/04/2012	29/04/2012	683.92	ANNUAL MAINTENANCE
		4	150	18/03/2013	31/03/2013	301.75	ANNUAL MAINTENANCE
		4	150	01/04/2012	09/06/2012	1675.25	ANNUAL MAINTENANCE
29	SHANAN HPS	1	15	20/10/2012	31/10/2012	271.9	ANNUAL MAINTENANCE
		1	15	18/09/2012	20/09/2012	53.17	MONTHLY MAINTENANCE
		1	15	01/11/2012	14/11/2012	329	ANNUAL MAINTENANCE
		2	15	01/12/2012	10/12/2012	231	ANNUAL MAINTENANCE
		2	15	15/11/2012	30/11/2012	375.48	ANNUAL MAINTENANCE
		3	15	11/12/2012	04/01/2013	579.92	ANNUAL MAINTENANCE
		4	15	05/01/2013	30/01/2013	607.25	ANNUAL MAINTENANCE
<u>RRVUNL</u>							
30	JAWAHAR SAGAR HPS	1	33	02/05/2012	31/03/2013	7982.5	ANNUAL MAINTENANCE
		3	33	02/04/2012	30/04/2012	680.83	ANNUAL MAINTENANCE
31	MAHI BAJAJ-I HPS	1	25	12/04/2012	16/05/2012	814.08	PLANNED MAINTENANCE
32	R P SAGAR HPS	1	43	02/04/2012	04/05/2012	772.45	ANNUAL MAINTENANCE
		2	43	05/05/2012	15/06/2012	989.23	ANNUAL MAINTENANCE
		3	43	12/07/2012	03/08/2012	534.67	ANNUAL MAINTENANCE
		4	43	01/06/2012	27/07/2012	1349.5	ANNUAL MAINTENANCE
<u>THDC</u>							
33	KOTESHWAR HPS	2	100	22/04/2012	23/05/2012	750.92	MISCELLANROUS
		3	100	07/05/2012	10/05/2012	75.08	MISCELLANROUS
34	TEHRI ST-1 HPS	1	250	15/04/2012	30/04/2012	373.98	ANNUAL MAINTENANCE
		3	250	01/04/2012	12/04/2012	276.95	PLANNED MAINTENANCE

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		3	250	11/03/2013	24/03/2013	315.5	PLANNED MAINTENANCE
		4	250	02/05/2012	18/05/2012	393.75	ANNUAL MAINTENANCE
<u>UJVNL</u>							
35	CHIBRO (YAMUNA) HPS	1	60	05/07/2012	07/07/2012	51.67	ANNUAL MAINTENANCE
		2	60	16/03/2013	31/03/2013	349.5	PLANNED MAINTENANCE
		2	60	01/04/2012	30/04/2012	719.98	ANNUAL MAINTENANCE
		2	60	20/11/2012	28/11/2012	196.33	ANNUAL MAINTENANCE
		3	60	27/11/2012	30/01/2013	1539	ANNUAL MAINTENANCE
		4	60	10/12/2012	31/03/2013	2654.67	ANNUAL MAINTENANCE
		4	60	17/06/2012	01/07/2012	331.17	ANNUAL MAINTENANCE
		4	60	01/04/2012	15/06/2012	1816.75	ANNUAL MAINTENANCE
36	CHILLA HPS	1	36	19/02/2013	28/03/2013	893.75	ANNUAL MAINTENANCE
		3	36	01/04/2012	23/04/2012	547.42	ANNUAL MAINTENANCE
		3	36	22/12/2012	09/02/2013	1175.58	ANNUAL MAINTENANCE
		4	36	07/11/2012	21/12/2012	1062.5	ANNUAL MAINTENANCE
37	DHAKRANI HPS	1	11.25	02/11/2012	31/03/2013	3566	PLANNED MAINTENANCE
38	DHALIPUR HPS	2	17	15/01/2013	05/03/2013	1183.08	ANNUAL MAINTENANCE
		3	17	16/11/2012	14/01/2013	1419.08	ANNUAL MAINTENANCE
39	KHATIMA HPS	2	13.8	29/01/2013	01/03/2013	747.08	ANNUAL MAINTENANCE
		2	13.8	01/04/2012	05/04/2012	107.08	ANNUAL MAINTENANCE
		3	13.8	05/03/2013	16/03/2013	263.75	ANNUAL MAINTENANCE
40	KHODRI HPS	1	30	01/11/2012	15/01/2013	1806.75	PLANNED MAINTENANCE
		2	30	04/01/2013	07/02/2013	825	PLANNED MAINTENANCE
		3	30	01/04/2012	21/05/2012	1215.92	PLANNED MAINTENANCE
		3	30	26/01/2013	31/03/2013	1524.5	ANNUAL MAINTENANCE
41	KULHAL HPS	1	10	09/01/2013	22/02/2013	1065.17	PLANNED MAINTENANCE
		2	10	19/11/2012	21/11/2012	55.33	ANNUAL MAINTENANCE
42	MANERI BHALI - I HPS	1	30	22/07/2012	20/09/2012	1449.33	ANNUAL MAINTENANCE
		3	30	06/10/2012	10/10/2012	116.25	TURBINE
43	MANERI BHALI - II HPS	1	76	01/04/2012	21/04/2012	492.5	ANNUAL MAINTENANCE
		2	76	02/01/2013	31/03/2013	2100.92	ANNUAL MAINTENANCE
		3	76	01/04/2012	12/05/2012	1002.17	ANNUAL MAINTENANCE
		4	76	02/01/2013	28/02/2013	1366.5	ANNUAL MAINTENANCE
44	RAMGANGA HPS	1	66	19/09/2012	01/11/2012	1033.48	ANNUAL MAINTENANCE
		2	66	17/07/2012	01/09/2012	1102.98	ANNUAL MAINTENANCE
		3	66	21/08/2012	14/10/2012	1298.98	ANNUAL MAINTENANCE

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
<u>UPJVNL</u>							
45	KHARA HPS	3	24	11/01/2013	31/01/2013	494.48	ANNUAL MAINTENANCE
46	MATATILA HPS	1	10.2	01/04/2012	26/04/2012	610	PAINTING OTHERS
		2	10.2	01/07/2012	17/07/2012	393.5	RENOVATION/MODERNISATIO
		2	10.2	01/04/2012	18/04/2012	418	RENOVATION/MODERNISATIO
		3	10.2	01/04/2012	26/04/2012	600.67	PAINTING OTHERS
		3	10.2	16/07/2012	13/08/2012	677	RENOVATION/MODERNISATIO
47	OBRA HPS	2	33	01/04/2012	31/05/2012	1463.98	STATOR
48	RIHAND HPS	1	50	19/07/2012	12/08/2012	582	ANNUAL MAINTENANCE
		5	50	19/05/2012	23/05/2012	103.92	HRI/HRC/POWER CHANNEL
		6	50	18/06/2012	11/07/2012	557.15	ANNUAL MAINTENANCE
<u>WESTERN REGION</u>							
<u>CSPGCL</u>							
1	HASDEOBANGO HPS	2	40	11/02/2013	31/03/2013	1140.3	ANNUAL MAINTENANCE
<u>GSECL</u>							
2	KADANA HPS	2	60	01/05/2012	16/08/2012	2586.42	TURBINE MISC/GOVERNOR
		4	60	01/04/2012	24/04/2012	575.98	TURBINE MISC/GOVERNOR
3	UKAI HPS	2	75	01/04/2012	09/08/2012	3139.5	RENOVATION/MODERNISATIO
<u>MAHAGENCO</u>							
4	BHIRA TAIL RACE HPS	1	40	01/12/2012	13/12/2012	300.08	MISCELLANROUS
		1	40	07/05/2012	11/05/2012	99.17	MISCELLANROUS
		2	40	05/02/2013	19/02/2013	328.17	MISCELLANROUS
		2	40	14/12/2012	27/12/2012	310.5	MISCELLANROUS
5	GHATGHAR PSS HPS	1	125	05/07/2012	23/08/2012	1175.5	ANNUAL MAINTENANCE
6	KOYNA DPH HPS	1	18	01/08/2012	23/08/2012	537.5	ANNUAL MAINTENANCE
		1	18	01/10/2012	07/10/2012	151.75	MISCELLANROUS
		2	18	08/10/2012	10/10/2012	54.42	MISCELLANROUS
		2	18	11/07/2012	30/07/2012	452.08	ANNUAL MAINTENANCE
7	KOYNA-I&II HPS	1	70	09/06/2012	14/06/2012	129.42	MISCELLANROUS
		2	70	16/06/2012	21/06/2012	124.83	MISCELLANROUS
		3	70	01/05/2012	07/05/2012	159.85	MISCELLANROUS
		3	70	14/01/2013	31/01/2013	416	MISCELLANROUS
		4	70	14/01/2013	31/01/2013	415	MISCELLANROUS
		4	70	28/06/2012	20/07/2012	532.33	MISCELLANROUS
		5	80	06/02/2013	23/02/2013	416.83	MISCELLANROUS
		5	80	20/11/2012	18/12/2012	671.58	MISCELLANROUS

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
8	KOYNA-III HPS	5	80	09/06/2012	14/06/2012	129.42	MISCELLANROUS
		6	80	01/04/2012	21/06/2012	1959.08	MISCELLANROUS
		6	80	01/08/2012	09/08/2012	209.25	MISCELLANROUS
		6	80	05/10/2012	07/10/2012	52.5	MISCELLANROUS
		6	80	21/11/2012	19/12/2012	682.42	MISCELLANROUS
		6	80	06/02/2013	23/02/2013	417.83	MISCELLANROUS
		6	80	01/03/2013	03/03/2013	59	MISCELLANROUS
		7	80	01/05/2012	07/05/2012	159.17	MISCELLANROUS
		8	80	28/06/2012	20/07/2012	532.33	MISCELLANROUS
		2	80	27/04/2012	29/04/2012	59.08	TURBINE MISC/GOVERNOR
		3	80	13/10/2012	19/10/2012	151.75	MISCELLANROUS
		3	80	18/04/2012	20/04/2012	57.67	TURBINE MISC/GOVERNOR
		4	80	04/04/2012	15/04/2012	275.08	ANNUAL MAINTENANCE
		4	80	01/09/2012	31/03/2013	5054.42	CAPITAL/3 YEARLY MTCE.
		1	250	04/01/2013	11/01/2013	177	MISCELLANROUS
9	KOYNA-IV HPS	2	250	20/08/2012	11/10/2012	1255.55	MISCELLANROUS
		4	250	14/01/2013	13/03/2013	1398	ANNUAL MAINTENANCE
		1	60	01/06/2012	22/06/2012	520.75	ANNUAL MAINTENANCE
11	VAITARNA HPS	1	60	01/11/2012	22/11/2012	513.5	ANNUAL MAINTENANCE
		1	60	24/11/2012	30/11/2012	152	ANNUAL MAINTENANCE
		1	60	08/09/2012	15/09/2012	168.25	MISCELLANROUS
<u>MPPGCL</u>							
12	BANSAGAR TONS-1 HPS	2	105	01/06/2012	19/06/2012	452.67	ANNUAL MAINTENANCE
		2	105	24/05/2012	31/05/2012	178.4	ANNUAL MAINTENANCE
		3	105	01/04/2012	18/05/2012	1148.17	ANNUAL MAINTENANCE
13	BANSAGAR TONS-II HPS	1	15	18/09/2012	24/09/2012	151.5	MISCELLANROUS
		1	15	10/05/2012	03/06/2012	587.75	ANNUAL MAINTENANCE
		2	15	25/03/2013	28/03/2013	85.67	INTAKE STRU/TRASH RACK
		2	15	02/02/2013	09/02/2013	174.75	INTAKE STRU/TRASH RACK
		2	15	30/05/2012	30/06/2012	745.08	ANNUAL MAINTENANCE
		2	15	20/09/2012	24/09/2012	103	MISCELLANROUS
		1	20	14/05/2012	28/05/2012	335.67	ANNUAL MAINTENANCE
14	BANSAGAR TONS-III HPS	2	20	01/06/2012	10/06/2012	234.67	ANNUAL MAINTENANCE
		3	20	01/06/2012	14/06/2012	320	ANNUAL MAINTENANCE

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
15	BARGI HPS	1	45	01/06/2012	09/06/2012	210.08	ANNUAL MAINTENANCE
		2	45	24/01/2013	29/01/2013	124.92	MISCELLANROUS
		2	45	18/05/2012	29/06/2012	1024.75	ANNUAL MAINTENANCE
16	GANDHI SAGAR HPS	1	23	02/04/2012	20/04/2012	433.75	ANNUAL MAINTENANCE
		1	23	13/06/2012	16/06/2012	79.5	MISCELLANROUS
		2	23	01/05/2012	28/05/2012	657.58	PLANNED MAINTENANCE
		3	23	15/06/2012	18/06/2012	64.5	MISCELLANROUS
17	MADHIKHERA HPS	1	20	11/06/2012	25/06/2012	337.17	ANNUAL MAINTENANCE
		2	20	30/05/2012	11/06/2012	283.33	ANNUAL MAINTENANCE
		3	20	14/05/2012	30/05/2012	382.42	ANNUAL MAINTENANCE
18	PENCH HPS	1	80	15/05/2012	18/06/2012	807.05	ANNUAL MAINTENANCE
19	RAJGHAT HPS	1	15	15/05/2012	12/06/2012	677.33	PLANNED MAINTENANCE
		2	15	13/06/2012	25/06/2012	294.75	ANNUAL MAINTENANCE
		2	15	13/09/2012	16/09/2012	82.17	TURBINE MISC/GOVERNOR
		3	15	01/06/2012	21/06/2012	497.5	ANNUAL MAINTENANCE
<u>NHDC</u>							
20	INDIRA SAGAR HPS	1	125	01/04/2012	11/04/2012	249	ANNUAL MAINTENANCE
		1	125	12/03/2013	29/03/2013	409	ANNUAL MAINTENANCE
		2	125	07/05/2012	21/05/2012	354	ANNUAL MAINTENANCE
		5	125	09/06/2012	28/06/2012	459	ANNUAL MAINTENANCE
		7	125	28/05/2012	08/06/2012	282	ANNUAL MAINTENANCE
		7	125	28/02/2013	10/03/2013	231	ANNUAL MAINTENANCE
		8	125	19/04/2012	03/05/2012	336	ANNUAL MAINTENANCE
21	OMKARESHWAR HPS	1	65	03/02/2013	17/02/2013	338.75	ANNUAL MAINTENANCE
		2	65	20/07/2012	26/07/2012	162.92	ANNUAL MAINTENANCE
		3	65	06/07/2012	15/07/2012	226	PLANNED MAINTENANCE
		4	65	09/03/2013	21/03/2013	301.1	ANNUAL MAINTENANCE
		5	65	29/06/2012	10/07/2012	269	ANNUAL MAINTENANCE
		6	65	11/06/2012	23/06/2012	293	ANNUAL MAINTENANCE
		7	65	19/06/2012	28/06/2012	226	ANNUAL MAINTENANCE
<u>SSNNL</u>							
22	S SAROVAR CHPH HPS	1	50	05/12/2012	19/12/2012	342.25	ANNUAL MAINTENANCE
		2	50	06/02/2013	07/03/2013	706.83	ANNUAL MAINTENANCE
		3	50	11/01/2013	02/02/2013	536	ANNUAL MAINTENANCE
23	S SAROVAR RBPH HPS	1	200	28/03/2013	31/03/2013	64	ANNUAL MAINTENANCE
		2	200	01/01/2013	21/01/2013	489.33	ANNUAL MAINTENANCE
		5	200	01/04/2012	04/04/2012	82.75	ANNUAL MAINTENANCE

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
<u>TATA</u>							
24	BHIRA PSS HPS	1	150	05/04/2012	08/04/2012	78.67	ANNUAL MAINTENANCE
25	BHIVPURI HPS	4	1.5	01/06/2012	06/06/2012	117.58	ANNUAL MAINTENANCE
<u>SOUTHERN REGION</u>							
<u>APGENCO</u>							
26	HAMPI HPS	2	9	18/08/2012	27/08/2012	217.83	MISCELLANROUS
		2	9	13/08/2012	18/08/2012	111.42	MISCELLANROUS
		3	9	13/06/2012	03/07/2012	480	OTHER EQUIPMENT
27	LOWER SILERU HPS	1	115	20/12/2012	28/12/2012	183	TURBINE MISC/GOVERNOR
28	MACHKUND HPS	6	21.25	24/08/2012	07/01/2013	3261.17	MISCELLANROUS
29	NAGARJUN SGR HPS	1	110	11/04/2012	31/07/2012	2678.48	MISCELLANROUS
		2	100.8	10/04/2012	13/04/2012	64.92	MISCELLANROUS
		3	100.8	01/07/2012	19/08/2012	1178.17	MISCELLANROUS
		8	100.8	01/08/2012	04/08/2012	54	TURBINE MISC/GOVERNOR
30	SRISAILAM HPS	6	110	04/02/2013	11/02/2013	173	MISCELLANROUS
		6	110	25/03/2013	29/03/2013	84.58	MISCELLANROUS
		7	110	20/02/2013	26/02/2013	146.17	MISCELLANROUS
31	SRISAILAM LB HPS	1	150	12/05/2012	17/07/2012	1586.25	MISCELLANROUS
		2	150	12/05/2012	17/07/2012	1586.25	MISCELLANROUS
		3	150	12/05/2012	17/07/2012	1586.25	MISCELLANROUS
		4	150	12/05/2012	17/07/2012	1586.25	MISCELLANROUS
		5	150	12/05/2012	17/07/2012	1586.25	MISCELLANROUS
		6	150	12/05/2012	17/07/2012	1586.25	MISCELLANROUS
32	T B DAM HPS	1	9	07/08/2012	31/08/2012	573	TURBINE MISC/GOVERNOR
		1	9	01/10/2012	31/10/2012	732	MISCELLANROUS
		1	9	07/06/2012	11/06/2012	98.92	ANNUAL MAINTENANCE
		1	9	19/05/2012	28/05/2012	215.75	ANNUAL MAINTENANCE
		2	9	13/06/2012	16/06/2012	75.92	MISCELLANROUS
		3	9	15/05/2012	24/05/2012	219.33	ANNUAL MAINTENANCE
		3	9	06/10/2012	10/10/2012	97.75	MISCELLANROUS
		3	9	10/07/2012	15/07/2012	119	MISCELLANROUS
		3	9	13/10/2012	30/10/2012	408.42	TURBINE MISC/GOVERNOR
		4	9	12/06/2012	14/06/2012	50.25	ANNUAL MAINTENANCE
		4	9	20/05/2012	31/05/2012	264.67	MISCELLANROUS
		4	9	18/06/2012	26/06/2012	181.33	ANNUAL MAINTENANCE
		4	9	10/07/2012	12/07/2012	50.58	TURBINE MISC/GOVERNOR

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
KPCL							
33	ALMATTI DPH HPS	1	15	06/06/2012	08/06/2012	54.25	ANNUAL MAINTENANCE
		1	15	04/05/2012	23/05/2012	456.92	ANNUAL MAINTENANCE
		2	55	13/03/2013	25/03/2013	293.67	ANNUAL MAINTENANCE
		2	55	25/04/2012	07/06/2012	1036.75	ANNUAL MAINTENANCE
		2	55	04/03/2013	07/03/2013	71.92	ANNUAL MAINTENANCE
		2	55	26/03/2013	30/03/2013	95.83	ANNUAL MAINTENANCE
		3	55	15/03/2013	19/03/2013	93.17	ANNUAL MAINTENANCE
		3	55	11/05/2012	21/05/2012	245.67	ANNUAL MAINTENANCE
		3	55	12/06/2012	18/06/2012	143.67	ANNUAL MAINTENANCE
		3	55	27/02/2013	06/03/2013	163.42	ANNUAL MAINTENANCE
		3	55	07/05/2012	10/05/2012	73.57	ANNUAL MAINTENANCE
		4	55	17/09/2012	17/10/2012	723	TURBINE MISC/GOVERNOR
		4	55	13/06/2012	15/06/2012	53.58	ANNUAL MAINTENANCE
		4	55	20/06/2012	23/06/2012	73.75	ANNUAL MAINTENANCE
		4	55	19/03/2013	25/03/2013	145.83	ANNUAL MAINTENANCE
		4	55	25/02/2013	27/02/2013	53.25	ANNUAL MAINTENANCE
		5	55	21/02/2013	25/02/2013	94	ANNUAL MAINTENANCE
		5	55	02/05/2012	07/05/2012	122.33	ANNUAL MAINTENANCE
		5	55	27/05/2012	30/05/2012	87.58	ANNUAL MAINTENANCE
		5	55	26/03/2013	30/03/2013	97	ANNUAL MAINTENANCE
		6	55	07/02/2013	21/02/2013	337.42	ANNUAL MAINTENANCE
		6	55	11/06/2012	14/06/2012	69	ANNUAL MAINTENANCE
		6	55	26/05/2012	28/05/2012	53.33	ANNUAL MAINTENANCE
		6	55	02/05/2012	07/05/2012	122.33	ANNUAL MAINTENANCE
		6	55	27/03/2013	31/03/2013	85.5	ANNUAL MAINTENANCE
34	GERUSUPPA HPS	2	60	15/02/2013	19/02/2013	108.23	GENERATOR
35	JOG HPS	1	13.2	01/05/2012	04/05/2012	72.33	OTHER EQUIPMENT
		1	13.2	19/03/2013	25/03/2013	152.5	OTHER EQUIPMENT
		3	13.2	02/04/2012	10/04/2012	198.08	ROUTINE MAINTENANCE
		3	13.2	22/01/2013	25/01/2013	73.5	TURBINE MISC/GOVERNOR
		3	13.2	30/04/2012	21/09/2012	3464	OTHER EQUIPMENT
		4	13.2	12/11/2012	15/11/2012	73	ROUTINE MAINTENANCE
		4	13.2	20/06/2012	23/06/2012	69.42	GENERATOR
		4	13.2	04/03/2013	23/03/2013	462.08	OTHER EQUIPMENT
		4	13.2	25/01/2013	28/01/2013	74.5	TURBINE MISC/GOVERNOR

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
36	KALINADI HPS	5	21.6	21/08/2012	24/08/2012	79.17	ROUTINE MAINTENANCE
		5	21.6	18/05/2012	24/05/2012	142.82	TURBINE MISC/GOVERNOR
		5	21.6	11/06/2012	14/06/2012	80	GENERATOR
		6	21.6	11/05/2012	15/05/2012	97.17	OTHER EQUIPMENT
		8	21.6	05/01/2013	07/01/2013	53.75	B.F.VALVE
		8	21.6	04/05/2012	08/05/2012	101	OTHER EQUIPMENT
		8	21.6	13/02/2013	22/02/2013	216.33	OTHER EQUIPMENT
		5	150	01/04/2012	09/08/2012	3121.23	ROUTINE MAINTENANCE
37	KALINADI SUPA HPS	6	150	05/05/2012	11/05/2012	146.93	MISCELLANROUS
		1	50	06/07/2012	06/09/2012	1491.93	ANNUAL MAINTENANCE
38	KODASALI HPS	1	40	09/01/2013	23/01/2013	342.08	ANNUAL MAINTENANCE
		1	40	27/06/2012	29/06/2012	51.75	STATOR
		1	40	12/05/2012	25/05/2012	317.75	PAINTING OTHERS
39	LIGANAMAKKI HPS	2	27.5	21/06/2012	08/07/2012	414	ANNUAL MAINTENANCE
40	MUNIRABAD HPS	1	9	01/06/2012	31/07/2012	1456.08	ANNUAL MAINTENANCE
		1	9	25/05/2012	31/05/2012	159.57	ANNUAL MAINTENANCE
		1	9	08/03/2013	31/03/2013	541.83	RENOVATION/MODERNISATIO
		2	9	07/05/2012	31/05/2012	590.32	ANNUAL MAINTENANCE
		2	9	01/03/2013	31/03/2013	709.08	RENOVATION/MODERNISATIO
		2	9	01/06/2012	06/07/2012	853.67	ANNUAL MAINTENANCE
		3	10	08/05/2012	31/05/2012	566.4	ANNUAL MAINTENANCE
		3	10	01/06/2012	02/09/2012	2245.5	ANNUAL MAINTENANCE
		3	10	04/01/2013	11/01/2013	167.83	GENERATOR
		3	10	15/03/2013	31/03/2013	372.42	RENOVATION/MODERNISATIO
		1	103.5	20/02/2013	28/02/2013	200.85	ANNUAL MAINTENANCE
		10	103.5	11/02/2013	14/02/2013	84.28	ROUTINE MAINTENANCE
		10	103.5	06/08/2012	14/09/2012	942.95	ANNUAL MAINTENANCE
41	SHARAVATHI HPS	2	103.5	28/04/2012	03/05/2012	125.6	PRESSURE SHAFT/PENSTOCK
		4	103.5	31/08/2012	03/09/2012	74.4	GENERATOR
		5	103.5	12/05/2012	02/06/2012	511.27	TURBINE MISC/GOVERNOR
		9	103.5	03/09/2012	20/09/2012	413.5	TURBINE MISC/GOVERNOR
		9	103.5	22/12/2012	25/12/2012	80.5	OTHER EQUIPMENT
		10	6	08/03/2013	19/03/2013	272.75	PRESSURE SHAFT/PENSTOCK
		10	6	09/05/2012	09/06/2012	746.33	MISCELLANROUS
		10	6	11/06/2012	18/06/2012	179.33	MISCELLANROUS
42	SIVASAMUNDRUM HPS	10	6	19/06/2012	15/08/2012	1375.58	MISCELLANROUS

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
43	VARAHI HPS	4	3	22/03/2013	30/03/2013	185.42	MISCELLANROUS
		6	3	14/02/2013	20/02/2013	150.75	MISCELLANROUS
		7	6	24/06/2012	01/07/2012	170.75	MISCELLANROUS
		8	6	08/03/2013	18/03/2013	248.5	ANNUAL MAINTENANCE
		9	6	08/03/2013	19/03/2013	272.75	ANNUAL MAINTENANCE
		1	115	06/08/2012	21/08/2012	360	ANNUAL MAINTENANCE
		1	115	01/08/2012	06/08/2012	120.5	MISCELLANROUS
		4	115	24/09/2012	09/10/2012	359	ANNUAL MAINTENANCE
<u>KSEB</u>							
44	IDAMALAYAR HPS.	1	37.5	11/12/2012	13/12/2012	54.27	RENOVATION/MODERNISATIO
		2	37.5	21/07/2012	26/12/2012	3801.48	RENOVATION/MODERNISATIO
45	IDUKKI HPS.	1	130	06/06/2012	05/07/2012	703.1	ANNUAL MAINTENANCE
		1	130	01/11/2012	30/11/2012	705.4	MONTHLY MAINTENANCE
		2	130	06/07/2012	30/07/2012	584.15	ANNUAL MAINTENANCE
		2	130	01/11/2012	30/11/2012	696.95	MONTHLY MAINTENANCE
		3	130	29/01/2013	13/02/2013	369.52	ANNUAL MAINTENANCE
		3	130	07/11/2012	30/11/2012	555.13	ANNUAL MAINTENANCE
		4	130	08/10/2012	28/10/2012	479.38	ANNUAL MAINTENANCE
		5	130	31/07/2012	19/10/2012	1928.07	ANNUAL MAINTENANCE
		5	130	01/11/2012	30/11/2012	691.2	MONTHLY MAINTENANCE
		6	130	01/11/2012	10/12/2012	925.4	ANNUAL MAINTENANCE
		1	25	02/01/2013	28/01/2013	642.43	PLANNED MAINTENANCE
46	KAKKAD HPS.	2	25	01/02/2013	03/03/2013	713.78	ANNUAL MAINTENANCE
		1	25	01/11/2012	03/12/2012	774.38	ANNUAL MAINTENANCE
47	KUTTIYADI HPS.	2	25	04/12/2012	02/01/2013	704.4	PLANNED MAINTENANCE
		3	25	02/04/2012	30/04/2012	682.42	ANNUAL MAINTENANCE
		3	25	04/03/2013	31/03/2013	640	ANNUAL MAINTENANCE
		5	50	23/04/2012	17/05/2012	576.25	MISCELLANROUS
48	KUTTIYADI ADDL. EXTN.	1	60	01/04/2012	24/04/2012	567.25	ANNUAL MAINTENANCE
		2	60	05/02/2013	01/03/2013	576	ANNUAL MAINTENANCE
		3	60	04/01/2013	28/01/2013	582.52	ANNUAL MAINTENANCE
50	NARIAMANGLAM HPS	1	15	02/01/2013	28/01/2013	632.92	ANNUAL MAINTENANCE
		2	15	04/04/2012	16/04/2012	284.55	GENERATOR
		3	15	04/04/2012	09/05/2012	835.58	GENERATOR
		4	25	01/02/2013	08/03/2013	851.17	ANNUAL MAINTENANCE
		4	25	04/04/2012	16/04/2012	283.72	GENERATOR

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
51	PALLIVASAL HPS.	1	5	25/04/2012	26/05/2012	755.38	ANNUAL MAINTENANCE
		1	5	01/02/2013	04/02/2013	81.83	MISCELLANROUS
		2	5	02/01/2013	30/01/2013	673.6	MISCELLANROUS
		2	5	30/01/2013	05/02/2013	152.08	MISCELLANROUS
		2	5	05/02/2013	12/02/2013	159.4	MISCELLANROUS
		3	5	12/02/2013	06/03/2013	535.22	ANNUAL MAINTENANCE
		3	5	02/01/2013	08/01/2013	134.4	MISCELLANROUS
		4	7.5	08/03/2013	12/03/2013	88.7	MISCELLANROUS
		4	7.5	12/03/2013	31/03/2013	446.33	ANNUAL MAINTENANCE
		4	7.5	09/01/2013	29/01/2013	474.17	MISCELLANROUS
		4	7.5	04/02/2013	25/02/2013	510.37	MISCELLANROUS
		4	7.5	28/02/2013	06/03/2013	137	MISCELLANROUS
		4	7.5	01/06/2012	15/06/2012	356.78	PLANNED MAINTENANCE
		5	7.5	10/04/2012	21/04/2012	277.38	ANNUAL MAINTENANCE
		5	7.5	08/02/2013	25/02/2013	395.33	MISCELLANROUS
		6	7.5	29/01/2013	07/02/2013	212.98	MISCELLANROUS
		6	7.5	03/12/2012	02/01/2013	724.38	ANNUAL MAINTENANCE
		6	7.5	07/02/2013	23/02/2013	372.43	MISCELLANROUS
		6	7.5	23/02/2013	25/02/2013	55.67	MISCELLANROUS
		6	7.5	02/01/2013	08/01/2013	148.77	MISCELLANROUS
52	PANNIAR HPS.	1	15	31/01/2013	05/03/2013	787.73	PLANNED MAINTENANCE
		2	15	01/04/2012	03/05/2012	777.9	ANNUAL MAINTENANCE
53	PORINGALKUTTU HPS.	1	8	01/08/2012	14/08/2012	335.57	HRI/HRC/POWER CHANNEL
		3	8	01/05/2012	08/05/2012	186.88	ANNUAL MAINTENANCE
		4	8	09/05/2012	31/05/2012	539.9	ANNUAL MAINTENANCE
54	SABARIGIRI HPS.	1	50	02/07/2012	23/07/2012	498.48	ANNUAL MAINTENANCE
		1	50	24/07/2012	30/07/2012	140.12	ANNUAL MAINTENANCE
		2	50	01/04/2012	23/04/2012	528.72	HRI/HRC/POWER CHANNEL
55	SENGULAM HPS.	1	12	06/05/2012	18/05/2012	284	MONTHLY MAINTENANCE
		2	12	19/04/2012	25/04/2012	140	ANNUAL MAINTENANCE
		3	12	02/05/2012	17/05/2012	376	MONTHLY MAINTENANCE
		3	12	02/06/2012	08/06/2012	148.32	MONTHLY MAINTENANCE
		3	12	10/04/2012	16/04/2012	142	ANNUAL MAINTENANCE
		4	12	25/04/2012	30/04/2012	139.83	ANNUAL MAINTENANCE

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
56	SHOLAYAR HPS.	1	18	25/06/2012	04/08/2012	968.07	ANNUAL MAINTENANCE
		2	18	01/04/2012	07/04/2012	137.35	MONTHLY MAINTENANCE
		3	18	01/10/2012	30/11/2012	1463.98	ANNUAL MAINTENANCE
<u>TANGEDCO</u>							
57	ALIYAR HPS.	1	60	01/07/2012	31/07/2012	735.83	ANNUAL MAINTENANCE
		1	60	04/05/2012	31/05/2012	652.37	ANNUAL MAINTENANCE
58	BHAWANI KATTAL	1	15	01/03/2013	12/03/2013	281	ANNUAL MAINTENANCE
59	KADAMPARI HPS.	1	100	16/01/2013	31/01/2013	368.73	TRI/TRC/DRAFT TUBE
		2	100	16/01/2013	19/02/2013	818.75	TRI/TRC/DRAFT TUBE
		3	100	15/03/2013	21/03/2013	147.75	PAINTING OTHERS
		3	100	16/01/2013	19/02/2013	818.75	TRI/TRC/DRAFT TUBE
		4	100	16/01/2013	19/02/2013	818.75	TRI/TRC/DRAFT TUBE
		4	100	01/09/2012	20/09/2012	468.25	TURBINE MISC/GOVERNOR
60	KUNDAH-I HPS.	1	20	17/07/2012	21/07/2012	103.25	ANNUAL MAINTENANCE
		3	20	20/11/2012	30/11/2012	241.83	ANNUAL MAINTENANCE
61	KUNDAH-II HPS.	2	35	03/06/2012	06/06/2012	83.63	MONTHLY MAINTENANCE
		3	35	11/06/2012	21/06/2012	246.72	MONTHLY MAINTENANCE
		5	35	26/01/2013	29/01/2013	86.25	MONTHLY MAINTENANCE
62	KUNDAH-III HPS.	1	60	26/11/2012	29/11/2012	75.5	TURBINE
		1	60	10/10/2012	18/10/2012	189.97	TURBINE MISC/GOVERNOR
		2	60	08/12/2012	23/12/2012	368.5	ANNUAL MAINTENANCE
		3	60	23/02/2013	31/03/2013	855.42	ANNUAL MAINTENANCE
63	KUNDAH-IV HPS.	1	50	28/10/2012	07/11/2012	244.12	ANNUAL MAINTENANCE
		2	50	21/05/2012	29/05/2012	202.08	ANNUAL MAINTENANCE
		2	50	14/10/2012	17/10/2012	78.5	MONTHLY MAINTENANCE
64	KUNDAH-V HPS.	1	20	26/06/2012	06/07/2012	256.17	ANNUAL MAINTENANCE
		1	20	14/10/2012	17/10/2012	76.08	MONTHLY MAINTENANCE
		2	20	09/05/2012	23/05/2012	343.5	ANNUAL MAINTENANCE
65	LOWER METTUR-I HPS.	1	15	20/02/2013	31/03/2013	927.5	ANNUAL MAINTENANCE
		1	15	30/04/2012	20/05/2012	479.5	CAPITAL/3 YEARLY MTCE.
		2	15	09/04/2012	28/04/2012	459.08	CAPITAL/3 YEARLY MTCE.
		2	15	30/04/2012	20/05/2012	480.17	CAPITAL/3 YEARLY MTCE.
66	LOWER METTUR-II HPS.	1	15	10/04/2012	30/04/2012	479.88	CAPITAL/3 YEARLY MTCE.
		2	15	10/04/2012	30/04/2012	479.88	CAPITAL/3 YEARLY MTCE.
67	LOWER METTUR-III HPS.	1	15	16/03/2013	31/03/2013	351	ANNUAL MAINTENANCE
		1	15	01/04/2012	09/04/2012	210.25	ANNUAL MAINTENANCE

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
68	LOWER METTUR-III HPS.	2	15	16/03/2013	31/03/2013	351	ANNUAL MAINTENANCE
		2	15	01/04/2012	09/04/2012	210.25	ANNUAL MAINTENANCE
		1	15	01/04/2012	09/04/2012	207.25	ANNUAL MAINTENANCE
		1	15	01/03/2013	11/03/2013	257.25	ANNUAL MAINTENANCE
		1	15	13/03/2013	31/03/2013	421.25	ANNUAL MAINTENANCE
		2	15	13/03/2013	31/03/2013	421.25	ANNUAL MAINTENANCE
69	METTUR DAM HPS.	2	15	11/04/2012	30/04/2012	459.25	CAPITAL/3 YEARLY MTCE.
		2	15	01/07/2012	24/07/2012	552.92	GENERATOR
		2	12.5	01/02/2013	28/02/2013	653.3	PLANNED MAINTENANCE
70	METTUR TUNNEL HPS.	4	12.5	04/03/2013	31/03/2013	640	ANNUAL MAINTENANCE
		1	50	03/04/2012	30/04/2012	664.98	ANNUAL MAINTENANCE
		1	50	01/05/2012	31/05/2012	737	ANNUAL MAINTENANCE
		1	50	01/02/2013	31/03/2013	1392	ANNUAL MAINTENANCE
		2	50	21/02/2013	31/03/2013	912	ANNUAL MAINTENANCE
		2	50	01/04/2012	31/05/2012	1457	ANNUAL MAINTENANCE
		3	50	01/03/2013	31/03/2013	720	ANNUAL MAINTENANCE
		3	50	01/05/2012	31/05/2012	737	ANNUAL MAINTENANCE
		4	50	01/05/2012	31/05/2012	737	ANNUAL MAINTENANCE
		4	50	01/03/2013	31/03/2013	720	ANNUAL MAINTENANCE
		4	50	03/04/2012	30/04/2012	664.98	ANNUAL MAINTENANCE
		1	12	14/04/2012	09/05/2012	604.17	TURBINE
		1	12	09/12/2012	07/01/2013	704.08	OTHER EQUIPMENT
		1	12	21/01/2013	24/01/2013	76.33	MISCELLANROUS
		1	8	01/01/2013	04/01/2013	85.33	PRESSURE SHAFT/PENSTOCK
72	PAPANASAM HPS.	1	8	12/03/2013	21/03/2013	223	TRI/TRC/DRAFT TUBE
		2	8	12/03/2013	21/03/2013	223	TRI/TRC/DRAFT TUBE
		2	8	03/04/2012	25/04/2012	528.25	ANNUAL MAINTENANCE
		3	8	26/04/2012	06/05/2012	242.75	PRESSURE SHAFT/PENSTOCK
		3	8	05/03/2013	28/03/2013	557	ANNUAL MAINTENANCE
		3	8	11/08/2012	13/08/2012	51	MISCELLANROUS
		4	8	03/12/2012	05/12/2012	52.08	TURBINE
		4	8	12/03/2013	21/03/2013	223	TRI/TRC/DRAFT TUBE
		4	8	26/04/2012	06/05/2012	242.75	PRESSURE SHAFT/PENSTOCK
		1	30	16/06/2012	18/06/2012	59.17	MONTHLY MAINTENANCE
73	PARSON'S VALLEY HPS.	1	30	16/06/2012	18/06/2012	59.17	MONTHLY MAINTENANCE

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
74	PERIYAR HPS.	1	35	22/03/2013	31/03/2013	206.5	MISCELLANROUS
		1	35	04/05/2012	26/05/2012	536.5	ANNUAL MAINTENANCE
		2	35	14/08/2012	22/08/2012	197	RENOVATION/MODERNISATIO
		2	35	26/06/2012	10/07/2012	351.75	ANNUAL MAINTENANCE
		3	35	01/04/2012	14/04/2012	328.75	ANNUAL MAINTENANCE
		3	35	15/04/2012	10/05/2012	600.75	ANNUAL MAINTENANCE
		4	35	15/04/2012	10/05/2012	608	ANNUAL MAINTENANCE
		4	35	06/03/2013	31/03/2013	590.75	MISCELLANROUS
75	PYKARA HPS.	2	7	19/06/2012	19/12/2012	4400.08	ANNUAL MAINTENANCE
76	PYKARA ULTMATE HPS.	1	50	07/10/2012	09/10/2012	55.25	MONTHLY MAINTENANCE
		1	50	10/02/2013	12/02/2013	55.5	MONTHLY MAINTENANCE
		1	50	16/02/2013	18/02/2013	53.75	MONTHLY MAINTENANCE
		1	50	07/07/2012	09/07/2012	56	MONTHLY MAINTENANCE
		2	50	23/07/2012	25/07/2012	54.92	TURBINE
		2	50	15/12/2012	17/12/2012	55.83	MONTHLY MAINTENANCE
		2	50	17/11/2012	19/11/2012	55.33	MONTHLY MAINTENANCE
		3	50	29/12/2012	31/12/2012	56.25	MONTHLY MAINTENANCE
77	SARKARPATHY HPS.	1	30	16/04/2012	19/09/2012	3754.42	ANNUAL MAINTENANCE
		1	30	20/03/2013	31/03/2013	253.17	ANNUAL MAINTENANCE
78	SHOLAYAR-I&II HPS.	1	35	01/04/2012	06/09/2012	3809.17	OTHER EQUIPMENT
		3	25	10/04/2012	12/07/2012	2242.75	ANNUAL MAINTENANCE
79	SURULIYAR HPS.	1	35	19/03/2013	23/03/2013	108.08	MISCELLANROUS
		1	35	22/09/2012	26/09/2012	90.67	PRESSURE SHAFT/PENSTOCK

EASTERN REGION

DVC

1	PANCHET HPS.	1	40	12/06/2012	17/06/2012	126.67	OTHER EQUIPMENT
---	--------------	---	----	------------	------------	--------	-----------------

JSEB

2	SUBERNREKHA-I HPS.	1	65	06/05/2012	31/03/2013	7890	TURBINE MISC/GOVERNOR
---	--------------------	---	----	------------	------------	------	-----------------------

NHPC

3	RANGIT HPS	1	20	17/02/2013	14/03/2013	619	ANNUAL MAINTENANCE
		2	20	09/01/2013	31/01/2013	547.17	ANNUAL MAINTENANCE
		3	20	04/12/2012	31/12/2012	669.7	ANNUAL MAINTENANCE
4	TEESTA V HPS	1	170	29/12/2012	18/01/2013	499.92	PLANNED MAINTENANCE
		2	170	22/01/2013	13/02/2013	544.48	ANNUAL MAINTENANCE

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
<u>OHPC</u>							
5	BALIMELA HPS.	6	60	17/12/2012	28/12/2012	276	ANNUAL MAINTENANCE
		7	75	21/01/2013	31/01/2013	255.98	ANNUAL MAINTENANCE
		8	75	01/04/2012	15/07/2012	2537	MONTHLY MAINTENANCE
6	HIRAKUD-I HPS	1	49.5	15/01/2013	31/03/2013	1791.92	ANNUAL MAINTENANCE
		3	32	13/06/2012	11/07/2012	673.67	ANNUAL MAINTENANCE
		4	32	18/04/2012	16/05/2012	682.17	ANNUAL MAINTENANCE
		5	37.5	16/11/2012	10/01/2013	1328.5	MONTHLY MAINTENANCE
7	HIRAKUD-II HPS	1	24	16/05/2012	10/06/2012	617	ANNUAL MAINTENANCE
		2	24	16/05/2012	10/06/2012	617	ANNUAL MAINTENANCE
		3	24	16/05/2012	10/06/2012	617	HRI/HRC/POWER CHANNEL
8	RENGALI HPS.	1	50	01/04/2012	31/05/2012	1463.45	RENOVATION/MODERNISATIO
		1	50	05/08/2012	07/08/2012	51.2	TURBINE MISC/GOVERNOR
		2	50	26/11/2012	31/03/2013	2991.42	RENOVATION/MODERNISATIO
		3	50	01/11/2012	22/11/2012	516.23	ANNUAL MAINTENANCE
9	UPPER INDRAVATI HPS.	2	150	20/06/2012	22/06/2012	57.42	INTAKE STRU/TRASH RACK
		2	150	02/05/2012	24/05/2012	537.5	ANNUAL MAINTENANCE
		3	150	25/02/2013	09/03/2013	294	ANNUAL MAINTENANCE
		3	150	02/04/2012	21/04/2012	466.6	ANNUAL MAINTENANCE
		3	150	11/12/2012	30/12/2012	455.67	MISCELLANROUS
		3	150	20/06/2012	22/06/2012	57.42	INTAKE STRU/TRASH RACK
		4	150	04/06/2012	23/06/2012	465.42	ANNUAL MAINTENANCE
		4	150	04/06/2012	23/06/2012	465.42	ANNUAL MAINTENANCE
10	UPPER KOLAB HPS.	1	80	02/05/2012	16/05/2012	343.5	ANNUAL MAINTENANCE
		2	80	16/06/2012	04/07/2012	441	ANNUAL MAINTENANCE
		4	80	10/12/2012	26/12/2012	391.42	ANNUAL MAINTENANCE
<u>WBSEDCL</u>							
11	JALDHAKA HPS ST-I	1	9	23/07/2012	30/07/2012	179.03	MISCELLANROUS
		1	9	22/11/2012	30/11/2012	204.82	MISCELLANROUS
		1	9	01/04/2012	08/07/2012	2354.83	PLANNED MAINTENANCE
		1	9	01/01/2013	31/03/2013	2136	ANNUAL MAINTENANCE
		2	9	23/07/2012	28/07/2012	129	MISCELLANROUS
		2	9	23/11/2012	28/11/2012	119.23	MISCELLANROUS
		2	9	08/04/2012	22/05/2012	1062.63	ANNUAL MAINTENANCE
		2	9	17/01/2013	11/03/2013	1275.67	ANNUAL MAINTENANCE

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
12	RAMMAM HPS.	3	9	23/07/2012	28/07/2012	128.63	MISCELLANROUS
		3	9	26/06/2012	01/07/2012	127.67	MISCELLANROUS
		3	9	22/08/2012	24/08/2012	50.55	MONTHLY MAINTENANCE
		3	9	08/04/2012	21/05/2012	1036.42	ANNUAL MAINTENANCE
		3	9	17/01/2013	01/03/2013	1035.67	ANNUAL MAINTENANCE
		2	12.5	01/04/2012	05/04/2012	111.42	ANNUAL MAINTENANCE
		3	12.5	09/04/2012	24/04/2012	355.85	TURBINE
		4	12.5	11/04/2012	14/06/2012	1542.72	TURBINE
<u>NORTHEASTERN REGION</u>							
<u>MeECL</u>							
1	KYRDEMKULAI HPS.	1	30	01/11/2012	10/11/2012	233.67	TURBINE
2	UMIAM HPS ST-I	4	9	07/11/2012	10/11/2012	83.17	MISCELLANROUS
3	UMIAM HPS ST-IV	8	30	07/05/2012	11/05/2012	102	PRESSURE SHAFT/PENSTOCK
<u>NEEPCO.</u>							
4	DOYANG HPS.	1	25	16/11/2012	03/12/2012	424.62	ANNUAL MAINTENANCE
		2	25	01/04/2012	03/04/2012	67.83	ANNUAL MAINTENANCE
		2	25	28/02/2013	16/03/2013	400.83	ANNUAL MAINTENANCE
		3	25	22/01/2013	31/01/2013	235.33	ANNUAL MAINTENANCE
5	KHONDONG HPS.	2	25	01/02/2013	31/03/2013	1392	ANNUAL MAINTENANCE
		2	25	01/04/2012	21/06/2012	1963.97	ANNUAL MAINTENANCE
6	KOPILI HPS.	2	50	01/04/2012	09/04/2012	208	ANNUAL MAINTENANCE
		3	50	01/04/2012	20/06/2012	1933.25	ANNUAL MAINTENANCE
		4	50	18/01/2013	31/03/2013	1728	ANNUAL MAINTENANCE
		4	50	23/04/2012	04/05/2012	280.02	ANNUAL MAINTENANCE
		5	25	26/10/2012	03/11/2012	205.93	SURGE SHAFT
7	RANGANADI HPS.	1	135	13/02/2013	22/02/2013	231.75	PLANNED MAINTENANCE
		2	135	23/01/2013	31/01/2013	211.05	ANNUAL MAINTENANCE
		3	135	03/01/2013	14/01/2013	280.45	ANNUAL MAINTENANCE

CHAPTER 5

FORCED OUTAGE OF HE UNITS

CHAPTER-5

FORCED OUTAGES OF HE UNITS

5.1 Based on the analysis carried out for 634 generating units installed in 182 Hydro Electric Power Stations, non-availability of hydro-electric units in the country due to forced outages during the year 2012-13 (excluding the causes not attributable to the power plant) was 3.27% as compared to 4.48% during 2011-12. Unit-wise details of forced outages of duration 24 hours and above are given in **Annex- 5.1**.

5.2 Forced outages of generating units were due to various problems in generating equipments, auxiliary systems, civil structures and also due to external reasons not attributable to the power plant equipment/civil structures etc. The external reasons are non-availability of water, transmission constraints, system disturbances, flood and also due to high silt in the river, etc.

The forced outages have been analysed component wise. The generator and turbine faults accounted for 15.38% and 14.53% respectively whereas forced outages due to system constraints accounted for 2.75% of total forced outages. Category wise forced outages of Hydro Electric Generating units are given in **Table 5.1** below.

TABLE 5.1
EQUIPMENT/SYSTEM WISE FORCED OUTAGES
FOR PERIOD: 2012-13

S.No.	CAUSES OF FORCED OUTAGE	DURATION OF OUTAGE (HOURS)	% OF TOTAL FORCED OUTAGE
A	RELATED WITH EQUIPMENT AND CIVIL STRUCTURE		
1	GENERATOR FAULTS	50538.41	15.38
2	TURBINE FAULTS	47745.02	14.53
3	CIVIL STRUCTURE FAULTS	7677.45	2.34
4	OTHER EQUIPMTNT FAULTS	46974.58	14.30
	SUB-TOTAL:	152935.45	46.55
B	NOT ASSOCIATED WITH THE EQUIPMENT AND CIVIL		
5	WATER CONSTRAINT	123755.54	37.67
6	SYSTEM CONSTRAINT	9036.72	2.75
7	OTHER MISC	42833.38	13.04
	SUB-TOTAL:	175625.64	53.45
	GRAND TOTAL (A+B):	328561.09	100.00

5.3 FORCED OUTAGE DUE TO GENERATOR COMPONENTS

Among the forced outages of various generator components, outage due to fault in thrust bearing was 25.35% followed by excitation system faults 22.99%, rotor faults 19.69, other faults 10.97% and protection system faults accounted for 9.22%.

The details of forced outages due to various generator faults and associated systems are given in **Table 5.2** below:

TABLE 5.2

**FORCED OUTAGE HOURS DUE TO BREAK DOWN OF GENERATOR COMPONENTS
PERIOD: 2012-13**

S.No.	COMPONENT OF GENERATOR	OUTAGE HOURS	% of TOTAL NO. OF HOURS
1	STATOR	1081.78	2.14
2	ROTOR	9951.10	19.69
3	EXCITATION SYSTEM	11619.50	22.99
4	AUTOMATIC VOLTAGE REGULATOR	328.65	0.65
5	PROTECTION SYSTEM	4662.05	9.22
6	GENERATOR COOLING SYSTEM	328.27	0.65
7	THRUST BEARING	12809.03	25.35
8	UPPER GUIDE BEARING	491.77	0.97
9	LOWER GUIDE BEARING	470.68	0.93
10	VIBRATION/ SOUND / ALIGNMENT	3193.97	6.32
11	BRAKE AND JACKS	59.30	0.12
12	OTHERS	5542.30	10.97
	TOTAL	50538.41	100.00

Performance of generating units under different category as per their unit size has been analyzed for failure of generator components. These are listed in Table 5.3 for unit size up to 50 MW, in **Table 5.4** for unit size above 50 MW & Upto 100 MW and in **Table 5.5** for unit size above 100 MW.

TABLE 5.3

**FORCED OUTAGE HOURS DUE TO BREAK DOWN OF GENERATOR COMPONENTS
(UNIT SIZE UPTO 50 MW)
PERIOD: 2012-13**

S.No.	COMPONENT OF GENERATOR	OUTAGE HOURS	% of TOTAL NO. OF HOURS
1	STATOR	60.50	0.48
2	ROTOR	5863.68	46.76
3	EXCITATION SYSTEM	5839.45	46.57
4	AUTOMATIC VOLTAGE REGULATOR	194.98	1.56
5	PROTECTION SYSTEM	213.58	1.70
6	GENERATOR COOLING SYSTEM	38.88	0.31
7	THRUST BEARING	84.98	0.68
8	UPPER GUIDE BEARING	4.67	0.04
9	LOWER GUIDE BEARING	49.27	0.39
10	VIBRATION/ SOUND / ALIGNMENT	22.07	0.18
11	BRAKE AND JACKS	0.00	0.00
12	OTHERS	166.55	1.33
	TOTAL	12538.62	100.00

TABLE 5.4

**FORCED OUTAGE HOURS DUE TO BREAK DOWN OF GENERATOR COMPONENTS
(UNIT SIZE ABOVE 50 MW AND UPTO 100 MW)
PERIOD: 2012-13**

S.No.	COMPONENT OF GENERATOR	OUTAGE HOURS	% of TOTAL NO. OF HOURS
1	STATOR	58.12	0.69
2	ROTOR	2145.58	25.51
3	EXCITATION SYSTEM	1561.85	18.57
4	AUTOMATIC VOLTAGE REGULATOR	54.03	0.64
5	PROTECTION SYSTEM	28.87	0.34
6	GENERATOR COOLING SYSTEM	189.90	2.26

7	THRUST BEARING	2683.92	31.92
8	UPPER GUIDE BEARING	99.50	1.18
9	LOWER GUIDE BEARING	109.48	1.30
10	VIBRATION/ SOUND / ALIGNMENT	0.00	0.00
11	BRAKE AND JACKS	8.20	0.10
12	OTHERS	1470.12	17.48
	TOTAL	8409.56	100.00

TABLE 5.5

**FORCED OUTAGE HOURS DUE TO BREAK DOWN OF GENERATOR COMPONENTS
(UNIT SIZE ABOVE 100 MW)
PERIOD: 2012-13**

S.No.	COMPONENT OF GENERATOR	OUTAGE HOURS	% OF TOTAL NO. OF HOURS
1	STATOR	963.17	3.26
2	ROTOR	1941.83	6.56
3	EXCITATION SYSTEM	4218.20	14.26
4	AUTOMATIC VOLTAGE REGULATOR	79.63	0.27
5	PROTECTION SYSTEM	4419.60	14.94
6	GENERATOR COOLING SYSTEM	99.48	0.34
7	THRUST BEARING	10040.14	33.93
8	UPPER GUIDE BEARING	387.60	1.31
9	LOWER GUIDE BEARING	311.93	1.05
10	VIBRATION/ SOUND / ALIGNMENT	3171.90	10.72
11	BRAKE AND JACKS	51.10	0.17
12	OTHERS	3905.63	13.20
	TOTAL	29590.22	100.00

From the tables above, it is observed that forced outage due to Generator Rotor faults was 46.76%, highest amongst the generator faults for unit size Upto 50 MW and Thrust Bearing fault was 31.92% highest amongst the generator faults for unit size above 50 MW and Upto 100 MW. In unit size above 100 MW, forced outages due to problems of Thrust Bearing fault accounted for 33.93%.

5.4 FORCED OUTAGE DUE TO TURBINE COMPONENTS

Out of various forced outages of turbine components, maximum forced outage of 39.68% was due to miscellaneous faults. As far as component wise outages are concerned, 19.98% was due to faults in Governor System followed by 12.73% due to problem in bearing and 10.39% due to Problem in Main Inlet Valves etc. The forced outage due to problems in Runner/Under Water Parts was the least at 1.55% as can be seen in **Table 5.6**.

TABLE 5.6

FORCED OUTAGE HOURS DUE TO BREAK DOWN OF TURBINE COMPONENTS PERIOD: 2012-13

S.No.	COMPONENT OF TURBINE	OUTAGE HOURS	% OF TOTAL NO. OF HOURS
1	BEARING	6076.38	12.73
2	RUNNER/UNDER WATER PARTS	742.27	1.55
3	MAIN INLET VALVE	4962.17	10.39
4	GOVERNOR SYSTEM	9541.00	19.98
5	GUIDE VANES	2754.25	5.77
6	SHAFT VIBRATION / ALIGNMENT /SOUND	4721.53	9.89
7	MISCELLANEOUS	18947.42	39.68
	TOTAL	47745.02	100.00

Performance of generating units under different category as per their unit size has been analyzed for failure of various turbine components. These are listed in Table 5.7 for unit size up to 50 MW, in **Table 5.8** for unit size above 50 MW & Upto 100 MW and in **Table 5.9** for unit size above 100 MW.

TABLE 5.7

FORCED OUTAGE HOURS DUE TO BREAK DOWN OF TURBINE COMPONENTS (UNIT SIZE UPTO 50 MW) PERIOD: 2012-13

S.No.	COMPONENT OF TURBINE	OUTAGE HOURS	% OF TOTAL NO. OF HOURS
1	BEARING	211.50	5.78
2	RUNNER/UNDER WATER PARTS	2.65	0.07
3	MAIN INLET VALVE	1070.32	29.26
4	GOVERNOR SYSTEM	1010.22	27.62
5	GUIDE VANES	25.08	0.69
6	SHAFT VIBRATION /ALIGNMENT /SOUND	2.37	0.06
7	MISCELLANEOUS	1336.03	36.52
	TOTAL	3658.17	100.00

TABLE 5.8

**FORCED OUTAGE HOURS DUE TO BREAK DOWN OF TURBINE COMPONENTS
(UNIT SIZE ABOVE 50 MW AND UPTO 100 MW)
PERIOD: 2012-13**

S.No.	COMPONENT OF TURBINE	OUTAGE HOURS	% OF TOTAL NO. OF HOURS
1	BEARING	91.90	3.65
2	RUNNER/UNDER WATER PARTS	61.25	2.43
3	MAIN INLET VALVE	321.28	12.75
4	GOVERNOR SYSTEM	923.73	36.66
5	GUIDE VANES	37.12	1.47
6	SHAFT VIBRATION /ALIGNMENT /SOUND	6.37	0.25
7	MISCELLANEOUS	1077.98	42.78
	TOTAL	2519.64	100.00

TABLE 5.9

**FORCED OUTAGE HOURS DUE TO BREAK DOWN OF TURBINE COMPONENTS
(UNIT SIZE ABOVE 100 MW)
PERIOD: 2012-13**

S.No.	COMPONENT OF TURBINE	OUTAGE HOURS	% OF TOTAL NO. OF HOURS
1	BEARING	5772.98	13.89
2	RUNNER/UNDER WATER PARTS	678.37	1.63
3	MAIN INLET VALVE	3570.57	8.59
4	GOVERNOR SYSTEM	7607.05	18.30
5	GUIDE VANES	2692.05	6.48
6	SHAFT VIBRATION /ALIGNMENT /SOUND	4712.80	11.34
7	MISCELLANEOUS	16533.40	39.78
	TOTAL	41567.21	100.00

5.5 ANALYSIS BASED ON TYPE OF TURBINE:

The analysis of forced outages caused by turbine components as per type of turbines is given in **Table 5.10**. Forced outage rate was observed to be the highest in case of Francis and Reversible turbines (94.71 Hrs/unit) and lowest in case of Bulb turbines (0.03 hrs/unit).

TABLE 5.10

**FORCED OUTAGES TURBINE TYPE WISE
PERIOD: 2012-13**

S.No.	Type of Turbine	Number of Units	Installed Capacity MW	Forced Outage Hours	Avg. Forced Outage per Unit Hours
1	BULB	16	399.00	0.55	0.03
2	FRANCIS AND REVERSIBLE	369	28632.30	34947.65	94.71
3	KAPLAN	119	4128.20	8692.58	73.05
4	PELTON	130	6331.90	4104.23	31.57
	TOTAL	634	39491.40	47745.02	75.31

5.6 ANALYSIS BASED ON MAKE OF UNITS:

The comparative performance of generating units of different makes is indicated in **Table 5.11**. The outage figures in the table relate to faults in turbine and generator only. Generating units from Canada (25.45 Hrs/unit) followed by units from U.K. (40.75 Hrs/unit) registered the best performance. Average forced outage for BHEL units was 120.08 Hrs/unit as against 184.92 Hrs/unit for imported units.

TABLE 5.11

**FORCED OUTAGES DUE TO FAULT IN TURBINE & GENERATOR
(SUPPLIER WISE)PERIOD: 2012-13**

S. No.	NAME OF SUPPLIER/ COUNTRY OF MAKE	NO. OF UNITS	INSTALLED CAPACITY (MW)	FORCED FAULT IN TOTAL HOURS	OUTAGES DUE TO GENERATING UNIT AVERAGE HOURS/UNIT
A-Indigenous					
1	BHEL	267	16197.00	32062.26	120.08
2	Others	11	459.00	389.78	35.43
	SUB TOTAL	278	16656.00	32452.04	116.73
B-Imported					
1	CANADA	44	3132.00	1119.87	25.45
2	U.K	64	1257.10	2607.95	40.75
3	SWITZERLAND	22	815.20	10934.28	497.01
4	FRANCE	33	2186.40	3817.92	115.69
5	JAPAN	77	6544.20	11317.62	146.98
6	U.S.A	9	351.00	3446.70	382.97
7	USSR	26	2804.00	11530.18	443.47

8	Other	81	5745.50	21056.86	259.96
	SUB TOTAL	356	22835.40	65831.38	184.92
	Total	634	39491.40	98283.43	155.02

5.7 ANALYSIS AGE-WISE:

Details of forced outages of generating units commissioned during different years are indicated in **Table 5.12**. 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. Per unit forced outage rate in respect of generating units commissioned during 2009-10 was observed to be the least (0.92 Hrs/unit) and was maximum in the case of units commissioned during 2000-2001(793.34 Hrs/unit)

TABLE - 5.12

**FORCED OUTAGES DUE TO EQUIPMENT BREAK DOWN:
(AGE-WISE)PERIOD: 2012-13**

S.NO.	YEAR OF COMMISSIONING	NO. OF UNITS	INSTALLED CAPACITY (MW)	FORCED OUTAGE (HOURS)	NON AVAILABILITY PER UNIT (HOURS)
1	2012-13	14	501.00	1866.19	133.30
2	2011-2012	11	1423.00	263.56	23.96
3	2010-2011	11	690.00	1707.56	155.23
4	2009-2010	1	39.00	0.92	0.92
5	2008-2009	8	969.00	1594.35	199.29
6	2007-2008	23	2443.00	1813.68	78.86
7	2006-2007	21	2286.00	1220.16	58.10
8	2005-2006	13	1340.00	1953.57	150.27
9	2004-2005	13	1115.00	665.33	51.18
10	2003-2004	18	2690.00	575.40	31.97
11	2002-2003	11	740.60	520.77	47.34
12	2001-2002	20	1092.20	4708.50	235.42
13	2000-2001	13	1129.00	10313.37	793.34
14	1989-90 To 1999-00	87	5775.70	20572.99	236.47
15	1978-79 To 1988-89	124	7275.60	16079.28	129.67
16	1967-68 To 1977-78	82	5300.25	16073.60	196.02
17	UP TO 1966-67	164	4682.05	65328.77	398.35
	TOTAL	634	39491.40	145258.00	229.11

5.8 REGIONWISE PERFORMANCE:

The region wise summary of performance of the hydel generating units is indicated in **Table 5.13**. 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. Performance of hydro generating equipments installed in Northern Region was the best as the non-availability due to forced outages was the least (2.25%). The non-availability of the units installed in the North-Eastern Region was observed to be on the higher side (10.65%).

TABLE 5.13
FORCED OUTAGES - REGION WISE
PERIOD: 2012-13

S.NO.	REGION	NO. OF UNITS	INSTALLED CAPACITY (MW)	% NON AVAILABILITY DUE TO FORCED OUTAGES
1	NORTHERN	206	15523.25	2.25
2	WESTERN	101	7392.00	2.29
3	SOUTHERN	239	11387.45	3.85
4	EASTERN	59	3946.70	5.12
5	NORTH EASTERN	29	1242.00	10.65
	ALL INDIA	634	39491.40	3.27

5.9 FORCED OUTAGE - UTILITY WISE:

The forced outages of hydro electric units under various Central Sector Utilities, Private Sector and State Electricity Boards/Power Generation Corporations are indicated in **Table 5.14**.

All types of forced outages/tripping due to problems in generating units, auxiliary equipments, civil structure and misc. (viz non-availability of water, system disturbances, etc) have been taken into account for the analysis. Per unit forced outages for generating units under MPCL (1.13 Hr/unit) was least followed by DLHP (3.05 Hr/unit). It was maximum in respect of hydro electric stations under APGENCO (1066.73 Hr/unit).

Table 5.14

**FORCED OUTAGES- BOARD /CORPORATION WISE
PERIOD:-2012-13**

S.NO.	ORGANISATION	NO. OF UNITS	INSTALLED CAPACITY (MW)	FORCED OUTAGE (HOURS)	FORCED OUTAGE PER UNIT (HOURS)
CENTRAL SECTOR					
1	BBMB	28	2866.30	1524.81	54.46
2	DVC	5	143.20	4492.85	898.57
3	NEEPCO.	13	755.00	9706.34	746.64
4	NHDC	16	1520.00	3112.67	194.54
5	NHPC	51	4141.20	33912.00	664.94
6	SJVNL	6	1500.00	96.00	16.00
7	THDC	8	1400.00	1846.90	230.86
	SUB TOTAL	127	12325.70	54691.57	430.64
PRIVATE SECTOR					
1	ADHPL	2	192.00	1620.09	810.05
2	DLHP	1	34.00	3.05	3.05
3	EPPL	2	100.00	1525.00	762.50
4	JPVL	11	1700	189.91	17.26
5	LGPPL	2	70.00	810.67	405.34
6	MPCL	2	86.00	2.25	1.13
7	TATA	15	447.00	2972.10	198.14
	SUB TOTAL	35	2629.00	7123.07	203.52
STATE SECTOR					
1	APGENCO	57	3783.35	60803.73	1066.73
2	APGPCL	2	100.00	946.61	473.31
3	CSPGCL	3	120.00	101.78	33.93
4	GSECL	8	540.00	419.82	52.48
5	HPSEB LTD.	12	366.00	1726.35	143.86
6	JKPDC	9	660.00	945.71	105.08
7	JSEB	2	130.00	6.67	3.34
8	KPCL	68	3585.40	45155.17	664.05
9	KSEB	48	1881.50	18288.36	381.01
10	MAHAGENCO	24	2406.00	4171.33	173.81
11	MeECL	11	282.00	9655.00	877.73
12	MPPGCL	23	875.00	10366.37	450.71
13	OHPC	31	2027.50	21144.00	682.06

14	PSPCL	25	1051.00	21384.35	855.37
15	RRVUNL	11	411.00	912.00	82.91
16	SSNNL	11	1450.00	2723.73	247.61
17	TANGEDCO	67	2137.20	28429.23	424.32
18	UJVNL	34	1252.15	31416.00	924.00
19	UPJVNL	15	501.60	594.24	39.62
20	WBSEDCL	11	977.00	7556.00	686.91
	SUB TOTAL	472	24536.70	266746.45	565.14
	ALL INDIA	634	39491.40	328561.09	518.24

5.10 DURATION OF FORCED OUTAGES:

There were total 4623 forced outages/tripping during the year 2012-13. Duration of individual outage varied widely from a few minutes to the maximum of full year.

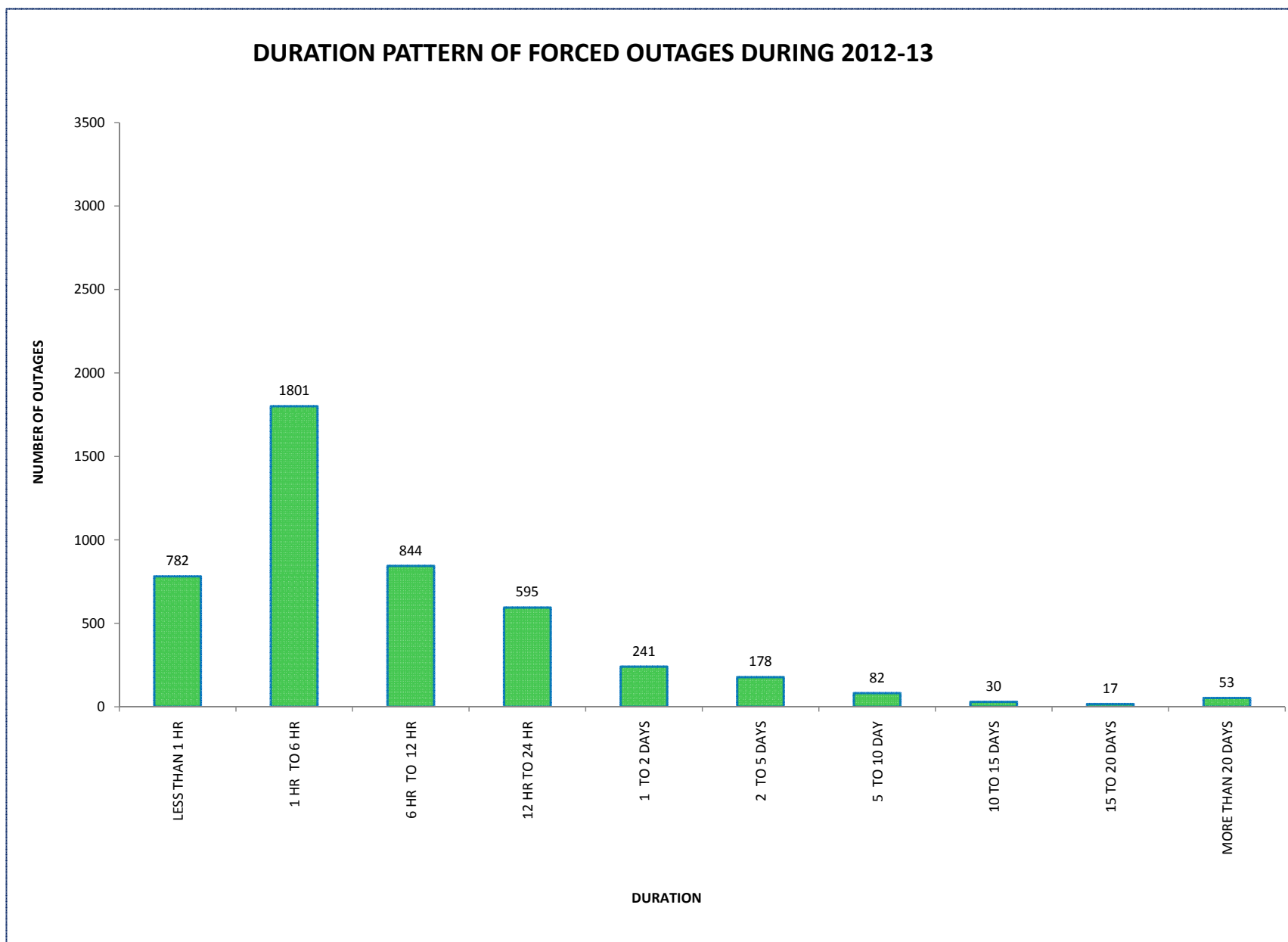
The duration pattern of forced outages is indicated in **Table 5.15** and **Exhibit 5.1**. It could be seen that about 87.00% of the total forced shutdown were of duration Upto 24 hours.

11.85% of outages were of duration varying from 1 to 20 days and only 1.15% of shutdowns were for more than 20 days.

TABLE 5.15

DURATION PATTERN OF FORCED OUTAGES PERIOD:-2012-13

S.NO.	DURATION IN HOURS	NUMBER OF OUTAGES	% OF TOTAL OUTAGES
1	Less than 1 hour	782	16.92
2	1 TO 6 hours	1801	38.96
3	6 TO 12 hours	844	18.26
4	12 TO 24 hours	595	12.87
5	1 TO 2 days	241	5.21
6	2 TO 5 days	178	3.85
7	5 TO 10 days	82	1.77
8	10 TO 15 days	30	0.65
9	15 TO 20 days	17	0.37
10	More than 20 days	53	1.15
	TOTAL NO. OF OUTAGES	4623	100



DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
<u>NORTHERN REGION</u>							
<u>ADHPL</u>							
1	ALLAIN DUHANGAN HPS	1	96	15/02/2013	17/02/2013	36.55	TURBINE OTHERS
		2	96	09/02/2013	28/03/2013	1117.92	THRUST BEARING
<u>BBMB</u>							
2	DEHAR H P S	1	165	20/09/2012	30/09/2012	241.87	FORCED OUTAGE
		1	165	11/07/2012	12/07/2012	36.37	SHEAR PIN
		2	165	25/09/2012	26/09/2012	25.33	SHAFT SEAL
		6	165	23/04/2012	01/06/2012	927.32	FORCED OUTAGE
3	KOTLA HPS	1	29.25	19/08/2012	21/08/2012	48.67	FORCED OUTAGE
4	PONG H P S	6	66	30/08/2012	05/09/2012	156.05	FORCED OUTAGE
<u>E.P.P.L.</u>							
5	MALANA-II HPS	2	50	10/01/2013	11/01/2013	34.33	SPEED RUNAWAY/OVER /UNDER
<u>HPSEBL</u>							
6	BASSI HPS	1	15	05/02/2013	06/02/2013	29.83	OTHERS
		3	15	20/08/2012	21/08/2012	24.78	SWITCHYARD MISC.
		4	15	15/08/2012	16/08/2012	29.58	MISCELLANEOUS
7	SANJAY HPS	1	40	18/10/2012	19/10/2012	36.83	AUTO. VOLTAGE REGULATOR
		1	40	13/10/2012	17/10/2012	89.25	OTHER (D/T,GUIDE/STAY VANES
		2	40	27/02/2013	03/03/2013	102	MISCELLANEOUS
		3	40	13/10/2012	17/10/2012	89.33	OTHER (D/T,GUIDE/STAY VANES
<u>JKSPDC</u>							
8	BAGLIHAR HPS	1	150	22/02/2013	24/02/2013	43.37	GOVERNOR SYSTM
		1	150	14/03/2013	26/03/2013	290.7	GOVERNOR SYSTM
		2	150	14/01/2013	16/01/2013	47.62	PENSTOCK
		3	150	09/10/2012	14/10/2012	137.5	U.A.T
9	UPPER SINDH-II HPS	3	35	04/07/2012	05/07/2012	33.88	PENSTOCK
		3	35	26/11/2012	30/11/2012	73.47	U.A.T
		3	35	02/05/2012	04/05/2012	43	SERVO MOTORS
		3	35	25/08/2012	26/08/2012	24.25	EHG/GOV. FAULTS, MISC.
		4	35	09/07/2012	10/07/2012	27.9	PENSTOCK
4	35	11/11/2012	31/03/2013	3354.25	TURBINE OTHERS		

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
<u>LGPPPL</u>							
10	BUDHIL HPS	1	35	10/07/2012	14/07/2012	99.35	OTHERS
		2	35	15/06/2012	26/06/2012	257.73	OTHERS
		2	35	19/08/2012	24/08/2012	136.97	OTHERS
		2	35	07/07/2012	19/07/2012	282.62	OTHERS
<u>NHPC</u>							
11	BAIRA SIUL HPS	1	66	21/09/2012	22/09/2012	26.05	SHAFT VIBRS./ALIGNM/SOUND
		3	66	10/09/2012	14/09/2012	116.8	SHAFT VIBRS./ALIGNM/SOUND
12	CHAMERA- II HPS	1	100	20/08/2012	22/08/2012	54.42	FORCED OUTAGE
		2	100	17/08/2012	18/08/2012	27.47	FORCED OUTAGE
		2	100	20/08/2012	22/08/2012	55.37	FORCED OUTAGE
		3	100	20/08/2012	22/08/2012	54.55	FORCED OUTAGE
13	CHAMERA-III HPS	1	77	03/10/2012	08/10/2012	129.65	GOVERNOR SYSTM
		1	77	20/08/2012	21/08/2012	27.45	DAM/SPILL WAYS
		1	77	21/08/2012	30/08/2012	216.42	TRANSFORMER PROTECTION
		2	77	20/08/2012	21/08/2012	25.65	DAM/SPILL WAYS
		3	77	20/08/2012	21/08/2012	26.78	DAM/SPILL WAYS
14	CHUTAK HPS	1	11	01/01/2013	12/01/2013	281.5	OTHER (D/T,GUIDE/STAY VANES
		1	11	04/06/2012	12/06/2012	197.58	VIBRATION/SOUND/ ALIGNMENT
		3	11	13/12/2012	16/12/2012	72.2	LINE BREAKER
		3	11	01/06/2012	10/12/2012	4617.92	VIBRATION/SOUND/ ALIGNMENT
15	DHAULI GANGA HPS	1	70	07/12/2012	11/12/2012	86.23	FORCED OUTAGE
		1	70	01/02/2013	03/02/2013	58.5	OTHER (D/T,GUIDE/STAY VANES
		2	70	01/02/2013	03/02/2013	58.33	OTHER (D/T,GUIDE/STAY VANES
		2	70	30/10/2012	07/11/2012	201.5	FORCED OUTAGE
		3	70	29/08/2012	04/09/2012	159.82	OTHER (D/T,GUIDE/STAY VANES
		3	70	15/03/2013	18/03/2013	72.67	TURBINE
		3	70	01/02/2013	03/02/2013	58.42	OTHER (D/T,GUIDE/STAY VANES
		3	70	19/04/2012	20/04/2012	34.75	MISCELLANEOUS
		3	70	10/12/2012	19/12/2012	214.38	MISCELLANEOUS
16	DULHASTI HPS	1	130	18/09/2012	19/09/2012	33.5	TURBINE OTHERS
		3	130	06/10/2012	11/10/2012	122.33	MISCELLANEOUS

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
17	SEWA-II HPS	1	40	18/04/2012	06/11/2012	4854.88	VIBRATION/SOUND/ ALIGNMENT
		3	40	06/01/2013	07/01/2013	35.5	EHG/GOV. FAULTS, MISC.
18	TANAKPUR HPS	1	31.4	21/01/2013	02/02/2013	268.07	FORCED OUTAGE
		1	31.4	27/02/2013	06/03/2013	179.47	FORCED OUTAGE
		2	31.4	27/10/2012	31/10/2012	94.6	FORCED OUTAGE
		2	31.4	02/02/2013	05/02/2013	72.57	FORCED OUTAGE
		3	31.4	28/05/2012	30/05/2012	54.3	FORCED OUTAGE
		3	31.4	21/12/2012	24/12/2012	74.4	FORCED OUTAGE
		3	31.4	12/05/2012	18/05/2012	129.82	FORCED OUTAGE
		3	31.4	31/10/2012	14/11/2012	339.6	FORCED OUTAGE
<u>PSPCL</u>							
19	ANANDPUR SAHIB HPS	1	33.5	16/12/2012	19/12/2012	77.75	HRI/HRC/SURGF SHAFT PROPS
		1	33.5	01/11/2012	02/11/2012	36.08	HRI/HRC/SURGF SHAFT PROPS
		2	33.5	16/12/2012	19/12/2012	77.75	HRI/HRC/SURGF SHAFT PROPS
		2	33.5	01/11/2012	02/11/2012	36.08	HRI/HRC/SURGF SHAFT PROPS
		3	33.5	01/11/2012	02/11/2012	36.08	HRI/HRC/SURGF SHAFT PROPS
		3	33.5	16/12/2012	19/12/2012	77.75	HRI/HRC/SURGF SHAFT PROPS
		4	33.5	16/12/2012	19/12/2012	77.75	HRI/HRC/SURGF SHAFT PROPS
		4	33.5	01/11/2012	02/11/2012	36.08	HRI/HRC/SURGF SHAFT PROPS
20	MUKERIAN HPS	8	19.5	04/09/2012	17/10/2012	1039.75	ABNORMAL SOUND
21	RANJIT SAGAR HPS	1	150	01/11/2012	20/11/2012	449.97	EXCITATION OTHERS
		2	150	18/10/2012	31/03/2013	3924.92	GOVERNOR SYSTM
		3	150	30/10/2012	09/03/2013	3128.58	EXCITATION OTHERS
22	SHANAN HPS	1	15	16/05/2012	20/05/2012	110.5	ROTOR
		1	15	01/04/2012	30/04/2012	698.8	PROTECTION OPERATION
		1	15	14/06/2012	16/07/2012	776.08	PROTECTION OPERATION
		4	15	01/04/2012	06/04/2012	129.67	RUNNER/UNDER WATER PARTS
		5	50	01/06/2012	06/06/2012	125.58	RUNNER/UNDER WATER PARTS
<u>RRVUNL</u>							
23	JAWAHAR SAGAR HPS	3	33	02/03/2013	31/03/2013	672.98	MISCELLANEOUS
		3	33	26/01/2013	28/01/2013	28.75	OTHERS
24	MAHI BAJAJ HPS	3	45	10/09/2012	12/09/2012	46	MISCELLANEOUS

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
<u>THDC</u>							
25	TEHRI ST-1 HPS	1	250	09/12/2012	10/12/2012	25	OTHERS
		2	250	09/12/2012	10/12/2012	25	OTHERS
		3	250	09/12/2012	10/12/2012	30.25	OTHERS
		4	250	09/12/2012	10/12/2012	25	OTHERS
<u>UJVNL</u>							
26	CHIBRO (YAMUNA) HPS	2	60	11/06/2012	13/06/2012	34.08	FORCED OUTAGE
		2	60	09/06/2012	10/06/2012	29.92	FORCED OUTAGE
		3	60	07/06/2012	09/06/2012	54.08	FORCED OUTAGE
		4	60	08/12/2012	10/12/2012	43.75	FORCED OUTAGE
27	CHILLA HPS	1	36	09/07/2012	10/07/2012	40.58	SHAFT SEAL
		1	36	06/09/2012	07/09/2012	37.75	HRI/HRC/SURGF SHAFT PROPS
		1	36	06/05/2012	08/05/2012	47.17	SHAFT SEAL
		1	36	26/09/2012	27/09/2012	38.75	SHAFT SEAL
		1	36	18/01/2013	20/01/2013	49.75	SHAFT SEAL
		2	36	06/09/2012	08/09/2012	42.25	HRI/HRC/SURGF SHAFT PROPS
		3	36	05/09/2012	07/09/2012	50.33	ABNORMAL SOUND
		3	36	10/02/2013	14/02/2013	91.67	MISCELLANEOUS
		3	36	21/05/2012	24/05/2012	75	PADS
		3	36	14/02/2013	15/02/2013	26	MISCELLANEOUS
		4	36	23/04/2012	26/04/2012	73.67	PERMANENT MAG GENERATOR
		4	36	15/08/2012	18/08/2012	62.42	SHAFT SEAL
		4	36	28/04/2012	30/04/2012	57	PERMANENT MAG GENERATOR
		4	36	06/09/2012	07/09/2012	38.67	HRI/HRC/SURGF SHAFT PROPS
		4	36	01/05/2012	03/05/2012	47.42	SHAFT VIBRS./ALIGNM/SOUND
		4	36	26/04/2012	28/04/2012	40.58	PERMANENT MAG GENERATOR
28	DHAKRANI HPS	1	11.25	16/07/2012	18/07/2012	49.25	FORCED OUTAGE
		1	11.25	15/07/2012	16/07/2012	28.25	FORCED OUTAGE
		1	11.25	26/06/2012	29/06/2012	73	FORCED OUTAGE
		1	11.25	04/06/2012	06/06/2012	41.5	FORCED OUTAGE
		1	11.25	12/05/2012	23/05/2012	261.67	FORCED OUTAGE
		1	11.25	14/04/2012	12/05/2012	670.17	FORCED OUTAGE

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
29	DHALIPUR HPS	1	11.25	22/10/2012	01/11/2012	233	FORCED OUTAGE
		1	11.25	02/10/2012	03/10/2012	36.83	FORCED OUTAGE
		1	11.25	04/08/2012	06/08/2012	43.67	FORCED OUTAGE
		1	11.25	21/07/2012	23/07/2012	40.33	FORCED OUTAGE
		1	11.25	18/07/2012	21/07/2012	62	FORCED OUTAGE
		2	11.25	20/10/2012	22/10/2012	52.42	FORCED OUTAGE
		2	11.25	24/11/2012	26/11/2012	37.5	FORCED OUTAGE
		2	11.25	18/04/2012	19/04/2012	31.83	FORCED OUTAGE
		2	11.25	23/04/2012	24/04/2012	25.92	FORCED OUTAGE
		2	11.25	04/08/2012	06/08/2012	42.75	FORCED OUTAGE
		2	11.25	30/11/2012	02/12/2012	45.83	FORCED OUTAGE
		2	11.25	18/12/2012	10/02/2013	1298.5	FORCED OUTAGE
		2	11.25	12/12/2012	14/12/2012	49.08	FORCED OUTAGE
		2	11.25	10/12/2012	12/12/2012	40	FORCED OUTAGE
		2	11.25	07/12/2012	10/12/2012	70.08	FORCED OUTAGE
		2	11.25	03/12/2012	07/12/2012	87.08	FORCED OUTAGE
		2	11.25	17/10/2012	18/10/2012	28.67	FORCED OUTAGE
		3	11.25	06/06/2012	10/06/2012	99.42	FORCED OUTAGE
		3	11.25	24/05/2012	25/05/2012	27.25	FORCED OUTAGE
		3	11.25	22/05/2012	24/05/2012	32	FORCED OUTAGE
		3	11.25	11/06/2012	15/06/2012	108.25	FORCED OUTAGE
		3	11.25	04/08/2012	06/08/2012	42.83	FORCED OUTAGE
		1	17	05/06/2012	06/06/2012	24.25	FORCED OUTAGE
		1	17	17/03/2013	22/03/2013	126.58	FORCED OUTAGE
		1	17	22/01/2013	23/01/2013	27.58	FORCED OUTAGE
		1	17	28/12/2012	15/01/2013	428.25	FORCED OUTAGE
		1	17	06/06/2012	07/06/2012	26.42	FORCED OUTAGE
		1	17	30/11/2012	02/12/2012	45.92	FORCED OUTAGE
		1	17	24/11/2012	26/11/2012	37.67	FORCED OUTAGE
		1	17	21/10/2012	23/10/2012	41.58	FORCED OUTAGE
		1	17	17/10/2012	18/10/2012	26.58	FORCED OUTAGE

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		1	17	03/12/2012	07/12/2012	87	FORCED OUTAGE
		2	17	25/10/2012	05/11/2012	252.08	FORCED OUTAGE
		2	17	18/04/2012	19/04/2012	30.5	FORCED OUTAGE
		2	17	11/05/2012	18/05/2012	166.25	FORCED OUTAGE
		2	17	21/05/2012	24/05/2012	76.5	FORCED OUTAGE
		2	17	08/06/2012	15/06/2012	181.17	FORCED OUTAGE
		2	17	26/06/2012	28/06/2012	44.67	FORCED OUTAGE
		2	17	16/07/2012	18/07/2012	49.25	FORCED OUTAGE
		2	17	18/07/2012	21/07/2012	65.33	FORCED OUTAGE
		2	17	21/07/2012	23/07/2012	40.25	FORCED OUTAGE
		2	17	04/08/2012	06/08/2012	43	FORCED OUTAGE
		2	17	06/11/2012	16/11/2012	248.33	FORCED OUTAGE
		2	17	07/12/2012	10/12/2012	60.08	FORCED OUTAGE
		2	17	10/12/2012	12/12/2012	40	FORCED OUTAGE
		2	17	12/12/2012	14/12/2012	49.08	FORCED OUTAGE
		2	17	18/12/2012	28/12/2012	232.67	FORCED OUTAGE
		3	17	24/10/2012	25/10/2012	29.08	FORCED OUTAGE
		3	17	04/08/2012	06/08/2012	42.5	FORCED OUTAGE
		3	17	18/05/2012	20/05/2012	36.25	FORCED OUTAGE
		3	17	02/02/2013	04/02/2013	46	FORCED OUTAGE
		3	17	30/01/2013	31/01/2013	31	FORCED OUTAGE
		3	17	28/01/2013	29/01/2013	30.5	FORCED OUTAGE
		3	17	15/01/2013	18/01/2013	70.83	FORCED OUTAGE
		3	17	04/11/2012	06/11/2012	34.58	FORCED OUTAGE
		3	17	24/05/2012	25/05/2012	27.25	FORCED OUTAGE
30	KHATIMA HPS	1	13.8	05/05/2012	09/05/2012	114.08	FORCED OUTAGE
		1	13.8	09/06/2012	10/06/2012	40.25	FORCED OUTAGE
		1	13.8	10/04/2012	21/04/2012	261.42	FORCED OUTAGE
		1	13.8	11/05/2012	12/05/2012	28.17	FORCED OUTAGE
		1	13.8	18/05/2012	19/05/2012	25	FORCED OUTAGE
		2	13.8	09/04/2012	10/04/2012	30.92	FORCED OUTAGE

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		2	13.8	28/04/2012	03/05/2012	130.83	FORCED OUTAGE
		2	13.8	06/12/2012	08/12/2012	40.33	FORCED OUTAGE
		2	13.8	21/04/2012	27/04/2012	148.42	FORCED OUTAGE
		3	13.8	16/05/2012	17/05/2012	31.83	FORCED OUTAGE
		3	13.8	03/05/2012	05/05/2012	57.83	FORCED OUTAGE
		3	13.8	27/04/2012	28/04/2012	32.5	FORCED OUTAGE
		3	13.8	05/04/2012	09/04/2012	97.67	FORCED OUTAGE
		1	30	05/02/2013	07/02/2013	35	THRUST BEARING
		1	30	23/01/2013	25/01/2013	43.42	SHAFT SEAL
31	KHODRI HPS	3	30	03/09/2012	20/09/2012	396.58	FORCED OUTAGE
32	KULHAL HPS	1	10	21/12/2012	07/01/2013	409.5	FORCED OUTAGE
		1	10	18/12/2012	21/12/2012	66.75	FORCED OUTAGE
		1	10	16/12/2012	17/12/2012	28	FORCED OUTAGE
		1	10	10/05/2012	11/05/2012	28.5	FORCED OUTAGE
		1	10	17/05/2012	21/05/2012	92.25	FORCED OUTAGE
		1	10	21/05/2012	22/05/2012	26	FORCED OUTAGE
		1	10	27/06/2012	29/06/2012	40.25	FORCED OUTAGE
		1	10	07/11/2012	14/11/2012	185	FORCED OUTAGE
		1	10	15/04/2012	20/04/2012	116	FORCED OUTAGE
		1	10	18/11/2012	19/11/2012	40.25	FORCED OUTAGE
		1	10	07/05/2012	08/05/2012	27.75	FORCED OUTAGE
		1	10	03/05/2012	06/05/2012	57.25	FORCED OUTAGE
		2	10	22/10/2012	26/10/2012	82.58	FORCED OUTAGE
		2	10	05/11/2012	06/11/2012	31	FORCED OUTAGE
		2	10	21/11/2012	07/12/2012	374.5	FORCED OUTAGE
		2	10	17/07/2012	18/07/2012	33	FORCED OUTAGE
		2	10	24/05/2012	25/05/2012	24.5	FORCED OUTAGE
		2	10	11/05/2012	17/05/2012	158.83	FORCED OUTAGE
		2	10	24/01/2013	25/01/2013	34.92	FORCED OUTAGE
		2	10	19/07/2012	21/07/2012	43.75	FORCED OUTAGE
		2	10	07/12/2012	08/01/2013	765.25	FORCED OUTAGE
		2	10	16/01/2013	18/01/2013	45.5	FORCED OUTAGE

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
33	MANERI BHALI - I HPS	3	10	23/04/2012	25/04/2012	52.5	FORCED OUTAGE
		3	10	25/04/2012	27/04/2012	43.25	FORCED OUTAGE
		3	10	29/04/2012	30/04/2012	28.5	FORCED OUTAGE
		3	10	05/05/2012	08/05/2012	68	FORCED OUTAGE
		3	10	22/05/2012	23/05/2012	25.42	FORCED OUTAGE
		3	10	14/11/2012	17/11/2012	69	FORCED OUTAGE
		3	10	20/11/2012	22/11/2012	32.75	FORCED OUTAGE
		3	10	24/11/2012	26/11/2012	34.92	FORCED OUTAGE
		3	10	01/12/2012	02/12/2012	34.5	FORCED OUTAGE
		3	10	03/12/2012	05/12/2012	46.5	FORCED OUTAGE
		3	10	12/12/2012	13/12/2012	24.25	FORCED OUTAGE
		3	10	07/01/2013	16/01/2013	205.5	FORCED OUTAGE
		3	10	22/01/2013	24/01/2013	34.7	FORCED OUTAGE
		3	10	19/03/2013	21/03/2013	33	FORCED OUTAGE
		3	10	31/05/2012	16/06/2012	395.75	FORCED OUTAGE
		3	10	28/06/2012	29/06/2012	27	FORCED OUTAGE
		3	10	15/07/2012	16/07/2012	27.75	FORCED OUTAGE
		3	10	17/10/2012	18/10/2012	31	FORCED OUTAGE
		3	10	20/10/2012	22/10/2012	43.5	FORCED OUTAGE
		3	10	20/04/2012	23/04/2012	81.75	FORCED OUTAGE
		3	10	26/10/2012	05/11/2012	237.17	FORCED OUTAGE
		3	10	22/10/2012	26/10/2012	82.58	FORCED OUTAGE
		1	30	05/04/2012	11/04/2012	143.42	FORCED OUTAGE
		1	30	11/04/2012	15/04/2012	90.83	FORCED OUTAGE
		1	30	16/04/2012	22/04/2012	140.5	FORCED OUTAGE
		1	30	22/04/2012	27/04/2012	115.08	FORCED OUTAGE
		2	30	15/04/2012	16/04/2012	28.75	FORCED OUTAGE
		3	30	27/04/2012	29/04/2012	56.08	FORCED OUTAGE
		3	30	01/05/2012	07/05/2012	161.67	FORCED OUTAGE
		3	30	03/04/2012	05/04/2012	56.17	FORCED OUTAGE

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
34	MANERI BHALI - II HPS	1	76	15/08/2012	21/08/2012	159.75	SHAFT SEAL
		1	76	03/08/2012	12/08/2012	211.67	SHAFT VIBRS./ALIGNM/SOUND
		1	76	21/08/2012	30/08/2012	197.58	SHAFT SEAL
		1	76	23/06/2012	29/06/2012	146.25	ALIGNMENT
		2	76	19/08/2012	22/08/2012	81.67	SHAFT SEAL
		2	76	03/10/2012	05/10/2012	54.92	SHAFT SEAL
		2	76	01/09/2012	03/09/2012	60.22	SHAFT SEAL
		3	76	29/07/2012	31/07/2012	56.92	SHAFT SEAL
		3	76	09/08/2012	10/08/2012	34.67	COOLING WATER SYSTEM
		3	76	05/10/2012	07/10/2012	58.57	FORCED OUTAGE
		4	76	25/07/2012	26/07/2012	27.43	SHAFT VIBRS./ALIGNM/SOUND
		4	76	07/06/2012	08/06/2012	36.4	SHAFT SEAL
		4	76	06/09/2012	09/09/2012	81.83	SHAFT SEAL
		4	76	13/09/2012	15/09/2012	51.08	SHAFT SEAL
		4	76	30/09/2012	02/10/2012	61.83	SHAFT SEAL
		4	76	04/07/2012	08/07/2012	103.33	PADS
		4	76	09/08/2012	10/08/2012	32.75	COOLING WATER SYSTEM
35	RAMGANGA HPS	3	66	24/11/2012	26/11/2012	39	FORCED OUTAGE
		3	66	03/11/2012	11/11/2012	198.08	FORCED OUTAGE
		3	66	13/11/2012	22/11/2012	221.98	FORCED OUTAGE
<u>UPJVNL</u>							
36	KHARA HPS	1	24	15/04/2012	17/04/2012	46.5	THRUST BEARING
		1	24	17/09/2012	17/11/2012	1460.33	EXCITATION PROBLEMS
		1	24	13/05/2012	16/05/2012	84.72	MISCELLANEOUS
37	OBRA HPS	3	33	09/05/2012	13/05/2012	91.87	RUNNER BLADE CONTROLPROBLEM
38	RIHAND HPS	5	50	26/04/2012	30/04/2012	95.42	EXCITATION OTHERS
		5	50	17/12/2012	18/12/2012	31.58	SHAFT SEAL
<u>WESTERN REGION</u>							
<u>CSPGCL</u>							
1	HASDEOBANGO HPS	3	40	25/09/2012	27/09/2012	53.58	THRUST BEARING
<u>GSECL</u>							
2	KADANA HPS	1	60	06/09/2012	08/09/2012	47.08	MISCELLANEOUS
		4	60	06/09/2012	19/09/2012	302.5	MISCELLANEOUS

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
<u>MAHAGENCO</u>							
3	BHIRA TAIL RACE HPS	1	40	24/07/2012	29/07/2012	121.42	EHG/GOV. FAULTS, MISC.
		1	40	30/07/2012	31/07/2012	27.15	EXCITATION OTHERS
		2	40	03/05/2012	05/05/2012	52.67	OTHERS
4	GHATGHAR PSS HPS	1	125	27/12/2012	03/01/2013	179.92	OTHERS
		1	125	06/09/2012	09/09/2012	72	TURBINE
		2	125	16/02/2013	20/02/2013	96.5	OTHERS
		2	125	27/12/2012	03/01/2013	179.92	OTHERS
5	KOYNA-III HPS	3	80	18/08/2012	31/08/2012	318.83	GENERATOR FAULTS
		4	80	15/05/2012	25/05/2012	219.92	ROTOR
6	KOYNA-IV HPS	2	250	20/06/2012	05/07/2012	376	OTHER (D/T,GUIDE/STAY VANES
		4	250	24/05/2012	03/06/2012	257.55	OTHER (D/T,GUIDE/STAY VANES
		4	250	15/10/2012	19/10/2012	106.5	OTHERS
		4	250	09/06/2012	12/06/2012	54.63	OTHERS
<u>MPPGCL</u>							
7	BANSAGAR TONS-1 HPS	1	105	01/08/2012	11/08/2012	220	HRI/HRC/SURGF SHAFT PROPS
		2	105	26/11/2012	14/12/2012	421.58	THRUST BEARING PADS.
		3	105	18/02/2013	20/02/2013	65.08	SHEAR PIN
		3	105	22/06/2012	24/06/2012	50.83	SHAFT VIBRS./ALIGNM/SOUND
8	BANSAGAR TONS-II HPS	1	15	17/06/2012	22/06/2012	130	OTHERS
9	BARGI HPS	1	45	28/07/2012	30/07/2012	68.67	MISCELLANEOUS
10	GANDHI SAGAR HPS	2	23	02/02/2013	04/02/2013	41.08	GUIDE VANES
11	MADHIKHERA HPS	1	20	23/08/2012	24/08/2012	24.42	MISCELLANEOUS
		3	20	10/10/2012	11/10/2012	28.5	EHG/GOV. FAULTS, MISC.
12	PENCH HPS	2	80	19/06/2012	13/07/2012	567.07	INTAKE STRICT./TRASH RACK
13	RAJGHAT HPS	1	15	21/12/2012	08/01/2013	454.75	GOVERNOR SYSTM
		1	15	22/10/2012	25/10/2012	65.75	AUTO. VOLTAGE REGULATOR
		1	15	18/10/2012	22/10/2012	91.5	AUTO. VOLTAGE REGULATOR
		1	15	09/08/2012	31/08/2012	530.77	SHAFT SEAL
		1	15	10/11/2012	16/11/2012	150.5	OTHERS
		1	15	09/01/2013	10/01/2013	30.25	OTHERS
		3	15	07/01/2013	08/01/2013	30.08	OTHERS

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
		3	15	07/11/2012	08/11/2012	35.02	OTHERS
		3	15	20/12/2012	26/12/2012	139.92	SHAFT SEAL
		3	15	27/12/2012	29/12/2012	61	SHAFT SEAL
<u>NHDC</u>							
14	INDIRA SAGAR HPS	1	125	08/09/2012	09/09/2012	32	OTHERS
		1	125	07/08/2012	09/08/2012	57.68	ROTOR
		2	125	07/08/2012	13/08/2012	159.05	ROTOR
		3	125	07/08/2012	08/08/2012	34.43	ROTOR
		4	125	07/08/2012	09/08/2012	56.57	ROTOR
		5	125	07/08/2012	08/08/2012	35.83	ROTOR
		6	125	07/08/2012	10/08/2012	92.38	ROTOR
15	OMKARESHWAR HPS	1	65	07/08/2012	09/08/2012	42.28	MISCELLANEOUS
		2	65	07/08/2012	09/08/2012	42.2	MISCELLANEOUS
		3	65	07/08/2012	09/08/2012	42.02	MISCELLANEOUS
		4	65	07/08/2012	09/08/2012	41.38	MISCELLANEOUS
		5	65	07/08/2012	09/08/2012	41.35	MISCELLANEOUS
		7	65	07/08/2012	09/08/2012	41.65	MISCELLANEOUS
		8	65	07/08/2012	09/08/2012	41.82	MISCELLANEOUS
<u>SSNNL</u>							
16	S SAROVAR CHPH HPS	1	50	21/12/2012	22/12/2012	24.08	ROTOR
		3	50	22/03/2013	23/03/2013	30.67	ROTOR
		4	50	16/11/2012	27/11/2012	263.75	ROTOR
		4	50	10/11/2012	16/11/2012	136.25	ROTOR
17	S SAROVAR RBPH HPS	3	200	09/08/2012	10/08/2012	25.58	EHG/GOV. FAULTS, MISC.
		4	200	22/11/2012	14/02/2013	2014.92	PENSTOCK
		4	200	20/07/2012	27/07/2012	159.83	GENRATOR OTHERS
<u>TATA MAH.</u>							
18	BHIRA PSS HPS	1	150	05/09/2012	31/12/2012	2820	PROTECTION OPERATION
		1	150	09/03/2013	11/03/2013	32.08	EHG/GOV. FAULTS, MISC.

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
<u>SOUTHERN REGION</u>							
<u>APGENCO</u>							
1	HAMPI HPS	1	9	19/07/2012	30/07/2012	272.33	MISCELLANEOUS
		3	9	31/07/2012	06/11/2012	2347.5	MISCELLANEOUS
		4	9	06/03/2013	08/03/2013	50.92	OTHERS
		4	9	04/07/2012	05/07/2012	32	MISCELLANEOUS
2	LOWER SILERU HPS	1	115	25/04/2012	27/04/2012	52.58	LOWER GUIDE BEARING
		1	115	29/04/2012	30/04/2012	25.5	OTHERS
		1	115	25/02/2013	26/02/2013	24.67	EHG/GOV. FAULTS, MISC.
		2	115	13/04/2012	19/04/2012	157.2	OTHERS
		3	115	14/01/2013	16/01/2013	43.17	OTHERS
		3	115	26/04/2012	30/04/2012	105	OTHERS
		3	115	07/01/2013	09/01/2013	54.5	OTHERS
		4	115	17/01/2013	23/01/2013	139.17	EHG/GOV. FAULTS, MISC.
		4	115	20/12/2012	22/12/2012	43.83	PR. SHAFT/PENSTOCK/B.F.V
		4	115	20/12/2012	22/12/2012	43.83	PR. SHAFT/PENSTOCK/B.F.V
3	MACHKUND HPS	1	17	04/11/2012	16/02/2013	2492.75	OTHERS
		1	17	18/04/2012	20/04/2012	67.42	EXCITATION OTHERS
		2	17	23/01/2013	25/01/2013	46	DRAINAGE DEWATERING SYSTEM
		2	17	04/04/2012	14/08/2012	3167.33	VIBRATION/SOUND/ ALIGNMENT
		3	17	05/11/2012	08/11/2012	87.75	TRT/TRC/SURGE CHAMBER PROBL.FM
		3	17	23/01/2013	25/01/2013	45.33	DRAINAGE DEWATERING SYSTEM
		3	17	21/09/2012	25/09/2012	101.42	LOWER GUIDE BEARING
		3	17	04/05/2012	09/05/2012	124.92	HRI/HRC/SURGF SHAFT PROPS
		5	21.25	09/03/2013	11/03/2013	50.33	UGB ALIGNMENT/MISC.
		5	21.25	22/03/2013	27/03/2013	116.92	EXCITATION PROBLEMS
		5	21.25	26/09/2012	13/11/2012	1162.42	SHAFT VIBRS./ALIGNM/SOUND
		6	21.25	14/05/2012	16/05/2012	44.08	EHG/GOV. FAULTS, MISC.
		6	21.25	02/05/2012	14/05/2012	294.92	EHG/GOV. FAULTS, MISC.
		6	21.25	09/03/2013	10/03/2013	25.92	EHG/GOV. FAULTS, MISC.
		6	21.25	05/02/2013	07/02/2013	49.75	EHG/GOV. FAULTS, MISC.
		6	21.25	21/04/2012	01/05/2012	235.55	OTHERS
		6	21.25	10/04/2012	12/04/2012	52.47	OTHERS
		6	21.25	20/05/2012	22/05/2012	68	GENERATOR FAULTS

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
4	NAGARJUN SGR HPS	5	100.8	01/12/2012	05/12/2012	117	OTHER EQUIPMENT FAULTS
5	PRIYADARSHNI JURALA HPS	3	39	05/09/2012	12/09/2012	166.02	FORCED OUTAGE
6	SRISAILAM LB HPS	5	150	18/10/2012	30/10/2012	287.63	GENRATOR OTHERS
7	T B DAM HPS	1	9	01/01/2013	31/01/2013	732	OTHER (D/T,GUIDE/STAY VANES
		4	9	26/12/2012	28/12/2012	54.5	MISCELLANEOUS
8	UPPER SILERU HPS	3	60	01/07/2012	04/07/2012	89	MISCELLANEOUS
KPCL							
9	BHADRA HPS	2	12	27/04/2012	28/04/2012	33.67	PROTECTION OPERATION
10	GHAT PRABHA HPS	2	16	29/04/2012	18/03/2013	7752.08	OTHERS
11	JOG HPS	1	13.2	04/10/2012	08/10/2012	104.13	GENRATOR OTHERS
		3	13.2	28/02/2013	01/03/2013	33.25	DESILTING SYSTEM
		4	13.2	27/02/2013	28/02/2013	31.42	DESILTING SYSTEM
		5	21.6	04/10/2012	26/10/2012	537.5	GENRATOR OTHERS
		5	21.6	23/02/2013	24/02/2013	24.67	DESILTING SYSTEM
		5	21.6	25/02/2013	26/02/2013	32.5	DESILTING SYSTEM
		6	21.6	23/02/2013	24/02/2013	24.67	DESILTING SYSTEM
12	KALINADI HPS	1	135	28/07/2012	05/08/2012	194.03	SPEED RUNAWAY/OVER /UNDER
		1	135	10/12/2012	12/12/2012	54.23	SPEED RUNAWAY/OVER /UNDER
		3	135	30/01/2013	31/01/2013	28.52	OTHERS
		3	135	07/06/2012	10/08/2012	1533.92	OTHER (D/T,GUIDE/STAY VANES
		4	150	07/06/2012	02/07/2012	602.3	OTHER (D/T,GUIDE/STAY VANES
13	KALINADI SUPA HPS	1	50	07/03/2013	08/03/2013	24.28	OTHERS
		2	50	28/05/2012	05/07/2012	921.55	TRANSFORMER PROTECTION
14	MUNIRABAD HPS	3	10	10/09/2012	12/09/2012	52.83	THRUST BEARING
15	SHARAVATHI HPS	10	103.5	19/03/2013	31/03/2013	278.12	UPPER GUIDE BEARING
		10	103.5	27/11/2012	28/11/2012	32.57	GENERATOR COOLING SYSTEM
		4	103.5	12/07/2012	20/07/2012	203.65	OTHER (D/T,GUIDE/STAY VANES
		4	103.5	16/05/2012	17/05/2012	38.05	EHG/GOV. FAULTS, MISC.
		5	103.5	15/03/2013	31/03/2013	377.05	THRUST BEARING
		8	103.5	21/06/2012	07/07/2012	385.02	TURBINE OTHERS
		8	103.5	07/07/2012	10/07/2012	65.85	TURBINE OTHERS
		8	103.5	01/11/2012	07/11/2012	133.87	PENSTOCK

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
16	SIVASAMUNDRUM HPS	1	3	04/07/2012	09/07/2012	110.83	TURBINE FAULTS
		3	3	18/04/2012	19/04/2012	32.08	OTHER (D/T,GUIDE/STAY VANES
		6	3	11/04/2012	14/04/2012	74.42	THRUST BEARING
17	VARAHI HPS	1	115	31/08/2012	03/09/2012	69.53	MISCELLANEOUS
		2	115	27/06/2012	30/06/2012	85.87	GOVERNOR SYSTM
		3	115	26/10/2012	28/10/2012	49.88	EHG/GOV. FAULTS, MISC.
		3	115	18/07/2012	30/07/2012	291.2	GEN./TR.BREAKER
		4	115	20/09/2012	22/09/2012	49.28	EHG/GOV. FAULTS, MISC.
		4	115	07/09/2012	14/09/2012	185.1	EHG/GOV. FAULTS, MISC.
		4	115	19/08/2012	21/08/2012	54.72	MISCELLANEOUS
<u>KSEB</u>							
18	IDAMALAYAR HPS.	1	37.5	11/02/2013	19/02/2013	185.25	GOVERNOR SYSTM
		1	37.5	04/07/2012	07/07/2012	72.27	THRUST BEARING
		2	37.5	11/02/2013	19/02/2013	190.97	GOVERNOR SYSTM
		2	37.5	29/12/2012	30/12/2012	27.45	GENEREATOR COOLING SYSTEM
19	IDUKKI HPS.	1	130	22/02/2013	27/02/2013	134.38	NEEDLE PROBLEM
		2	130	14/04/2012	16/04/2012	51.1	GENRATOR OTHERS
		2	130	14/03/2013	15/03/2013	28.92	TRANSFORMER PROTECTION
		4	130	15/05/2012	30/05/2012	368.22	RUNNER/UNDER WATER PARTS
20	KAKKAD HPS.	1	25	11/07/2012	14/07/2012	89.47	TRANSFORMER PROTECTION
21	KUTTIYADI HPS.	4	50	12/11/2012	13/11/2012	26.58	OTHER (D/T,GUIDE/STAY VANES
22	LOWER PERIYAR HPS.	2	60	10/04/2012	18/04/2012	202.48	OTHER (D/T,GUIDE/STAY VANES
		3	60	10/04/2012	18/04/2012	209.27	OTHER (D/T,GUIDE/STAY VANES
23	NARIAMANGLAM HPS	4	25	04/06/2012	06/06/2012	61.42	FORCED OUTAGE
		4	25	27/06/2012	29/06/2012	66.65	MISCELLANEOUS
		4	25	20/11/2012	22/11/2012	53.95	EHG/GOV. FAULTS, MISC.
24	PALLIVASAL HPS.	3	5	09/01/2013	30/01/2013	493.6	OTHERS
		5	7.5	26/06/2012	30/06/2012	105.32	TURBINE OTHERS
25	PANNIAR HPS.	1	15	06/03/2013	08/03/2013	45.78	COOLING WATER SYSTEM
		1	15	26/04/2012	27/04/2012	37.67	DRAINAGE DEWATERING SYSTEM
		2	15	14/09/2012	15/09/2012	25.23	POWER HOUSE MISC.
26	PORINGALKUTTU HPS.	1	8	14/08/2012	16/08/2012	39.97	EHG/GOV. FAULTS, MISC.
		1	8	16/08/2012	17/08/2012	26.83	EHG/GOV. FAULTS, MISC.
		2	8	16/06/2012	18/06/2012	51.3	PROTECTION OPERATION

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
27	SABARIGIRI HPS.	1	50	14/04/2012	15/04/2012	32.55	MISCELLANEOUS
		3	50	05/04/2012	06/04/2012	24.7	BUS PROTECTION TRIP
		6	50	05/04/2012	06/04/2012	26.32	BUS PROTECTION TRIP
28	SHOLAYAR HPS.	1	18	16/08/2012	22/08/2012	143.07	GENERATOR COOLING SYSTEM
		1	18	01/06/2012	17/06/2012	399.83	T.B. ALIGNMENT/MISC.
		2	18	24/04/2012	26/04/2012	56.72	THRUST BEARING
<u>TANGEDCO</u>							
29	ALIYAR HPS.	1	60	03/04/2012	04/04/2012	24.17	LT AC PANELS
30	KODAYAR HPS.	2	40	14/02/2013	18/02/2013	103.87	MISCELLANEOUS
31	KUNDAH HPS.	1	20	28/05/2012	31/05/2012	77.25	MISCELLANEOUS
		11	60	09/05/2012	12/05/2012	69.33	MISCELLANEOUS
		14	20	10/09/2012	11/09/2012	28.75	PENSTOCK
		5	35	19/11/2012	25/02/2013	2357.9	STATION SERVICE TRANSFORM
		6	35	16/05/2012	17/05/2012	26.17	LOWER GUIDE BEARING
		6	35	23/06/2012	25/06/2012	54.82	PENSTOCK
		8	35	14/10/2012	15/10/2012	32	PENSTOCK
32	MOYAR HPS	1	12	28/01/2013	01/02/2013	98.25	COOLING WATER SYSTEM
		1	12	15/05/2012	16/05/2012	31.08	RUNNER/UNDER WATER PARTS
33	PAPANASAM HPS.	2	8	30/12/2012	31/12/2012	43.98	MISCELLANEOUS
		2	8	20/12/2012	29/12/2012	218.22	MISCELLANEOUS
		2	8	01/01/2013	06/01/2013	133.92	EHG/GOV. FAULTS, MISC.
		3	8	16/10/2012	20/10/2012	93.25	DC/BATTERY
		3	8	18/09/2012	20/09/2012	36.67	TURBINE FAULTS
34	PYKARA HPS.	2	7	15/05/2012	17/05/2012	59.42	ROTOR
		5	13.6	09/12/2012	11/12/2012	53.67	PENSTOCK
		5	13.6	17/09/2012	18/09/2012	25.5	PENSTOCK
		6	11	15/10/2012	16/10/2012	31.67	PENSTOCK
35	PYKARA ULTMATE HPS.	2	50	12/05/2012	23/05/2012	272.58	ROTOR
		3	50	25/02/2013	31/03/2013	797.5	GOVERNOR SYSTM
		3	50	06/02/2013	10/02/2013	86.13	COOLING WATER SYSTEM
36	SHOLAYAR HPS.	2	35	05/01/2013	08/01/2013	69.25	UPPER GUIDE BEARING
		2	35	06/11/2012	07/11/2012	32.85	TURBINE FAULTS
		3	25	10/12/2012	11/12/2012	26	GENERATOR FAULTS

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
<u>EASTERN REGION</u>							
<u>DVC</u>							
1	MAITHON HPS.	1	23.2	07/08/2012	09/08/2012	48.88	SPEED RUNAWAY/OVER /UNDER
2	PANCHET HPS.	1	40	29/08/2012	31/08/2012	60.48	EHT/CT/PT
		1	40	01/07/2012	03/07/2012	65	LGB OIL SYSTEMS PROBLEMS
		1	40	06/04/2012	07/04/2012	26.75	DRAINAGE DEWATERING SYSTEM
		1	40	25/05/2012	29/05/2012	107.08	EHG/GOV. FAULTS, MISC.
		2	40	17/09/2012	22/09/2012	111.3	MISCELLANEOUS
		2	40	03/09/2012	04/09/2012	29.55	OTHERS
		2	40	28/05/2012	06/06/2012	233.6	EHT/ISOLATOR
<u>NHPC</u>							
3	RANGIT HPS	2	20	09/05/2012	10/05/2012	26.5	U.G.B.OIL SYSTEM
		3	20	27/06/2012	29/06/2012	63	MISCELLANEOUS
		3	20	25/05/2012	11/06/2012	408.78	FORCED OUTAGE
4	TEESTA LOW DAM-III HPS	2	33	08/06/2012	10/06/2012	49.35	LINE BREAKER
		2	33	13/06/2012	16/06/2012	71.35	EHG/GOV. FAULTS, MISC.
		2	33	26/06/2012	29/06/2012	64.63	DAM/SPILL WAYS
		3	33	07/06/2012	09/06/2012	35.3	RUNNER BLADE CONTROLPROBLEM
		4	0	04/06/2012	06/06/2012	30.7	GOVERNOR SYSTM
		4	0	21/06/2012	24/06/2012	73.17	GENERATOR FAULTS
		4	0	26/06/2012	29/06/2012	62.32	DAM/SPILL WAYS
5	TEESTA V HPS	1	170	08/11/2012	12/11/2012	92.88	DAM/SPILL WAYS
		1	170	18/11/2012	20/11/2012	44.68	FORCED OUTAGE
		1	170	06/11/2012	08/11/2012	44.52	FORCED OUTAGE
		2	170	13/02/2013	16/02/2013	62.43	FORCED OUTAGE
		2	170	16/02/2013	18/02/2013	32.85	FORCED OUTAGE
		2	170	21/09/2012	22/09/2012	35.75	SHAFT SEAL
		2	170	21/12/2012	23/12/2012	43.18	MISCELLANEOUS
		2	170	08/11/2012	11/11/2012	69.2	DAM/SPILL WAYS
		3	170	08/11/2012	12/11/2012	91.92	DAM/SPILL WAYS
		3	170	15/02/2013	01/03/2013	327.03	FORCED OUTAGE

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
<u>OHPC</u>							
6	BALIMELA HPS.	1	60	31/01/2013	31/03/2013	1407	THRUST BEARING
		2	60	31/01/2013	15/03/2013	1044.5	THRUST BEARING
		3	60	31/01/2013	10/03/2013	922.37	THRUST BEARING
		4	60	01/04/2012	11/08/2012	3188	T.B.OIL SYSTEM PROBLEM
		4	60	31/01/2013	26/03/2013	1299.82	THRUST BEARING
		5	60	22/08/2012	27/08/2012	122.72	EHT/CT/PT
		8	75	15/07/2012	28/07/2012	315.15	OTHERS
7	HIRAKUD HPS	1	49.5	31/12/2012	15/01/2013	359.15	TURBINE OTHERS
		10	24	20/09/2012	24/09/2012	114.17	EXCITATION PROBLEMS
		10	24	20/12/2012	08/01/2013	466	GENRATOR OTHERS
		10	24	01/04/2012	12/05/2012	998.5	TURBINE
		10	24	18/06/2012	27/08/2012	1684.5	MISCELLANEOUS
		2	49.5	24/02/2013	26/02/2013	38.92	EHG/GOV. FAULTS, MISC.
		2	49.5	31/12/2012	07/01/2013	177.57	TURBINE OTHERS
		2	49.5	05/11/2012	08/11/2012	66.25	TURBINE OTHERS
		2	49.5	01/04/2012	09/08/2012	3132	TURBINE FAULTS
		3	32	05/11/2012	06/11/2012	24.25	TURBINE OTHERS
		3	32	31/12/2012	04/01/2013	103.23	TURBINE OTHERS
		3	32	13/07/2012	26/07/2012	320.08	HRI/HRC/SURGF SHAFT PROPS
		4	32	31/12/2012	03/01/2013	75.65	TURBINE OTHERS
		5	37.5	05/11/2012	16/11/2012	255.5	TURBINE OTHERS
		5	37.5	01/09/2012	03/09/2012	47.25	GEN./TR.BREAKER
		6	37.5	30/12/2012	05/01/2013	155	EXCITATION OTHERS
		6	37.5	04/07/2012	09/07/2012	122.67	MISCELLANEOUS
		7	37.5	31/12/2012	12/01/2013	296.9	TURBINE OTHERS
		7	37.5	27/04/2012	30/04/2012	62.83	GOVERNOR SYSTM
		7	37.5	11/05/2012	21/05/2012	242.92	OTHERS
		8	24	31/08/2012	03/09/2012	68.83	GEN./TR.BREAKER
8	RENGALI HPS.	1	50	17/03/2013	19/03/2013	38.68	EHG/GOV. FAULTS, MISC.
		3	50	02/07/2012	07/07/2012	128.58	HRI/HRC/SURGF SHAFT PROPS
		3	50	01/04/2012	03/04/2012	66.75	GEN./TR.BREAKER
		4	50	01/04/2012	20/04/2012	468.42	GEN./TR.BREAKER
		5	50	08/09/2012	09/09/2012	27.53	MISCELLANEOUS

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
9	UPPER INDRAVATI HPS.	1	150	05/10/2012	06/10/2012	30.27	GENRATOR OTHERS
		3	150	09/03/2013	22/03/2013	309.25	SHEAR PIN
		3	150	02/01/2013	25/02/2013	1287.58	SHEAR PIN
		3	150	14/11/2012	11/12/2012	652.93	SHEAR PIN
		3	150	26/05/2012	31/05/2012	132.77	SHEAR PIN
10	UPPER KOLAB HPS.	1	80	10/03/2013	27/03/2013	415.5	GENERATOR FAULTS
		2	80	13/09/2012	15/09/2012	47.45	GEN./TR.BREAKER
		2	80	01/03/2013	03/03/2013	47.93	BRAKE AND JACKS
		3	80	01/11/2012	09/11/2012	209.67	NEEDLE PROBLEM
<u>WBS EDCCL</u>							
11	JALDHAKA HPS ST-I	1	9	11/09/2012	12/09/2012	37	MISCELLANEOUS
		1	9	14/07/2012	16/07/2012	61.33	PROTECTION OPERATION
		1	9	11/08/2012	13/08/2012	38.58	MISCELLANEOUS
		2	9	06/09/2012	07/09/2012	31.67	GOVERNOR SYSTM
		2	9	05/08/2012	10/08/2012	130.08	EHG/GOV. FAULTS, MISC.
		2	9	04/06/2012	06/06/2012	38.5	MISCELLANEOUS
		2	9	08/06/2012	09/06/2012	34.3	MISCELLANEOUS
		2	9	16/06/2012	17/06/2012	36.72	MISCELLANEOUS
		2	9	14/07/2012	16/07/2012	40.88	MISCELLANEOUS
		2	9	20/07/2012	21/07/2012	25.92	MISCELLANEOUS
		3	9	09/01/2013	10/01/2013	32.78	GOVERNOR SYSTM
		3	9	20/07/2012	21/07/2012	25.73	MISCELLANEOUS
		3	9	24/06/2012	25/06/2012	25	MISCELLANEOUS
		3	9	21/06/2012	23/06/2012	52.28	MISCELLANEOUS
		3	9	06/07/2012	07/07/2012	31.92	PROTECTION OPERATION
		3	9	02/07/2012	04/07/2012	39.7	MISCELLANEOUS
		3	9	14/07/2012	16/07/2012	40.63	MISCELLANEOUS
		3	9	16/06/2012	17/06/2012	37.75	MISCELLANEOUS
12	RAMMAM HPS.	1	12.5	08/02/2013	17/02/2013	213.97	OTHERS
		1	12.5	20/02/2013	21/02/2013	29.33	OTHERS
		1	12.5	23/02/2013	27/02/2013	95.5	OTHERS

DETAILS OF LONG DURATION FORCED OUTAGES IN HYDRO - ELECTRIC UNITS DURING 2012-2013
(OUTAGE DURATION 24 HOURS AND ABOVE)

Sl. No.	STATION	UNIT	CAPACITY (MW)	DATE OF OUTAGE	DATE OF RETURN	OUTAGE HOURS	REASONS
<u>NORTH EASTERN REGION</u>							
<u>APGCL</u>							
1	KARBI LANGPI HPS.	1	50	06/06/2012	11/06/2012	97.98	PENSTOCK
		1	50	16/07/2012	24/07/2012	199.87	MISCELLANEOUS
		2	50	20/06/2012	12/07/2012	523.83	GENRATOR OTHERS
<u>MeECL</u>							
2	KYRDEMKULAI HPS.	1	30	30/07/2012	01/08/2012	48.17	SHAFT SEAL
		1	30	20/09/2012	23/09/2012	54.88	SHAFT SEAL
		1	30	21/06/2012	27/06/2012	140.33	SHAFT SEAL
		2	30	16/09/2012	18/09/2012	47.17	SHAFT SEAL
		2	30	17/07/2012	18/07/2012	25.75	OTHER (D/T,GUIDE/STAY VANES
		2	30	11/04/2012	12/04/2012	32.25	U.A.T
3	UMIAM HPS ST-I	1	9	11/07/2012	12/07/2012	35.92	OIL PROBLEMS
		3	9	28/11/2012	30/11/2012	44.33	ROTOR
4	UMIAM HPS ST-IV	7	30	16/05/2012	18/05/2012	48	THRUST BEARING
		7	30	09/10/2012	14/10/2012	125.33	ROTOR
		7	30	24/04/2012	25/04/2012	25.92	THRUST BEARING
		8	30	05/06/2012	06/06/2012	24.87	EXCITATION OTHERS
<u>NEEPCO.</u>							
5	DOYANG HPS.	1	25	05/04/2012	09/04/2012	96	OTHER (D/T,GUIDE/STAY VANES
		2	25	14/04/2012	19/04/2012	121.08	FORCED OUTAGE
		2	25	05/04/2012	09/04/2012	96	OTHER (D/T,GUIDE/STAY VANES
		3	25	05/04/2012	09/04/2012	96	OTHER (D/T,GUIDE/STAY VANES
6	KHONDONG HPS.	1	25	10/03/2013	12/03/2013	66.72	HRI/HRC/SURGF SHAFT PROPS
		1	25	17/02/2013	18/02/2013	28	LOWER GUIDE BEARING
7	KOPILI HPS.	1	50	25/02/2013	27/02/2013	50.5	PENSTOCK
		1	50	30/11/2012	01/12/2012	33.17	GUIDE VANES
		1	50	13/08/2012	03/09/2012	502.72	SHAFT VIBRS./ALIGNM/SOUND
		1	50	25/06/2012	06/08/2012	1008.15	TURBINE
		1	50	24/05/2012	26/05/2012	51.97	COOLING SYSTEM
		1	50	11/04/2012	12/04/2012	43.03	COOLING WATER SYSTEM
		1	50	11/08/2012	13/08/2012	48.27	MISCELLANEOUS
		2	50	26/06/2012	10/12/2012	4009.57	FORCED OUTAGE
		2	50	25/02/2013	27/02/2013	50.5	PENSTOCK
		2	50	10/06/2012	12/06/2012	64.98	GUIDE VANES

CHAPTER 6

OPERATING AVAILABILITY OF HE UNITS

CHAPTER-6

OPERATING AVAILABILITY OF HE UNITS

6.1 On the basis of planned maintenance undertaken and forced outages caused at 634 Hydro Electric Generating units of 182 HE Stations comprising of 39491.40 MW for which data has been received & analyzed, operating availability of various units and stations has been computed. During the year 2012-13, the average availability of generating units on all India basis was 89.17% as compared to 88.09% % during 2011-12.

6.2 Twenty one H.E. Stations achieved operating availability of more than 99%. The details of these stations are given in **Table 6.1**.

TABLE 6.1

HYDRO-ELECTRIC POWER STATIONS WHICH PROVIDED HIGHEST OPERATING AVAILABILITY DURING 2012-13

Sl. No.	NAME OF POWER STATION	UTILITY	CAPACITY (MW)	% OPERATING AVAILABILITY OF STATION
1	PURULIA PSS HPS	WBSEDCL	600	100.00
2	N J SAGAR-LBC HPS	APGENCO	60	100.00
3	N J SAGAR-RBC HPS	APGENCO	90	100.00
4	MYNTDU ST-I HPS	MeECL	126	100.00
5	MALANA HPS	MPCL	86	99.99
6	BHIVPURI HPS	TATA	75	99.97
7	POCHAMPAD HPS	APGENCO	27	99.96
8	BHANDARDHARA HPS ST-II	DLHP	34	99.96
9	MUKERIAN-IV HPS	PSPCL	58.5	99.90
10	BASPA HPS	JPVL	300	99.87
11	NATHPA JHAKRI HPS	SJVNL	1500	99.86
12	UPPER SILERU-I&II HPS	APGENCO	120	99.75
13	KHOPOLI HPS	TATA	72	99.69
14	PONG H P S	BBMB	396	99.66
15	KADRA HPS	KPCL	150	99.54
16	BHIRA HPS	TATA	150	99.50
17	MAHI BAJAJ-II HPS	RRVUNL	90	99.39
18	GERUSUPPA HPS	KPCL	240	99.17

19	VISHNU PRAYAG HPS	JPVL	400	99.08
20	TEESTA LOW DAM-III HPS	NHPC	99	99.07
21	PARSON'S VALLEY HPS.	TANGEDCO	30	99.01

6.3 OPERATING AVAILABILITY - REGIONWISE

Region wise operating availability of hydro-electric units during 2012-13 is indicated in **Table 6.2**. It would be seen that the operating availability of hydel generating units in Western Region was the highest (91.54%). This was mainly due to comparatively less planned maintenance and forced outages.

The operating availability was the lowest in case of units in North Eastern Region (84.03%).

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**. Station wise details are shown in **Exhibits from 6.1 to 6.14**.

TABLE 6.2
AVAILABILITY OF UNITS - REGION-WISE
PERIOD: 2012-13

SL. No.	REGION	NO.OF UNITS	INSTALLED CAPACITY MW	PLANNED MAINTENANCE %	FORCE D OUTAGE %	OPERATING AVAILABILITY
1	NORTHERN	206	15523.25	9.07	2.25	88.68
2	WESTERN	101	7392.00	6.17	2.29	91.54
3	SOUTHERN	239	11387.45	7.09	3.85	89.06
4	EASTERN	59	3946.70	6.25	5.12	88.63
5	NORTH EASTERN	29	1242.00	5.32	10.65	84.03
	ALL INDIA	634	39491.40	7.56	3.27	89.17

6.4 OPERATING AVAILABILITY: AGE-WISE

The average operating availability during 2012-13 of hydro units commissioned in various years has been indicated in **Table 6.3**. It is seen that unit commissioned during 2009-10 have achieved the highest operating availability of 98.08%. Operating availability was less than 90% for the units commissioned during the period 2002-03, 2000-2001, 1989-90 to 1999-00, 1978-79 to 1988-89, 1967-68 TO 1977-78 and those commissioned up to 1966-67. Operating availability was more then 90% for all the other years.

TABLE - 6.3

**OPERATING AVAILABILITY - AGE-WISE
PERIOD: 2012-13**

SL. NO	YEAR OF COMMISSIONING	NUMBER OF UNITS	INSTALLED CAPACITY (MW)	OPERATING AVAILABILITY
1	2012-2013	14	501.00	95.15
2	2011-2012	11	1423.00	96.82
3	2010-2011	11	690.00	91.83
4	2009-2010	1	39.00	98.08
5	2008-2009	8	969.00	95.30
6	2007-2008	23	2443.00	92.62
7	2006-2007	21	2286.00	92.13
8	2005-2006	13	1340.00	92.42
9	2004-2005	13	1115.00	94.95
10	2003-2004	18	2690.00	97.84
11	2002-2003	11	740.60	82.79
12	2001-2002	20	1092.20	91.64
13	2000-2001	13	1129.00	70.56
14	1989-90 TO 1999-00	87	5775.70	88.77
15	1978-79 TO 1988-89	124	7275.60	87.36
16	1967-68 TO 1977-78	82	5300.25	88.93
17	UP TO 1966-67	164	4682.05	82.47
	TOTAL	634	39491.40	89.17

6.5 OPERATING AVAILABILITY - UTILITY WISE

Sector wise/State Electricity Board/Power Generating Corporation wise operating availability of HE units is indicated in Table 6.4.

It has been observed that operating availability of generating units among the utilities was the highest 99.99% for MPCL.

6.6 MISCELLANEOUS NON AVAILABILITY

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, system disturbance, low system demand, disaster/natural calamity, reserve shutdown, transmission constraints & power evacuation problems, low head or high tailrace level, strikes and other misc. reasons etc. It was highest (i.e. 45.98%) in case of SJVNL.

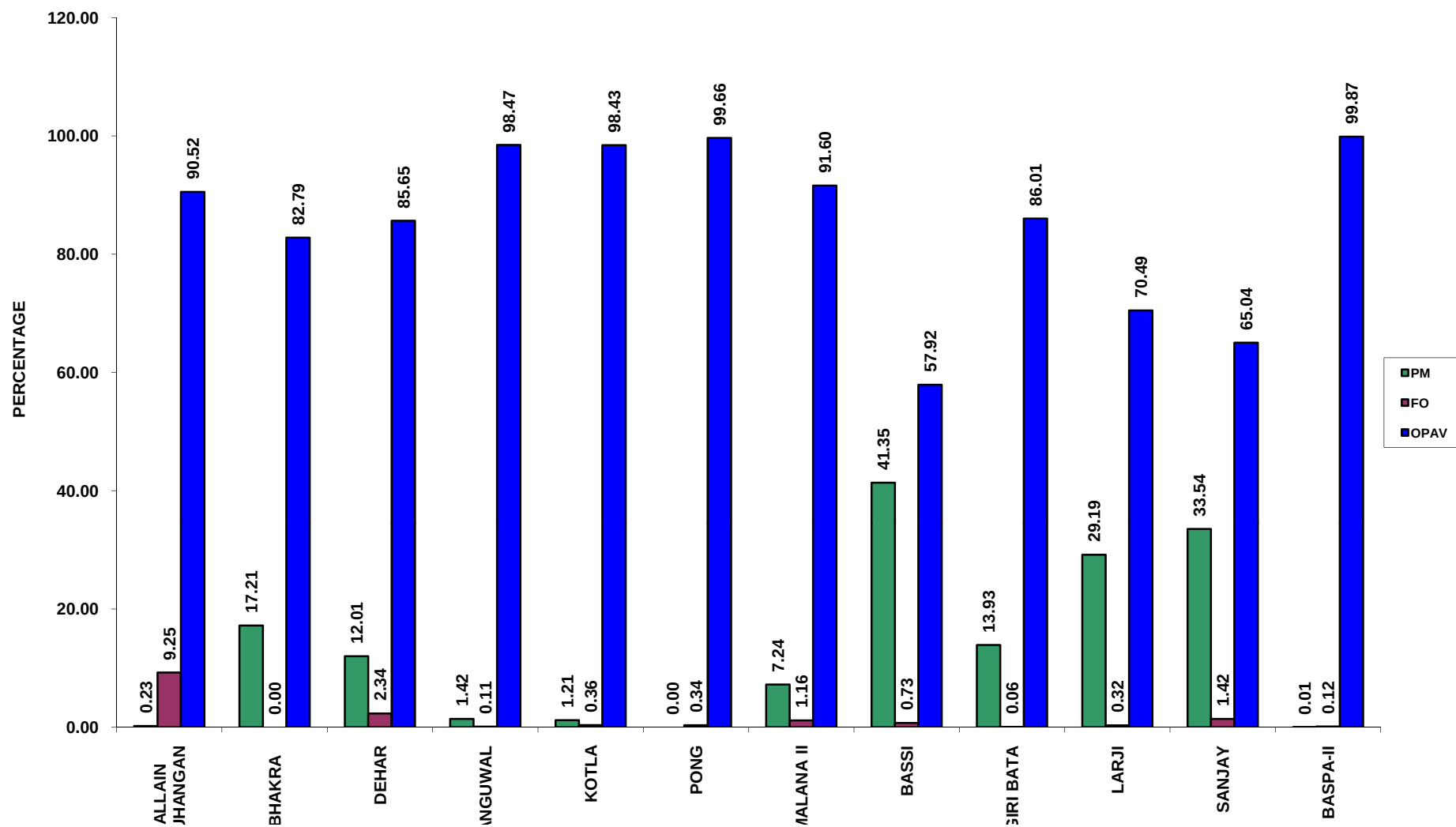
TABLE 6.4

**SECTOR WISE OPERATING AVAILABILITY & MISCELLANEOUS
NON-AVILABILITY OF BOARDS / CORPORATIONS FOR PERIOD: 2012-13**

S. NO.	ORGANISATION	NO.OF UNITS	INSTALLED CAPACITY (MW)	PLANNED MAINTENANCE (%)	FORCED OUTAGE (%)	OPERATING AV. PER UNIT (%)	MISC. NON AVAILABILITY (%)
CENTRAL							
1	BBMB	28	2866.30	12.18	0.87	86.95	7.87
2	DVC	5	143.20	0.40	5.99	93.61	0.03
3	NEEPCO	13	755.00	6.41	6.71	86.88	0.09
4	NHDC	16	1520.00	3.09	0.59	96.31	0.02
5	NHPC	51	4141.20	7.42	4.02	88.56	2.40
6	SJVNL	6	1500.00	0.00	0.14	99.86	45.98
7	THDC	8	1400.00	5.00	1.29	93.71	1.24
	SUB TOTAL	127	12325.70	6.46	2.13	91.41	8.79
STATE							
1	APGENCO	57	3783.35	6.12	3.94	89.94	5.29
2	APGPCL	2	100.00	0.00	4.93	95.07	43.15
3	CSPGCL	3	120.00	4.38	0.46	95.16	0.00
4	GSECL	8	540.00	15.81	0.55	83.64	0.00
5	HPSEB LTD.	12	366.00	29.77	0.43	69.80	0.78
6	JKPDC	9	660.00	5.61	3.50	90.89	17.13
7	JSEB	2	130.00	45.07	0.00	54.93	0.00
8	KPCL	68	3585.40	5.13	3.02	91.85	6.99
9	KSEB	48	1881.50	9.87	3.90	86.22	12.48
10	MAHAGENCO	24	2406.00	9.36	1.46	89.17	0.01
11	MPPGCL	23	875.00	5.60	2.25	92.15	0.00
12	MeECL	11	282.00	6.79	2.87	90.34	0.00
13	OHPC	31	2027.50	7.43	7.27	85.30	0.01
14	PSPCL	25	1051.00	16.56	12.99	70.45	4.46
15	RRVUNL	11	411.00	12.86	0.88	86.26	27.80
16	SSNNL	11	1450.00	2.99	3.68	93.34	0.00

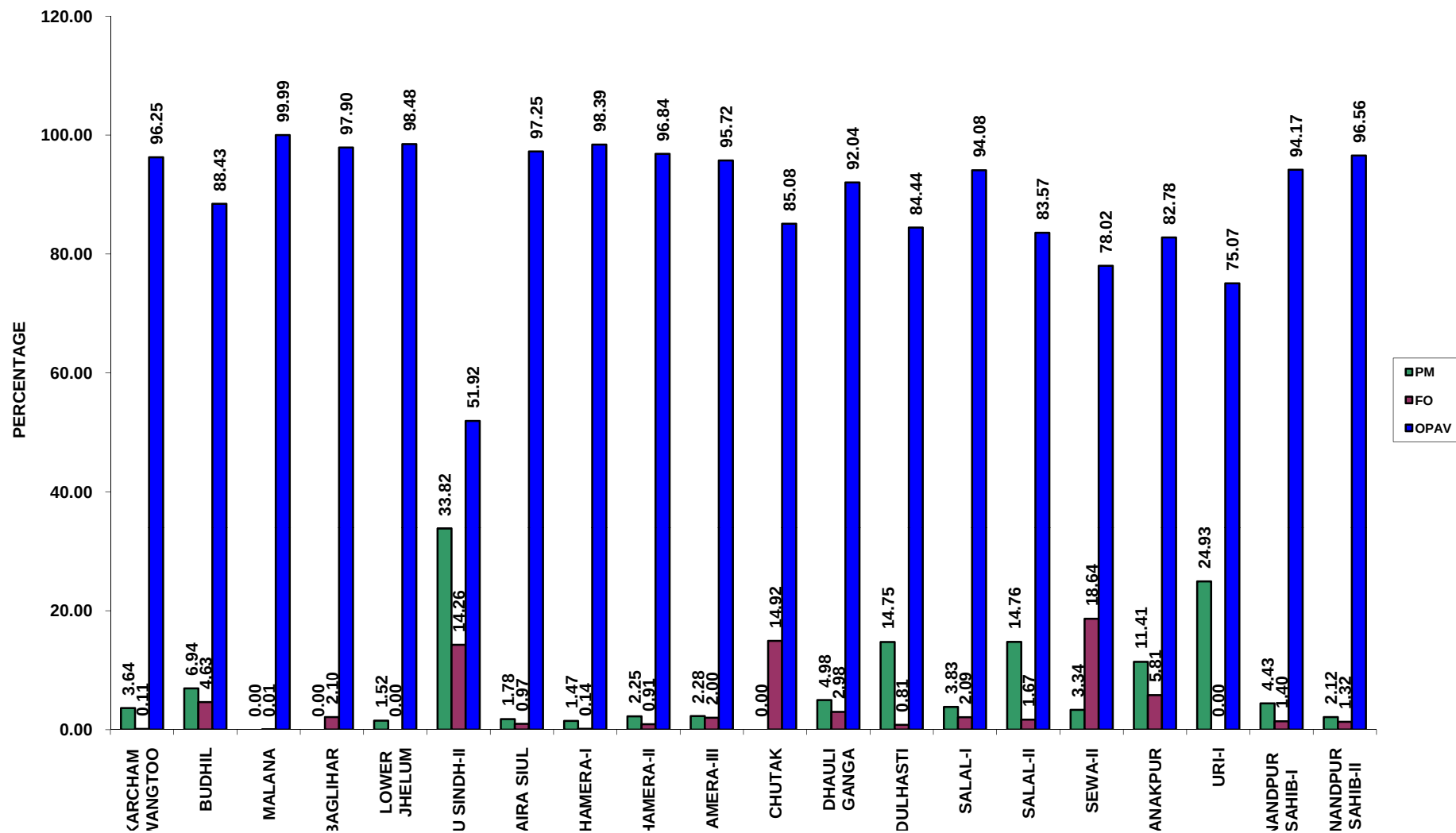
17	TANGEDCO	67	2137.20	9.68	5.06	85.26	0.40
18	UJVNL	34	1252.15	11.47	5.85	82.68	9.91
19	UPJVNL	15	501.60	32.62	1.21	66.17	0.00
20	WBSEDCL	11	977.00	1.35	0.16	98.48	1.38
	SUB TOTAL	472	24536.70	8.71	3.90	87.39	4.70
PVT							
1	ADHPL	2	192.00	0.23	9.25	90.52	0.00
2	DLHP	1	34.00	0.00	0.04	99.96	0.00
3	EPPL	2	100.00	7.24	1.16	91.60	43.02
4	JPVL	11	300.00	2.28	0.17	97.55	0.97
5	LGPPL	2	70.00	6.94	4.63	88.43	0.00
6	MPCL	2	86.00	0.00	0.01	99.99	0.17
7	TATA	15	447.00	0.52	11.11	88.37	0.00
	SUB TOTAL	35	2629.00	1.92	2.74	95.33	2.44
	ALL INDIA TOTAL	634	39491.40	7.56	3.27	89.17	5.83

OPERATING AVAILABILITY OF H E STATIONS DURING 2012-13



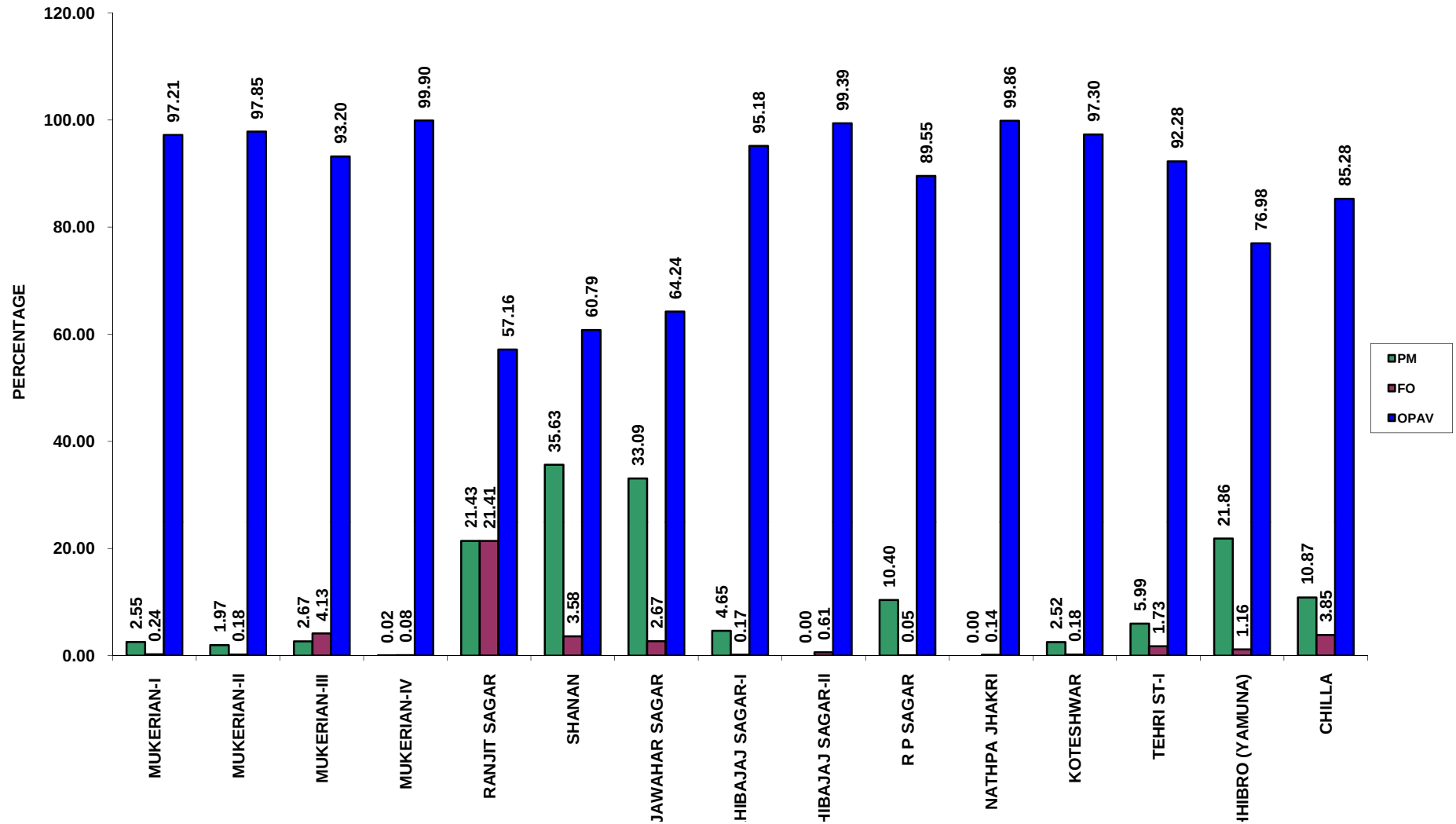
OPERATING AVAILABILITY OF H E STATIONS DURING 2012-13

EXHIBIT 6.2



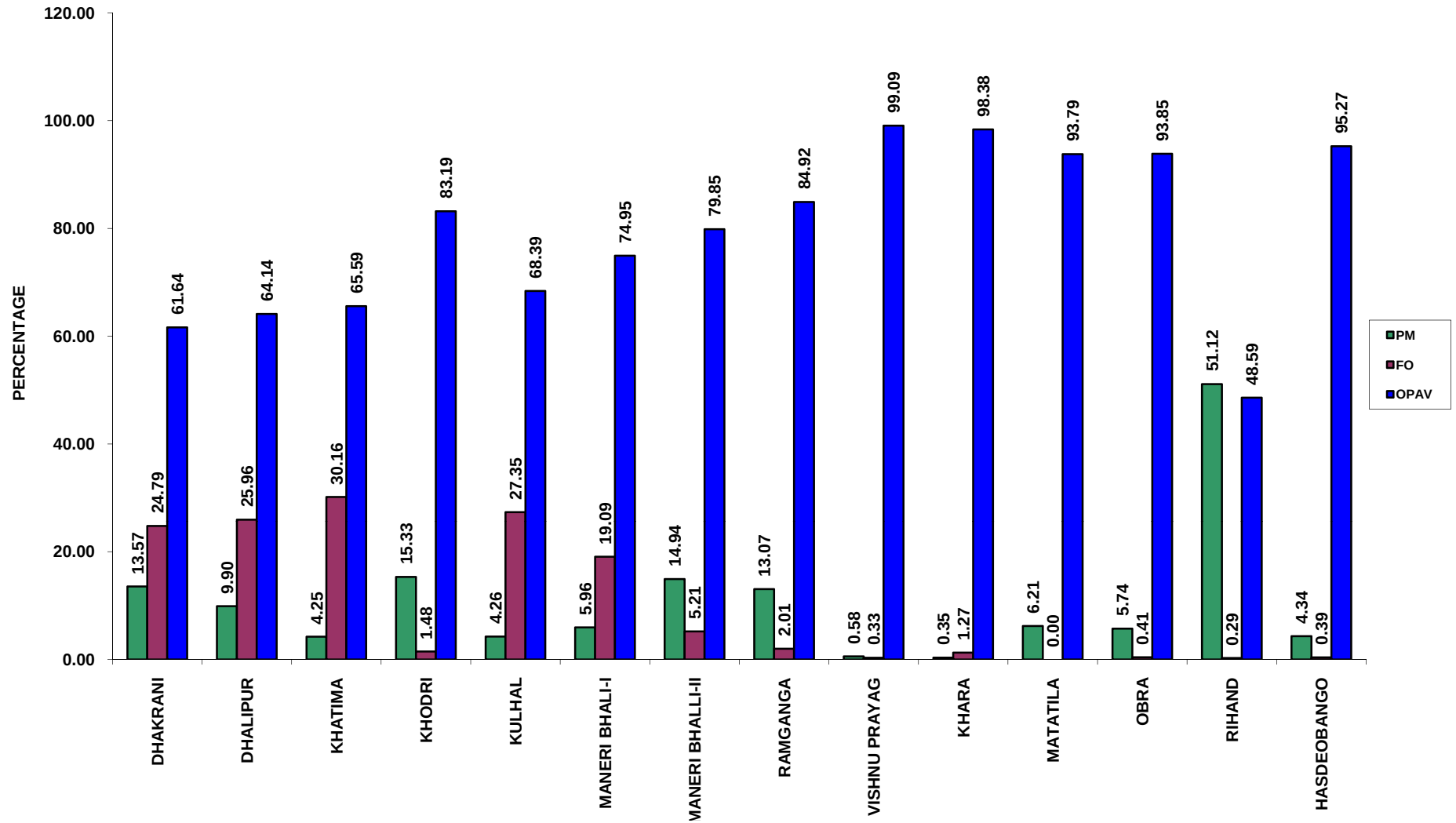
OPERATING AVAILABILITY OF H E STATIONS DURING 2012-13

EXHIBIT 6.3



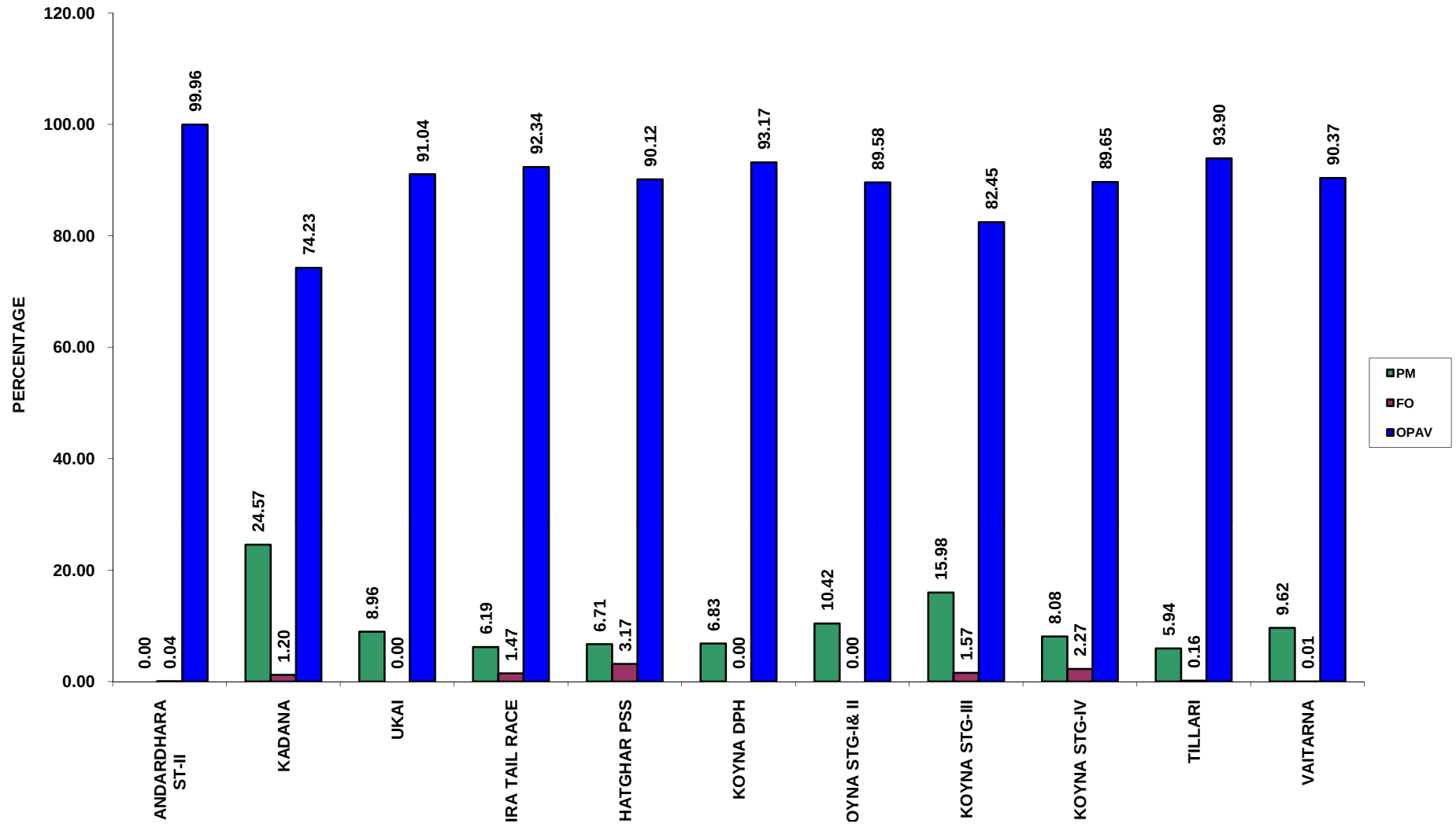
OPERATING AVAILABILITY OF H E STATIONS DURING 2012-13

EXHIBIT 6.4



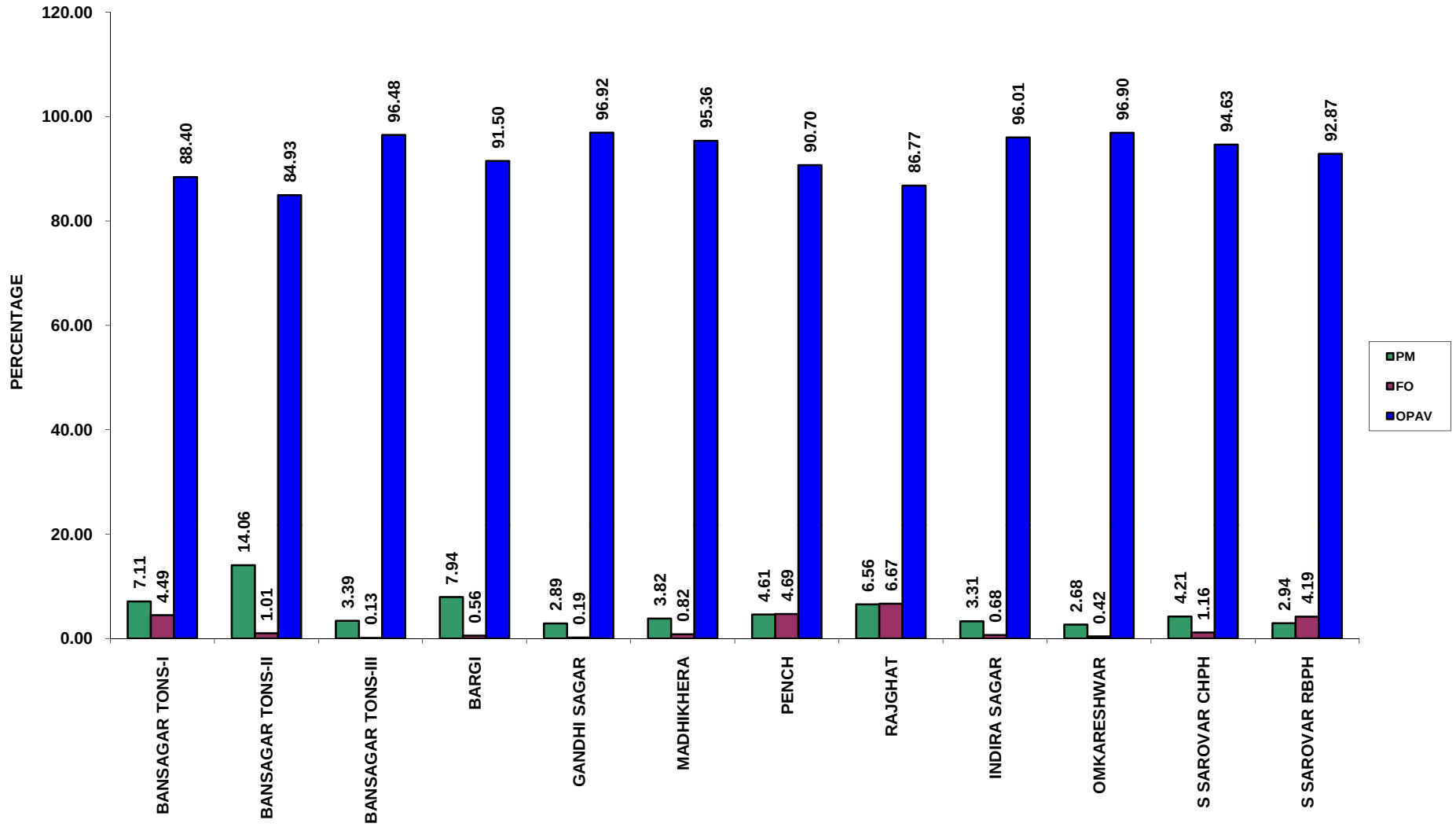
OPERATING AVAILABILITY OF H E STATIONS DURING 2012-13

EXHIBIT 6.5



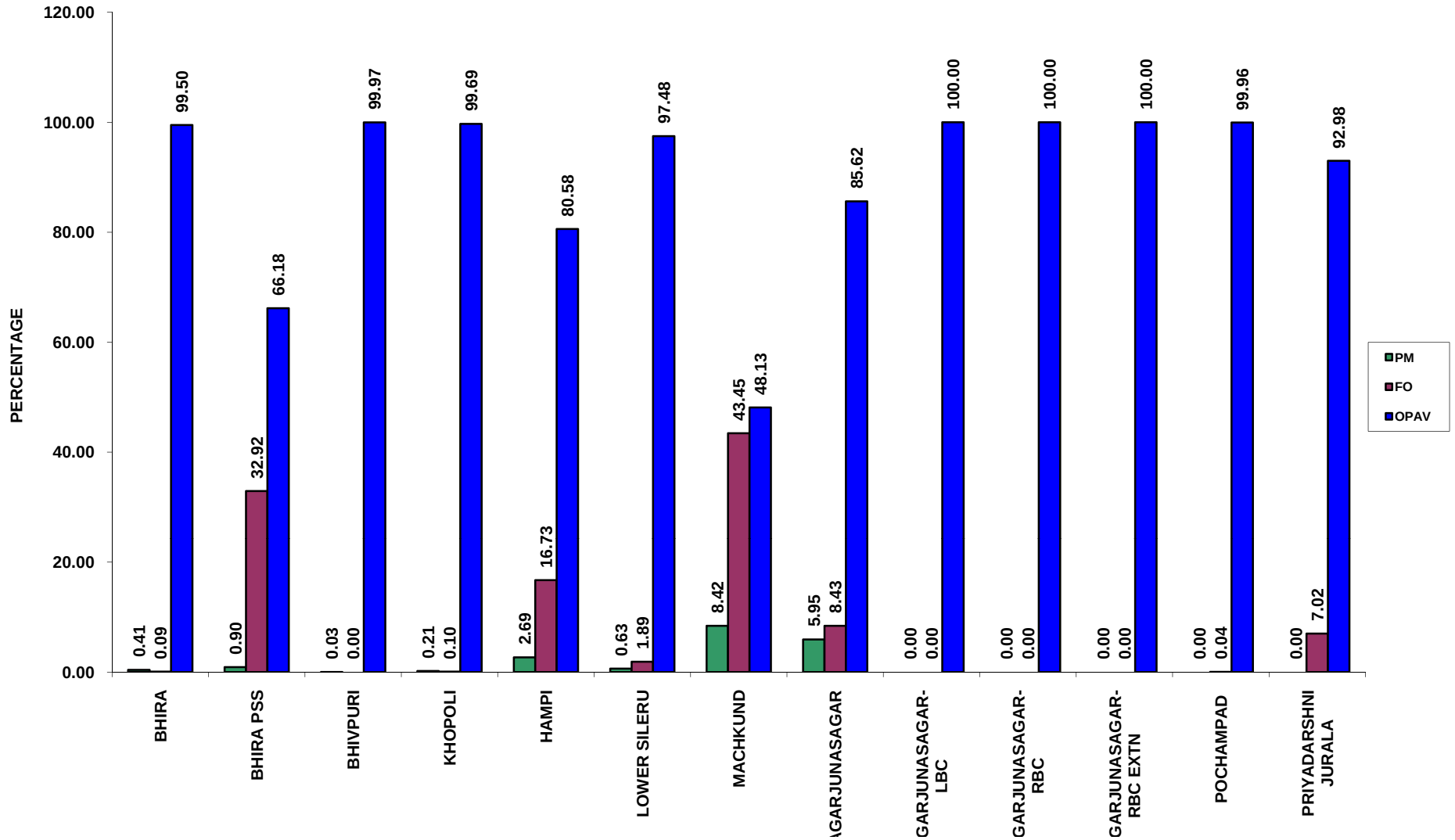
OPERATING AVAILABILITY OF H E STATIONS DURING 2012-13

EXHIBIT 6.6



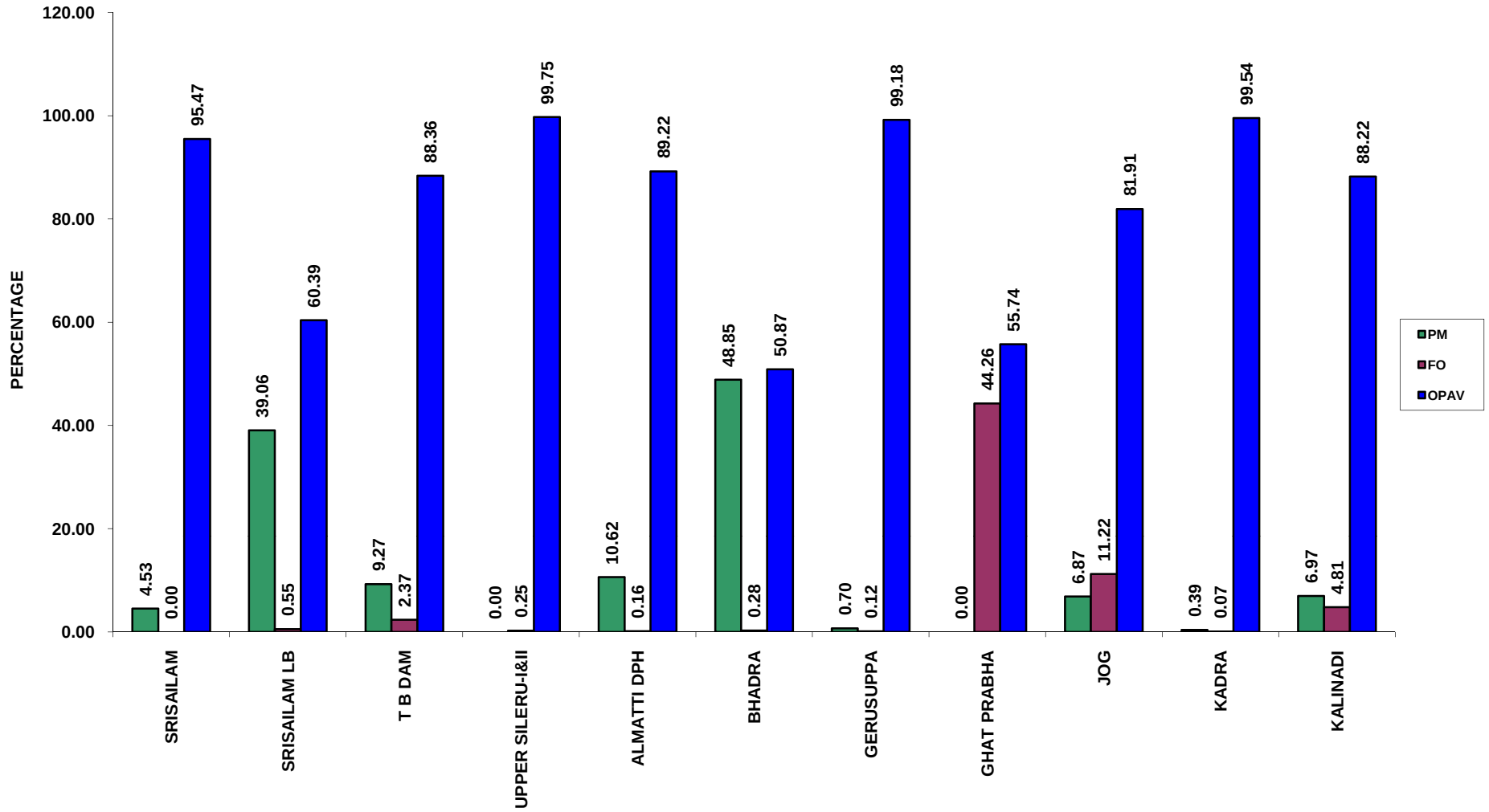
OPERATING AVAILABILITY OF H E STATIONS DURING 2012-13

EXHIBIT 6.7



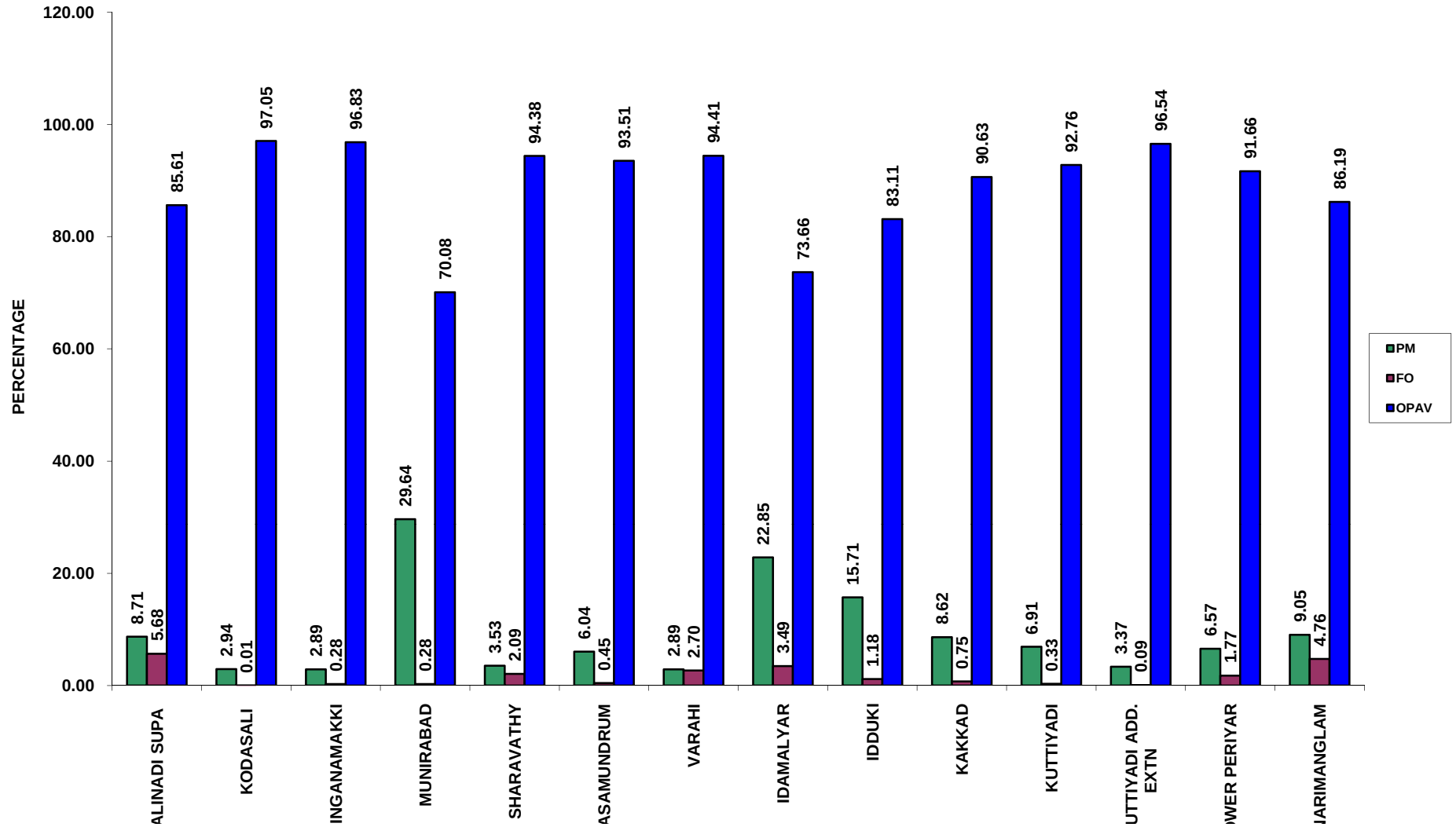
OPERATING AVAILABILITY OF H E STATIONS DURING 2012-13

EXHIBIT 6.8



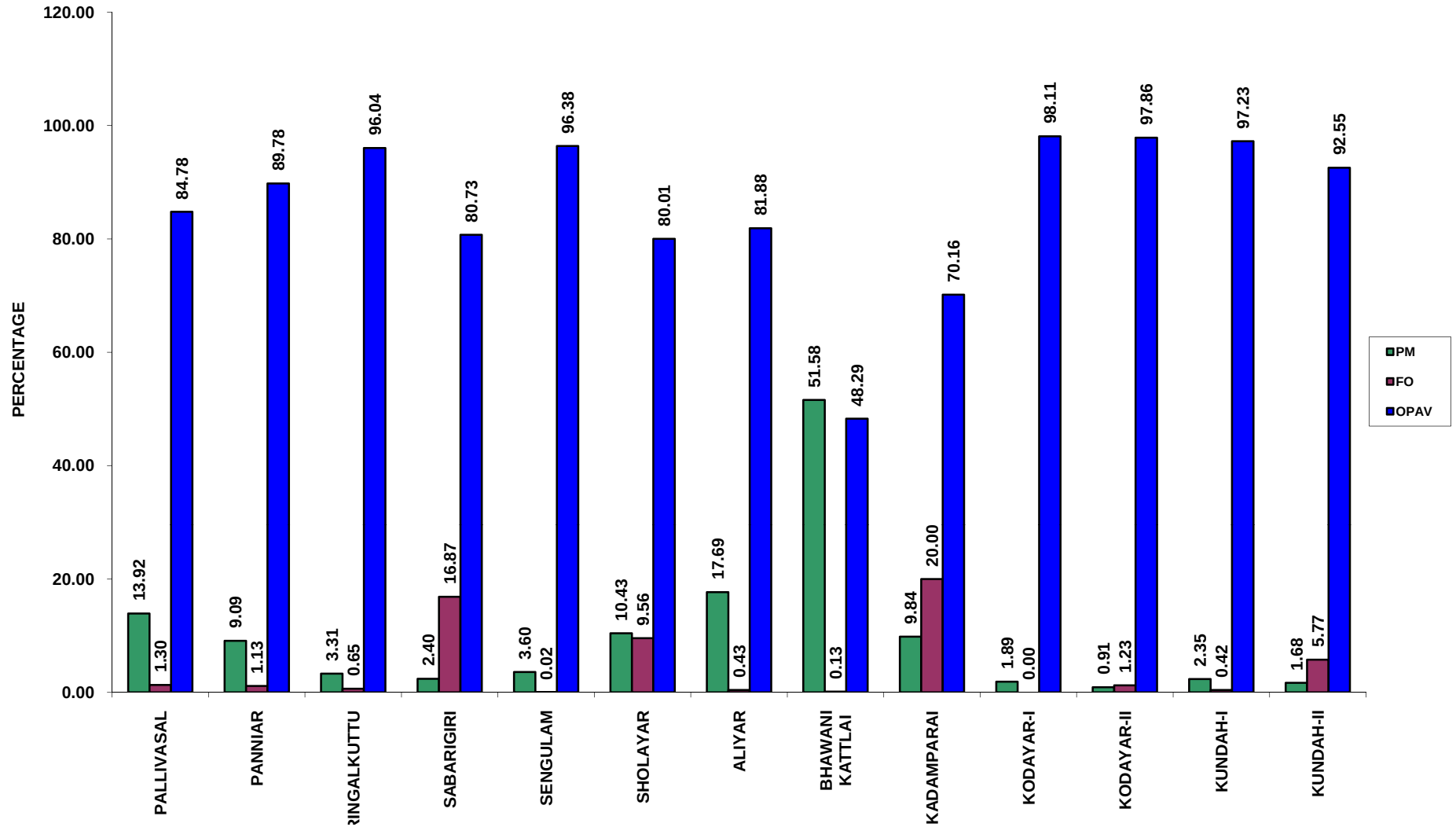
OPERATING AVAILABILITY OF H E STATIONS DURING 2012-13

EXHIBIT 6.9



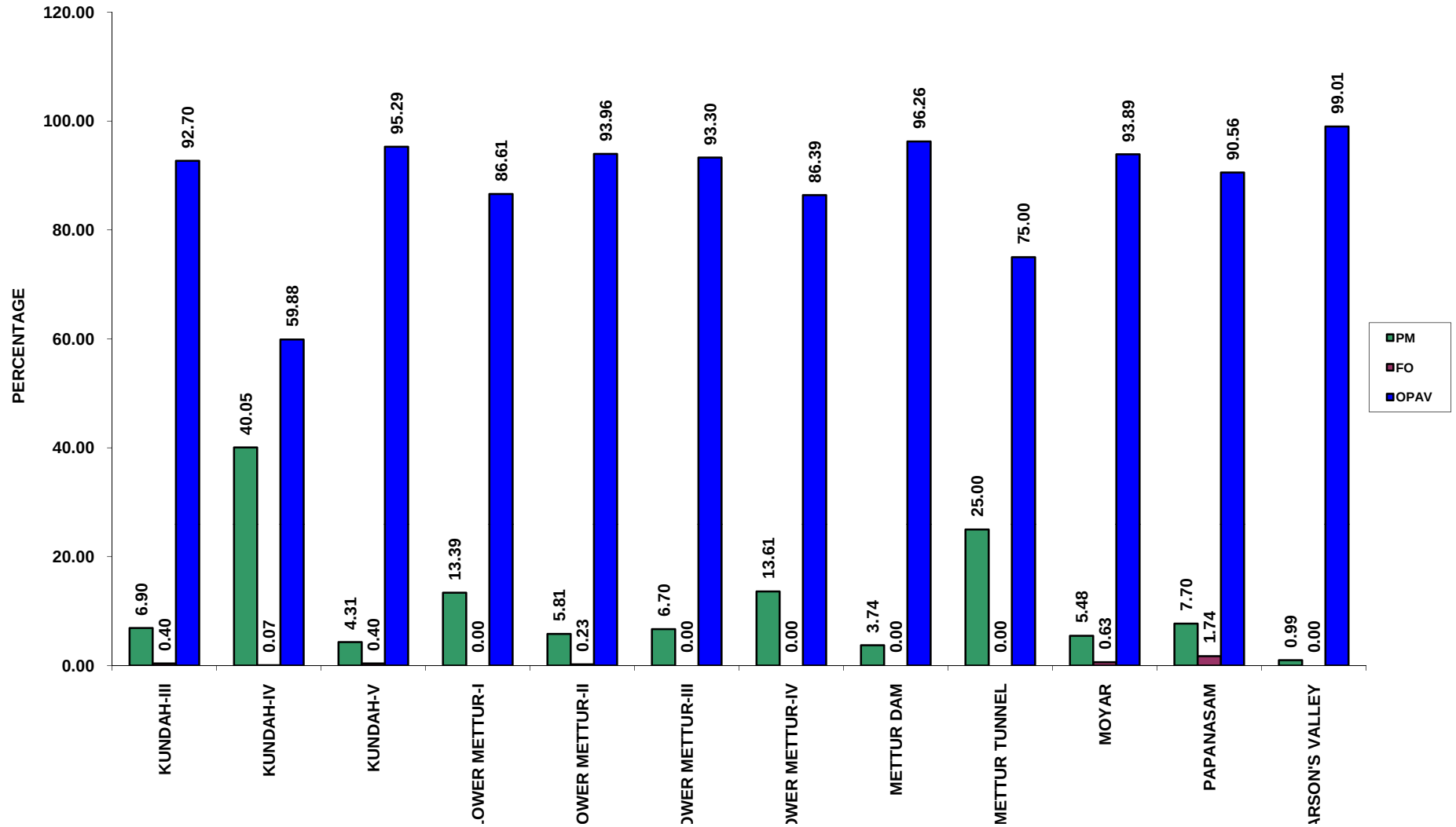
OPERATING AVAILABILITY OF H E STATIONS DURING 2012-13

EXHIBIT 6.10



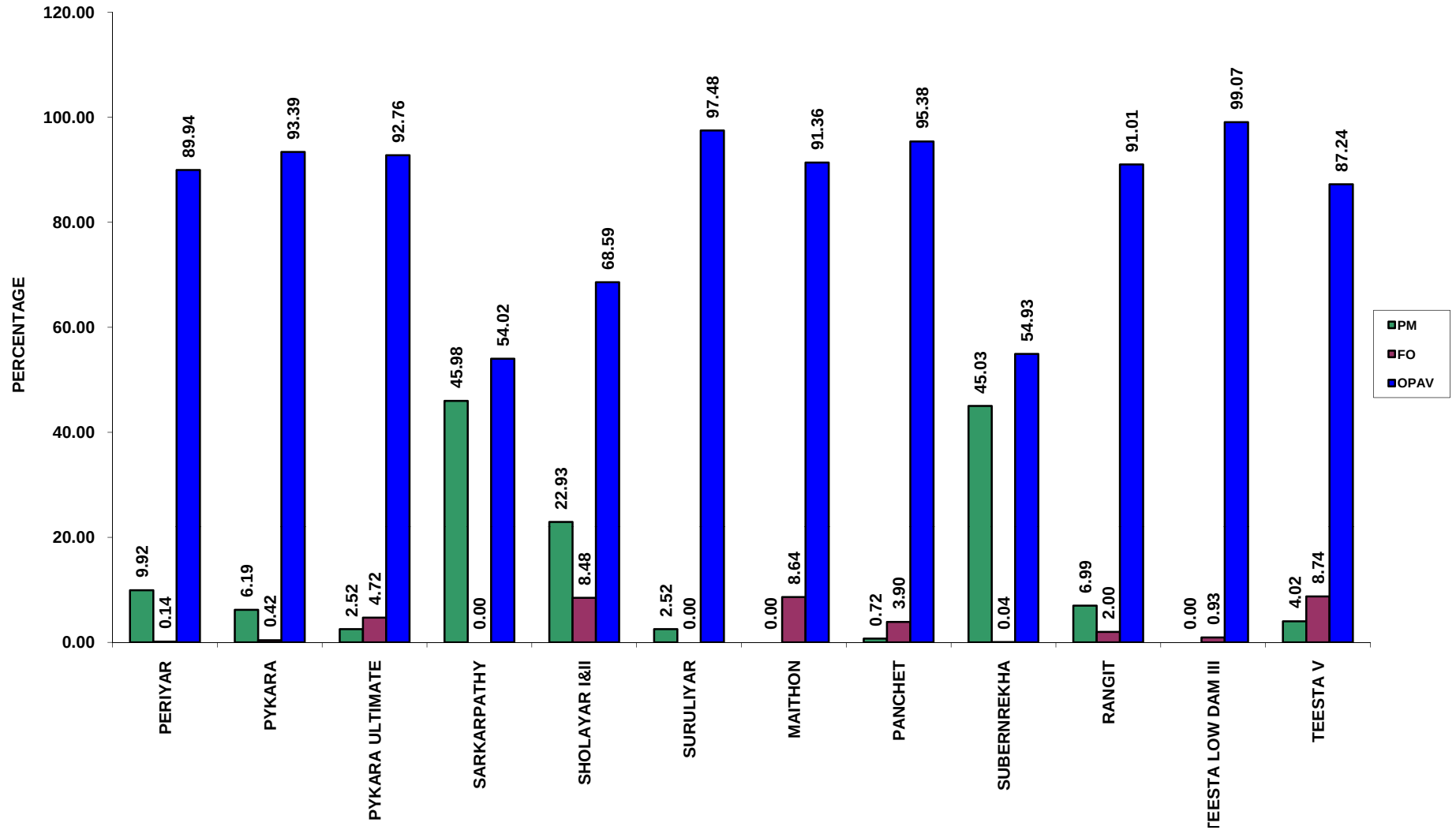
OPERATING AVAILABILITY OF H E STATIONS DURING 2012-13

EXHIBIT 6.11



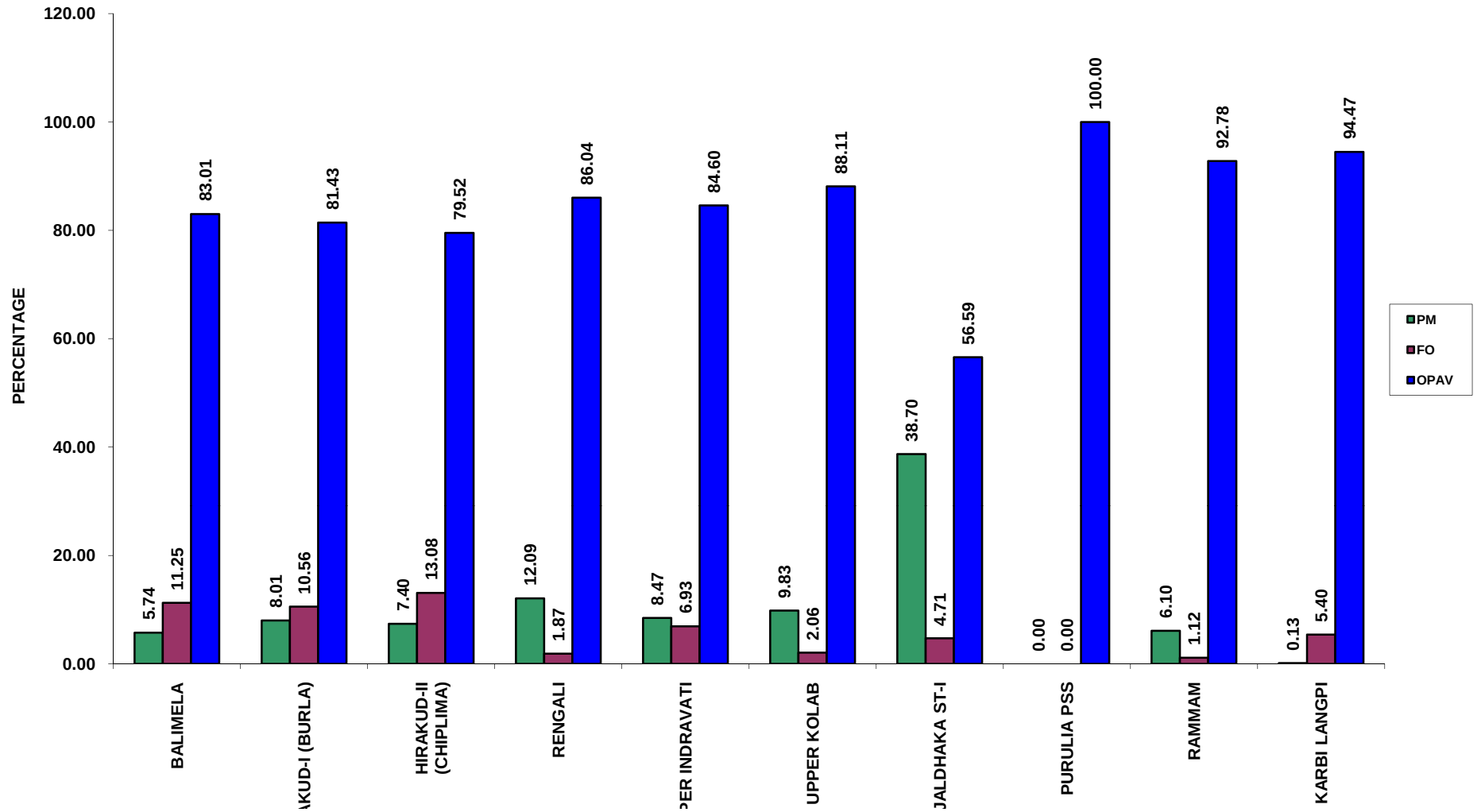
OPERATING AVAILABILITY OF H E STATIONS DURING 2012-13

EXHIBIT 6.12



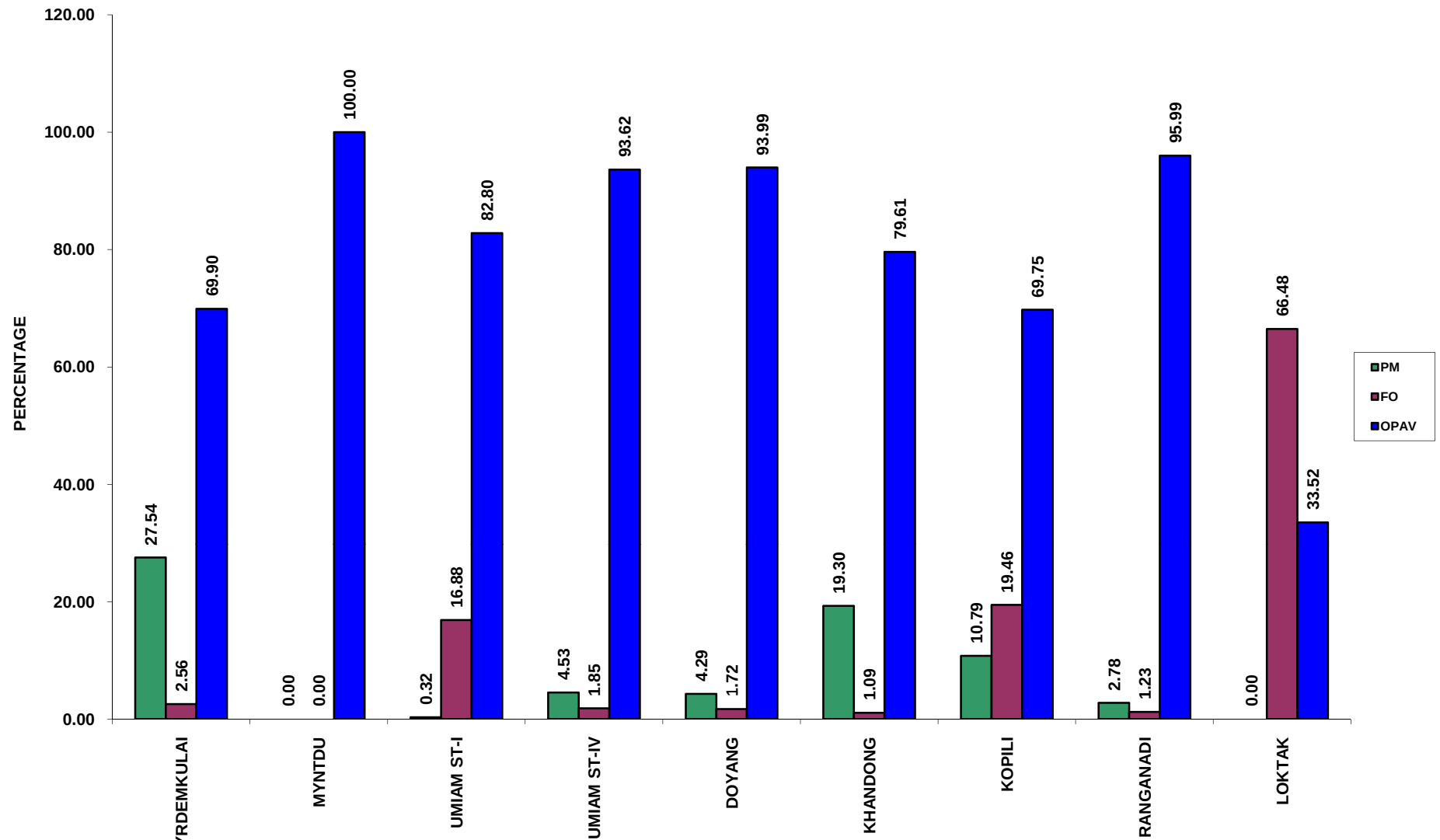
OPERATING AVAILABILITY OF H E STATIONS DURING 2012-13

EXHIBIT 6.13



OPERATING AVAILABILITY OF H E STATIONS DURING 2012-13

EXHIBIT 6.14



OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY (MW)	PLANNED MAINTENANCE (P.M.) (%)	FORCED OUTAGE (F.O.) (%)	OPERATING AVAILABILIT Y (100-FO-PM)	MISC. NON AVAILABILITY (%)
<u>NORTHERN REGION</u>							
<u>ADHPL</u>							
1	ALLAIN DUHANGAN HPS	1	96	0.46	5.65	93.89	0.61
		2	96	0.00	12.85	87.15	0.13
TOTAL :			192	0.23	9.25	90.52	0.37
<u>BBMB</u>							
2	BHAKRA-L P S	1	108	0.00	0.00	100.00	2.80
		2	108	99.73	0.00	0.27	0.00
		3	108	10.76	0.00	89.24	6.37
		4	108	0.89	0.00	99.11	3.92
		5	108	99.73	0.00	0.27	0.00
3	BHAKRA-R P S	1	157	0.00	0.00	100.00	4.46
		2	157	0.00	0.00	100.00	6.31
		3	157	0.00	0.00	100.00	5.83
		4	157	0.00	0.02	99.98	11.74
		5	157	0.00	0.00	100.00	7.22
TOTAL(L&R) :			1325	17.21	0	82.79	5.28
4	DEHAR H P S	1	165	0.48	3.18	96.35	28.71
		2	165	1.40	0.29	98.31	7.14
		3	165	35.39	0.02	64.59	2.63
		4	165	34.78	0.00	65.22	13.85
		5	165	0.00	0.00	100.00	6.33
		6	165	0.00	10.59	89.41	14.94
TOTAL :			990	12.01	2.34	85.65	12.27
5	GANGUWAL HPS	1	29.25	1.04	0.00	98.96	2.94
		2	24.2	2.35	0.35	97.30	1.60
		3	24.2	0.96	0.00	99.04	2.15
TOTAL :			77.65	1.42	0.11	98.47	2.27
6	KOTLA HPS	1	29.25	0.74	0.95	98.31	3.81
		2	24.2	0.64	0.00	99.36	3.69
		3	24.2	2.36	0.00	97.64	1.41
TOTAL :			77.65	1.21	0.36	98.43	3.02
7	PONG H P S	1	66	0.00	0.23	99.77	5.95
		2	66	0.00	0.00	100.00	5.10
		3	66	0.00	0.00	100.00	12.25

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED MAINTENANCE	FORCED OUTAGE	OPERATING AVAILABILITY	MISC. NON AVAILABILITY
			(MW)	(P.M.) (%)	(F.O.) (%)	Y (100-FO-PM)	(%)
		4	66	0.00	0.00	100.00	9.03
		5	66	0.00	0.00	100.00	7.73
		6	66	0.00	1.78	98.22	5.58
	TOTAL :		396	0.00	0.34	99.66	7.61
	<u>E.P.P.L.</u>						
8	MALANA-II HPS	1	50	14.28	1.07	84.65	40.77
		2	50	0.21	1.25	98.54	45.27
	TOTAL :		100	7.24	1.16	91.60	43.02
	<u>HPSEBL</u>						
9	BASSI HPS	1	15	43.36	0.57	56.07	0.34
		2	15	27.59	0.65	71.76	0.5
		3	15	66.57	0.97	32.46	0.89
		4	15	27.87	0.74	71.39	0.54
	TOTAL :		60	41.35	0.73	57.92	0.57
10	GIRI BATA HPS	1	30	16.38	0.03	83.59	1.07
		2	30	11.49	0.09	88.42	0.68
	TOTAL :		60	13.93	0.06	86.01	0.88
11	LARJI HPS	1	42	39.54	0.28	60.19	2.05
		2	42	27.27	0.24	72.49	2.7
		3	42	20.76	0.44	78.80	0.57
	TOTAL :		126	29.19	0.32	70.49	1.78
12	SANJAY HPS	1	40	12.05	1.72	86.23	0.35
		2	40	80.35	1.31	18.34	0.17
		3	40	8.23	1.23	90.54	1.57
	TOTAL :		120	33.54	1.42	65.04	0.7
	<u>JPVL(HP)</u>						
13	BASPA -II HPS	1	100	0.00	0.36	99.64	0.40
		2	100	0.00	0.00	100.00	0.38
		3	100	0.02	0.00	99.98	0.40
	TOTAL :		300	0.01	0.12	99.87	0.39
14	KARCHAM WANGTOO HPS	1	250	0.00	0.14	99.86	0.00
		2	250	0.94	0.05	99.02	0.00
		3	250	0.00	0.12	99.88	0.00
		4	250	13.64	0.14	86.22	0.00
	TOTAL :		1000	3.64	0.11	96.25	0.00

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY (MW)	PLANNED MAINTENANCE (P.M.) (%)	FORCED OUTAGE (F.O.) (%)	OPERATING AVAILABILITY Y (100-FO-PM)	MISC. NON AVAILABILITY (%)
<u>LG PPL</u>							
15	BUDHIL HPS	1	35	8.41	1.13	90.46	0.00
		2	35	5.48	8.12	86.40	0.00
	TOTAL :		70	6.94	4.63	88.43	0.00
<u>MPCL</u>							
16	MALANA HPS	1	43	0.00	0.00	100.00	0.18
		2	43	0.00	0.03	99.97	0.16
	TOTAL :		86	0.00	0.01	99.99	0.17
<u>JKSPDC</u>							
17	BAGLIHAR HPS	1	150	0.00	4.02	95.98	11.67
		2	150	0.00	0.55	99.45	35.40
		3	150	0.00	1.73	98.27	29.43
	TOTAL :		450	0.00	2.10	97.90	25.50
18	LOWER JHELM HPS	1	35	0.77	0	99.23	0.56
		2	35	0.56	0	99.44	0.56
		3	35	3.25	0	96.75	0.25
	TOTAL :		105	1.52	0	98.48	0.46
19	UPPER SINDH-II HPS	3	35	0.34	2.96	96.70	0.53
		4	35	1.39	39.82	58.79	0.42
		5	35	99.73	0.00	0.27	0.00
	TOTAL :		105	33.82	14.26	51.92	0.32
<u>NHPC</u>							
20	BAIRA SIUL HPS	1	66	1.83	0.76	97.42	1.00
		2	66	3.53	0.28	96.19	0.98
		3	66	0.00	1.88	98.12	0.90
	TOTAL :		198	1.78	0.97	97.25	0.96
21	CHAMERA- I HPS	1	180	2.09	0.11	97.80	3.35
		2	180	2.32	0.20	97.48	0.00
		3	180	0.00	0.10	99.90	0.00
	TOTAL :		540	1.47	0.14	98.39	1.12
22	CHAMERA- II HPS	1	100	5.92	0.83	93.25	0.23
		2	100	0.00	1.00	99.00	0.25
		3	100	0.84	0.89	98.27	0.22
	TOTAL :		300	2.25	0.91	96.84	0.24

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED MAINTENANCE	FORCED OUTAGE	OPERATING AVAILABILITY	MISC. NON AVAILABILITY
			(MW)	(P.M.) (%)	(F.O.) (%)	Y (100-FO-PM)	(%)
23	CHAMERA-III HPS	1	77	1.85	4.39	93.75	0.00
		2	77	0.27	0.68	99.05	0.00
		3	77	4.70	0.94	94.36	0.00
		TOTAL :	231	2.28	2.00	95.72	0.00
24	CHUTAK HPS	1	11	0.00	5.49	94.51	0.00
		2	11	0.00	0.46	99.54	0.00
		3	11	0.00	53.75	46.25	0.00
		4	11	0.00	0.00	100.00	0.00
		TOTAL :	44	0.00	14.92	85.08	0.00
25	DHAULI GANGA HPS	1	70	5.77	1.79	92.44	0.75
		2	70	4.73	3.12	92.15	0.75
		3	70	4.96	6.39	88.65	0.76
		4	70	4.44	0.64	94.92	0.73
		TOTAL :	280	4.98	2.98	92.04	0.75
26	DULHASTI HPS	1	130	16.15	0.60	83.25	1.15
		2	130	15.31	0.09	84.60	1.14
		3	130	12.78	1.74	85.48	1.07
		TOTAL :	390	14.75	0.81	84.44	1.12
27	SALAL-I HPS	1	115	0.00	3.52	96.48	20.62
		2	115	2.74	1.47	95.79	2.55
		3	115	8.76	1.29	89.95	1.17
		TOTAL :	345	3.83	2.09	94.08	8.11
28	SALAL-II HPS	1	115	33.84	0.91	65.24	1.00
		2	115	3.56	2.94	93.50	3.63
		3	115	6.88	1.17	91.95	1.31
		TOTAL :	345	14.76	1.67	83.57	1.98
29	SEWA-II HPS	1	40	0.02	55.43	44.56	0.01
		2	40	4.77	0.06	95.17	0.05
		3	40	5.23	0.44	94.33	0.04
		TOTAL :	120	3.34	18.64	78.02	0.03
30	TANAKPUR HPS	1	31.4	0.00	5.60	94.40	16.49
		2	31.4	8.88	3.44	87.68	10.85
		3	31.4	25.36	8.38	66.26	9.72
		TOTAL :	94.2	11.41	5.81	82.78	12.35
31	URI-I HPS	1	120	0.00	0.00	100.00	0.00
		2	120	0.00	0.00	100.00	0.00

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED MAINTENANCE	FORCED OUTAGE	OPERATING AVAILABILITY	MISC. NON AVAILABILITY
			(MW)	(P.M.) (%)	(F.O.) (%)	Y (100-FO-PM)	(%)
		3	120	0.00	0.00	100.00	0.00
		4	120	99.73	0.00	0.27	0.00
	TOTAL :		480	24.93	0.00	75.07	0.00
	<u>PSPCL</u>						
32	ANANDPUR SAHIB ST-I HPS	1	33.5	8.56	1.47	89.97	16.35
		2	33.5	0.30	1.33	98.37	23.58
	TOTAL :		67.0	4.43	1.40	94.17	19.97
33	ANANDPUR SAHIB ST-II HPS	1	33.5	1.12	1.33	97.55	22.99
		2	33.5	3.11	1.31	95.58	16.25
	TOTAL :		67.0	2.12	1.32	96.56	19.62
34	MUKERIAN ST-I HPS	1	15	7.52	0.25	92.23	2.85
		2	15	0.06	0.30	99.64	21.20
		3	15	0.06	0.16	99.78	11.88
	TOTAL :		45	2.55	0.24	97.21	11.98
35	MUKERIAN ST-II HPS	1	15	2.45	0.23	97.32	11.56
		2	15	3.47	0.24	96.29	5.53
		3	15	0.00	0.08	99.92	12.24
	TOTAL :		45	1.97	0.18	97.85	9.78
36	MUKERIAN ST-III HPS	1	19.5	0.00	0.11	99.89	13.63
		2	19.5	8.02	12.12	79.86	5.52
		3	19.5	0.00	0.16	99.84	15.41
	TOTAL :		58.5	2.67	4.13	93.20	11.52
37	MUKERIAN ST-IV HPS	1	19.5	0.00	0.00	100.00	11.30
		2	19.5	0.00	0.18	99.82	14.23
		3	19.5	0.06	0.07	99.87	8.89
	TOTAL :		58.5	0.02	0.08	99.90	11.47
38	RANJIT SAGAR HPS	1	150	54.71	5.14	40.15	0.00
		2	150	8.31	44.80	46.89	0.00
		3	150	0.14	35.71	64.15	0.00
		4	150	22.57	0.00	77.43	0.00
	TOTAL :		600	21.43	21.41	57.16	0.00
39	SHANAN HPS	1	15	7.56	18.62	73.82	0.00
		2	15	7.07	0.11	92.82	0.00
		3	15	6.70	0.01	93.29	0.00
		4	15	7.10	1.63	91.27	0.00
		5	50	69.87	1.76	28.37	0.00
	TOTAL :		110	35.63	3.58	60.79	0.00

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY (MW)	PLANNED MAINTENANCE (P.M.) (%)	FORCED OUTAGE (F.O.) (%)	OPERATING AVAILABILIT Y (100-FO-PM)	MISC. NON AVAILABILITY (%)
<u>RRVUNL</u>							
40	JAWAHAR SAGAR HPS	1	33	91.16	0.00	8.84	0.00
		2	33	0.35	0.00	99.65	0.00
		3	33	7.77	8.01	84.22	0.00
TOTAL :			99	33.09	2.67	64.24	0.00
41	MAHI BAJAJ-I HPS	1	25	9.29	0.03	90.68	59.91
		2	25	0.00	0.30	99.70	49.31
		TOTAL :			50	4.65	0.17
42	MAHI BAJAJ-II HPS	1	45	0.00	1.22	98.78	91.02
		2	45	0.00	0.00	100.00	94.70
		TOTAL :			90	0.00	0.61
43	R P SAGAR HPS	1	43	8.82	0.00	91.18	0.00
		2	43	11.29	0.21	88.50	0.00
		3	43	6.10	0.00	93.90	0.00
		4	43	15.41	0.00	84.59	0.00
TOTAL :			172	10.40	0.05	89.55	0.00
<u>SJVNL</u>							
44	NATHPA JHAKRI HPS	1	250	0.00	0.00	100.00	48.41
		2	250	0.00	0.09	99.91	45.26
		3	250	0.00	0.40	99.60	44.17
		4	250	0.00	0.11	99.89	48.49
		5	250	0.00	0.10	99.90	44.62
		6	250	0.00	0.14	99.86	44.95
TOTAL :			1500	0.00	0.14	99.86	45.98
<u>THDC</u>							
45	KOTESHWAR HPS	1	100	0.00	0.25	99.75	0.00
		2	100	8.57	0.23	91.20	0.00
		3	100	1.14	0.23	98.63	0.00
		4	100	0.36	0.00	99.64	0.00
TOTAL :			400	2.52	0.18	97.30	0.00
46	TEHRI ST-1 HPS	1	250	6.34	1.32	92.34	2.04
		2	250	2.03	2.08	95.89	1.37
		3	250	8.78	1.99	89.23	1.53
		4	250	6.82	1.52	91.66	2.02
TOTAL :			1000	5.99	1.73	92.28	1.74

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY (MW)	PLANNED MAINTENANCE (P.M.) (%)	FORCED OUTAGE (F.O.) (%)	OPERATING AVAILABILITY Y (100-FO-PM)	MISC. NON AVAILABILITY (%)
<u>UJVNL</u>							
47	CHIBRO (YAMUNA) HPS	1	60	0.59	0.00	99.41	0.00
		2	60	14.45	2.63	82.92	0.00
		3	60	17.57	0.79	81.64	0.00
		4	60	54.82	1.23	43.95	0.00
	TOTAL :		240	21.86	1.16	76.98	0.00
48	CHILLA HPS	1	36	10.57	4.24	85.20	1.47
		2	36	0.17	0.76	99.08	1.48
		3	36	19.78	4.02	76.20	1.62
		4	36	12.97	6.37	80.66	1.61
	TOTAL :		144	10.87	3.85	85.28	1.54
49	DHAKRANI HPS	1	11.25	40.71	28.99	30.31	0.14
		2	11.25	0.00	40.55	59.45	0.06
		3	11.25	0.00	4.85	95.15	0.00
	TOTAL :		33.75	13.57	24.79	61.64	0.06
50	DHALIPUR HPS	1	17	0.00	37.62	62.38	0.24
		2	17	13.51	30.01	56.48	0.10
		3	17	16.20	10.24	73.56	0.00
	TOTAL :		51	9.90	25.96	64.14	0.11
51	KHATIMA HPS	1	13.8	0.00	74.57	25.43	0.18
		2	13.8	9.75	9.05	81.20	0.83
		3	13.8	3.01	6.85	90.14	0.82
	TOTAL :		41.4	4.25	30.16	65.59	0.61
57	KHODRI HPS	1	30	20.62	0.90	78.48	0.00
		2	30	9.42	0.00	90.58	0.00
		3	30	31.28	5.02	63.70	0.00
		4	30	0.00	0.00	100.00	0.00
	TOTAL :		120	15.33	1.48	83.19	0.00
53	KULHAL HPS	1	10	12.16	21.84	66.00	0.00
		2	10	0.63	27.16	72.21	2.91
		3	10	0.00	33.04	66.96	0.03
	TOTAL :		30	4.26	27.35	68.39	0.98
54	MANERI BHALI - I HPS	1	30	16.54	6.65	76.81	0.21
		2	30	0.00	47.09	52.91	9.33
		3	30	1.33	3.52	95.15	9.04
	TOTAL :		90	5.96	19.09	74.95	6.19

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED MAINTENANCE	FORCED OUTAGE	OPERATING AVAILABILITY	MISC. NON AVAILABILITY
			(MW)	(P.M.) (%)	(F.O.) (%)	Y (100-FO-PM)	(%)
55	MANERI BHALI - II HPS	1	76	5.62	9.33	85.05	0.44
		2	76	23.98	3.21	72.80	2.65
		3	76	14.56	2.29	83.15	3.14
		4	76	15.60	6.03	78.37	2.59
	TOTAL :		304	14.94	5.21	79.85	2.20
56	RAMGANGA HPS	1	66	11.80	0.00	88.20	67.11
		2	66	12.59	0.00	87.41	60.20
		3	66	14.83	6.02	79.15	43.76
	TOTAL :		198	13.07	2.01	84.92	57.02
	<u>JPVL(UTTRAKHAND)</u>						
57	VISHNU PRAYAG HPS	1	100	0.11	0.32	99.58	0.95
		2	100	0.21	0.34	99.45	0.91
		3	100	0.84	0.35	98.81	0.95
		4	100	1.18	0.33	98.49	12.57
	TOTAL :		400	0.58	0.33	99.09	3.84
	<u>UPJVNL</u>						
58	KHARA HPS	1	24	0.81	1.50	97.70	0.00
		2	24	0.00	1.20	98.80	0.00
		3	24	0.25	1.11	98.64	0.00
	TOTAL :		72	0.35	1.27	98.38	0.00
59	MATATILA HPS	1	10.2	6.98	0.00	93.02	0.00
		2	10.2	4.77	0.00	95.23	0.00
		3	10.2	6.87	0.00	93.13	0.00
	TOTAL :		30.6	6.21	0.00	93.79	0.00
60	OBRA HPS	1	33	0.26	0.00	99.74	0.00
		2	33	16.71	0.19	83.10	0.00
		3	33	0.25	1.05	98.70	0.00
	TOTAL :		99	5.74	0.41	93.85	0.00
61	RIHAND HPS	1	50	6.64	0.00	93.36	0.00
		2	50	92.75	0.00	7.25	0.00
		3	50	99.73	0.00	0.27	0.00
		4	50	99.73	0.00	0.27	0.00
		5	50	1.52	1.74	96.74	0.00
		6	50	6.36	0.00	93.64	0.00
	TOTAL :		300	51.12	0.29	48.59	0.00

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY (MW)	PLANNED MAINTENANCE (P.M.) (%)	FORCED OUTAGE (F.O.) (%)	OPERATING AVAILABILITY Y (100-FO-PM)	MISC. NON AVAILABILITY (%)
<u>WESTERN REGION</u>							
<u>CSPGCL</u>							
1	HASDEOBANGO HPS	1	40	0.00	0.00	100.00	0.00
		2	40	13.02	0.21	86.77	0.00
		3	40	0.00	0.95	99.05	0.00
	TOTAL :		120	4.34	0.39	95.27	0.00
<u>DLHP</u>							
2	BHANDARDHARA HPS ST-II	2	34	0.00	0.04	99.96	0.00
	TOTAL :		34	0.00	0.04	99.96	0.00
<u>GSECL</u>							
3	KADANA HPS	1	60	0.00	1.03	98.97	0.00
		2	60	29.53	0.24	70.24	0.00
		3	60	62.19	0.00	37.81	0.00
		4	60	6.58	3.53	89.89	0.00
	TOTAL :		240	24.57	1.20	74.23	0.00
4	UKAI HPS	1	75	0.00	0.00	100.00	0.14
		2	75	35.84	0.00	64.16	0.00
		3	75	0.00	0.00	100.00	0.00
		4	75	0.00	0.00	100.00	0.00
	TOTAL :		300	8.96	0.00	91.04	0.03
<u>MAHAGENCO</u>							
5	BHIRA TAIL RACE HPS	1	40	4.63	1.90	93.47	0.38
		2	40	7.74	1.04	91.22	0.06
	TOTAL :		80	6.19	1.47	92.34	0.22
6	GHATGHAR PSS HPS	1	125	13.42	3.03	83.55	0.00
		2	125	0.00	3.31	96.69	0.00
	TOTAL :		250	6.71	3.17	90.12	0.00
7	KOYNA DPH HPS	1	18	7.87	0.00	92.13	0.00
		2	18	5.78	0.00	94.22	0.00
	TOTAL :		36	6.83	0.00	93.17	0.00
8	KOYNA-I&II HPS	1	70	1.48	0.00	98.52	0.00
		2	70	1.43	0.00	98.57	0.00
		3	70	6.57	0.00	93.43	0.00
		4	70	10.81	0.00	89.19	0.00
		5	80	13.90	0.00	86.10	0.00
		6	80	38.59	0.00	61.41	0.00

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED MAINTENANCE	FORCED OUTAGE	OPERATING AVAILABILITY	MISC. NON AVAILABILITY
			(MW)	(P.M.) (%)	(F.O.) (%)	Y (100-FO-PM)	(%)
		7	80	1.82	0.00	98.18	0.00
		8	80	6.08	0.00	93.92	0.00
	TOTAL :		600	10.42	0.00	89.58	0.00
9	KOYNA-III HPS	1	80	0.00	0.00	100.00	0.00
		2	80	0.67	0.00	99.33	0.00
		3	80	2.39	3.76	93.85	0.00
		4	80	60.84	2.51	36.65	0.00
	TOTAL :		320	15.98	1.57	82.45	0.00
10	KOYNA-IV HPS	1	250	2.02	0.00	97.98	0.00
		2	250	14.33	4.29	81.38	0.00
		3	250	0.00	0.00	100.00	0.00
		4	250	15.96	4.78	79.26	0.00
	TOTAL :		1000	8.08	2.27	89.65	0.00
11	TILLARI HPS	1	60	5.94	0.16	93.90	0.02
	TOTAL :		60	5.94	0.16	93.90	0.02
12	VAITARNA HPS	1	60	9.62	0.01	90.37	0.00
	TOTAL :		60	9.62	0.01	90.37	0.00
	<u>MPPGCL</u>						
13	BANSAGAR TONS-1 HPS	1	105	0.50	5.01	94.49	0.03
		2	105	7.69	5.98	86.33	0.00
		3	105	13.15	2.47	84.38	0.00
	TOTAL :		315	7.11	4.49	88.40	0.01
14	BANSAGAR TONS-II HPS	1	15	12.07	1.69	86.24	0.00
		2	15	16.04	0.34	83.62	0.00
	TOTAL :		30	14.06	1.01	84.93	0.00
15	BANSAGAR TONS-III HPS	1	20	3.83	0.13	96.04	0.00
		2	20	2.68	0.21	97.12	0.00
		3	20	3.65	0.05	96.30	0.02
	TOTAL :		60	3.39	0.13	96.48	0.01
16	BARGI HPS	1	45	2.73	0.84	96.43	0.00
		2	45	13.14	0.28	86.58	0.00
	TOTAL :		90	7.94	0.56	91.50	0.00
17	GANDHI SAGAR HPS	1	23	5.86	0.00	94.14	0.01
		2	23	7.87	0.52	91.60	0.00
		3	23	0.74	0.27	98.99	0.02

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED MAINTENANCE	FORCED OUTAGE	OPERATING AVAILABILITY	MISC. NON AVAILABILITY
			(MW)	(P.M.) (%)	(F.O.) (%)	Y (100-FO-PM)	(%)
		4	23	0.00	0.12	99.88	0.00
		5	23	0.00	0.02	99.98	0.00
	TOTAL :		115	2.89	0.19	96.92	0.01
18	MADHIKHERA HPS	1	20	3.85	0.40	95.75	0.00
		2	20	3.23	1.25	95.51	0.00
		3	20	4.37	0.79	94.84	0.00
	TOTAL :		60	3.82	0.82	95.36	0.00
19	PENCH HPS	1	80	9.21	2.13	88.66	0.00
		2	80	0.00	7.26	92.74	0.00
	TOTAL :		160	4.61	4.69	90.70	0.00
20	RAJGHAT HPS	1	15	8.86	15.78	75.35	0.00
		2	15	4.57	0.49	94.95	0.00
		3	15	6.24	3.75	90.01	0.00
	TOTAL :		45	6.56	6.67	86.77	0.00
	<u>NHDC</u>						
21	INDIRA SAGAR HPS	1	125	7.51	1.04	91.45	0.00
		2	125	4.04	1.82	94.14	0.00
		3	125	0.00	0.40	99.60	0.00
		4	125	0.00	0.66	99.34	0.00
		5	125	5.24	0.41	94.35	0.00
		6	125	0.00	1.05	98.95	0.00
		7	125	5.86	0.03	94.11	0.00
		8	125	3.84	0.04	96.12	0.00
	TOTAL :		1000	3.31	0.68	96.01	0.00
22	OMKARESHWAR HPS	1	65	3.87	0.48	95.65	0.00
		2	65	1.86	0.48	97.66	0.00
		3	65	2.58	0.48	96.94	0.00
		4	65	3.44	0.47	96.09	0.00
		5	65	3.07	0.47	96.46	0.00
		6	65	3.34	0.00	96.66	0.47
		7	65	2.58	0.48	96.94	0.00
		8	65	0.72	0.48	98.80	0.00
	TOTAL :		520	2.68	0.42	96.90	0.06
	<u>SSNNL</u>						
23	S SAROVAR CHPH HPS	1	50	3.99	0.30	95.71	0.00
		2	50	9.63	0.04	90.33	0.01
		3	50	6.20	0.75	93.05	0.00

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED MAINTENANCE	FORCED OUTAGE	OPERATING AVAILABILITY	MISC. NON AVAILABILITY
			(MW)	(P.M.) (%)	(F.O.) (%)	Y (100-FO-PM)	(%)
		4	50	0.36	4.63	95.01	0.01
		5	50	0.85	0.06	99.10	0.00
	TOTAL :		250	4.21	1.16	94.63	0.00
24	S SAROVAR RBPH HPS	1	200	0.73	0.00	99.27	0.00
		2	200	5.80	0.00	94.20	0.16
		3	200	0.33	0.29	99.38	0.03
		4	200	0.10	24.83	75.07	0.04
		5	200	1.20	0.00	98.80	0.02
		6	200	9.47	0.01	90.52	0.00
	TOTAL :		1200	2.94	4.19	92.87	0.04
	<u>TATA MAH.</u>						
25	BHIRA HPS	1	25	0.41	0.09	99.51	0.00
		2	25	0.41	0.12	99.48	0.00
		3	25	0.41	0.09	99.51	0.00
		4	25	0.41	0.09	99.51	0.00
		5	25	0.41	0.09	99.51	0.00
		6	25	0.41	0.09	99.51	0.00
	TOTAL :		150	0.41	0.09	99.50	0.00
26	BHIRA PSS HPS	1	150	0.90	32.92	66.18	0.00
	TOTAL :		150	0.90	32.92	66.18	0.00
27	BHIVPURI HPS	1	24	0.00	0.00	100.00	0.00
		2	24	0.00	0.00	100.00	0.00
		3	24	0.00	0.00	100.00	0.00
		4	1.5	1.34	0.00	98.66	0.00
		5	1.5	0.00	0.16	99.84	0.00
	TOTAL :		75	0.03	0.00	99.97	0.00
28	KHOPOLI HPS	1	24	0.21	0.04	99.75	0.00
		2	24	0.21	0.14	99.65	0.00
		3	24	0.21	0.11	99.68	0.00
	TOTAL :		72	0.21	0.10	99.69	0.00
	<u>SOUTHERN REGION</u>						
	<u>APGENCO</u>						
1	HAMPI HPS	1	9	0.29	3.16	96.55	0.00
		2	9	3.95	35.66	60.39	0.00
		3	9	5.83	26.91	67.26	0.00
		4	9	0.70	1.20	98.10	0.00
	TOTAL :		36	2.69	16.73	80.58	0.00

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED MAINTENANCE	FORCED OUTAGE	OPERATING AVAILABILITY	MISC. NON AVAILABILITY
			(MW)	(P.M.) (%)	(F.O.) (%)	Y (100-FO-PM)	(%)
2	LOWER SILERU HPS	1	115	2.44	1.17	96.39	0.00
		2	115	0.00	1.79	98.21	0.00
		3	115	0.02	2.31	97.66	0.00
		4	115	0.05	2.28	97.68	0.00
		TOTAL :	460	0.63	1.89	97.48	0.00
3	MACHKUND HPS	1	17	0.03	29.62	70.36	0.00
		2	17	0.06	37.01	62.92	0.00
		3	17	0.13	5.83	94.04	0.00
		4	21.25	0.00	97.05	2.95	0.00
		5	21.25	0.25	67.83	31.92	0.34
		6	21.25	45.01	11.76	43.23	0.00
		TOTAL :	114.75	8.42	43.45	48.13	0.06
4	NAGARJUN SGR HPS	1	110	30.58	0.00	69.42	0.00
		2	100.8	0.74	0.00	99.26	0.00
		3	100.8	13.45	0.00	86.55	0.00
		4	100.8	0.00	0.00	100.00	0.00
		5	100.8	0.00	68.18	31.82	0.00
		6	100.8	0.00	0.00	100.00	0.00
		7	100.8	0.00	0.00	100.00	0.00
		8	100.8	0.62	0.00	99.38	0.00
		TOTAL :	815.6	5.95	8.43	85.62	0.00
5	NAGARJUN SGR LBC HPS	1	30	0.00	0.00	100.00	0.00
		2	30	0.00	0.00	100.00	0.00
		TOTAL :	60	0.00	0.00	100.00	0.00
6	NAGARJUN SGR RBC HPS	1	30	0.00	0.00	100.00	0.00
		2	30	0.00	0.00	100.00	0.00
		TOTAL :	60	0.00	0.00	100.00	0.00
7	NAGARJUN SGR RBC EXTN. HPS	1	30	0.00	0.00	100.00	0.00
		TOTAL :	30	0.00	0.00	100.00	0.00
8	POCHAMPAD HPS	1	9	0.00	0.00	100.00	0.01
		2	9	0.00	0.04	99.96	0.02
		3	9	0.00	0.08	99.92	0.01
		TOTAL :	27	0.00	0.04	99.96	0.01
9	PRIYADARSHNI JURALA HPS	1	39	0.00	40.21	59.79	48.55
		2	39	0.00	0.00	100.00	93.26
		3	39	0.00	1.93	98.07	95.22

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED	FORCED	OPERATING	MISC.
			(MW)	MAINTENANCE (P.M.) (%)	OUTAGE (F.O.) (%)	AVAILABILITY Y (100-FO-PM)	NON AVAILABILITY (%)
		4	39	0.00	0.00	100.00	94.92
		5	39	0.00	0.00	100.00	88.12
		6	39	0.00	0.01	99.99	93.47
	TOTAL :		234	0.00	7.02	92.98	85.59
10	SRISAILAM HPS	1	110	4.51	0.00	95.49	0.00
		2	110	4.51	0.03	95.46	0.00
		3	110	4.51	0.00	95.49	0.00
		4	110	4.51	0.00	95.49	0.00
		5	110	4.51	0.00	95.49	0.00
		6	110	7.48	0.00	92.52	0.00
		7	110	1.67	0.00	98.33	0.00
	TOTAL :		770	4.53	0.00	95.47	0.00
11	SRISAILAM LB HPS	1	150	46.88	0.00	53.12	0.00
		2	150	46.91	0.00	53.09	0.00
		3	150	46.91	0.00	53.09	0.00
		4	150	46.77	0.00	53.23	0.00
		5	150	0.00	3.28	96.72	0.00
		6	150	46.91	0.00	53.09	0.00
	TOTAL :		900	39.06	0.55	60.39	0.00
12	T B DAM HPS	1	9	18.50	8.39	73.11	0.00
		2	9	1.67	0.05	98.29	0.00
		3	9	9.80	0.42	89.78	0.00
		4	9	7.10	0.62	92.28	0.00
	TOTAL :		36	9.27	2.37	88.36	0.00
13	UPPER SILERU -I HPS	1	60	0.00	0.00	100.00	0.00
		2	60	0.00	0.00	100.00	0.00
14	UPPER SILERU -II HPS	1	60	0.00	1.02	98.98	0.00
		2	60	0.00	0.00	100.00	0.00
	TOTAL(I&II) :		240	0.00	0.25	99.75	0.00
	<u>KPCL</u>						
15	ALMATTI DPH HPS	1	15	6.38	0.80	92.81	0.00
		2	55	17.66	0.18	82.17	0.00
		3	55	9.39	0.18	90.43	0.00
		4	55	13.47	0.02	86.51	0.00

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED	FORCED	OPERATING	MISC.
			(MW)	MAINTENANCE (P.M.) (%)	OUTAGE (F.O.) (%)	AVAILABILITY Y (100-FO-PM)	NON AVAILABILITY (%)
		5	55	5.46	0.25	94.30	0.00
		6	55	8.27	0.01	91.72	0.00
	TOTAL :		290	10.62	0.16	89.22	0.00
16	BHADRA HPS	1	2	0.02	0.30	99.68	0.00
		2	12	0.00	0.60	99.40	0.00
		3	12	99.73	0.00	0.27	0.00
		4	7.2	99.73	0.00	0.27	0.00
		5	6	0.02	0.52	99.46	0.00
	TOTAL :		39.2	48.85	0.28	50.87	0.00
17	GERUSUPPA HPS	1	60	0.18	0.08	99.74	0.00
		2	60	1.71	0.27	98.03	0.00
		3	60	0.53	0.09	99.38	0.00
		4	60	0.40	0.05	99.55	0.00
	TOTAL :		240	0.70	0.12	99.18	0.00
18	GHAT PRABHA HPS	1	16	0.00	0.00	100.00	96.74
		2	16	0.00	88.52	11.48	7.27
	TOTAL :		32	0.00	44.26	55.74	52.00
19	JOG HPS	1	13.2	3.53	1.40	95.07	0.02
		2	13.2	0.00	99.73	0.27	0.00
		3	13.2	42.85	0.39	56.76	0.33
		4	13.2	8.48	0.36	91.16	0.02
		5	21.6	4.21	6.83	88.96	0.01
		6	21.6	1.52	0.55	97.94	0.58
		7	21.6	0.54	0.00	99.46	0.00
		8	21.6	4.51	2.68	92.82	0.00
	TOTAL :		139.2	6.87	11.22	81.91	0.13
20	KADRA HPS	1	50	0.36	0.05	99.60	58.27
		2	50	0.29	0.09	99.62	88.20
		3	50	0.53	0.06	99.41	85.97
	TOTAL :		150	0.39	0.07	99.54	77.48
21	KALINADI HPS	1	135	0.98	3.55	95.47	0.00
		2	135	0.49	0.38	99.13	0.02
		3	135	0.19	18.41	81.39	0.03
		4	150	0.53	7.12	92.35	0.00

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED MAINTENANCE	FORCED OUTAGE	OPERATING AVAILABILITY	MISC. NON AVAILABILITY
			(MW)	(P.M.) (%)	(F.O.) (%)	Y (100-FO-PM)	(%)
		5	150	36.03	0.02	63.95	0.00
		6	150	1.68	0.19	98.14	0.05
	TOTAL :		855	6.97	4.81	88.22	0.02
22	KALINADI SUPA HPS	1	50	17.03	0.55	82.42	0.00
		2	50	0.38	10.80	88.81	0.00
	TOTAL :		100	8.71	5.68	85.61	0.00
23	KODASALI HPS	1	40	8.34	0.01	91.66	80.44
		2	40	0.20	0.01	99.79	91.12
		3	40	0.30	0.01	99.70	84.54
	TOTAL :		120	2.94	0.01	97.05	85.37
24	LIGANAMAKKI HPS	1	27.5	0.49	0.41	99.10	0.00
		2	27.5	5.29	0.16	94.56	0.00
	TOTAL :		55	2.89	0.28	96.83	0.00
25	MUNIRABAD HPS	1	9	24.69	0.00	75.31	0.20
		2	9	24.94	0.00	75.05	0.20
		3	10	38.32	0.78	60.90	0.06
	TOTAL :		28	29.64	0.28	70.08	0.15
26	SHARAVATHI HPS	1	103.5	3.32	0.57	96.12	0.00
		2	103.5	2.51	0.71	96.78	0.06
		3	103.5	0.29	0.15	99.56	0.00
		4	103.5	1.47	2.96	95.57	0.00
		5	103.5	7.07	4.65	88.28	0.00
		6	103.5	0.00	0.00	100.00	0.00
		7	103.5	0.87	0.36	98.77	0.00
		8	103.5	0.75	6.92	92.33	0.00
		9	103.5	6.30	0.69	93.01	0.00
		10	103.5	12.74	3.88	83.38	0.00
	TOTAL :		1035	3.53	2.09	94.38	0.01
27	SIVASAMUNDRUM HPS	1	3	0.67	1.64	97.68	2.33
		2	3	0.04	0.19	99.77	0.65
		3	3	0.09	0.63	99.28	0.47
		4	3	2.22	0.32	97.46	0.12
		5	3	0.06	0.53	99.41	0.83
		6	3	5.01	0.97	94.02	0.88
		7	6	2.00	0.22	97.79	0.27

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED	FORCED	OPERATING	MISC.
			(MW)	MAINTENANCE (P.M.) (%)	OUTAGE (F.O.) (%)	AVAILABILITY Y (100-FO-PM)	NON AVAILABILITY (%)
		8	6	3.14	0.55	96.32	1.06
		9	6	3.34	0.07	96.59	0.48
		10	6	29.78	0.17	70.05	0.20
	TOTAL :		42	6.04	0.45	93.51	0.67
28	VARAHI HPS	1	115	5.99	1.20	92.81	0.31
		2	115	0.36	1.95	97.69	0.16
		3	115	0.78	4.25	94.97	2.05
		4	115	4.41	3.41	92.17	0.78
	TOTAL :		460	2.89	2.70	94.41	0.83
	<u>KSEB</u>						
29	IDAMALAYAR HPS.	1	37.5	1.73	3.73	94.54	0.39
		2	37.5	43.97	3.25	52.78	0.01
	TOTAL :		75	22.85	3.49	73.66	0.20
30	IDUKKI HPS.	1	130	17.39	1.73	80.89	0.00
		2	130	16.25	1.04	82.71	0.00
		3	130	11.67	0.06	88.28	0.00
		4	130	6.25	4.21	89.54	0.00
		5	130	30.84	0.05	69.11	0.00
		6	130	11.86	0.01	88.13	0.11
	TOTAL :		780	15.71	1.18	83.11	0.02
31	KAKKAD HPS.	1	25	7.92	1.19	90.89	40.93
		2	25	9.31	0.31	90.38	39.58
	TOTAL :		50	8.62	0.75	90.63	40.26
32	KUTTIYADI HPS.	1	25	9.39	0.12	90.49	0.00
		2	25	8.51	0.11	91.38	0.00
		3	25	15.60	0.00	84.40	0.00
		4	50	0.53	0.71	98.77	0.00
	TOTAL :		125	6.91	0.33	92.76	0.00
33	KUTTIYADI ADDL. EXTN.	5	50	6.58	0.00	93.42	0.00
		6	50	0.17	0.18	99.65	0.00
	TOTAL :		100	3.37	0.09	96.54	0.00
34	LOWER PERIYAR HPS.	1	60	6.48	0.44	93.08	2.54
		2	60	6.58	2.48	90.94	1.84
		3	60	6.65	2.39	90.96	2.34
	TOTAL :		180	6.57	1.77	91.66	2.24

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED MAINTENANCE	FORCED OUTAGE	OPERATING AVAILABILITY	MISC. NON AVAILABILITY
			(MW)	(P.M.) (%)	(F.O.) (%)	Y (100-FO-PM)	(%)
35	NARIAMANGLAM HPS	1	15	7.35	17.69	74.96	3.16
		2	15	3.46	0.20	96.35	2.92
		3	15	9.80	0.00	90.20	2.68
		4	25	12.99	2.58	84.43	1.49
	TOTAL :		70	9.05	4.76	86.19	2.41
36	PALLIVASAL HPS.	1	5	10.32	0.41	89.27	0.57
		2	5	12.22	0.09	87.69	0.76
		3	5	8.50	5.87	85.63	0.17
		4	7.5	23.26	0.19	76.56	9.11
		5	7.5	7.93	1.54	90.52	16.25
		6	7.5	17.70	0.52	81.77	0.36
	TOTAL :		37.5	13.92	1.30	84.78	5.34
37	PANNIAR HPS.	1	15	9.26	1.31	89.44	55.83
		2	15	8.92	0.96	90.12	56.01
	TOTAL :		30	9.09	1.13	89.78	55.92
38	PORINGALKUTTU HPS.	1	8	3.89	1.38	94.72	26.74
		2	8	0.47	1.00	98.53	0.39
		3	8	2.47	0.15	97.39	0.08
		4	8	6.41	0.06	93.54	0.11
	TOTAL :		32	3.31	0.65	96.04	6.83
39	SABARIGIRI HPS.	1	50	7.61	0.58	91.81	67.77
		2	50	6.15	0.01	93.84	78.63
		3	50	0.17	0.57	99.27	77.30
		4	50	0.00	99.73	0.27	0.00
		5	50	0.18	0.02	99.80	71.88
		6	50	0.30	0.34	99.36	68.18
	TOTAL :		300	2.40	16.87	80.73	60.63
40	SENGULAM HPS.	1	12	3.33	0.01	96.65	8.96
		2	12	1.69	0.02	98.29	15.65
		3	12	7.61	0.04	92.35	5.72
		4	12	1.76	0.03	98.21	18.44
	TOTAL :		48	3.60	0.02	96.38	12.19
41	SHOLAYAR HPS.	1	18	12.28	6.43	81.29	4.39
		2	18	2.29	0.97	96.75	20.20
		3	18	16.71	21.28	62.01	15.18
	TOTAL :		54	10.43	9.56	80.01	13.25

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY (MW)	PLANNED MAINTENANCE (P.M.) (%)	FORCED OUTAGE (F.O.) (%)	OPERATING AVAILABILITY Y (100-FO-PM)	MISC. NON AVAILABILITY (%)
<u>TNGDCL</u>							
42	ALIYAR HPS.	1	60	17.69	0.43	81.88	0.07
	TOTAL :		60	17.69	0.43	81.88	0.07
43	BHAWANI KATTAL	1	15	3.43	0.27	96.31	0.01
		2	15	99.73	0.00	0.27	0.00
	TOTAL :		30	51.58	0.13	48.29	0.00
44	KADAMPARI HPS.	1	100	4.21	79.63	16.16	0.00
		2	100	9.35	0.00	90.65	0.00
		3	100	11.13	0.00	88.87	0.00
		4	100	14.69	0.38	84.92	0.00
	TOTAL :		400	9.84	20.00	70.16	0.00
45	KODAYAR-I HPS.	1	60	1.89	0.00	98.11	13.92
	TOTAL :		60	1.89	0.00	98.11	13.92
46	KODAYAR-II HPS.	1	40	0.91	1.23	97.86	0.00
	TOTAL :		40	0.91	1.23	97.86	0.00
47	KUNDAH-1 HPS.	1	20	2.49	1.01	96.50	0.00
		2	20	0.69	0.26	99.05	0.00
		3	20	3.88	0.00	96.12	0.00
	TOTAL :		60	2.35	0.42	97.23	0.00
48	KUNDAH-II HPS.	4	35	0.97	0.05	98.99	0.00
		5	35	1.6	27.13	71.28	0.00
		6	35	3.35	0.92	95.73	0.00
		7	35	0.77	0.22	99.01	0.00
		8	35	1.73	0.52	97.75	0.00
	TOTAL :		175	1.68	5.77	92.55	0.00
49	KUNDAH-III HPS.	9	60	4.30	0.00	95.70	0.00
		10	60	5.23	0.07	94.69	0.00
		11	60	11.17	1.08	87.75	0.01
	TOTAL :		180	6.90	0.40	92.70	0.00
50	KUNDAH-IV HPS.	12	50	3.72	0.06	96.21	0.00
		13	50	4.38	0.07	95.55	0.00
	TOTAL :		100	40.05	0.07	59.88	0.00
51	KUNDAH-V HPS.	14	20	4.34	0.60	95.06	0.00
		15	20	4.27	0.20	95.53	0.00
	TOTAL :		40	4.31	0.40	95.29	0.00

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED MAINTENANCE	FORCED OUTAGE	OPERATING AVAILABILITY	MISC. NON AVAILABILITY
			(MW)	(P.M.) (%)	(F.O.) (%)	Y (100-FO-PM)	(%)
52	LOWER METTUR-I HPS.	1	15	16.06	0.00	83.94	0.00
		2	15	10.72	0.00	89.28	0.00
		TOTAL :	30	13.39	0.00	86.61	0.00
53	LOWER METTUR-II HPS.	1	15	5.87	0.08	94.05	0.00
		2	15	5.74	0.38	93.87	0.00
		TOTAL :	30	5.81	0.23	93.96	0.00
54	LOWER METTUR-III HPS.	1	15	6.98	0.00	93.02	0.00
		2	15	6.41	0.00	93.59	0.00
		TOTAL :	30	6.70	0.00	93.30	0.00
55	LOWER METTUR-IV HPS.	1	15	10.33	0.00	89.67	0.00
		2	15	16.89	0.00	83.11	0.00
		TOTAL :	30	13.61	0.00	86.39	0.00
56	METTUR DAM HPS.	1	12.5	0.09	0.00	99.91	0.00
		2	12.5	7.46	0.00	92.54	0.00
		3	12.5	0.09	0.00	99.91	0.00
		4	12.5	7.31	0.00	92.69	0.00
		TOTAL :	50	3.74	0.00	96.26	0.00
57	METTUR TUNNEL HPS.	1	50	31.89	0.00	68.11	0.00
		2	50	27.04	0.00	72.96	0.00
		3	50	16.83	0.00	83.17	0.00
		4	50	24.22	0.00	75.78	0.00
		TOTAL :	200	25.00	0.00	75.00	0.00
58	MOYAR HPS	1	12	16.11	1.59	82.30	0.00
		2	12	0.10	0.18	99.73	0.07
		3	12	0.22	0.14	99.64	0.06
		TOTAL :	36	5.48	0.63	93.89	0.04
59	PAPANASAM HPS.	1	8	4.77	0.33	94.90	0.01
		2	8	9.40	4.85	85.74	0.01
		3	8	9.95	1.56	88.49	0.00
		4	8	6.69	0.20	93.11	0.01
		TOTAL :	32	7.70	1.74	90.56	0.01
60	PARSON'S VALLEY HPS.	1	30	0.99	0.00	99.01	0.05
		TOTAL :	30	0.99	0.00	99.01	0.05
61	PERIYAR HPS.	1	35	8.98	0.41	90.61	0.00
		2	35	6.36	0.08	93.56	0.00

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY (MW)	PLANNED MAINTENANCE (P.M.) (%)	FORCED OUTAGE (F.O.) (%)	OPERATING AVAILABILITY Y (100-FO-PM)	MISC. NON AVAILABILITY (%)
		3	35	10.65	0.00	89.35	0.00
		4	35	13.68	0.05	86.26	0.00
	TOTAL :		140	9.92	0.14	89.94	0.00
62	PYKARA HPS.	1	7	0.44	0.27	99.29	0.00
		2	7	50.32	0.68	49.00	0.00
		3	7	0.19	0.00	99.81	0.00
		4	13.6	0.00	0.00	100.00	0.00
		5	13.6	0.29	0.98	98.72	0.00
		6	11	0.54	0.44	99.02	0.00
	TOTAL :		59.2	6.19	0.42	93.39	0.00
63	PYKARA ULTMATE HPS.	1	50	3.06	0.23	96.71	0.00
		2	50	2.34	3.54	94.13	0.00
		3	50	2.16	10.41	87.43	0.00
	TOTAL :		150	2.52	4.72	92.76	0.00
64	SARKARPATHY HPS.	1	30	45.98	0.00	54.02	0.29
	TOTAL :		30	45.98	0.00	54.02	0.29
65	SHOLAYAR HPS.	1	35	43.65	0.32	56.03	0.10
		2	35	0.00	22.38	77.62	0.00
		3	25	26.03	0.43	73.54	0.22
	TOTAL :		95	22.93	8.48	68.59	0.10
66	SURULIYAR HPS.	1	35	2.52	0.00	97.48	0.00
	TOTAL :		35	2.52	0.00	97.48	0.00
	<u>EASTERN REGION</u>						
	<u>DVC</u>						
1	MAITHON HPS.	1	23.2	0.00	1.06	98.94	0.05
		2	20	0.00	25.80	74.20	0.03
		3	20	0.00	0.28	99.72	0.05
	TOTAL :		63.2	0.00	8.64	91.36	0.04
2	PANCHET HPS.	1	40	1.45	3.12	95.44	0.04
		2	40	0.00	4.68	95.32	0.02
	TOTAL :		80	0.72	3.90	95.38	0.03
	<u>JSEB</u>						
3	SUBERNREKHA-I HPS.	1	65	90.07	0.00	9.93	0.00
4	SUBERNREKHA -II HPS.	2	65	0.00	0.08	99.92	0.00
	TOTAL(I&II) :		130	45.03	0.04	54.93	0.00

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY (MW)	PLANNED MAINTENANCE (P.M.) (%)	FORCED OUTAGE (F.O.) (%)	OPERATING AVAILABILITY Y (100-FO-PM)	MISC. NON AVAILABILITY (%)
<u>NHPC</u>							
5	RANGIT HPS	1	20	7.07	0.00	92.93	1.25
		2	20	6.25	0.35	93.41	1.41
		3	20	7.64	5.66	86.70	1.32
	TOTAL :		60	6.99	2.00	91.01	1.32
6	TEESTA LOW DAM-III HPS	1	33	0.00	0.04	99.96	0.01
		2	33	0.00	2.26	97.74	1.2
		3	33	0.00	0.49	99.51	0.01
	TOTAL :		99	0.00	0.93	99.07	0.41
7	TEESTA V HPS	1	170	5.84	6.66	87.50	11.56
		2	170	6.22	8.02	85.76	11.59
		3	170	0.00	11.55	88.45	13.69
	TOTAL :		510	4.02	8.74	87.24	12.28
<u>OHPC</u>							
8	BALIMELA HPS.	1	60	0.73	16.06	83.21	0.00
		2	60	0.73	11.92	87.35	0.00
		3	60	0.73	10.53	88.74	0.00
		4	60	0.46	51.23	48.31	0.00
		5	60	0.82	1.40	97.78	0.00
		6	60	3.97	0.00	96.03	0.00
		7	75	3.47	0.00	96.53	0.00
		8	75	29.60	3.60	66.80	0.00
	TOTAL :		510	5.74	11.25	83.01	0.00
9	HIRAKUD -I (BURLA) HPS	1	49.5	20.85	4.75	74.40	0.00
		2	49.5	0.35	39.27	60.38	0.25
		3	32	8.24	5.33	86.42	0.00
		4	32	8.23	1.01	90.76	0.00
		5	37.5	15.59	3.83	80.58	0.00
		6	37.5	0.59	3.17	96.24	0.00
		7	37.5	0.61	7.09	92.31	0.00
	TOTAL :		275.5	8.01	10.56	81.43	0.04
10	HIRAKUD-II(CHIPLIMA) HPS	1	24	7.58	1.19	91.23	0.00
		2	24	7.46	0.09	92.45	0.00
		3	24	7.15	37.96	54.88	0.00
	TOTAL :		72	7.40	13.08	79.52	0.00

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY	PLANNED MAINTENANCE	FORCED OUTAGE	OPERATING AVAILABILITY	MISC. NON AVAILABILITY
			(MW)	(P.M.) (%)	(F.O.) (%)	Y (100-FO-PM)	(%)
11	RENGALI HPS.	1	50	18.53	1.04	80.43	0.00
		2	50	34.41	0.22	65.37	0.00
		3	50	6.33	2.28	91.39	0.00
		4	50	0.46	5.47	94.07	0.00
		5	50	0.75	0.31	98.94	0.00
	TOTAL :		250	12.09	1.87	86.04	0.00
12	UPPER INDRAVATI HPS.	1	150	2.46	0.40	97.14	0.00
		2	150	8.98	0.00	91.02	0.00
		3	150	16.51	27.31	56.18	0.00
		4	150	5.94	0.01	94.05	0.00
	TOTAL :		600	8.47	6.93	84.60	0.00
13	UPPER KOLAB HPS.	1	80	4.74	4.74	90.51	0.00
		2	80	5.78	1.09	93.13	0.00
		3	80	23.59	2.39	74.02	0.00
		4	80	5.23	0.00	94.77	0.00
	TOTAL :		320	9.83	2.06	88.11	0.00
	<u>WBSIEDCL</u>						
14	JALDHAKA HPS ST-I	1	9	56.89	3.64	39.47	1.34
		2	9	30.37	5.27	64.36	19.56
		3	9	28.85	5.22	65.93	11.90
	TOTAL :		27	38.70	4.71	56.59	10.93
15	PURULIA PSS HPS.	1	225	0.00	0.00	100.00	0.00
		2	225	0.00	0.00	100.00	0.00
		3	225	0.00	0.00	100.00	0.00
		4	225	0.00	0.00	100.00	0.00
	TOTAL :		900	0.00	0.00	100.00	0.00
16	RAMMAM HPS.	1	12.5	0.55	3.90	95.55	9.05
		2	12.5	1.80	0.03	98.17	24.79
		3	12.5	4.08	0.12	95.79	32.07
		4	12.5	17.95	0.42	81.64	20.85
	TOTAL :		50	6.10	1.12	92.78	21.69

OPERATING AVAILABILITY OF HYDRO ELECTRIC UNITS DURING 2012-2013

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY (MW)	PLANNED MAINTENANCE (P.M.) (%)	FORCED OUTAGE (F.O.) (%)	OPERATING AVAILABILITY Y (100-FO-PM)	MISC. NON AVAILABILITY (%)
<u>NORTH EASTERN REGION</u>							
<u>APGPCL</u>							
1	KARBI LANGPI HPS.	1	50	0.10	4.18	95.72	39.75
		2	50	0.17	6.62	93.21	53.32
	TOTAL :		100	0.13	5.40	94.47	46.53
<u>MeECL</u>							
2	KYRDEMKULAI HPS.	1	30	2.67	3.21	94.12	0.00
		2	30	52.40	1.91	45.69	0.00
	TOTAL :		60	27.54	2.56	69.90	0.00
3	MYNTDU(LESHKA) St-1 HPS	1	42	0.00	0.00	100.00	0.00
		2	42	0.00	0.00	100.00	0.00
		3	42	0.00	0.00	100.00	0.00
	TOTAL :		126	0.00	0.00	100.00	0.00
4	UMIAM HPS ST-I	1	9	0.13	0.43	99.44	0.00
		2	9	0.06	0.00	99.94	0.00
		3	9	0.00	66.65	33.35	0.00
		4	9	1.08	0.45	98.47	0.00
	TOTAL :		36	0.32	16.88	82.80	0.00
5	UMIAM HPS ST-IV	7	30	0.51	2.83	96.67	0.00
		8	30	8.56	0.88	90.56	0.00
	TOTAL :		60	4.53	1.85	93.62	0.00
<u>NEEPCO.</u>							
6	DOYANG HPS.	1	25	4.85	1.30	93.85	0.00
		2	25	5.35	2.49	92.16	0.68
		3	25	2.69	1.35	95.96	0.00
	TOTAL :		75	4.29	1.72	93.99	0.23
7	KHONDONG HPS.	1	25	0.00	1.73	98.27	0.00
		2	25	38.60	0.44	60.97	0.00
	TOTAL :		50	19.30	1.09	79.61	0.00
8	KOPILI HPS.	1	50	0.00	20.08	79.92	0.00
		2	50	2.37	47.61	50.01	1.06
		3	50	22.07	7.27	70.66	0.00
		4	50	22.92	11.76	65.31	0.00
		5	25	2.35	1.64	96.01	0.07
	TOTAL :		225	10.79	19.46	69.75	0.24

SL. NO.	STATION/ CORPORATION	UNIT NO.	CAPACITY (MW)	PLANNED MAINTENANCE (P.M.) (%)	FORCED OUTAGE (F.O.) (%)	OPERATING AVAILABILITY (100-FO-PM)	MISC. NON AVAILABILITY (%)
9	RANGANADI HPS.	1	135	2.65	0.49	96.86	0.00
		2	135	2.51	0.00	97.49	0.00
		3	135	3.20	3.21	93.59	0.00
		TOTAL :	405	2.78	1.23	95.99	0.00
	<u>NHPC</u>						
10	LOKTAK HPS.	1	35	0.00	0.00	100.00	0.00
		2	35	0.00	99.73	0.27	0.00
		3	35	0.00	99.73	0.27	0.00
		TOTAL :	105	0.00	66.48	33.52	0.00

CHAPTER 7

GENERATION PROGRAMME FOR THE YEAR 2013-14

CHAPTER 7

GENERATION PROGRAMME FOR THE YEAR 2013-14

7.1 As on 31.3.2013, 182 HE Stations (of more than 25 MW capacity) having total installed capacity of 39491.40 MW are being monitored in the country. With the addition of new hydro units during 2013-14, the anticipated installed capacity of HE Stations in the country would be 41430.40 MW (HE station capacity above 25 MW) by 31st March, 2014. Generation Programme for HE stations in the country for the year 2013-14 has been fixed at 127063 MU (including 4800 MU import from Bhutan) which was 8548.21 MU more than actual generation of 118514.79 MU (including 4794.50 MU import from Bhutan during 2012-13).

7.2 Region wise details of likely installed capacity on 31.03.2014, Generation Programme for 2013-14 and actual generation during 2012-13 are given in **Table 7.1** below:

TABLE 7.1

REGIONWISE LIKELY INSTALLED CAPACITY OF HE STATIONS AND GENERATION PROGRAMME DURING 2013-14

Sl. No.	Region	Likely Installed Capacity on 31.03.2014 (MW)	Generation Programme for 2013-14 (MU)	Generation during 2012-13 (MU)	
				Programme	Actual
1.	Northern	17005.25	61597	60243	62549.87
2.	Western	7512.00	15843	15159	17665.00
3.	Southern	11432.45	29454	32362	21144.61
4.	Eastern	4238.70	11191	10081	8449.73
5.	N-Eastern	1242.00	4178	4200	3911.08
Sub total		41430.40	122263	122045	113720.29
6.	Import – from Bhutan	-	4800	5480	4794.50
Total		41430.40	127063	127525	118514.79

7.3 While finalizing the Generation Programme for 2013-14, it was anticipated that 34 H.E. units having installed capacity of 1939 MW will be added during the year. Unit wise details of these units are given in **Annex-7.1**.

7.4 Actual generation during the year 2012-13 from HE Stations was 118514.79 MU against the Generation Programme of 127525 MU including import from Bhutan. Sector wise, Utility wise details of likely installed Capacity as on 31.03.2014, targets and actual generation during 2012-13, generation target for 2013-14 are given in **Annex-7.2**.

HYDRO ELECTRIC GENERATING UNITS LIKELY TO BE ADDED DURING 2013-14

Sl. No	Name of the Project	State/ Organization	Unit No.	Capacity (MW)	Programmed date of Commissioning
	Central Sector				
1	Nimoo Bazgo	J&K / NHPC	U-1 U-2 U-3	15 15 15	2013-14 2013-14 2013-14
2	Uri-II	J&K / NHPC	U-1 U-2 U-3 U-4	60 60 60 60	2013-14 2013-14 2013-14 2013-14
3	Parbati-III	HP / NHPC	U-1 U-2 U-3 U-4	130 130 130 130	2013-14 2013-14 2013-14 2013-14
4	Teesta Low Dam III	WB/ NHPC	U-4	33	2013-14
5	Teesta Low Dam IV	WB/ NHPC	U-1 U-2 U-3 U-4	40 40 40 40	2013-14 2013-14 2013-14 2013-14
6	Rampur	HP / SJVNL	U-1 U-2 U-3 U-4 U-5 U-6	68.67 68.67 68.67 68.67 68.67 68.67	2013-14 2013-14 2013-14 2013-14 2013-14 2013-14
	State Sector				
5	Bhawani Kattalai Barrage-II	TamilNadu / TANGEDCO	U-1 U-2	15 15	2013-14 2013-14
6	Bhawani Kattalai Barrage-III	TamilNadu / TANGEDCO	U-2	15	2013-14
	Private Sector				
7	Sorang	HP / HSPL	U-1 U-2	50 50	2013-14 2013-14

Sl. No	Name of the Project	State/ Organization	Unit No.	Capacity (MW)	Programmed date of Commissioning
8	Shrinagar	Uttarakhand / GVK Ind	U-1 U-2	82.5 82.5	2013-14 2013-14
9	Maheshwar	MP/ SMHPCL	U-1 U-2 U-3	40 40 40	2013-14 2013-14 2013-14
10	Chujachen	Sikkim/ GIL	U-1 U-2	49.5 49.5	2013-14 2013-14
		Total: 2013-14	34	1939 MW	

**SECTORWISE PERFORMANCE OF HYDRO ELECTRIC STATIONS
DURING 2012-13 & TARGETS FOR 2013-14**

SECTOR/STATE	Installed Capacity on 31.03.2014	Generation during 2012-13 (MU)		Generation Programmed for 2013-14 (MU)
		Targets	Actual	
A.CENTRAL SECTOR				
BBMB	2866.30	10023	10944.67	9665
NHPC	5139.20	19117	18893.49	21107
SJVNL	1912.00	6500	6777.78	6548
THDC	1400.00	3942	4266.06	3952
NHDC	1520.00	3384	4203.92	3384
DVC	143.20	256	199.33	283
NEEPCO	755.00	2698	2377.74	2392
Sub Total	13735.70	45920	47662.99	47331.00
B.STATE ELECTRICITY BOARDS/CORPORATIONS				
HPSEBL	366.00	1708	1460.22	1603.00
JKPDC	660.00	3423	3700.00	3437.00
PSPCL	1051.00	3852	3925.85	3920.00
RRVUNL	411.00	545	845.34	562.00
UPJVNL	501.60	885	1577.92	1006.00
UJVNL	1252.15	4604	4677.87	4574.00
CSPGC	120.00	250	301.51	250.00
GSECL	540.00	616	880.02	690.00
SSNNL	1450.00	3141	3698.29	3141.00
MPPGCL	875.00	2389	3023.79	2575.00
MAHAGENCO	2406.00	3874	4011.46	3873.00
APGENCO	3783.35	8187	3456.75	6603.00
KPCL	3585.40	12205	10169.78	11606.00
KSEB	1881.50	6909	4650.08	6589.00
TANGENCO	2182.20	5061	2868	4656.00
JSEB	130.00	160	141.98	160.00
OHPC	2027.50	5497	4373.80	5650.00
WBSIEDCL	977.00	1069	1138.12	1078.00
APGCL	100.00	425	343.04	390.00
MeECL	282.00	629	609.89	896.00
Sub Total	24581.70	65429	55853.71	63259.00
C.PRIVATE SECTOR				
MPCL(HP)	86.00	350	333.15	344.00
ADHL(HP)	192.00	750	681.32	720.00

LGPPL(HP)	70.00	277	156.79	291.00
EPPL (HP)	100.00	400	312.50	386.00
JPVL (HP & UK)	1700.00	7414	7173.82	7402.00
HSPL (HP)	100.00	-	-	21.00
SMHPCL(MP)	400.00	-	-	415.00
TATA HYDRO	447.00	1450	1450.03	1450.00
DLHP(MAH.)	34.00	55	95.98	65.00
GIL(SIKKIM)	99.00	-	-	537.00
GVK INDIA(UK)	165.00	-	-	42.00
Sub Total	3113.00	10696	10203.59	11673.00
Total All India	41430.40	122045	113720.29	122263.00
Import from Bhutan		5480	4794.50	4800.00
Total Hydro generation including import from Bhutan		127525	118514.79	127063.00

Note:- Hydro schemes above 25 MW has been considered.

CHAPTER 8

RENOVATION & MODERNISATION OF HYDRO-ELECTRIC POWER STATIONS

CHAPTER – 8

RENOVATION & MODERNISATION OF HYDRO ELECTRIC POWER PROJECTS

8.0 Introduction

Renovation & Modernisation (R&M) and uprating wherever feasible of old hydro power plants in the present scenario of resource constraint is considered to be the best option for bridging the gap between the demand and supply of power as R&M schemes are cost effective and quicker than the setting up of green field power plants.

8.1 R&M Phase-I Programme:

Recognizing 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.

8.2 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.

8.3 National Perspective Plan:

CEA formulated 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.

8.4 VIII, IX, X and XI Plan Achievements:

Under the hydro R&M programme, 83 (19 in Central Sector and 64 in State Sector) hydro electric schemes (13 upto the VIII Plan, 20 in the IX Plan, 32 in the X Plan and 18 in the XI Plan) with an installed capacity of 15332 MW at a cost of Rs.2,021 Crores have been completed by the end of the XI Plan (i.e. by 31.03.2012) & have accrued a benefit of 3086 MW through Life Extension, Uprating and Restoration. The state-wise list of hydro R&M schemes completed during the VIII, IX, X Plan & XI Plan is given at **Annex. 8.1, 8.2, 8.3 & 8.4** respectively.

8.5 XII Plan Programme:

During XII Plan, a total of 39 hydro R&M schemes (5 in Central Sector and 34 in State Sector) having an installed capacity of about 6981 MW and which will accrue benefit of about 2342 MW through uprating, life extension and restoration are expected to be completed at an estimated cost of about Rs. 3302 Crores. A total of 12 schemes are programmed to be taken up in XII Plan and will accrue benefit of 1408 MW during XIII Plan. The state-wise list of hydro R&M schemes programmed for completion during XII Plan (39 schemes) and XIII Plan (12 schemes) is given at **Annex 8.5** and **Annex 8.6** respectively. Out of the 39 schemes programmed for completion

during XII Plan, 4 schemes in State sector with an installed capacity of about 991 MW have been completed till June, 2013 and have accrued a benefit of 100 MW through Life Extension.

8.6 Summary of R&M of Hydro Projects (As on 30.06.2013)

I Hydro R&M schemes completed up to XI Plan

Sl. No.	Plan Period	No. of Projects			Installed Capacity (MW)	Estimated Cost (Rs. in Crs.)	Actual Expenditure (Rs. in Crs.)	Benefit (MW)
		Central Sector	State Sector	Total				
1.	VIII Plan Schemes completed	2	11	13	1282.00	125.57	127.37	429.00 [39.00(U) + 336.00(Res.) + 54.00(LE)]
2.	IX Plan Schemes completed	8	12	20	4892.10	597.84	570.16	1093.03 [339.00(U) + 331.03(Res.) + 423.00(LE)]
3.	X Plan Schemes completed	5	27	32	4336.60	1016.31	1028.97	829.08 [123.40(U) + 701.25 (LE) + 4.43(Res.)]
4.	XI Plan Schemes completed	4	14	18	4821.20	412.83	294.84	735 [12 (U) + 15 (LE) + 708 (Res.)]

II Candidate Hydro R&M schemes for XII Plan

Sl. No.	Plan Period	No. of Projects			Installed Capacity (MW)	Estimated Cost (Rs.in Crs.)	Actual Expenditure (Rs. in Crs.)	Benefit (MW)
		Central Sector	State Sector	Total				
a)	Programmed (Original)	5	40	45	6980.60	3302	1133.92	2342 [163(U) + 2164(LE) + 15(Res.)]
	Revised	5	34	39				
b)	Completed	-	4	4	990.60	120	62.17	100 [100 (LE)]
c)	Under implementation	3	19	22	3112	2112	1057	1593 [133.00(U) + 1445(LE) + 15.0(Res.)]
d)	Under Tendering	1	8	9	2258	800	9	414 [25(U) + 389(LE)]
e)	Under DPR Preparation/ Finalization and Approval	1	3	4	620	270	5.75	235 [5(U) + 230(LE)]

Abbreviations: MW – Mega Watt; Res. – Restoration; U – Uprating; LE – Life Extension

III Candidate Hydro R&M schemes to be taken up during XII Plan and programmed for completion in XIII Plan

Sl. No.	Plan Period	No. of Projects			Installed Capacity (MW)	Estimated Cost (Rs. in Crs.)	Actual Expenditure (Rs. in Crs.)	Benefit (MW)
		Central Sector	State Sector	Total				
a)	Programmed	-	12	*12	1373	2540	0.84	1408 [35(U) + 1373(LE)]
b)	Under Tendering	-	7	7	817	1499	-	846 [29(U) + 817(LE)]
c)	Under DPR Preparation	-	3	3	460	1041	0.84	466 [6(U) + 460 (LE)]
d)	Under RLA Studies	-	2	2	96	-	-	96 [96(LE)]

Abbreviations:

MW – Mega Watt;
Res. – Restoration;
U – Uprating;
LE – Life Extension

* Out of these 12 schemes, 9 schemes have been rescheduled for completion from XII Plan to XIII Plan.

8.7 Programme for the year 2012-13

For the year 2012-13, it is programmed to complete 10 schemes having an installed capacity of 2731 MW. On completion of these schemes, there will be a benefit of 287 MW through Life Extension and Uprating at an estimated cost of about Rs. 399 Crores.

S.No. Name of Scheme (I.C. in MW), Agency (2012-13)

1. Bassi (4x16.5), HPSEBL
2. Sumbal Sindh (2x11.3), JKSPDC
3. Lower Jhelum (3x35), JKSPDC
4. Srisailem RB (7x110), APGENCO
5. Lower Sileru (4x115), APGENCO
6. Nagarjuna Sagar (1x110+7x100.8), APGENCO
7. Sabirigiri(6x50), KSEB
8. Idamalayar (2x37.5), KSEB
9. Jaldhaka St.I (3x9), WBSEDCL
10. Rengali (1x50), OHPC

8.8 Achievement during the year 2012-13

R&M schemes namely Rengali Unit-1 of OHPC, Nagarjuna Sagar of APGENCO and Idamalayar of KSEB having an aggregate installed capacity of about 941 MW have been completed during the year 2012-13 at an actual cost of Rs. 62.17 Crores and accrued benefit of 50 MW through Life Extension, Uprating and Restoration. Remaining 7 schemes namely Bassi of HPSEBL, Lower

Jhelum and Sumbal Sindh of JKSPDC, Srisailam RB & Lower Sileru of APGENCO, Sabirigiri of KSEB and Jaldhaka of WBSSEDCL are yet to be completed.

8.9 Programme for the year 2013-14

For the year 2013-14, it is programmed to complete following 13 schemes having an installed capacity of 1819 MW. On completion of these schemes, there will be a benefit of about 216 MW through Life Extension, Restoration and Uprating at an estimated cost of about Rs.717 Crores.

S. No. Name of Scheme (I.C. in MW), Agency

1. Rengali Unit-2 (1x50), OHPC
2. Bassi (4x16.5), HPSEBL
3. Chenani (5x4.66), JKSPDC
4. Sumbal Sindh (2x11.3), JKSPDC
5. Ganderbal (2x3+2x4.5), JKSPDC
6. Lower Jhelum (3x35), JKSPDC
7. Pathri (3x6.8), UJVNL
8. Srisailam RB (7x110), APGENCO
9. Lower Sileru (4x115), APGENCO
10. Supa (2x50), KPCL
11. Sabarigiri (6x50), KSEB
12. Jaldhaka St.I (3x9), WBSSEDCL
13. Kopili (2x50), NEEPCO

State wise List of Hydro RM&U schemes completed upto the VIII 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.	Bairasiul, NHPC	CS	3x60	25.98	25.98	18.00 (U)	RM&U	1991-92
2.	Giri, HPSEB	SS	2x30	9.85	7.90	6.00 (U)	RM&U	1995-96
Punjab								
3.	UBDC-I, PSPCL	SS	3x15	11.00	8.00	11.00 (Res)	R&M+Res.	1990-92
Uttar Pradesh								
4.	Rihand, UPJVNL	SS	6x50	1.43	1.43	100.00 (Res)	R&M+Res.	1995-96
Karnataka								
5.	Nagjhari, U-2, KPCL	SS	1x135	11.97	11.32	15.00 (U)	RM&U	1995-96
6.	Shivasamudram, VVNL	SS	6x3 + 4x6	8.00	8.00	18.00 (LE)	RM&LE (3 MW Units)	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	200.00 (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	25.00 (Res)	R&M+Res.	1991-92
Tripura								
13.	Gumti, TSECL	SS	3x5	17.50	17.50	-	R&M	1994-95
	Total		1282.00	125.57	127.37	429.00 [39.0 (U) + 336.0 (Res) + 54.0(LE)]		

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

State wise List of Hydro RM&U schemes completed in the IX Plan

S. 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.	Dehar 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, HPSEBL	SS	4x15	5.35	4.3446	-	R&M	2000-01
Jammu & Kashmir								
5.	Salal St.I, NHPC	CS	3x115	51.50	51.50	-	R&M	2000-01
6.	Chenani, JKSPDC	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	4.1136	-	R&M	1998-99
12	Tiloth, UJVNL	SS	3x30	8.02	5.513	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	Srisaillam, 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	178.20 (Res) + 115.20 (U)	RM&U +Res.	1997-98
16	Sharavathy, U-9&10, KPCL	SS	2x89.1	17.96	14.68	19.10 (Res) + 28.80(U)	RM&U +Res.	1997-98
Odisha								
17	Hirakud-I, U1&2, OHPC	SS	2x37.5	95.10	95.10	24.00(U) + 75.00(LE)	RMU&LE	1997-98

S. No	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
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, MAHAGENCO	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, MAHAGENCO	SS	3x80	4.65	4.65	-	R&M	1997-98
	Total		4892.10	597.84	570.16	1093.03 [339.0(U) + 331.03(Res) +423.0(LE)]		

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

State wise List of Hydro RM&U schemes completed in the X Plan

S. No	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost	Actual Exp.	Benefits (MW)	Category	Year of completion
				(Rs. in Cr.)				
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 (incl. IDC 6.28)	81.9935	25.89 (LE) +2.10 (Res)	RM& LE+ Res.	2006-07
3.	Kotla, U-1, BBMB	CS	1x29.25	51.28 (incl. IDC 6.28)		26.61 (LE) +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 3x15 MW & R&M for 3 x 15.45 MW	2006-07
8.	Mukerian St.I, PSPCL	SS	3x15	6.04	4.38	-	R&M	2006-07
Uttarakhand								
9.	Chhibro, UJVNL	SS	4x60	10.45	10.52	-	R&M	2006-07
Karnataka								
10.	Nagjhari, U-1&3, KPCL	SS	2x135	26.12	21.62	30.00 (U)	RM&U	2002-03
11.	Supa PH, KPCL	SS	2x50	2.64	2.47	-	R&M	2002-03

S. No	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
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
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	Neriamangalam KSEB	SS	3x15	58.00	53.05	45.00 (LE) + 9.00 (U)	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
Odisha								
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	20.00(LE)+3.20(U)	RMU&LE	2004-05

S. No	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost	Actual Exp.	Benefits (MW)	Category	Year of completion
				(Rs. in Crs.)				
Maharashtra								
28	Bhira Tail Race, MAHAGENCO	SS	2x40	1.60	0.70	-	R&M	2003-04
29	Tillari, MAHAGENCO	SS	1x60	4.50	4.24	6.0 (U)	RM&U	2004-05
30	Koyna Gen. Complex, MAHAGENCO	SS	4x70+4x80+4x80	12.00	11.50	-	R&M	2004-05
Meghalaya								
31	Umium St.I MeECL	SS	4x9	81.88	84.21	36.00 (LE)	RM&LE	2002-03
Assam								
32	Khandong, NEEPCO	CS	2x25	4.00	3.3499	-	R&M	2003-04
	Total		4336.60	1016.31	1028.9704	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 already been accounted for at Sl. No. 4.

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

State-wise List of Hydro RM&U schemes completed in the XI Plan

S. No	Project, Agency	CS/SS	Inst. Cap. (MW)	Estimated Cost	Actual Exp.	Benefits (MW)	Category	Completion Schedule
				(Rs. in Crs.)				
Completed Schemes								
Himachal Pradesh								
1.	Dehar Ph. A BBMB	CS	6x165	11.00	6.936		R&M	2010-11 Completed
2.	Dehar Ph. B BBMB	CS	6x165	49.00	24.454	330 (LE)	RM&LE	2009-10 Completed
Uttarakhand								
3	Tanakpur, NHPC	CS	3x31.4	10.77	11.95	-	R&M	2007-08 Completed
4	Khodri Ph.A UJVNL	SS	4x30	5.25	6.39	-	R&M	2008-09 Completed
5	Chilla Ph.A, UJVNL	SS	4x36	23.55	21.24	-	R&M	2008-09 Completed
Andhra Pradesh								
6	Upper Sileru, APGENCO	SS	4x60	4.20	3.34	-	R&M	2009-10 Completed
Karnataka								
7	Nagjhari, U1 to 6, KPCL	SS	5x150 + 1x135	14.75	15.31	-	R&M	2009-10 Completed
8	Sharavathy Ph.B, KPCL	SS	10x103.5	20.50	11.14	-	R&M	2009-10 Completed
9	Supa, KPCL	SS	2x50	3.45	4.90	-	R&M	2009-10 Completed
10	Bhadra, KPCL	SS	2x12	1.44	0.85	-	R&M	2009-10 Completed
11	Lingnamakki, KPCL	SS	2x27.5	3.81	2.62	-	R&M	2010-11 Completed
Tamil Nadu								
12	Mettur Dam, TANGEDCO	SS	4x10	30.17	24.16	10 (U) + 40 (LE)	RMU&LE	2007-08 Completed
Maharashtra								
13	Koyna St.I & II, MAHAGENCO	SS	4x70 + 4x80	87.50	81.82	-	R&M	2008-09 Completed
14	Vaitarna, MAHAGENCO	SS	1x60	16.00	0.14	-	R&M	2009-10 Completed
15	Koyna Dam PH, MAHAGENCO	SS	2x18	5.78	0.25	-	R&M	2009-10 Completed
16	Koyna St.III, MAHAGENCO	SS	4x80	16.65	5.79	320 (LE)	RM&LE	2011-12 Completed
Manipur								
17.	Loktak, NHPC	CS	3x30 derated	18.55	17.88	15.00 (Res.)	R&M + Res.	2011-12 Completed
Meghalaya								
18	Umium St.II , MeECL	SS	2x9	90.46	55.67 (as on 31.03.12)	2(U)+ 18.00 (LE)	RM&LE	2011-12
	Total		4821.20	412.83	294.84	735 [12.00(U) + 708.00 (LE) + 15.0(Res)]		

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

State-wise List of Hydro RM&U schemes programmed for completion in the XII Plan

As on 30.06.2013

S. No	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost (Prov.)	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
Completed Schemes								
Odisha								
1	Rengali Unit-1 OHPC	SS	1x50	47.50	36.76 (as on 30.06.12)	50(LE)	RM&LE	2012-13
2	Rengali Unit-2 OHPC	SS	1x50	25.2 (approx)	-	50(LE)	R&M	2013-14
Andhra Pradesh								
3	Nagarjuna Sagar, APGENCO	SS	1x110+ 7x100.8	33.35	13.90 (as on 31.03.2012)	-	R&M	2012-13
Kerala								
4	Idamalayar, KSEB	SS	2x37.5	14.50	11.51 (as on 28.12.12)	-	R&M	2012-13
	Sub Total(A)		990.60	120.55	62.17	100		
Ongoing Schemes – Under implementation								
Himachal Pradesh								
5	Bhakra LB, BBMB	CS	5x108	489.77	238.51 (as on 30.06.13)	540.00 (LE) + 90.00 (U)	RMU&LE	2014-15
6	Bassi, HPSEBL	SS	4x16.5	119.83	155.21 (as on 30.06.13)	6.0(U)+ 60 (LE)	RMU&LE	2013-14
Jammu & Kashmir								
7	Ganderbal, JKSPDC	SS	2x3+ 2x4.5	34.65	11.25 (as on 31.03.13)	9.00 (LE)	RM&LE	2013-14
8	Chenani, JKSPDC	SS	5x4.66	39.18	6.61 (as on 31.03.13)	23.30 (LE)	RM&LE	2013-14
9	Sumbal Sindh, JKSPDC	SS	2x11.3	45.92	24.94 (as on 31.03.13)	-	R&M	2013-14
10	Lower Jhelum, JKSPDC	SS	3x35	126.41	81.73 (as on 31.03.13)	15.00 (Res.)	R&M+ Res.	2013-14

S. No	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost (Prov.)	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
Uttar Pradesh								
11	Matatila, UPJVNL	SS	3x10.2	10.29	1.47 (as on 30.06.13)	30.6 (LE)	RM&LE	2015-16
12	Obra, UPJVNL	SS	3x33	43.14	13.71 (as on 30.06.13)	99.00 (LE)	RM&LE	2015-16
13	Rihand, UPJVNL	SS	6x50	132.20 (Rev.)	75.6 (as on 30.06.13)	300.00 (LE)	RM&LE	2015-16
Uttarakhand								
14	Pathri, UJVNL	SS	3x6.8	105.62	42.19 (as on 30.06.13)	20.40 (LE)	RM&LE	2013-14
15	Khatima, UJVNL	SS	3x13.8	256.77	19.52 (as on 30.06.12)	41.40 (LE)	RM&LE	2015-16
Andhra Pradesh								
16	Srisailem RB, APGENCO	SS	7x110	16.70	13.36 (as on 31.03.12)	-	R&M	2013-14
17	Lower Sileru, APGENCO	SS	4x115	8.75	6.66 (as on 31.03.12)	-	R&M	2013-14
Karnataka								
18	Bhadra River bed units, KPCL	SS	2x12	20.515	4.508 (as on 30.06.13)	-	R&M	2014-15
19	Supa, KPCL	SS	2x50	3.45	3.88	-	R&M	2013-14
Kerala								
20	Sabirigiri, KSEB Unit-4	SS	1x60	52.2	49.79 (as on 30.06.13)	5(UR)	RMU&LE	2013-14
21	Poringalkuthu, KSEB	SS	4x8	88.63	2.34 (as on 31.03.13)	32.00 (LE)+ 4 (U)	RM&LE	2014-15
Tamil Nadu								
22	Periyar, TANGEDCO	SS	2x42+ 2x35	161.18	124.65 (as on 30.06.13)	140.00 (LE) + 28.00(U)	RMU&LE	2014-15
West Bengal								
23	Jaldhaka St.I, WBSEDCL	SS	3x9	88.62	76.04 (as on 31.12.12)	27.00(LE)	RM&LE	2013-14

S. No	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost (Prov.)	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
Odisha								
24	Hirakud-II, OHPC	SS	3x24	192.47	59.33 (as on 30.06.13)	72.00 (LE)	RM&LE	2015-16
Assam								
25	Kopili, NEEPCO	CS	2x50	50.22	29.19 (as on 31.03.13)	-	R&M & Refurbishme nt of Units 1 & 2	2013-14
26	Khandong, NEEPCO	CS	2x25	25.05	16.34 (as on 31.03.13)	50.00 (LE)	RM&LE	2014-15
	Sub Total(B)		3112	2112	1057	1593		
Ongoing Schemes – Under Tendering								
Himachal Pradesh								
27	Giri, HPSEBL	SS	2x30	34.80	-	60.00 (LE)	RM&LE	2015-16
Uttarakhand								
28	Tiloth, UJVNL	SS	3x30	126.23	-	90 (LE)	RM&LE	2016-17
Karnataka								
29	Nagjhari, U-1 to 6, KPCL	SS	6x135	16.5	0.6 (upto 30.06.13)	-	R&M	2014-15
30	Sharavathy (Ph B), KPCL	SS	10x103.5	20	2.59 (upto 30.06.13)	-	R&M	2014-15
31	Bhadra, KPCL	SS	2x12	7.5	0.34 (upto 30.06.13)	-	R&M	2014-15
Tamil Nadu								
32	Sholayar-I, TANGEDCO	SS	2x35	40.68	-	14.00(U) + 70.00 (LE)	RMU&LE	2016-17
Jharkhand								
33	Panchet, U-1, DVC	CS	1x40	58.22	1.99 (as on 31.03.12)	40.00 (LE)	RM&LE	2016-17
Odisha								
34	Hirakud-I U5&6, OHPC	SS	2x37.5	296.83	3.16 (as on 30.06.13)	75.00 (LE)+ 11 (UR)	RM&LE	2016-17

S. No	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost (Prov.)	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
Kerala								
35	Sholayar, KSEB	SS	3x18	199	0.044 (as on 31.12.10)	54.00 (LE)	RM&LE	2016-17
	Sub Total(C)		2258	800	9	414		
Ongoing Schemes – Under DPR Preparation/Finalization								
Andhra Pradesh								
36	Machkund, APGENCO	SS	3x17 (St.I) & 3x21.25 (St.II)	124.45	-	5.25 (U) + 114.75 (LE)	RMU&LE	2016-17
Kerala								
37	Kuttiadi, KSEB	SS	3x25	Not estimated	-	75.00 (LE)	RM&LE	2016-17
38	Idukki, KSEB	SS	3x130	90	Nil	-	R&M	2015-16
West Bengal								
39	Maithon, U-1&3, DVC	CS	2x20	56.03	5.75	40.00 (LE)	RM&LE	2016-17
	Sub Total(D)		620	270	5.75	235		
	Total (A+B+C+D)		6981	3302	1133.92	2342 [163(U) + 2164(LE) + 15(Res.)]	Total (A+B+C+D)	

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

State-wise List of Hydro RM&U schemes programmed for completion in the XIII Plan

As on 30.06.2013

S. No	Project, Agency	CS/ SS	Inst. Cap. (MW)	Est. Cost (Prov.)	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
Ongoing Schemes – Under Tendering								
Uttarakhand								
1	*Chilla Ph B UJVNL	SS	4x36	337.00	-	28.8(U) + 144(LE)	RMU&LE	2018-19
2	*Dhakrani, UJVNL	SS	3x11.25	116.41	-	33.75 (LE)	RM&LE	2017-18
3	*Dhalipur, UJVNL	SS	3x17	116.81	-	51.00 (LE)	RM&LE	2017-18
4	*Kulhal, UJVNL	SS	3x10	118.72	-	30(LE)	RM&LE	2017-18
5	*Chibro, UJVNL	SS	4x60	184.88	-	240(LE)	RM&LE	2019-20
6	*Khodri UJVNL	SS	4x30	169.63	-	120(LE)	RM&LE	2019-20
7	Ramganaga		3x66	455.20	-	198(LE)	RM&LE	2017-18
	Sub Total(A)		817	1499	-	846		
Ongoing Schemes – Under DPR Preparation								
Odisha								
8	*Balimela, OHPC	SS	6x60	664.7	0.84	360(LE)	RM&LE	2017-18
Meghalaya								
9	Umium St.III, Kyrdemkulai, MeECL	SS	2x30	376.68	-	60(LE)+6 (UR)	RMU&LE	XIII Plan
Tamil Nadu								
10	*Kodayar Ph-II, TANGEDCO	SS	1x40	-	-	40.0(LE)	RM&LE	XIII Plan
	Sub Total(B)		460	1041	0.84	466		
Ongoing Schemes – Under RLA Studies								
Tamil Nadu								
11	*Kodayar Ph.I, TANGEDCO	SS	1x60	-	-	60.00 (LE)	RM&LE	XIII Plan
12	Moyar PH, TANGEDCO	SS	3x12	-	-	36(LE)	RM&LE	XIII Plan
	Sub Total(C)		96	-	-	96		
	Total (A+B+C)		1373	2540	0.84	1408 [35 (U)+1373 (LE)]		

* These 9 schemes have been rescheduled for completion from XII Plan to XIII Plan.

CHAPTER 9

DEFINITIONS AND ABBREVIATIONS

CHAPTER-9

DEFINITIONS AND ABBREVIATIONS

9.1 DEFINITIONS

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

1. **Capacity:** Capacity in MW is the installed or Uprated/Derated capacity of the unit.
2. **Forced Outage Non-availability (FO) (%)**

$$= \frac{(Cf1 \times hf1 + Cf2 \times hf2 + \dots + Cfn \times hfn) \times 100}{CxH}$$

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

3. **Planned Maintenance Non-availability (PM) (%)**

$$= \frac{(Cp1 \times hp1 + Cp2 \times hp2 + \dots + Cpn \times hpn) \times 100}{CxH}$$

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

4. **Operating availability (OFA) (%) = (100-FO-PM)**
5. **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
 - Low head/too high tail water level
 - No irrigation demand
 - Grid disturbance/failure
 - Reserve shutdown/spinning reserve

6. **Design Energy:** Means the quantum of energy which could be generated in a 90% dependable year with 95% installed capacity of the generating station.
7. **Targeted Energy:** Estimated energy generation during the year based on the rainfall data, past records of energy generation etc.
8. **FRL-Full Reservoir Level:** The level up to which the water could normally be stored in the reservoir for conservation and regulation.
9. **MDDL-Minimum Draw Down Level:** The minimum level up to which the reservoir could be depleted under normal operating conditions.
10. **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
 Pumped Storage Schemes

11. Average PLF (%):

$$\frac{\text{Energy Generated (GWH)}}{\text{Installed Capacity (MW)} \times 8760 (\text{Total hours of year})} \times 100$$

9.2 Abbreviations

MW	Mega Watt	(10 ⁶ Watts)
Kwh	Kilo Watt hour (I 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	

Abbreviations of Agencies

Northern Region

1 Himachal Pradesh	HPSEB Ltd.	HPSEB Ltd.
	NHPC Ltd.	NHPC Ltd.
	SJVN Ltd.	SJVN Ltd
	MPCL	Malana Power Company Ltd.
	JPVL	Jaiprakash Power Venture Ltd.
	EPC	Everest Power Company Ltd.

	ADPL	Allain Duhangan Power Ltd.
	LGPPL	Lanco Green Power Pvt. Ltd.
2 Jammu & Kashmir	JKSPDC	J&K State Power Development Corporation.
3 Punjab	PSPCL	Punjab State Power Corporation Ltd.
	BBMB	Bhakra Beas Management Board
4 Rajasthan	RRVUNL	Rajasthan Rajya Vidyut Utpadan Nigam Ltd.
5 Uttar Pradesh	UPVUNL	Uttar Pradesh Jal Vidyut Nigam Ltd.
	THDC	Tehri Hydro Development Corporation
6 Uttarakhand	UJVNL	Uttarakhand Jal Vidyut Nigam Ltd.
	JPVL	Jaiprakash Power Venture Ltd.
<u>Western Region</u>		
1 Gujarat	GSECL	Gujarat State Electricity Corporation Ltd.
	SSNNL	Sardar Sarovar Narmada Nigam Ltd.
2 Madhya Pradesh	MPPGCL	Madhya Pradesh Power Generation Co. Ltd.
	NHDC	Narmada Hydroelectric Development Co. Ltd.
3 Chhatisgarh	CSPGCL	Chhatisgarh State Power Generation Co Ltd.
4 Maharashtra	MAHAGENCO	Maharashtra State Power Generation Co. Ltd.
	DLHP	Dodson-Lindblom Hydro Power Pvt Ltd.
	TATA	Tata Power Company
<u>Southern Region</u>		
1 Andhra Pradesh	APGENCO	Andhra Pradesh Generation Corporation.
2 Karnataka	KPCL	Karnataka Power Corporation Ltd.
3 Kerala	KSEB	Kerala State Electricity Board
4 Tamil Nadu	TANGEDCO	Tamil Nadu Generation & Distribution Co. Ltd
<u>Eastern Region</u>		
1 Jharkhand	JSEB	Jharkhand State Electricity Board
	DVC	Damodar Valley Corporation
2 Odisha	OHPC	Odisha Hydro Power Corporation
3 West Bengal	WBSEDCL	West Bengal State Electricity Distribution Co. Ltd.
<u>North Eastern Region</u>		
1 Assam	APGCL	Assam Power Generation Co. Ltd.
2 Meghalaya	MeECL	Meghalaya Energy Corporation Limited
	NEEPCO	North-Eastern Electric Power Corporation Ltd.