



भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केन्द्रीय विद्युत प्राधिकरण
Central Electricity Authority
जल विद्युत अभियांत्रिकी और नवीनीकरण एवं आधुनिकीकरण प्रभाग
Hydro Engineering and R&M Division

जल विद्युत परियोजनाओं का नवीनीकरण एवं आधुनिकीकरण अवधि 2017-22 व 2022-27 का कार्यक्रम तथा यथास्थिति



Renovation & Modernisation of Hydro Power Stations

Status/ Programme for the period 2017-22 & 2022-27

QUARTERLY PROGRESS REPORT
(JANUARY-MARCH, 2019)
(4th Quarter of 2018-19)

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Renovation & Modernisation Schemes of Hydro Power Stations

Status/ Programme for the period 2017-22 & 2022-27

INDEX OF SCHEMES**Programmed for completion during 2017-22**

S. No.	State	Name of Scheme in the Sector		Agency	Completion Schedule	Status	Page No.
		Central	State				
Northern Region							
I.	Himachal Pradesh						
1.		Ganguwal & Kotla	-	BBMB	2017-18	Completed	1
2.		Dehar PH	-	BBMB	2017-18	Completed	1
3.		Bhakra LB	-	BBMB	2020-21	Under Implementation	1-3
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II.	Jammu & Kashmir						
9.		Salal	-	NHPC	2019-20	Completed	10
10.		-	Chenani	J&KSPDC	2019-20	Under Implementation	10-11
11.		-	Ganderbal	J&KSPDC	2019-20	Under Implementation	11-12
III.	Punjab						
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13.		-	Ranjit Sagar Dam	PSPCL	2020-21	Under Tendering	15-18
14.		-	Shanan HEP	PSPCL	2019-20	Under Tendering	18-19
15.		-	UBDC St.I & St.II HEP	PSPCL	2019-20	Under Tendering	19-20
16.		-	Anandpur Sahib Hydel Project,	PSPCL	2019-20	Under Tendering	20-21
IV.	Uttarakhand						
17.		-	Tiloth	UJVNL	2021-22	Under Implementation	21-22
18.		-	Dhalipur	UJVNL	2021-22	Under Implementation	21-22
19.		-	Chilla (Ph-B)	UJVNL	2021-22	Under Tendering	22-23
20.		-	Ramganga	UJVNL	2021-22	Under Tendering	23
21.		-	Dhakrani	UJVNL	2021-22	Under Tendering	23
V.	Uttar Pradesh						
22.		-	Rihand	UPJVNL	2019-20	Under Implementation	24
23.		-	Obra	UPJVNL	2021-22	Under Implementation	24-27
Western Region							
VI.	Madhya Pradesh						
24.		-	Gandhi Sagar	MPPGCL	2020-21	Under Implementation	28-29
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26.		-	Pench	MPPGCL	2021-22	Under Implementation	29
27.		-	Bansagar Ton-I	MPPGCL	2021-22	Under Implementation	30
VII	Gujarat						
28.		-	Ukai	GSECL	2021-22	Under Implementation	31
29.		-	Kadana PSS	GSECL	2021-22	Under Implementation	32

S. No.	State	Name of Scheme in the Sector		Agency	Completion Schedule	Status	Page No.
		Central	State				
Southern Region							
VIII.	Telangana						
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31.		-	Nagarjuna Sagar Left Canal Power House	TSGENCO	2019-20	Under Implementation	35
IX.	Karnataka						
32.		-	Bhadra River Bed units	KPCL	2019-20	Under Implementation	36-38
33.		-	Munirabad Dam Power House	KPCL	2019-20	Under Implementation	38
34.		-	Nagjhari, U-1 to 3	KPCL	2021-22	Under Implementation	39
35.		-	Shivasamudram	KPCL	2021-22	Under Implementation	40
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40.		-	MGHE (Mahatma Gandhi HE)	KPCL	2021-22	Under DPR Preparation/ Finalisation/Approval	43-44
41.		-	Supa Dam Power House	KPCL	2021-22	Under DPR Preparation/ Finalisation/Approval	44-45
42.		-	Sharavathy Generating Station	KPCL	2021-22	Under DPR Preparation/ Finalisation/Approval	45-46
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43.		-	Sholayar	KSEB	2019-20	Under Implementation	47
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45.		-	Kuttiadi	KSEB	2021-22	Under Tendering	49
XI.	Tamil Nadu						
46.		-	Sholayar PH-I	TANGEDCO	2019-20	Under Implementation	50
Eastern Region							
XII.	Jharkhand						
47.		Panchet, U-1	-	DVC	2021-22	Under Tendering	51
XIII.	Odisha						
48.		-	Hirakud-I, U5&6	OHPC	2019-20	Under Implementation	52-53
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50.		-	Balimela	OHPC	2021-22	Under Implementation	54
XIV.	West Bengal						
51.		Maithon, U1&3	-	DVC	2021-22	Under DPR Preparation/ Finalisation/Approval	55
North Eastern Region							
XV.	Meghalaya						
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XVI.	Assam						
53.		Khandong Power Station	-	NEEPCO	2021-22	Under DPR Preparation/ Finalisation/Approval	58

Programmed for completion during 2022-27

S. No.	State	Name of Scheme in the Sector		Agency	Completion Schedule	Status	Page No.
		Central	State				
Northern Region							
I.	Jammu&Kashmir						
1.		-	Lower Jehlum HEP	J&KSPDC	2022-27	Under DPR Preparation/ Finalisation/Approval	59
2.		-	USHP – II Kangan	J&KSPDC	2022-27	Under DPR Preparation/ Finalisation/Approval	59
II.	Uttarakhand						
3.		-	Chibro	UJVNL	2025-26	Under DPR Preparation/ Finalisation/Approval	60
4.		-	Khodri	UJVNL	2025-26	Under DPR Preparation/ Finalisation/Approval	60
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Southern Region							
III.	Kerala						
6.		-	Idukki 2 nd Stage	KSEB	2022-27	Under RLA Studies	62
IV.	Andhra Pradesh						
7.		-	Machkund St.I & St.II	APGENCO	2025-26	Under DPR Preparation/ Finalisation/Approval	63
8.		-	Tungabhadra HE (J) Dam	APGENCO	2022-27	Under RLA	64
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V.	Tamil Nadu						
10.		-	Moyar PH	TANGEDCO	2023-24	Under Tendering	65
11.		-	Kodyar PH-I	TANGEDCO	2022-24	Under Tendering	65
12.		-	Kodyar PH-II	TANGEDCO	2025-26	Under DPR Preparation/ Finalisation/Approval	65-66
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14.		-	Kundah-II				
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17.		-	Kundah-V				
18.		-	Mettur Tunnel				
19.		-	Sarkarpathy				
20.		-	Sholayar-II				
21.		-	Suruliyar				
22.		-	Kadamparai PH,				
23.		-	Aliyar				
North Eastern Region							
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**Background
&
Plan-wise Summary**

**जल विद्युत परियोजनाओं का
नवीनीकरण, आधुनिकीकरण और उन्नयन**

पृष्ठभूमि

संसाधनों के इष्टतम उपयोग, कुशल संचालन, बेहतर उपलब्धता सुनिश्चित करने के साथ-साथ देश में क्षमता वृद्धि (उन्नयन) करने के लिए मौजूदा पूर्वस्थापित जल विद्युत परियोजनाओं का नवीनीकरण और आधुनिकीकरण, तथा उन्नयन और जीवन विस्तार (आरएमयू एंड एलई) को एक लागत प्रभावी विकल्प माना जाता है।

जलविद्युत परियोजनाओं के नवीनीकरण और आधुनिकीकरण के लाभों को समझते हुए, भारत सरकार ने 1987 में एक राष्ट्रीय समिति और 1998 में एक स्थायी समिति का गठन किया था। इसके उपरान्त आर एंड एम के तहत कार्यान्वयन आरंभ करने के लिए परियोजनाओं/योजनाओं को चिह्नित किया था। वर्ष 2000 के दौरान केंद्रीय विद्युत प्राधिकरण में देश में जलविद्युत परियोजनाओं के नवीनीकरण और आधुनिकीकरण के लिए राष्ट्रीय परिप्रेक्ष्य योजना दस्तावेज भी तैयार किया गया था। ग्यारहवीं योजना के अंत, अर्थात् मार्च, 2012 तक कार्यान्वयन/पूरी करने के लिए पूर्व में चिह्नित विभिन्न परियोजनाओं/योजनाओं की स्थिति को राष्ट्रीय परिप्रेक्ष्य योजना में शामिल किया गया है।

आठवीं योजना से बारहवीं योजना तक

12वीं योजना के अंत तक 104 (21 केंद्रीय और 83 राज्य क्षेत्र में) जल विद्युत संयंत्रों (आठवीं योजना तक 13, नौवीं योजना में 20, दसवीं योजना में 32, ग्यारहवीं योजना में 18 और बारहवीं योजना में 21) जिनकी कुल स्थापित क्षमता 20611 मेगावाट थी में नवीनीकरण और आधुनिकीकरण का कार्य पूरा किया गया है, जिसके फलस्वरूप जीवन विस्तार, उन्नयन और पुनरुद्धार के माध्यम से 3636 मेगावाट का लाभ हुआ है। आठवीं, नौवीं, दसवीं, ग्यारहवीं और बारहवीं योजनाओं के दौरान पूरी की गई जल विद्युत आरएमयू एंड एलई स्कीमों की राज्यवार सूची क्रमशः अनुलग्नक- I, II, III, IV और V में दी गई है।

2017-22 के दौरान

2017-22 के दौरान, आर एंड एम के लिए 53 जल विद्युत उत्पादन केंद्रों (10 केंद्रीय क्षेत्र में और 43 राज्य क्षेत्र में) पर 9982.80 मेगावाट की कुल स्थापित क्षमता में नवीनीकरण और आधुनिकीकरण करने का कार्यक्रम बनाया गया है, जिनमें जीवन विस्तार और उन्नयन के माध्यम से लगभग 5171.35 मेगावाट का लाभ होगा। 2017-22 के दौरान पूरी की जाने वाली 53 योजनाओं में से केंद्रीय क्षेत्र में कुल मिलाकर लगभग 788.4 मेगावाट की क्षमता वाली 3 योजनाएं मार्च, 2019 तक पूरी कर ली गई हैं और जीवन विस्तार के माध्यम से उनसे 48.4 मेगावाट का लाभ हुआ है। 2017-22 के दौरान पूरी की जाने वाली जल विद्युत आर एंड एम स्कीमों की राज्यवार सूची अनुलग्नक-VI में दी गई है।

2022-27 के दौरान

2022-27 के दौरान, आर एंड एम के लिए 25 जल विद्युत उत्पादन केंद्रों (1 केंद्रीय क्षेत्र में और 24 राज्य क्षेत्र में) में 2788 मेगावाट की कुल स्थापित क्षमता में नवीनीकरण और आधुनिकीकरण करने का कार्यक्रम बनाया गया है, जिससे जीवन विस्तार और उन्नयन के माध्यम से लगभग 2786 मेगावाट का लाभ होगा। 2022-27 के दौरान पूरी की जाने वाली जल विद्युत आर एंड एम स्कीमों की राज्यवार सूची अनुलग्नक-VII में दी गई है।

RENOVATION, MODERNISATION & UPRATING OF HYDRO ELECTRIC POWER PROJECTS

BACKGROUND

Renovation & Modernisation, Uprating and Life Extension (RMU&LE) of the existing old hydro electric power projects is considered a cost effective option to ensure optimization of resources, efficient operations, better availability and also to augment (uprating) capacity addition in the country.

Recognizing the benefits of R&M of hydroelectric power projects, Govt. of India set up a National Committee in 1987 and a Standing Committee in 1998 and thereafter had identified the projects/ schemes to be taken up for implementation under R&M. The National Perspective Plan document for R&M of hydroelectric power projects in the country was also prepared in CEA during the year 2000. The status of various projects/schemes already identified for implementation/completion till the end of XI Plan, i.e. March, 2012 has been incorporated in the National Perspective Plan.

VIII Plan to XII Plan

The R&M works at 104 (21 in Central and 83 in State Sector) hydro power plants (13 up to the VIII Plan, 20 in the IX Plan, 32 in the X Plan, 18 in the XI Plan & 21 in the XII Plan) with an aggregate installed capacity of 20611 MW have been completed by the end of the XII Plan, total benefit of 3636 MW through Life Extension, Uprating and Restoration has been accrued. The state-wise list of Hydro RM&U Schemes completed during VIII, IX, X, XI and XII Plans are given at Annex-I, II, III, IV & V respectively.

During 2017-22

During 2017-22, an aggregate capacity of 9982.80 MW at 53 Hydro Electric Power Station (10 in Central Sector and 43 in State Sector) is programmed for R&M which will accrue benefit of about 5171.35 MW through Life Extension and Uprating. **Out of the 53 schemes targeted for completion during 2017-22, 3 schemes in Central Sector (Ganguwal & Kotla and Dehar Power House (Unit-3) in 2017-18 and Salal HEP in 2019-20) with an aggregate installed capacity of about 788.4 MW have been completed till March, 2019 and have achieved a benefit of 48.4 MW through Life Extension.** The state - wise list of hydro R&M schemes expected for completion during 2017-22 is given at Annex-VI.

During 2022-27

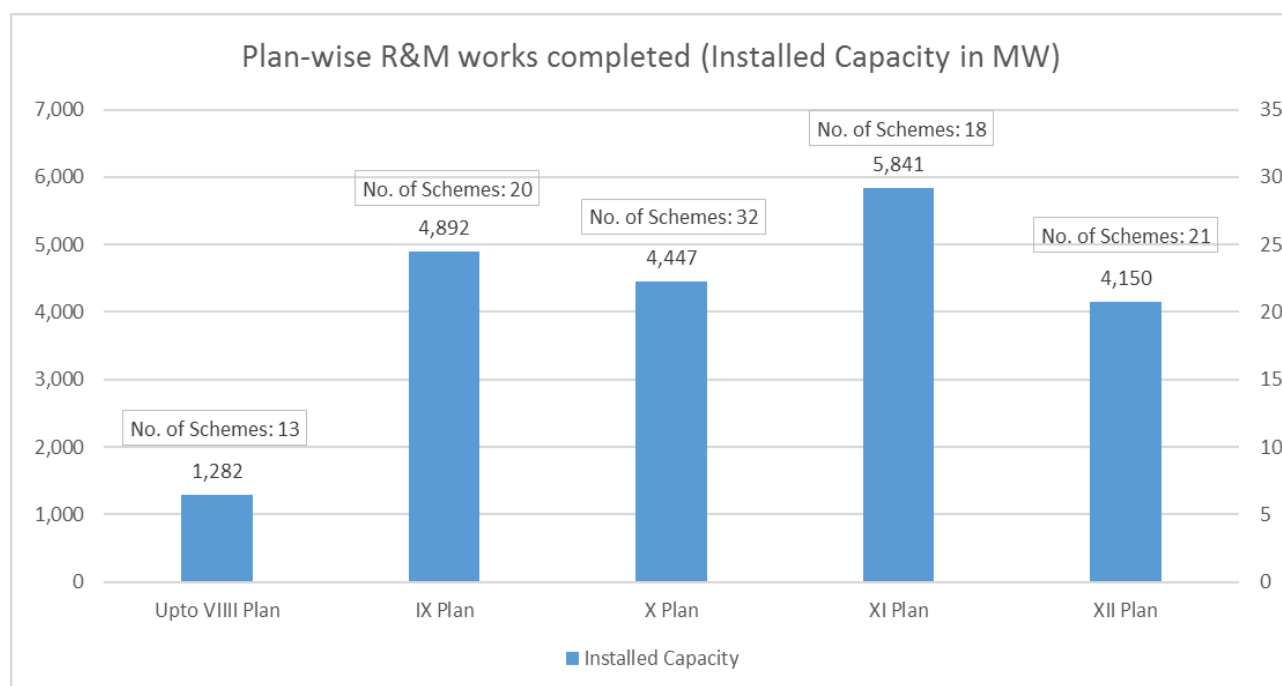
During 2022-27, an aggregate capacity of 2788 MW at 25 Hydro Electric Power Station (1 in Central Sector and 24 in State Sector) is programmed for R&M, which will accrue benefit of 2786 MW through Life Extension and Uprating. The state-wise list of hydro R&M schemes expected for completion during 2022-27 is given at Annex-VII.

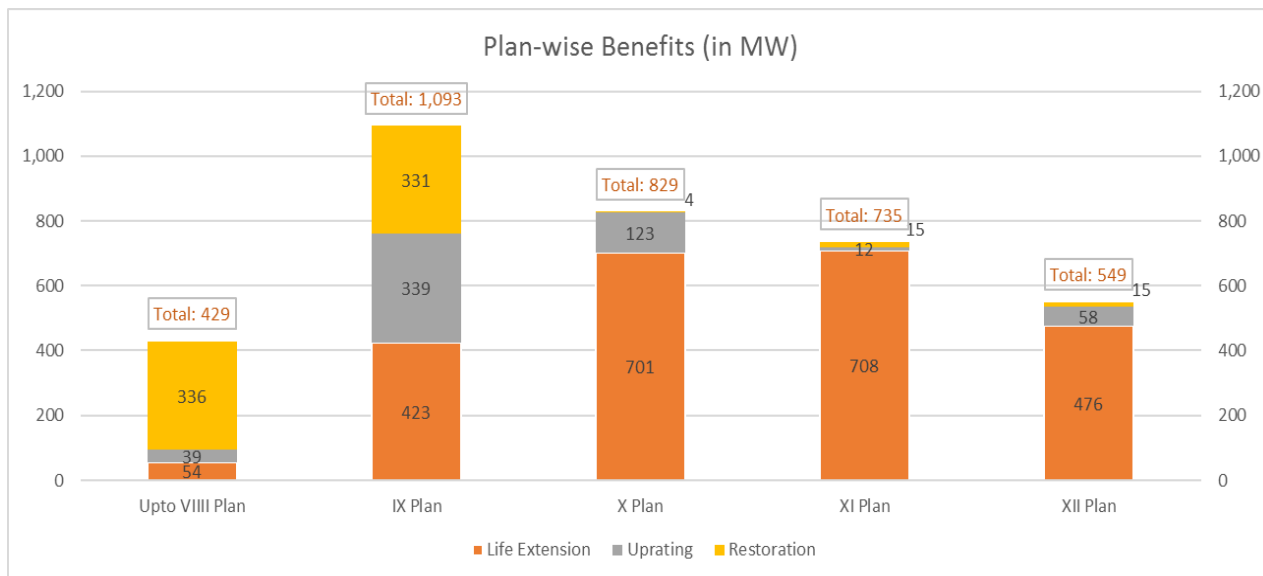
Summary of R&M of Hydro Electric Projects

(As on 31.03.2019)

I Hydro R&M schemes completed up to XII Plan

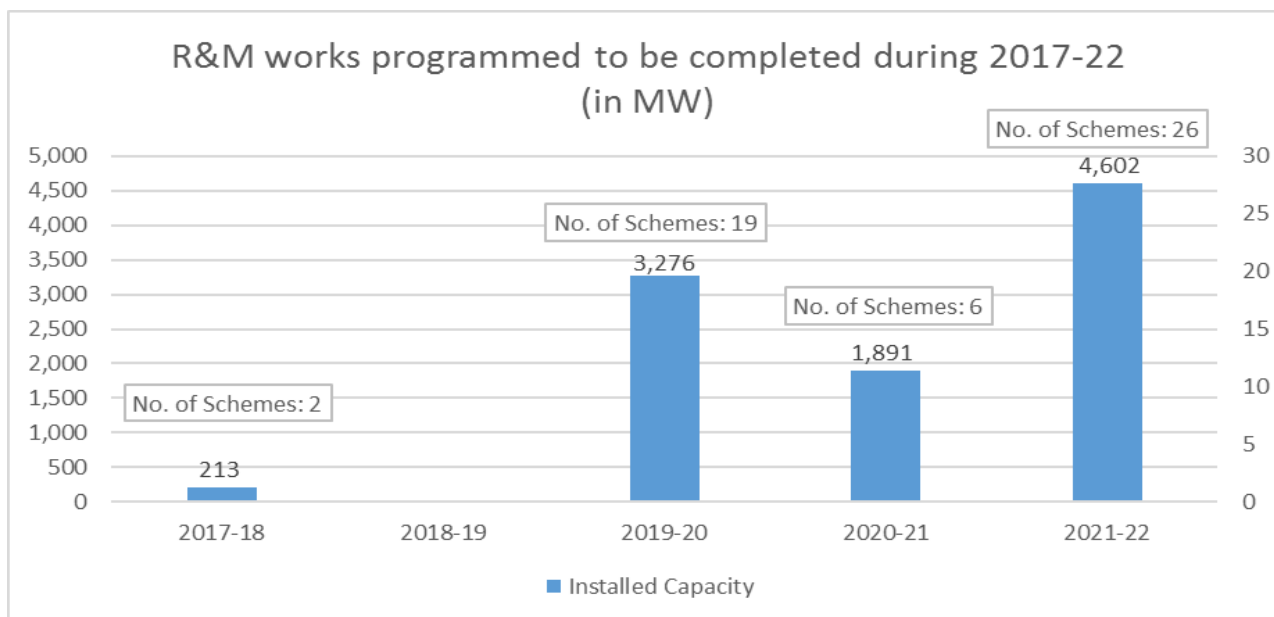
Sl. No.	Plan Period	No. of Projects			Installed Capacity (MW)	Actual Expenditure (Rs. in Crs)	Benefit (MW)
		Central Sector	State Sector	Total			
1.	Upto VIII Plan Schemes	2	11	13	1282.00	127.37	429.00 [39.00(U) + 54.00LE+ 336.00(Res.)]
2.	IX Plan Schemes	8	12	20	4892.10	570.16	1093.03 [339.00(U)+ 423.00(LE)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





II Programme of R&M works during 2017-22

Sl. No.	Category	No. of Projects			Capacity covered under RMU&LE (MW)	Estimated Cost (Rs. in Crs.)	Benefit (MW)
		Central Sector	State Sector	Total			
1.	Programmed	10	43	53	9982.80	6672.18	5171.35 [5021.65(LE) +149.7(U)]
2.	Completed	3	0	3	788.4	76.66 (Actual Cost)	48.4 (LE)
3.	Under Implementation	3	25	28	5347.10	3406.24	2549.50 [2433.30 (LE) +116.20 (U)]
4.	Under Tendering	2	15	17	2483.10	2579.67	1209.25 [1175.75 (LE) +33.5 (U)]
5.	Under DPR Preparation/ Finalisation/Approval	2	3	5	1364.20	594.20	1364.20 (LE)



III Programme of R&M works during 2022-27

Sl. No.	Category	No. of Projects			Capacity covered under RMU&LE (MW)	Benefit (MW)
		Central Sector	State Sector	Total		
1.	Programmed	1	24	25	2788	2786 [2728 (LE)+ 58 (U)]
2.	Under Tendering	0	2	2	96	112.00 [96 (LE)+ 16 (U)]
3.	Under DPR Preparation/Finalisation/Approval	1	7	8	865	907.00 [865 (LE) + 42 (U)]
4.	Under RLA Studies	-	15	15	1827	1767 (LE)

Abbreviations:

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

**Year-wise Summary of Completion
Programme of R&M Schemes at
Hydro Power Stations
(During 2017-22)**

STATE-WISE STATUS OF R&M SCHEMES DURING 2017-22

As on 31.03.2019

2017-18	2018-19	2019-20	2020-21	2021-22
Himachal Pradesh: i) Ganguwal U2 & Kotla U3, (1x24.2+1x24.2) =48.4 MW (Completed) ii) Dehar Power House (U-6), (1x165) =165 MW (Completed)	-	Jammu & Kashmir: i) Salal, (5x115) =575MW (Completed) ii) Ganderbal, (2x3+2x4.5) =9 MW iii) Chenani, (5x4.66) =23.3 MW Himachal Pradesh: i) Bhaba Power House, (3x40) =120 MW ii) Dehar Power House (U-3), (1x165) =165 MW	Himachal Pradesh: i) Bhakra LB, (5x108) =540 MW ii) Baira Siul, (3x60) =180 MW iii) Giri, (2x30) =60 MW iv) Pong, (6x66) =396 MW Punjab: i) Ranjit Sagar Dam, (4x150) =600 MW,	Uttarakhand: i) Chilla Ph B, (4x36)=144 MW ii) Ramganga, (3x66)=198 MW iii) Dhakrani, 3x11.25=33.75MW, iv) Dhalipur, (3x17)=51MW v) Tiloth, (3x30)=90 MW Uttar Pradesh: i) Obra, (3x33)=99 MW Madhya Pradesh: i) Bargi, (2x45)=90 MW ii) Pench, (2x80)=160 MW, iii) Bansagar Ton-I, (3x105)=315 MW
-	-	Uttar Pradesh: i) Rihand, (6x50) = 300MW Kerala: i) Idukki 1st Stage, (3x130) =390 MW ii) Sholayar, (3x18)=54MW Tamil Nadu: i) Sholayar-I, (2x35)=70 MW Telangana: i) Nagarjuna Sagar LCPH, (2x30.6) =61.2 MW ii) Nagarjuna Sagar Ph-II, (1x110+7x100.8) =815.6 MW	Madhya Pradesh: i) Gandhi Sagar, (5x23) =115 MW	Odisha: i) Balimela, (6x60) =360 MW Gujarat: i) Ukai, (3x75)=225MW ii) Kadana PSS, (4x60)=240 MW Kerala: i) Kuttiadi, (3x25)=75 MW Assam: i) Khandong Power Station, (2x25)=50 MW Meghalaya: i) Umium St.III (Kyrdekulai), (2x30)=60 MW West Bengal: i) Maithon U 1& 2, (2x20)=40 MW

STATE-WISE STATUS OF R&M SCHEMES DURING 2017-22

As on 31.03.2019

2017-18	2018-19	2019-20	2020-21	2021-22
		Odisha: i) Hirakud-I, (2x37.5) =75 MW ii) Hirakud-II, (1x24)=24MW Karnataka: i) Bhadra River Bed Units, (2x12)=24 MW ii) Munirabad Dam Power House, (2x9 + 1x10) = 28 MW Punjab: i) Mukerin St.I, St.II, St.III & St.IV, (3x15+3x15+3x19.5+3x19.5) = 207 MW, ii) Shanan HEP, (1x50+4x15) =110 MW,		Jharkhand: i) Panchet U-1, (1x40)=40 MW Karnataka: i) Nagihari U-1 to U-3, (3x150)=450 MW, ii) Shivasamudram, (6x3+4x6)=42 MW, iii) MGHE, (4x21.6+4x13.2) =139.2 MW iv) Kadra Dam Power House, (3x50) =150 MW v) Kodalalli Dam Power House, (3x40)=120 MW vi) Supa Dam Power House, (2x50)=100 MW vii) Linganamakki Dam Power House, (2x27.5) =55 MW
-	-	Punjab: iii) UBDC St.I & St. II, (3x15+3x15.45) =91.35 MW iv) Anandpur Sahib Hydel Project, (4x33.5) = 134 MW		Karnataka: viii) Gerusoppa Dam Power House, (4x60) =240 MW ix) Sharavathy Generating Station, (10x103.5)=1035 MW
213.40 MW (2 Schemes)	-	3276.45MW (19 Schemes)	1891MW (6 Schemes)	4601.95 MW (26 Schemes)

**State-wise Status of R&M Schemes
(During 2017-22)**

State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations for completion during 2017-22

NORTHERN REGION

HIMACHAL PRADESH

(Amount in Rs. Crores)

S. No.	Scheme / Category/ Completion Schedule	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
A - SCHEMES COMPLETED – CENTRAL SECTOR (BBMB)				
1.	Ganguwal (U-2), 1x29.25+ 2x24.2 MW BBMB 1962 (U1, 1955 (U2&3) Kotla (U-3), 1x29.25+ 2x24.2 MW BBMB 1961 (U1) 1956 (U-2&3) RM& LE 2017-18	24.2 (LE) 14.19 9.58 24.2 (LE) (Cost included in above)	- Replacement of: Existing damaged propeller type turbine runners, Thrust sleeve & turbine water shaft sleeve (Ganguwal PH only). - Repair/ modification/ painting of turbine components and other allied works.	- Ganguwal Power House Unit-2 has been commissioned on 23.11.2017. - Kotla Power House Unit-3 commissioned on 04.12.2017.
2.	Dehar Power House, 1x165 MW BBMB (Unit 6) 1983 R&M 2017-18	- 19.87 16.00	Replacement of: - Stator (Complete with Frame, Core, Bars and Air Coolers), - Rotor Poles, Pole Keys, Air guides, Temperature Recorders along with other allied items.	Dehar Power House Unit-6 has been commissioned on 01.11.2017.
B - SCHEMES ONGOING – Under Implementation - CENTRAL SECTOR (BBMB)				
3.	Bhakra LB, 5x108 MW BBMB 1985 5x90 MW (Original) 1960-61 RMU&LE 2020-21	540(LE)+ 90(U) 489.77 397.08 (as on 28.02.19)	Turbine Replacement of runners, guide vanes, guide vane operating mechanism, GV pads, turbine shaft sleeve and coupling cover, head cover, shaft sealing box. Governor oil pr. Motor pump, aeration pipe, instrument panel etc. Generator Replacement of stator winding, stator core and frame assembly, rotor pole assembly, thrust collar, air coolers, thrust bearing pads, upper and lower guide	- Works awarded to consortium led by M/s Sumitomo Corporation, Japan (with other members i.e. M/s Hitachi Ltd. Japan and VA Tech Hydro, GmbH, Austria) on 27.10.2007. - Contract agreements were signed on 02.11.2007 at a total cost of Rs. 489.77 Crores (including Rs. 29.57 Crores towards replacement of turbine & generator shafts). <u>Unit 2</u> - Works started from. 26.4.2010, with scheduled completion period of 210 days. The unit was synchronized

S. No.	Scheme / Category/ Completion Schedule	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
			bearings, upper and lower bracket, braking system, generator temp. monitoring panel, excitation system, slip ring, NGT etc. Auxiliaries Control & Protection panels, Generator Transformers, Bus Bars with CTs, PTs etc. LAVT cubicle, switchyard equipments, control cables etc.	on 23.06.13. - Regarding localized cavitation, the modification of runner blade profile through solid piece welding carried out at the site by 10th June, 2016. - Unit was taken on shutdown for the joint inspection of modified runner on 20.11.17 after 2203 hours of operation at high head range (Total 9187.15 hours) by M/s Hitachi and BBMB. “No cavitation” has been observed on the modified portion at the leading edge of crown side of all the 17 nos blades. The modification of runner has been found successful and has been approved by Board on 19.11.2018. BBMB issued TOC to consortium on 29.11.2018. <u>Unit 5</u> - Based on CPRI report, it has been decided that spare new Generator Shaft shall be used on Power House Unit no. 5. - Order placed on M/s Andritz Hydro GmbH, Austria on 14.10.2016 for replacement of existing spider, rim and other related parts along with replacement of existing generator shaft with new Generator Shaft. - The box up completed on 04.06.2018 after various activities viz assembly of LGB, UGB, TGB & Thrust bearing and other related works. Machine put on continues load run for 72 hours on 12.06.2018. Unit commissioned on 15.06.2018. - Modification of runner blade profile through solid piece welding as done in Unit-2 will be taken up in February-March 2020. <u>Unit 4</u> BBMB along with M/s Hitachi carried out inspection (after completion of 11,200 hours of operation) on 22nd September, 2017 and observed cavitation on leading edge area of the runner almost the same. M/s Hitachi recommended to

S. No.	Scheme / Category/ Completion Schedule	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
				carry out unrestricted operation of the machine upto September, 2018 without cavitation repair. Hitachi has started the work for Modification of runner blade profile through solid piece welding as done in Unit-2 on 04.04.2019. <u>Unit No. 3</u> Unit taken on shutdown on 01.04. 2019. The dispatch authorization of Runner & turbine component and Generator component has been issued to the consortium for transportation of material to the consignee. Work of Stator Assembly of Unit No. 3 in the service bay started on 22nd January, 2019. Stator frame segments joined and Final welding of sole plates with the stator frame completed. The work of dovetail bar completed on 11.03.2019 and The stator core punching have been placed in its position & final core pressing is in progress. Unit is planned to be commissioned in November-December, 2019. <u>Unit No. 1</u> The commencement of works shall be based on commissioning of Unit-3.
4.	Pong Power House, BBMB 6x66 MW 1977-83 T&G-BHEL RM&LE 2020-21	396 (LE) - -		Work order issued to M/s CPRI, Bangalore to prepare Scope of works for RLA studies on 13.12.2016. The Team of CPRI visited for walk down survey. Report sent to field office for scrutiny. Replacement of Stator of Unit-3 completed and Work Order for replacement of Complete Wound Stator for Unit-2 has been issued to M/s BHEL on 07.09.2018 and Unit handed over to M/s BHEL on 14.02.2019. Unit Transformers (6nos.) of 67 MVA each replaced by 75 MVA in July, 2016. (Unit-2&5: M/s.

S. No.	Scheme / Category/ Completion Schedule	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
				Alstom, Unit-1&4: Ms/ BHEL and Unit-3&6: Ms/ABB). The commissioning of Governors has been completed for three units by M/s. Andritz Hydro Pvt Ltd., Bhopal and work under progress for remaining units. NIT for replacement of Old Semi Static Excitation System published and PQ documents are under scrutiny.
5.	Baira Siul, NHPC 3x60 MW 1980-81 RM&LE 2020-21	180 (LE) 341.41 34.41	- Activities covering main equipment i.e. turbine, generator and C&I equipment and other plant equipment essential for efficient and sustained performance of the units as well as station. - Activities having direct impact on improvement of generation, efficiency, machine availability etc. - Activities which yield up rating benefits because of Generator with Class F insulation, runner with improved profile. - HP-HVOF coating on under water parts of turbine. Adoption of closed circuit cooling system, Cu-Ni tubes for coolers etc. - State of the art equipment such as electronic governors, static excitation system, Numerical relays, on line monitoring devices including silt content in water. - Augmentation of water conductor system and associated Civil/ HM works and infrastructure works.	CERC accorded “in-principle approval” on 03.06.2016. LoA for Main Plant package awarded to M/s BHEL on 16.08.2016 at Rs. 132.74 Cr. LoA for HM package awarded to “M/s Om Metals Infraprojects Ltd, New Delhi” on 30.11.2016 at Rs. 19.91 crores. LoA for Switchyard Equipment awarded to M/s GE. Related civil works like equipment foundation, trench etc. also awarded. LoA for Civil Package (Dam & HRT) awarded to “M/s Alpha Pacific Systems Pvt. Ltd., New Delhi.” at Rs. 10.79 crores. LoA for Bhaledh Weir(Civil works) awarded to “M/s Starcon Infra Project(I) Pvt. Ltd., Delhi.” at Rs. 17.72 crores. Status of Works - All Major Works of Civil, HM and E&M have already been awarded and are in Progress. - Complete Shutdown of Power House has been taken w.e.f 15.10.2018 for a period of 6 months. - During this shutdown period common auxiliary system and other works of Water Conductor system are to be completed. - All works suffered due to heavy rainfall and snowfall during Feb-March’2019 leading to landslides, frequent blockage of roads and disruption of power supply etc.

S. No.	Scheme / Category/ Completion Schedule	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
				Civil Works a) No major damages observed HRT during inspection. Repair of Overt & Invert with high performance cementitious mortar is in progress and 82% work completed. Balance is in progress & likely to be completed by April'2019. b) Spillway repair work is in almost completed. HM Works a) HRT Intake- Erection of EOT and gate is in progress. Erection of Intake trash rack panel completed. b) Erection of service gate and emergency gate of Diversion tunnel is in progress. c) Erection pf Sill beam of Radial gate & Stoplog gate completed. d) Penstock Painting works in all the 3 Penstocks 52% completed. E&M Works a) Dismantling of Unit-2 completed. Refurbishment of Spiral casing, Draft Tube and Disc valve is in progress. Assembly of Butterfly Valve is being taken up. b) Erection of Bus Duct of Unit-2 is in progress. c) Switch Yard equipment- Erection work of link line and most of the items viz. CT, CVT, LA, WT except earth switch & underhung isolator has been completed. Testing of equipments is in progress.
6.	Bhaba Power House, 3x40 MW HPSEBL 1989 T&G - BHEL RMU&LE 2019-20	76.03 74.15 (For the works of rehabilitation of damaged/burnt eqpts.)	Replacement of existing 245 kV Gas Insulated Switchgear, Control and Relay Panels, 22 kV Indoor switchgear, 415 Volt LT Panels, 220 kV EHT Cables, 22 kV HT Cables, Control & Power cables and other associated equipment along with "Safe dismantling/ removing from site of the existing	- The power house was under forced shut down since 22.01.2015 due to fire incidence. The repair & rehabilitation works completed by M/s Alstom. - Unit-1 commissioned on 10.07.2016. - Unit-2 commissioned on 21.09.2016. - Unit-3 commissioned on 20.11.2016.

S. No.	Scheme / Category/ Completion Schedule	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
			plant & equipment including carriage, stacking at Owner's store/yard and handing over to the Owner" on Single Responsibility Basis. • Providing & installation of 400 kVA, 22/415 kV transformer in place of present 100 kVA, 22/415 kV transformer for emergency supply from Nathpa Sub-Station. • Overhauling and repair of 120/20 Ton EOT Crane, 5 Ton EOT crane in GIS hall, OTIS lift and allied system, Dehydration plant and Vacuum plant and Ventilation & exhaust system. • Providing emergency drainage system for transformer oil in case of fire. • Repair & refurbishment of Fire Fighting System. • Providing 50/31.50 MVA, 220/66/6.6 kV Power Transformer along with allied switch gear for connecting to the 66 kV Bus at Nathpa sub-station for catering to the power requirements of the Kinnaur Valley or evacuating the power from the Kinnaur. • Replacement and providing additional surveillance system (CCTV Camera and allied components such as OFC). <u>Civil Works</u> • Providing false ceiling in control room, LT Panel Room and Battery Charger Room of Power	• Order for supply, erection, testing & commissioning of 10 MVA, 220/22 kV, Station Transformer, additional 22 kV VCB panel and associated power & control cables placed on M/s GE T&D India Ltd., Noida on 31.01.2019.

S. No.	Scheme / Category/ Completion Schedule	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
	3x40 MW RM&LE 2019-20	120 (LE) 90.14 16.76	House. - Construction of cable trenches in Pot head yard. - Rehabilitation of Generator of Unit-1. - Replacement of Electro-Hydraulic Transducer (EHT) with handle, Main Distribution Valve (MDV) spool & sleeve assy., Pilot needle & sleeve assy., Duplex filter element only (inner & outer sleeve), Solenoid valve (Size 10) of MIV Hydro Control Panel (HCP), Pilot operating main distributing valve type for MIV HCP, NRV of PP Set, Nozzle Servomotors & Drain Pipe Lines Route of Decompression Valve & Seal Valve of MIV. - Replacement of three (3) nos. Digital governors including oil pumping unit, pressure tank & sump tank, valves & piping to form an individual pressure system for each governor complete in all respects. - Replacement of three (3) nos. Static Excitation and Digital AVR systems complete with accessories, equipment, devices, instruments,	- Unit No.1 was earlier commissioned on 10.07.2016 but due to over speeding, stator winding was damaged & machine again stopped on 25.09.2016. Rehabilitation works completed by M/s BHEL and Unit re-commissioned on 04.12.2017 but tripped on 28.01.2018 due to internal fault. The machine has been re-commissioned on 09.03.2018 after rectification of fault by BHEL. - During execution of the rehabilitation works of Unit-1, it was found by M/s BHEL Engineers that the Nozzle servomotors of all machines need to be replaced and same has been awarded on 28.03. 2017. - The Nozzle Servomotors of two Units have been commissioned except Unit-II which is expected to be commissioned during last week of April, 2019 (lean period). - Replacement of EHT with handle, MDV spool & sleeve assy., Pilot needle & sleeve assembly, Duplex filter element only (inner & outer sleeve). Unit-1&III have been completed except replacement of Solenoid valve type for MIV HCP, Pilot operating main distribution valve for MIV HCP and NRV of PP Set. - The work for re-routing of pipe for decompression valve of the three Units completed and connection work shall be completed by last week of April, 2019 (lean period). - The work of dismantling & replacement of existing excitation system, Unit Control board, Electro-Hydraulic Governor, Power & Control cables and Providing Control & Monitoring (SCADA) system awarded to M/s GE Power

S. No.	Scheme / Category/ Completion Schedule	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
			cabling and wiring etc. including all services, labour, tools and tackles in all respects. - Replacement of Unit Control Boards and providing control & monitoring system (DCS based SCADA) complete with accessories, equipment, devices, instruments, cabling and wiring etc. including all services, labour, tools and tackles in all respects. - Supply, laying, termination of all associated power and control cables for the above systems. - Supply of 2 nos. Forged Fabricated Pelton Runners (Without coating) having 21 buckets suitable for single runner turbine with two jets developing 41240 KW (55282 HP) at a rated net head of 887.20 mtr and design discharge of 5.67 cumecs per unit.	India Ltd. on 19.07.2018. The tender document for procurement of two nos. Forged Fabricated Pelton floated. Pre-bid meeting held on 23.08.2018 (three firms participated). Techno commercial bid opened on 30.11.2018 and Price Bid opened on 26.02.2019.
C - SCHEMES ONGOING – Under Tendering - STATE SECTOR (HPSEB)				
7.	Giri, 2x30 MW HPSEBL 1978 T&G - BHEL RM&LE 2020-21	60(LE) 139.80 Nil	Brief description of work proposed to be undertaken are as given below: - 1. Civil works: Repair of power house building & Control Room area and Tail Race Channel. Restoration of Flexible apron, protection works on left bank of upstream side of barrage. Replacement of Spherical roller bearing of spillway gates. Improvement of trash rake, stop logs. Centralized Control of operation of barrage gates from Barrage control room. Strengthening of civil works at 132 kV	Revised scheme amounting to Rs.139.80 crore has been framed on the basis of negotiated rates offered by M/s BHEL (OEM) for EM equipments & balance plant items. Revised administrative approval for Rs. 139.80 Cr. accorded on 30.12.2015. HPERC has accorded in principle approval. Tender documents under preparation. Negotiations are going on with REC & PFC for loan.

S. No.	Scheme / Category/ Completion Schedule	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
			Switchyard. 2. Mechanical works: Replacement of Guide vanes with stainless steel guide vanes of Unit -1, Overhauling of MIV, Add. Penstock gate in Surge Shaft, Replacement of Governors with modern digital governors, Revamping of Cooling water system, Provision of online discharge measurement and head measurement for both machines. 3. Electrical works: Replacement of 11 KV PILC cable with bus duct, Overhauling of 2x40 MVA, 11/132kV Generator Transformers and Unit Auxiliary Transformers, Replacement of Control and Protection panels, Replacement of rotor field windings with class "F" insulation and complete Overhauling of Generators, Replacement of semi-static exciter system by static excitation system. Replacement of ABCBs with SF6 breakers, Replacement of 33 kV MOCB with SF6 breaker, Replacement of Batteries and battery charging system, Aug. of 16/20 MVA, 132/33 kV Transformer into 25/31.5 MVA etc.	
8.	Dehar Power House, 1x165 MW BBMB (Unit 3) 1979 T&G - BHEL R&M 2019-20	- 23 Nil	Replacement of existing Stator of Unit-3, Slapper with a new one of latest design complete with Frame, Core, Bars and Air Coolers. Oil coolers, Rotor field pole assemblies, Air guides. Rotor Braking & Jacking system, Temperature Recorders along with other allied items.	BHEL's offer opened on 27.11.2018 and Evaluation completed. Case is under further processing.

State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations for completion during 2017-22

NORTHERN REGION

JAMMU & KASHMIR

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
A. - SCHEMES COMPLETED – CENTRAL SECTOR (NHPC)				
9.	Salal 6x115 MW NHPC 1987-95 T&G – BHEL R&M 2019-20	- 58.01 51.08	i) Replacement of Runners. ii) Replacement of old Governor with Digital Governor in 6 units. iii) Replacement of AVR with Digital Voltage Regulator (DVR) in 3 units i.e. Unit No. 4, 5 & 6.	i) Order placed on M/s Voith Siemens. Model test of runner completed. Runner installed & commissioned in all units. (Unit-6 on 14.04.2017, Unit-4 on 20.01.2018, Unit-5 on 10.03.2018, Unit-3 on 30.01.2019, Unit-2 on 20.02.2019 & Unit-1 on 05.04.2019) ii) Digital Governor has been installed and commissioned in all 6 Units. iii) DVR has been installed and commissioned in Unit- 4,5 & 6.
B. - SCHEMES ONGOING - Under Implementation STATE SECTOR (J&KSPDC)				
10.	Chenani, 5x4.66 MW J&KSPDC 1971-75 T&G - Ganz Mavag, Hungary RMU&LE 2019-20	23.3 (LE) 39.60 (Rev.) 24.63	Turbine Procurement of 4 nos. Runners and re-conditioning of spherical valves, replacement of Governors, Overhauling of BF valves, Penstock, Saddle Blocks Generator Change of Stator Windings with Class F insulation, Generator Cooling system, new 125 KVA DG set. Replacement of existing excitation system with Digital excitation system. Protection Replacement of D.C.	Erection of all four runners completed by Ms. Andritz Hydro Ltd. Reconditioning of spherical valve for all machines completed. Overhauling of the Penstock Protection Valve (PPV) / Butterfly valve (BFV) was left incomplete by M/s BOOM System Pvt. Ltd. Fresh bids are being invited. M/s Andritz Hydro Pvt. Ltd. has been requested to prepare budgetary offer for the work. Change of stator winding insulation with class -F completed for Machine no. 5, 3 & 1 and New 125 kVA DG set installed. Commissioning of 12 nos isolators and rewinding of 5 MVA Transformer completed. Replacement of Static excitation system completed. Retrofitting of numerical relays and protection completed. Replacement of

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
			System, 6.6 /132 KV switchyard equipments, spares for Generating units etc. Auxiliary System Procurement and Re-conditioning of Gate & Gearings, Repairing of CO2 Plants and Trash Rack. Civil Improvement/restoration in water conductor system, construction of retaining walls/breast walls and toe walls of service road, Desilting of Forebay, Channelization of River, Nallah Training Works.	3 Nos. 132 kV MOCBs with SF6 Breakers completed. Refurbishment of 3 Transformers completed and 3 remaining. Replacement of water and oil coolers, reconditioning of gates, trash racks and repair of CO₂ plant completed. Replacement of 5 nos. air coolers completed. Erection of 2 nos 6.6 kV VCB Panel completed. Replacement of speed governors completed. Work order has been allotted for major spares and supply is under progress. Construction of trash racks and fencing of tail race completed. River channelization works, Nallah retaining works and improvement work of water conductor system completed. It was decided to construct RCC aqueduct instead of wooden flume, thus increasing the price for which contractor was reluctant to execute the works. Now the contractor has started the work. 60% work completed and scheduled to be completed by May' 2019. Desilting of forebay completed and forebay tank lining completed. Final testing of gates to be conducted in present available shutdown. All the five nos of machines ready for generation up to optimum level subject to availability of full discharge in forebay.
11.	Ganderbal, 2x3 MW+ 2x4.5 MW J&KSPDC 1955 (3 MW m/cs) & 1963 (4.5 MW m/cs) 3 MW m/cs – T&G – Escher Wyss, Switzerland 4.5 MW m/cs –	9 (LE) 31.57 (Revised) 11.33	Turnkey Package for Dismantling, Supply, Installation, Testing and Commissioning of the 1x4.5MW Unit (Generator and Turbine including Spherical Valve), Generator Control Panels & Control Desks of Unit (4.5MW), Electronic Governor, 6.6 KV Instrumentation Transformers (CTs & PTs), Synchronizing Panel, 1.875MVA Single Phase Power Transformer, 33KV	Repairs of Units I & II completed to provide generation during execution works of units III & IV. The works awarded to M/s Gogoal Hydro Power Pvt. Ltd. On 02.07.2015. 80% work completed. Almost all the material including main equipments like Generator, Turbine, Spiral Casing, MIV, Control & Protection Panels received. Laying of Power Cables under progress. All the Control / Protection Panels installed. Battery Charger & LTAC Panels commissioned. All Civil Works like

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
	T&G - Ganz Mavag, Hungary RM&LE 2019-20		Control & Relay Panels, 33KV Instrumentation Transformers (CTs & PTs), 33kV SF6 Breakers, 33kV Isolators, Marshalling Kiosks, Surge Arrestors, 250kVA 3-Phase Servo Controlled Automatic Voltage Regulator, AC/DC Distribution Boards, Power & Control Cables and allied hardware including reconditioning of Penstock, trash racks necessary civil related works etc. Civil Works Improvement in Head Works, remodeling of Ganderbal Power Canal, construction of desilting basin, improvement and remodeling of cross drainage works, construction of catch water drains, breast walls etc.	construction of new cable trench and MS Cable Trays completed. The unit is likely to be commissioned by July' 2019.

State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations for completion during 2017-22

NORTHERN REGION

PUNJAB

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit(MW) / Estimated Cost/ Expenditure	Scope of work	Present Status
B - SCHEMES ONGOING - Under Tendering STATE SECTOR (PSPCL)				
12.	Mukerin HEP, 3x15 MW (St.-1), 3x15 MW (St.-2), 3x19.5 MW (St.-3) & 3x19.5 MW (St.-4) PSPCL 1983 (St.-I), 1988-89 (St.-II), 1989 (St.-III) & (St.-IV) T&G - BHEL R&M 2019-20	- 136.07 30.71	1. Replacement of existing Governors of all the six Machines of MPH-1&2 with Modern Digital Technology based Governing System. 2. Replacement of existing Excitation System of all twelve Machines of MPH-1, 2, 3&4 with Static Excitation System along with Modern Digital technology based AVR. 3. Replacement of existing Electro-Magnetic Relays with Numerical Relays of all twelve Machines of MPH-1,2,3&4. 4. Replacement of existing conventional DPRs, O/Cs & Directional E/F Relays with Numerical relays of Two Nos. 5. Replacement of existing 3 nos. 630 KVA, 11KV/415 Volt UATs with Dry Type Transformers of similar capacity at MPH-1. 6. Replacement of existing 3 nos. 800 KVA, 11KV/415 Volt UATs at MPH-3 & 4. 7. Capital overhauling along-with replacement of stator core & stator coils and strengthening of Rotor poles with class F insulation of Machine No. 2, 5, 9 & 10.	1. LoI to be issued to M/s Voith Hydro soon. Supplies expected in 2019-20. PO dated 28.01.2019 placed on M/s Voith Hydro Pvt. Ltd. Proposal for procurement of Oil for new Governor system under preparation. 2. M/s Flovel Energy Pvt. Ltd., Faridabad has commissioned all twelve sets of Static Excitation system. 3. Work order issued to M/s Siemens on 26.02.2018. Material received at site and installation under progress. 4. The case being prepared for approval of the competent authority. 5. Order placed on M/s ABB on 06.12.2017. Amendment issued and revised drawings approved on 18.09.2018. Delivery period is 4 months from the date of approval of drawings. Firm offered one transformer for inspection but it was rejected as material was not same per PO. 6. Tender to be opened on 16.04.2019. 7. Works of Machine no. 10 completed by M/s BHEL. Revised Offer received from BHEL for machine no. 2 on 16.02.2019 and is under consideration. Proposal under preparation for machine no. 5 & 9.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit(MW) / Estimated Cost/ Expenditure	Scope of work	Present Status
			8. Replacement of existing 11 KV XLPE Aluminum cables of size 1x500 mm² with XLPE Aluminum 1x800 mm² cables from Generator Bus duct to LV side of Generator Transformers of all units at MPH-1 & 2. 9. Procurement of one no. Trash Rack Cleaning Machine at MPH-1. 10. Procurement of 2 sets of Trash Racks for intake bays of Machine No.2&3 at MPH-1 11. Replacement of existing One No. Drainage and One No. Dewatering VT Pumps with submersible Pumps at each Power House. 12. Replacement of existing LT panels at MPH-1&2. 13. Replacement of 12 nos. 132 KV Line Circuit Breakers at MPH-1,2,3&4. 14. Replacement of existing 5 Nos. 11/132 KV, 20 MVA Generator Transformers at MPH-1&2. 15. Capital overhauling of one no. Generator Transformer at MPH 3 and one no. Generator Transformer at MPH-4. 16. Replacement of Two nos. of 11KV Vacuum Circuit Breakers at MPH-3 and Four Nos. 11kV VCB at MPH-4. 17. Replacement of oil and Air cooler for Machine 7,8,10 & 11	8. Proposal under preparation. 9. Proposal dropped. 10. PO amounting to Rs. 34.08 Lac placed on M/s Pilot Engineering Works, Ludhiana on 03.08.2018. 11. PO issued to M/s SK Sales for dewatering Pumps on 28.01.2019. 12. Proposal under preparation. 13. Order placed on M/s CG Power and Industrial Solutions Ltd, Gurugram on 25.09.2018. Delivery period for 7 CBs within 6 months from the date of PO & for remaining 7 CBs within 8 months from the date of PO. Inspection for 1st lot under process. 14. GTs commissioned by M/s Bharat Bijli Limited, New Delhi (2 at UBDC and 2 at MHP). 15. Proposal under preparation. 16. 6 Nos. VCBs received from TSPCL. 17. Tender to be opened on 21.02.2019.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit(MW) / Estimated Cost/ Expenditure	Scope of work	Present Status
			at MPH 3&4. 18. Replacement of tubular poles with rail poles of 11KV Auxiliary line. 19. Replacement of existing 3 Nos. 11/132 KV, 20/25 MVA Generator Transformers with 11/132 KV 25 MVA at MPH-3&4. 20. Providing Toilets at all the Bye-Pass gates of all Power Houses of MHP. 21. Renovation of water supply system of residential colony at Unchi Bassi MHP.	18. Proposal dropped. 19. Order for Rs. 9.09 Cr. was placed on M/s BBL, New Delhi for supply of 3 nos. GTs on 28.03.2018. GTs received at site. 20. Proposal under preparation. 21. Work completed.
13.	Ranjit Sagar Dam, 4x150 MW PSPCL 2000 T&G – BHEL R&M 2020-21	- 48.00 1.6	1. Installation and commissioning of Digital Electro Hydraulic Governor capable of Restricted Governing Operation Mode (RGMO). 2. Procurement of spares of Auto Sequencers. 3. Replacement of 220 KV Circuit Breakers of 7 nos. feeders. 4. Renovation of emulsifier system of Generator Transformer. 5. Capital maintenance of Unit no 2. 6. Installation & Commissioning of 8 Nos Microprocessor based scroll type compressor Water cooled Chilling Machine-AC Plants. 7. Providing additional submersible pump for dewatering. 8. Capital Maintenance of Unit no 3. 9. Up-gradation of HP compressors of condenser	1. PO placed on M/s BHEL on 04.12.2018. Dispatch clearance given. 2. Tender floated on 30.01.2018. 3. Rescheduled for 2020-23. 4. Work proposed to be taken up in 2019-20. 5. Yet to be taken. 6. Tender dropped due to poor response from the firms. Fresh Tender Enquiry after review of Technical Specifications is under preparation. 7. Work completed by M/s S.K Sales Company, Jalandhar. 8. Rescheduled for 2020-23. 9. Administrative approval of Rs. 18.83 Lakhs accorded on

S. No.	Scheme/ Category/ Completion Target	Expected Benefit(MW) / Estimated Cost/ Expenditure	Scope of work	Present Status
			mode operation. 10. Replacement of drainage pumps of unit bay and service bay side-2 nos. each. 11. Capital Maintenance of Unit-1. (Replacement of runner disc to be carried out) 12. Replacement of flow meters. 13. Replacement of defective fire alarm panel other accessories (work being executed by site). 14. Renovation of drinking water supply system of Power Plant& Switch House Building. 15. Providing RCC Wall with water gate from right bank of tail race to dam. 16. Replacement of Blowers of Ventilation System-5 nos. 17. Renovation of Circle Office and R.E.Office. 18. Construction of Porches over all entry points of Power House Building.	24.12.2018 for procurement of 6 no. Bare Head Compressors without motors for HP Compressors air system for synchronous condenser mode. 10. Works proposed to be taken up later. 11. BHEL submitted bid on 11.09.2018 for runner disc replacement. The case is under consideration. 12. Bids received from following firms are under evaluation: - i) M/s BHEL, ii) M/s Interface Devices, Chandigarh and iii)M/s Brainchild Projects, Faridabad. The requisite documents submitted by the firms were not in line with NIT. 13. Bids received from following firms are under evaluation: - i) Modern Agencies, Chandigarh ii) Fire Envo Safety Engineers, Chandigarh iii) Ceasefire Ludhiana. PO issued to M/s Modern Agencies, Chandigarh. 14. Work proposed to be taken up in 2020-23. 15. Work proposed to be taken up in 2020-23. 16. Work proposed in 2020-23. 17. Proposal under preparation. 18. Proposal under approval stage.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit(MW) / Estimated Cost/ Expenditure	Scope of work	Present Status
			19. Renovation of 5 No. Store Sheds at S&T Store Yard. 20. Renovation of UC fencing around S&T Store Yard & 220 KV Switch yard. 21. Providing Detachable scaffolding set for Power Plant Maintenance. 22. Condenser mode of operation of 4 no. units 23. Repair of Single phase 13.8 KV/220/√3 KV, 62.5 MVA, Generator Transformer make NGEF, S No. 6800000152, YOM-1996 of unit no.2 (W-phase) damaged at RSD HEP Shahpurkandi. 24. Procurement of 11/0.415kV, 1250kVA, Dry type Station Service Transformers.	19. Work proposed to be taken up in 2020-23. 20. Work proposed to be taken up in 2020-23. 21. Work proposed to be taken up. 22. Work order dated 27.08.2014 issued on BHEL. BHEL Bhopal inspected the machines and opined that the volume of air in the blown down receiver is on the lower side and the pressure being maintained is on the higher side causing excessive drop during synchronous mode operation and water pressure being depressed more than required. As such air mixed with water is being released in the tail race. BHEL suggested that the capacity of air compressors and required volume and pressure applied for water depression is required to be analyzed. BHEL also pointed out that proper nipping/bedding of guide vanes should be ensured which may be the root cause of water being released to tail race. Further, BHEL Engineers again visited and recommended replacement of magnetic float level indicators. 23. Proposal under approval. 24. Part-I & Part-II of the single bid submitted by BHEL opened on 18.12.2018. Officer has been deputed to carry out Work appraisal of BHEL Jhansi manufacturing unit.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit(MW) / Estimated Cost/ Expenditure	Scope of work	Present Status
			25. Replacement of valves of Power House. 26. Design, Manufacturing, Testing, Supply, Delivery & Commissioning under firm's supervision for 2 nos. Tubular Battery Banks of 220 V, 2000 AH in SAN Containers. 27. Procurement and commissioning of numerical Distance Protection Relays (16 nos.). 28. Procurement of 4 nos Magnetic Float Level Indicators with switching contacts. 29. Modernization and Renovation of RSD Elevator/ lift.	25. Tender Enquiry dated 06.03.2019 floated with due date of opening as 16.04.2019 26. Batteries commissioned successfully by M/s Exide Ltd, Delhi at Rs. 78.321 Lacs. 27. Work completed by M/s. GE T&D India Ltd. 28. Order placed on BHEL on Single Tender basis. Various terms & conditions under negotiation. 29. Work completed by M/s Kone at Rs. 20 Lakhs.
14.	Shanan HEP, 4x15 MW+1x50 MW PSPCL 1932(U1 to U4) T - Ganz Mavag, Hungary G – BTH, UK 1982 (U5-extn) T&G - BHEL R&M 2019-20	- 37.81 19.71	1. Renovation of water cooling bus of 4x15 MW machines. 2. Procurement of one runner for 50 MW machine and two runners for 15 MW machines. 3. Procurement of 07 Nos. 12 MVA GTs for 4x15 MW machine & 4 Nos. 19 MVA GTs for 50 MW machine. 4. Providing CCTV cameras at Shanan PH. 5. Procurement of needles and nozzles of all six machines. 6. Replacement/Retrofitting of 66, 132 KV isolators & L.E with new ones at 132 KV Sub-station. 7. Replacement of 33 KV BOCB with new 66 KV SF6 breaker at 132 KV sub-station. 8. Procurement of 2 nos. SAN Container DC Batteries of	1. M/s BHEL requested to submit the offer. 2. All runners commissioned by M/s Flovel Energy Pvt. Ltd., Faridabad. 3. All GTs commissioned by M/s BBL. 4. Specifications under preparation. 5. Work completed by M/s BHEL. 6. Specifications under preparation. 7. 66kV Breakers received at site. Proposal for Construction of foundation work is under preparation/approval. 8. Work completed.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit(MW) / Estimated Cost/ Expenditure	Scope of work	Present Status
			400AH Capacity for the replacement of existing DC Batteries 9. Replacement of insulation of existing spare field coils of rotor of 50 MW machine with 'F' class. 10. Replacement of needle control device, deflector shafts of 4x15 MW machines. 11. Replacement of existing relay and annunciation panels in control room. 12. Clearance of silt of new reservoir. Restoration of Toe wall and grouted stone pitching on U/S of UHL weir at Brot 13. Painting of Penstocks.	9. Proposal under approval. 10. Proposal is under preparation. 11. Proposal is under preparation. 12. Work of desilting has been completed. 13. Order has been issued to M/s Shalimar Paint Ltd. Parvanu (HP) on 22.07.2017 for procurement of aluminum paint. Material received at site. Tender for supply of labour for painting work is under process.
15.	UBDC St.I & St II HEP, 3x15 MW (St.-I) & 3x15.45 MW (St.-II) PSPCL 1971-73 (St.-I) & 1989-92 (St.-II) St. I T&G-AEI, UK St.-II T&G-BHEL R&M 2019-20	- 23.55 Nil	1. Capital overhauling of Power House No.2 Stage I. 2. Replacement of existing Electro-Mechanical Excitation/AVR system with Digital Static Excitation System of UBDC Stage II Power House. 3. R&M of protection and measurement system by providing new C&R Panels equipped with numerical relays and digital instruments of UBDC Stage I Power House. 4. Spare Generator Transformer 20 MVA 11/132 KV. 5. Capital overhauling of UBDC Power House No.3 Stage I. 6. Replacement of Electro	1. Proposal dropped 2. PO issued to M/s ABB on 29.01.2019. 3. Tender opened on 02.04.2019 and two Bids received for following firms: i) M/s GE. ii) M/s Siemens Tender under techno-commercial evaluation. 4. Tender to be opened on 24.04.2019. 5. Proposal dropped. 6. Tender to be opened on

S. No.	Scheme/ Category/ Completion Target	Expected Benefit(MW) / Estimated Cost/ Expenditure	Scope of work	Present Status
			Hydraulic Governors with microprocessor based digital governor of UBDC Stage II Power Houses. 7. R & M of dewatering and drainage system of UBDC Stage II Power Houses. 8. Replacement of Protection and measurement system by Electromagnetic relays and instruments with numerical relays and digital instruments of UBDC Stage II Power Houses. 9. R & M of C&R panels of 132 KV O/G feeders at UBDC Power House No.3 Stage I. 10. Replacement of Governor Pumps of UBDC Stage I Power Houses	16.04.2019. 7. Specification under preparation. 8. Proposal to be processed in 2020-23. 9. Proposal to be processed in 2020-23. 10. Proposal to be processed in 2020-23.
16.	Anadpur Sahib Hydel Project – I&II, 4x33.5 MW PSPCL 1985-86 T&G – BHEL R&M 2019-20	- 43.11 -	1. Replacement of existing 4 nos. 220 volts 400 AH batteries of ASHP-I at Ganguwal and ASHP-II at Nakkian. 2. Replacement of existing 6 nos. 500 kV 11/0.4 kV (3 nos. installed at each power house) oil cooled with Dry Type transformers. 3. Procurement of 38 nos. Stator Air Coolers. 4. Design, Manufacturing, Testing, Supply, Erection & Commissioning of control system SCADA, Microprocessor based Digital Excitation, Digital Governing System, Digital Numeric Relays Ganguwal & Nakkian P.H at ASHP. 5. Renovation and Modernization (R&M) of BHEL make Generating units of 33.5 MW at ASHP.	1. PO issued to M/s Exide on 29.11.2018. Dispatch Clearance given on 29.03.2019. 2. Administrative approval accorded on 27.11.2018. NIT under preparation Tender to be floated after revocation of MCC. 3. LoI issued to M/s S.K Sales Company Jalandhar and M/s Hari Om Enterprises, Haridwar on 07.01.2018. 4. Specifications under preparation. 5. Proposal is under process.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit(MW) / Estimated Cost/ Expenditure	Scope of work	Present Status
			6. Replacement of existing 4 no. compressor (2 No. at each Power House) with new unit compressors. 7. Renovation and modernization of emulsifier system of Generator Transformer of Ganguwal & Nakkian of ASHP. 8. Renovation and modernization of Existing LT Scheme/panels for Ganguwal & Nakkian of ASHP. 9. Renovation and modernization of Existing conventional DPRs, O/C & Directional E/F Relays with Numerical relays of outgoing 2 nos 132KV Circuits at Ganguwal & Incoming 2 nos. and outgoing 3 nos. 132 kV Circuits at Nakkian of ASHP. 10. Replacement of OPU (Oil Pressure Unit) for 4x 33.5 MW machines of ASHP. 11. Replacement of existing 4 nos. Service Compressor (2 nos. at each Power House no. I&II) with new Service Compressors. 12. Procurement of T&P articles for Ganguwal and Nakkian Power House.	6. Proposal is under process for Administrative approval. 7. Rescheduled to 2nd control period MYT Plan 2020-23. 8. Rescheduled to 2nd control period MYT Plan 2020-23. 9. Case is under preparation. 10. Case is under preparation. 11. Case is under preparation. 12. Case is under preparation.

State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations for completion during 2017-22

NORTHERN REGION

UTTARAKHAND

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
A - SCHEMES ONGOING - Under Implementation - STATE SECTOR (UJVNL)				
17.	Tiloth, 3x30 MW UJVNL LTD. 1984 T&G – BHEL RM&LE 2021-22	90(LE) 384.66 12.83	-Refurbishment of turbine (three new & one spare), new sets of guide vanes. Repairing of various gates and gantry cranes. -Refurbishment of generators with new class F insulated stator & rotor winding. New SEE, Replacement of ABCBs by SF6 breakers, 11 kV Switchgear. Installation of numerical type protection system. -Civil works of barrage, power channel, power station & Tail race channel.	Agreement for Rs.139.9 Cr. signed with M/s Andritz Hydro Pvt. Ltd (AHPL) on 14.12.2016. <u>Works Completed</u> Reverse Engineering works of Unit-I completed on 14.07.2017. <u>Works Under Progress</u> Design, Engineering and Manufacturing works are in progress. One Machine handed over to M/s Andritz on 12.12.2018. 43% work completed.
18.	Dhalipur, 3x17 MW UJVNL LTD. 1965-70 T - Litostroj, Yugo. G - Rade Koncar, Yugo RM&LE 2021-22	51 (LE) 152.65 11.58	-Replacement of turbine, new sets of guide vanes. Repairing of various gates and gantry cranes. -Refurbishment of generators with new stator core and new class F insulated stator & rotor winding. New SEE, Replacement of 11 kV Switchgear. Installation of numerical type protection system. -Civil works of power channel, power station & Tail race channel.	Order placed on M/s Gogoal Energo Pvt. Limited (GEPL), New Delhi for Rs 78.25 Crs. on 28.12.2016. <u>Work Completed</u> Reverse Engineering Works for Unit-B completed on 19.07.2017. Order for optional items placed on M/s GEPL on 20.06.2018 & 29.09.2018. Computational Fluid Dynamics (CFD) analysis for Turbine approved. <u>Work Under Progress</u> Design and Engineering works are in progress. Works started in Unit-B on 11.02.2019.
B - SCHEMES ONGOING - Under Tendering STATE SECTOR (UJVNL)				
19.	Chilla (Ph-B), 4x36 MW UJVNL LTD. 1980(U-1 to 3) 1981(U-4) T&G – BHEL RMU&LE 2021-22	144 (LE) + 12 (U) 490.56 NIL	-Replacement of existing Kaplan turbine and their complete auxiliaries, refurbishment of existing generators. Complete replacement of switchyard equipment along with Power Transformer, Replacement of 11 kV system, New Excitation system, New Electronic Governors, new control metering	• DPR prepared by M/s SNC Lavlin and approved by the Board. However, GoU cancelled signing of agreement. Revalidation of DPR was done by AHEC, IIT Roorkee and approved by UJVNL Board on 26.11.13. Required changes in specifications were done by the committee. • Capital Investment approval

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
			& protection system & SCADA, HM Works and Civil Works. -Uprating from 4x36 MW i.e. 144 MW to 4x39 i.e. 156 MW.	accorded by UERC on 29.01.2016. Revised Tender floated. • Tender cancelled after BoD order dated 31.12.2018. • New tender uploaded on 09.01.2019 and Pre-bid meeting held on 11.02.2019. • Part-I to be opened on 30.04.2019.
20.	Ramganga, 3x66 MW UJVN LTD. 1976 T&G-BHEL RM&LE 2021-22	198 (LE) 455.20 NIL	-Replacement of runner, rehabilitation of generators, installation of intake hoisting arrangement, installation of DT gantry crane, 11 kV Circuit Breakers, control protection and replacement of Switchyard equipment, instrumentation, governors, pumps and life extension of units based on RLA studies.	• DPR was prepared in-house and was reviewed by AHEC, IIT Roorkee. Specifications were vetted by AHEC. Tender on turnkey basis floated on e-portal. • Tender has been scrapped as UERC declined Investment approval on 12.02.2016. • Appeal has been filed in the Appellant Tribunal, New Delhi.
21.	Dhakrani, 3x11.25MW UJVN LTD. 1965-70 T - Litostroj, Yugoslavia. G - Rade Konkar, Yugoslavia RM&LE 2021-22	33.75 (LE) 137.31 NIL	-Replacement of turbine new governors, new sets of guide vanes. Repairing of various gates and gantry cranes. -Refurbishment of generators with new class F insulated stator & rotor windings. New SEE, Replacement of ABCBs by SF6 breakers, 11 kV Switchgear. Installation of numerical type protection system. -Civil works of barrage, power channel, power station & Tail race channel	• Decision was taken to cancel KfW loan. Approval accorded for inviting fresh bids on National Competitive Bidding (NCB) route through domestic funding. • DPR was revised based on present price level and Specifications were reframed. Revised DPR was approved by Board on 30.09.2015. • UERC accorded approval on 27.06.2017. • Techno Commercial evaluation completed. • Financial Bid opened and Financial approval accorded by CPC on 16.11.2017. BoD directed to put up the proposal again with modifications. Investment approval of Board is yet to be accorded.

State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations for completion during 2017-22

NORTHERN REGION

UTTAR PRADESH

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
I - SCHEMES ONGOING - Under Implementation - STATE SECTOR (UPJVNL)				
22.	Rihand, 6x50 MW UPJVNL 1962 (U-1to5) 1966 (U-6) T&G - EE, UK RM&LE 2019-20	300 (LE) 132.20 (Revised) 105.49	- Replacement of Stator Core, and Coils insulation with Class F. - Replacement of insulation of field coils with Class F - Replacement of Governors - Replacement of Excitation Equipment, 60 MVA generator transformers by 67.5 MVA Transformers, switchyard equipments, Bus bars and under water parts - New Air Cooler and Ventilation system.	Works of all six units completed by M/s BHEL (Units Commissioned on: U-1: 16.09.2016, U-2: 14.02.2018, U-3: 15.06.2015, U-4: 04.08.2014, U-5: 23.04.2011 and U-6: 31.05.2017). Over hauling of intake gate along with alignment of T-Guide and their hoisting completed in Unit- 2, 3 & 4 and is yet to be taken up in Unit-1, 5 & 6. <u>COMMON WORKS</u> <u>A. WORKS COMPLETED</u> Erection of 132kV CT & PT, Supply of Control Cable for Switchyard equipment, Silicon rubber disc insulation and Power Cable for auxiliary equipment. Commissioning of 500kVA Unit Auxiliary & Station Service Transformers (8 Nos.), DG Set with new L.T. Breaker Panel, Commissioning of L.T. Breaker, stringing of copper Conductor for main & reserve bus, Commissioning of Draft Tube gates 3 Set (6 Nos.), Commissioning of 132kV Isolators for all Units and Smoke Detection System. <u>B. WORKS UNDER EXECUTION</u> 1. Nil. <u>C. WORKS YET TO BE TAKEN UP</u> 1. Supply of delivery pipe (2 sets) for dewatering pump. 2. SCADA System including Auto Synchronizer & Auto Sequencer. 3. Lifts. 4. Mulsifire Pipeline. 5. Supply and Commissioning of 132kV Isolators for feeders.
23.	Obra, 3x33 MW UPJVNL 1970 (U-1&2), 1971 (U-3) T&G - BHEL	99 (LE) 58.80 35.47	- Replacement of Stator coil, core & rotor pole etc. (Unit#1,2 & 3). - Replacement of rotor spider arm (Unit# 1&3). - Replacement of digital governor (Unit#1,2 & 3).	<u>UNIT NO. 1</u> <u>A. WORKS COMPLETED</u> 1. Replacement of oil after overhauling of 11/132KV, 37.5 MVA GT& UAT. 2. Control & Protection of Generator, GT& UAT.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
	RM&LE 2021-22		- Supply of Gov. oil pump (Unit#1,2 & 3). - Supply & installation of Static Excitation System (Unit#1,2 & 3). - Supply of Gen. air coolers (Unit#1). - Rehabilitation of Intake gate of Units - Rehabilitation of stop logs, draft tube gates. - Refurbishment of draft tube gate crane. - New earthing of Switchyard - Station battery. - Replacement of 132KV Breakers. - Overhauling of 132KV Isolator (32 Set). - Supply of replacement of 132KV CT&PT. - Replacement of numeric relay panels of Units & Feeders. - Replacement of station battery - Installation of Radio Remote Control of both EOI cranes. - Smoke Fire detection system. - Supply of dewatering pumps, air compressor. - Supply & replacement of Elevator (1 No.). - Supply of 1 No. Electrostatic Liquid Cleaner (ELC) & 1 No. Low Vacuum Dehydration (LVDH) Machine. - SCADA - Other works covered in various packages approved by ETF.	3. Rehabilitation of Intake Gate with new vane type pumps. 4. Replacement of stator core & coil. 5. Re-insulation of rotor pole coils with F class insulation. 6. Replacement of dynamic excitation with Static Excitation System. 7. Refurbishment of generator coolers. B. <u>WORKS YET TO BE TAKEN UP</u> 1. Capital overhauling along with replacement of vapors seal, spring mattress support of thrust bearing, brake-jack system, carbon segment gland; inception of HS lube oil system, backwash type cooling water strainer, centralized self-lubricating system, refurbishment of runner, runner chamber, GV & Stay vanes, liner of pivot ring etc. Price bid opened on 03.10.2018. Final approval awaited. <u>UNIT NO. 2</u> A. <u>WORKS COMPLETED</u> 1. Replacement of oil after overhauling of GT& UAT. 2. Replacement of stator winding, rotor winding, rotor pole winding, overhang support ring and stator core. 3. Control & Protection of Generator, GT & UAT. 4. Rehabilitation of Intake Gate with new vane type pumps. B. <u>WORK UNDER EXECUTION</u> 1. Replacement of dynamic excitation with Static Excitation. (Installed at site but testing pending.) 2. Refurbishment of generator coolers. C. <u>WORK YET TO BE TAKEN UP</u> Capital overhauling along with replacement of vapors seal, spring mattress support of thrust bearing, brake-jack system, carbon segment gland; inception of HS lube oil system, backwash type cooling water strainer, centralized self-lubricating system, refurbishment of runner, runner chamber, GV & Stay vanes, liner of pivot ring etc. Price

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
				bid opened on 03.10.2018. Final approval awaited. <u>UNIT NO. 3</u> <u>A. WORKS COMPLETED</u> 1. Replacement of oil after overhauling of GT & UAT. 2. Control & Protection of Generator, GT & UAT. 3. Rehabilitation of intake Gate. 4. Replacement of Vane type pump of Intake Gate with new one. 5. Replacement of dynamic excitation with Static Excitation system. <u>B. WORKS UNDER EXECUTION</u> 1. Replacement of stator core under tendering process. <u>C. WORKS YET TO BE TAKEN UP</u> 1. Capital overhauling along with replacement of vapors seal, spring mattress support of thrust bearing, brake-jack system, carbon segment gland; inception of HS lube oil system, backwash type cooling water strainer, centralized self-lubricating system, refurbishment of runner, runner chamber, GV & Stay vanes, liner of pivot ring etc. Price bid opened on 03.10.2018. Final approval awaited. COMMON WORKS <u>A. WORKS COMPLETED</u> 1. Replacement of cable of tainter Gate & dam Top Gantry Crane-II ckt. 2. Supply & Replacement of Lightning Arrestors. 3. Erection of 132kV CTs & PTs by 0.2 accuracy class CTs & PTs. 4. Supply & replacement of 11/0.4kV 400 kVA Station Transformer. 5. Control & Protection of 6 Nos. 132 kV feeders & 2 Nos. Station. Tr. 6. Supply & replacement of deluge valves and NRV's of mulsifier system. 7. Supply & replacement of metering/ measuring instruments. 8. Refurbishment of Intake gate crane 125/25 T (order placed).

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
				9. Renovation of CO₂ Fire extinguishing system of generator of all 3 machines (Centralized Unit) completed. B. WORKS UNDER EXECUTION 1. Control and protection system of 2 nos.132KV feeders. 2. Provision of station supply from Obra HEP 132 KV Bus. 3. Supply, Erection and Commissioning of new elevator. (Under Tendering) C. <u>WORK YET TO BE TAKEN UP</u> 1. SCADA system.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
			3.Procurement, erection, testing & commissioning of 9 Nos. Gang operated 132 KV SF6 Circuit Breakers including dismantling of existing old MOCB installed at outgoing 132 KV feeders. 4.Procurement of 48-volt battery charger along with 24 Nos., 2 volts, 300 Ah battery cell. 5.Procurement, erection & commissioning of new digital governor with RGMO feature including dismantling of existing governor. 6.Replacement of existing Electromagnetic relays of Generator and Generator Transformer with Numerical relays. 7.Replacement of existing Electromagnetic relays of Station Transformer of 20 MVA with Numerical relays.	3. Order has been placed on M/s. Electro Services, Vadodara on 13.04.2016. Drawing approved. Material has reached at site. 4. Proposal under process. 5. Progress halted due to funds constraint. 6. Progress halted due to funds constraint. 7. Progress halted due to funds constraint.
25.	Bargi, 2x45 MW MPPGCL 1988 T&G – BHEL R&M 2021-22	- 3.12 0.36	Procurement, erection & commissioning of DVR for replacement of existing AVR under modernization & up-gradation of excitation system.	Order placed on M/s BHEL. Material received at site. Works to be taken up during annual overhauling of units.
26.	Pench, 2x80 MW MPPGCL 1986-87 T&G – BHEL R&M 2021-22	- 13.36 -	1.Change in insulation class of stator from Class B to Class F of Unit-2. 2.Procurement, erection, testing & commissioning of 4 Nos. 132 kV SF6 Circuit Breakers including dismantling of existing old MOCB installed at outgoing 132 KV feeders.	1. Revised offer for RLA has been obtained. Progress halted due to funds constraint. 2. Order has been placed on M/s. Electro Services, Vadodara on 13.04.2016. Drawing approved & material reached at the site.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
27.	Bansagar Tons-I, 3x105 MW MPPGCL 1991-92 T&G – BHEL R&M 2021-22	- 4.97 -	1.Replacement of RTU and 220 kV Feeders – Carrier Protection & Auto re-closure feature. 2.PLCC cabinets for Rewa – 1&2 and Kotar. 3.Replacement of existing Generator Protection & Transformer Protection Electro-Mechanical with Numerical relays, Sequence Event Recorder, Disturbance Event Recorder & Diagnostic Station 4.Procurement of 7 nos. 220kV wave trap for carrier communication & protection, auto reclosure, alternate data channel etc.	1. Order for C&R panel with numerical relays has been placed on M/s. Scope T&M Pvt. Ltd, Mumbai in January, 2018. Material received at site. Commissioning to start from next month as per availability of shutdown. Order placed on M/s Puncom for supply, testing and commissioning of Carrier communication equipments. Material received at site. 2. Order for C&R panel with numeric relays has been placed on M/s. Scope T&M Pvt. Ltd, Mumbai in January, 2018. Material received at site. Commissioning to start from next month as per availability of shutdown. 3. Order has been placed on M/s. Scope T&M Pvt. Ltd, Mumbai in January, 2018. Material received at site on 10.10.2018. Commissioning to start as per availability of shutdown. 4. Order has been placed on M/s. GE (T&D) India Ltd, Mumbai on 21.05.2018 for an amount of Rs. 19.82 Lakhs. Inspection completed and Material received at site.

**State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power
Stations for completion during 2017-22**

WESTERN REGION

GUJARAT

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
A - SCHEMES ONGOING - Under Implementation - STATE SECTOR (GSECL)				
28.	Ukai, (U- 1, 2 & 4), 4x75 MW GSECL 1974-76 T&G – BHEL R&M 2021-22	- 7.3 4.48	Replacement, erection, commissioning & testing of New Microprocessor based Digital Governing System with existing Governing System in Unit No. 1, 2 & 4.	Orders placed to BHEL. Erection work of Unit-4 completed in June'2018. Erection work of Unit-2 completed in July, 2018. M/s BHEL experts visited from 10.12.2018 to 22.12.2018 for commissioning & testing of both Units. But commissioning was not successful and after that they left due to non-availability of irrigation schedule. On 24.12.2018, units 2 & 4 started & synchronized. During start-stop, various observations/ defects came to notice and the same has been conveyed to BHEL on 29.12.2018. Unit-1 work will be started after successful commissioning & testing of Unit-2&4.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
29.	Kadana PSS, 4x60 MW GSECL Units 1&2 1989-90 T&G-Skoda Units 3&4 1998-99 T&G-BHEL R&M 2021-22	- 6.37 6.18 108.00	Replacement of existing Governing System by microprocessor based digital governing system for 2x60 MW pump turbine unit 1&3 or (any Two units). Replacement of existing AVR excitation system by DVR excitation system of Unit-2. Installation of vibration monitoring system for Unit no. 3&4. Supply, erection, Commissioning and testing of on-line ultrasonic flow measurement system (SKODA/ BHEL make turbine) for unit 1&3 (any two units). Refurbishment/ upgrading for successful running in pump mode operation of Unit-3.	Replacement of Governing system of Unit No. 2 was completed by M/s Voith Hydro and performance found satisfactory. Replacement of governing system of Unit no. 3 will be carried out after trial run of Pump mode operation during 2018-19. Spares received at site. Order placed on M/s BHEL on 11.09.2018. Installation completed on 20.02.2017 by M/s Protech Monitoring Pvt. Ltd, New Delhi. Order has been issued to Automation & Maintenance Management System, Coimbatore on 16.05.2018 for unit 1&3. Material received and work will be undertaken during overhauling of machines. The trial run of Unit No. 3 under reversible pump mode operation at 55MW load was taken on 20.12.2018 in coordination with SLDC, Gujarat. S.E., Irrigation department., Lunavada Central Water and Power Research Station (CWPRS), Khadakwasla Pune. Unit was run in Pump mode for 20 minutes and following parameters were observed during trial run: • Current 2700A & Load 55MW. • Power consumption: 16MWH • Water discharged from downstream to upper reservoir- 3.89 Million cubic feet. • High Vibrations were observed. Proper analysis of the vibrations and their effects is to be done. Required maintenance will be done so that Unit can run in pump mode operation.

State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations for completion during 2017-22

SOUTHERN REGION

TELANGANA

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
A- SCHEMES ONGOING -Under Implementation - STATE SECTOR (TSGENCO)				
30.	Nagarjuna Sagar Phase II works, 1x110 + 7x100.8 MW, TSGENCO 1978-85 <u>Unit-1:</u> T&G - BHEL <u>Units 2 to 8:</u> PT - Hitachi, Japan MG - MELCO, Japan R&M 2019-20	- 22.17 14.34	1. Replacing existing AVR's with latest DVRs alongwith thyristor modules for 7 units at NSPH. 2. Replacement of all L.T. Breakers of all units and SABs of NSPH. 3. Retrofitting of Numerical Relays of Generator Protection Schemes of Units 2 to 8. 4. Overhauling of EOT Cranes and Gantry cranes at NSPH. 5. Procurement of control cables of different sizes for units 1 to 8, common auxiliaries, Switchyard equipments and switchyard marshalling boxes and laying of Power Cables and Control Cables for Penstock Inlet Gates from main control room for NSPH. 6. Procurement of 245 KV Section Breaker for BUS-A, BUS-B at NSPH switchyard, Bus Coupler at 220 KVRS and the related Isolators and accessories, erection, repositioning of PTs etc. at NSPH Switchyard. 7. Servicing and reconditioning/ procurement of new Isolators required for motoring mode operation for 89G, 89M, 189S1 and 189S2 for units-1 to 8. 8. Procurement of 245 KV SF6 Circuit Breakers.	1. Completed. 2. Completed. 3. Completed. 4. LoI issued and work is under progress. 5. Material procured and Erection under progress. 6. Not feasible for Nagarjuna Sagar Power House Switch Yard due to space constraint. 7. Completed. 8. Completed.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
			9. Overhaul of stop log gates, penstock gates and seals replacement for draft tube gates for all units at NSPH including trash rack at tail race. 10. Replacement of switchyard equipment that have completed 25 years of service of 220 KV CVTs (10 Nos.), 132 KV CVTs (17 Nos.), 220 KV PTs (5 Nos.), 132 KV PTs (8 Nos.), 220 KV LAs (13 Nos.) and 132 KV LAS (13 Nos.) for NSHES. 11. Procurement of 220 KV CTs (18 Nos.) for units (silicon rubber composite type).	9. i) Overhauling of stoplog gates: Out of 18 elements reconditioning of one element completed and for remaining 17 elements yet to be taken up. ii) Overhauling of penstock gates and seals replacement for draft tube gates is yet to be taken up. iii) Trash rack rectification works at tail race and reservoir side completed. 10. Completed. 11. Completed.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
31.	Nagarjuna Sagar Left Canal Power House (NSLCPH), 2x30 MW TSGENCO 1992 T-Boving, UK G-General Electric, UK R&M 2019-20	- 30.99 2.00	1.Replacing existing AVR's with latest DVRs along with thyristor modules for 2 units. 2.Capital overhauls on generator and turbine and its auxiliaries including spares and consumables for all 2 units. 3.Overhauling of EOT Cranes and gantry cranes. 4.Modification in design of runner for both the units at Nagarjuna Sagar Left Canal Power House (NSLCPH) for operating at lower heads. 5.Procurement of 132KV SF6 Circuit Breakers for both units and its feeders. 6.Implementation of SCADA. 7.Providing of latest version of EHG System for 1 Unit. 8.Cooling water line erections. 9.Overhaul of stop log gates at NSLCPH and trash rack rectification including gantry crane.	1. Yet to be decided. 2. Unit-1 overhauling completed and taken into service on 20.11.17. Unit-2 overhaul yet to be taken up. 3. Yet to be taken up. 4. Yet to be processed. 5. Completed. 6. Completed. 7. Completed. 8. Completed. 9. Trash rack rectification works completed. Gantry crane works and reconditioning of stop log gates is yet to be taken up.

**State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations
for completion during 2017-22**

SOUTHERN REGION

KARNATAKA

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
A - SCHEMES ONGOING - Under Implementation - STATE SECTOR (KPCL)				
32.	Bhadra River Bed units, 2x12 MW KPCL 1963 T- Neyrpic, France G- Hitachi, Japan R&M 2018-19	- 31.05 (A-7.5 B-23.55) 25.25	A. Refurbishment of Generator Auxiliaries 1. Supply and replacement of existing excitation system with SEE. 2. Replacement of governors. 3. Replacement of electromagnetic relays with digital relays. Replacement of 11 kV switchgear, LAVT & NGT/NGR cubicles, 11 kV cables. B. Replacement/ Refurbishment of Turbine and associated equipments 1. Replacement of BF valve, TGB, Guide vanes, Rubber hub, Top cover, Vacuum brake valve, Air compressor system, CW Pipelines Gov oil pipes, Brake pads, Rotor lead etc. 2. Refurbishment of Guide vane servo motor, Runner servo motor, Turbine shaft, Runner cross head, pivot ring etc.	- Contract agreement signed with M/s Andritz Hydro Pvt. Ltd. on 21.09.2012. - Unit 2 commissioned and synchronized on 18.02.2016. Status of Unit-1: - During the erection few problems were faced in both the units & there was delay. - The alignment readings were beyond permissible limits and oil leakage was observed through runner blade servomotor to shaft coupling flange area. - Discussion held with leading manufacturers for the generating units. It was decided to carryout machining of the rotor shaft to bring the alignment within the tolerable limits. Order was placed for refurbishment of generator shaft for Rs.2.5 crores. - After repeated trials, the combined alignment run out checks competed. - M/s AHPL carried out preliminary checks of Generator, Turbine and auxiliaries before rotation on 23.03.2018 after discharge of water by KNNL. Mechanical spinning was taken up on 28.03.2018. - Problems arised during Testing and Commissioning of oil header assembly. - Mechanical rotation of the unit carried out on 22.06.2018. - Unit was stopped due to

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
				abnormal sound observed at 225 rpm near LGB. • After inspection, LGB air vapor seals were dismantled and grinding works carried out. • Unit synchronized on 25.07.2018. • Unit was stopped at 14:50 hrs. on 29.07.2018 due to abnormal sound in MIV bypass valve. On inspection it was found that bypass valve was stuck in open condition. M/s AHPL agreed to replace the bypass valve. • During performance guarantee test, Guide vane was hunting continuously. After dismantling it was observed that runner bearing was damaged, hence opening and closing of runner blade was not possible. • Unit synchronized on 04.08.2018. • On 11.08.2018, Unit tripped on operation of Generator protection relay and Generator transformer protection relay and it was found that 66KV "B" phase bushing of GT had failed. The work of replacement of faulty bushings of Unit-1 Generator transformer and testing & commissioning of transformer was entrusted to Shree Abhirami Engineering works. The agency completed the works and the transformer was charged on 22.11.2018. • As per KNNL requirement, Unit-2 was taken in to service on 09.01.2019. Unit stopped, as the Jack brass bushes were broken in to pieces. Hence, brake jacks were released manually & Unit was started and synchronized. Unit stopped

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
				on 11.01.2019 as per KNNL requirement. The work of replacement of burnt brass bushes were taken up. - Unit-1&2 taken in to service on 30.01.2019 and 31.01.2019 respectively as per KNNL requirement. - River bed Units 1&2 are under shutdown as per the requirement of Karnataka Niravari Nigama Ltd (KNNL). The units will be taken in to service depending on water availability.
33.	Munirabad Dam Power House, 2x9 MW (U-1&2) 10 MW (U-3) KPCL 1962(U-1&2) 1965 (U-3) T-Hitachi Ltd, Japan G- U-1&2: Hitachi U-3: VoestAlpine, Austria R&M 2018-19	- 4.60 -	Generator protection and DCS based SCADA system for Unit 1,2&3.	Contract agreement was signed with M/s ABB India Ltd. on 04.05.2018. Inspection of DCS for Unit & common auxiliaries, unit & LTAC metering panel, controls & protection panels, ACDB & DCDB panels is completed and Dispatch instructions issued for the same. Joint inspection of all panels carried out at site for supplied items. Manufacturing clearance issued for Generator metering & control panel of Unit-4(To provide complete station SCADA). Inspection of Cables completed & dispatch instructions issued. Review of CT & NCT's is in progress. e- tender for 2 nos 11 kV Tee-off cubicle of Units 1&2 and 11kV Gescom-UAT switchgear cubicle refloated twice. Single bid received and also bidder does not qualify Pre-Qualification Requirements (PQR). PQR & other terms of tender modified after discussions with prospective bidders & Fresh tender with revised PQR was floated on 29.03.2019 in e-portal.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
34.	Nagjhari, U-1 to 3, 3x150 MW KPCL 1979 (U-1), 1980 (U-2), 1981 (U-3) T&G - BHEL RM&LE 2021-22	450 (LE) 222 -	R&M of Turbine of Unit-1, 2 & 3. Supply of major components, spares of turbine like Top cover, Pivot ring, labyrinth, MIV seals, guide vanes, aeration valves, runner, guide apparatus, GV servomotor regulating ring, rotary valve, shaft coupling bolt, spare guide vanes, runner & shaft etc. (Generator related works carried out in earlier R&M) Replacement of 6 nos. of Unit Auxiliary Panels (UAPs) and retrofitting of 4 nos. breakers, replacement of electro-mechanical relays by numerical relays in 5 incomers, bus coupler & 4 nos. outgoing feeders in common auxiliary panel. SCADA	• KERC accorded approval. • Replacement of Generator gauge panel, Brake & Jack assembly, oil coolers, thrust collar, unit auxiliary panels, Generator coupling bolts, High Pressure lubrication system, replacement of Lower End Bearing is planned in phased manner. • Mid-term life assessment of 245kV Circuit Breakers and procurement of 245kV CTs is planned. • Replacement / Refurbishment of Turbine components, MIV & its auxiliaries is planned in phased manner. • Order placed on M/s BHEL on 24.02.2018 for Rs. 99.25 Crores (Excluding taxes, freight and insurance) for Turbine, MIV, Governor & its accessories for Units 1,2, & 3. Drawings/ documents under review. • Part material received at site. • Order placed on M/s Balaji Electro Controls Pvt. Ltd. on 19.05.2018. • Supply of equipments completed. Erection and commissioning works of UAPs for Units 2, 3 & 4 completed. This includes erection & commissioning of Auto sequencer, installation of Dynamic disturbance recorder, online vibration monitoring system planned in phased manner, fire protection system, Commissioning of Thermo signaling devices in addition to RTD's, replacement of hydraulically operated valves by electrically operated Solenoids.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
35.	Shivasamudram Hydro Power Station, 6x3 MW 4x6 MW KPCL 1920-38 T - Boving, UK (U1 to U6) Escher Wyess, Switzerland (U7 to U10) G - GEC, USA RM&LE 2021-22	42 (LE) 146.41 -	R&M of Turbines, Governor & Excitation system, improvements in water conducting system, Control and relay panels and SCADA. Design, detailed engineering, supply, retrofit, erection, testing and commissioning of 66kV switchyard equipments, materials and spares for strengthening of 66kV switchyard. (Generator related works carried out in earlier R&M)	Contract agreement with M/s AHPL (OEM) for supply of Turbine & its auxiliaries, Excitation system, governing system, SCADA system, Controls & protection system, signed on 31.01.2019 and Kickoff meeting held on 27.02.2019. Order placed on M/s GE T&D India LTD. for Rs. 2,66,15,960/- on 23.02.2018. Material received at site and Erection to be taken up.

B - SCHEMES ONGOING - Under Tendering - STATE SECTOR (KPCL)

36.	Kadra Dam Power House, (3x50MW) KPCL 1997-1999 T&G - BHEL RM&LE 2021-22	150 (LE) 44.47 -	• Turbine - Replacement of runner cones, guide vane servo motor, pressure oil supply valves, cooling water supply valves, refurbishment of top/bottom surface of pivot rings, turbine top cover, runner blades, blade seals, runner chamber, draft tube, turbine guide bearing. Cleaning & painting of inside surfaces of underwater parts. • Generator - Replacement of air coolers, cleaning of stator winding, stator core & frame assembly, tightening of wages, rotor pole assembly, break pad assembly, replacement of UAP, ACDB and CAP. • 220kV Switchyard - Replacement of breakers, protective painting of switch yard structures. • Relays and control panels - replacement of numerical relays of control panels, GT panel, auto synchronous panel. • SCADA - New SCADA System is to be implemented.	KERC accorded approval. M/s BHEL furnished Techno-commercial offer for Turbine and Generator works. Presently works were deferred as the units are running smoothly with regular routine preventive & annual maintenance works. Cost estimate and technical specifications for UAP, ACDB and CAP replacement prepared and under administrative approval. Financial bid for procurement of breaker opened. PO to be placed on M/s ABB. Administrative approval availed to issue NIT for revised scope of works. Preparation of technical specification is in progress.
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S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
			- Excitation system - Replacement of excitation system, digital voltage regulator. - Battery Charger - New battery charger with battery bank DC source for Main I & II protection is to be commissioned as per SRPC guidelines to maintain two sources of DC for Main I & Main II. - Civil works: Repair works of power channel side walls, bed, collapsed abutments and piers of foot bridge and aqueduct cum bridge.	Contract agreement signed with M/s ABB India Ltd. on 27.06.2018. SES Panel received at site after inspection. Commissioned in Unit- 2&3 and erection works to be taken up in Unit-1. Work yet to be taken up. Work yet to be taken up.
37.	Kodasalli Dam Power House, (3x40MW) KPCL 1998-1999 T&G - BHEL RM&LE 2021-22	120 (LE) 50.60 -	- Turbine - Replacement of runner cones, guide vane servo motor, pressure oil supply valves, cooling water supply valves, refurbishment of top/bottom surface of pivot rings, turbine top cover, runner blades, blade seals, runner chamber, draft tube, turbine guide bearing. Cleaning & painting of inside surfaces of underwater parts. - Generator - Replacement of air coolers, cleaning of stator winding, stator core & frame assembly, tightening of wages, rotor pole assembly, break pad assembly, replacement of UAP, ACDB and CAP. 220kV Switchyard - Replacement of breakers, protective painting of switch yard structures. - Relays and control panels - replacement of numerical relays of control panels, GT panel, auto synchronous panel. - SCADA - New SCADA System is to be implemented.	KERC accorded approval. M/s Techno-commercial offer for Turbine and Generator works. Cost estimate and technical specifications for UAP, ACDB and CAP replacement prepared and under administrative approval. Financial bid for procurement of breaker opened. PO to be placed on M/s ABB. Cost estimation & Technical Specification under preparation. Cost estimation & Technical Specification under preparation.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
			- Excitation system - Replacement of excitation system, digital voltage regulator. - Battery Charger - New battery charger with battery bank DC source for Main I & II protection is to be commissioned as per SRPC guidelines to maintain two sources of DC for Main I & Main II.	Contract agreement signed with M/s ABB India Ltd. on 27.06.2018. SES Panel received at site after inspection. Unit-1 commissioned and Unit-2&3 to be taken up. Work yet to be taken up.
38.	Linganamakki Dam Power House (LDPH), (2x27.5MW) KPCL 1979-1980 T – Electrosilla, USSR G - Electrosilla, Energomach-USSR RM&LE 2021-22	55 (LE) 56.20 -	- Major civil works proposed. Replacement of seals of penstock gates proposed. - Replacement of damaged runner cone - Refurbishment of turbine and associated equipment's. - Refurbishment of generator along with replacement of air coolers. - Replacement of relays with numerical relays meters proposed. Line protection panels & DCS based SCADA system.	KERC accorded approval. Out of proposed major civil works, drilling and grouting in the masonry portion of Linganamakki dam which includes shotcreting, plugging of suction points are in progress. Techno-commercial offer furnished by M/s Voith & M/s GE for Turbine and generator works were reviewed. Contract Agreement signed with M/s ABB Limited for Rs. 2,45,97,408/- on 23.01.2018. Supply of Plant SCADA, DCS for Unit & common auxiliaries, Network & metering panel, Line & Bus coupler C&R Panel, ACDB & DCDB, UPS System, Modular desk, Cables, GPS, LVS, energy meter & EMS etc., completed. Erection & commissioning of panels for Bus coupler & line (1 no.) is completed. Erection of panels for balance lines is in progress. Presently works were deferred as Turbine & Generator parts & accessories are in good condition. Requested for Execution of some of the works & procurement of spares from site itself.

[illegible]

C - SCHEMES ONGOING - Under DPR Preparation/ Finalisation/ Approval - STATE SECTOR (KPCL)

40.	MGHE (Mahatma Gandhi HE), 4x13.2 MW (St.I) 4x21.6 MW (St.II) KPCL 1947-52 T - Boving, UK G - BTH, UK(St.I) G - GE, USA(St.II)	139.2 (LE) 97 -	Hydro- Mechanical Works Refurbishment works of penstock intake gates & trash racks, replacement of stop log gates and refurbishment of penstocks etc. Turbine and Inlet valve Refurbishment of butterfly valves, over velocity devices installed on penstocks, procurement of spare bearing shells, capital overhauling of turbine components along with the replacement of damaged parts etc. Generator and its auxiliaries Refurbishment of generator components along with air coolers, Fire protection system with non CO₂ gas system (Clean gas based) for generators, replacement of relays with numerical relays etc. Complete renovation of outdoor	DPR sent to KERC & all ESCOM's on 24.12.2018.
	RM&LE 2021-22			Order placed on M/s GE T&D

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
			110kV switchyard with all line and unit bays. R&M of trolley system for PH approach along with civil and electrical works. The transformer oil draining system along with draining sump, power house safety and firefighting equipments, lighting system. Replacement of 8 Nos. Generator Transformer. Civil works Repair works of power channel side walls, bed, collapsed abutments and piers of foot bridge and aqueduct cum bridge.	India LTD. at a cost of Rs. 8.63 crores towards supply portion, Rs. 2.77 crores towards erection & Commissioning, Rs, 87,40,00/- towards Civil works. All the drawings except Tower foundation drawings approved. At Stage-I, major materials inspected and dispatch clearance issued. Dismantling works completed. Revised Estimates for additional tower foundations works prepared. Civil works started on 27.12.2018. In the first phase replacement of 1st stage 4x16.5MVA GTs taken up. Contract agreement signed with M/s Toshiba on 22.11.2018 and supply to be completed by August, 2019. Stage Inspection on CRGO mother coils carried out on 18.03.2019 and on tank (i.e. pressure & vacuum test) carried out on 23.03.2019. Replacement of 2nd stage 4x27 MVA GTs will be taken up during 2019-20.
41.	Supa Dam Power House, (2x50MW) KPCL 1985 T&G - BHEL RM&LE 2021-22	100 (LE) 47.91 -	Electro-mechanical Works: Turbine - Refurbishment of underwater turbine components. Generator and its auxiliaries- Replacement of air coolers, flow meters for cooling water system. Inspection of Stator & Rotor. • 110kV Switchyard, UAP & CAP- Replacement of breakers, Station 11 kV UAT switch gear panels. • SCADA -All instrumentation and field devices of E&M equipment, New annunciation system for units, auto & manual synchronizer and	KERC accorded approval. Consent of state distribution companies awaited for starting of works. Order placed on M/s Balaji Electro Controls Pvt. Ltd. on 19.05.2018. GA, SLD & schematic drawings approved. Supply of panels, spares & networking equipments completed in Nov'18. Erection work to be taken up after clearance from LDC.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
			temperature recorder at machine hall, etc. - Other systems: New smoke detectors & MVWS system for cable ducts, new battery charger with battery bank, overhaul/Reconditioning GT(spare), Renovation of emulsifier system of Unit 1 & 2, etc. - Auxiliary & Colony Power Supply- Providing auxiliary supply for power house and extending power supply to Ganeshgudi colony from Supa Power House. Civil works: - Protection to upstream reservoir left and right banks (Left bank), Improvement to eroded portion below gabions at left and right bank downstream, providing shotcrete to hillock portion at Left bank upstream side of Supa Dam, etc.	Order placed on M/s RR Durafabs Pvt Ltd., Hyderabad, at a cost of Rs. 3.15 crores. Drawings approval, Inspection of equipments & issue of dispatch clearance is in progress.
42.	Sharavathy Generating Station, (10x103.5MW) KPCL 1964-77 T- U:1-8 - Neyrpic, France, U:9-10- BHEL, G- U:1&2-Hitachi, Japan, U:3to8 –GE Co, USA, U:9&10- BHEL, RM&LE 2021-22	1035 (LE) 196.56 11.07	Electro-mechanical works: Overhauling of all spherical valves. NDT tests on turbine components and R&M works. Replacement of instruments compatible to SCADA, etc. Generator and associated components: General checking and replacement of air coolers/ tubes. R&M of SEE. Other works: Uprating/ redesign of NGT to suit uprated capacity. Providing 2x115 MVA transformer for Unit-9 & 10. Hydro-mechanical Works: Overhauling of tunnel Stop log gates, Gates and gantry crane of surge shaft, R&M of BF valves, Civil structure (rails) for movement of gantry crane, cleaning and painting of internal and exterior surfaces of all	KERC accorded. Consent of state distribution companies awaited for starting of works. GT of Unit-10 commissioned on 28.02.2018 and GT of Unit-9 commissioned on 30.03.2018.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
			penstocks, etc. Civil Works: Under water scanning, plugging, Drilling, grouting to Talakalale Dam, Improvements and Asphalting to roads, etc.	

**State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power
Stations for completion during 2017-22**

SOUTHERN REGION

KERALA

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
A - SCHEMES ONGOING - Under Implementation - STATE SECTOR (KSEB)				
43.	Sholayar, 3x18 MW KSEB 1966-68 T-Litostroj, Yugoslavia G-Rade Koncar, Yugoslavia RM&LE 2019-20	54 (LE) 199.55 45.24	Replacement of Butterfly Valve, Penstock pipes, Turbine & PRV, Governors, Stator & Rotor windings with Class F insulation, Excitation System, Control & Protection, 11 kV panels, LT distribution system, DC Panel, Switchyard equipments and Power Transformers.	Renovation of Generating Equipments: Order placed on M/s FEPL-FUYUAN on 06.07.2015. Model test of the turbine conducted. Dismantling of Unit-3 completed. Supply of equipment completed. Inspection of Drainage and Dewatering system of all machines completed. Governor system remote control panels erected in control room. 11kV control room completed. Boxing up of Generator completed. Generator & Turbine alignment done. SCADA panels erected. Thrust Upper Guide Bearing (UGB) & Lower Guide Bearing (LGB) setting completed. Field Acceptance test of Control & Relay panel completed. Inspection of one Generator done. Drainage and dewatering system of all machine completed. MIV & Guide Vanes stroking checked. Pre commissioning of Governing system done. Panel loop testing completed. Compressor Airline work completed. Relay testing before mechanical spinning completed. Mechanical spinning done and Balancing completed. Trial run completed and machine in service. MIV: Erection completed. Renovation of Penstock: Penstock and allied works awarded to M/s PES Engineering Pvt. Ltd., Hyderabad on 31.03.2017. Dismantling of penstock of Unit - 3 completed. Fabrication of penstock is in progress. All works completed for Unit-3. Works of Unit-1&2 will be taken up after completion of Unit-3 works.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
44.	Idukki 1st Stage, 3x130 MW KSEB 1975-76 T - Neyrpic, France G - GE, Canada R&M 2019-20	- 89.9 36.95	Refurbishing the Main Inlet Valves, modernizing the auxiliary systems, replacement of Governing Systems & Excitation Systems with new PLC. Introduction of SCADA control. Procurement of one no. MIV. Installation of new D.G. Set. Renovation work of fire fighting system of Generator and Generator Transformers of 1st and 2nd stage.	The Board decided to go for retender since requirement could not be met by the L1 Bidder. Only M/s ALSTOM (Now GE), participated in the tender. The work of modernizing the auxiliary system, replacement of switchyard equipment's, replacement of Governing system, Excitation system, Introduction of SCADA and renovation works of fire fighting system of Generator and Generator Transformers of both of 1st and 2nd stage units were awarded to M/s GE Power. Detailed Engineering almost completed. 90% material arrived at site. Most of the Drawing approvals issued. Unit-3 handed over to M/s GE Power on 17.06.2017. Protection panel replacement & Bus coupler completed. Installation of 7.5kV Auxilliary Uninterrupted Power Supply (AUPS) panel positioning completed. Panel positioning of Unit-1, CB and governor cubicle completed. Positioning of cable protection panels at switchyard completed. Installation of stator air coolers completed. Mechanical spinning over. Works of Unit-3 completed on 16.03.2019 and handed over to KSEB. Works for Unit- 2&3 are scheduled to begin from June'2019 and August'2019 respectively. The manufacturing of MIV completed by M/s HBHC, China and dispatch clearance issued. Completed. Completed.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
B - SCHEMES ONGOING - Under Tendering - STATE SECTOR (KSEB)				
45.	Kuttiyadi, 3x25 MW KSEB 1972 T&G-Fuji, Japan RMU&LE 2021-22	75 (LE)+ 7.5 (U) 377.41 -	Inspection and rectification of Trash rack. Butterfly valve operation to be made electrically and mechanically with remote. New penstock, MIV replacement with PLC controls. PMG replacement with SSG. Pelton turbine runner's replacement. Replacing Generators, Static excitation with AVR. Replacing Cooling water system. Replacement DG set. Integrated SCADA, New fire protection system, Store and AC system modification of switchyard. New 11 kV switch gear	The Board decided to entrust M/s. AHEC, IIT Roorkee for conducting RLA study on the generating unit. RLA report submitted in October 2013 didn't mention about the uprating of the existing units. Further RLA study was conducted to explore the possibility of uprating the units and final report submitted to KSEB. DPR approved on 14.06.2017. Technical specification for E&M works finalized. Tendering is in progress.

**State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power
Stations for completion during 2017-22**

SOUTHERN REGION

TAMIL NADU

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
A - SCHEMES ONGOING - Under Implementation - STATE SECTOR (TANGEDCO)				
46.	Sholayar PH-1, 2x35 MW TANGEDCO 1971 T - Litostroj, Yugoslavia G - Rade Koncar, Yugoslavia RMU&LE 2019-20	70 (LE)+ 14(U) 90.44 42.17	Replacement of stator core & winding, rotor winding, poles, Excitation system, governing system, Runner, guide vanes, cooling water & De-watering systems, Generator Transformers, Generator protection, LT switch gear, lubrication system, 11 KV LAVT, Neutral Grounding Transformers, Annunciation system, power and control cable, UAT, fire-fighting system for generator, yard, cable gallery yard. Refurbishment of turbine inlet valves and Butterfly valves, Air admission system, brake & jack and bearings.	Contract Agreement signed with M/s Andritz Hydro Private Limited (AHPL), Haryana on 21.07.15. <u>Works Completed</u> Reverse Engineering works of Machine-2 completed. The machine was synchronized after Reverse Engineering and achieved 33 MW of load on 01.04.16 with satisfactorily performance. The works of Unit-I completed and commercial operation commenced on 29.10.2018. Unit-II has been handed over to M/s. AHPL on 12.11.2018.

State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations for completion during 2017-22

EASTERN REGION

ODISHA

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
A - SCHEMES ONGOING – Under Implementation - STATE SECTOR (OHPC)				
48.	Hirakud-I HEP (U5&6), 2x37.5 MW OHPC Ltd. 1962-63 T&G - Hitachi, Japan RMU & LE 2019-20	75 (LE)+ 12.2 (U) 158.77 68.32	Replacement of i) The Turbine & Generator with new ones except the embedded parts. ii) The auxiliaries of the Unit including the common auxiliaries. iii) Existing Governor with micro-processor based Digital Governor. iv) Exciter and AVR with Static Excitation System. v) New Thrust bearing pads self-lubricated PTFE Type. vi) C&I system. vii) Protection system by state of the art Numerical Relays. viii) New 55 MVA, 11/132 kV Generator Transformer. ix) Power and control cable with FRLS type cable. x) Architectural works including interior decoration of Power House. xi) Refurbishment of Intake gates and Draft Tube gates.	The contract agreement signed with M/s Voith Hydro Pvt. Ltd on 16.10.2015. OHPC engaged M/s WAPCOS Ltd. as consultant. <u>Completed works (Unit 6):</u> - Refurbishment of Draft Tube gates. - Dismantling of Generator, Turbine and Auxiliaries. - Drainage & Dewatering Pump installation. - HV test on stator winding. - Concreting of Turbine HPU area. - By pass valve replacement. - Bus duct & GT installation. - Sand blasting and painting of intake gate. - Ultrasonic test & DP test on existing stay vanes - Core magnetization. <u>Works under progress (Unit 6):</u> - Refurbishment of intake gate. - Refurbishment of spiral case, barrel and discharge ring. - Supply of different E&M and HM equipments. - Cable tray installation. - Piping work of Cooling water system and compressed air system. - Stator building. <u>Completed works (Unit 5):</u> - Refurbishment of Draft Tube gates. - Dismantling of Generator, Turbine and Auxiliaries. - By pass valve replacement. - Sand blasting and painting of intake gate. - Drainage & Dewatering Pumps installation - Bus duct & GT installation. - Ultrasonic test & DP test on existing stay vanes. - Core magnetization. <u>Works under progress (Unit 5):</u> - Refurbishment of intake gate. - Dismantling of runner.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
				- Supply of different E&M and HM equipments. - Stator Building. - Cable tray installation. - Piping work of Cooling water system and compressed air system.
49.	Hirakud-II (U-3) (Chiplima), 3x24 MW OHPC Ltd. 1964 Unit-1&2 T-JM Voith, Germany G-Hitachi, Japan Unit-3 T-LMZ, USSR G-Electrosila, USSR RM&LE 2019-20	24(LE) 65.67 35.01	Replacement of i) The Turbine & Generator with new ones except the embedded parts. ii) The auxiliaries of the Unit including the common auxiliaries. iii) Existing Governor with micro-processor based Digital Governor. iv) Exciter and AVR with Static Excitation System. v) New Thrust bearing pads self-lubricated PTFE Type. vi) C&I system. vii) Protection system by state of the art Numerical Relays. iii) New 30 MVA, 11/132 kV Generator Transformer. ix) Power and Control cable with FRLS type cable. x) Architectural works including interior decoration. Refurbishment of Intake gates and Draft Tube gates.	The Contract Agreement was signed with M/s Voith Hydro Pvt. Ltd. on 15.10.2015. OHPC engaged M/s WAPCOS Ltd. as consultant. Works Completed: - Manufacturing & supply of almost all equipments. - Dismantling of the Turbine and Generator. - Refurbishment of Intake Gate and Draft Tube gates. - Discharge ring welding, concreting, machining and surface finishing. - Machining of bottom ring facing plate. - Stator placed inside the generator pit. - Control panel positioned in control room. - LAVT, NGT, Protection panel, Excitation panel Excitation Transformer, Unit Auxiliary Board, DC Distribution Board, UAT have been place in respective locations. - Installation of Drainage & Dewatering Pump system. - Generator Transformer erection. - All guide vanes installed. - Cable tray installed. - Dry commissioning of UAB & DCDB. - Air line erection completed for Brake/Jack system. - Lowering of assembled Runner with inner head cover completed. - Lowering of Upper and Lower Bracket and installation of thrust collar completed. - Cooling water pipe line installation including header completed. Works under progress: - Piping work of Fire-fighting system and HS Lubrication is under progress. Pre-alignment works and Instrumentation work of turbine and Generator, Control cabling works and checking of control circuits is under progress.

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
50.	Balimela, 6x60 MW OHPC 1973-77 T-LMZ, USSR G- Electrosila, USSR RM&LE 2021-22	360(LE) 382.91 18.16	Replacement of i) The Turbine & Generator with new ones except the water conductor system. ii) The auxiliaries of the Units including the common auxiliaries. iii) Existing Governors with micro-processor based Digital Governor. iv) Exciter and AVR with Static Excitation System. v) New Thrust bearing pads self-lubricated PTFE Type. vi) C&I system. vii) Protection system by state of the art Numerical Relays. viii) Replacement, 11/220 kV Generator Transformer, Bus Duct system. ix) New Station Auxiliary Transformer. x) Control Power cable with FRLS type cable. xi) Architectural works including interior decoration of Power House. xii) Extension of 1No. 220kV bay in Switchyard. Refurbishment of Intake gates, Draft Tube gates and civil works.	Contract Agreement signed with M/s BHEL on 21.09.2016. M/s BHEL took over the units on 18.12.2017. OHPC engaged M/s WAPCOS Ltd. as consultant. Works Completed: - Dismantling of Unit-1&2 completed. Works under progress: - Refurbishment work of spiral casing, stay ring and stay vanes of Unit 1&2. - Refurbishment work of Safety Relief Valve/ Main Inlet Valve (SRV/ MIV) and Butterfly Valve (BFV) of Unit 1&2 is in progress. - Refurbishment of Draft Tube gate of Unit 1 under progress. - Installation/trial assembly of pivot ring (bottom ring) of Unit 1&2 is under progress. - Shot blasting of penstocks of Unit-1 is under progress.

**State-wise Programme/Status of Renovation and Modernisation Schemes of Hydro
Power Stations for completion during 2017-22**

EASTERN REGION**WEST BENGAL****(Amount in Rs. Crores)**

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
C - SCHEMES Ongoing - Under DPR Preparation/ Finalisation/ Approval - CENTRAL SECTOR (DVC)				
51.	Maithon U-1&3, 2x20 MW + 1x23.2 MW DVC 1957-58 T - Neyrpic, France G - Siemens, W.Germany RM&LE 2021-22	40 (LE) 56.034 7.76	1. Scope to be prepared based on DPR. 2. Replacement/ refurbishment of the Governing System & Unit control cum protection system of Units- 1,2&3. 3. Renovation work of 132/33 kV Switchyard.	Work order for RLA study, uprating study, preparation of DPR, specification etc. placed on M/s MECON on 11.04.2019. Preparation for isolation of turbine is under progress to facilitate the work. NIT floated on 27.02.2018 for upgradation of Control and Governing system of all the units. Tender cancelled on 10.10.2018 due to technical problem during e-reverse bidding. NIT for re-tender issued on 26.03.2019. Bid to be opened on 30.04.2019. DVC has completed the work of renovation of Maithon switchyard at a cost of Rs 6.98 Crs.

**State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro
Power Stations for completion during 2017-22**

NORTH EASTERN REGION

MEGHALAYA

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
C – SCHEMES ONGOING – Under Tendering -STATE SECTOR (MePGCL)				
52.	Umiam Stage-III, (Kyredemkulai) 2x30 MW MePGCL 1979 T&G - BHEL RMU & LE 2021-22	60(LE) +6(U) 408 -	Mech. Equipments (Turbine & its auxiliaries) : - Replacement of Runners, head cover & bottom ring, facing & wearing rings. Guide vanes, guide vane servomotor & gate operating mechanism. Guide bearings, coolers & bearing housing, turbine shaft, shaft seal & sealing box. Upper draft tube & draft tube liner. Inlet valve along with its servomotor & by-pass valve. Governor and turbine control system, oil pressure supply system, compressed air supply system, cooling water supply, drainage & dewatering system, auxiliary machine control etc. - Refurbishment of spiral case and stay ring, penstock & by-pass valve etc. Civil & Hydro Mechanical Work - Site Installation - Low Pressure Grouting and lining - Repair of Pressure Tunnel - Steel liner Installation - Recoating of penstock - Repair of trash rack and link tunnel - Repair of intake gate - Repair of trash rack - Repair of radial gate - Investigation and Rehabilitation of Dykes and other related item.	The feasibility study was conducted and completed by JV of TEPSCO & TEPCO, Japan under JETRO grant and IIT Roorkee submitted head measurement studies. An updated DPR as per CEA's recommendation was prepared by MePGCL and posed the scheme for JICA funding through MoP. The Department of Economic Affairs vide letter dated 20.10.2016 requested to confirm the 20 percent Counterpart Funding of the state and also provide the debt sustainability confirmation/ self-certification in respect of the 10 percent loan component of the external assistance of 80 percent of the project cost. The JICA study team, visited Shillong from 2nd to 7th October, 2017, as part of the "Preparatory Survey". After completion of the preparatory study, Minutes of Discussion signed among MePGCL, MoP and JICA. Bids opened on the 28.01.2019. Only two firms submitted their proposal, i.e M/s Tokyo Electric Power Services Co. Ltd. in JV with Nippon Koei Co. Ltd and M/s Integral S.A. in JV with Rodic Consultant Pvt. Ltd. The Technical Evaluation Report was prepared and the same was approved by the Board on 20.03.2019 and the report was sent to the JICA India office on 08.04.2019 for their concurrence.

			Elec. Equipments (Generator & its auxiliaries): - Replacement of stator cores, stator windings & neutral leads. Rotor spoke & rim, rotor winding & excitation leads & rotor pole, Shaft, thrust & guide collars, thrust runner, coupling bolts & coupling cover. Thrust bearing pads. Segment type upper & lower guide bearings and oil coolers. Brake ring & brake/jack system, air cooler, current transformers, fire protection system, instruments & relays, terminal boxes on control cubicle, all cables, AC excitation system, digital AVR & excitation cubicle, excitation transformer etc. - Refurbishment of upper & lower bearing brackets, top cover, hood and air housing - Replacement of 11 KV metal enclosed cubicles & unit auxiliary transformers, station battery bank & charger etc. - Replacement of generator transformer & instruments, station service transformers, control and protection boards etc. - Replacement of motorized disconnecting switches, CTs, PTs, conductors & accessories for 132 KV switchyard. - Replacement of 12 KV power cables, 600 V power cables, control cables, paint etc.	
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State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations for completion during 2017-22

NORTH EASTERN REGION

ASSAM

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
C – SCHEMES ONGOING – Under DPR Preparation/ Finalisation/Approval -STATE SECTOR (NEEPCO)				
53.	Khandong Power Station, 2x25MW NEEPCO 2021-22 RM&LE	50 (LE) 196.70 12.71	i) Activities covering main equipment i.e. Turbine, Generator, GTs and other plant equipment. ii) Activities for integration of control, monitoring and protection system of power plant such as Electronic/ Digital Governors, SCADA SAS etc. iii) Renovation of Switchyard with capacity enhancement along with replacement of instrument transformers of higher accuracy class, PI, LA, SST etc. iv) Activities having direct impact on improvement of generation efficiency machine availability etc.	DPR from CPRI, Bangalore received in the month of June'2018. Estimated cost of Rs. 196.70 crores as per DPR of CPRI is being studied for financial feasibility. Hydro-technical aspects are being reviewed to optimize the plant output while maintaining a techno-economic balance. Design energy given in the DPR is under review. Detail engineering on the scope of the works is in the process.

**State-wise Status of R&M Schemes
(During 2022-27)**

State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations during 2022-27

NORTHERN REGION

JAMMU & KASHMIR

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
B - SCHEMES ONGOING - Under DPR Preparation/Finalisation/Approval - STATE SECTOR (J&KSPDC)				
1.	Lower Jehlum HEP, 3x35 MW J&KSPDC 1978-1979 T&G – BHEL RMU&LE 2022-27	105(LE) + 27(U) - NIL	Detailed scope of work will be arrived after Preparation of DPR.	DPR to be prepared in due course.
2.	USHP – II Kangan, 3x35 MW J&KSPDC 2000-2002 T&G – BHEL RM&LE 2022-27	105(LE) - NIL	Detailed scope of work will be arrived after Preparation of DPR.	

State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations during 2022-27

NORTHERN REGION

UTTARAKHAND

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
B - SCHEMES ONGOING - Under DPR Preparation/Finalisation/Approval - STATE SECTOR (UJVN LTD.)				
3.	Chibro, 4x60 MW UJVN LTD. 1975 (U-1 to 3) 1976 (U-4) T&G – BHEL RM&LE 2025-26	240(LE) 184.88 NIL	- Refurbishment of Turbine, four nos. new runners & one spare runner, new sets of guide vanes. - Repairing of various gates and gantry cranes. - Major overhauling of EOT crane. - Replacement of trash rack & provision of trash cleaning mechanism. - Refurbishment of generators with new F class insulated stator and rotor winding. Replacement of 220 kV oil filled cable by XLPE cable. Replacement of ageing parts of 220 kV & 33 kV Switchyard, 220 kV ABCBs by SF6 Circuit Breakers, 11 kV Switchgear. Installation of numerical type protection system. - Civil works of Dam, HRT, Surge tank, Power Station	• Board accorded approval for cancellation of KfW funding. • DPR to be revised based on present price level and specifications are to be reframed. • These two projects are proposed to be taken up for RMU after completion of RMU works of Dhakrani HEP and Chilla HEP.
4.	Khodri (PH-B), 4x30 MW UJVN LTD. 1984 T&G – BHEL RM&LE 2025-26	120(LE) 169.63 NIL	- Refurbishment of turbine, four nos. new runners & one spare runner, new sets of guide vanes. - Repairing of various gates and gantry cranes. - Refurbishment of generators with new F class insulated stator & rotor winding. - Replacement of ABCBs by SF6 breakers, 11 kV Switchgear. Installation of numerical type protection system. - Civil works of power station, HRT, TRC & surge shaft.	
5.	Kulhal, 3x10 MW UJVN LTD. 1975 T&G - BHEL RM&LE 2023-24	30(LE) 115.24 NIL	-Replacement of turbine, new governors, new sets of guide vanes. Repairing of various gates and gantry cranes. -Refurbishment of generators with new stator core and new class F insulated stator & rotor windings. New SEE, Replacement of 11 kV Switchgear. Installation of	• LoI issued to M/s Gogoal-Emico (Consortium) on 04.03.2014. UERC declined approval vide order dt. 13.03.2015 with the advice that on account of obsolescence of protection equipment, suitable proposal be mooted. UJVNL approached commission with suitable

			numerical type protection system. -Civil works of barrage, power channel, power station & Tail race channel	modifications. However, UERC declined Investment approval due to better availability of the machines. • Appeal has been filed in the Appellant Tribunal New Delhi.
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State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations for completion during 2022-27

SOUTHERN REGION

KERALA

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
A - SCHEMES ONGOING - Under RLA Studies - STATE SECTOR (KSEB)				
6.	Idukki 2nd Stage, 3x130 MW KSEB	390 (LE) - -	Detailed scope of work will be arrived after finalization of specification based on RLA study report.	RLA studies to be taken up in due course.
	RM&LE			
	2022-27			

**State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power
Stations for completion during 2022-27**

SOUTHERN REGION

ANDHRA PRADESH

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
C- SCHEMES ONGOING - Under DPR Preparation/ Finalisation/ Approval - STATE SECTOR (APGENCO)				
7.	Machkund, 3x17 MW (St.-I) & 3x23 MW (St.-II) APGENCO 1955-56 (St.-I) & 1959 (St.-II) St.-I: T - M.Smith, USA G - W.House, USA St.-II: T - J.M.Voith, W. Germany G - Westing House, USA RMU&LE 2025-26	120 (LE)+ 9 (St.-I) (U) 400 -	Replacement of entire equipment except concrete embedded parts. Note: Three units of Stage-I each rated at 17 MW are proposed to be uprated to 20 MW.	The Govt. of AP & Govt. of Odisha mutually agreed for carrying out RM&U by sharing the costs & benefits in the ratio of 50:50. Draft modified agreement copy submitted to GoAP for approval towards signing of agreement by both The Govt. of AP & Govt. of Odisha. Also, the transfer of assets of Machkund HES from Govt. of AP to APGENCO is under progress to enable to take up RM&U by APGENCO. M/s Voith Hydro Pvt. Ltd. inspected the Units from 12.11.2018 to 14.11.2018 and submitted their budgetary offer along with detailed scope of works. Offer submitted by M/s Voith was found to be on higher side. Revised offer from M/s Voith is awaited. DPR will be prepared after receiving revised offer. In Machkund HEP, Stage-I Units were running at derated capacity of 16 MW and Stage –II Units were running at derated capacity of 21 MW against its original capacity of 17 MW and 23 MW.

State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations for completion during 2022-27

SOUTHERN REGION

ANDHRA PRADESH

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
C- SCHEMES ONGOING - Under RLA Studies - STATE SECTOR (APGENCO)				
8.	Tungabhadra HE(J) Scheme, (4x9 MW) APGENCO 1957-64 Unit-1&2 T-Escherways, Zurich G- Browin Bovert, Switzerland Unit-3&4 T- Hitachi, Japan G- Toshiba,Japan RM&LE 2025-26	36 (LE) 100 -	Replacement of entire equipment except concrete embedded parts.	Tender floated for carrying out RLA Study on one Unit of TB Dam Power House & one Unit of Hampi power house. M/s Andritz Hydro Pvt. Ltd. inspected units from 22.11.2018 to 23.11.2018 for assessment of scope of works and submitted budgetary offer along with detailed scope of works on 27.03.2019. DPR will be prepared after obtaining budget Sanction from Government of Andhra Pradesh.
9.	Hampi Canal PH, (4x9 MW) APGENCO 1958-64 Unit-1&2 T-Charmilles, Switzerland G- Browin Bovert,Switzrland Unit-3&4 T- Hitachi, Japan G- Toshiba,Japan RM&LE 2025-26	36 (LE) 100 -		

**State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power
Stations for completion during 2022-27**

SOUTHERN REGION

TAMILNADU

(Amount in Rs. Crores)

S. No.	Scheme/ Category Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
A - SCHEMES ONGOING - Under Tendering- STATE SECTOR (TANGEDCO)				
10.	Moyar PH, 3x12 MW TANGEDCO 1952-53 T – Boving,UK G -Metropolitan Vickers, UK RMU&LE 2023-24	36 (LE)+ 6 (U) 67.05 Nil	Planning, design, model testing, engineering, manufacture, procurement/ supply of new components and spares at site, painting including penstock (internal and external), insurance, dismantling, capital repairs, erection, testing and commissioning of 3 nos. hydro generating units including P.G. Test in any one of the units. Associated technological, civil, mechanical, electrical works as required with new TG set from 3x12MW to 3x14 MW and Plant, Equipment & facilities.	The work for conducting RLA study and uprating study on Turbine, Generator and other auxiliaries for Rs. 82.8 lakhs was awarded to M/s MECON, Ranchi on 17.06.2013. MECON submitted final DPR for works on 07.02.15. Administrative approval accorded on 04.06.2016. Bid opened on 15.02.2019. Techno-commercial evaluation is under progress.
11.	Kodayar PH-I, 1x60 MW TANGEDCO 1970 T-Vevey Engg. works, Switzerland G-Alstom, France RMU&LE 2022-24	60 (LE)+ 10 (U) 88.48 Nil	Planning, design, CFD/model testing, engineering with RE, manufacture, procurement/ supply of new components and spares at site, painting-penstock, insurance dismantling, capital repairs, erection, testing and commissioning of P.G. Test. Associated technological, civil, mechanical, electrical works as required with new TG set from 1x60MW to 1x70MW and Plant, Equipment & facilities.	Contract was awarded to M/s MECON Ltd., Ranchi for Rs. 91 lakhs on 22.09.2014 for conducting RLA study and uprating study on Turbine, Generator and other auxiliaries. They have completed the study and furnished the final DPR. Administrative approval accorded on 03.02.2017. Bid opened on 28.02.2019. Techno-commercial evaluation is under progress.
B - SCHEMES ONGOING – Under DPR Preparation/ Finalisation/ Approval - STATE SECTOR (TANGEDCO)				
12.	Kodayar PH-II, 1x40 MW TANGEDCO 1971 T- Litostroj,Yugoslavi a G-Rade Koncar,	40 (LE)+ 6 (U) - Nil	Replacement of stator core & winding, rotor winding, poles, Excitation system, Governing system, Runner, guide vanes, Cooling water & De-watering systems, Generator Transformers, Generator protection, LT	M/s MECON submitted RLA study report in 2006 and proposed to uprate from 40 to 46 MW. It is proposed to take up RMU works of Kodayar PH-II on completion of RMU works of Kodayar PH-I as the water of PH-I is used for PH-II.

S. No.	Scheme/ Category Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
	Yugoslavia. RMU&LE 2025-26		switch gear, lubrication system, 11 KV LAVT, Neutral Grounding Transformer, Annunciation system, power and control cable, UAT, fire-fighting system for generator, yard, cable gallery yard, Refurbishment of turbine inlet valves and Butterfly valves, Air admission system, brake & jack and bearings.	
C – SCHEMES ONGOING – Under RLA Studies - STATE SECTOR (TANGEDCO)				
13.	Kundah-I, 3x20 MW TANGEDCO 1960-64 RM&LE 2022-27	60 (LE) - Nil	Detailed scope of work will be arrived after finalization of specification based on RLA study report.	RLA studies to be taken up in due course.
14.	Kundah-II, 5x35 MW TANGEDCO 1960-65 RM&LE 2022-27	175 (LE) - Nil	Detailed scope of work will be arrived after finalization of specification based on RLA study report.	RLA studies to be taken up in due course.
15.	Kundah-III, 3x60 MW TANGEDCO 1965-78 RM&LE 2022-27	180 (LE) - Nil	Detailed scope of work will be arrived after finalization of specification based on RLA study report.	RLA studies to be taken up in due course.
16.	Kundah-IV, 2x50 MW TANGEDCO 1966-78 RM&LE 2022-27	100 (LE) - NIL	Detailed scope of work will be arrived after finalization of specification based on RLA study report.	RLA studies to be taken up in due course.

S. No.	Scheme/ Category Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
17.	Kundah-V, 2x20 MW TANGEDCO 1964-88 RM&LE 2022-27	40 (LE) - NIL	Detailed scope of work will be arrived after finalization of specification based on RLA study report.	RLA studies to be taken up in due course.
18.	Mettur Tunnel, 4x50 MW TANGEDCO 1965-66 RM&LE 2022-27	200 (LE) - NIL	Detailed scope of work will be arrived after finalization of specification based on RLA study report.	RLA studies to be taken up in due course.
19.	Sarkarpathy, 1x30 MW TANGEDCO 1966 RM&LE 2022-27	30 (LE) - NIL	Detailed scope of work will be arrived after finalization of specification based on RLA study report.	RLA studies to be taken up in due course.
20.	Sholayar-II, 1x25 MW TANGEDCO 1971 RM&LE 2022-27	25 (LE) - NIL	Detailed scope of work will be arrived after finalization of specification based on RLA study report.	RLA studies to be taken up in due course.
21.	Suruliyar, 1x35 MW TANGEDCO 1978 RM&LE 2022-27	35 (LE) - NIL	Detailed scope of work will be arrived after finalization of specification based on RLA study report.	RLA studies to be taken up in due course.
22.	Kadamparai PH, 4x100 MW TANGEDCO 1987-89 RM&LE 2022-27	400 (LE) - NIL	Detailed scope of work will be arrived after finalization of specification based on RLA study report.	RLA studies to be taken up in due course.

S. No.	Scheme/ Category Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
23.	Aliyar 1x60 MW TANGEDCO 1970 RM&LE 2022-27	60 (LE) - NIL	Detailed scope of work will be arrived after finalization of specification based on RLA study report.	RLA studies to be taken up in due course.

State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations for completion during 2022-27

NORTH EASTERN REGION

MANIPUR

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
B – SCHEMES ONGOING – Under DPR Preparation/ Finalisation/ Approval - CENTRAL SECTOR (NHPC)				
24.	Loktak, 3x35 MW NHPC USSR 1983 LMZ T-LMZ G-Leningrade, (U-1) T&G – BHEL(U-2&3) RM&LE 2022-23	105 (LE) 236.07 -	i) Activities covering main equipment i.e. turbine, generator, generator transformers other plant equipment essential for efficient and sustained performance of the units as well as station. ii) Activities having direct impact on improvement of generation, efficiency, machine availability etc. iii) Activities for Integration of Control, Monitoring & Protection system of Power Plant such as Electronic Governors, Static Excitation System, numerical relays, SCADA. iv) Refurbishment of water conductor system and associated Civil/HM works and infrastructure works.	Petition filed in CERC on 08.08.2018 at total Estimated Cost of Rs. 273.59 crores including IDC & FC (Price Level: Sep'17). Petition on the appeal filed by respondent state Assam (APDCL) was heard in CERC on 27.02.2019. Final order of CERC is awaited.

State-wise Programme/ Status of Renovation and Modernisation Schemes of Hydro Power Stations for completion during 2022-27

NORTH EASTERN REGION

Meghalaya

(Amount in Rs. Crores)

S. No.	Scheme/ Category/ Completion Target	Expected Benefit (MW)/ Estimated Cost/ Expenditure	Scope of work	Present Status
A - SCHEMES ONGOING - Under RLA Studies - STATE SECTOR (MePGCL)				
25.	Umiam-Umtru Stage-IV, 2x30MW MePGCL, 1992 T&G-BHEL	- - -	Detailed scope of works will be arrived after finalization of specifications based on RLA sFtudy report.	RLA studies to be taken up in due course.
	R&M			
	2022-27			

ANNEXURES

State-wise List of Hydro RMU&LE 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 (U)	RM&U	1991-92
2	Giri, HPSEB	SS	2x30	9.85	7.90	6 (U)	RM&U	1995-96
Punjab								
3	UBDC-I, PSPCL	SS	3x15	11.00	8.00	11 (Res)	R&M+Res.	1991-92
Uttar Pradesh								
4	Rihand, UPJVNL	SS	6x50	1.43	1.43	100(Res.)	R&M+Res.	1995-96
Karnataka								
5	Nagjhari, U-2, KPCL	SS	1x135	11.97	11.32	15 (U)	RM&U	1995-96
6	Shivasamudram, VVNL	SS	6x3 + 4x6	8.00	8.00	18 (LE)	RM&LE	N.A.
Kerala								
7	Sholayar, KSEB	SS	3x18	7.58	7.58	-	R&M	1996-97
Tamil Nadu								
8	Kadamparai (Units 3&4), TANGEDCO	SS	2x100	23.17	33.69	200(Res.)	R&M+Res.	1993-95
9	Kundah III (Units 1&2), TANGEDCO	SS	2x60	5.45	3.20	-	R&M	1991-92
10	Moyar, TANGEDCO	SS	3x12	1.62	1.30	36.00 (LE)	RM&LE	1990-91
11	Sholayar-I, TANGEDCO	SS	2x35	1.40	0.85	-	R&M	1994-95
Meghalaya								
12	Khandong, U-1, NEEPCO	CS	1x25	0.62	0.62	25 (Res)	R&M+Res.	1991-92
Tripura								
13	Gumti, TPGL	SS	3x5	17.50	17.50	-	R&M	1994-95
Total			1282	125.57	127.37	429 [39 (U) + 336 (Res) + 54(LE)]		

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

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

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

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

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

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

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

Annex- III
(Sheet 2/3)

(Sheet 25)

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

Annex- III
(Sheet 3/3)

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

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

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

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

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

Annex- IV
(Sheets 2 of 2)

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

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

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

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

Annex- V
(Sheet 2 of 2)

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

Annex- VI
(Sheet 1 of 4)

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

Sl. No	Name of Project, Agency Inst. Cap. (No. x MW)	CS/ SS	Capacity Covered Under RMU&LE (No.x MW)	Est. Cost	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
A. Completed Schemes								
Himachal Pradesh								
1	Ganguwal (1x29.25+2x24.2) & Kotla (1x29.25+2x24.2), BBMB	CS	1x24.2 (U-2) 1x24.2 (U-3)	14.19	9.58	48.4 (LE)	RM&LE	2017-18
2	Dehar Power House (Unit-3), BBMB (6x165)	CS	1x165	19.87	16.00	-	R&M	2017-18
3	Salal, NHPC (6x115)	CS	5x115	58.01	51.08	-	R&M	2019-20
Sub Total (A)			788.4	92.07	76.66	48.4 (LE)		
B. Ongoing Schemes – Under Implementation								
Himachal Pradesh								
4	Bhakra LB, BBMB (5x108)	CS	5x108	489.77	397.08	540.00(LE)+ 90.00 (U)	RMU&LE	2020-21
5	Baira Siul, NHPC (3x60)	CS	3x60	341.41	54.33	180 (LE)	RM&LE	2020-21
6	Pong Power House, HPSEB (6x66)	CS	6x66	-	-	396 (LE)	RM&LE	2020-21
7	Bhaba Power House, HPSEB (3x40)	SS	3x40	166.17@	90.91	120 (LE)	RM&LE	2019-20
Jammu & Kashmir								
8	Chenani, J&KSPDC (5x4.66)	SS	5x4.66	39.60	24.63	23.30 (LE)	RM&LE	2019-20
9	Ganderbal, J&KSPDC (2x3+2x4.5)	SS	2x4.5	31.57	11.33	9.00 (LE)	RM&LE	2019-20
Uttarakhand								
10	Tiloth, UJVNL (3x30)	SS	3x30	384.66	12.83	90 (LE)	RM&LE	2021-22
11	Dhalipur, UJVNL (3x17)	SS	3x17	152.65	11.58	51 (LE)	RM&LE	2021-22
Uttar Pradesh								
12	Rihand, UPJVNL (6x50)	SS	6x50	132.20	105.49	300 (LE)	RM&LE	2019-20
13	Obra, UPJVNL (3x33)	SS	3x33	58.80	35.47	99 (LE)	RM&LE	2021-22

Annex- VI
(Sheet 2 of 4)

Sl. No	Name of Project, Agency Inst. Cap. (No. x MW)	CS/ SS	Capacity Covered Under RMU&LE (No.x MW)	Est. Cost	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
Gujarat								
14	Ukai, GSECL (4x75)	SS	3x75 (U-1,2,&4)	7.3	4.48	-	R&M	2021-22
15	Kadana PSS, GSECL (4x60)	SS	4x60	114.37	6.18	-	R&M	2021-22
Telangana								
16	Nagarjuna Sagar Ph-II works, TSGENCO (1x110+7x100.8)	SS	1x110+7x100.8	22.17	14.34	-	R&M	2019-20
17	Nagarjuna Sagar Left Canal Power House, TSGENCO (2x30.6)	SS	2x30.6	30.99	2.00	-	R&M	2019-20
Karnataka								
18	Bhadra River Bed units, KPCL (2x12)	SS	2x12	31.05	25.25	-	R&M	2019-20
19	Munirabad Dam Power House, KPCL (2x9 + 1x10)	SS	2x9 + 1x10	4.6	-	-	R&M	2019-20
20	Nagjhari KPCL (3x150)	SS	3x150 (U-1 to 3)	222	-	-	R&M	2021-22
21	Shivasamudram, KPCL (6x3+4x6)	SS	6x3+4x6	146.41	-	42 (LE)	RM&LE	2021-22
Kerala								
22	Sholayar, KSEB (3x18)	SS	3x18	199.55	45.24	54 (LE)	RM&LE	2019-20
23	Idukki 1 st stage, KSEB (3x130)	SS	3x130	89.90	36.95	-	R&M	2019-20
Tamil Nadu								
24	Sholayar-I, TANGEDCO (2x35)	SS	2x35	90.44	42.17	70 (LE) + 14(U)	RMU&LE	2019-20
Madhya Pradesh								
25	Gandhi Sagar, MPPGCL (5x23)	SS	5x23	21.83	-	-	R&M	2020-21
26	Bargi, MPPGCL (2x45)	SS	2x45	3.12	0.36	-	R&M	2021-22
27	Pench, MPPGCL (2x80)	SS	2x80	13.36	-	-	R&M	2021-22
28	Bansagar Ton-I, MPPGCL (3x105)	SS	3x105	4.97	-	-	R&M	2021-22

Annex- VI

(Sheet 3 of 4)

Sl. No	Name of Project, Agency Inst. Cap. (No. x MW)	CS/ SS	Capacity Covered Under RMU&LE (No.x MW)	Est. Cost	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
Odisha								
29	Hirakud-I OHPC (2x37.5)	SS	2x37.5 (U5&6)	158.77	68.32	75.00 (LE) + 12.2 (U)	RMU&LE	2019-20
30	Hirakud-II (Chiplima), OHPC (3x24)	SS	1x24 (U-3)	65.67	35.01	24.00 (LE)	RM&LE	2019-20
31	Balimela, OHPC (6x60)	SS	6x60	382.91	18.16	360(LE)	RM&LE	2021-22
Sub Total (B)			5347.10	3406.24	1042.11	2549.50 [2433.30(LE) + 116.20(U)]		
C. Ongoing Schemes – Under Tendering								
Himachal Pradesh								
32	Giri, HPSEB (2x30)	SS	2x30	139.8	-	60.00 (LE)	RM&LE	2020-21
33	Dehar Power House (Unit-3), BBMB (1x165)	CS	1x165	23	-	-	R&M	2019-20
Punjab								
34	Mukerin St.I, St.II, St.III & St.IV, PSPCL (3x15, 3x15, 3x19.5&3x19.5)	SS	3x15, 3x15, 3x19.5& 3x19.5	136.07	30.71	-	R&M	2019-20
35	Ranjit Sagar Dam, PSPCL (4x150)	SS	4x150	48.00	1.6	-	R&M	2020-21
36	Shanan HEP, PSPCL (1x50+4x15)	SS	1x50+ 4x15	37.81	19.71	-	R&M	2019-20
37	UBDC St.I & St.II, PSPCL (3x15+3x15.45)	SS	3x15+ 3x15.45	23.55	-	-	R&M	2019-20
38	Anandpur Sahib Hydel Project, PSPCL (4x33.5)	SS	4x33.5	43.11	-	-	R&M	2019-20
Uttarakhand								
39	Chilla Ph B UJVNL (4x36)	SS	4x36	490.56	-	144(LE)+ 12(U)	RMU&LE	2021-22
40	Ramganaga, UJVNL (3x66)	SS	3x66	455.2	-	198(LE)	RM&LE	2021-22
41	Dhakrani, UJVNL (3x11.25)	SS	3x11.25	137.31	-	33.75 (LE)	RM&LE	2021-22

Annex- VI
(Sheet 4 of 4)

Sl. No	Name of Project, Age Inst. Cap. (No.X MW)	CS/ SS	Capacity Covered Under RMU&LE	Est. Cost	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
Karnataka								
42	Kadra Dam Power House, KPCL (3x50)	SS	3x50	44.47	-	150 (LE)	RM&LE	2021-22
43	Kodasalli Dam Power House, KPCL (3x40)	SS	3x40	50.6	-	120 (LE)	RM&LE	2021-22
44	Linganamakki Dam Power House, KPCL (2x27.5)	SS	2x27.5	56.20	-	55 (LE)	RM&LE	2021-22
45	Gerusoppa Dam Power House (Sharavathy Tail Race), KPCL (4x60)	SS	4x60	59.66	-	240 (LE)	RM&LE	2021-22
Kerala								
46	Kuttiyadi, KSEB (3x25)	SS	3x25	377.41	-	75.00 (LE) + 7.5 (U)	RMU&LE	2021-22
Jharkhand								
47	Panchet, DVC (2x40)	CS	1x40 (U-1)	48.92	2.19	40(LE)+ 8(U)	RMU&LE	2021-22
Meghalaya								
48	Umium St.III, (Kyrdemkulai) MePGCL (2x30)	SS	2x30	408.00	-	60(LE) + 6(U)	RMU&LE	2021-22
Sub Total (C)			2483.10	2579.67	54.21	1209.25 [1175.75(LE) + 33.5(U)]		
D. Ongoing Schemes – Under DPR Preparation/ Finalisation/ Approval								
Karnataka								
49	MGHE, KPCL (4x21.6+4x13.2)	SS	4x21.6+ 4x13.2	97.00	-	139.2 (LE)	RM&LE	2021-22
50	Supa Dam Power House, KPCL (2x50)	SS	2x50	47.91	-	100 (LE)	RM&LE	2021-22
51	Sharavathy Generating Station, KPCL (10x103.5)	SS	10x103.5	196.56	11.07	1035 (LE)	RM&LE	2021-22
West Bengal								
52	Maithon, DVC (2x20+1x23.2)	CS	2x20 (U-1&3)	56.03	7.76	40.00 (LE)	RM&LE	2021-22
Assam								
53	Khandong Power Station, NEEPCO (2x25)	CS	2x25	196.7	12.71	50 (LE)	RM&LE	2021-22
Sub Total (D)			1364.20	594.20	31.54	1364.20(LE)		
Total (A+B+C+D)			9982.80	6672.18	1204.52	5171.35 [5021.65(LE) +149.7(U)]		

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

Abbreviations: R&M – Renovation & Modernisation; U – Uprating; LE – Life Extension; Res – Restoration;

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

Sl. No	Name of Project, Agency Inst. Cap. (No.X MW)	CS/ SS	Capacity Covered Under RMU&LE (No.x MW)	Est. Cost	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
A. Ongoing Schemes – Under Tendering								
Tamil Nadu								
1	Moyar PH, TANGEDCO (3x12)	SS	3x12	67.05	-	36(LE)+ 6(U)	RMU&LE	2023-24
2	Kodayar PH-I, TANGEDCO (1x60)	SS	1x60	88.48	-	60 (LE)+ 10 (U)	RMU&LE	2022-24
Sub Total(A)			96	155.53	-	112.00 [96(LE)+ 16(U)]		
B. Ongoing Schemes – Under DPR Preparation/ Finalisation/ Approval								
Jammu & Kashmir								
3	Lower Jehlum HEP, J&KSPDC (3x35)	SS	3x35	-	-	105 (LE)+ 27 (U)	RMU&LE	2022-27
4	USHP-II Kangan, J&KSPDC (3x35)	SS	3x35	-	-	105 (LE)	RM&LE	2022-27
Uttarakhand								
5	Chibro, UJVNL (4x60)	SS	4x60	184.88	-	240(LE)	RM&LE	2025-26
6	Khodri PH-II UJVNL (4x30)	SS	4x30	169.63	-	120(LE)	RM&LE	2025-26
7	Kulhal, UJVNL (3x10)	SS	3x10	115.24	-	30(LE)	RM&LE	2023-24
Andhra Pradesh								
8	Machkund St.I & St.II, APGENCO (3x17+3x23)	SS	3x17+ 3x23	400	-	120 (LE) + 9 (U)	RMU&LE	2025-26
Tamil Nadu								
9	Kodayar PH-II, TANGEDCO (1x40)	SS	1x40	-	-	40.0(LE)+ 6(U)	RMU&LE	2025-26
Manipur								
10	Loktak, NHPC (3x35)	CS	3x35	236.07	-	105 (LE)	RM&LE	2022-23
Sub Total(B)			865	-	-	907.00 [865(LE)+ 42(U)]		
C. Ongoing Schemes – Under RLA Studies								
Tamil Nadu								
11	Kundah-I, TANGEDCO (3x20)	SS	3x20	-	-	60 (LE)	RM&LE	2022-27
12	Kundah-II, TANGEDCO (5x35)	SS	5x35	-	-	175 (LE)	RM&LE	2022-27

Sl. No	Name of Project, Agency Inst. Cap. (No.X MW)	CS/ SS	Capacity Covered Under RMU&LE (No.x MW)	Est. Cost	Actual Exp.	Benefits (MW)	Category	Year of Completion
				(Rs. in Crs.)				
13	Kundah-III, TANGEDCO (3x60)	SS	3x60	-	-	180 (LE)	RM&LE	2022-27
14	Kundah-IV, TANGEDCO (2x50)	SS	2x50	-	-	100 (LE)	RM&LE	2022-27
15	Kundah-V, TANGEDCO (2x20)	SS	2x20	-	-	40 (LE)	RM&LE	2022-27
16	Mettur Tunnel, TANGEDCO (4x50)	SS	4x50	-	-	200 (LE)	RM&LE	2022-27
17	Sarkarpathy, TANGEDCO (1x30)	SS	1x30	-	-	30 (LE)	RM&LE	2022-27
18	Sholayar-II, TANGEDCO (1x25)	SS	1x25	-	-	25 (LE)	RM&LE	2022-27
19	Suruliyar, TANGEDCO (1x35)	SS	1x35	-	-	35 (LE)	RM&LE	2022-27
20	Kadamparai, PH TANGEDCO (4x100)	SS	4x100	-	-	400 (LE)	RM&LE	2022-27
21	Aliyar, TANGEDCO (1x60)	SS	1x60			60 (LE)	RM&LE	2022-27
Kerala								
22	Idukki 2 nd stage, KSEB (3x130)	SS	3x130	-	-	390 (LE)	RM&LE	2022-27
Andhra Pradesh								
23	Tungabhadra Dam, APGENCO (4x9)	SS	4x9	100	-	36 (LE)	RM&LE	2025-26
24	Hampi Canal PH, APGENCO (4x9)	SS	4x9	100	-	36 (LE)	RM&LE	2025-26
Meghalaya								
25	Umiyam-umtru Stage-IV, MePGCL (2x30)	SS	2x30	-	-	-	R&M	2022-27
Sub Total(C)			1827	-	-	1767		
Total (A+B+C)			2788	-	-	2786 [2728(LE)+ 58(U)]		

Abbreviations: R&M – Renovation & Modernisation; U – Uprating; LE – Life Extension; Res – Restoration;

MW – Mega Watt; CS-Central Sector; SS- State Sector

Abbreviations

1	APGENCO	Andhra Pradesh Generation Corporation
2	BBMB	Bhakra Beas Management Board
3	DVC	Damodar Valley Corporation
4	GSECL	Gujarat State Electricity Corporation Ltd.
5	HPSEB	Himachal Pradesh State Electricity Board
6	J&KSPDC	Jammu & Kashmir State Power Development Corpn.
7	JSEB	Jharkhand State Electricity Board.
8	KPCL	Karnataka Power Corporation Ltd.
9	KSEB	Kerala State Electricity Board
10	MSPGCL	Maharashtra State Power Generation Corporation Ltd.
11	MePGCL	Meghalaya Power Generation Corporation Ltd.
12	MPPGCL	Madhya Pradesh Power Generation Corporation Ltd.
13	NEEPCO	North-East Electric Power Corporation
14	OHPC	Odisha Hydro Power Corporation
15	PSPCL	Punjab State Power Corporation Ltd.
16	RRVUNL	Rajasthan Rajya Vidyut Utpadan Nigam Ltd.
17	TANGEDCO	Tamil Nadu Generation and Distribution Corporation Ltd.
18	TSGENCO	Telangana State Power Generation Corporation
19	UPJVNL	Uttar Pradesh Jal Vidyut Nigam Ltd.
20	UJVNL	Uttarakhand Jal Vidyut Nigam Ltd.
21	VVNL	Vishwesharayya Vidyut Nigam Ltd.
22	WBSEDCL	West Bengal State Electricity & Distribution Company Ltd.
23	AVR	Automatic Voltage Regulator
24	BOQ	Bill of Quantity
25	CERC	Central Electricity Regulatory Commission
26	CPRI	Central Power Research Institute
27	DPR	Detailed Project Report
28	DVR	Digital Voltage Regulator
29	JICA	Japan International Co-operation Agency
30	LOA	Letter of Award
31	RLA	Residual Life Assessment