



# Studies preceding R&M works & Essentialities in Detailed Project Report

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# Need for R&M Works



- **Operational life of a Hydro Electric Project (HEP)**
  - 35 years as per (CEA)/ (CERC) regulation.
  - Actual life of a HEP varies from case-to-case basis depending upon operating conditions of generating units, actual running period, O&M practices followed by the Project authority etc.
  - May be less than 35 years in Himalayan region due to silting problems and more than 40-45 years in southern region.
  
- **Technological advancements**
  - Certain equipments are rendered obsolete.
  - Manufacturers have also stopped manufacturing some equipments of older design causing no availability of spares.
  
- **Commercial aspects**
  - Cost of carrying R&M works comparatively very low in comparison to setting up a new Hydro Project.
  - land and various Statutory clearances are not required to be taken in case of taking up R&M works.

# Benefits of RMU&LE Works



## ➤ R&M Works

- Improves availability, performance, reliability & efficiency of the power plant.
- Caters to technological obsolescence (since in a fast changing technological environment, it becomes desirable after lapse of 15 years or so to go for modernisation in view of the new system requirements).
- Caters to changes in Rules & Regulations

## ➤ Upgrading Works

- Upgrades capacity of HPP at low capital investments compared to new projects.

## ➤ Restoration Works

- Restoration of the lost/ derated capacity.

## ➤ LE Works

- Extends the normal useful life of Hydro Power Plant (CERC/CEA regulations defining useful life as 35 years).

# VIII to XI Plan



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

# XII Plan Status



Sl.No	Description of Status of Scheme	No. of Projects			Installed Capacity (MW)	Estimated Cost (Rs. in Crs.)	Actual Expenditure (Rs. in Crs.)	Benefit (MW)
		Central Sector	State Sector	Total				
1.	Programmed (Original)	5	40	45	7105.40	5405.85	-	3344.25 [182.05(U) + 3147.20(LE) + 15(Res.)]
	Revised	2	21	23	4076.90	1372.67	1098.63	566.70 [43(U) + 508.70(LE) + 15(Res.)]
2.	Completed	2	18	20	4014.6	1266.21	1049.39	534 [43 (U)+ 476 (LE)+15(Res.)]
3.	Under Implementation	0	3	3	62.30	106.46	49.24	32.30 [32.3(LE)]

# 2017-22 & beyond



Sl.No	Description of Status of Scheme	No. of Projects			Installed Capacity (MW)	Estimated Cost# (Rs. in Crs.)	Actual Expenditure (Rs. in Crs.)	Benefit (MW)
		Central Sector	State Sector	Total				
1.	Programmed	8	44	*52	9288.05	5915.42	607.87	3608.65 [200.75(U) + 3407.90(LE)]
2.	Under Implementation	4	9	13	3826.00	1422.70	536.74	1341.60 [131.20 (U)+ 1210.40 (LE)]
3.	Under Tendering	2	14	16	3035.10	3014.91	31.60	1215.55 [28.80 (U) + 1186.75 (LE)]
4.	Under DPR Preparation/Finalisation/Approval	2	11	13	1191.95	1477.81	39.53	1051.50 [40.75(U) + 1010.75 (LE)]
5.	Under RLA Studies	-	10	10	1235.00	-	-	-

\* Out of these 52 schemes, 23 schemes have been rescheduled for completion from XII Plan to 2017-22 & beyond.

# Estimated cost of 12 schemes not included in the Estimated Cost as the Estimates of these schemes are yet to be finalized.

# Requirements for Clearance of R&M Works from CEA preparation of DPR



- Residual Life Assessment (RLA) study is a proven method to find out the remaining life of a plant/ equipments.
- Generating utility shall conduct RLA study by an independent agency.
- Based on the RLA study, complete Scope of Works need to be identified and all relevant sketches and layout/schematic drawings may be included in the proposal wherever required.
- Based on the Scope of R&M works, **Detailed Project Report (DPR)** needs to be prepared.

# Organisations Conducting RLA Studies



- Bharat Heavy Electricals Ltd., Bhopal
- Central Power Research Institute (CPRI), Bangalore
- Alternate Hydro Energy Centre (AHEC), IIT, Roorkee
- MECON Limited, Ranchi
- SNC-Lavalin Inc., New Delhi
- Toshiba Plant System & Services Corporation (TPSC) Ltd., Noida
- Lahmeyer International (India) Pvt. Ltd., Gurgaon
- Fourseasons Marketing & Project Ltd., New Delhi



# Contents of DPR



The DPR may be formulated as per following format:

- Section-I: Introduction, Background & Salient Features
- Section-II: Water Availability and Power Optimisation Studies
- Section-III: R&M Proposal along with Justification
- Section-IV: Cost of R&M
- Section-V: Economic Evaluation & Tariff
- Section-VI: Schedule of R&M works



# Section-I: Introduction & Salient Features

## **This section should give**

- Basic introduction of power plant and salient features.
- Technical Particulars of Generating Units/ Transformers/ Switchgears.
- Performance data for the last 5 years containing Design Energy, Actual Energy Generation, Target Generation, Plant Availability Factor etc.
- Details of major R&M works carried out earlier and benefits/improvement achieved.
- Major forced and planned outages during last 5 years.
- Need, and scope of R&M along with brief Justification.
- Benefits anticipated in terms of MW/MU.
- Expected increase in life of generating units/ equipments after R&M works.

# Section-II: Water Availability and Power Optimisation Studies



- This Section should include
  - River system and Basin characteristics, Climatology of the Area, Water Availability Studies, Inflow series and Inflow data considered for Optimisation study, Head loss calculations etc.
  - Confirmation letter regarding levels (FRL & TWL) given in DPR for the project by State Govt. and other hydro-power projects existing/proposed on the upstream and downstream of proposed HEP along with their TWL & FRL respectively
  
- In case, optimisation studies recommendation result in uprating of plant then adequacy or its strengthening, if any, of existing civil/ hydro-mechanical/ electro-mechanical structures & components need to be assessed for meeting this requirement in subsequent Section-III

# Section-III: R&M Proposal along with Justification



- This section should include complete technical details of various components in below classified categories:
  - Civil
  - Hydro-Mechanical (HM)
  - Electro-Mechanical (E&M)
- Justification for each equipment/ item whether to be retained, refurbished or to be replaced
- Civil, HM and E&M Drawings and General Plant Layout along with Water Conductor System and Dams/ Barrages/ Rivers/ Lake/ Catchment area/ Single Line Diagram
- Findings of RLA report

# Section-IV: Cost of R&M



- This section should include complete details of cost of various equipments/ components in following categories:
  - Civil
  - Hydro-Mechanical (HM)
  - Electro-Mechanical (E&M)
  
- Basis on this, estimated cost has been given shall also be provided

# Section-V: Economic Evaluation & Tariff



- This section should contain
  - economic justification of the cost of R&M works in detail
  - change in unit cost of energy on account of R&M works,
  - the final unit cost of energy in comparison to earlier/original cost, pay-back period etc.
  - Return on Equity (RoE), Depreciation, Operation and Maintenance charges as approved by CERC/ SERCs as applicable, Interest Rate etc.

# Section-VI: Schedule of R&M works



- Detailed tentative schedule of works in all the three categories i.e. Civil, Hydro-Mechanical (HM) and Electro-Mechanical (E&M) should be given in the form of PERT Charts.
- In preparing schedule, care should be taken that the period in which all units are under shutdown period should be minimum and maximum part of this should be covered during lean season.
- Completion schedule can be compressed by coordinating supply & erection/ commissioning unit-wise rather than taking up erection activity only after completion of full supply, which may also cause storage and handling problems.

# Challenges & Constraints in DPR Preparation



- Limited number of agencies available for conducting RLA studies and DPR preparation.
- Delay in Finalisation of DPR (delayed start-end/ finalisation of Consultant) by Utilities.
- Lack of Experience.



# Implementation of Hydro R&M schemes

## Conclusion & Recommendations



- **Identification of R&M schemes by Utilities** – The candidate R&M schemes need to be identified timely by utilities and R&M programme needs to be properly planned.
- **RLA Studies and DPR preparation** – limited agencies available. As such, utilities need to take care of this aspect while making their R&M programme.
- **Approvals and clearances by the concerned authorities** – need to be expedited.
- **Funds Availability** – timely tie-up - a good DPR is prerequisite.
- **Resourceful & Competent Executing Agencies** – Work to be optimally designed for implementation in terms of Contract Packages so as to get best executing agency at least cost.
- **Good Project Management** – Obtaining necessary approvals, supply orders for equipment & delivery, close monitoring of erection & commissioning, availability of generating units' shutdown, etc. needs to be well planned & coordinated for early & timely completion of work.



***THANK YOU***