



THDC INDIA LIMITED

RESEARCH & DEVELOPMENT POLICY

1.0 PREAMBLE

Research and Development (R&D) is essential for sustaining civilization and its progress. It is in the enlightened interest of any business entity to strengthen its technological capabilities, for not only ensuring growth, but also for survival. R&D also helps to address the emerging challenges and opportunities in an increasingly competitive business ecology.

‘Research’ is defined as original and planned investigation undertaken with the prospect of gaining new scientific or technical knowledge and understanding. According to Accounting Standard issued by Institute of Chartered Accountants of India (Standard-26), the research activities shall include :

- a) activities aimed at obtaining new knowledge,
- b) the search for, evaluation and final selection of, applications of research findings or other knowledge,
- c) the search for alternatives for materials, devices, products, processes, systems or services, and
- d) the formulation, design, evaluation and final selection of possible alternatives for new or improved materials, devices, products, processes, systems or services.

‘Development’ is the application of research findings or other knowledge to a plan or design for the production of new or substantially improved materials, devices, products, processes, systems or services prior to the commencement of commercial production or use, which may include the following activities:

- a) The design, construction and testing of pre-production or pre-use prototypes and models,
- b) The design of tools, jigs, moulds and dies involving new technology,
- c) The design, construction and operation of a pilot plant that is not of a scale economically feasible for commercial production,
- d) The design, construction and testing of a chosen alternative for new or improved materials, devices, products, processes, systems or services and
- e) The design, construction and operation of a demonstration plant of reasonable capacity for proving the technology at commercial scale.

'Scientific Research and Development' also means a systematic investigation and search in the field of Technology / Natural or Applied Science if:

- a) It is carried out by means of experiment or analysis,
- b) It is in the nature of :
 - i) Basic research, namely work undertaken for the advancement of scientific knowledge without a specific practical application in view,
 - ii) Applied research, namely work undertaken for advancement of scientific knowledge with a specific practical application in view,
 - iii) Experimental development, namely work undertaken for the purpose of achieving technological advancement for the purpose of creating new or improving existing materials , devices, products or processes including incremental improvement thereof and
- c) It is not in the nature of :
 - i) Market research or sales promotion or
 - ii) Quality control or routine testing of materials, devices, product or process or processes or
 - iii) Research in the social science or the humanities or
 - iv) Prospecting, exploring or drilling for or producing minerals, petroleum or natural gas or
 - v) The commercial production of a new or improved material, device or product or commercial use of new or improved process
 - vi) Style change or
 - vii) Routine data collection.

2.0 DPE Guidelines on R&D

The DPE vide their DO. No. 3(9)/2010-DPE(MoU), Dated 20.09.2011 has issued guidelines on Research & Development for Central Public Sector Enterprises. The Guidelines provide that CPSEs shall frame their R&D Policy aligned with the Company's Vision and Mission. Based on the R&D Policy, an R&D Manual and R&D Plan shall be developed.

The R&D Policy for THDCIL has been framed in line with the guidelines issued by DPE.

3.0 Objective of R&D

The objective of R&D is to contribute in-house capacity building process and enhance the collaboration with other PSU's and Organizations working in Power Sector in the country and abroad. The focus of R&D shall be on building up expertise within the Organization, to find solutions for the existing problems and also for the problems that may arise in future in the areas of power sector. Research & Development in THDCIL shall address challenging problems being faced by power stations and also for the implementation of latest technological advances in execution & operation of hydro-electric projects and in other areas like thermal power, new & renewable sources of energy etc. Emphasis shall be on the following aspects :

- Promote innovation by sharing the expertise and experience
- Setting up R&D infrastructure such as computer lab & other labs.
- Develop and sustain manpower for R&D in power sector.
- To upgrade the existing hydraulic design practices for the design and construction of Dam, spillways, water conductor system, power house, hydro-mechanical and electro-mechanical works.
- To develop and use computer based techniques for the design, fabrication, installation and operation of different components of hydro power plants and other related technologies.
- To establish documentation for in-house research activities, and publication of research papers in hydro power development.
- To obtain patents of the technology and processes.

4.0 Scope of R&D

R&D activities in THDCIL shall include but not be limited to the following areas / activities:

- Efficiency improvement & cost reduction.
- Improving availability, reliability and safety of man and machines of the plants.
- Studies related to solutions to chronic problems of the plants.
- Energy conservation.
- Product development, material development, process modifications / development.

- Reduction in environmental impact with introduction of new technology.
- Improving transmission system efficiency.
- Increasing equipment life.
- Progressively optimizing land use
- Development of monitoring & diagnostic techniques.
- Alternate and new & renewable energy sources including emerging technologies like Off shore Wind Energy, economic Solar options etc
- Climate change issues, waste management / recycling and water management / conservation.

The nature of R&D in THDCIL shall be any one or combination of the following :

- a) R&D activities shall be original and planned and shall result in new knowledge.
- b) The application of R&D should result in new / improved products or processes or services that should be new to the Company or new to the region or new to the world.
- c) The search for knowledge may be related to product, material, device, process, system or services. It may be related to design or new or alternative or improved use of materials, products, processes, systems or services. It also includes application of research findings for new or substantially improved materials, products, processes or systems or services prior to commencement of commercial production or use.
- d) Setting up of demonstration / pilot plants for the first time by the Organization.

5.0 R&D Plan

- 5.1 Based on the broad provisions laid down in the R&D policy of THDCIL, a specific R&D Plan shall be developed. An R&D Manual shall also be framed. Specific R&D plans shall be long, medium and short term as per need and shall have clearly earmarked objectives, scope, expenditure, benefits expected, deliverables, time periods etc. The R&D Plan shall also include details of expected tax benefits. To achieve the objectives and goals, it is necessary to prioritize R&D projects depending on the benefits that are likely to accrue.

The activities to be undertaken in R&D shall be planned as below :-

Short Term Activities:

Short Term Activities are those activities which are planned for completion in less than one year.

Medium Term Activities:

Medium Term Activities are those activities which are planned for completion from one year to three years.

Long Term Activities:

Long Term Activities are those activities which are planned to be completed in more than three years. THDCIL will submit its project proposals in the major thrust areas under National Perspective Plan for R&D in Power Sector, prepared according to the NPP guidelines and Application Format given in NPP Manual in collaboration with reputed institutes in R&D. These projects of R&D shall be from the Hydro Power field of Electro-Mechanical, Underground Works in Civil Engineering, Geology and New & Renewable source of Energy.

- 5.2 The R&D Plan and R&D budget shall require approval of Board of Directors.
- 5.3 The R&D Plan shall contain details about implementation as well as procedures and methodologies for monitoring results and modalities of concurrent and final evaluation. It shall also specify mandatory documentation of the R&D efforts as well as results achieved. It shall also, where applicable, include provisions for obtaining / maintaining recognition of its R&D centre by the Department of Scientific & Industrial Research so that applicable tax / duty benefits can be claimed by Corporation.
- 5.4 The R&D Plan shall contain projects to be undertaken. The targets to be achieved against each project needs to be clearly defined. The plan shall specify:
 - Projects to be undertaken.
 - Activities to be undertaken for each project.
 - Budget allocated as a percentage of PAT.
 - Responsibilities & authorities.
 - Major measurable and perceivable results expected.
 - Knowledge management systems and HR issues of manpower, incentives and rewards.
 - Proposed networking with academic/research institutions, customers and vendors.
- 5.5 Projects labeled as R&D shall not overlap with projects under Corporate Social Responsibility or Sustainable Development.

5.6 THDCIL shall formulate a procedure for identifying in-house / collaborative R&D projects.

5.7 Funding of R&D:

- i) The Corporation shall set aside 0.5% of its Profit After Tax (PAT) for its R&D budget, being the prescribed minimum amount for expenditure under R&D for Mini Ratna PSEs.
- ii) R&D budgeting for the next 3 years shall be indicated. However, the projected annual expenditure for the year under consideration will be taken as the target for the year.
- iii) The funding of R&D budget will not lapse. It will be transferred to a R&D fund which will accumulate.
- iv) THDCIL shall select three R&D projects to be taken as target in the MoU, from the illustrative list of R&D activities provided for power generation & transmission in accordance to R&D guidelines issued by DPE, GOI, as indicated in **Annexure-I**.

6.0 Implementation

6.1 R&D shall be developed as a discipline in the Organization through a systematic approach.

6.2 Director(Technical) shall be responsible for oversight of R&D activities of the Company. There shall be an Apex Advisory Committee(R&D) under the chairmanship of Director(Technical). There shall be 4 other members to be nominated by Chairman and Managing Director. The members shall be either eminent academics serving in Institutions of National importance or professionals of high repute from Power Sector. Head of R&D in THDCIL shall be the Convener to the AAC (R&D).

The Apex Advisory Committee(R&D) shall be responsible for planning / monitoring at the apex level to decide on R&D activities on long term / short term basis. The Apex Advisory Committee(R&D) shall carry out periodic assessment of the progress of the activities.

6.3 The implementation of an R&D project shall be based on the following procedure:

Permanent Mechanism:

The Apex Advisory Committee (R&D) shall decide the procedures for taking up R&D activities along with other parameters such as cost, benefits expected and time period etc. The mechanism for the implementation of R&D shall be constituted at the beginning of the R&D Project. The R&D project initiation format shall contain:

- Project description, outcome, work plan and milestones along with the time schedule.
- Project team, possible partnerships and collaborations
- Procurement plan for equipment , pilot plant, software etc
- Infrastructure, financial and manpower requirements
- Empowerment of the R&D team required to take crucial decisions
- Identification of grey / critical areas and plan to overcome the same.

Baseline Survey:

The impact made by R&D activities shall be quantified to the best possible extent with reference to baseline data which shall be developed by THDCIL before the start of Project. The base line data shall have information on previous work done and technologies available in similar areas.

Project Identification:

R&D projects shall be identified keeping in mind the business needs of Corporation. Wherever possible, the projects selected shall be in line with the core activities and outcome of the R&D shall help in achieving the long term goals of Corporation in order to yield measurable economic / social benefits. In other words the R&D project selected shall be within the framework of THDCIL strategic objectives and Organizational structure while considering and integrating financial and strategic benefits of each project.

Specifying Outcomes:

The outcome expected at the end of the project should be clearly defined before the start of the project as it would help us to understand and communicate to others how the projects and services will contribute to the broader and more enduring goals of the Organization.

Time schedule & Milestones:

All R&D projects, before initiation, shall be defined with respect to time period for different activities / milestones indicating an overview of major events and deadlines associated with that project. Good planning and the implementation of those plans are critical for the success of that project.

Collaboration & Synergizing:

Activities may be undertaken individually as in-house activities in R&D Centre. Alternatively, R&D activities may be undertaken / outsourced through specialized agencies like Academic Institutions, Universities, IITs, Central Organizations, i.e., CSIR, etc. and other National & International laboratories / academic institutions, Private Companies, Labs or Institutions. Collaboration may also be taken up for in-house projects amongst different departments in the organization if the requirement so arise.

For the state-of-the-art technologies for which technology base and expertise is not available in the country, THDCIL shall explore collaboration with the best foreign universities, research labs / institutions so as to compress the technology development cycle.

Outsourcing:

Outsourcing of essential competencies for meeting R&D project activities / objectives shall be need based. The team shall identify and utilize all such resources to curtail development schedules.

Incentive and Rewards:

Timely and successful completion of a project could be considered for incentives and awards. THDCIL will formulate schemes for incentivizing scientists and engineers for outstanding R&D activities like IPR- Patent filing, Publications, Commercialization of R&D process/patent /know-how etc.

Empowerment of R&D Team:

THDCIL shall suitably empower the R&D Group for smooth implementation of the projects.

Similarly, if the R&D team finds it essential to consult an expert individual/ agency / institute after ensuring availability of the resource for desired results, the team shall be empowered to obtain such services / competencies as per established procedure in THDCIL.

7.0 Monitoring of R&D activities

7.1 R&D projects shall be monitored and reviewed at regular intervals (monthly / quarterly / annually). The review of the project shall be done with respect to the targets set at the beginning of the project. The project report submitted for the review shall contain both physical and financial progress of the R&D project. This will not only help in getting a valuable feedback but will also help in determining whether a particular project should be continued.

7.2 Types of Review may be concurrent or final, based on the activity chart of the project & its completion time.

Concurrent Review shall cover :

- a) Activities with-respect-to deliverables / Milestones
- b) Need for any course change
- c) Need for financial or networking modifications
- d) IPR feasibility

Final Review shall cover:

- a) Deliverables as anticipated
- b) Reasons for short closure or change of course
- c) Reasons for change in budgeted expenses
- d) Adherence to time schedule
- e) Possibility of IPR

7.3 A separate paragraph / chapter shall be included in the Annual Report of the Corporation on the implementation of R&D activities / projects, including the facts relating to physical and financial progress.

7.4 Results of R&D shall be recorded and reasons of failure of the project, if any, shall be analyzed and recorded so that the same may be used as reference in future.

8.0 Evaluation

8.1 The performance of a project will be evaluated based on its objective, scope, deliverables and benefits (techno-commercial). Evaluation will be based on actual performance vis-à-vis targets. Results / benefits of long term R&D projects may not accrue in the short run or during the year under consideration; in such a situation the progress in terms of efforts made may be taken into account. Report of actual performance of R&D projects / activities is to be prepared.

- 8.2 For each R&D project, performance indicators shall be identified, monitored and measured to gauge actual performance of project vis-a-vis the planned performance. An illustrative list of performance indicators is provided as **Annexure-II**.
- 8.3 At the year end, THDCIL shall prepare a Self-Evaluation Report on R&D performance in respect of :
- (i) Actual expenses on R&D as against agreed target and as a percentage of PAT.
 - (ii) Actual achievements / milestones in respect of each R&D project / activity agreed in MoU target.

Such Self-Evaluation Report shall be duly supported by a Verification Report of an Independent Expert or Apex Advisory Committee (R&D).

THDCIL shall submit the evaluation report to DPE after approval of the Board of Directors through the Administrative Ministry.

A Checklist for evaluation of R&D Projects is indicated at **Annexure-III**.

9.0 Promotion & Development

9.1 National R&D HUB

It shall be ensured that every R&D project / activities to be undertaken shall be communicated and listed in the central data base of National R&D HUB created by Department of Public Enterprises in conjunction with National Foundation for Corporate Social Responsibility under the Indian Council of Corporate Affairs, Ministry of Corporate Affairs & the CPSEs. The project / activity that appears in the data base of HUB will only be allotted marks during evaluation of the MoU signed with Ministry of Power.

9.2 Forum for Knowledge Sharing

THDCIL may share the experience of R&D with other related CPSEs. Efforts may be made to conduct R&D conferences / meets of all CPSEs on an annual basis to share the experience and knowledge gained through R&D.

9.3 **Assimilation & Usage of results**

A “detailed technical report” shall be compiled by the project team. The report shall be approved by head of the R&D Centre for its contents and accuracy. The report shall be discussed with the end user for implementation. The report, IPRs in soft form shall be available and securely archived in THDCIL Knowledge Management Portal.

9.4 **Propagation and promotion**

The outcome of R&D projects shall be published in various journals and presented in National & International seminars / conferences / workshops for its commercial exploitation. Advertisement in the media may also be considered depending on the type of project. The Scientists and Engineers associated with R&D projects shall be encouraged to participate and present technical papers in National & International conferences/ seminars/ workshops.

ILLUSTRATIVE LIST OF R&D ACTIVITIES AS PER DPE GUIDELINES

- Alternate and New & Renewable Energy Sources.
- Climate Change Issues, waste management / recycling and water management/ conservation.
- Efficiency Improvement & Cost Reduction.
- Improving availability, reliability & safety of man & machines of the plants.
- Studies related to solutions to chronic problems of the plants.
- Energy conservation.
- Product development, Material development, process modifications/ development.
- Reduction in Environmental impact with introduction of new technology.
 - GIS (Reduced Space Requirement)
 - HDVC (Reduced ROW for each MW flow)
 - 1200 KV (Reduced ROW for each MW flow)
- Improving transmission system efficiency.
- Increasing Equipment Life.
- Progressively optimizing land use.
- Development of monitoring & diagnostic techniques.
- Development of software to monitor timely completion of projects.
- Use of time & energy saving devices / machines.
- Inventory management.
- Developing inputs from six sigma analysis for improving processes.
- Environment management etc.

ANNEXURE-II

ILLUSTRATIVE LIST OF PROJECT BASED PERFORMANCE INDICATORS SUGGESTED BY DPE

1. Projected expenses vis-a-vis budget.
2. Sponsored research by a CPSE or by a consortium – Expenses on sponsored research vis-a-vis benefit derived.
3. Commercialization of R&D.
4. Improvement in efficiency.
5. New sales generated vis-a-vis Cost incurred on R&D.
6. Market share increase due to introduction of new or improved product.
7. Additional profit generated vis-a-vis Cost incurred on R&D.
8. Cost savings realized vis-a-vis Cost incurred on R&D.
9. Productivity improvements introduced vis-a-vis Cost incurred on R&D.
10. Number of technologies transferred / acquired.
11. Reduce environmental Impact.
12. Milestones achieved.
13. Increased Reliability / Availability.
14. Process development / improvement.
15. Number of IPR's (patents, copyrights, etc.) filed.
16. Number of papers / publications presented / published in National / International seminars / symposium / journals.
17. Quality improvement.
18. Knowledge Generation / Dissemination.
19. Addition of New facilities / equipment.
20. Any other indicator acceptable to Task Force.

CHECKLIST FOR EVALUATION

Checklist	
1.	Project reference (ID)
2.	Title
3.	Start Date
4.	End Date Proposed
5.	Last Evaluation Date
6.	Objectives, benefits and deliverables
7.	Background & Description of the Project with list of activities
8.	Baseline Survey
9.	Time Schedule & Mile Stones
10.	Action Plan
11.	Milestones achieved
12.	Collaborations, if any
13.	Detailed documentation on the project
14.	Resources employed in terms of manpower & infrastructure
15.	Budget absolute and as % of PAT
16.	Expenditure incurred and estimated for the remaining period
17.	Beneficiaries
18.	Impact
19.	Status
20.	Outcome in terms of IPR generated, papers published etc.
21.	Valuation report by an independent agency