



केंद्रीय विद्युत अनुसंधान संस्थान

(विद्युत मंत्रालय, भारत सरकार के अधीन स्वायत्त सोसाइटी)

Central Power Research Institute

(An Autonomous Society Under Ministry of Power, Govt. Of India)

**CALL FOR PROPOSALS FOR FUNDING SUPPORT UNDER THE
“R & D SCHEMES OF MINISTRY OF POWER BEING IMPLEMENTED
THROUGH CPRI”**

FOR

**Recycling of waste generated from end-of-the-
life components of solar power plants and
wind power plants**

Focussing on

development of a sustainable, cost effective process to recycle or repurpose solar panel, wind turbine blades and Lithium ion Batteries thereby co-creating a circular economy for the same.

Last date of submission:

16th May 2022

Central Power Research Institute
(A Government of India Society, Ministry of Power)
Prof.Sir C.V.Raman Road,Post Box No: 8066,
Sadashiva Nagar (p.o),
Bengaluru,India , Pincode : 560080

<https://www.cpri.res.in>

GENERAL INFORMATION

The Ministry of Power, Govt. of India is promoting Research and Development for the Indian power sector through Central Power Research Institute (CPRI), which promotes applied research leading to technology development in the power sector. The Ministry supports R&D in the Indian Power Sector through CPRI under the “R&D schemes of Ministry of Power being implemented through CPRI” which consists of the following schemes:

- (i) R&D under National Perspective Plan (NPP)
- (ii) Research Scheme on Power (RSoP)
- (iii) In-House R&D (IHRD)

The details of the schemes are available on CPRI website: <https://www.cpri.res.in/r-%26-d-schemes/research-scheme>

The scheme basically aims to provide funds for carrying out need based research in power sector including solving of operational problems encountered by Indian power system. Project should be pertinent to the electric power sector.

The projects may be devised with the involvement of industries / utilities or ultimate beneficiary, except for the projects which will focus on exploring and validating new ideas. Research Station proposing the project should ensure that the key investigators indicated in the project proposal are available for the entire duration of the project. Project proposals are to be formulated after a thorough survey of literature in order to ensure that similar work is not undertaken elsewhere. Project should have substantial research content and element of innovation.

The specific objectives of this R&D programme are:

- To develop and integrate technologies in identified areas
- To promote modern / advanced technologies
- To promote modernization of traditional technologies, tools and skills
- To facilitate enhancement of quality and performance of power systems
- To promote activities aimed at improving technology, materials, Processes and other appropriate activities as applicable to Power Sector.

1.0 Brief Background

There has been rapid adoption of renewable energy sources in India, primarily driven by a combination of government policies and declining costs. The International Energy Agency (IEA) has predicted that the Indian solar photovoltaic (PV) installed capacity is expected to increase to over 724 Gigawatts (GW) by 2040. Also, India sees a growth in wind energy generation to 30 GW by 2030.

The shift towards the renewable energy has given rise to challenges that may arise in future like disposing of end-of-the-life components of solar power generation (like solar panels), wind power generation (like wind turbine blades) and energy storage devices associated with the renewable energy plants (like Lithium ion batteries). It may be noted that most of these components are not biodegradable. According to a study conducted by an energy consultancy firm, the PV waste volume in India alone is estimated to grow to 200,000 tons by 2030 and around 1.8 million tons by 2050. While the lifespan of PV panels is 25–30 years, studies have also highlighted that various factors can result in the early retirement of the panels. These include improper installation, minor manufacturing defects, poor maintenance and unfavorable climatic conditions. Similar situation may also arise for the wind turbine blades. Thus it is of utmost importance to come up with indigenous innovative solutions for fast recycling of the waste generated from the end-of-life components from solar and wind power stations in a cost effective manner. With indigenous innovative solutions, India can take a lead in this sector and tap the potential of the solar/wind/battery waste recycling market. Such innovative solutions if successful can turn into global economic opportunities and aid in creation of a circular economy model.

2.0 Objectives of Call

The objective of the call is to promote applied research to come up with innovative indigenous and implementable solutions for recycling/reprocessing of end-of-life components from solar power generation, wind power generation and Lithium ion batteries.

The Principal investigator should have a research team to foster interdisciplinary, multi-institutional networked research projects synergizing strengths of respective partners to deliver efficient devices/systems meeting national needs. The call envisages close interaction between industry, academia and research institutions. Participation of industrial collaborator from early stage is desirable to build long term linkage and take up leads to develop solutions which can eventually be commercialized. The outcome of the scientific endeavor under the call should be scalable. The deliverables of the projects should have the potential to change business -as -usual scenarios.

3.0 CALL STREAMS

The proposals are invited under three different broad streams. The Principle Investigator can apply in any one of the three streams as Principal Investigator where he/she is best to deliver the outcome to country. The topics indicated in call are only illustrative and any other topic addressing call spirit may be considered. The call has the following three different streams:

3.1 Recycling/repurposing of waste from solar power plants

Focus:	Development of processes/technologies for recycling/repurposing of waste generated from end-of-the-life components in solar power plant with major emphasis on solar panels.
Project duration:	Upto 2 Years
Project cost :	No ceiling

3.2 Recycling/repurposing of waste from wind power plants

Focus:	Development of processes/technologies for recycling/repurposing of waste generated from end-of-the-life components in wind power plant with major emphasis on Wind turbine blades.
Project duration:	Upto 2 Years
Project cost :	No ceiling

3.3 Recycling/repurposing of Lithium Ion Battery

Focus:	Development of processes/technologies for recycling/repurposing of end-of-the-life lithium ion battery
Project duration:	Upto 2 Years
Project cost :	No ceiling

4.0 CALL DATES

OPENING DATE : 11th March 2022

CALL CLOSING DATE: 16th May 2022

5.0 PROJECT FORMULATION GUIDELINES

5.1 GENERAL

The proposals should clearly define the objectives and list the deliverables. For system / component / consumables related proposals, the deliverable should include a target performance and establish it in the proposal. How proposed process/ product/system stands in comparison to comparable national and international ones in terms of performance and projected cost. The CV of the project investigators should be brief and highlight their competence and experience related to the proposed project area. Consortia may be formed wherever required by clearly explaining the need for forming the consortia and the roles and responsibilities of each partner. The Industry partner should have proven standing and R&D capability in the area related to the call and should exhibit the potential to commercialize the products / systems developed under the proposal. The extent of participation and contribution of the industry partner should be clearly defined. Participating Industry would be required to invest within its own system i.e. production/ test lines and/or develop required infrastructure to adopt research leads and is expected to bring design and engineering capability for the benefit of the project.

5.2 COMPONENTS OF FINANCIAL OUTLAY OF THE PROJECT

The expenditure pertaining to the project proposal such as Equipment, Instruments, Travel, Consultancy, Hiring charges for temporary research staff, overheads and miscellaneous & incidentals can be built into the cost of the project. Generally, overhead charges @10% is allowed to be built into the cost of the project. Projects with the objective of only carrying out only simulation studies and purchase of expensive software packages is not encouraged under this scheme.

Inclusion of salary component of permanent research staff is not encouraged. However cost towards hiring temporary research staff for the duration of the project is acceptable.

5.3 EXPERT REVIEW

The proposals as and when received by CPRI are sent to external domain experts from various eminent Institutions and put up for techno-economic evaluation by a Technical Committee. Presently there are four technical committees pertaining to a specific domain viz. 1) Transmission 2) Generation-Thermal 3) Generation-Hydro 4) Grid, Distribution, and Energy Conservation.

5.4 TECHNO-ECONOMIC EVALUATION

The project proposals reviewed by experts will be evaluated by Technical Committee which is chaired by Professors from IITs and has participation from Utilities and Industry. The principal investigators will be normally required to defend their project at the Technical Committee meetings. The Committee while undertaking techno-economical evaluation specifically examines aspects of deliverables of the project and their impact on the Utility/Power Sector at large before recommending the proposal to the Competent Authority for approval.

5.5 PROJECT APPROVAL AND COMMENCEMENT:

Proposals recommended by Technical Committee after Techno-Economic evaluations are put up to the Competent Authority for according approval. Director General of CPRI is the approving authority for proposals having outlay upto 50 lakhs. Projects above Rs 50 lakhs are vetted by the Standing Committee on R&D (SCRD) chaired by Chairperson, CEA. The SCRDC after thorough evaluation of the merit of the proposal grants approval for the project.

Once approved, the formal sanction and release of grant will be sought from the Ministry of Power. Communication of the approval and release of first installment of the grant will immediately be done after signing of MoU between CPRI and Project Implementing Organization.

5.6 QUARTERLY PROGRESS REPORTS (QPR):

It is the responsibility of Principal Investigator to furnish the progress (Technical and Financial) of the project for each quarter within a month after completion of the quarter. For the purpose of furnishing quarterly reports, the 1st quarter starts in April of every financial year. The QPRs are to be furnished in the prescribed formats for reporting technical & financial progress respectively.

5.7 FUND UTILIZATION CERTIFICATE (UC):

Principal Investigator shall submit the Fund Utilization Certificate for the released amount immediately after exhaustion of funds. Satisfactory technical progress and submission of progress reports and utilization Certificates as per the specified format are pre-requisites for release of further tranche for the project.

5.8 PROJECT MONITORING:

The R&D Management department monitors the projects by analysing the data submitted through QPR and UC. Progress of the projects is reviewed by the Technical Committee at Bengaluru or in some cases at respective investigating organizations.

5.9 PROJECT COMPLETION & TECHNICAL REPORT:

The investigating agency shall make a presentation to the Technical Committee once the project is completed. Prior to this, CPRI will scrutinize & analyze the final results of the project and give a report to the Technical Committee.

The Technical Committee finally declares that the project is completed with the deliverables as stipulated in the original project proposal.

5.10 DISSEMINATION:

The information on technologies / products developed as part of research scheme is currently available on CPRI website. The Project Investigators are encouraged to conduct workshops and seminars for dissemination of the knowledge.

5.11 WHO CAN SUBMIT THE PROPOSAL?

- Power Utilities
- Academic Institutes
- R&D Institute
- Manufacturers

Collaborative proposals are also encouraged under this scheme.

5.12 WHEN AND HOW TO SUBMIT A PROPOSAL?

1. Research proposals can be sent to CPRI on or before 16th May 2022.
2. The formats for submission of proposal and other details are available on the CPRI Web site under the respective call for proposal or can be obtained by writing to Head, R&D Management Division. The format for submission of the proposal is also enclosed as **Annexure I**.
3. Proposals prepared in the format should be submitted through the head of the respective institution to Head, R&D Management Division CPRI. Proposals in the prescribed format may be sent to the following address:

**Joint Director & HoD
R&D Management Division
Central Power Research Institute,
Prof. Sir.C.V.Raman Road,
Sadashivanagar (p.o.), P.B.No.8066,
Bangalore -560 080**

4. The Principal Investigator is normally required to make presentation on the proposal to the Technical Committee.
5. Technical Committee meets only 2-3 times in a year for techno-economic evaluation and recommendation of projects to the Competent Authority for according approval.
6. Recommendations of the Technical Committee will be communicated to the Principal Investigator through e-mail.

Format for New Project Proposal for submission to CPRI, Bangalore

Annexure I

1. Basic information
 - a. Name of the Implementing Organization/Institute and Address
 - b. Name of the Collaborating Industry and Address
 - c. Name of the Principal Investigator (PI) and Project team
 - d. Name of the project team members of Collaborating Industry
 - e. Project Title
 - f. Objectives
2. A broad overview of the technical programme
 - a. Brief technical description of the technology (7-8 points)
 - b. Current status of the technology offering – (planned/ongoing/ready for pilot/prototype ready/ready for commercialization)
 - c. Technology readiness level (TRL)
 - d. Status of compliance to standards - (meets existing standards (Indian/international), does not meet existing standards, has not been tested against existing standards, standard does not exist)
 - e. Is there any possibility of remote monitoring/maintenance through a networked system in the proposed offering, if applicable
 - f. All stakeholders, involved in the creation process
3. Details of End-user / Partner for the execution of project work/field implementation and nature of involvement of partner
4. Key outcome Indicators
 - a. Benefits/returns from the project work (indicate likely benefits to Indian Power Sector / Indian Utility / Manufacturer / Society)
 - b. Economic competitiveness (Atmanirbhar Bharat)
 - i. Will the technology offer a potential increase in Indian exports, reduction in imports?
 - ii. Details of the processes adopted for technology development/ product design (Lean manufacturing, Design for Manufacturing and others).
 - iii. Scalability of the technology/ solution.
 - c. Sustainable manufacturing (Make in India, Swacch Bharat)
 - i. How energy efficient is the offering compared to existing solutions if any?
 - ii. What kind of environmental footprint does the offering have?
5. Specific deliverables of the project in terms of
 - a. Knowledge gained by industry/lab/apprentices/interns etc.
 - b. Research publications
 - c. Patents
 - d. Process and product development

- e. Contribution towards improvements in issues concerning System operation
 - f. Value addition
6. Facilities required by the Implementing Organization/Institute
- a. Equipments / Accessories
 - b. Provide details of how new equipment established/ acquired under this grant will be made available to the broader Public R&D ecosystem
7. Foreseeable Roadblocks in implementing the proposed offering (ex. Technical, scalability, governance, policy etc.).
8. Support needed from the Ministry/Dept. for technology scale-up and product management– (piloting support, engineering support, techno-economic feasibility studies, procurement and others)
9. Provide a tentative/ indicative business plan for how technologies developed under the grant can be commercialized

Or

Provide an example of how the proposed technology has been deployed elsewhere in India or Middle-Income Countries (MICs)

10. Facilities provided by the collaborating Industry (in terms of equipment's / accessories)
11. Any linkage with National Missions (Atma Nirbhar Bharat, Swaach Bharat, Skill India etc)

Note:

- Please refer to **Appendix – I** for timelines, detailed expenditure breakup and mandatory enclosures
- A soft copy of the proposal in CD (in MS Word format) has to be enclosed along with the four hard copies of the certified NPP project proposal
- Once the project proposal is approved by SCRD, the extension of project duration may not be entertained. Hence precaution should be taken to clearly state the project duration by considering all the factors of project implementation.

Certificate

- A. This proposal has the approval of the Organization and all the existing facilities shall be made available for carrying out the studies on the proposed scheme.
- B. That the research work proposed in the scheme does not in any way duplicate the research work already done or being carried out in the research station on the subject.
- C. That the project is not being partly or fully financed by a grant from any other Organization / Government
- D. All efforts have been made/ will be made to bring industry collaboration for this project

Name and Signature of the Principal Investigator

Signature of the HOD / Head of the Implementing Institution / Organization
(With seal)

Date:

Appendix – 1

1. Bar chart / Table of technical work quarterly with major milestones to be achieved.

Activity	Q1	Q2	Q3	Q4

2. Total Estimated Cost of Project (*Rs Lakhs*)

a) Expenditure Details*:

SL No	Particulars	Year wise break up(<i>Rs Lakhs</i>)		Total Cost(<i>Rs Lakhs</i>)
		I year	II year	
1	Major Equipment a) b)			
2	Software / Hardware			
3	Temporary manpower (SRF/JRF/RA/PA/Consultancy)			
4	Consumables / Miscellaneous			
5	Travel / Contingencies (Consider contingencies/travel costs to access existing equipment in the i-STEM network)			
6	Outsourcing of facilities			
7	Others (<i>if any</i>)			
8	Institutional overheads (10%)			
Total				

**on approval of the project the PI is required to submit a Monthly Expenditure Plan as well as a Quarterly Expenditure Plan. Release of grants will be done monthly as per the submitted plan to avoid any unnecessary parking of funds at the implementing agency.*

b) Financial contribution from the Industry

c) Project duration (*not to exceed 2 years*)

Mandatory Enclosures:

- A brief summary of work carried out by PI and team members in the last 5 years.
- Brief Summary of technologies developed/ deployed/ commercialized by this team in the last 5 years
- Details of Publications in National / International Journals / Patents.
- Details of Research projects completed / ongoing of the PI (*if any*)

SL No	Project Title	Outlay (Rs Lakhs)	Sponsored (Scheme)	Project Outcome / Deliverables	Publications / Patents (numbers)
1					

- Details of industry experts consulted during the planning of the proposal
- Details of existing incubator/ accelerator consulted for start-up spin-off strategies for technology/products to be developed under this grant.
- Brief CV / Biodata of PI and team members
- Complete address of PI for communication (*includes Mobile, Landline and Faxnumber, email id etc.*)
- Details of Existing Lab / Analytical / Computational facilities.
- In the case of Engineering Colleges, details of the research centre, facilities, PG courses, Doctoral program and number of PhD Scholars may be furnished.
- Letter of consent from the collaborating Industry to support the research project

