Department of Science and Technology
(Technology Mission Division-EWO)

Challenge Awards 2021 on Solar Energy

1. Preamble

Clean energy research initiative encourages interventions where knowledge advanced than current industrial practices are supported for future breakthrough technologies. The promising leads are promoted to move up the technology chain and are taken to higher technology readiness levels. The initiative recognizes the importance of creating an ecosystem for clean energy research and innovations with the involvement of stakeholders and places due emphasis on creating required capacities and capabilities to position country in eminent position in clean energy research landscape.

The harvesting of energy from Solar in efficient and affordable configuration is being attempted to provide novel solution to provide green power solution in the country. The Indian research and engineering capabilities are leveraged for developing materials, devices, testing validation and pilot demonstration for efficient devices.

2. Objective of the Challenge Awards

Slowing the effect of global warming, one of the most pressing challenges of this century, demands a shift to sustainable technologies for electricity generation. Silicon (Si) based Photovoltaic (PV) technologies have been rapidly growing and dominating the renewable energy market. Amongst the other potential under development thin films PV technologies: Organic Solar Cells , Perovskites, Kesterites etc. are promising leads to deliver electricity at a lower cost with the lowest carbon footprint of all.

Solar cell research and development is a multi-disciplinary research and demands joint working of physicists, chemists, materials scientists, computational

scientists, and engineers to demonstrate high efficiency and cost effective modules. In India, educational and research institutions need to step up multi-institutional research work to produce global competitive devices while addressing the challenges from materials-to-processing techniques to devices. The wafer size for silicon based solar cell are trending towards large area (210 mm x 210 mm) driven by the lowering of levelized cost of electricity (LCOE), according to estimation by industry. The wafer thickness will also continue to decrease, as this is one the main costs of cell production. There are no issues with cell fabrication at smaller thickness, but breakage at the module fabrication stage of thin wafers will be in focus. The change in device architectures also show preferences to high quality n-type wafers, knowhow in nanolithography, masking or ion implantation which are costly affairs needing sensitive tools.

The other non- silicon technologies have a few unique strengths are being utilized for diverse real-world applications without competing with the Silicon solar cells. These emerging solar cells offer a versatile clean energy solution for applications that need mechanical flexibility, thinness, semi-transparency, and high-performance-to-weight ratio, and a combination of these features suitable for niche applications like building-integrated photovoltaics, wearable, and portable electronics, internet-of-things (IoT) devices, textiles, bio sensors etc.

The lab-to-manufacturing translation, the performance degradation caused in scaling up from the record lab-scale devices to industrial-scale modules is also a critical challenge in solar industry. In Non-silicon module/panels, multiple lab-scale devices are assembled using electrical connections that decrease the efficiency. The patterning of electrodes and the active materials to manufacture the sub-cells and interconnects with minimum loss are other prominent challenges apart from the materials and their processing. An integrated strategy combining materials development, materials processing, and interface engineering, and an optimized lab-to-module scaling is thus essential to tackle the efficiency and stability challenges for the commercialization of these technologies. Few to these developments appear promising for indoor energy sources with features of lightweight, flexible and semi-transparent. Success in these area would prepare our country with PV technologies with the lowest carbon dioxide equivalent (CO_{2e}) footprint of all.

The Indian research community needs a wholesome approach from developing materials to processes and to device applications with the highest scientific and technological impact. In the current context, for improving the research outcomes through the success of research and development projects the following outcomes could be the part of overall consortium:

1. **Setting up a virtual platform for standardization of devices and modules:** A central platform for certifying the efficiency and stability of devices and modules, appears an elementary need to adopt a high performing lab-scale device for scaling to module level for commercialization. For lifetimes, the devices can be aged and electrically monitored either outdoors or under

simulated outdoor conditions in a laboratory setting, as outlined by the International Summit on Hybrid and Organic Photovoltaic Stability (ISOS) protocols. The stability assessment of materials and devices should be encouraged for reporting.

2. **A link-up work plan for facilitating access to research infrastructure:** A suite of specialized characterization and processing techniques may not be available to all research groups in India. To foster wider access to essential infrastructural capabilities, a link-up work plan should be devised for connecting and building synergy with nearest well-equipped research groups.

3. **Applied research work package:** A research proposal may have one/ two focused exploration of novel applications of devices as energy sources (building-integration, IoTs, bio-sensors, etc.) which may utilize the "know-how" of the technological development taking place in smart grid domain.

4. **A multi-institutional approach** to enhance the chances of success of challenge awards.

3. Thematic Thrust Challenge

The interdisciplinary and transformative R&D proposals leading to development of efficient devices and system that could be adopted in the real field/industry utilization with well-identified /suitably quantified targets addressing scientific and technological challenges. Objectives having focus on fundamental science, material science and study of properties etc. would not be acceptable under the award. The scientific outcome of the proposal should dwell upon the options for industrial /societal scale up of the targeted devices .

The following research challenges emanate from several scientific discussions and consultations with stakeholders. However, any other challenge which could lower the cost of solar energy through technological innovations can also be proposed.

- Development of large area monocrystalline p-type (166 mm x 166 mm (M6)/210 mm x 210 mm) high efficiency PERC Solar Cell (>23%).

- Development of large area monocrystalline n-type (166 mm x 166 mm (M6)/210 mm x 210 mm) high efficiency (>24%) PERT Bifacial solar cell.

- Development of large area (158.75 x 158.75 (G1)/ 182 mm x 182 mm (M10)) high efficiency (>25.5%) HJT solar cell.

- Development of large area (158.75 x 158.75 (G1)/182 mm x 182 mm (M10)) high efficiency (>25%) n-type TOPcon Solar cell.

- Development of large area (158.75 mm x 158.75 mm (G1)/ 182 mm x 182 mm (M10) High efficiency (>27%) Si based tandem Solar cell.

- Development of large area (158.75 mm x 158.75 mm (G1)) high efficiency (>26%) interdigitated back contact solar cell.

- Low temperature metal paste for fine line printing of grids. ≤ 25μm wide, aspect ratio (height/width) ≥ 0.5, line resistance, ≤ 2Ω/cm, bulk resistivity ≤ $5x10^{-6}$ Ωcm

- Low cost low temperature Ag paste: Blended paste with Ag content of 40% (half of Ag content compared to currently used Ag pastes for HJT), 40μm wide line printing with line resistance < 5Ω/cm after curing at <200 C for 30 minutes.

- High mobility Indium free TCO: For 80nm film, mobility ≥ 80 cm^2/Vs, carrier concentration 0.5-$1x10^{20}$ cm^3

- Tunnel recombination junction (TRJ): Perfect Ohmic behavior, Optical absorption loss ≤2%, demonstrate as Ohmic junction in a series connected tandem solar cell (carrying current of not less than 15 mA/cm^2) with voltage loss ≤ 0.5V in the junction.

  Non-Silicon Technologies: The key to success for potential commercialization is to generate more voltage from device without increasing its physical dimension since more of this electrical circuits in sensors and actuators of low energy harvesters need around 2-3V and a current of nA while in sleep and μA for running.

- **Highly efficient (>20%) and stable (1000 hrs) perovskite solar cells:** The crucial issues limiting the commercialization of PSCs are their long-term device stability under stressed conditions (high humidity, elevated temperature, and intense illumination) keeping the efficiency high with following indicative target.

Power conversion Efficiency	Stability in N2 environment	Stability after Encapsulation in air	Active area
> 20 %	>1000 hrs	~1000 hrs	>10 mm^2

- **Flexible perovskite Solar Cells:**

Substrate choice	efficiency target after 1000 bending cycle	max tensile strain	flexibility in percent after 1000 bending cycle
Flexible (polymer/organic/smart material)	>15%	1.5%	80%

- **Indoor perovskite Solar Cells:**

Power conversion Efficiency (under 1 sun)	Power conversion Efficiency (under 1000 lux)	Voc (V)	Stability (with encapsulation)
>15%	>25%	>0.8 V	>800 hrs

- Tandem/bilayer Kesterite based solar cells with efficiency > 18% suitable for niche application.

- Development of high-performing eco-friendly non-fullerene acceptors (NFAs) for organic solar cells (OSCs) with efficiency (>16%) and lifetime (> 7 years).

- Improving the efficiency (>18%) and lifetime (> 10 years) of OSCs (>18%) through device engineering and low-cost processing methods.

- Development of large-area (>200 cm^2) modules with efficiency (> 10%) and lifetime (> 5 years) using low-cost scalable manufacturing techniques.

- Development of new generation copper electrolytes for indoor light harvesting photovoltaic devices which can realize above 1V from single junction device and efficiency >30% under 1000 lux indoor (CFL/LED) illumination on 1cm^2 standard active area.

- Design and synthesis of scalable organic dyes and cocktail mixtures that are compatible with alternate copper electrolytes and having overlapping absorption with the spectra of indoor lights with higher molar absorption coefficients in visible region.

- New innovative device designs contributing to higher efficiencies suitable for indoor light harvesting, improved process ability and with reduction in materials leading to low cost production and easy scale-up.
- Probing the interfacial dynamics (recombination, regeneration, mass transport etc.) in copper electrolytes devices using electrical and optical perturbation tools.
- Development and demonstration of innovative self-powered products/porotypes that works independently under 1000 lux indoor illumination integrated with the indoor solar cells partnering with end-users/industries.
- Aqueous electrolytes, replacing organic acetonitrile with water as solvent, use of printable electrolytes, monolithic design, preparation of conductive substrates (to replace FT and ITO) which are atleast 100 times or more conductive than these conventional players. These are some futuristic considerations that can also be accounted if required.

- Development / Metrology of multi-junction solar cell (MJSC) with 2-4 junctions aiming conversion efficiency >20% with prototype demonstration

- Design & development of III-nitride based photovoltaic device with conversion efficiency >3%.

The above cell size and target efficiency are indicative in nature. The research consortium that has overall high merit proposal while leveraging their existing facilities to achieve the targeted efficiency on even small size solar cells will be given preference. A suite of specialized characterization and processing techniques may not be available to all research groups in India. To foster wider access to essential infrastructural capabilities, a link-up work up plan should be devised for connecting a nearest well-equipped research group. The fabrication process for such devices need sophisticated growth techniques which also required lots of support accessories. These growth techniques essentially regular maintenance as they are prone to broke down. Besides, regular & critical characterization techniques are required to optimize the quality, physical, chemical & electrical properties of the grown layer. Due care shall be taken in budget toward maintenance as these may not be excuse, while executing the challenge award.

The consortium is requested to report the status of solar cell device parameters reported/ stabilized out in labs with due reference to scientific journal publication / third party validation of their claims. The champion cells fabricated at the end of the project needs to be validated from third party. The technical work packages have to be led by investigators who have verifiable expertise in the subject. The scientific out-come of the proposal should have direct relevance to Indian scenario and should consider industrial collaboration for future commercialization of these solar cells.

Disclaimer: Topics given are not prioritized and are the suggestions received from various stakeholders. Submissions of the project proposal on these topics do not indicate preferential treatment or otherwise. The onus or establishing need and demand of the project objectives depends upon the proposal contents through supportive facts and data.

4. **Who can apply:** The consortium proposals are to be led by faculties/ scientists working in regular position in recognized academic institutions, public funded R&D Institution/ Laboratories, DSIR recognized SIRO organization in partnership with other academic/ R&D organization etc. Participation of industries/ start-ups and industry association is desirable. The industrial partner should have proven standing and R&D capability in the proposed area. Faculties of recognized universities and academic institutions, scientists working in National Laboratories, R&D institutions and Research organizations recognized and Start-ups could be part of consortium.

5. **ASSESSMENT CRITERIA:** The proposal will be evaluated based on following criteria:

a) Scientific and Technical merit .
b) Expertise, facilities and track record and ability of the Project Investigation Team to achieve the research goals.
c) Proposal formulation (Precision in objective, adequacy and completeness of literature review, preliminary work done, highest efficiency achieved by group in previous year with declared active area (efficiency table showing targeted Jsc, Voc, FF), clearly mentioned stability (under air, heat and light) already achieved by the group and expected stability, proposed encapsulation strategies, methodology, device architecture and work plan.
d) Resources requested for purpose in effectiveness of planning and utilization of existing assets nationally etc.

DST at the behest of the Expert Panel may introduce/ change criteria for critical evaluation of award.

Project cost: No ceiling on project cost. Sharing of resources is welcome as it signifies commitment and participation of stakeholders. The company/industry collaborators contribute in the form of industry attributable technical inputs and resources in kind. Contribution in cash by industry, though welcome, but not mandatory for the projects submitted under this call.

6. **Project duration:** Upto 3 years

7. CALL DATES:

OPENING DATE: **01st November 2021**

CALL CLOSING DATE: **31st December 2021**

8. SPECTRUM OF ACTIVITIES SUPPORTED

The spectrum of activities focusses on translational research to convert available know how to useful product /process etc. The strategy for sustainability of intervention and post intervention also needs to be explicitly stated. The applicants are advised to indicate TRL level at the beginning and end of the project.

9. PROJECT FORMULATION GUIDELINES

The proposals should clearly define the objectives and list the deliverables. The CV of the project investigators should be brief and highlight their competence and experience related to the proposed project area. Consortia is desirable with roles and responsibilities of each partner. The industry partner should have proven standing and R&D capability in Energy Technologies 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.

10. ONLINE SUBMISSION OF PROPOSAL

Proposals are accepted **only online** at e-PMS under Technology Mission Division in the prescribed format within the prescribed closing Date/Time. Proposal format can be downloaded from Website https://onlinedst.gov.in/Login.aspx . Go to: Schemes And Formats : Technology Mission Division :[Challenge Award 2021:Solar Energy] : Download Call format.

Kindly take care of following instructions while submission of proposal

- Before filling up the form, Indian applicants are advised to carefully go through the relevant call document and guidelines at the DST Website (https://dst.gov.in/) and also available under Proposal Formats in the e-PMS Portal after logging in to the portal site.
- To save time and avoid data loss, please download the appropriate proposal format and fill all the information required as per the format as a Word and PDF file and then keep it ready for upload during submission of mandatory documents.
- Click on the "**Submit proposals**" link which would take to a page seeking multiple information starting with – General information, Principal investigator etc.:
- After filling in all the above particulars, there is a provision to preview your details before the final submission of the application form by clicking on the "Preview" button. The preview page will display all facts/particulars that have been mentioned on entry time. If the applicant is sure with filled details, then click on the "**Submit**" button to finally push data into the server.
- Applicants are advised to carefully fill in and verify the details required for the online application themselves, as no change will be possible/ entertained after clicking the **FINAL SUBMIT BUTTON.**

a. Under **General Information** tab: In **Project Keyword:** Ensure to mention the "Si: *CIGS etc*)

b. Under **Principle Investigator** tab: In **Co-Investigator List**- Please ensure to mention the details of all the persons involve in the project including collaborator.

c. Under **Suggested Referees** tab: At least 3 referees are mandatory to be mentioned.

d. Under **Ongoing projects** tab: Declared those projects related to the Principal investigator**.**

e. Under **Submission** tab: **Certificate from PI (Pdf Max 800 Kb)**: Please ensure certificate of all PI's and Co-PI's in the project team should be merged together and uploaded as a single pdf document.

f. Under **Submission** tab: **Endorsement from Head of Institute (Pdf Max 800 Kb)**: Please ensure that certificate from relevant institutes (if any) of all PI's, Co-PI's, collaborators, Letter of Intent from beneficiary (as applicable for selected stream) of project should be merged together and uploaded as a single pdf document.

g. Declaration regarding Conflict of Interest (max Size 800KB) **[as per Format enclosed].**

h**.** Complete Full Project Proposal along with all annexures (signed and stamped by Authorized signatory) and attachments as mentioned in project guidelines.

i. Nomenclature for soft copy of Project proposal document:(Lead - PI first name –Institute -City) eg; if Lead- PI name is Dr. Anil Kumar and his affiliation is National Institute of Technology, Raipur then soft copy file name is Anil-NIT-Raipur.docx/Anil-NIT-Raipur.pdf.

It is advised to submit the proposal at the earliest and not wait till last moment, as submission of proposal on the closing day of call may hamper due to congestion on server.

11. **For online submission problem**: Contact Portal Help-Desk Executive at 011-26590545.

12. **For any other Information**: Contact Programme officers: Dr. Vineet Saini, Scientist 'F' / Mr. Dhirendra Tiwari, Scientist 'C'; Technology Mission Division (EWO), Department of Science & Technology (DST), Technology Bhavan, New Mehrauli Road, New Delhi- 110016 (Ph 011-26590372/011-26590622).

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TMD: CERI: RENEWABLE ENERGY SYSTEM

FORMAT FOR SUBMISSION OF PROPOSAL

CHALLENGE AWARDS : SOLAR ENERGY 2021

CONTENTS

I. Proposal Summary: **Challenge Awards : Solar Energy 2021**

(To be limited to two A-4 pages)

Ensure to read the Guidelines (in italics fonts) and fill the selected/relevant text only in the boxes

1.	Project Title		
2.	Project cost *(Amount in lakhs)*	DST:	Collaborator(s) *(if any):*
3.	Duration *(in months)*		
4.	Lead- PI Name Date of Birth		
5.	Co-PI (s) Name Date of Birth		
6.	Lead Organisation		
7.	Status of Lead Organisation	*Recognized universities and academic institutions/ National Laboratories/R&D institution,/Research organizations recognized by DSIR/Others-Specify the affiliation clearly*	
8.	Collaborator/Consortium partner name(s), *if any*	*(Consortium may be formed wherever necessary. In sections 11 and 12 of the proposal, clearly explain the strength of the consortium and the roles and responsibilities of each partner).*	
9.	Collaborators'/ Consortium partners' Status	*(In case of private sector company, please indicate **DSIR** registration number of recognition of in-house R&D units)* *(Industry partner should have proven standing and R&D capability 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 in the proposal).*	
10.	Objectives	***(Precise and quantified)***	
11.	Baseline/Foundation merits (bullets form)	***(Mention critical device parameters and its achieved values; existing R&D strength in the group)***	
12.	Deliverables	*(Deliverables should include targeted specification)*	

13. Budget details:

A.	Project Manpower *(Post & Nos Research group/ institution-wise if more than one institutions*	DST: (*JRF/SRF/Research Associate/ Project Assistant / other Professional Manpower)*	Collaborator(s):

	are involved)		
B.	List of Equipments required *(Research group/ institution-wise if more than one institutions are involved)*	DST:	Collaborator(s):
C.	Fabricated system /prototype, if any	DST:	Collaborator(s):
D	Nature of Contribution from Collaborators	In Cash & Kind *(Please elaborate)*	

14. Funds requirements from DST:

S. No	Item Head	1st Year	2nd Year	3rd Year	Total (Rs.)
A	**Non-recurring (Capital Items)**				
1	Permanent Equipments				
2.	Plant cost /Fabricated systems/ Demonstration models				
	Sub total (capital items)				
B	**Recurring Items (General)**				
1.	Manpower				
2.	Consumables				
3.	Contingencies				
4.	Travel				
5.	Other Costs (Outsource work etc),if any				
6.	Overhead				
	Sub total (General)				
C	**Total cost of the project (A+B)**				

Total requirement of funds from DST =
Contribution of participating institution(s), if any=
Total project cost =

II. CORE PROPOSAL

(Kindly ensure to read the Guidelines (in italics fonts) and fill the text accordingly)

1. **Project Title**

2. **Lead Organization Principal Investigator (PI)**

Name:

Designation:

Complete Address *(with city pin code):*

Telephone & Mobile No. :

E-mail:

Lead Organization Co-Principal Investigator(s) (Co-PI)*

Name:

Designation:

Complete Address *(with city pin code):*

Telephone & Mobile No. :

E-mail:

3. **Co-PIs /Consortium partner's organization(s) details:**

Name(s) of Principal Investigator(s):

Designation:

Complete address *(with city pin code)***:**

Telephone & Mobile No. :

E-mail:

(No project shall be considered in absence of Co- PIs from lead institute)*

4. **Collaborating Industries** *(If any)*

(In sections 10 and 11 of the proposal, clearly explain the roles and responsibilities of researcher in work packages.)

5. **Objectives of the Proposal**

(Precise and quantified: Estimated target values, Use bullet form)

6. Critical Review of Status Identifying Gaps
(*include important references & IPR survey*)

7.1 National Status Review

7.2 International Status Review

7. Outline of the Project *(How the proposed consortium bridge the gap between national and global capabilities or enhance the national advantage to produce the champion device/ system in not more than 100 words)*

8. Baseline/Foundation merits *(Details of critical device parameters and its achieved values; existing R&D strength in the group to gauge the merits)*

Critical parameter	Already Achieved values	Remarks

9. Deliverables of the project *(Deliverables should include target performance, and how these targets stand globally)*

10. Methodology

(This section should highlight base work existing with the investigators and its approach to move ahead while synergizing with its other team member to achieve the champion device/system in given time period ; a link-up work plan [mechanism/ frequency to exchange information within other team members and associated activity])

Work Package (WP: 1,2,3…n)

Work Package 1 (Description of the Activities)	**Name of the PI driving the activity**	**Time duration**	**Remarks (Associated responsibilities/link up plan)**

11. Work Timeline (*Highlight Milestones)*

Sl no.	***Milestone***	***1st year***		***2nd year***		**3rd year**	
		1-6 M	***6-12 M***	***13-18 M***	***19-24 M***	***25-30 M***	***31-36 M***
A1							
A2							
-	*Third part testing of device / system*						
**	*Draft completion report (2 month prior to date of completion)*						

12. Names of 5 Experts working in the similar area

(Please give complete Name, Designation, Email, Address with pin code, telephone number)

13. Any other information relevant to the Project proposal/ execution of the project *(Group strength and its network with other international Indian scientific,Technical diaspora etc)*

14. Facilities and Infrastructure already available to the PI(s)/Co-PI(s) at their respective institute for Implementing the project.

Name of the institute :

S.no	**Equipment Name**	**For which purpose it would be utilised in current project**

III. BUDGET ESTIMATES

Break-up of Total Budget

I. Funds requirement from DST
All amount in lakh

Institute name in consortium	**Capital Items (A) (Non- recurring) (Rs.)**	**Other items (B) Recurring head (Rs.)**	**Total (C = A+B) (Rs.)**
Total**			

II) Nature of Contribution from Collaborators, if any : Cash / Kind *(Please elaborate)*

III) Total cost = Rs. (DST) + Rs. (Cash amount provided by Collaborator,if any) = Rs.

*[**Kindly cross check the break-up amount indicated above of individual organization match with the figure in subsequent section]*

Budget

(* To be given institution/ research group-wise in case of consortium projects)

Name of the Institute : _____

a) DST Support (All Amount in Lakh)

S. No	Item Head	1st Year	2nd Year	3rd Year	Total (Rs.)
A	**Non-recurring (Capital Items)**				
1	Permanent Equipment				
2.	Plant cost /Fabricated systems/ Demonstration models				
	Sub total (capital items)				
B	**Recurring Items (General)**				
1.	Manpower				
2.	Consumables				
3.	Contingencies				
4.	Travel				
5.	Other Costs (Outsource work etc),if any				
6.	Overhead				
	Sub total (General)				
C	**Total cost of the project (A+B)**				

Details of Itemized Budget

(To be given separate for each institution/ research group-wise in case of consortium projects)*

Name of the Institute :

A. Non-recurring (Capital Items)

A1. Equipment*

Budget for Permanent Equipment (To be borne by DST**)**

Description of Equipment	**Unit Landed Price (CIF+ Custom Duty/ Taxes + others charges etc)* (Rs.in lakh)**	**Nos. of Equipment**	**Total Cost (Rs. in lakh)**	**Justification in context of proposed work.**
		Gross total =		

Page/sheet indicating the total landed cost in Indian rupees(* ***Ensure to mention Currency Exchange rate considered in case of imported equipments,* *freight , taxes, spares, special installation, etc)* ***Please project the actual cost taking into account reliable cost estimates as no cost revision would be admissible***

A2. Fabrication system: Tailor made models/ experimental set up (if any)

i) Budget for Fabrication system/Tailor made items

Description of fabricated system	**Unit Landed Price (CIF+ Custom Duty+ others charges)* (Rs in lakh)**	**Nos. of Equipment**	**Total Rupees (Rs. in lakh)**	**Justification in context of proposed work**
	Gross total			

Page/sheet indicating the total landed cost in Indian rupees(* ***Ensure to mention Currency Exchange rate considered in case of imported equipments,* *freight , taxes, spares, special installation, etc)* ***Please project the actual cost taking into account reliable cost estimates as no cost revision would be admissible***

B. Recurring Items (General)
B1. Manpower

Designation*	Educational Qualification	Experience in years, if applicable	Justification

(*Emoluments shall be provided as per DST Guidelines for Research fellow, Research Scientist and Project Assistant .In case any special manpower is needed ,enclosed your Institute manpower order copy along with proposal in annexure)

Manpower Budget
JRF /SRF/ Research Associates/ Project Assistants Details (applicable for the given category)

Designation	Total Emoluments (in Rupees)				No. of persons	Total Amount (Rs.) (Inclusive of all Allowances)
	1st Year	2nd Year	3rd Year	Total (1st +2nd+3rd Years)		
	Gross amount required for manpower budget head =					

Please mention category/ class of city for admissible HRA along with %. _____

B2. Consumables
Budget for Consumable Materials (*To be borne by DST***)**

Items	Unit Price	Qty Neeeded	Amount (Rs. in lakh)	Justification
Gross total =Rs lakh				

B3. Contingencies
Budget for Contingencies (*To be borne by DST***)**

Items *(unforeseen expenses, patents,report preparations etc)*	Amount (Rs. in lakh)	Justification
Total		

B4. Domestic Travel*

Budget for Domestic Travel (To be borne by DST**)**

Items (to attend)	**Total Amount**	**Detailed Justification (In case of extensive field/ inter-lab visits needed in project indicating breakup of cost w.r.t. to journeys, mode and class of transport needed)**
Organize Review meetings and other project related work		
Total		

(*) Foreign travel is generally not permitted under DST grants. Class and mode of transportation should be as per the entitlement of the concerned staff in the institute.

B5. Other Costs, **if applicable**

Budget for Other Costs (To be borne by DST**)**

Item	**Total (Rs. in lakh)**	**Detailed Justification (derived cost calculation and relevant Quotation at Annexure- / page no*)**
Outsource work		
Other items, if any		
Gross total =	Rs.	

<u>Collaborator budget / Contribution</u>

Submit similar above detail breakup for each collaborator, if any

IV. Proforma for Bio-Data of Principal Investigator(s) (PI), Co-Principal Investigator(s) (Co PI) and Coordinating Investigator of each partner Institution (Please be brief and follow the format)

1. **Name**

2. **Gender**

3. **Date of Birth**

4. **E-mail ID:**
5. **Mobile**
6. **Category : General/SC/ST**
7. **Qualification :**

S. No.	Degree	Institution	Year	Division/Class

Ph. D details : (Title and Guide)

8. **Employment Experience**

S. No.	Position & Organisation	Nature of Job	Period

9. **Selected List of Ten Best Publications** *(relevant to the proposed project)*

10. **Patents filed/Granted with details** *(relevant to the proposed project)*

11. **Books Published /Chapters contributed** ***(relevant to the proposed project)***

12. **a. Sponsored Research Projects (last five years)**

S. No	Title	Sponsoring Agency and Officer Concerned	Period	Amount	Achievements

b.Consultancy Projects (last five years)

S. No	Title	Sponsoring Agency	Period	Amount

c. Sponsored Research/Consultancy Projects submitted for approval

S.No.	Title	Funding Agency	Duration	Amount

13. Awards and Honours:

A. National list

B. International list:

14 Knowledge disseminated/ Technologies Developed / Transferred:

(please provide brief bullet of the impactful finding of your publication relevant to the proposed work /Details of technologies transferred to industry, technologies commercialized)

Date (Signature of PI)

V. CERTIFICATE FROM THE INVESTIGATOR(S)

Project Title:

1. I/We have carefully read the terms and conditions of the Programme and I/We agree to abide by them.
2. I/We have not submitted this or a similar Project proposal elsewhere for financial support.
3. I/We have explored and ensured that the equipment and the basic facilities described in the Research Proposal in the relevant organization , will actually be available as and when required for the purpose of the Project. I/We shall not request financial support under this project, for procurement of these items.
4. I/We undertake that spare or idle capacity of the permanent equipment procured under the project will be made available to other legitimate users from parent and other organizations.
5. The Company agree that the agreement, as per norms of the scheme, shall be executed with the department towards implementation of the project.
6. I/We have enclosed the following :

A Endorsement from the Heads of the Institution
(on letter head)

B Undertaking from the Collaborator(s)
(on letter head)

C Complete Project Proposal with all enclosures

Name(s) and Signature(s) of the Investigators*

Date

Place

(* To be signed by PI and Co-PI of each Participating Institution)

VI. ENDORSEMENT FROM THE HEAD OF THE ORGANISATION

(*To be typed on the letter-head of the organization*)
(To be provided by each of the participating Institutions)

Project Title

1. Certified that the organization welcomes the participation of Dr/Mr/Mrs ……..as the PI and Dr/Mr/Mrs……as the Co-PI for the project and that in the unforeseen and legitimate event of discontinuation by the PI, the Co-PI will assume full responsibility for completion of the project. Information to this effect, endorsed by me, will be promptly sent to the DST
2. Certified that the equipment, other basic facilities and other administrative facilities as per the terms and conditions of the award of the Project, will be extended to the investigator(s) throughout the duration of the project.
3. The Organization shall ensure that financial and purchase procedures are followed as per the prevailing norms of the organization, within the allocated budget.
4. The Organisation shall provide timely the Statement of Expenditure and the Utilisation Certificate of the grant as required by the DST in the prescribed format.
5. **The grant for the proposal, if approved , the funds shall be transferred to following organization account :**

1	Name of A/c holder (as per Bank record)	
2	Bank Account No.	
3	Bank Branch Name & Address	
4	MICR Code	
5	IFSC Code	
6	E-mail (Agency /PI)	
7	Mobile No. (Agency/PI)	
8	Unique agency code*	

***** *As per the extant guidelines of Govt. of India, institutes are requested to register on PFMS website and inform unique agency code to facilitate the electronic fund transfer. {website link- https://pfms.nic.in/Users/LoginDetails/Login.aspx}.*

(Head of the Institute)
Seal/Stamp

Date
Place

VII. Endorsement from collaborating Industry/ Agency *(if any)*

(On the official letter head)

I have gone through the Project proposal entitled…….. submitted by ……*(Name of PI)* …of…….*(Name of the Institute)* for DST funding and noted the obligations and responsibilities indicated in our name which are as below :

1. Contribution in financial terms *(mention amount in Rs.)*

2. Contribution in kind *(list activities)*

I hereby affirm that my organization/ industry is committed to participate in the Project to the full extent as indicated including financial liabilities accruing therefrom as detailed above. A brief profile of my organization is summarised below:

Name of Organisation
Line of Business/ Major Products
No. of employees
Annual Turn over

The Annual Report for the last financial year is enclosed.

(Head of the Organisation)
Seal/Stamp

Date
Place

VIII. Terms & Conditions of the Grant

1. Approval of the Research Proposal and the grant released for it is for the specific Project sanctioned and the released grant should be exclusively spent on the Project within the stipulated period. The Institution may use funds obtained from any other Organisation with the concurrence of DST, for the Project. **Any un-spent balance out of the amount sanctioned must be surrendered to the Government of India by depositing in bharatkosh account by using link**(www.bharatkosh.gov.in), No draft/cheque for deposition of unspent/interest will be accepted in any case.
2. For permanent, semi-permanent assets acquired solely or mainly out of the project grant, an audited record in the form of a register shall be maintained by the Institute. The term "Assets" include (a) the immovable property acquired out of the grant; and (b) movable property of capital nature where the value exceeds Rs 1000/-. The Institute is required to send to the Department of Science & Technology a list of Assets acquired from the grant. The grant shall not be utilised for construction of any building unless specific provision is made for that purpose. Full infrastructural facilities by way of accommodation, water, electricity, communication, etc. for smooth implementation of the project shall be provided by the Institute.
3. All the Assets acquired from the grant will be the property of the Government of India and should not be disposed off or encumbered or utilised for purposes other than those for which the grant had been sanctioned, without the prior sanction of the DST. The extent rules of Department of Science & Technology in respect of equipment retention/buy back will be applicable.
4. At the conclusion/ termination of the project, the Government of India will be free to sell or otherwise dispose off the Assets which are the property of the Government. The Institute shall render to the Government necessary facilities for arranging the sale of these assets. The Government of India has the discretion to gift the assets to the beneficiary Institution or transfer them to any other Institution if it is considered appropriate.
5. The Institution/ PI will furnish Half Yearly Progress Report (5 copies) of the work on the Project on half-yearly basis (i.e. if the date of start of a project is 12.09.21 the first Six Monthly Technical Progress report shall be for the period 12.09.21 to 31.03.22, the next will be from 01.04.22 to 30.09.23 and so on). In addition, the DST may designate a Scientist/ Specialist or an Expert Panel to visit the Institution periodically to review the progress of the work being carried out and to suggest suitable measures to ensure realisation of the objectives of the Project. During the implementation of the Project the Institution will provide all facilities to the visiting scientist/ specialist or the Expert Panel by way of accommodation, etc. at the time of their visit. In case of exceptional circumstances, request for extension for time period must be submitted to DST six months prior to the approved date of completion of the project. On completion of the Project, submit the final statement of Expenditure along with utilization certificate and ten copies of self-contained Project Completion Report as per DST format. 30% funds under capital Head for procurement of

equipment will be released initially , PI has to submit proof/Documents for procurement process for further release

6. At the time of seeking further instalment of the grant, The Institution/ PI has to furnish the following documents:
   a) Statement of Expenditure (SE) and Utilisation Certificate (UC) for financial year up to 31st March (in original or copy if sent earlier)
   b) An authenticated up-to-date Statement of Expenditure including Committed Expenditure for the Project on the date of seeking further instalment.
7. Request for specific approval of the Department to **carry forward** the unutilized grant to the next financial year for utilisation for the same Project, should be sent along with SE & UC, after completion of the financial year.
8. **The Comptroller & Auditor General of India, at his discretion, shall have the right of access to the books and accounts of the Institution maintained in respect of the grant received from the Government of India.**
9. The Institution will maintain separate audited accounts for the Project. The information/financial documents has to be provided when ever required by the DST officials. If it is found expedient to keep a part or whole of the grant in a bank account earning interest, the interest thus earned should be reported to the DST and should be reflected in the Statement of Expenditure. All expenditure to be booked through EAT module, which is mandatory to be implemented by the Institute before releasing of the funds
10. The Institution will not entrust the implementation of the work (except the out-sourced part as approved) for which the grant is being sanctioned to any other institution nor will it divert the grant receipts to other institutions as assistance. In case the Institution is not in a position to implement or complete the Project, it should refund back to the DST the entire grant received by it or the balance grant through **Bharatkosh Portal.**
11. PIs/grantee organizations will ensure that procurement process in such cases are completed within the same financial year as specified in the sanction , provided that grant is released at least 8 Months prior to the close of financial year. Carry forward of such capital grant will be permitted only for Immediate succeeding financial year with the approval of DST only.
12. PIs / Institute must ensure that all interest gained on unspent balance in both heads will be deposited to Government of India account in bharatkosh by using link(www.bharatkosh.gov.in) before issuing UC/SE for releasing of next Installment.
13. In no case inter head expenditure will permitted and PIs/Institute must ensure be adhere to make expenditure accordingly as per sanction issued.
14. All the personnel including Research personnel appointed under the project, for the full/ part duration of the project, are to be treated as temporary employees and will be governed by the Administrative rules/ service conditions (for leave, TA/DA etc) of the implementing Institute. They are not to be treated as employees of the Government of India and the DST will have no liability, whatsoever, for the project

staff after the completion of the Project duration. For the expeditious implementation of the research Project, the PI will take the assistance of the Institution in the process of selection and appointment of staff and payment to them. Scale and emoluments for the posts not covered under DST's OM are governed by the norms prevalent in the implementing Institution or as agreed upon in consultation with the DST.

15. **The DST reserves the right to terminate the project at any stage if it is convinced that the grant has not been properly utilised or satisfactory progress is not being made.**

16. **The date of Start of project will be 15 days of receipt of funds Project becomes operative with effect from the date on which the ECS/Draft/ Cheque is received by the implementing Institute.** This date should be intimated by the Institution authorities/ Principal Investigator to the DST.

17. If the Principal Investigator (PI) to whom a grant for a project has been sanctioned wishes to leave the Institution where the project is based, the PI/Institution will inform the DST of the same at least 6 months before in advance with suitable justification and reasons and in consultation with the DST, evolve steps to ensure successful completion of the Project, before the PI is relieved.

18. The data pertaining to the project should be systematically collected, scientifically documented and submitted to DST which later would be placed in public domain. This clause would not be applicable for the projects where legal protection of the know–how generated is felt necessary.

19. The project guidelines of the call may be modified as per administrative/ technical requirement in consultation with Head(TMD).

20. Investigators wishing to publish technical/ scientific papers based on the research work done under the project should acknowledge the assistance received from the DST, indicating the scheme. Investigators are expected to publish some of the research papers emerging out of the Project work in leading Indian Journals.

21. If the results of research are to be legally protected, the results should not be published without securing legal protection for the research results. For projects identified to have a distinct potential for generating know-how, in the form of product/ process, that could be protected through patenting, copyrights etc., the PI should carefully follow the "**Guidelines/ Instructions for Technology Transfer and Intellectual Property Rights"** provided in the **Guidelines for Implementing Research Projects** booklet issued by the DST. [http://www.tifac.org.in] For further information/ clarification on this subject- The Director, Technology Information, Forecasting and Assessment Centre (TIFAC), Patent Facilitating Cell, Vishwakarma Bhawan, Shaheed Jeet Singh Marg, New Mehrauli Road, New Delhi- 110016, E-mail: tifac@nda.vsnl.net.in, may be contacted.

DEPARTMENT OF SCIENCE AND TECHNOLOGY
POLICY ON CONFLICT OF INTEREST

FOR APPLICANT

Issues of Conflicts of Interest and ethics in scientific research and research management have assumed greater prominence, given the larger share of Government funding in the country's R & D scenario. The following policy pertaining to general aspects of Conflicts of Interest and code of ethics, are objective measures that is intended to protect the integrity of the decision making processes and minimize biasness. The policy aims to sustain transparency, increase accountability in funding mechanisms and provide assurance to the general public that processes followed in award of grants are fair and non-discriminatory. The Policy aims to avoid all forms of bias by following a system that is fair, transparent and free from all influence/ unprejudiced dealings, prior to, during and subsequent to the currency of the programme to be entered into with a view to enable public to abstain from bribing or any corrupt practice in order to secure the award by providing assurance to them that their competitors will also refrain from bribing and other corrupt practice and the decision makers will commit to prevent corruption, in any form, by their officials by following transparent procedures. This will also ensure a global acceptance of the decision making process adopted by DST.

Definition of Conflict of Interest:

Conflict of Interest means "any interest which could significantly prejudice an individual's objectivity in the decision making process, thereby creating an unfair competitive advantage for the individual or to the organization which he/she represents". The Conflict of Interest also encompasses situations where an individual, in contravention to the accepted norms and ethics, could exploit his/her obligatory duties for personal benefits.

1. **Coverage of the Policy**:

a) The provisions of the policy shall be followed by persons applying for and receiving funding from DST, Reviewers of the proposal and Members of Expert Committees and Programme Advisory Committees. The provisions of the policy will also be applicable on all individuals including Officers of DST connected directly or indirectly or through intermediaries and Committees involved in evaluation of proposals and subsequent decision making process.

b) This policy aims to minimize aspects that may constitute actual Conflict of Interests, apparent Conflict of Interests and potential Conflict of Interests in the funding mechanisms that are presently being operated by DST. The policy also aims to cover, although not limited to, Conflict of interests that are Financial (gains from the outcomes of the proposal or award), Personal (association of relative / Family members) and Institutional (Colleagues, Collaborators, Employer, persons associated in a professional career of an individual such as Ph.D. supervisor etc.)

2. Specifications as to what constitutes Conflict of Interest.

Any of the following specifications (non-exhaustive list) imply Conflict of Interest if,

(i) Due to any reason by which the Reviewer/Committee Member cannot deliver fair and objective assessment of the proposal.

(ii) The applicant is a directly relative# or family member (including but not limited to spouse, child, sibling, parent) or personal friend of the individual involved in the decision making process or alternatively, if any relative of an Officer directly involved in any decision making process / has influenced interest/ stake in the applicant's form etc.

(iii) The applicant for the grant/award is an employee or employer of an individual involved in the process as a Reviewer or Committee Member; or if the applicant to the grant/award has had an employer-employee relationship in the past three years with that individual.

(iv) The applicant to the grant/award belongs to the same Department as that of the Reviewer/Committee Member.

(v) The Reviewer/Committee Member is a Head of an Organization from where the applicant is employed.

(vi) The Reviewer /Committee Member is or was, associated in the professional career of the applicant (such as Ph.D. supervisor, Mentor, present Collaborator etc.)

(vii) The Reviewer/Committee Member is involved in the preparation of the research proposal submitted by the applicant.

(viii) The applicant has joint research publications with the Reviewer/Committee Member in the last three years.

(ix) The applicant/Reviewer/Committee Member, in contravention to the accepted norms and ethics followed in scientific research has a direct/indirect financial interest in the outcomes of the proposal.

(x) The Reviewer/Committee Member stands to gain personally should the submitted proposal be accepted or rejected.

The Term "Relative" for this purpose would be referred in section 6 of Companies Act, 1956.

3. Regulation:

The DST shall strive to avoid conflict of interest in its funding mechanisms to the maximum extent possible. Self-regulatory mode is however recommended for stake holders involved in scientific research and research management, on issues pertaining to Conflict of Interest and scientific ethics. Any disclosure pertaining to the same must be made voluntarily by the applicant/Reviewer/Committee Member.

4. Confidentiality:

The Reviewers and the Members of the Committee shall safeguard the confidentiality of all discussions and decisions taken during the process and shall refrain from discussing the same with any applicant or a third party, unless the Committee recommends otherwise and records for doing so.

5. Code of Conduct

(a) The applicant must refrain from suggesting referees with potential Conflict of Interest that may arise due to the factors mentioned in the specifications described above in Point No. 2.
(b) The applicant may mention the names of individuals to whom the submitted proposal should not be sent for refereeing, clearly indicating the reasons for the same.

6. Final Appellate authority:

Secretary, DST shall be the appellate authority in issues pertaining to conflict of interest and issues concerning the decision making process. The decision of Secretary, DST in these issues shall be final and binding.

7. Declaration

I have read the above "Policy on Conflict of Interest" of the DST applicable to Applicant and agree to abide by provisions thereof.

I hereby declare that I have no conflict of interest of any form pertaining to the proposed grant *

I hereby declare that I have conflict of interest of any form pertaining to the proposed grant *

* & # (Tick whichever is applicable)

(Name /Signature with date)