

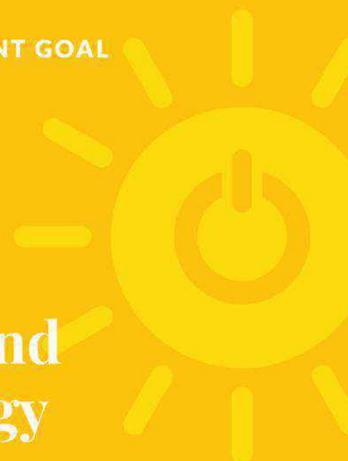
7.4 Energy and Community



SUSTAINABLE DEVELOPMENT GOAL

7

**Affordable and
Clean Energy**



7.4.4 - Does your university as a body inform and support government in clean energy and energy-efficient technology policy development?

Yes, Our university actively supports government efforts in clean-energy and energy-efficiency policy development by contributing expert research, policy briefs, and technical guidance. Faculty specialists participate in advisory committees and working groups on renewable-energy integration, storage systems, grid modernization, and green-technology adoption. **The university shares data-driven insights** from pilot projects, impact studies, and campus sustainability practices such as solar power and energy-efficiency measures. Through **capacity-building workshops, government training programs, and joint research**, the institution strengthens policymaking skills and supports evidence-based decision-making. Ongoing engagement and transparent collaboration ensure that the university helps shape **future-ready clean-energy policies**, demonstrating strong alignment with SDG 7.



St. PETER'S INSTITUTE OF HIGHER EDUCATION AND RESEARCH
 (Deemed to be University U/S 3 of the UGC Act, 1956)
 AVADI, Chennai - 600 054, Tamil Nadu.

Phone: 044-26558080-84
 E-mail: registrar@spiher.ac.in
 Website: www.spiher.ac.in

Policy on Green Building and Renovation

Policy Created on:	01/07/2020	Approved by:  REGISTRAR
Revision 1	10/02/2024	



Registrar
 St. Peter's Institute of Higher Education and Research
 (Deemed to be University U/S 3 of the UGC Act, 1956)
 Avadi, Chennai - 600 054.

SDGs directly supported:

- SDG 7 Affordable and Clean Energy
- SDG 13 Climate Action

SDGs Indirectly supported SDGs

- SDG 9 Industry, Innovation and Infrastructure
- SDG 11 Sustainable Cities and Communities
- SDG 12 Responsible Consumption and Production
- SDG 4 Quality Education



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Policy on Green Building and Renovation

Introduction

SPIHER's Energy Efficiency Policy reflects the Institution's ongoing commitment to sustainable campus development, integrating modern technologies, updated regulatory frameworks, and global best practices in green construction. This policy supports SPIHER's broader goal of achieving carbon neutrality by 2035.

Purpose

To strengthen compliance with updated energy codes and sustainability benchmarks, ensuring that all new buildings, retrofits, and renovations within SPIHER meet or exceed the latest national and international energy performance standards.

Scope

Applicable to all physical infrastructure projects undertaken by SPIHER, including academic, residential, research, and administrative buildings, as well as renovation, retrofitting, and major maintenance work. It applies to **partnerships with public or private construction agencies.**

Policy Standards

All projects shall comply with and, where possible, exceed the following:

- ISO 50001:2018 – Energy Management Systems (replacing 2011 version)
- Energy Conservation Building Code (ECBC 2017, amended 2023)
- Bureau of Energy Efficiency (BEE)
- National Building Code (NBC 2016) – Energy Efficiency Provisions
- ASHRAE Standard 90.1-2019 for performance benchmarking
- IGBC or GRIHA 4-Star Green Building Rating System for institutional buildings

Implementation Guidelines

Design Stage: All proposals must undergo Sustainability and Energy Efficiency Review (SEER) by the SPIHER Sustainability Committee. Incorporate Building Information Modeling (BIM) to simulate and optimize



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energy performance, and prioritize passive cooling, solar shading, and daylight-responsive lighting systems.

Construction Stage: Use low embodied energy materials such as fly ash bricks, recycled aggregates, and low-volatile organic compounds (VOC) paints. Ensure on-site renewable generation meets at least 20% of total building energy demand.

Post-Construction Stage: Conduct green audit tests to verify compliance with design intent. Perform third-party energy audits and report findings in SPIHER's Sustainability Report.

Governance and Accountability

The Construction section shall oversee implementation and performance tracking. The Internal Green Campus Audit Committee will review annual reports and suggest corrective measures. All tenders and contracts must explicitly mention adherence to ECBC and ISO standards.

Monitoring and Reporting

SPIHER will publish periodic Energy Performance Report outlining achievements, challenges, and energy-saving metrics. Key indicators include energy use intensity (EUI), renewable energy share, and carbon reduction per square meter.

Policy Review

This policy will be reviewed periodically to incorporate future updates in standards and sustainability technologies. SPIHER remains committed to continuous improvement, aligning its infrastructure development with the United Nations Sustainable Development Goals (SDG 7 and SDG 13).

10.02.2024



REGISTRAR



Registrar
St. Peter's Institute of Higher Education and Research
(Deemed to be University U/S 3 of the UGC Act, 1956)
Avadi, Chennai-600 054.

1. Introduction

St. Peter's Institute of Higher Education and Research (SPIHER) actively supports government agencies in the formulation, implementation, and improvement of clean energy and energy-efficiency policies through technical expertise, research insights, and community-based programmes. The university functions as a knowledge partner to public authorities by providing evidence-based inputs, field-level data, and expert consultation that contribute to informed decision-making.

Aligned with the United Nations Sustainable Development Goals, especially SDG 7 (Affordable and Clean Energy) and SDG 17 (Partnerships for the Goals), SPIHER contributes to policy development by connecting academic research with administrative practice.

2. Institutional Role in Policy Support

SPIHER engages with government bodies through:

- Expert advisory interactions
- Policy consultation meetings
- Technical research inputs
- Participation in energy working groups
- Organisation of public-policy dialogues

The university adopts a collaborative approach to strengthen governance capacity.

3. Research-Based Policy Inputs

The university contributes to policy development through:

- Applied research in clean-energy systems
- Solar-energy system modelling and performance evaluation
- Energy-storage feasibility studies
- Emission-reduction analysis
- Development of sustainable energy recommendations

Outputs from funded projects, including government-supported initiatives, provide data-driven guidance.

4. Community-Level Data Support for Public Policy

SPIHER supplies evidence from:

- Energy audits in industries and communities
- Solar project field performance data
- Rural and urban renewable adoption studies
- Community energy-consumption behaviour analysis

This data enables authorities to formulate region-specific policies.

5. Training and Knowledge Dissemination

SPIHER supports government by conducting:

- Training programmes for officials
- Capacity-building workshops
- Awareness sessions for scheme implementation
- Technical skill-development programmes

Government officers benefit from exposure to emerging technologies and best practices

6. Collaboration with Public Agencies

SPIHER partners with:

- Municipal and Panchayat offices
- Renewable-energy departments
- Pollution control boards
- Energy development agencies
- Government-funded research bodies

These collaborations enable joint programmes and policy evaluation.

7. Impact and Outcomes

SPIHER's involvement contributes to:

- Improved policy understanding
- Practical implementation improvements
- Technology adoption support
- Programme effectiveness enhancement
- Policy refinement through research input
- Community-focused governance

9. Alignment with SDGs

This engagement contributes to:

- SDG 7 – Affordable and Clean Energy
- SDG 11 – Sustainable Cities and Communities
- SDG 12 – Responsible Consumption and Production
- SDG 17 – Partnerships for the Goals

Local Engagement

At the local level, our university works with city and municipal authorities on clean energy and energy-efficient technologies. Staff provide expertise on building standards, campus energy projects, transport planning and public awareness campaigns, often sharing data and lessons from our own facilities.

EVENT REPORT

The poster features the university's logo and accreditation details at the top. The main text reads: "On Occasion of Engineer's Day DEPARTMENT OF MECHANICAL ENGINEERING Organizes Engineer's Drive for a Greener Future A Rally for Public Awareness on Carbon Footprint Mitigation". It includes icons for SDGs 7, 11, and 13. The event is scheduled for 18th September 2024 at 10:30 a.m. The convener is Dr. N. Rajeswari, HOD, Department of Mechanical Engineering, and the coordinator is Mrs. K. Sunitha, Asst. Professor, Department of Mechanical Engineering. At the bottom, there are five action items: Eco Footprint, Cleaner World, Carbon Conscious Communities, Green Actions Bright Future, and Action on Climate change. Contact information for phone, website, and social media is provided at the very bottom.

REPORT ON ENGINEER'S DAY - ENGINEER'S DRIVE FOR A GREENER FUTURE

Public Awareness on “Carbon Footprint Mitigation”

Date: 18th September 2024

On September 18, 2024, the Department of Mechanical Engineering organized a rally aimed at raising public awareness on "Carbon Footprint Mitigation." The event convened by Dr. N. Rajeswari, Professor & Head and organized by Ms. K. Sunitha, Asst. Professor with significant contributions from all teaching and non-teaching members of the Department of Mechanical Engineering, involved students from various engineering departments and highlighted the critical issues about carbon emissions and their impact on the environment.

The rally commenced with an inspiring speech by Dr. S. Selvan, the Engineering Dean, who emphasized the urgency of addressing climate change and the role individuals can play in mitigating its effects. Following this, students along with the faculty members marched through Tonakela Camp Road, Sankar Nagar, Avadi, engaging the public with informative posters and distributing leaflets outlining actionable steps to reduce carbon footprints.

The rally focused on educating public about the various impacts of carbon emissions, including:

- **Climate Change:** The connection between carbon footprints and global warming.
- **Health Issues:** How poor air quality resulting from emissions can lead to health problems.
- **Economic Impact:** The rising costs associated with food, water, and energy due to climate change.
- **Extreme Weather:** The increasing frequency of severe weather events and rising sea levels as a result of environmental degradation.

Public were given awareness to adopt sustainable practices, which included:

- **Reducing Energy Usage:** Turning off lights, using energy-efficient appliances, and minimizing reliance on cooling systems.
- **Choosing Sustainable Transportation:** Promoting walking, cycling, carpooling, and public transit to reduce carbon emissions associated with personal vehicle use.
- **Reducing, Reusing, Recycling:** Advocating for waste reduction through reusing materials and supporting products with sustainable packaging.
- **Conserving Water and Natural Resources:** Using water responsibly and reducing the consumption of goods that harm the environment.
- **Supporting Clean Energy:** Encouraging the use of renewable energy sources and advocating for sustainable practices in local communities.
- **Planting Trees and Preserving Green Spaces:** Engaging in reforestation efforts and protecting local green areas that serve as carbon sinks.
- **Contributing to Climate Action:** Promoting practices that reduce greenhouse gas emissions and advocating for a sustainable future.

The rally concluded with a call to action for all participants to commit to these sustainable practices and inspire others in their communities. Feedback from attendees indicated a heightened awareness of the importance of individual actions in combating climate change.

Students Exhibiting the Banners for Rally in support of clean energy and energy-efficient technology policy development



Dr.S. Selvan, Engg. Dean, Commencing the Rally



Students on March to Create Awareness on Carbon Footprint Mitigation



Batch of Girl Students as the part of Rally March exhibiting university as a body support in clean energy and energy-efficient technology policy development



Students as the part of Rally March exhibiting university as a body support in clean energy and energy-efficient technology policy development



Students as the part of Rally March exhibiting university as a body support in clean energy and energy-efficient technology policy development

Role of Hydrogen in Sustainable Transportation

Seminar Topic: ‘Role of Hydrogen in Sustainable Transportation’

Date: 19/09/2024

Recourse Person: Dr. AK. Sahu, Principal Scientist, Central Electrochemical Research Institute, Madras Unit, CSIR Madras Complex, Taramani, Chennai.

This seminar on “*Role of Hydrogen in Sustainable Transportation*” was organized to highlight emerging clean-energy solutions and their impact on the future of mobility. In alignment with SDG 7: Affordable and Clean Energy, the session focused on hydrogen as a renewable, carbon-free fuel essential for building an energy-efficient and environmentally responsible transportation sector.

The seminar discussed the production of green hydrogen, its high energy density, and its potential to drastically reduce emissions from heavy vehicles, public transport, and industrial logistics. Participants gained insights into fuel-cell technology, hydrogen storage systems, and global advancements in hydrogen-powered mobility. The resource person emphasized how hydrogen can complement solar and wind energy to create a resilient and diversified clean-energy ecosystem.

By creating awareness of hydrogen's role in decarbonizing transportation, the seminar encouraged students to explore innovative, sustainable energy solutions and contributed to strengthening institutional commitment to SDG 7: ensuring access to clean, reliable, and modern energy for all.

Programme Brochure



St. PETER'S
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 Accredited by NAAC with A+ Grade, AICTE Approved and
 ISO 9001:2015 Certified





**INSTITUTION'S
 INNOVATION
 COUNCIL**



A+
 NAAC

DEPARTMENT OF
ELECTRICAL AND ELECTRONICS ENGINEERING

Organizes
 Seminar on

7
AFFORDABLE AND
 CLEAN ENERGY

Role of Hydrogen in Sustainable Transportation



19th September 2024 | 9.30 am to 11.00 am



Seminar Hall, Main Building, SPIHER



Resource Person

Dr. AK Sahu
 Principal Scientist
 Central Electrochemical Research Institute
 Madras Unit, CSIR Madras Complex
 Taramani, Chennai

Convener

Dr. R. Rani Hemamalini
 Director-IQAC & Head

Co-ordinator

Dr. Arunkumar J
 Assoc-Professor

Department of Electrical & Electronics Engineering

 +91 9445638085

 www.spither.ac.in

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Dr. R. Rani Hemamalini addressing the gathering in the context of spreading awareness on the importance of energy efficiency and clean energy



Interaction of the Chief Guest with the team and Vice Chancellor on the importance of energy efficiency and clean energy

Public Links

<https://www.instagram.com/p/DADJFiPPeXY/?igsh=MWZoNXAyYzZpemcwOQ==>

<https://www.facebook.com/share/p/6dSR6UYqBQbTJSV1/?mibextid=qi2Omg>

<https://x.com/SpiherIndia/status/1836297508986790332?t=FRWZA bKTIImK4py4Ry8rRw&s=19>

<https://x.com/SpiherIndia/status/1836297508986790332?t=FRWZA bKTIImK4py4Ry8rRw&s=19>

SAPLING PLANTATION DRIVE

Program Title	Sapling Plantation Drive
Program theme	NSS CAMP
Duration of Event	3 hrs
Organized by	Department of ECE in Association with Dr.A.P.JAbdulkalam Dreams Trust and NSS Unit
Date and Time	30th July 2024, 10.00 a.m
Co-ordinator	Dr.Periyaswamy Prof-Mech and Ms. R. Nirmala, AP-ECE
NSS brochures Links	https://www.instagram.com/p/C9913KdP1kY/?igsh=MWtzN2FsbtRpcW5jdA==
	https://www.facebook.com/share/p/ayMy7TYgGyiu4qNy/?mibextid=qi2Omg
	https://www.linkedin.com/posts/spiherchennai_climateaction-spiher-nss-activity-7223303002139283456-S9xR?utm_source=share&utm_medium=member_android
	https://x.com/SpiherIndia/status/1817537477793779891?t=QAd691DV45Su3ZfYqE4V0g&s=19
Convenor	Dr. G. P. Ramesh Prof & Head, ECE, SPIHER
Venue	Kannappalayam Village Government School
Key Points Discussed	<ul style="list-style-type: none"> <input type="checkbox"/> Environmental Impact: Improving air quality, supporting biodiversity, controlling erosion, and contributing to climate regulation. <input type="checkbox"/> Educational Value: Enhancing students' understanding of ecology, botany, and environmental responsibility.

	<p>□ Community Engagement: Strengthening community ties and promoting collective action for environmental conservation.</p>
Objectives	Sapling plantation drive is well-organized and impactful, fostering a sense of environmental stewardship among students and improving the overall health of the ecosystem.
Outcome of the program / Benefits	Sapling plantation drive in a village school has the potential to create significant positive impacts across various areas, contributing to environmental sustainability, educational enrichment, and community well-being.
Total no. of students participated	32
No. of faculty members participated	3
No of External Members	4 (Collaborate with local environmental organizations-Dr.A.P.JAbdulkalam Dreams Trust S.Udyakumar, A.Mathew . Kannappalayam Ward member Devi Nithyanandhan, Jamuna -Head master Kannappalayam Government School are the External member involved in Sapling Plantation Drive.)



Faculty and Students taking part in the sapling plantation drive in the context of spreading awareness of clean energy

PUBLICITY MATERIAL

2



■ டாக்டர்.அப்துல் கலாம் ஐயா அவர்களின் நினைவு நாளை முன்னிட்டு செயின்ட் பீட்டர்ஸ் இன்ஸ்டிடியூட் ஆஃப் ஹெயர் எஜுகேஷன் அண்ட் ரிசர்ச் NSS மாணவ மாணவிகள், DR.APJ ABDUL KALAM 2021 DREAM TRUST - கீரின் டிரிம்ஸ் பவுண்டேசன் இணைந்து, கண்ணப்பாளையம் கிராம அரசுப் பள்ளி வளாகத்தில் மரக்கன்றுகள் நடும் நிகழ்ச்சி சிறப்பாக நேற்று காலை நடைபெற்றது. இந்நிகழ்ச்சியில் டாக்டர். பி. பெரியசாமி (NSS COORDINATOR), திரு. ஆர். நிர்மலா (NSS), திரு. S.உதயகுமார் மற்றும் திரு. மேத்யூ (டாக்டர். ஏ.பி.ஜே. அப்துல் கலாம் 2021 டிரிம் டிரஸ்ட் ஆகியோர் கலந்து கொண்டனர் சிறப்பித்தார்கள். மேலும் தேனி நித்யானேந்தம் (கண்ணப்பாளையம்வார்டு உறுப்பினர்), மற்றும் ஜமுனா (அரசு பள்ளித் தலைமையாசிரியை கண்ணப்பாளையம் கிராமம் ஆகியோர் கலந்து கொண்டு சிறப்பித்தார்கள்.

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Mr. PONRAJ RAVI RAMKUMAR, Director

Transforming environmental sustainability through innovative carbon capture technologies.

TITLE: Removal of CO2 using Direct Air Carbon Capture Techniques

Incubation Agreement:

भारतीय गैर न्यायिक
एक सौ रुपये
Rs. 100
ONE HUNDRED RUPEES
रु. 100
भारत INDIA
INDIA NON JUDICIAL

14 JUN 2024
Tamilnadu TAMILNADU
Thennai Air Filters Pvt Ltd

DL 509602
S. Kavitha
0.12144, B-1, 98
S. KAVITHA
STAMP VENDOR
231, M.K.N ROAD, ALANDUR

INCUBATION AGREEMENT
BETWEEN
St. PETER'S ENGINEERING COLLEGE TECHNOLOGY BUSINESS INCUBATOR
AND
M/s THENNAL AIR FILTERS PRIVATE LIMITED

This Incubation Agreement is executed at Chennai on this 23.05.2025,

1. St. PETER'S ENGINEERING COLLEGE TECHNOLOGY BUSINESS INCUBATOR, a company registered under THE TAMILNADU SOCIETIES REGISTRATION ACT, 1975 (TAMIL NADU ACT 27 OF 1975) (Sl.No: 53/2009) with its registered office at Tonakela Camp Road, Avadi, Chennai - 600054. (Hereinafter called as SPEC-TBI and represented by its Chief Executive Officer and authorized signatory as the FIRST PARTY)

AND

2. M/s THENNAL AIR FILTERS PRIVATE LIMITED is a company with its registered office, No 4/37, 16th Street, Thillai Ganga Nagar, Nanganallur, Chennai - 600061, Tamil Nadu, INDIA (Hereinafter called as "Incubatee") Mobile No: 9710071471, email: thennalairfilters@gmail.com and represented through its authorized signatory Mr. Ponraj Ravi Ramkumar resident of India as the SECOND PARTY.

(Hence the both parties called as "Parties")

For THENNAL AIR FILTERS PVT LTD
Director

Recitals:

WHEREAS St.PETER'S ENGINEERING COLLEGE TECHNOLOGY BUSINESS INCUBATOR, registered under 'SOCIETIES REGISTRATION ACT 1975' Sl.No: 53/2009, is an umbrella for promotion of entrepreneurship and provides support for technology - based entrepreneurship with the main objective of promoting partnership with new technology entrepreneurs and start-up companies and provide incubation services to different start-ups in the Knowledge and Technology based area and aims at creating a complete and comprehensive ecosystem to promote and nurture innovative enterprises.

WHEREAS M/s THENNAL AIR FILTERS PRIVATE LIMITED is desirous of availing the incubation services and has applied for the incubation services through its incubation application dated 23.05.2025 and its business plan [as appended in Schedule 1]

NOW THIS Incubation AGREEMENT WITNESS AS UNDER

Purpose of this Agreement:

The purpose of this Agreement is to have clear understanding between the Incubator and the Incubatee during the course of the association between them.

The Chief Executive Officer, St. PETER'S ENGINEERING COLLEGE TECHNOLOGY BUSINESS INCUBATOR has approved the incubation application of M/s THENNAL AIR FILTERS PRIVATE LIMITED on the payment of Incubation Service charges and documentation charges for availing the incubation Services at ST.PETER'S ENGINEERING COLLEGE TECHNOLOGY BUSINESS INCUBATOR pursuant to the detailed terms and conditions of this agreement.

Scope of Services:

SPEC-TBI will provide following incubation services to the Incubatee:-

1.1 Laboratory Infrastructure

SPEC-TBI will facilitate access to the Laboratory infrastructure of the Institute, St.PETER'S INSTITUTE OF HIGHER EDUCATION AND RESEARCH (SPIHER) on request of the Incubatee for specific activity as per the regulations of the Institute and the Incubator.

1.2 Other Services

The Incubation services will also include: -

- Pool of mentors, experts in technology, legal, financial and related matters (only advisory), with or without consideration
- Trainings and workshops
- Organizing events to help incubatee in networking and showcasing their technologies
- Meetings with visitors of SPIHER (such as alumni, Students, Research Scholars, VCs, industry professionals etc.)
- Other benefits of the Ecosystem



Handwritten signature in green ink

For THENNAL AIR FILTERS PVT LTD

Handwritten signature in blue ink
Director

2. Rules and Regulations of Incubation:

Except as otherwise set forth in this agreement, the Incubatee hereby agrees to comply and follow the Rules and Regulations, framed by SPEC-TBI for the Incubation Services, specified in the detail and appended hereto Schedule 1 forms part of this agreement and unless other provided in this agreement, is hereby accepted by the Incubatee in its entirety and the Incubatee and its directors/Promoters hereby indemnify SPEC-TBI and undertake to remain responsible for all dues payable or losses suffered only on account of any act, negligence, default directly attributable on the part of the Incubatee and its Directors and employees and determined judicially to be so.

3. Period of Incubation

The total period of the incubation (hereafter called incubation period) will be for 1 (one) year from the date of signing. The incubation period can be extended only by SPEC-TBI at its sole discretion.

4. Termination of the agreement

SPEC-TBI reserves the right to terminate this agreement even during the Incubation Period and/or to deny access to the Incubation services and the premises, after giving a Fifteen days' notice, in the following circumstances: -

- Where the incubatee violates any of the terms and conditions of this Agreement and Rules and regulations as may be framed by SPEC-TBI, from time to time; or
- Commits any fraud, theft or any other offense punishable under law; or
- Unsatisfactory performance of the incubatee as per the determination of the SPEC-TBI Advisory Board
- Where the incubatee violates any rules and regulations of SPEC-TBI.
- Such other circumstances as may deem fit in the interest of the parties to this agreement.

Upon termination of the Agreement, the Incubatee shall be prohibited from accessing the Incubation premises (If any) as set out in Schedule 2 and the Incubation Premises, provided by SPEC-TBI to the incubatee, will be sealed. This form of exit from the incubator would be considered an abnormal exit and SPEC-TBI will be entitled to forfeit the security deposit (If any), provided by the Incubatee.

5. Consideration

- 5.1 Amendments: SPEC-TBI may change the above rates from time to time at its sole discretion and date of implementation of the amended charges shall be applicable with immediate effect.
- 5.2 Consequences of default: In the event, if the Incubatee fails to make the half yearly/annually payment and/or other charges and rates for infrastructure and facilities, as mentioned above, continuously for a period of three months, this agreement shall be deemed to be terminated and the incubatee shall vacate the Incubation Premises (If any) immediately. Under these circumstances, SPEC-TBI reserves the right to seal the Incubation Premises of the Incubatee.



Back.. -

For THERMAL AIR FILTERS PVT LTD

PRK
Director

Exemption:-

However, the Chief Executive Officer of SPEC-TBI may at his sole discretion, based on the sufficient causes submitted by the Incubatee for the delay in making the half yearly/annually payment continuously for three months; or any other relevant reasons, may relax this delay and may permit the Incubatee to avail the incubation services on clearance of all the dues, charges, rates etc. of SPEC-TBI either with or without interest of 20% p.a. on such pending dues, as a penalty for the late payment, subject to such terms and conditions as may be imposed by him.

6. No Guarantee of Results

SPEC-TBI does not undertake responsibility, but shall endeavor for

- a) Ensuring success of the Incubatee, its products/ process/ services or marketability.
- b) Ensuring quality of support and services provided by SPEC-TBI to the complete satisfaction of the Incubatee or their promoters/ founders
- c) Ensuring quality of services of the consultants engaged by the Incubatee through SPEC-TBI network. Incubatee will have to apply its judgment before getting in to a relationship with them
- d) The incubatee companies agree that SPEC-TBI or their employees shall not be held liable for any reason on account of the above.

7. Separate Agreement for: Seed Money Support \ Innovation Grant etc.

i. The Incubatee undertakes that SPEC-TBI does not guarantee for the Seed Money Support or any Grant or Debt support to the Incubatee with reference to the different Funding Programs of SPEC-TBI and that the Incubatee shall submit its application as per the eligibility criteria of the said programs and the selection of the Incubatee for the funding shall be completely independent, subject to the different eligibility norms of the said Funding programs and the Incubatee, on selection, shall have to execute separate agreements for these programs. However SPEC-TBI will update the Incubatee for these funding programs on a time to time basis.

ii. Success Fees.

SPEC-TBI shall charge success fees of 10% on the total funds raised through Government Schemes/Angel/Venture/Private Entity with the support of SPEC-TBI.

8. Intellectual Property Rights

Any Intellectual property rights [IPRs] developed by the Incubatee during the Incubation period will be the property of the Incubatee only. If such IPRs are created only with the direct financial investment involvement of the SPEC-TBI than any agreement between the Incubatee and SPEC-TBI specifying the sharing rights for the IPRs will hold good. The Incubatee will be required to execute a separate agreement for licensing or assignment of any IPRs, under the shared ownership of which lies with SPEC-TBI.

9. Liability towards third party

Cannot be held legally responsible if the incubatee is involved in any litigation with a third party over any legal issue whatsoever, during the incubation period.

10. Indemnification



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For THEENNAL AIR FILTERS PVT LTD

Handwritten signature in blue ink.
Director

SPEC-TBI shall not accept any responsibility to compensate anyone as a result of any accident or damage (electrical / explosion etc.) taking place at the incubation premises or at any place, directly resulting from Incubatees activities. The victims could be the incubatee or their employees, other persons working in St.Peter's Institute of Higher Education and Research Campus premises or any visitors to the SPEC-TBI. Where any such accident or damage is directly attributable to the act or omission of the incubatee and determined judicially to be so, then paying any compensation to those who have suffered arising out of such a contingency shall be the sole responsibility of the incubatee. Where any such accident or damage is directly attributable to the act or omission of the incubate and determined judicially to be so, it shall be the responsibility of the incubatee alone to compensate for any loss caused to the property of the SPEC-TBI. Furthermore, SPEC-TBI shall be responsible for any accident or directly attributable to the act or omission of SPEC-TBI or its employees or its representatives that the Incubatee or his assignees/representatives might meet within the course of their work within the premises of SPEC-TBI or any premises of SPIHER Campus.

11. Assignment

The Incubatee and St. PETER'S ENGINEERING COLLEGE TECHNOLOGY BUSINESS INCUBATOR shall have no right to assign their respective rights hereunder or transfer their respective rights and obligations, in whole or in part, to any third party.

12. Variation

Notwithstanding anything contained herein above or in the 'Rules and Regulations for the Incubation Agreement' annexed thereto, St. PETER'S ENGINEERING COLLEGE TECHNOLOGY BUSINESS INCUBATOR shall/may with the consent of the Incubatee and after proper negotiations with the Incubatee amend the terms of this Agreement (or of any of the documents referred to in this Agreement) at such circumstances as it may deem fit and the Incubatee shall be bound by the said amendments. The amendments shall be applicable only after the Incubatee is notified of the amendments.

13. Entire Agreement

This Agreement together with any agreement specifically executed pursuant to this Agreement constitutes the whole and only agreement between the Parties relating to the Incubation Services. This Agreement supersedes and extinguishes any prior drafts, agreements, undertakings, representations, warranties and arrangements of any nature whatsoever, whether or not in writing, relating thereto.

14. Applicability of Laws:

This Agreement shall be construed, governed by, interpreted and applied in accordance with the Laws of India.

15. Settlement of Disputes

Any/all disputes between the Incubatee shall be referred for arbitration to the person(s) so nominated jointly SPEC-TBI and the Incubatee under the Indian Arbitration & Conciliation Act whose decision shall be final and binding upon the parties. The place of arbitration shall be Chennai.

16. Lien: SPEC-TBI shall have any lien on the assets (If any) of the Incubatee at the incubation centre till such time that the Incubatee clears all the outstanding dues.

In witness whereof parties hereto have signed this Incubation Agreement on the date and year mentioned hereinbefore.

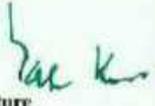


back...

For TRIENNAL AIR FILTERS PVT LTD

[Signature]

Director

<p>For & on behalf of St. PETER'S ENGINEERING COLLEGE TECHNOLOGY BUSINESS INCUBATOR</p> <p>Dr.L.MAHESH KUMAR</p> <p> Signature</p> <p></p> <p>Name : Dr.L.MAHESH KUMAR</p> <p>Designation : Chief Executive Officer</p> <p>Date : 23.05.2025</p> <p>Place of signing: SPEC TBI</p> <p>Witness:- 1. </p>	<p>For & on behalf of M/s THENNAL AIR FILTERS PRIVATE LIMITED</p> <p>Mr. PONRAJ RAVI RAMKUMAR</p> <p> Signature</p> <p></p> <p>Name: PONRAJ RAVI RAMKUMAR</p> <p>Designation: Director</p> <p>Date: 23.05.2025</p> <p>Place of signing: SPEC TBI</p> <p>Witness:- 1. </p>
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Schedule 1

Rules and Regulations for the Incubation

1. Eligibility for Incubation

The Incubatee has to be a registered company.

It is hereby informed that Section 8 Company is not eligible to be incubated at SPEC-TBI.

2. Proven track record of the promoters and Directors of the Incubatee

- a) The Directors and promoters of the company must not have any default, showing in the data of Credit Information Bureau (India) Limited [CIBIL]. Default showing in CIBIL because of some disputes or genuine reasons can be relaxed by the Chief Executive Officer, SPEC-TBI subject to any condition that may be imposed by him.
- b) All the directors, in the board of directors, on the effective date of this agreement must be qualified under Companies Act 2013 or any other relevant Act or Laws of India.
- c) The directors and promoters must not have committed any criminal offense or must not be under any criminal prosecution under any laws of INDIA.

- ##### **3. Inspection rights:** SPEC-TBI has the right to inspect and examine the premises (If any) allotted to the incubatee at any point of time during the incubation period/stay at Incubation Premises. On the completion of the Incubation or when the Incubatee leaves SPEC-TBI due to any reason, all the furniture, space and any other facilities provided shall be surrendered in good condition. All costs incurred for such restoration to good condition shall be borne by the Incubatee and in case, SPEC-TBI has to incur any further expenditure to get the equipment or the room back into good condition then the same shall be recovered from the Incubatee and/or its directors or promoters. All dues should be cleared by the Incubatee before it leaves the incubation otherwise, all outstanding dues shall be recovered from the Incubatee or its directors and/or promoters.

4. Reporting requirements: -

The Incubatee shall be required to deliver the items mentioned below as part of the Incubation in accordance with the following provisions: -

1.1 Documentation.

The incubatee will be required to submit all the required documents in regards with the company such as a) certificate of incorporation, b) Memorandum of Association (MOA) c) Articles of Association (AOA) d) Shareholding pattern e) ID and Address proof of the directors and the promoters. The incubatee also agrees to intimate SPEC-TBI regarding any alteration in the MOA, AOA and the shareholding pattern as when the alteration is initiated.

1.2 Monthly report

The incubatee is required to submit its monthly report in terms of its financials; revenue generates, gross sales, potential customers/clients approached, foreign collaborations, contracts/MoU entered into, details of the employees, employees hired and fired, assets purchased or disposed of, status of the implementation of the business plan and its strategies, progress on the incubation projects or any other relevant information prescribed by SPEC-TBI.



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For THIENNAL AIR FILTERS PVT LTD

Handwritten signature
Director

1.3 Mid Term Report

The incubatee is required to submit its unaudited/audited financial statement every six months within 7 days of the subsequent month.

1.4 Annual report

The incubatee is required to submit its financial statement and cash flow statement duly audited by the statutory auditors of the company with their Audit report and the report of the Board of Directors, with SPEC-TBI by the year. Incubatee is also required to ensure timely filings of the annual returns and the balance sheet with Income Tax Authorities and The Registrar of Companies within the prescribed time-limit as specified by Income Tax Act and Companies Act.

1.5 Participation in the Business review meetings/Diagnostic panel

The Incubatee hereby agrees to participate in the business review meetings, diagnostic panel as and when held by SPEC-TBI will intimate the Incubatee for these review meetings through a 6 (six) days advance notice, comprising the details and the presentations required to be submitted by the Incubatee. The venue, timings and the mode of attending the meeting (In Person or through Video Conferencing etc.) will be decided by SPEC-TBI.

1.6 Event based reporting:-

The Incubatee hereby agrees to keep SPEC-TBI informed for following events

- ✓ Change of name of the company
- ✓ Conversion from Private Limited to Public Limited company
- ✓ Listing in any recognised stock exchange of India
- ✓ Any major change in the business plan
- ✓ Changes in the shareholding pattern
- ✓ Changes in the board of directors

5. INVESTMENT BY THIRD PARTIES:

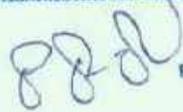
The Incubatee shall keep SPEC-TBI informed in writing every time it proposes to bring in further investment or funds in, either from the existing shareholders or from third party investors at any time after the Effective Date of this agreement and will have to share the Term Sheet/Shareholder's Agreement/ Investment Agreement with SPEC-TBI and will have to obtain its approval before entering into the said agreement.

6. SPEC-TBI will not take any responsibility to provide any valuation certificate to the Incubatee and can only connect the Incubatee with different merchant bankers, certified valuers etc. in this regard, the consideration and procedure of valuation will be decided by the incubatee itself only and SPEC-TBI will have no role to intervene in settling or negotiating the consideration payable by the Incubatee to these merchant bankers, certified valuers etc.
7. The Incubatee is required to abide by the laws of INDIA and will obtain all the trade licenses, permits and sanctions independently, wherever required, as prescribed under



Lack.. -

For THIENNAL AIR FILTERS PVT LTD


Director

the Indian Laws in order to run the business. SPEC-TBI is not responsible to get all these licenses and permits sanctioned from the Government.

8. Exit

The Incubatee will be required to leave the incubator under the following circumstances:

- ✓ After the completion of the incubation including extended incubation period, if any.
- ✓ Underperformance or in-ability to perform business as evaluated and decided by SPEC-TBI on case to case basis
- ✓ Irresolvable promoters' disputes in opinion of SPEC-TBI on case to case basis
- ✓ Violation of any Statute, rules and regulations of SPEC-TBI in the opinion of SPEC-TBI on a case to case basis.
- ✓ When the company enters in an acquisition, merger or amalgamation deal or reorganization deal resulting in a substantial change in the profile of the company, its promoters, directors, shareholders, products or business plan.
- ✓ Incubatee plans for a public issue in the opinion of SPEC-TBI on case to case basis
- ✓ Change in promoters' / founders' team in the opinion of SPEC-TBI on a case to case basis.
- ✓ Any change of more than 50% of equity ownership unless approved by SPEC-TBI, in the opinion of SPEC-TBI on case to case basis* (optional)
- ✓ Any other reason for which SPEC-TBI may find it necessary for an incubatee resident company to leave.
- ✓ In case an incubatee wants to leave the incubator for any reason with one month's notice.

Notwithstanding anything written anywhere, SPEC-TBI's decision in connection with the exit of an incubatee company shall be final and shall not be disputed by the incubatee.

9. The incubatee is not authorized to use the logo of either SPEC-TBI unless a written permission is granted by SPEC-TBI or SPEC-TBI on this behalf
10. The incubatee is required to abide by the rules and regulations of SPEC-TBI.
11. The incubatee shall undertake Research & Development, Design/Testing, prototype development from Incubation premises but shall not carry out warehousing, storage, marketing sales or other commercial routine activity including fundraising in the SPEC-TBI campus.
12. The incubatee should observe that noise levels are kept at minimum and no abnormal noise by any machine or by their employees or visitors should be made. Any complaint of high noise level will result in appropriate action by SPEC-TBI.



Handwritten signature in green ink.

For THIENNAI AIR FILTERS PVT LTD

Handwritten signature in blue ink.

Director

13. The Incubatee is required to observe health and safety standards. No hazardous material can be brought inside the SPEC-TBI campus/Incubation Premises without the prior approval of SPEC-TBI.
14. No Incubatee can display notices or signage except in the space or Boards provided for such signage by SPEC-TBI.
15. It is the responsibility of the Incubatee and their employees to use the common facilities e.g. common area, fax & other machines etc. with due diligence and care.
16. Incubatees required to keep SPEC-TBI informed about any visitor from abroad, foreign collaboration and/or foreign partner or director, and abide by the rules/procedures in vogue in SPEC-TBI.

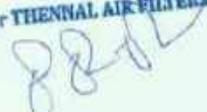
Schedule 2

Facilities to the incubatees subject to the Rules and Regulations and as mentioned in clause 3 of the Agreement.

1. Mentoring and Nurturing Services by St Peters Institute of Higher Education and Research (Domain specific Experts) – on mutually agreed basis
2. Students Interns from St Peters Institute of Higher Education and Research - on mutually agreed basis
3. Marketing guidance
4. Assistance to apply for funding.
5. Participation in Guest Lectures/ Workshops organized by SPEC-TBI/ SPIHER (only in Free sessions)



Yash k... -

For THIENNAL AIR FILTERS PVT LTD.

Director



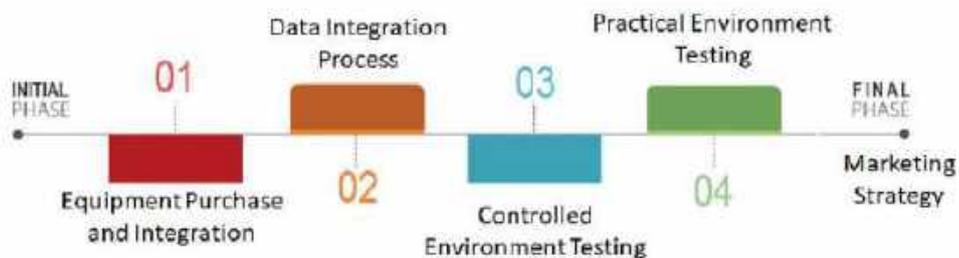
Agreement Signed on 14-06-2024

Note:

SPIHER as formerly as St.Peter's Engineering College Technology Business Incubator.

REPORT

Proposed Plan



Financials

Revenue Model

Plan A Units Sale	Plan B Pouch Sale	Plan C CO2 Sale
Rs. 50 to 20k B2C & B2B	Rs. 600 to 5k B2C (Recurring)	Standard Market Price B2B (Recurring)



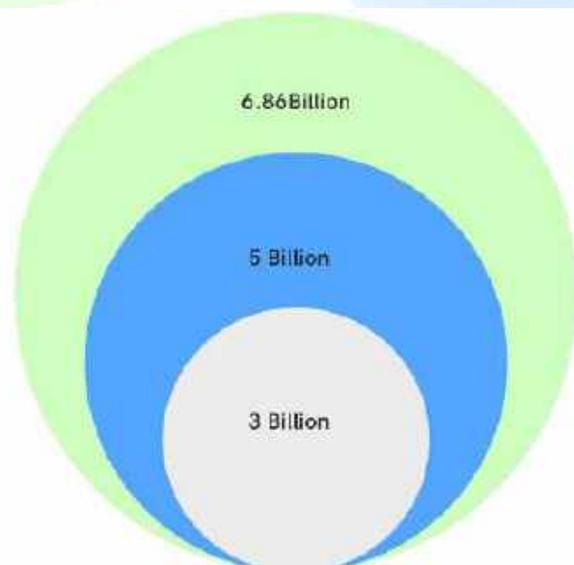
FINANCIALS

Size of the Market

Total Available Market (TAM):
\$6.86 Billion

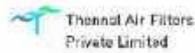
Serviceable Available Market (SAM):
\$5 Billion

Serviceable Obtainable Market (SOM):
\$3 Billion



<https://www.maximizemarketresearch.com/market-report/global-direct-air-carbon-capture-technology-market/80672/>

<https://www.statista.com/statistics/1414965/global-direct-air-capture-market-size/>



<p>Competitive Advantage 1 Patented Nanotechnology</p>	<p>Competitive Advantage 2 Compact</p>
<p>Competitive Advantage 3 Efficient</p>	<p>Competitive Advantage 4 Scalability</p>

CURRENT MARKET TREND



Thennal Air Filters Private Limited

	CURRENTLY		AT THENNAL
Cost	\$500 - \$1000	At 1/3rd of cost	\$200 - \$350
Adsorption	per tonne	10 times more	per 10 tonnes
Geo-Position	Remote Locations	Versatile	Anywhere
Future Proof	Not likely	Ease of Control	Precise Control
Effective Time Line	Decades	Fast Implementation	2-3 years
Analytics	Difficult	Continuous monitoring	Real Time

<https://phys.org/news/2024-03-climate-carbon-capture-tech-booming.html>

MARKET

Thennal Air Filters
Private Limited

OTHER FILTERS ACTIVATED CARBONS	THENNAL FILTERS UNIQUE CARBON NANOMATERIAL STRUCTURE
Sophisticated Structures	NANO ENGINEERED Structures
Large Volume	95% Smaller Volume
High Specific Surface Area	High Specific Surface Area
Inefficient CO2 capture	High Density Active Sites
Low Industrial Scalability	High Industrial Scalability
Random Pore Size	Narrow pore size

COMPETITOR LANDSCAPE	Company	Origin	Product	Technology	Application	Advantages	Disadvantages	Funds Raised	
	7	Carbon Collect	Ireland	Yes	Mechanical Tree	Outdoor	Passive DAC	Heating, indoor inefficient	\$12M
	8	Carbon Capture	UK	No	Amine MOF sorbents	Outdoor	Plug & Play sorbents	Production Scalability of MOF	\$35M
	9	Climeworks	Switzerland	Yes	Chemical filters	Outdoor	Long storage, carbfix	Heating, chemicals	\$824M
	10	Skytree	USA	Yes	Sorbents	Outdoor	Sorbent use	Heating of Sorbent	\$6M
	11	Carbon Engineering	Canada	Yes	Chemical Reaction	Outdoor	Photosynthetic model	Chemicals and Natural gas	\$110M
	12	Thermal	India	No	Nano-engineered Carbon Xerogel Sorbents	Modular, Indoor	Electrifiable Sorbents, Indoor Efficient, scalable and compact	-	-
COMPETITOR LANDSCAPE	Company	Origin	Product	Technology	Application	Advantages	Disadvantages	Funds Raised	
	1	Heirloom Carbon	USA	No	Limestone Hydroxides	Outdoor	Cheap raw materials	Crushing, heating	\$56M
	2	Mission Zero	UK	No	Ion selective electrochemical separation	Outdoor	Efficient	Scalability	\$11M
	3	Sustaera	USA	No	Nano structured sorbents	Modular, Outdoor	Solar and wind powered	Steam Heating, thin layered	\$10M
	4	Noyo	USA	No	Activated Carbon	Outdoor	Cheap raw materials	Heating and non-mesoporous	\$11M
	5	Verdiox	USA	No	Electro-swing	Outdoor, Indoor	Efficient	Carbon Nanotubes and thin electrode	\$82M
	6	Carbon Infinity	UK	No	Nano structured Sorbents	Indoor, Outdoor	Efficient, factories	Scalability, thin electrodes	\$59k

DACC GAINT CLIMEWORKS



NOT A INDOOR FRIENDLY CONCEPT

Thennel Air Filters
 Private Limited

Direct Competitors	Indirect Competitors
Carbon Infinity	Climeworks
Verdox	Heirloom Carbon
Sustaera	Carbon Engineering
Noya	Skytree
Carbon Capture	
Carbon Collect	

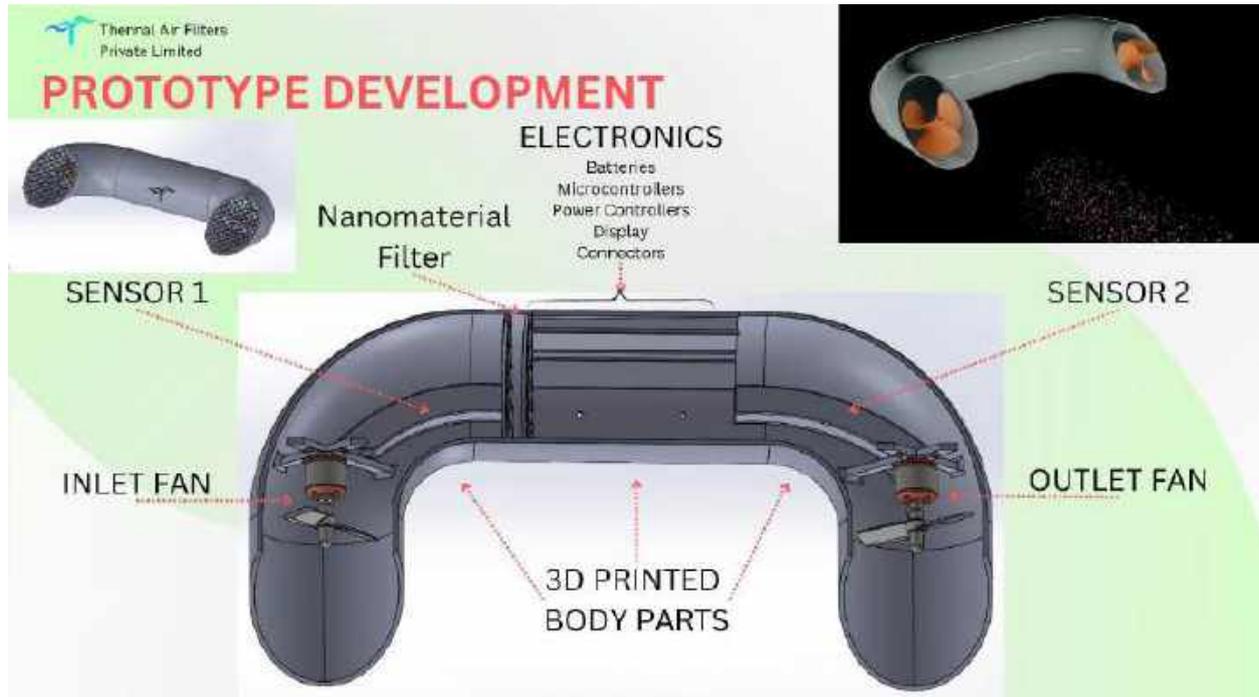
COMPETITIONS

Thonnal Air Filters
Private Limited

PROTOTYPE DEVELOPEMENT

We are constantly iterating our 'CarbaXe' designs to improve the Power Efficiency, Re-usability, Data quality, User Friendly and Environment Friendly Carbon Negative Product





FORECAST ON CO2 AIR POLLUTION

	<p>New record daily global average temperature reached in July 2024 The Earth has just experienced its warmest day in recent history, according to C3S data. This article... <small>CopernicusECMWF</small></p>	
	<p>Climate Change 2022: Impacts, Adaptation and Vulnerability Intergovernmental Panel on Climate Change Working Group II contribution to the Sixth... <small>ipcc</small></p>	
	<p>Air quality and climate policy integration in India - Analysis Air quality and climate policy integration in India - Analysis and key findings. A report by the... <small>IEA</small></p>	
<p>Climate change indicators reached record levels in 2023 The state of the climate in 2023 gave ominous new significance to the phrase "off the charts." <small>World Meteorological Organization / Mar 18, 2024</small></p>		

<https://www.un.org/en/climate-action/un-issues-red-alert>
<https://www.iea.org/reports/air-quality-and-climate-policy-integration-in-india>
<https://wmo.int/news/media-centre/climate-change-indicators-reached-record-levels>

MAJOR CAUSE OF ROAD CAR ACCIDENTS

Lack of Concentration is reflected as Induced Sleepiness in Drivers, due to high CO2 concentration (>2000 ppm) vis-a-vis lack of Oxygen to Brain

<https://www.emro.who.int/emhj-volume-28-2022/volume-28-issue-9/risk-assessment-of-road-traffic-accidents-related-to-sleepiness-during-driving-a-systematic-review.html>

<https://www.thehindu.com/news/national/kerala/sleep-deprived-drivers-responsible-for-40-of-road-accidents-say-transport-officials/article61629032.ece>

<https://morth.nic.in/road-accident-in-india>

<https://www.nhtsa.gov/risky-driving/drowsy-driving>



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Eastern Mediterranean Health Journal | All issues | Volume 28 (2022) | Issue 9 (Issue 9) | Risk assessment of road traffic accidents related to sleepiness during driving: a systematic review

Eastern Mediterranean Health Journal

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Risk assessment of road traffic accidents related to sleepiness during driving: a systematic review

Review

Shehrazad Saleem¹

¹Department of Community Medicine, King Edward Medical University, Lahore, Punjab, Pakistan (Correspondence to: S. Saleem, shehrazad79@gmail.com).

Abstract

Background: Injuries due to accidental crashes are the 6th leading cause of death worldwide. Sleepiness results in disrupted neurological function and is a major risk factor for road traffic accidents.

Aims: This systematic review assessed the relationship between sleepiness during driving and road traffic accidents.

Methods: A systematic review was conducted using three databases such as Wiley Online Library, JSTOR, Medline, and Pubmed. Full-text, English language articles published between May 2010 and November 2020 were relevant. Road traffic accident was set as the outcome of interest and sleepiness during driving as the exposure. The review included studies containing adjusted risk estimates (95% confidence interval), for cross-sectional studies (N = 35,348), 3 case-control studies (N = 3021), and 2 cohort studies (N = 16,816) were included.

Results: Over 50% of the participants in the different studies experienced sleep deprivation ranging from 3.5% to 67.3%. All et al. reported the highest (58%) frequency of sleepiness during driving in their cross-sectional study in Japan, and Wu et al. reported the lowest (1.3%) in their cohort study in France.

Conclusion: Sleepiness and sleep deprivation were related to road traffic accidents and these associations were much stronger for sleepiness while driving.

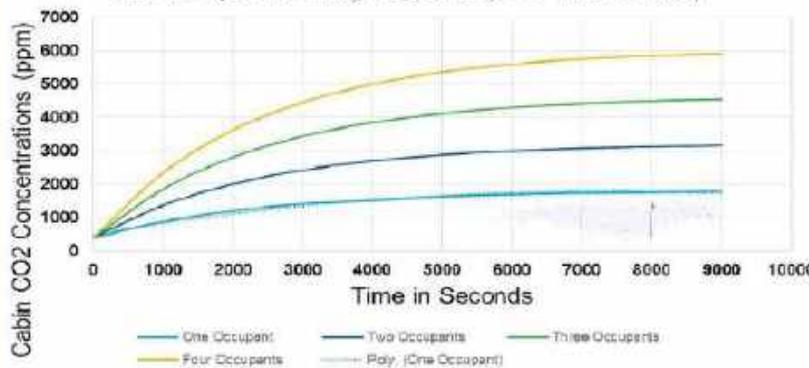
WHERE IS THE NEED

1. IN CARS AND TRUCKS!!!
2. IN AEROPLANES!!!
3. IN AC ROOMS!!!



DANGEROUSLY CLOSE

Cabin CO2 Concentrations for 1 to 4 Occupants with Vehicle at 70mph, Recirc Mode (at a Lung Capacity of 1.65 l/min)



How CO2 levels impact on the human body



Source: Occupational Safety and Health (https://www.osha-slc.gov)



WHAT IS THE NEED IN INDIA



INDIA - WORLD'S 3RD MOST POLLUTED COUNTRY IN 2023
 (NEXT TO BANGLADESH AND PAKISTAN)

42 OF TOP 50 WORLD'S MOST POLLUTED CITIES ARE IN INDIA

<https://www.igair.com/in-en/india>



CLIMATE ACTION

8 BILLION PEOPLE
USING 1 BILLION 'CARBAXE'
PRODUCT



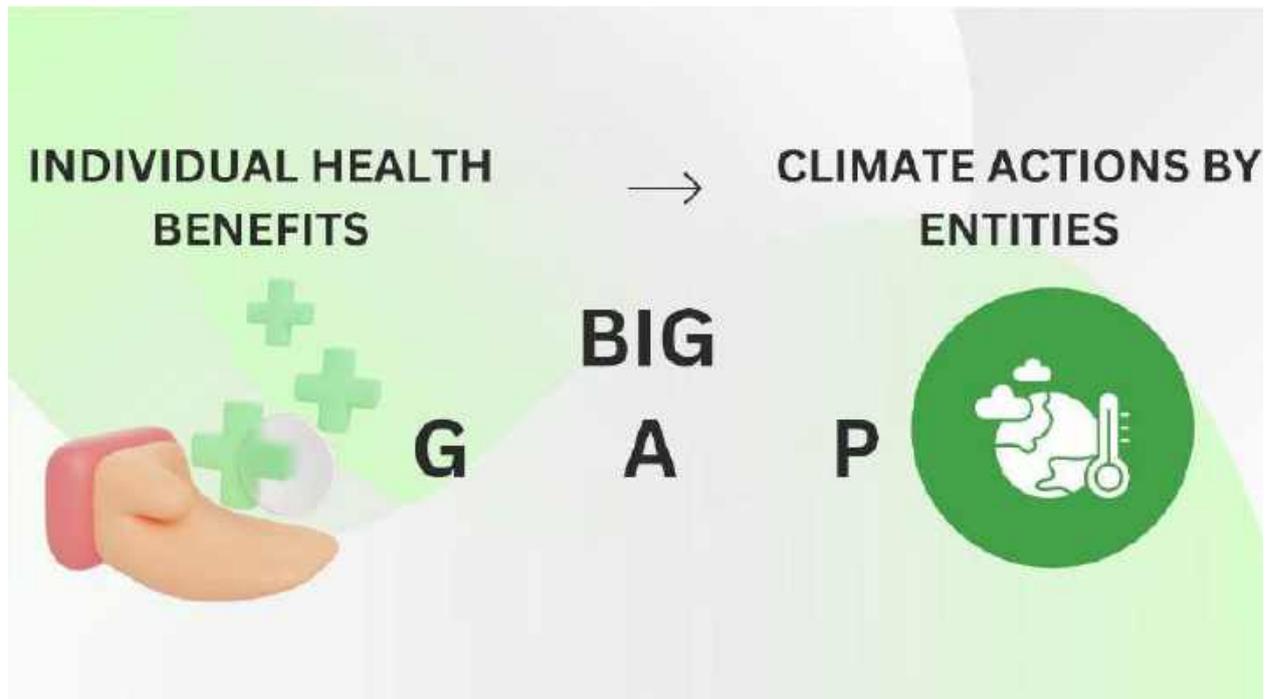
HELPING THEM TO BREATHE A CLEAN AIR
BY CAPTURING
1 KILOGRAM OF CO2 EVERY MONTH



IN THEIR LIVING SPACE!

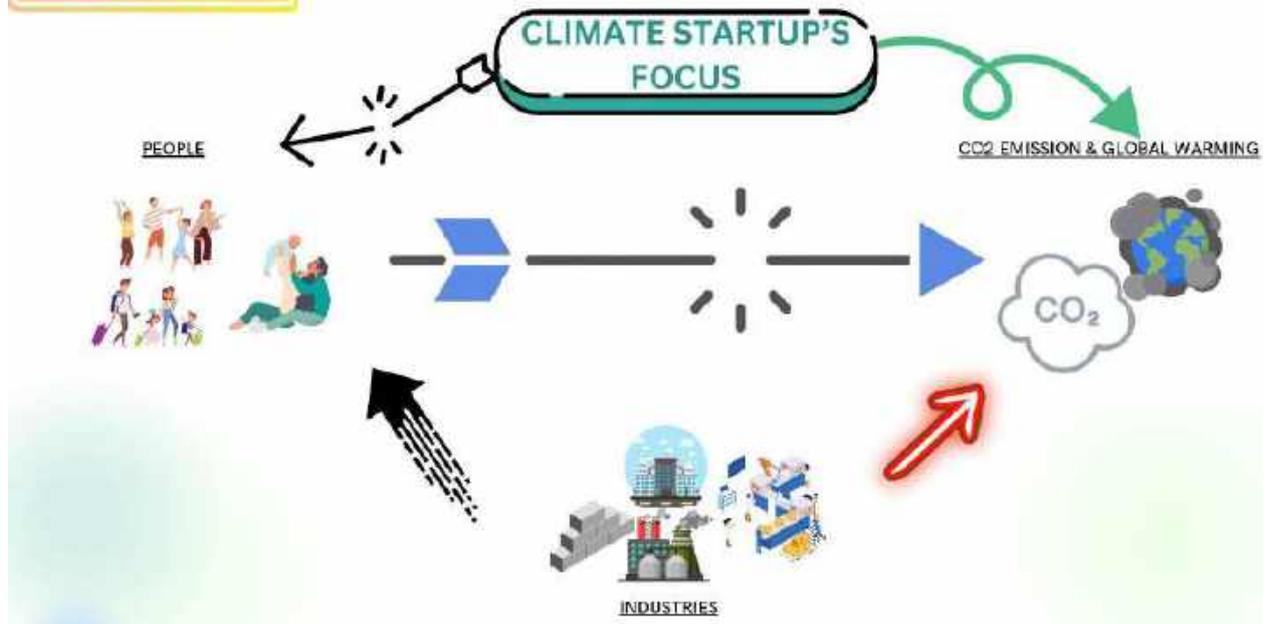
RESULTING
1 BILLION KILOGRAM OF CO2 CAPTURED
EVERY MONTH





Problem

A DISCONNECTION BETWEEN PUBLIC AND CLIMATE ACTIONS



PROBLEM STATEMENT

TITLE: Removal of CO2 using Direct Air Carbon Capture Techniques



THENNAL AIR FILTERS PRIVATE LIMITED



A GREEN Tech – Clean Tech – CLimate TECH START UP

Incorporation Completed



Ramkumar P R
Founder & CEO
THENNAL AIR FILTERS PRIVATE LIMITED

Date of Incorporation: 12.10.2024



Team



Ramkumar.P.R

Founder & Chief Executive Officer
 Nanotechnology Specialist
 12+ years in Nano Science and Technology Research



Namagal.S

Research & Development
 Specialist in Nano Materials
 7+ years in Materials Science Research
 Full-time Member



Sujatha.S

Chief Operational Officer
 3+ years experience in programming
 Team Leader at Newgen
 Full-Time Member



Impact

Climate



Reduced CO2

In few decades of practice, CO2 level can be reduced to pre-industrial level of 280 ppm



Negative Carbon Foot Print

Individuals can contribute to climate action by having negative carbon footprint in their daily lives



Sustainable Balanced Future

For centuries to come, humans can maintain critical balance with environmental eco-system, by themselves neutralizing their carbon foot-print

Social



Survival

140 million people in cities can survive extreme climate and air pollution condition as in Delhi like cities.



Safety

Number of Accidents on road could be reduced by 50%



Better Future

Number of patients in hospital with respiratory illness could be reduced by 80%, especially Children.

Thank
you

There is
NO Planet B

EARTH
is more
valuable than money

 www.thennal.com

 info@thennal.com

 +91-97100 71471

Thank you for your time!
Reach out to us for questions.



St. Peter's Institute of Higher Education and Research
(Deemed to be University U/S of the UGC Act, 1956)
NAAC Accredited, AICTE Approved and ISO-9001: 2015 Certified
AVADI, Chennai - 600 054, Tamil Nadu.
Phone: 26558060-110 / 9345111200



Department of Computer Science and Engineering

BEST PRACTICE REPORT

Air Quality Monitoring and Data Analysis

1. Objectives

- To design and develop an indigenous air quality monitoring system integrated with IoT and deep learning.
- To provide accurate, real-time air pollution data for diverse environments— industrial, residential, and solid waste disposal sites.
- To assist the Ministry of Environment, Forest and Climate Change (MoEF) in natural resource conservation through advanced data-driven environmental monitoring.
- To promote interdisciplinary research combining AI, sensor technology, and environmental science.

2. Context

The CSE Department recognized the critical need for low-cost, indigenous technology to monitor air pollution across Indian cities. Conventional monitoring systems were limited by cost, spatial coverage, and lack of predictive accuracy.

To address this, the department initiated a research project supported by the MoEF, focusing on smart sensors, drone-based monitoring, and AI-driven forecasting models. The project reflects the department's commitment to technological innovation for environmental sustainability.

3. The Practice

- The project implemented an integrated framework combining Nano-sensor design for pollutant detection (e.g., CO₂, SO₂, NO₂, VOCs, PM_{2.5}).
- IoT and UAV integration for remote data collection across varying altitudes.
- Deep learning models (Bi-GRU and FSA algorithms) to predict pollution trends with high accuracy.
- Data visualization tools for real-time environmental monitoring.

Faculty and students collaboratively developed prototypes, conducted field testing in Manali, Chennai, and validated the model's performance against real-time data. The project achieved a high level of precision with RMSE values between 1.35–1.63 across test zones. The developed model is also used to monitor the emission level within the SPIHER campus and the readings obtained are maintained within tolerable limits striving to achieve Net Zero.

4. Evidence of Success

- **Enhanced Monitoring Accuracy:** The indigenous system provided more reliable readings than imported alternatives, supporting data-driven interventions for pollution control.
- **Early Detection of Pollution Hotspots:** Real-time analysis enabled identification of environmental threats and rapid response strategies.
- **Optimized Resource Allocation:** The system's analytics guided policymakers to prioritize funding for high-risk zones.
- **Policy and Public Engagement:** Visualized air quality data increased public awareness through digital platforms, promoting community-level action.
- **Capacity Building:** Collaborative research among academia, government, and industry enhanced skill development in IoT, AI, and environmental engineering.

Additionally, the project resulted in high-impact publications in Q1 journals such as Sustainability and Sustainable Cities and Society, demonstrating strong academic dissemination.

5. Problems Encountered and Solutions

Challenges	Impact	Solution
Complex sensor calibration	Inconsistent pollutant data	Iterative testing and AI-based correction models
Drone operational constraints	Limited spatial coverage	Improved UAV design and flight path optimization
Large dataset handling	Computational overhead	Adoption of cloud-based data storage and parallel computing
Limited awareness of indigenous technology	Low early adoption	Awareness programs and training workshops for stakeholders

6. Impact and Future Plans

The project's success has established a research ecosystem in the CSE Department focusing on AI for environmental intelligence.

The outcomes contribute directly to national missions on sustainability and smart cities and also used to monitor the emission level in the campus regularly

Future work includes:

- Expanding pollutant categories for broader environmental modeling.
- Integrating the system into urban planning dashboards for city administrations.
- Collaborating with other HEIs to replicate the technology.

7. Conclusion

This initiative exemplifies the CSE Department's best practice in applying advanced computing to solve real-world environmental challenges. It bridges technology and sustainability, producing tangible benefits for research, policy, and society. The project aligns perfectly with the MoEF's mission to protect the environment through innovation, capacity building, and data-driven governance.

**GLIMPSES OF THE AIR QUALITY MONITORING EQUIPMENT USED WITHIN SPIHER CAMPUS TO
MONITOR AIR QUALITY**



Best Practices Report: Solar Panel Erection

1. Objectives of the Practice

- To harness renewable energy resources and promote sustainable power generation within the campus.
- To reduce dependence on conventional grid electricity and lower the institution's carbon footprint.
- To provide students with practical exposure to solar photovoltaic (PV) systems and installation techniques.
- To encourage research, innovation, and awareness in renewable energy technologies.
- To support institutional alignment with SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action).

2. Context

The growing global energy demand and environmental degradation due to fossil fuel use have emphasized the importance of renewable energy sources. The campus experiences significant power consumption due to laboratories, classrooms, and administrative facilities. To address this, the Department of Electrical and Electronics Engineering initiated a Solar Panel Erection Practice aimed at generating a portion of the campus energy demand through clean, renewable sources.

The major challenge was to identify feasible rooftop areas, manage funding, and ensure proper integration of the solar PV system with the existing electrical network.

3. The Practice

- Phase 1 – Feasibility Study: Conducted an energy demand analysis and rooftop suitability assessment for solar panel installation. Load profile studies and shadow analysis were performed to determine the optimal panel orientation.
- Phase 2 – Design and Planning: Designed a grid-connected solar PV system with appropriate capacity. Components included PV modules, inverters, mounting structures, and protection devices.
- Phase 3 – Installation and Erection: Panels were installed on suitable building rooftops following safety and electrical standards. Faculty and students from the EEE department actively participated in the wiring, inverter setup, and commissioning stages.
- Phase 4 – Monitoring and Maintenance: A real-time monitoring system was established to track energy generation, efficiency, and load sharing. Regular cleaning and performance checks were scheduled for sustained output.
- Phase 5 – Awareness and Training: Students were trained on system design, inverter configuration, and maintenance procedures through workshops and live demonstrations.

4. Evidence of Success

- Commissioning of a 10 kW rooftop solar PV system on campus.
- Reduction of electricity bills by 10–12% within six months of operation.
- Avoidance of approximately 5 tons of CO₂ emissions annually.
- Students developed academic projects and internships focused on solar technologies.
- The initiative was appreciated in IQAC reviews and presented as a best practice in institutional audits.

5. Problems Encountered and Solutions

Challenges

Limited initial funding for solar panel procurement

Structural constraints on some building rooftops

Maintenance issues due to dust accumulation

Lack of expertise in inverter configuration

Solutions Implemented

Received partial funding under institutional green initiative budget; phased installation implemented.

Conducted load-bearing analysis and selected suitable rooftops with structural reinforcement.

Scheduled regular cleaning and panel inspection using student volunteer groups.

Faculty underwent a short-term training program in solar PV system integration.

6. Impact and Future Plans

- Strengthened institutional commitment toward green energy and sustainable operations.
- Enhanced technical competency of students in renewable energy systems.
- Reduced dependence on conventional power supply, resulting in cost and energy savings.
- Plans to expand the capacity to 25 kW to cover a larger portion of the campus energy needs.
- Proposal to integrate solar power with IoT-based energy monitoring and battery storage systems for improved reliability.
- Encouragement for students to pursue mini-projects and research papers in solar energy applications.

Electricity Consumption measured in SPIHER Campus for the year 2024

Month year	SPIHER	SPCET	SCHOOL	Arts college
01/2024	330604.00	79405.00	102710.00	44708.00
02/2024	422515.00	105034.00	155566.00	44525.00
03/2024	468475.00	119376.00	157738.00	51522.00
04/2024	467102.00	127523.00	167873.00	50496.00
05/2024	482638.00	131905.00	164633.00	49279.00
06/2024	380154.00	127116.00	162764.00	49149.00
07/2024	500392.00	117515.00	139847.00	64688.00
08/2024	501065.00	146026.00	163521.00	56435.00

09/2024	497960.00	166273.00	183536.00	55139.00
10/2024	477610.00	141071.00	163096.00	57546.00
11/2024	434093.00	147776.00	189837.00	58062.00
12/2024	370628	131261.00	154463.00	51017.00

7. Conclusion

The Solar Panel Erection Practice stands as a successful initiative demonstrating the Institution's dedication to sustainability, innovation, and experiential learning. It not only supports environmental conservation but also provides students with valuable technical skills in renewable energy engineering. With continued expansion and integration, this practice will contribute to a carbon-neutral and self-sustained campus in the coming years.

Solar power 10KW SPIHER Campus consumption details

Month/year	Monthly wise consumption units	Total Consumption units
01/2024	1000	6525
02/2024	1082	7607
03/2024	1131	8738
04/2024	1014	9752
05/2024	907	10679
06/2024	1035	11714
07/2024	1046	12760
08/2024	1051	13811
09/2024	959	14770
10/2024	766	15536
11/2024	665	16101
12/2024	536	16637
01/2025	563	17200
02/2025	930	18130
03/2025	1186	19271

04/2025	1214	20845
05/2025	1099	21651
06/2025	612	22263
07/2025	99	22362
08/2025	38	22400
09/2025	50	22450

Electrical maintenance department
Electricity bills for Jan to November 2024

Month Year	SPIHER	Consumption units
01/2024	330604.00	22604
02/2024	422515.00	33284
03/2024	468475.00	38660
04/2024	467102.00	38492
05/2024	482638.00	40328
06/2024	380154.00	28580
07/2024	503092.00	39884
08/2024	501065.00	40044
09/2024	497960.00	39320
10/2024	477610.00	36292
11/2024	434093.00	32488
Total	4965308.00	389980
Total	4965308.00	389980

Electrical maintenance department
 Electricity bills for July 2024 to Aug 2025

Month year	SPIHER	Consumption units
08/2024	500562.00	40044
09/2024	497463.00	39320
10/2024	477133.00	36292
11/2024	433659.00	32488
12/2024	370258.00	25352
01/2025	348537.00	23008
02/2025	446273.00	33792
03/2025	529879.00	42800
04/2025	538956.00	43564
05/2025	519289.00	42324
06/2025	373592.00	26104
07/2025	518583.00	40256
08/2025	549198.00	42820
Total	9435382.00	468164

Month year	SPIHER		SPCET		school		Art college	
	units	Bill amount	units	Bill amount	units	Bill amt	units	Bill amount
1/2024	23008	348886	3771	106350	8224	149404	1640	55564
2/2024	33792	446719	5583	124597	10428	171528	2160	60778
3/2024	42800	529879	3561	144227	12144	188753	2440	63602
4/2024	43564	538956	5183	144335	10828	175543	1800	57012
5/2024	42324	519289	3561	144321	15096	218385	1800	56917
6/2024	26104	373592	5183	140621	10708	174338	2262	62060
7/2024	40256	518583	4957	144135	13200	205806	3452	76212
8/2024	42820	519198	3561	144121	14148	215631	3716	79176
9/2024	45880	581301	5183	140221	12580	199381	3880	81097

St.Peter's Campus electrical consumption report for the year 2024

Electrical maintenance department
Electricity bills for July 2024 to July 2025

Month Year	SPIHER Campus	Consumption units
07/2024	500562.00	40044
08/2024	497463.00	39320
09/2024	477133.00	36292
10/2024	433659.00	32488
11/2024	370258.00	25352
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06/2025	518583.00	40256
07/2025	549198.00	42820
Total	9435382.00	468164

Regional and National Contributions

SPIHER has signed an MoU with Nature Science Foundation to carry out comprehensive Green, Energy and Environment, Water, Soil and Environment audits on campus. Through this partnership, the institution aims to assess its current environmental performance and identify areas for sustainable improvement. The audits will help SPIHER reduce resource consumption, minimize waste and enhance the overall ecological health of the campus. Students and staff will also gain awareness and involvement in eco-friendly practices through related activities and initiatives. This collaboration reflects SPIHER's strong commitment to sustainability and its responsibility towards society and the environment.



5/4/24
 தமிழ்நாடு தமில்நாடு TAMIL NADU
 St. PETER'S INSTITUTE OF HIGHER
 EDUCATION AND RESEARCH
 CHENNAI - 54.

27AC 579303
R. Vasanthakumari
 R. VASANTHAKUMARI
 Stamp Vendor, L.No. 4255/E195
 No.11A,M.T.H.Road, Avadi, Ch-54

MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding (hereinafter called as the 'MOU') is entered into on this 09th day of April 2024.

BETWEEN

St. Peter's Institute of Higher Education and Research (SPIHER), located at Tonakela Camp Road, Avadi, Chennai-600054, the First Party represented herein by Dr. L. MAHESH KUMAR, REGISTRAR, St. Peter's Institute of Higher Education and Research (hereinafter referred as 'SPIHER', the Institution which expression, unless excluded by or repugnant to the subject or context shall include its successors – in-office, administrators and assigns).

AND

M/s. Nature Science Foundation, hereinafter, with a registered address at LIG-II, 2669, Gandhi Managar, Peelamedu, Coimbatore – 641 004, Tamil Nadu, India. herein after MOU Between SPIHER and NSF



SPIHER MOU signed with M/s Nature Science Foundation to conduct Green, Energy and Environment Audit in SPIHER Campus

referred to as “NSF” an organization which expression, unless excluded by or repugnant to the subject or context shall include its successors – in – office, administrators and assigns) (SPIHER and “NSF” are hereinafter jointly referred to as ‘Parties’ and individually as ‘Party’)

1. Purpose

The Parties recognize the benefits to be derived from increased collaboration, cooperation and interaction for the further research and development activities on nature conservation and environmental protection (hereafter, collectively referred to as the “Field”).

The purpose of this MOU is to define the areas for fundamental, academic research in which the Parties desire to work together in the future for their mutual benefit to foster a collaborative framework between SPIHER and NSF in the Field with a view to benefiting from each other’s initiatives and working procedures and to support collaboration among the researchers associated with both Parties.

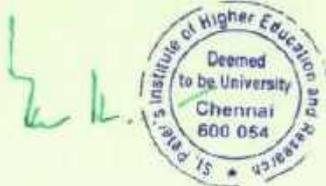
2. Scope

This MOU sets forth the intentions of the Parties for increased collaboration, cooperation and interaction and does not create any legally binding commitments. If the Parties later agree to undertake specific joint projects with legally binding obligations, they will develop separate written agreements for such projects, setting out each Party’s contributions, deliverables, and budgets.

The parties collaborate, cooperate and interact to achieve the following scopes of this MOU.

1. The Parties intend to pursue collaboration on fundamental, academic research, conducting training programme and conference / seminars / workshops related to nature conservation and environmental protection.

MOU Between SPIHER and NSF



2. Both parties exchange the technical expertise such as experimental procedures, instrumental knowledge and development of new protocols in the field of Arts, Commerce and Science including some areas in Engineering and Technology.
3. Both parties agree to exchange the expertise of their working staff under mutual convenience when requested by either Parties. For example, NSF can request to utilize the expertise of SPIHER staff members for their technical events. However, exchange of faculties or staff members or scientist is to be done under mutual convenience of the Parties when such exchanges doesn't affect the normal functioning of the Parties. During Conferences, Seminars, Symposia and Workshops organized by either Parties, exchange of working staff may be availed with mutual consent.
4. Both Parties agree to develop collaborative research projects for submitting to various funding agencies in the areas of nature conservation and environmental protection.
5. SPIHER can give venues like laboratories and seminar halls to NSF to conduct Conferences, Seminars, Symposia and Workshops on mutual understandings.
6. SPIHER can conduct "NSF Annual Meet and Award Distribution Ceremony" and can start "International Eco Club Student Chapter" at SPIHER campus.
7. SPIHER can nominate a few staff coordinators and students to start "International Eco Club Student Chapter" at SPIHER campus.
8. SPIHER can nominate one staff coordinator for NSF Advisory Board Committee to improve the activities of NSF in coming days.
9. SPIHER can work as an Out station (Branch) of NSF to coordinate the activities of NSF.
10. SPIHER can undertake, if interested, "Eco Audit", "Green Campus Audit", "Energy Audit" and "Hygiene Audit: with special discount fees structure with NSF coinciding with the fees collected for 'International Eco Club Student Chapter'.

MOU Between SPIHER and NSF



11. NSF will support SPIHER in organizing and conducting "Lead Auditor Course on Environment Management Systems, Green Campus Audit, Hygiene Audit and Energy Audit" jointly with NSF.
12. SPIHER can become an Ordinary/Provisional/Life membership with NSF to avail the benefits of 'Environmental Management Audits', 'International Eco Club Student Chapter' and 'Awards and Honours' (best faculty awards, best scientist awards, best institution awards and Fellow awards) including the conduct of the 'National and International Day celebrations'.
13. The Students and staff members seeking for financial support to carry out the 'Student Project Scheme' should be a member of the 'International Eco Club Student Chapter' and the Institution should be enrolled with the NSF.
14. NSF is promoting R&D work having social relevance, significance and usefulness to our country in terms of environmental protection and nature conservation and will assist SPIHER.

3. Costs

Each Party will be responsible for its own costs in connection with all matters relating to collaborations under this MOU. Where possible and appropriate, the parties may also seek funding for collaborations from other Government and private agencies.

4. General Provisions

4.1. Treatment of intellectual property rights developed through collaborations under this MOU will be determined between the Parties through mutual consultation and separate written agreements on a case-by-case basis.

4.2. Publication credits of any kind arising as a result of this MOU shall be shared by both the Parties. The corresponding authors of the publications would be the Party which

MOU Between SPIHER and NSF



has prepared the manuscript. The publications as a result of this MOU will be made under mutual consent of the Parties while either Parties are intimated verbally.

5. Confidentiality

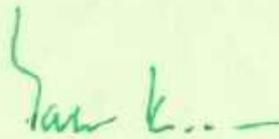
The parties agree that there is no intention to share any confidential or proprietary information in any collaboration under this MOU. If either Party wishes to disclose information it considers to be confidential or proprietary to the other Party, the Parties will enter into a written non-disclosure agreement.

6. Duration

This MOU shall be effective for a period of FIVE (5) years from the date of final signature. It may be modified or extended by mutual written agreement by the Parties. This MOU may be terminated by either party upon THREE (3) months advance written notice. In witness thereof, the parties hereto signed this agreement to be executed as on the day, month and the year indicated below

For and Behalf of
**St. Peter's Institute of Higher
Education and Research**

Office Seal



Signature of Head of the Institution
St. Peter's Institute of Higher
Education and Research

Office Seal

For and Behalf of
Nature Science Foundation

Office Seal

Signature of the Chairman
Nature Science Foundation

Office Seal

Startup Name: THENNAL AIR FILTERS PRIVATE LIMITED

Regionally and nationally, academic staff participate in advisory groups, consultations and technical panels. Research on renewable energy, energy efficiency, low-carbon transport and industry is translated into clear policy briefs and reports that help inform regulations, standards and incentive schemes. Government funding agency has provided financial support to execute a funded project titled Design and Development of Thin Film / Flexible – 10 kW Solar-Based Power System with Grid-Tie Inverter for Puzhal Panchayat Union for an Sanctioned Amount of Rs. 99,62,000/-



Glimpses of the Outreach Activity where Faculty Members of SPIHER enlighten the Local Community on Utilizing Renewable Energy Sources

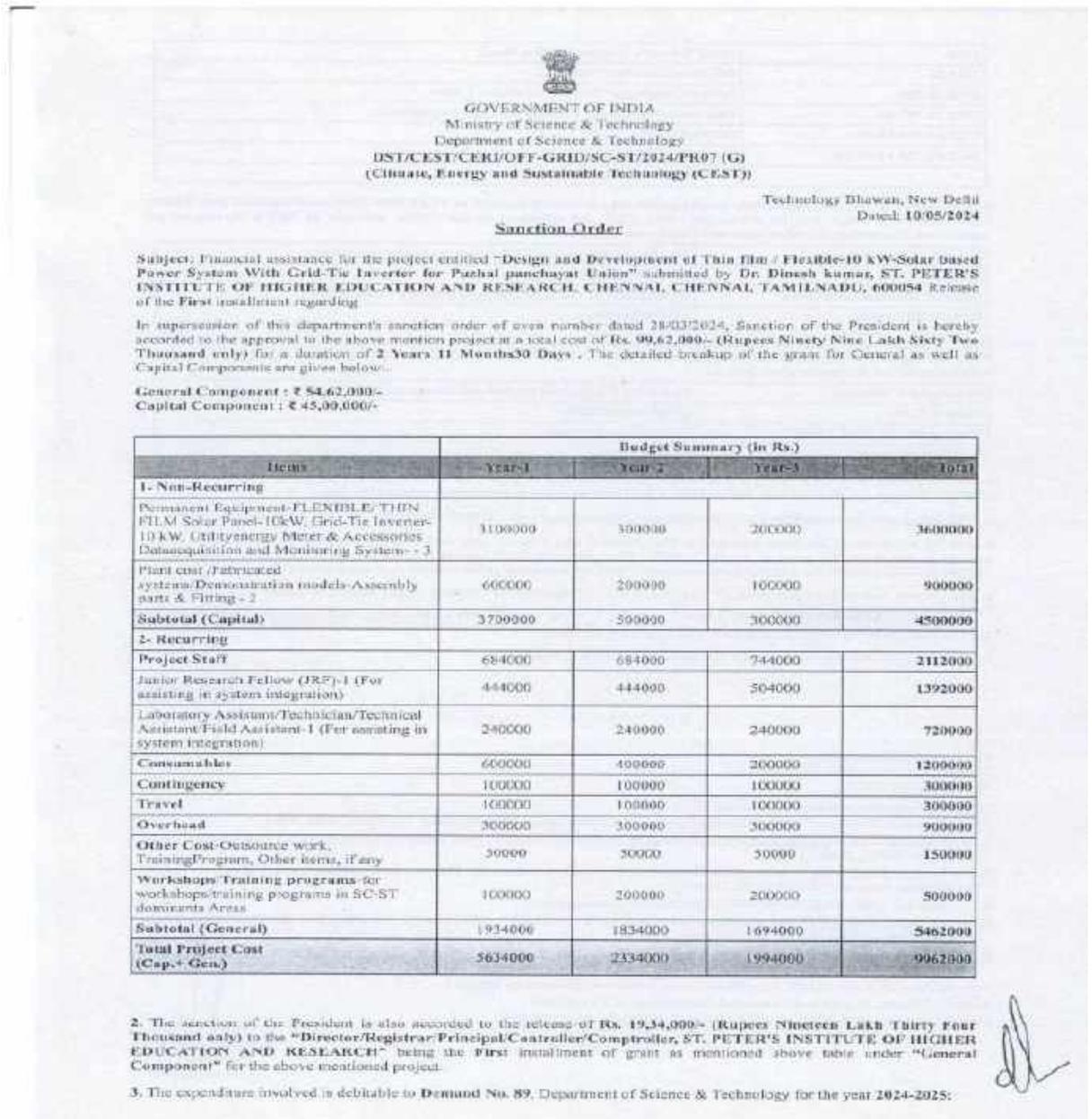
Major Research Contribution: DST Funded Project on Solar Energy Systems

SPIHER's commitment to clean energy is further strengthened by its major funded research initiative supported by the Department of Science and Technology (DST), Government of India.

Project Title:

Design and Development of Thin Film / Flexible – 10 kW Solar-Based Power System with Grid-Tie Inverter for Puzhal Panchayat Union

Sanctioned Amount: Rs. 99,62,000/-



₹ 99,62,000/-

3425	Other Scientific Research(Major Head)
3425.60	Others : (Sub-Major Head)
3425.60.789	Special Component Plan for Scheduled Castes
3425.60.789.15	Innovation,Technology Development and Deployment
3425.60.789.15.00	Detailed Head
3425.60.789.15.00.31	Grants-in-aid General
	(Previous: 3425.60.789.01.01.31)

4. The amount of Rs. 1/- (Rupee One only) against the sanctioned amount of 19,34,000/- (Rupees Nineteen Lakh Thirty Four Thousand only) will be drawn by DDO, DST and disbursed to the "CNA account of SERB in respect of Innovation,Technology Development and Deployment Scheme".

Name of A/C Holder	Innovation Technology Development and Deployment
Bank A/C No	349902010051240
Name of the Bank & branch	Union Bank of India, Safdarjung Enclave - New Delhi
RTGS/IFSC code	UBIN0534994

5. CNA shall assign/allocate the amount of Rs. 19,34,000/- (Rupees Nineteen Lakh Thirty Four Thousand only) to the Director/Registrar/Principal/Controller/Comptroller, ST. PETER'S INSTITUTE OF HIGHER EDUCATION AND RESEARCH" as per details given below:-

Name of A/C Holder	St. Peter's Institute of Higher Education and Research
Bank A/C No	101412010002200
Name of the Bank & branch	Union Bank of India
RTGS/IFSC code	UBIN0810142

6. As per Rule 234 of CFR 2017, the sanction has been entered at S. No 10 . in the register of grants maintained in the Climate, Energy and Sustainable Technology (CEST) for the scheme Renewable Energy System .

7. This issues with the concurrence of IED vide their Concurrence Dy/ No. IED/C/II/090524/31.000417 dated 09/05/2024.

8. The GI will keep all the funds received in the Central Nodal Account only and shall not transfer the funds to any other account or not divert the same to Fixed Deposits/ Flexi-Account/ Multi-Option Deposit Account/ Corporate Liquid Term Deposit (CLTD) account etc. The funds released to GI shall not be parked in bank account of any other agency.

9. The GI will ensure the compliance of OM. No. F. No. 1(18)/PFMS/PCD/2021 dated March 9, 2022 of Department of Expenditure, Ministry of Finance.

10. The Institute is registered on Darpan Portal Id-TN/2018/0193481

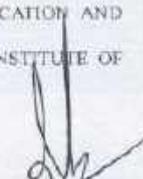
11. This sanction order is subject to the Terms & Conditions as annexed .


Dharendra Tiwari
(Scientist - 'D')
d.tiwari@gov.in

To,
The Pay & Accounts Officer,
Department of Science & Technology,
New Delhi - 110 016.

Copy of information and necessary action to:-

1. The Principal Director of Audit, Scientific Department, IIrd floor, AGCR Building, I.P. Estate, New Delhi
2. The Financial Advisor, Integrated Finance Division, Technology Bhavan, New Mehrauli Road, Block C, Qutab Institutional Area, New Delhi, Delhi 110016
3. The Internal Audit Wing, Department of Science & Technology, Technology Bhavan, New Mehrauli Road, Block C, Qutab Institutional Area, New Delhi, Delhi 110016
4. Drawing and Disbursing Officer, DST, Cash Section. (two copies)
5. Dr. Dinesh Kumar, Assistant Professor, Mechanical, ST. PETER'S INSTITUTE OF HIGHER EDUCATION AND RESEARCH, Chennai, Chennai, Tamilnadu - 600054
6. The Director/Registrar/Principal/Controller/Comptroller/Chief Executive Officer(CEO), ST. PETER'S INSTITUTE OF HIGHER EDUCATION AND RESEARCH, Chennai, Chennai, Tamilnadu - 600054
7. Secretary, SERB, New Delhi (for allocation of limits to implementing agency)
8. Head (Climate, Energy and Sustainable Technology (CEST)) DST
9. Sanction Folder (Climate, Energy and Sustainable Technology (CEST))


Dharendra Tiwari
(Scientist - 'D')
d.tiwari@gov.in



GOVERNMENT OF INDIA
Ministry of Science & Technology
Department of Science & Technology
DST/CEST/CERI/OFF-GRID/SC-ST/2024/PR07 (G)

Terms & Conditions

1. The grantee organization will furnish to the Department of Science & Technology, financial year wise Utilization Certificate (UC) in the proforma prescribed as per GFR 2017 and audited statement of expenditure (SE) along with up to date progress report (Vis-a-Vis Target Vs-Achievement) at the end of each financial year duly reflecting the interest earned / accrued on the grant received under the project. This is also subject to the condition of submission of the final statement of expenditure, utilization certificate and project completion report within one year from the scheduled date of completion of the project.
2. The grantee organization will have to enter & upload the Utilization Certificate in the PFMS portal besides sending it in physical form to this Division. The subsequent/final installment will be released only after confirmation of the acceptance of the UC by the Division and entry of previous Utilization Certificate in the PFMS.
3. If the grant has been released under capital head through separate sanction order under the same project for purchase of equipment(s), separate SE/UC has to be furnished for the released Capital head grant.
4. The grant-in-aid being released is subject to the condition that:-
 - a) A transparent procurement procedure in line with Provisions of General Financial Rules 2017 will be followed by the Institute/Organization under the appropriate rules of grantee organization while procuring capital assets sanctioned for the above mentioned project and a certificate to this effect will be submitted by the Grantee organization immediately on receipt of the grant.
 - b) While submitting Utilization Certificate/Statement of Expenditure, the organization has to ensure submission of supporting documentary evidences with regard of the purchase of equipment/capital assets as per the provisions of GFR 2017. Subsequent release of grants under the project shall be considered only on receipt of the said documents.
5. As per the GFR 2017 Rule 230 (8) the Grantee Institute should ensure that all the interests or other earnings against Grant-in-Aid or advances (other than reimbursement) released to any Grantee institution should be mandatorily remitted to the Consolidated Fund of India immediately after finalization of the accounts. Such advances will not be allowed to be adjusted against future releases.
6. As per the GFR 2017 Rule 230 (17) "the Grantee Institute should agree to make reservations for Scheduled Castes and Scheduled Tribes or OBC in the posts or services under its control on the lines indicated by the Government of India".
7. The grantee organization will maintain separate audited account for the project and the entire amount of grant will be kept in an interest bearing bank account. For Grants released during F.Y. 2017-18 and onwards, all interests and other earnings against released Grant shall be remitted to Consolidated Fund of India (through Non-Tax Receipt Portal (NTRP), i.e. www.bharatkosh.gov.in), immediately after finalization of accounts, as it shall not be adjusted towards future release of Grant. A certificate to this effect shall have to be submitted along with Statement of Expenditure/ Utilization Certificate for considering subsequent release of Grant/ Closure of Project accounts.
8. DST reserves sole rights on the assets created out of grants. Assets acquired wholly or substantially out of government grants (except those declared as obsolete and unserviceable or condemned in accordance with the procedure laid down in GFR 2017), shall not be disposed of without obtaining the prior approval of DST.
9. The account of the grantee organization shall be open to inspection by the sanctioning authority and audit (both by C&AG of India and Internal Audit by the Principal Accounts Office of the DST), whenever the organization is called upon to do so, as laid down under Rule 236(1) of General Financial Rules 2017.
10. Due acknowledgement of technical support / financial assistance resulting from this project grant should mandatorily be highlighted by the grantee organization in bold letters in all publication / media release as well as in the opening paragraphs of their Annual Reports during and after the completion of the project.
11. Failure to comply with the terms and conditions of the Bond will entail full refund with interest in terms of Rule 231 (2) of GFR 2017.
12. It is mandatory to use EAT module in PFMS, failing which no further funds shall be released.
13. Goods (Consumable/Equipment) available in GeM portal are to be procured mandatorily online through GeM only as per the provisions of Rule 149 of GFR.
14. The Grantee Institute should follow Global Tendering Enquiry (GTE) conditions as per Department of Expenditure ID Note No:4/1/2021-PPD dated 10.09.2021.
15. If One time assistance or non-recurring grant as Grant-in-Aid for Rs. 10.00 lakhs to Rs. 50.00 lakhs, it should be included in the Annual Report of the Institute.
16. The Grantee Institute must ensure any other provisions of GFR-2017 (<https://doe.gov.in/order-circular/general-financial-rules2017-0>) and guidelines/amendments issued from Govt. of India from time to time.


अंतराज



भारत सरकार
विज्ञान और प्रौद्योगिकी मंत्रालय
विज्ञान और प्रौद्योगिकी विभाग
DST/CEST/CERI/OFF-GRID/SC-ST/2024/PR07 (G)
निबंधन और शर्तें

1. अनुदानग्राही संस्थान प्रत्येक वित्त वर्ष के अंत में इस परियोजना के अंतर्गत प्राप्त अनुदान पर अर्जित/प्रोद्भूत ब्याज को विविधित रूप से दर्शाते हुए अद्यतन प्रगति रिपोर्ट (लक्ष्य ब्रह्मण उपलब्धि) के साथ जीएफआर 2017 में विनिर्दिष्ट प्ररूप में वित्तीय वर्ष-वार उपयोग प्रमाण पत्र (पूजी) और व्यय का लेखापरीक्षित विवरण (एसई) विज्ञान और प्रौद्योगिकी विभाग को प्रस्तुत करेगा। यह परियोजना की समाप्ति की निर्धारित तारीख से एक वर्ष भीतर व्यय का अंतिम विवरण, उपयोग प्रमाण-पत्र और परियोजना समाप्ति रिपोर्ट प्रस्तुत करने की शर्तों के भी अध्वधीन है।

2. अनुदानग्राही संस्थान को उपयोग प्रमाण-पत्र इस प्रभाग में भौतिक रूप में भेजने के साथ-साथ पीएफएमएस पोर्टल पर प्रविष्ट और अपलोड करना होगा। अनुवर्ती/अंतिम किस्ता प्रभाग द्वारा पूजी की स्वीकृति की पुष्टि और पीएफएमएस में पूर्ववर्ती उपयोग प्रमाण-पत्र की प्रविष्टि के बाद ही जारी की जाएगी।

3. यदि अनुदान एक ही परियोजना के अंतर्गत उपस्कर (सी) की खरीद के लिए पृथक संस्वीकृति आदेश के माध्यम से पूजी-शर्तों के अंतर्गत जारी किया गया है तो जारी किया गया पूजी-शर्तों अनुदान के लिए पृथक एसई/पूजी प्रस्तुत करना होगा।

4. जारी किया जा रहा सहायता अनुदान निम्नलिखित शर्तों के अध्वधीन है-

क) उपयुक्त परियोजना के लिए संस्वीकृत पूजी अस्तित्वों की खरीद करते समय अनुदानग्राही संस्थान के उचित नियमों के तहत संस्थान-संगठन द्वारा सामान्य वित्तीय नियमावली 2017 के उपबंधों के अनुरूप पारदर्शी खरीद प्रक्रिया का अनुपालन किया जाए और अनुदान प्राप्ति पर तुरंत प्रभाव से अनुदानग्राही संगठन द्वारा इस आशय का प्रमाण-पत्र प्रस्तुत किया जाए।

ख) उपयोग प्रमाण-पत्र व्यय विवरण प्रस्तुत करते समय, संगठन को जीएफआर 2017 के उपबंधों के अनुसरण में उपस्कर/पूजी अस्तित्वों की खरीद के संबंध में संबंधित दस्तावेज-साक्ष्य प्रस्तुत करना सुनिश्चित करना होता है।

5. जीएफआर नियमावली 2017 के नियम 230 (8) के अनुसार अनुदानग्राही संस्थान को सुनिश्चित करना चाहिए कि किसी भी अनुदानग्राही संस्थान को जारी किए गए सहायता अनुदान या अग्रिम (प्रतिपूर्ति से भिन्न) पर प्राप्त समस्त प्रकार के ब्याज या अन्य आय को लेखों को अंतिम रूप दिए जाने के तुरंत बाद भारतीय समेकित निधि में अनिवार्य रूप से विधेयित किया जाए। ऐसे अग्रिमों को भविष्य में जारी की जाने वाली निधियों में समापोजित करने की अनुमति नहीं दी जाएगी।

6. जीएफआर नियमावली 2017 के नियम 230 (17) के अनुसार, "अनुदानग्राही संस्थान को भारत सरकार के निर्देशानुसार अपने नियंत्रणाधीन पदों या सेवाओं में अनुसूचित जाति या अनुसूचित जनजाति या अंबीसी के लिए आरक्षण रखने पर सहमत होना चाहिए।"

7. अनुदानग्राही संस्थान परियोजना का पृथक परीक्षित लेखा रखेगा और अनुदान की समस्त राशि बैंक खाते में सव्याज रखी जाएगी। वित्तीय वर्ष 2017-18 के दौरान और उसके बाद जारी अनुदान के लिए, अनुदान के लिए सभी प्रकार के ब्याज या अन्य आय ऐसे लेखों को अंतिम रूप दिए जाने के तुरंत बाद भारतीय समेकित निधि में तैर कर प्राप्ति पोर्टल (एनटीआरपी) अर्थात् www.bharatkosh.gov.in के माध्यम से विधेयित की जाएगी, क्योंकि यह राशि भविष्य में जारी की जाने वाली राशि में समापोजित नहीं की जाएगी। अनुवर्ती अनुदान के निर्गम/परियोजना खाते को बंद करने पर विचार किए जाने के लिए, व्यय विवरण/उपयोग प्रमाण-पत्र के साथ इस आशय का प्रमाण पत्र प्रस्तुत करना होगा।

8. डीएसटी, अनुदान से सुचित परिसंपत्तियों पर एकमात्र सुरक्षित अधिकार रखता है। सरकारी अनुदानों से पूरी तरह से या पर्याप्त रूप से अर्जित संपत्ति (जीएफआर 2017 में निर्धारित प्रक्रिया के अनुसार अप्रचलित और अनुप्रयोज्य, अनुपयोगी घोषित अनुदानों से इतर), का नियंत्रण डीएसटी का पूर्व अनुमोदन प्राप्त किए बिना नहीं किया जाएगा।

9. जैसा कि सामान्य वित्तीय नियमावली 2017 के नियम 236 (1) के तहत निर्धारित किया गया है, अनुदानग्राही संगठन का लेखा स्वीकृति प्रदाता प्राधिकारी और लेखा परीक्षक (भारत के नियंत्रक एवं महालेखापरीक्षक और डीएसटी के प्रधान लेखा कार्यालय दोनों द्वारा आंतरिक लेखा परीक्षा) द्वारा निरीक्षण किए जाने, जब भी संगठन को ऐसा करने के लिए कहा जाता है, हेतु अभिगम्य होगा।

10. इस परियोजना अनुदान से प्राप्त तकनीकी सहायता/वित्तीय सहायता की उचित यावली को अनुदानग्राही संगठन द्वारा सभी प्रकाशनों/मिडिया प्रकाशनों में मोटे अक्षरों में और परियोजना के पूरा होने के दौरान और तदुपरांत उनकी वार्षिक रिपोर्टों के शुरुआती पैराग्राफों में अनिवार्य रूप से दिखाया किया जाना चाहिए।

11. बॉन्ड के नियमों और शर्तों का पालन करने में असफल होने पर जीएफआर 2017 के नियम 231 (2) के अनुसार पूरी राशि सव्याज वापस करनी होगी।

Project Objective:

This DST-funded project aims to design, develop, and deploy a 10 kW solar-based power system using thin-film and flexible solar technology integrated with a grid-tie inverter. The project is focused on supporting the energy needs of the Puzhal Panchayat Union, demonstrating the application of clean-energy solutions in a real-world rural governance environment.

Key Features of the Project:

- Development of lightweight and flexible solar modules
- Installation of a grid-connected solar power system
- Real-time demonstration of solar-performance efficiency
- Support for public-infrastructure energy needs
- Integration of research with community benefit

Societal Impact:

This project:

- Enables energy generation from renewable sources
- Reduces dependency on conventional electricity
- Promotes solar adoption at the community-governance level
- Demonstrates scalable technology for rural electrification
- Encourages sustainable public infrastructure

Academic and Community Significance:

The DST project serves as:

- A live research and demonstration platform
- A training ground for students and faculty
- A reference model for future renewable-energy deployment
- A monitoring and evaluation system for performance analysis

The project strongly supports government energy policies and reflects SPIHER's leadership in converting research into community impact.

Energy-Efficiency Promotion

SPIHER encourages practical energy-saving practices such as:

- LED transition awareness
- Adoption of energy-star-rated appliances
- Education on power consumption reduction
- Basic energy auditing at household level

Participants receive guidance on how to implement energy conservation in daily life.

Policy Advocacy and Expert Engagement

SPIHER facilitates discussions involving:

7.1 Expert Talks

- Government officials
- Renewable-energy engineers
- Environmental experts
- Policy advisors

Community Dialogues

Topics discussed include:

- Renewable-energy incentives
- Financial feasibility
- Solar-installation procedures
- Grid-integration methods

These interactions deepen knowledge and policy awareness.

Measurable Impact and Outcomes

The outcomes of SPIHER's renewable-energy initiatives include:

- Increased public awareness about solar energy

- Community interest in rooftop solar adoption
- Skill development through workshops
- Student involvement in real-world energy projects
- Strengthened rural clean-energy infrastructure
- Reduced carbon footprint

SDG Alignment

SPIHER actively contributes to:

SDG 7 – Affordable and Clean Energy

SDG 11 – Sustainable Cities and Communities

SDG 12 – Responsible Consumption and Production

SDG 13 – Climate Action

Monitoring and Continuous Improvement

SPIHER ensures continuous improvement through:

- Event documentation
- Community feedback collection
- Annual sustainability reviews
- Research outcome tracking
- Partnership evaluations

Global Involvement

Internationally, the university engages in global research networks and contributes to studies, reports and expert dialogues. By sharing comparative evidence, case studies and best practices, we support the development of clean energy and energy-efficient technology policies worldwide, while remaining independent and non-partisan.

2. Priya VS, Brindha S. **Optimizing Solar Power Generation and Integration in Automotive Systems Through IoT.** *Indian Journal of Science and Technology*. 2024 Oct 23;17(40):4158-67.

INDIAN JOURNAL OF SCIENCE AND TECHNOLOGY



RESEARCH ARTICLE



Optimizing Solar Power Generation and Integration in Automotive Systems Through IoT

OPEN ACCESS

Received: 11-09-2024
Accepted: 03-10-2024
Published: 23-10-2024

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Citation: Priya VS, Brindha S (2024). Optimizing Solar Power Generation and Integration in Automotive Systems Through IoT. *Indian Journal of Science and Technology* 17(40): 4158-4167. <https://doi.org/10.17985/IJSITV17I40.21017>

* **Corresponding author:**
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Funding: None

Competing Interests: None

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Published By Indian Society for Education and Environment (IS3E)

ISSN
Print: 0974-6846
Electronic: 0974-5645

Abstract

Objective: This study presents an internet of Things (IoT)- based system with edge intelligence that predicts power production with over 98% accuracy and monitors substations and smart solar installations, ensuring reliable power distribution in industrial IoT environments. This system enhances sustainability, safety, and energy management in smart buildings by reducing power fluctuations by 30% and improving decision-making, leading to a 95% reduction in energy management costs. **Method:** An IoT-enabled power monitoring system was implemented for smart solar panels and substations, incorporating edge intelligence for instantaneous prediction and decision-making. An IoT-enabled solar charging station was deployed for smart homes and Industry 4.0 applications. The cloud was used for analyzing sensor data, with a response time of less than 1 second. **Findings:** The proposed framework increased the efficiency and reliability of power production and distribution by 25% across commercial, residential, and industrial contexts. It significantly mitigated power fluctuations, reducing downtime by 40% and achieving a 95% cost reduction in energy management compared to traditional systems. IoT integration improved safety and sustainability metrics by 20% in smart buildings. **Novelty:** The framework integrates edge intelligence with IoT in smart solar systems and substations, providing a sophisticated control system that enhances power distribution decision-making. It facilitates real-time monitoring and prediction of power production with over 98% accuracy, emphasizing sustainability, safety, and energy management improvements of up to 30% in smart buildings.

Keywords: IoT-based control system; Smart solar systems; Edge intelligence; Power substations; Load management; Energy sustainability

1 Introduction

IoT is currently assuming a significant role in global research, particularly in the field of sophisticated wireless communication, and is serving as the basis for a number of

3. Subbulakshmi G, Sujatha S, Saraswathi V. Harnessing Blockchain and Deep Learning for Enhanced Energy Analytics in Photovoltaic Systems. In 2024 International Conference on System, Computation, Automation and Networking (ICSCAN) 2024 Dec 27 (pp. 1-7). IEEE.

Harnessing Blockchain and Deep Learning for Enhanced Energy Analytics in Photovoltaic Systems

Publisher: IEEE [Go to Item](#) [PDF](#)

Subbulakshmi G., Sujatha S., Saraswathi V., Rangaswamy Raju Venkatesh, All Authors

24
 Full
 Full view

Abstract:
 The rapid evolution of solar energy in sustainable sectors has sparked a growing interest in renewable energy, particularly within the context of smart grids and systems. The effective detection and management of energies within photovoltaic (PV) systems, such as solar panels, is a critical challenge. This abstract introduces a proposed model aimed at exploring the integration of blockchain networks within large-scale solar energy infrastructures. The primary objective is to establish a framework that enables the distribution of solar energy in a decentralized manner to end-users while ensuring secure energy transactions between producers and consumers. Blockchain technology serves as the cornerstone of this model, incorporating intelligent techniques to address energy mitigation challenges within the solar energy network. By leveraging blockchain, the detection of energies within solar power plants becomes shared knowledge accessible to all users connected to the solar power network. The research within this framework emphasizes the exploration and application of diverse Deep Learning (DL) architectures, including autoencoders, Convolutional Neural Networks (CNNs), Long Short-Term Memory (LSTM) networks, Deep Stacking Networks (DSNs), and Deep Belief Networks (DBNs). Furthermore, this research extends beyond conventional machine learning approaches, incorporating knowledge-driven methodologies. It explores generative models such as Generative Adversarial Networks and Transfer Learning, expanding the scope of machine learning in optimizing energy detection, distribution, and consumption within the blockchain-based solar energy infrastructure. This interdisciplinary approach integrates a significant role in formulating sustainable energy systems. By integrating blockchain's decentralized nature with sophisticated DL architectures and knowledge-driven models, it establishes a resilient and efficient sustainable energy infrastructure capable of meeting escalating demands for sustainable energy.

Keywords:
 Blockchain, Deep Learning, Smart Grids, Renewable Energy, Energy Distribution, Sustainable Energy.

Published in: 2024 International Conference on System, Computation, Automation and Networking (ICSCAN)

Date of Conference: 27-30 December 2024
 Date Added to IEEE Xplore: 01 February 2025

DOI: 10.1109/ICSCAN58073.2024.10800982
 Publisher: IEEE
 Conference Location: PUEUCHERRY, India

Introduction:
 In the pursuit of sustainable and distributed energy production and consumption, renewable energy sources, particularly photovoltaic systems, have gained significant attention. However, the intermittent nature of solar energy and the challenges of efficient energy storage and distribution present a complex set of challenges. This paper addresses these challenges by proposing a novel architecture for smart grids, leveraging blockchain technology and deep learning (DL) to optimize energy distribution and consumption. The proposed system aims to enhance the efficiency and reliability of energy distribution, while ensuring secure and transparent transactions. The research within this framework emphasizes the exploration and application of diverse DL architectures, including autoencoders, Convolutional Neural Networks (CNNs), Long Short-Term Memory (LSTM) networks, Deep Stacking Networks (DSNs), and Deep Belief Networks (DBNs). Furthermore, this research extends beyond conventional machine learning approaches, incorporating knowledge-driven methodologies. It explores generative models such as Generative Adversarial Networks and Transfer Learning, expanding the scope of machine learning in optimizing energy detection, distribution, and consumption within the blockchain-based solar energy infrastructure. This interdisciplinary approach integrates a significant role in formulating sustainable energy systems. By integrating blockchain's decentralized nature with sophisticated DL architectures and knowledge-driven models, it establishes a resilient and efficient sustainable energy infrastructure capable of meeting escalating demands for sustainable energy.

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Figures



Certificate of Presentation

4. Ramar M, Mariappan SM, Gunasekaran S, Navaneethan M, Singhal A, Yang K, Archana KJ, Balagopalan S, Ambikeswari N, Shkir M, Karthikeyan B. Tuning Electron–Phonon Coupling in Se-Doped Fe₂O₃ for Efficient Photocatalysis: Experimental and First-Principles Calculations. *ACS Applied Nano Materials*. 2024 Mar 22;7(7):6935-45.

ACS Applied Nano Materials > Vol 7/Issue 7 > Article

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ARTICLE | March 22, 2024

Tuning Electron–Phonon Coupling in Se-Doped Fe₂O₃ for Efficient Photocatalysis: Experimental and First-Principles Calculations

Mahalakshmi Ramar, Sivelingam Muthu Mariappan, S. Gunasekaran*, M. Navaneethan, Ayush Singhal, Kesong Yang*, K. Janani Archana, Susmitha Balagopalan, N. Ambikeswari, Mohd Shkir*, and Balasubramanian Karthikeyan*



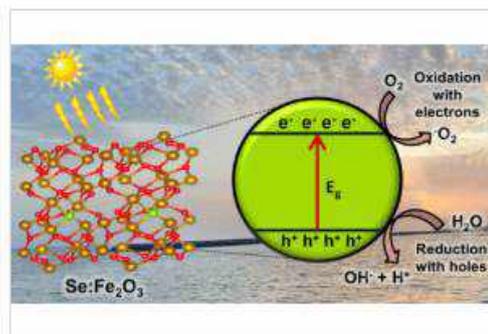
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Supporting Information (1)

Abstract

Reducing the electron–phonon (el–ph) coupling in Fe₂O₃ can significantly boost carrier mobility by overcoming the customary trapping effects caused by polaron formation. Despite various efforts to understand the polaron formation and their transport properties, any direct measurement of el–ph coupling strength is still lacking. Hence, we prepared Fe₂O₃ and Se-doped Fe₂O₃ through a solid-state reaction and measured the el–ph coupling strength through the Fano-resonance approach. The reduced coupling strength in Se-modified Fe₂O₃ indicates that the self-trapped carriers can easily hop the lattice and consequently have a larger lifetime, as confirmed in time-resolved photoluminescence measurements. Further, to determine the Se doping site and to reveal the underlying mechanism for the changes in carrier lifetime, we performed first-principles density functional theory calculations by considering all the possible substitutional doping models. Our calculations show that Se will substitute the O atoms (Se@O) under ambient conditions rather than Fe atoms



Monitoring and Continuous Engagement

SPIHER maintains:

- Documentation of engagement activities
- Policy feedback mechanisms
- Expert committee records
- Annual reviews
- Follow-up evaluations

Conclusion

SPIHER plays a proactive role in strengthening energy governance through informed participation in clean-energy and energy-efficiency policymaking. By offering technical consultation, research intelligence, and field-based data, the university bridges the gap between academic expertise and public administration. SPIHER remains committed to empowering government entities through knowledge partnership, contributing meaningfully to national sustainability goals and public welfare.