IUSSTF

Indo-U.S. Science and Technology Forum

Annual Report 2022-23

Catalyzing Indo-U.S. Science and Technology Cooperation

ANNUAL REPORT

2022-23

IUSSTF
Indo-U.S. Science and Technology Forum

INDO-U.S. SCIENCE AND TECHNOLOGY FORUM
Fulbright House, 12 Hailey Road, New Delhi 110 001, India
www.iusstf.org

Contents

Introduction to IUSSTF

IUSSTF: THE GENESIS

The **Indo-U.S. Science and Technology Forum (IUSSTF)** is a binational organization jointly created by India and the United States of America through a formal agreement signed by the two Governments on March 21, 2000. IUSSTF acquired legal status a few months later, when it was registered as a Society under the "Societies Registration Act" in India in June 2000, with its office at New Delhi.

IUSSTF is also the secretariat for the **U.S. - India Science and Technology Endowment Fund** which was jointly set up later by the two Governments, through a separate agreement in the year 2009.

The *Department of Science and Technology (DST)* of the Ministry of Science and Technology, Government of India, and the *U.S. Department of State* are the arms of the two Governments that overview the functioning of IUSSTF through a Governing Body having equal representation from both sides.

IUSSTF: VISION, MISSION, AND OBJECTIVES

Vision

Excellence in Science, Technology, and Innovation space through collaborative initiatives between India and the United States of America.

Mission

- Act as a catalyst to promote long-term scientific collaborations between India and the U.S. through partnership amongst individual scientists, scientific institutions and the scientific community at large.
- Establish platforms and mechanisms to connect the S&T ecosystems of both the countries to act as a fertile ground to foster individual and institutional partnerships in a natural and sustainable manner.

Objectives

- Create awareness through exchange and dissemination of information and opportunities in S&T cooperation.
- Capitalize and build on the scientific and technological synergy leading to long term partnership on shared values.
- Support exciting program portfolio that leads to sustainable interactions and strengthens strategic partnerships.
- Nurture contacts between young and mid-career scientists to develop mutual trust, foster excellence and explore new frontiers.
- Encourage public-private partnerships to foster elements of innovation, application and enterprise.

IUSSTF PROGRAM PORTFOLIO

Classified by Verticals

1

Strategic Initiatives

- U.S. - India Artificial Intelligence (USIAI) Initiative
- Solar Decathlon Initiative

2

Scientific Networks

- Bilateral Workshops/Training Programs/Symposia
- Indo-U.S. Virtual Networked Centres
- Indo-U.S. Virtual Networks for COVID-19

3

Innovation and Entrepreneurship

- U.S.-India Science and Technology Endowment Fund (USISTEF)
- COVID-19 Ignition Grants
- Technology-based Energy Solutions: Innovations for Net Zero

4

Research and Development

- Indo-U.S. Joint Clean Energy Research and Development Center (JCERDC)
- PACEsetter Fund

5

Visitations and Fellowships

- IUSSTF-Viterbi Program
- Khorana Program for Scholars

IUSSTF PROGRAM PORTFOLIO

(Classified by Nature of Support)

1

IUSSTF Core

- Bilateral Workshops/Training Programs/Symposia
- Indo-U.S. Virtual Networked Centres
- Indo-U.S. Virtual Networks for COVID-19
- IUSSTF-Viterbi Program
- U.S. - India Artificial Intelligence (USIAI) Initiative
- Solar Decathlon Initiative

2

U.S.-India Science and Technology Endowment Fund (USISTEF)

- U.S.-India Science and Technology Endowment Fund (USISTEF) Calls
- COVID-19 Ignition Grants
- Technology-based Energy Solutions: Innovations for Net Zero

3

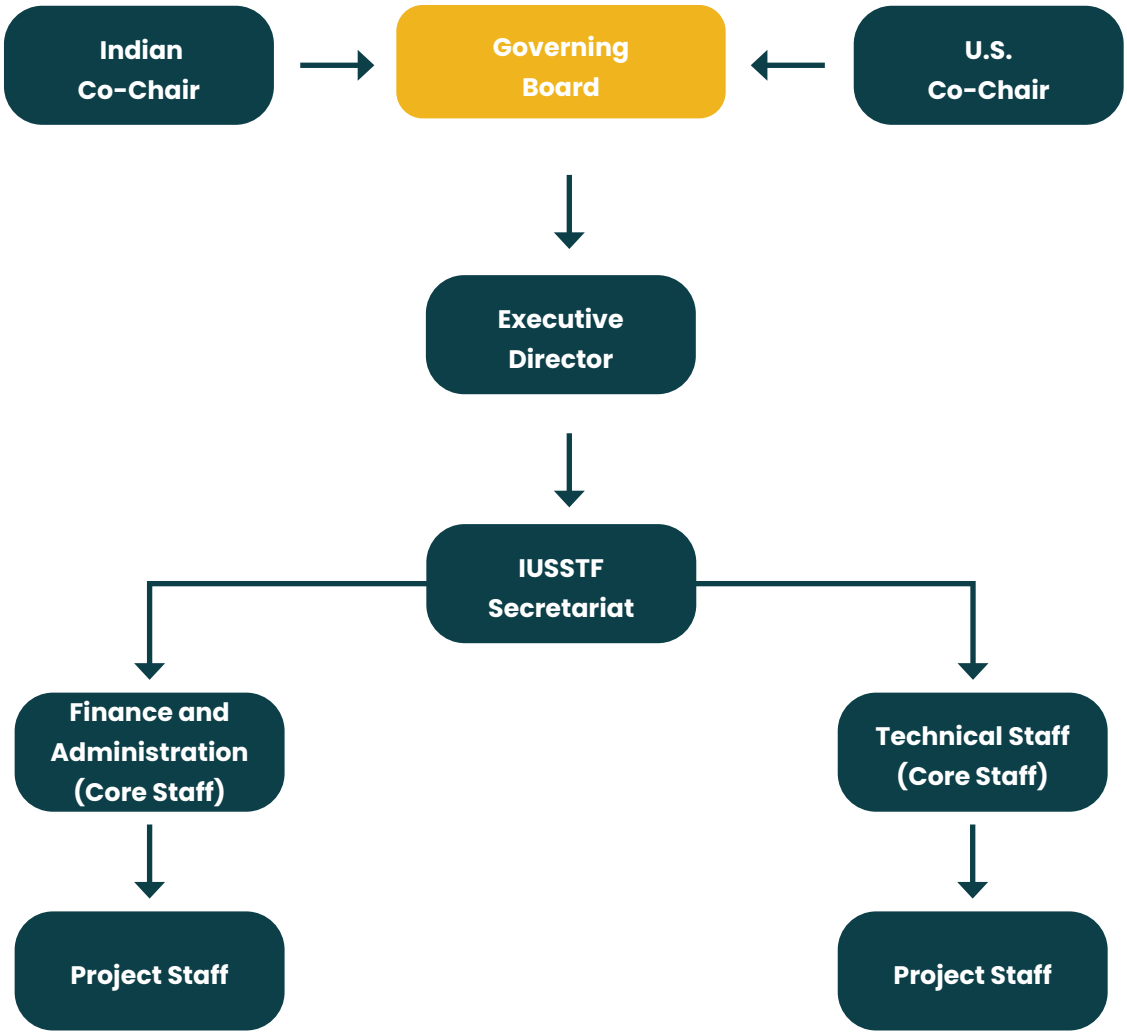
Extra-Mural Programs (EMPs)

(Supported by External Agencies/ Industry)

- Indo U.S. Joint Clean Energy Research and Development Centre
- PACEsetter Fund
- Khorana Program for Scholars

Governance Structure

IUSSTF ORGANIZATIONAL CHART



Administrative Mechanism

- Autonomous
- Bilateral
- Non-governmental
- Not-for-profit-society

Funding Source

- Annual Interest from U.S. Endowment Fund with matching contribution from DST, Government of India
- Freedom to secure private and other funding

IUSSTF GOVERNING BOARD

Srivari Chandrasekhar
Co-Chair
Department of Science & Technology, Government of India

Chintan Vaishnav
Atal Innovation Mission, NITI Aayog, Government of India

Vishvajit Sahay
Department of Science & Technology, Government of India

Alka Sharma
Department of Biotechnology, Government of India

Ramanuj Narayan
CSIR-Indian Institute of Chemical Technology

Subhasis Chaudhari
Indian Institute of Technology Bombay

Mayank Singhal
PI Industries Limited

Jason Donovan
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Elizabeth Urbanas
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Kumud Srinivasan
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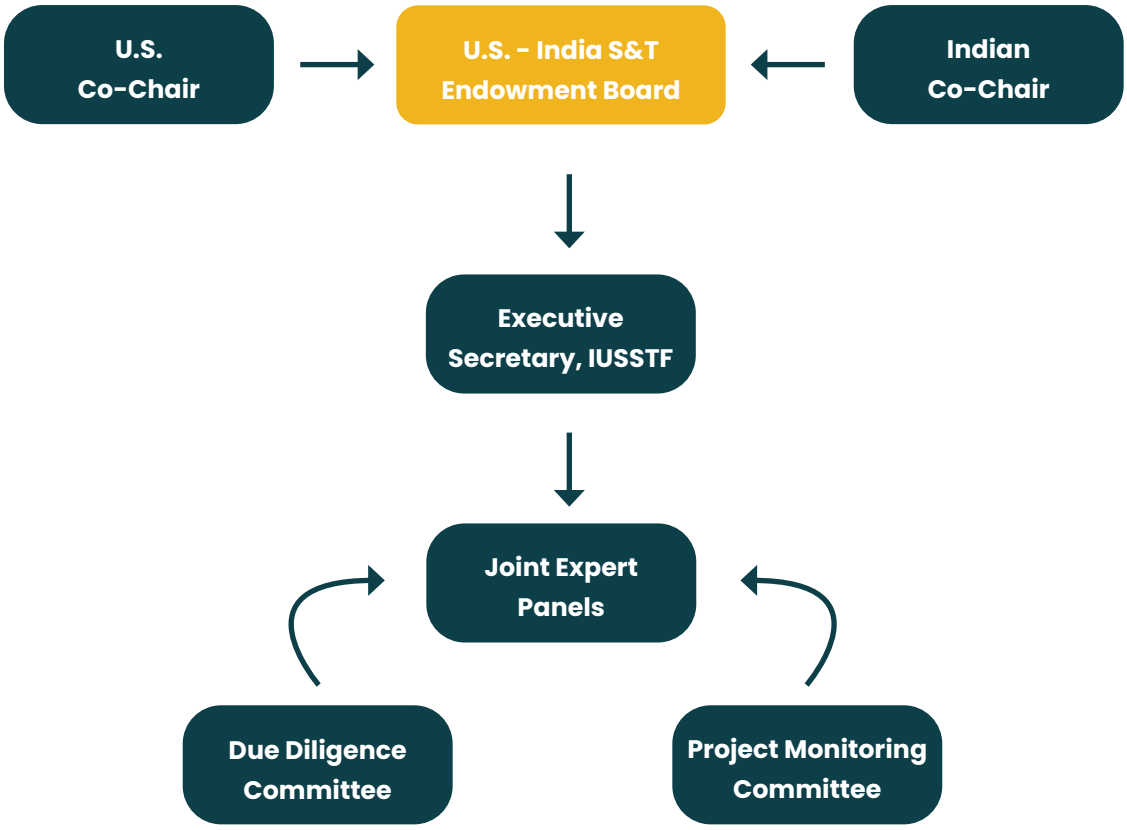
Aseem Ansari
St. Jude Children's Research Hospital

Amita Gupta
Johns Hopkins University

FUNCTIONAL STRUCTURE FOR USISTEF



USISTEF BOARD

S.K.Varshney
Co-Chair
Department of Science & Technology, Government of India

Anita Gupta
Department of Science & Technology, Government of India

Ajai Kumar Garg
Ministry of Electronics and Information Technology Government of India

Mahesh Kumar
Ministry of External Affairs, Government of India

V. Premnath
National Chemical Laboratory, Pune

Shirshendu Mukherjee
Programme Management Unit (PMU) supported by DBT-BIRAC-BMGF-Wellcome Trust

Anantapadmanabhan Anantaram Sarma
SIDBI Venture Capital Ltd.

Mini Shaji Thomas
Jamia Milia Islamia

Drew Schufletowski
Co-Chair
U.S. Embassy, New Delhi

Representative
U.S. Department of State

Shyam Sunder
National Institute of Standards and Technology

Ranjan Gupta
Division of International Relations, National Institutes of Health

Peter T. Dabrowski
Tano Capital/Tano Ventures

Tania Fernandez
DreamCatcher Ventures

Somshubhro (Som) Pal Choudhury
Bharat Innovation Fund

IUSSTF STAFF MEMBERS

Nandini Kannan
Executive Director

Core Staff

Nishritha Bopana
Principal Science Officer

Chaitali Bhattacharya
Principal Science Officer

Rajesh Arya
Controller

Anita Vishwakarma
Accounts Officer

Monika Madan
Senior Personal Secretary

Manoj Prasad
Assistant Admin Officer

Program Staff

Babulal Chaudhary
Senior Program Officer

Pushpa Iyer
Program Officer

Priya Thomas
Program Officer

Aashita Apoorva
Program Officer

Subhashree Basu
Program Officer

Rakesh Kumar Singh
Senior Accounts Associate II

Year at a Glance

Year at a Glance

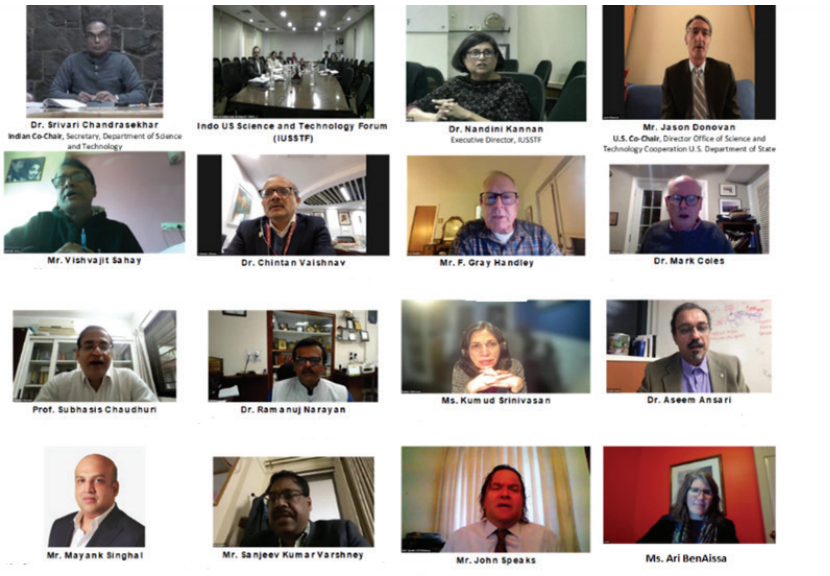
Highlights of 2022-23:

- A first-of-its kind survey on the state of higher education in AI and data science in India was conducted by IUSSTF, in collaboration with itihaasa Research and Digital, the National Program on Technology Enhanced Learning (NPTEL), and the Association for Computing Machinery (ACM) India. 113 institutions, representing a diverse mix of public and private educational institutions in India, responded to the survey.
- A report on "The AI & Data Science Workforce" was published by IUSSTF in partnership with itihaasa based on the results and analyses of the survey conducted. IUSSTF hopes that this report will lead to more substantive conversations, catalyze the community, and lead to successful Indo-U.S. collaborations in AI and data science workforce development.
- The Indo-U.S. Visioning Workshop titled **"Developing a Diverse, Robust AI Workforce"** was conducted on August 10th and 11th, 2022 at Indian Institute of Science (IISc) Bengaluru by IUSSTF, in partnership with itihaasa and IISc Bengaluru. The workshop brought together academicians, industry representatives, and government officials from India and the U.S. to discuss the challenges and opportunities in building a diverse and strong AI workforce in India.
- 10 teams were selected and announced for the award after an intensive due diligence process under the call for Technology-based Energy Solutions: Innovations for Net Zero program. The call was announced by the **United States–India Science & Technology Endowment Fund (USISTEF)** in partnership with Social Alpha.
- IUSSTF received an overwhelming response of 536 applications under the 2023 call for applications under the **Khorana Program for Scholars**. 75 meritorious students were selected to avail internships under the program in 2023.
- IUSSTF received 165 applications in response to the 2023 call for the **IUSSTF - Viterbi Program**. 15 Interns will be selected to pursue internships at the University of Southern California in the summer of 2023.

Board Meetings:

- **U.S.-India Science and Technology Endowment Board (USISTEB) Meeting:** The 23rd Meeting of the U.S.-India Science and Technology Endowment Board (USISTEB) was held on 30th November 2022 under the Co-Chairmanship of Mr. Sanjeev Kumar Varshney, Adviser & Head, International Cooperation, Department of Science & Technology, Government of India (Indian Co-Chair) and Mr. Drew Schufletowski, Minister Counselor for Energy, Environment, Science, and Technology, U.S. Embassy, New Delhi (U.S. Co-Chair) to finalize the promising "Technology Showstoppers" awards that address the development and implementation of new technologies, tools, and systems that tackle climate and clean energy challenges in the areas of next-generation clean and renewable energy, energy storage, and carbon sequestration. The Board members acknowledged the excellent track record of the USISTEF program and appreciated the Executive Director's leadership and her team's efforts in bringing in external partners. The Board Members also expressed optimism that the Net-Zero call could serve as a model for future collaborations and appreciated how the Endowment program has evolved over the years in addressing the needs of the S&T ecosystem.

- **Twenty-Second Governing Board (GB) Meeting:** The 22nd Governing Board Meeting was held virtually on 15th December 2022. Dr. Srivari Chandrasekhar, Indian Co-Chair, and Secretary, Department of Science and Technology, remarked that IUSSTF has been at the forefront of ensuring that India-US Science and Technology relations flourish. He commended the organization for its wide range of activities in all areas of science and technology, with a particular emphasis on net zero, Carbon Neutrality, and Global Warming issues. Mr. Jason Donovan, U.S. Co-Chair, Director of the Office of Science and Technology Cooperation, U.S. Department of State, mentioned the recent partnership in which President Biden and Prime Minister Modi launched the initiative on Critical and Emerging Technology (iCET), emphasizing the importance of bringing together science and technology resources from both countries to address global challenges as a like-minded partner, sharing values of openness and collaboration, transparency, and accountability as the two countries do such important work. The GB members acknowledged and appreciated the activities undertaken by IUSSTF in FY 2022-23, especially in the strategic areas of AI and climate.



22nd Governing Board (GB) Meeting of the Indo-U.S. Science & Technology Forum (IUSSTF)
15 December 2022

Section I: Strategic Initiatives

U.S. - India Artificial Intelligence (USIAI) Initiative

Overview

The Indo-U.S. Science and Technology Forum (IUSSTF) launched the U.S. - India Artificial Intelligence (USIAI) Initiative in 2021. USIAI is a platform for key stakeholders to discuss opportunities and barriers for bilateral AI R&D collaborations, share ideas for developing an AI workforce, and recommend modes and mechanisms for catalyzing partnerships between the two countries.

As part of the activity, IUSSTF has organized a series of events that brought together U. S. and Indian representatives from academic institutions, industry, and government to 1) identify emerging research areas in AI, Data Science and related areas, and future workforce needs; 2) discuss challenges and opportunities for training and capacity building; and 3) recommend mechanisms to facilitate bilateral partnerships.

a. Survey and Report on the State Of Higher Education in AI and Data Science in India

Under the USIAI "AI Workforce" track, the Indo-US Science and Technology Forum (IUSSTF), in collaboration with itihaasa Research and Digital, the National Programme on Technology Enhanced Learning (NPTEL), and the Association for Computing Machinery (ACM) India, conducted a first-of-its-kind survey on the state of higher education in AI and data science in India. The survey aimed to identify emerging research fields in AI and data science, outline the knowledge and skills required for various AI careers, address curriculum development at different levels of higher education, and identify the infrastructure and resources needed by higher education institutions to offer AI and data science programs.

The survey included 113 educational institutions from both the public and private sectors in India. The findings and analysis of the study have been published in a report titled **"The AI & Data Science Workforce."** The report provides an overview of curriculum development initiatives in the United States and Europe to serve as a benchmark for the AI Workforce track, along with some of the gaps and challenges in the Indian context, as well as next steps and action items to engage the broader stakeholder in these efforts.

b. The Indo-U.S. Visioning Workshop on Developing a Diverse, Robust AI Workforce

IUSSTF, in partnership with itihaasa and the Indian Institute of Science (IISc) Bengaluru, held a two-day Indo-US Visioning Workshop titled "Developing a Diverse, Robust AI Workforce" on August 10th and 11th. The workshop brought together academics, industry representatives, and government officials from both India and the U.S. to discuss the challenges and opportunities in building a diverse and strong AI workforce in India. The workshop was structured into three sessions: Provocateurs, Exemplar, and Breakout, and it focused on specific aspects of training and program development under four broad themes:

- AI, Data Science training for Industry 4.0
- Undergraduate Level AI Program and Curriculum Development
- Graduate Level AI Program and Curriculum Development: Computer Science focused
- Graduate Level Programs – Other Engineering / Science / Research focused

The distinguished panel of provocateurs S. Panchanathan, Director, National Science Foundation, Sandeep Verma, Secretary, Science and Engineering Research Board, Kris Gopalakrishnan, Chairman, Axilor Ventures, and G. Rangarajan, Director, IISc. challenged the participants to think about diversity and inclusion, and innovative, collaborative approaches to developing a globally engaged AI Workforce. The provocateurs also released the report on **The AI & Data Science Workforce: The State of Higher Education in India and an Overview of the U.S.** Landscape. A first of its kind report by the IUSSTF and itihaasa based on the survey conducted on the Indian higher education landscape in AI and data science in partnership with the National Programme on Technology Enhanced Learning (NPTEL) and the Association for Computing Machinery (ACM) India.

Dr. Nandini Kannan, ED, IUSSTF welcoming the participants to the workhsop

Our Provocateurs G. Rangarajan, Director, Indian Institute of Science, S. Panchanathan, Director, National Science Foundation, Sandeep Verma, Secretary, Science and Engineering Research Board and Kris Gopalakrishnan, Chairman, Axilor Ventures

The report 'The AI & Data Science Workforce: The State of Higher Education in India and an Overview of the U.S. Landscape' being released at the workshop

The Exemplar session of the workshop featured presenters from academia and industry. The presenters included, Ani Adhikari from U.C. Berkeley, Rajesh Sundaresan from IISc, Vipin Chaudhary from Case Western Reserve University, Andrew Thangaraj from IIT Madras and Rohini Srivathsa from Microsoft India. The key objective of the session was to present a few models of successful, innovative AI and Data Science programs at Indian and U.S. Institutions.

Clockwise from the top left: Rajesh Sundaresan from IISc Bangalore, Rohini Srivathsa from Microsoft India, Andrew Thangaraj from IIT Madras, and Vipin Chaudhary from Case Western Reserve University (Ani Adhikari from U.C. Berkeley addressed the participants virtually)

The breakout sessions organized around the four broad themes enabled the participants, who were divided into groups based on the four broad themes identified, to critically reflect upon various aspects of workforce development, share their unique insights and perspectives, and contribute to the creation of a roadmap for developing a diverse AI workforce. Furthermore, the groups were also asked to identify synergies for Indo-U.S. and industry/academia collaborative research and training activities, as well as models/mechanisms to facilitate these collaborations.

Breakout Session on Undergraduate Level AI Program and Curriculum Development

Breakout Session on AI, Data Science training for Industry 4.0

Breakout Session on Graduate Level Programs – Other Engineering / Research focused

The final day of the workshop focused on synthesizing the discussions during the breakout session and making high-level recommendations for developing a diverse and robust AI workforce. During this session, the four team Co-moderators presented the key discussion points held in their respective groups.

Solar Decathlon India (SDI)

Solar Decathlon India (SDI) was established under an MoU between the **Indo-U.S. Science and Technology Forum** (IUSSTF) and the **US Department of Energy** and is implemented by the **Alliance for an Energy Efficient Economy** (AEEE) and the **Indian Institute for Human Settlements** (IIHS). Solar Decathlon India is supported by the Department of Science and Technology (DST), GoI.

Launched in 2020, SDI is a unique, annual design challenge for undergraduate and postgraduate students from Indian colleges and universities to address climate change by developing innovative, net-zero energy and climate resilient solutions for the building sector in India. The teams of student's partner with real estate entities and collaborate with technology providers from the manufacturing industry. They develop affordable and energy efficient solutions for live building projects. They get hands-on experience and an opportunity to have their ideas implemented by their partners.

In the second year of the program, SDI had over 1200 students representing 109 institutions from 42 different cities across India participating in 99 interdisciplinary teams. Projects included residential, commercial, educational buildings, on-site housing for construction workers, as well as disaster relief community shelters. The teams were judged by an eminent panel of experts on various aspects of the designs including Energy and water performance, resilience, affordability, innovation, scalability and market potential, and comfort and environmental quality.

SDI is helping develop the next generation of architects, engineers, and entrepreneurs who can deliver net-zero energy buildings and help India achieve its 500 GW by 2030 goal. SDI aligns with the *Panchamrit* agenda and the *Atmanirbhar Bharat Abhiyaan* campaign, supporting India's ambitious climate targets while also helping to accelerate progress toward the goals of the U.S. India Strategic Clean Energy Partnership.

Union Minister of State (I/C) Science & Technology; Minister of State (I/C) Earth Sciences; MoS PMO, Personnel, Public Grievances, Pensions, Atomic Energy and Space, Dr. Jitendra Singh addressed the gathering and handed over the awards to the winners as Chief Guest at the Solar Decathlon India Awards Ceremony

To recognise the winners of the Solar Decathlon India net zero building challenge, an awards ceremony was held on 1st July 2022. **Dr. Jitendra Singh, Union Minister of State (I/C) Science & Technology; Minister of State (I/C) Earth Sciences; MoS PMO, Personnel, Public Grievances, Pensions, Atomic Energy and Space** graced the occasion as the Chief Guest. **Dr. S. Chandrasekhar, Secretary, Department of Science and Technology** also joined the event to felicitate the awardees. The event was organized by the IUSSTF in partnership with Indian Institute for Human Settlements (IIHS) and Alliance for an Energy Efficient Economy (AEEE).

Hon'ble Minister Dr. Jitendra Singh with the SDI award winners and the organizers

Section II: Scientific Networks

SCIENTIFIC NETWORKS

IUSSTF-funded collaborations provide a platform for young and early-career scientists to interact and network with their seniors and counterparts, who could potentially become both mentors and collaborators. Building scientific networks not only helps share expertise thereby doubling the value of the effort but also many times leads to the generation of completely novel ideas.

IUSSTF promotes such networks to foster long-term collaborations between the scientific communities of India and the United States through two separate yet complimentary programs. While **"Bilateral Workshops"** are expected to act as an instant connect and point of formal initiation, **"Virtual Networked Centers"** provide a formal mechanism to support specific collaborations for an extended period of time.

Bilateral Workshops/Symposia/Training Programs

Bilateral Workshops are targeted to promote interactions between Indian and American scientists and engineers from academia, laboratories and industry with the explicit aim to develop sustained linkages. Proposals are peer-reviewed both in India and the United States. The review parameters include novelty of topic, mutual benefits to India and the U.S., background of workshop coordinators and participants, potential for developing new and sustained bilateral linkages, student participation, etc.

IUSSTF did not solicit new applications for Bilateral Workshops/Symposia/Training Programs in the year 2022-23.

Virtual Networked Centres

The aim of **Virtual Networked Centers** is to enable Indian and American scientists to carry out joint research activities by leveraging already existing infrastructure and funding available with the partners on both sides through a linkage established by a virtual mechanism that provides for seamless connectivity and exchange of faculty/ scientists and students from both sides. These centers are supported under two categories:

- ***Knowledge R & D Networked Centres:***
  - Partners: R&D labs and academia partnership (2+2)
  - Provide opportunities for integrating research and education
- ***Public-Private Networked Centers:***
  - Partners: Academia/ R&D lab - Industry partnership (2+2)
  - Promote pre-commercial R & D with application potential

IUSSTF did not solicit new applications for Virtual Networked Centers in the year 2022-23. The list of ongoing Virtual Networked Centers is given as Annexure I.

Special Call: Indo-U.S. Virtual Networks for COVID-19

In response to the pandemic, IUSSTF had announced a Special Call for Proposals for Indo-U.S. Virtual Networks for COVID-19 in April 2020. The intent was to encourage proposals that convincingly demonstrate the benefits and value of the Indo-U.S. partnership to advance research and address critical challenges related to COVID-19. Following a rigorous binational peer-review process, IUSSTF announced awards to eight teams on 17th August 2020. These teams, representing leading researchers from top Indian and U.S. Institutions pursued cutting-edge research in areas that include studies on pathogenesis and disease management in COVID-19, antiviral coatings, immune modulation, tracking SARS CoV-2 in wastewater, disease detection mechanisms, reverse genetics strategies, and drug repurposing.

The projects awarded under the call were declared successfully closed in the FY 2022-23. The list of projects that were closed is given as Annexure II.

Section III: Innovation and Entrepreneurship

INNOVATION AND ENTREPRENEURSHIP

Innovation supported by a vibrant entrepreneurial ecosystem will be the key to success in this era of rapid technological evolution. IUSSTF's innovation and entrepreneurship engagements are S&T driven and have the capability and potential to benefit not only India and the U.S., but the world at large.

IUSSTF provides grant-in-aid funding support to startups under the **United States India Science and Technology Endowment Fund (USISTEF)**. This program enables bilateral teams from India and the United States to translate S&T driven innovations with a tangible societal impact into distinct market opportunities.

United States–India Science & Technology Endowment Fund (USISTEF)

The governments of the United States of America (through the Department of State) and India (through the Department of Science & Technology) established the U.S. - India Science and Technology Endowment Fund (USISTEF) for the promotion of joint activities that would lead to innovation and entrepreneurship through the application of science and technology. USISTEF activities are implemented and administered through the bi-national Indo-U.S. Science and Technology Forum (IUSSTF).

Through a highly competitive process, USISTEF selects and supports financially promising joint U.S.-India entrepreneurial initiatives on co-developing products or technologies that are beyond the ideation stage, high on societal impact, and have significant potential to commercialize within 2-3 years. USISTEF has thus far supported 43 joint U.S.-India entrepreneurial projects through 10 regular calls and 11 COVID-19 Ignition Grants projects under a special call.

Technology-based Energy Solutions: Innovations for Net Zero

Climate Change is one of the biggest challenges facing our world today, spurring the call for global collaborations to tackle this crisis. The launch of the U.S.-India Climate and Clean Energy Agenda 2030 partnership in April 2021 reiterated the commitment of both nations to work together to achieve their ambitious climate and clean energy targets and to strengthen bilateral collaborations. With this background, the ***United States–India Science & Technology Endowment Fund*** (USISTEF) in partnership with ***Social Alpha***, announced a **Call for Ignition Grants** titled ***Technology-based Energy Solutions: Innovations for Net Zero***. The intent was to identify and support "technology showstoppers" - promising joint U.S.-India S&T based entrepreneurial initiatives that address the development and implementation of new technologies, tools, and systems that tackle climate and clean energy challenges in the areas of **Next generation Clean and Renewable Energy, Energy Storage and Carbon Sequestration**. The U.S.-India Science and Technology Endowment Fund activities are implemented and administered through the bi-national Indo-U.S. Science and Technology Forum (IUSSTF).

The Program was formally launched by the USISTEF Co-Chairs, Mr. Sanjeev Varshney, Adviser & Head, International Cooperation, Department of Science & Technology, Government of India and Mr. John Speaks, Minister Counselor for Energy, Environment, Science and Technology (Acting), U.S. Embassy, New Delhi. The Request for Proposals (RFP) was announced on December 17, 2021, with an application deadline of 15th March 2022. Proposals were solicited in two categories - **Ignition Stage I** (to support early-stage creative ideas develop a proof-of-concept and/or build a prototype) and **Ignition Stage II** (to support projects with a workable, validated prototype, and significant potential to commercialize within 2-3 years). **In response to the RFP, a total of 63 Stage-I and 36 Stage-II proposals were received**.

After the preliminary eligibility check 51 Stage-I and 36 Stage-II proposals were considered for the Level I screening. The proposals were evaluated based on its innovativeness & feasibility, if the proposal addressed the climate and sustainability crisis, team capabilities, and the quality of the U.S.-India partnership. 25 Stage-I proposals and 14 Stage-II proposals were shortlisted for Level II of the screening process. Consequently only 24 projects were considered for the in-person presentations to the **Joint Experts Panel (JEP).**

The JEP convened virtually for four days (23rd - 26th August 2022) to hear team presentations and finalize next-stage review recommendations. A total of 8 Ignition Stage-I and 5 Ignition Stage-II proposals were shortlisted for review by the **Due-Diligence (DD) Committee**. The DD Committee proposals at a meeting held on 27th September 2022, recommended that two proposals be forwarded to the USISTEF Board for their consideration subject to fulfilling the recommendations made by the Committee. Ten projects were finally awarded under the call based on the recommendations of the USISTEF Board.

The details of the 10 projects awarded under the call are given below:

1. **Development of a Cyanobacterial Chemical Production Technology for Aviation Fuels from Carbon dioxide**

Partners

Syed Shams Yazdani
International Centre for Genetic Engineering and Biotechnology, New Delhi

Shota Atsumi
University of California, Davis

Najeeb Bin Haneef Zaara
Biotech, Cochin

With the aviation sector contributing 2.1% of global CO_2 emissions, sustainable alternatives to aviation fuels will play a critical role in the path to net-zero. This project proposes a synthetic biology approach to engineer marine cyanobacteria to produce aviation fuels. Owing to their faster growth compared to other photosynthetic organisms, their ability to fix CO_2 as well as their genetic tractability, cyanobacteria are an extremely effective platform for the production of bio-based chemicals and fuels. The aim is to engineer the cyanobacteria to produce branched-change alkanes that are in the aviation fuel range.

2. Design and Development of Highly Efficient Electrolyser System for Green Hydrogen Generation

Partners

Rohit Srivastava
Pandit Deendayal Energy University, Gandhinagar

Arunachala Mada Kannan
Arizona State University, Mesa

Snehangshu Patra
Eliteck Industries Pvt. Ltd., Kolkata

Most commercially available electrolysers employ expensive, noble metal based electrodes that function only in distilled or demineralized water due to stability issues. Consequently, the overall operational cost for running the electrolysers is high, which in turn makes green hydrogen generation expensive. Therefore, it is critical to develop a functional electrolyser consisting of highly active, electrically conductive, energy efficient, and easy to synthesize electrocatalysts, which are also industrially scalable. The team is proposing a functional electrolyser using bi-functional catalysts based on high entropic material to generate green hydrogen. The electrolyser will be designed to operate with regular tap water.

3. Hydrogen Separation from Coal-derived Syngas: A Near Term Opportunity for Commercialization using New Membrane Compositions

Partners

M.S. Santosh
CSIR - Central Institute of Mining and Fuel Research, Dhanbad

Prabhakar Singh
University of Connecticut, Storrs

M. Viswanathan
Rensol Power Pvt Ltd, Chennai

Hydrogen has emerged as a promising carbon-free energy carrier in the effort to control emissions. With large coal reserves in India and well-known gasification technologies, hydrogen production from coal is a promising near-term opportunity. The team proposes to develop new cost-effective membrane compositions and durability for gas separation applications. The main objectives are to evaluate the optimum hydrogen flux and fouling process of bimetallic biopolymeric composite membranes through advanced membrane tests and thermochemical analysis and to conduct techno-economic analysis and long-term performance evaluation of the membranes in a pilot-scale gasification facility.

4. Integrated Solution to Convert Two GHGs CO_2 and CH_4 to H_2 rich Syn Gas (ISTAG)

Partners

Sumana Chenna
CSIR - Indian Institute of Chemical Technology, Hyderabad

Vemuri Balakotaiah
University of Houston, Houston

Kishan Gurram
Sravathi Advance Process Technologies Pvt Ltd, Bengaluru

While Dry Reforming of methane (DRM) is widely used to convert CH_4 and CO_2 to synthesis gas, high endothermicity, coking, and high reaction temperatures remain major challenges. DRM is also not capable of producing syngas ratio greater than or equivalent to two. The team proposes the development of an efficient catalytic bi-reforming of methane (BRM) process that combines dry and steam reforming for syngas production. The novel integrated approach leverages quantum mechanics (QM) simulations and AI/ML models to first search the catalyst space and identify potential candidates, followed by experimental studies to design, synthesize, and validate heterogenous catalyst systems for BRM.

5. Ion Exchange Driven Direct Carbon Capture and Sequestration System (IXDCCS)

Partners

Sudipta Sarkar
Indian Institute of Technology Roorkee and Wastearn Private Limited, Kolkata

Arup K. Sengupta
Lehigh University, Bethlehem

Current mitigation strategies based on carbon capture and storage (CCS) technologies aim to prevent the release of carbon dioxide from large point-sources such as coal-fired power plants, steel mills, cement kilns, and other chemical industries. The team is proposing the development of a solar-power driven, ion-exchange assisted direct CO_2 capture system that is capable of capturing from ambient air and producing 10 kg of CO_2 per day at ambient temperature. The captured carbon dioxide can then be converted into short chain volatile fatty acids (VFAs) for further conversion to commercially useful organic chemicals and raw material for bioplastics. The proposed technology does not require external addition of chemicals, operates at ambient temperature, and can be scaled up rapidly and cost-effectively.

6. Carbon dioxide Sequestration by Industrial Wastes and its Conversion to Artificial Soil

Partners

Raghavendra Ragipani Indian
Institute of Technology
Kanpur

Bu Wang
University of Wisconsin-
Madison

Shashi Bhushan
Tree Green Solutions Pvt Ltd,
Hubballi

Iron and steel industries contribute 11% to global CO_2 emissions and produce large amounts of solid residues which often end up in landfills. Carbon dioxide capture and sequestration using industrial waste such as steel slag can simultaneously address the twin challenges of CO_2 removal and solid waste utilization. The team is proposing a new technology that can simultaneously sequester carbon dioxide and convert solid industrial residues (ash/ slag) into artificial soil. The innovation lies in the low-cost carbonation technology that is capable of direct CO_2 capture and produces a residue that is conducive for plant growth. The team plans to produce 2000 kg of carbonated steel slag which will then be converted to artificial soil.

7. Indigenous Battery Materials from Recycled Graphite and Biomass

Partners

Smruti Prakash Barik
Attero Recycling Pvt. Ltd.,
Noida

Vinod Nair
Farad Power Inc., Sunnyvale

There is great interest on the part of the Government of India in developing a domestic lithium-ion battery manufacturing ecosystem. Production of the lithium-ion battery will depend heavily on an expanding supply of critical materials for which significant manufacturing infrastructure does not exist, especially from domestic sources of downstream raw materials. Efforts to develop high-performing anode materials using Carbon-Silicon composites have become an attractive alternative to graphite. The team aims to develop a commercially viable process for producing high-performance Lithium-ion battery anode materials. The process involves the conversion of furfural extracted from agricultural waste, silicon from rice husk, and recycled graphite from used Li-ion batteries to develop a C-Si composite.

8. Commercializing ZincGel Battery for Renewable Microgrids

Partners

Manoj Gupta
TP Renewable Microgrid Ltd., Noida

Tejas Kusurkar
Offgrid Energy Labs Inc., San Fransisco

Kanwar Singh Nalwa
Indian Institute of Technology, Kanpur

Lead-acid batteries comprise 60% of the rechargeable batteries market despite being an inefficient and toxic technology. Over the next decade, lithium-ion batteries are expected to capture the market as they become cost-efficient with growing volumes. The team has recently developed the ZincGel® battery technology that uses temperature-stable, nonflammable electrolytes and sustainable, non-toxic materials. This proposal aims to develop a functional pilot of a ZincGel-powered 30KWh capacity renewable microgrid (RM) and demonstrate the performance of these batteries over traditional lead-acid batteries. The innovation is the customizable technology wherein electrolyte, cathode material and design can be modified to make variants targeting different applications.

9. Motion Free Optical Tracking to Reduce Cost of Electricity by 25%

Partners

Lakshmi Santhanam
Renkube Private Ltd., Yeshwanthpur

Rajesh Manapat,
Arka.Energy, Union City

Existing solar roofing solutions suffer from poor energy yield due to misalignment and incorrect orientation of the roof when compared to south-facing, ground-mounted installations with mechanical trackers. The project aims to demonstrate the increased efficiency of an integrated roofing solution that uses motion-free optical tracking technology embedded in solar tiles. The proposed solution is expected to provide 40% more energy yield. The 3D prism design - an innovative light harvesting glass that tracks sunlight and bends it towards the solar cells thereby increasing the energy yield of the solar panel.

10. Rechargeable Sodium Battery for Sustainable Energy Storage

Partners

Vilas Shelke
Rechargion Energy Pvt. Ltd., Pune

Pulickel Ajayan
Rice University, Houston

While Li-ion batteries are considered the most viable energy storage system in the market today, the scarcity of raw materials, safety, environmental concerns, and costs are major concerns. Thermal runaway arising from mechanical, electrical, or thermal disturbances warrants alternate strategies for mobility or stationary energy storage. This project aims to develop rechargeable Sodium batteries that exhibit high energy and power density, and cyclability comparable to that of Li-ion batteries. The main deliverable will be a customizable pouch cell that will serve as the basic building block for small and large battery packs. This low-cost and safe technology can disrupt the electric mobility (2/3-wheeler) and stationary storage segments in India.

Regular Call: An update

BeAble Health Pvt Ltd, supported under the USISTEF Program was granted a U.S. patent for ArmAbleTM (A Game based Neuro Rehabilitation device), University of Maryland Baltimore County is the U.S. Partner on this project. The project "ArmAble: An interactive Arm Training Rehabilitation Device" was supported under the Ninth call of the program.

Section IV: Research and Development

RESEARCH AND DEVELOPMENT

IUSSTF supports a broad portfolio of R&D programs in key strategic areas that are of mutual interest to both countries. The current portfolio includes flagship programs like the **Joint Clean Energy Research and Development Centre (JCERDC) on Smart Grid and Energy Storage and Indo-U.S. PACEsetter Fund**.

Joint Clean Energy Research and Development Centre (JCERDC)

The Indo-U.S. Joint Clean Energy R&D Centre (JCERDC) is a joint initiative of the Ministry of Science and Technology, Government of India and the U.S. Department of Energy. The aim of the program is to facilitate joint research and development on clean energy technologies that may be deployed rapidly with the greatest impact. The JCERDC is based on a public-private partnership model of funding and is a first-of-its-kind initiative. Phase I of the program began in the year 2012 with IUSSTF as the implementing agency. It brought together more than 100 Indian and U.S. academic and industrial partners to work jointly in the space of clean energy research.

The ***"UI-ASSIST: U.S.-India collAborative for smart diStribution System wIth Storage"*** consortium was awarded under the Phase II of the program led in India by Suresh C. Srivastava from the Indian Institute of Technology (IIT) Kanpur, and in the United States by Noel Schulz from Washington State University, Pullman, was awarded in September 2017.

UI-ASSIST: Objectives

- To evolve future distribution grid that will allow the continuing increase of Distributed Energy Resources (DER) penetration towards a carbon-free electricity system
- To develop and demonstrate the DSO functions for optimal utilization and management of DER by interfacing with DER control and microgrid control system with high penetration of energy storage.

UIASSIST: Institutional Engagement

India	USA
• Indian Institute of Technology, Kanpur • Indian Institute of Technology, Delhi • Indian Institute of Technology, Roorkee • Indian Institute of Technology, Madras • Indian Institute of Technology, Bhubaneswar • The Energy and Resources Institute, New Delhi • NTPC Energy Technology Research Alliance, Greater NOIDA • Power Grid Corporation of India Limited, Gurgaon • UP Power Corporation Limited, Lucknow • BSES Rajdhani Power Ltd., New Delhi • Synergy, Faridabad • Customized Energy Solution, Pune • Panasonic India Pvt. Ltd., Gurgaon • GE Global R & D, Bengaluru	• Washington State University, Pullman • Massachusetts Institute of Technology, Cambridge, • Texas A&M University, College Station • Hawaii Natural Energy Institute, Honolulu • National Renewable Energy Laboratory, Colorado • Pacific Northwest National Laboratory, Washington • Lawrence Berkeley National Lab, Berkeley • Snohomish County Public Utility District No 1., Everett • Burns and McDonnell, Kansas City • ETAP, Operation technology, Inc., Irvine • National Rural Electric Cooperative Association, Arlington • AVISTA Utilities, Spokane • Venkata Consulting Solutions Inc., Arizona • Clean Energy Solutions, Massachusetts • GE, Massachusetts

UI-ASSIST: Deliverables

The following deliverables were identified through the Research and Development (R&D) efforts of the project:

- **Benchmark System Development:** A field pilot /utility data driven, benchmark of semi-urban and rural benchmark capable of simulating grid connected solar inverters was developed. It is now being implemented in IIT Kanpur lab-testbed for further testing and co-verification of field data. It is in addition to the modified CIGRE model developed for co-simulation and synthetic model being developed at WSU. The synthetic model-based systems will be given open access for use for researchers in this area. Various R&D concepts were validated in practical environment through offline and online simulations at lab levels.
- **Energy Storage Modelling and Optimization:** To analyse and model storage technology for smart distribution system. It also includes optimal siting, sizing, and control of energy storage system at microgrid and feeder levels. As a part of this task, hardware models were developed to study the impact of storage systems under dynamic operation of microgrids.
- **Microgrid and Active Distribution System:** Development of novel converter topologies, associated controls, and protection system for AC/DC microgrid application. primary controller design, secondary controls development for coordinated power management and control at microgrid level through microgrid Energy Management System (μEMS).
- **Cyber Security and Infrastructure:** To study various cyber infrastructure suitable for smart distribution grid. To make the system intelligent and smart, R&D work on exploring various disruptive communication technologies, new protocols, IoT integration issues, communication network issues in controls, cyber threat detection and cyber-security measures are also being carried out.

- **DSO (Distribution System Operations) Functions/Energy Management and DSO – Market and Regulator Issues**: Various Advance Distribution Management System (ADMS) functions, such as state estimation, volt-var management, optimal reconfiguration, optimal power scheduling in presence of Distributed Energy Resources (DERs), demand side management, transactive controls, integrating market based signals etc., required to be performed by Distribution System Operators (DSOs) in future, apart from developing protection system scheme at distribution network level for detecting and locating the fault, islanding detection and adaptive settings, load, solar and wind forecasting tools were studies. Under study of market and regulatory Issues distribution market development, integration of market mechanisms with frequency regulation and volt-VAR control were covered. The research work also focussed on societal and policy/regulatory issues, aimed at providing a set of recommendations for successful adoption of such systems. A report co-authored by **Indian Institute of Technology, Delhi, TERI - The Energy and Resources Institute, and Indian Institute of Technology, Kanpur** on the studies conducted was drafted by the consortium and is scheduled to be launched in the coming months.
- **Field Demonstration Pilots:** An important component of UI-ASSIST is the demonstration of evolving microgrid and advance distribution system concepts in actual field. For this purpose, 2 rural, 2 semi-urban and 2 urban pilots in India, and 2 semi-urban and 2 urban pilots in the U.S. have been set up. Before starting of these pilots, social surveys were carried out, to asses if the technology being adopted is in view of the local needs at various field demo sites.

UIASSIST: Impact

- The research facilities can be used to test various Smart-grid technologies. The testing facilities are equipped to evaluate real-time simulation of various smart-grid concepts, storage integration in microgrids, cyber security of smart-grid, Microgrid protection and relaying schemes in development and deployment of Smart-grids.
- The field pilots are demonstrating the deployment of renewable sources, storage integrated microgrids and smart distribution networks under the rural, semi-urban and urban settings. Apart from significant technical advantages these pilots will demonstrate several social impacts. As an example, through our utility partner, grid supply has been brought to two village hamlets in Harnoo village in Kanpur, India. Looking at the local needs, available and unutilized resources in the village, biomass plant and solar irrigation pumps were also installed. Rural pilots demonstrate waste to energy conversion, enhanced agricultural production and local employment. The project will benefit approximately 3000 individuals.
- Impact in Numbers:

S. No.	Achievements	Numbers
1.	Research Staff Trained	164
2.	Students Trained	82
3.	Professionals in Training	108
4.	ITI Professionals	35
5.	International Publications	384
6.	National Publications	29
7.	Patents Filed	4

UIASSIST: Activities, 2022-23

1. A Stakeholder Consultation Session was held on 19th April 2023 to discuss the detailed report bringing out functions, institutional framework as well as regulatory and policy considerations to establish Distribution System Operators in India. The main objective of the stakeholder consultation was to gather feedback, inputs, and suggestions for transition to full-fledged Distribution system Operators (DSO). The session was attended by the Expert members, representatives from the state and central utilities and DISCOMS, representatives from the Government of India, project team and funding agencies.
2. The Project Monitoring Committee (PMC) members visited the Delhi sites on 30th May 2023. The Fifth Project Monitoring Committee Meeting was held on 31st May 2023 at IIT Delhi.

3. For the first time in three years, the Indian and American Researchers under the UI-ASSIST came together in person for the joint Progress Meeting held from 13th to 15th July 2022 in Golden, Colorado. The researchers provided updates on activities across the eleven themes including research and development, laboratory demos, field demonstrations, policy and social impacts and workforce opportunities and challenges.

4. A Workshop on the Operational and Regulatory Challenges in DER Integrated Smart Distribution Systems was held on 20th - 21st December at the Indian Habitat Centre, New Delhi. The main objective of this workshop was to familiarize the participants from the regulatory organizations, load dispatch centres, utilities, and R&D organizations with different operational, regulatory, reliability, and security challenges that need to be addressed in deploying renewable and storage integrated smart active distribution systems.

5. The Project Monitoring Committee (PMC) Members visited the Kanpur Rural Sites at Harnoo Village and Semiurban and Urban Pilots at the IIT Kanpur Campus on 6th February 2023. The Sixth Project Monitoring Committee Meeting was held on 7th February 2023 at IIT Kanpur.

Indo-U.S. PACEsetter Fund

In 2015, the Governments of India (through the Ministry of New and Renewable Energy) and the United States of America (through the U.S. Embassy) jointly established the PACESetter Fund, an INR 50 crore (USD 7.9 million). Indo-US Science and Technology Forum (IUSSTF) is the administrator of the Fund.

The objective of the PACESetter Fund is to support the PEACE initiative by providing early-stage grant funding to accelerate the commercialization of innovative off-grid clean energy products, systems, and business models. The Fund's main purpose is to improve the viability of off-grid renewable energy businesses that sell small scale (under 1 megawatt) clean energy systems to individuals and communities without access to grid connected power or with limited/intermittent access (less than 8 hours per day).

There have been two calls under the Indo-U.S. PACESetter Fund so far. The first round was completed successfully in 2020 and included projects such as small-scale waste-to-energy innovation, microgrid remote monitoring and control, development of the world's first pay-as-you-go electricity network, integrated home energy system, community-based solar pumps, and others.

A summary of the ongoing projects under the second call is mentioned below:

1. **Rural Enterprise Model for Branded Packaged Diced and Dehydrated Vegetables and other dried products using hybrid biomass and solar energy.**

   a. Objective:

   The project aims to develop a self-sustaining rural enterprise model through production of packaged dehydrated vegetables using low-cost energy efficient processes, and introduction of a novel product range of dehydrated vegetables and other agri-products into the market, looking to leverage the price differential between seasonal and off-season prices in some key produce.

   Given that processing is the best form of preservation to extend the shelf-life of perishable vegetables while also adding value to raw produce, the project envisages value-addition at or close to source of raw produce, thereby generating new off-farm incomes and jobs in rural areas especially for women and strengthening the rural economy.

   b. Institutions Involved/ PIs of the project:

   The project is led by Dr. Kalpana Arora and D. Raghunandan at the Centre for Technology and Development, Society for Economic and Social Studies, New Delhi

   c. Achievements / Impact of 2022-23:

   Under the project, 4 field sites have been selected at different altitudes in the hilly Dehradun District which include the 'Mother' Unit at Sahaspur, about 28km from Dehradun city for finished product processing and retail packaging; and 'Satellite' units at Vikasnagar in the foothills; Kalsi in the mid-hills at around 1000m altitude; and Chakrata in the higher hills at 2000m altitude for collecting and primary processing of the agri produce from a cluster of villages. Each location grows a different range of vegetables depending on local climate and altitude.

The project team has progressed on infrastructure development and induction training of villagers. Each Satellite Unit has been provided with a Biomass Drier and 2 Solar Driers along with other infrastructure.

The project team has standardized and tested **20 dehydrated products** (amla, ginger, green chilli, turmeric, cauliflower, tomato, spinach, fenugreek, carrot, mustard, bathua, onion, turnip, chamomile, etc.) thus far, and about **10000 kg** of total vegetables dehydrated and stored in large LDPE bags and small packs in preparation for test marketing. As initial steps towards trial marketing and market promotion, the team has been engaged in distributing samples, and their display and demonstration in fairs, melas etc. under the brand name **Farmers Selection™**. The team has received very good feedback, especially from bulk consumers like caterers and restaurants who appear to be the best prospective buyers.

The project team has trained **15 nodal staff/ master trainers** on equipment handling and dehydration process and protocols at the Sahaspur and 2 satellite units. About **55 beneficiaries**, out of which most are women, have been trained for value addition processes in Vikasnagar and Chakrata satellite units. Training manuals have been prepared in Hindi for ease of understanding by the beneficiaries.

2. Solar dryer-based self-employment model for rural tribal communities, women, and differently abled persons

a. Objective:

The project aims to design, develop, and commercialize innovative solar and biomass energy-based hybrid drying technologies and implement a rural enterprise model for tribal communities with a focus on women and differently abled individuals. Drying of farm produce such as leafy vegetables, chillis and fruits locally would help prevent food wastage and generation of additional income for the farmers. Drying will increase the shelf life of the products.

To this end, the project team looks forward to deploying 25 solar drying systems in three clusters and creating an enterprise model for production and sale of dried products in urban markets. The focus will also be on preparing a detailed feasibility report and business plan for expansion and scaling up.

b. Institutions Involved/ PIs of the project:

The project is led by Mr. Shirish S Garud, Director, The Energy and Resources Institute (TERI), New Delhi and Mr. Harikrishna G, Society for Energy, Environment and Development (SEED), Hyderabad.

c. Achievements / Impact of 2022-23:

Thus far, the project team has developed, tested an integrated drying system, and established two demonstration models in Delhi and Hyderabad. Compared to conventional solar dryers, this system offers continuous drying for 24 hours due to storage of solar energy at night-time, and during cloudy conditions due to biomass-based backup availability. As a result of continuous drying, the product quality has been improved.

The team is presently engaged in refining the technology further to improve the performance and reduce costs and identifying beneficiaries.

3. Intelligent solar charge controller for increasing energy output & life cycle batteries and revival of under-performing old SPV & their batteries.

a. Objective:

The project aims to develop an intelligent solar charge controller that includes an algorithm for understanding, initiating, controlling, and terminating issues with a lead acid battery in off-grid solar plant. The new charge controller will be able to improve energy output by over 20% in operating off-grid solar plants and is expected to revive around 70% of the non-functioning solar batteries, not more than 6-7 years old.

b. Institutions Involved/ PIs of the project:

The project is led by Harsh Thacker, Rajarshi Sen and the team at the Customized Energy Solutions (CES), Pune.

c. Achievements / Impact of 2022-23:

Thus far, the project team has developed an algorithm which can monitor battery degradation and automatically decide on special charge treatment frequency, duration, mode and number of such treatment cycles depending on battery design, usage, and its age.

In the past year, the team reprogrammed the algorithm in Python language for the site prototype and programmed the procured intelligent hardware controller with the developed algorithm for site applications. The intelligent controller was then successfully paired with MPPT charge controller of the Studer make, after which the following parameters were verified in the laboratory:

During charging:

- Charge controller following charging limits of current and voltage during normal mode.
- Charge controller maintaining floating charging limits during normal charging mode.
- Shifting of normal to equalize mode & vice versa as per CES algorithm.
- Voltage and current control during equalization mode.

During discharging:

- Correct measurement of SOC as per provided battery discharge curves. (Battery SOC Vs voltage data)
- Correct Selection of charging mode as per improvement in battery capacity after equalization. (As mentioned in CES algorithm)

The team has developed four field prototypes and installed the intelligent controller at a solar power plant in Irshalwadi, 100 km from Pune, Maharashtra, Tiwari Bazaar and Salpur Semra sites in Gonda, Uttar Pradesh. The team is presently evaluating functioning and testing their algorithm in the field conditions. The fourth prototype has been sent to NISE for testing and validation.

The Indo-U.S. Science and Technology Forum convened the third meeting of the Techno-Financial Expert Committee (TFEC) on 23rd February 2023 to evaluate the progress of the three projects under the PACEsetter Fund -II. During the meeting, the project teams presented the work carried out by them since the last review and updated the TFEC on the financial standing of the project. The TFEC evaluated the projects and made necessary recommendations to guide the teams going forward.

Section V: Visitations and Fellowships

VISITATIONS AND FELLOWSHIPS

It has been unambiguously demonstrated that providing students and young scientists an exposure to cutting-edge scientific research experiences at a formative stage not only broadens their intellectual horizons but also leads to increased engagements in scientific and technological research careers.

IUSSTF collaborates with several Federal agencies, Industry, Professional Bodies and Not-for-profit Organizations to administer many Visitation Programs, across various domains and stakeholder levels. The details of the calls announced in the year are as given below:

IUSSTF- Viterbi Program:

IUSSTF and the Viterbi School of Engineering at the University of Southern California (USC) partnered to support the IUSSTF-Viterbi Program between Indian engineering institutions and the Viterbi School of Engineering.

The IUSSTF - Viterbi Program is a dynamic student internship program that creates long-term, sustainable, and vibrant linkages between the two nations. The program provides an opportunity for Indian students pursuing a bachelor's or master's degree in electrical engineering, Computer Engineering and Computational Sciences at a recognized institution of higher education and learning in India to undertake 8 week summer internship at the Viterbi School of Engineering.

Call for 2022:

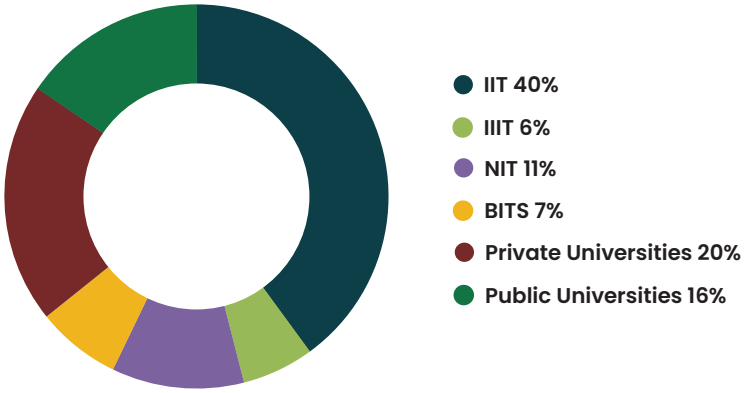
Against the call for 2022 announced on 25th November 2021 with a submission deadline 3rd January 2022 IUSSTF had received 330 applications, 15 students were selected for the internship. Owing to travel and visa restrictions only 5 interns could travel to USC to avail of the in-person internship in 2022, the rest pursued virtual internships in the year 2022. The students who availed the internships both in-person and virtual are listed in Annexure III.

IUSSTF- Viterbi Scholars of 2022 (L-R): *Kaushiki Dixit, Anchit Proch, Devansh Gupta, Visweswaran Baskaran and Debaditya Pal*

Call for 2023:

The call for applications was announced on 1st November 2022, with the application deadline of 15th December 2022. IUSSTF received 165 applications in response to the call. 15 Interns will be selected to pursue internships at USC. The applicants for the 2023 batch have diverse research interests, including Artificial Intelligence (AI), Machine learning Algorithms for Robotic and bio medical applications, Natural Language Processing, Federated Learning and Software Engineering, Data science for health, Neuromorphic hardware and FPGA-based Hardware Accelerators, Integrated Circuits, Vision-based navigation in new environments, Probability Theory and Statistics, Reinforcement Learning, Stochastic Systems, Analog circuits, Signal Processing, Image Processing to name a few. The students will avail their internships during the summer of 2023.

Institute wise distribution of Applicants:



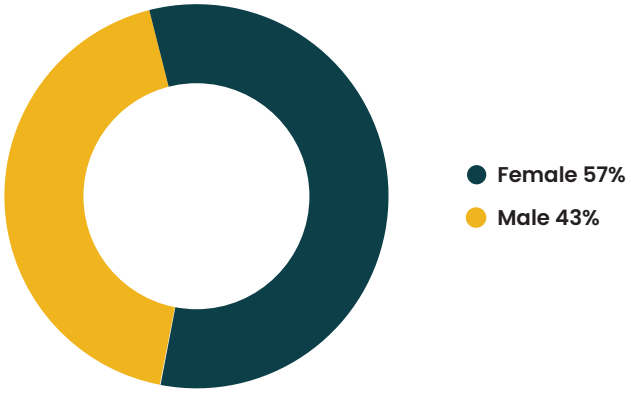
Khorana Program for Scholars

The Khorana Program for Scholars is a prestigious internship program for Indian students currently enrolled in graduate and post graduate programs in Biotechnology, Life Sciences and allied areas to undertake a summer research internship at U.S. Universities Funded by the Department of Biotechnology, the program is implemented by IUSSTF in partnership with WINStep Forward.

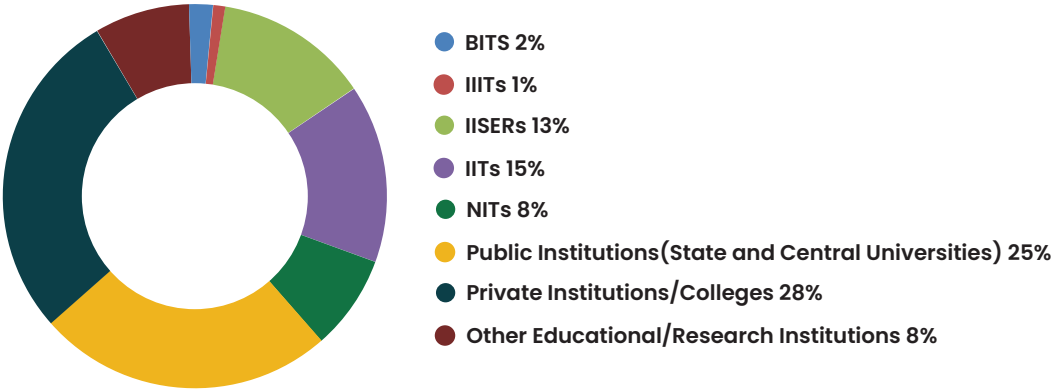
Call for 2023:

The 2023 call for applications under the Khorana Program for Scholars, closed on 15th January 2023. IUSSTF received an overwhelming response of 536 applications. Out of the 536, 505 applications were found eligible and were received from institutions across the country, including IITs, IISERs, NITs, IIITs, public-funded universities and private institutions. A screening committee comprising of subject-area experts reviewed the applications and shortlisted 145 applications for final review by the Selection Committee. This Committee met on 20th February 2023 at IUSSTF office and provisionally selected 75 meritorious students. The Award to these scholars is subject to their successful placements in suitable U.S Host Universities. IUSSTF will work with WINStep Forward in the coming months to place these students in suitable universities.

Gender-wise Distribution of the Applications Recieved In 2023



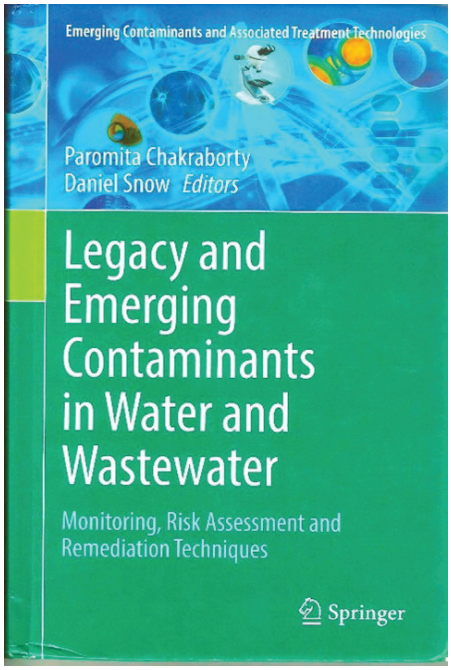
Institution-wise Distribution of Applicants



Notable Achievements of our former fellows in 2022-23:

1. Dr. Paromita Chakraborty, SRM Institute of Science and Technology and Professor Daniel Snow, University of Nebraska-Lincoln published "Legacy and Emerging Contaminants in Water and Wastewater" addressing current research outcomes in these critical areas! This long-standing collaboration was facilitated by the prestigious Water Advanced Research & Innovation (WARI) Fellowship awarded to Dr. Chakraborty in 2016 to visit the University of Nebraska-Lincoln.

   The Department of Science and Technology (DST), Govt. of India, the University of Nebraska-Lincoln (UNL), the Daugherty Water for Food Global Institute at the University of Nebraska (DWFI) and the Indo-U.S. Science and Technology Forum (IUSSTF) have partnered to nurture cooperation between students and scientists from both countries. The Water Advanced Research and Innovation (WARI) Fellowship Program - a dynamic and transformative program has thus been developed to foster long term Indo-American science and technology partnerships.



2. Dr. Riffat John, Senior Assistant Professor at the Department of Botany University of Kashmir was awarded the prestigious SERB-POWER Fellowship by the Government of India to support her innovative work on understanding cold tolerance maize plants. Dr. Riffat John received the Indo-U.S. Genome Engineering/Editing Technology Initiative (GETin) fellowship award in 2018. She is also an alumnus of Indian National Young Academy of Sciences (INYAS). The Department of Biotechnology (DBT), Govt. of India along with Indo U.S. Science & Technology Forum, IUSSTF implemented the Genome Engineering/Editing Technology (GETin) fellowship program.

Section VI: Money Matters

MONEY MATTERS

IUSSTF receives funding from three broad channels:

- Direct support from the U.S. Government
- Direct support from the Indian Government
- Extra Mural Programs (EMPs)

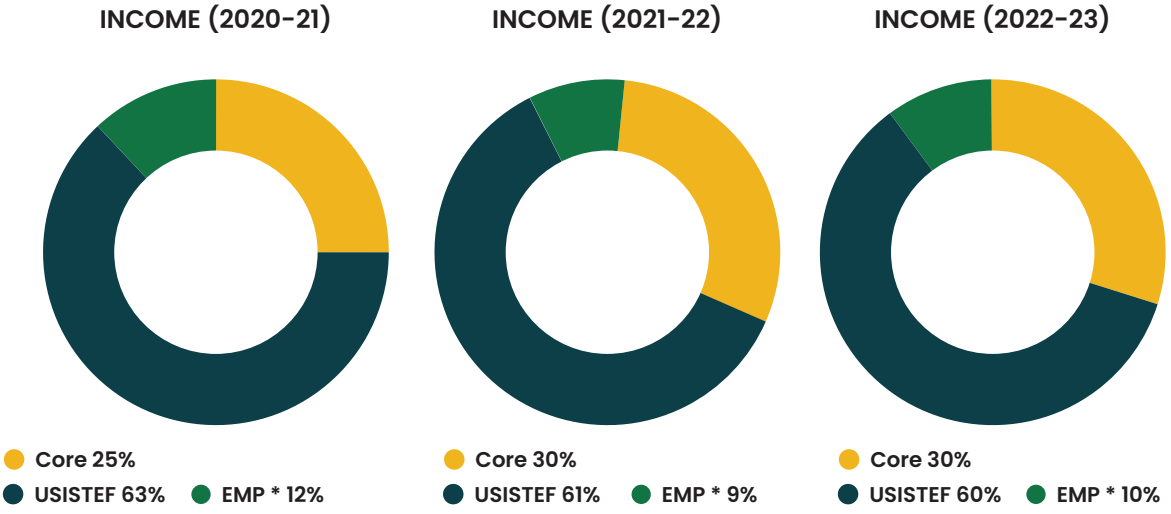
The support from the U.S. Government comes by way of annual interest on two separate Endowments (IUSSTF and USISTEF), to which the Indian Government provides matching grants semi-annually.

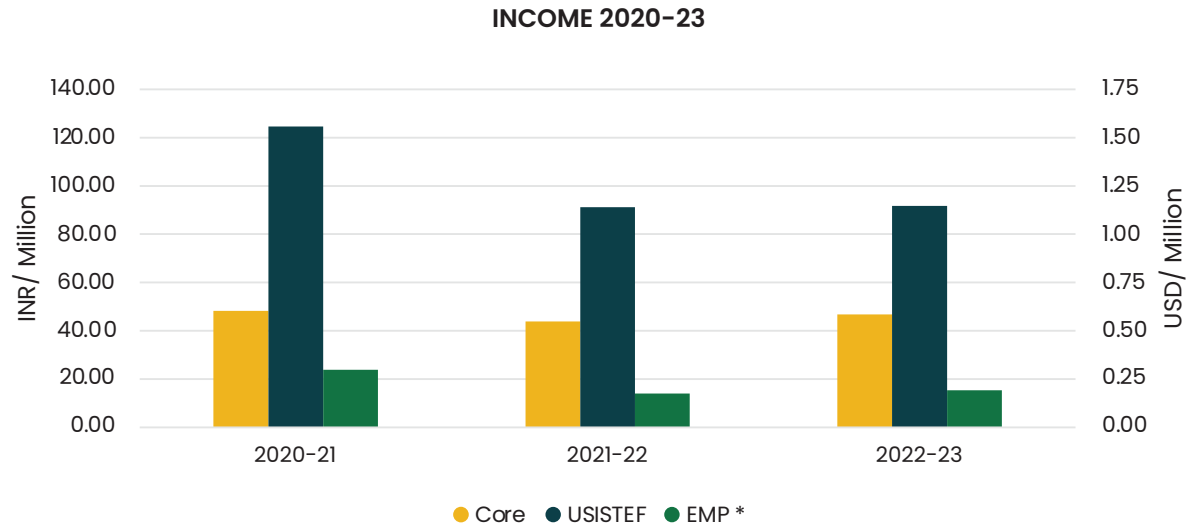
Support for the EMPs is received from various federal agencies such as DST, DBT, MNRE, SERB and Industry. Such support is provided in project mode for the implementation of specific program(s), against a nominal management fee.

(A) Overall Income (2020-2023)							
S.No	Head	2020-21		2021-22		2022-23	
		(INR/ Million)	(USD/ Million)	(INR/ Million)	(USD/ Million)	(INR/ Million)	(USD/ Million)
1.	Core	48.22	0.65	43.84	0.59	46.78	0.58
2.	USISTEF	124.54	1.68	91.20	1.23	91.69	1.15
3.	EMP *	23.93	0.32	14.03	0.19	15.34	0.19
	TOTAL	**196.69**	**2.66**	**149.07**	**2.01**	**153.82**	**1.92**

** EMP income exclude targeted funds received from the funding agencies*

I USD= 80 INR (2022-23); 74 INR (2020-21 & 2021-22)



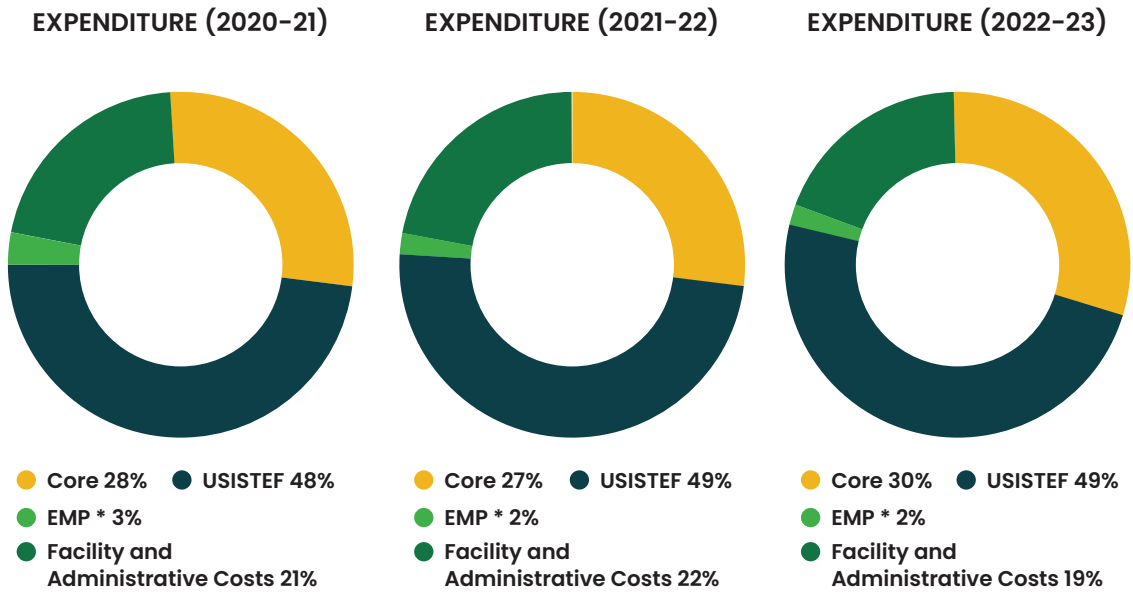


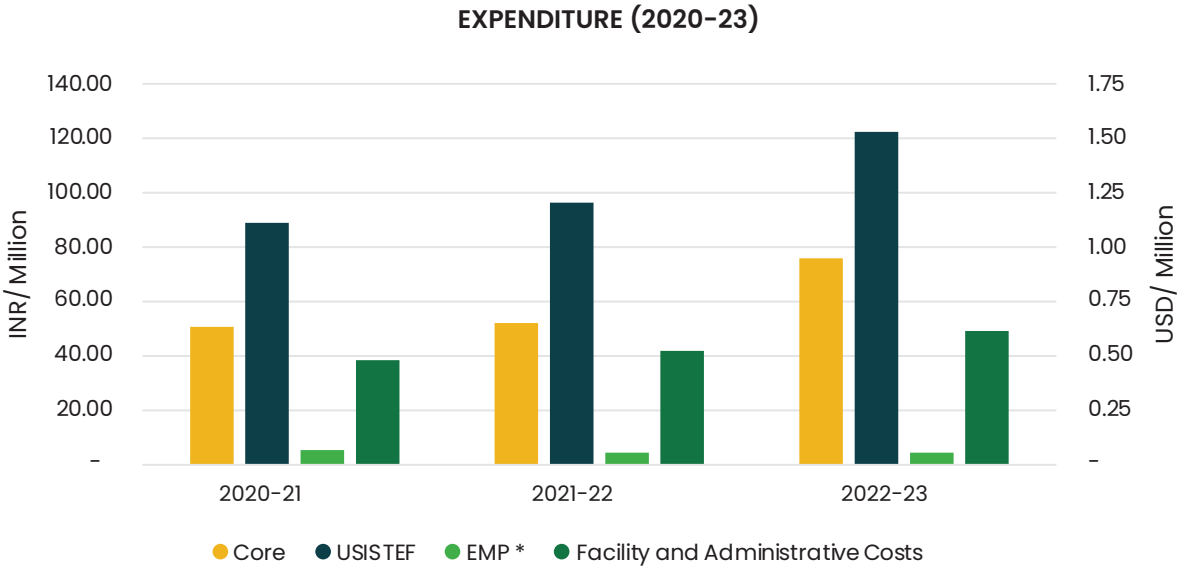
(B) Overall Expenditure (2020-2023)							
S.No	Head	2020-21		2021-22		2022-23	
		(INR/ Million)	(USD/ Million)	(INR/ Million)	(USD/ Million)	(INR/ Million)	(USD/ Million)
1.	Core	50.67	0.68	52.14	0.70	75.81	0.95
2.	USISTEF	88.91	1.20	96.33	1.30	122.27	1.53
3.	EMP *	5.39	0.07	4.48	0.06	4.44	0.06
4.	Facility and Administrative Costs	38.44	0.52	41.83	0.57	49.19	0.61
	TOTAL	**183.40**	**2.48**	**194.78**	**2.63**	**251.71**	**3.15**

Core & USISTEF expenditure includes grants given in advance to grantees

EMP expenditure includes direct expenditure on management of targeted grants received from the funding agencies

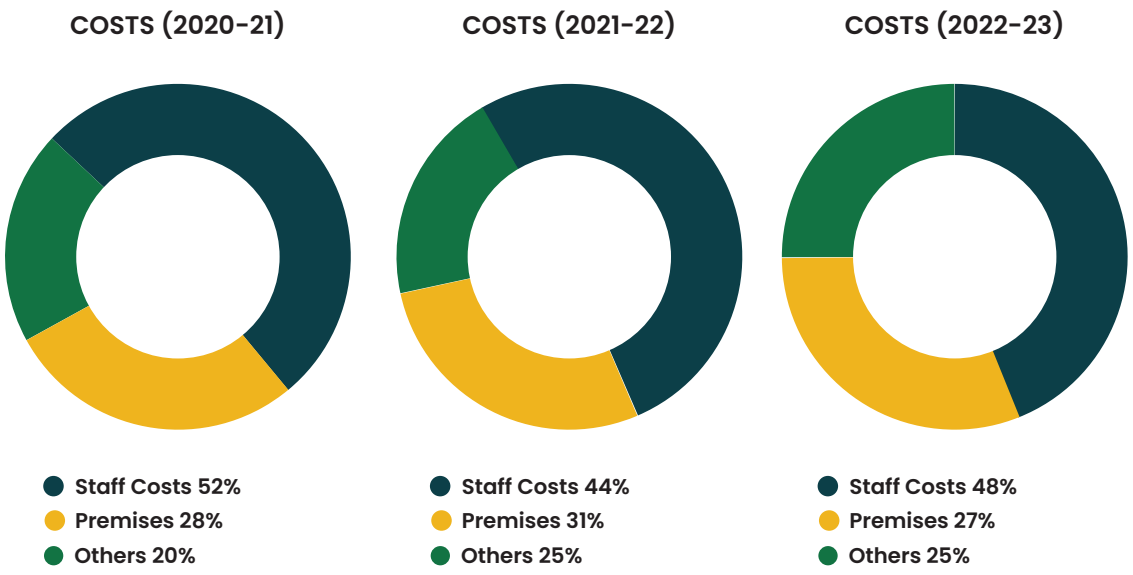
I USD= 80 INR (2022-23); 74 INR (2020-21 & 2021-22)

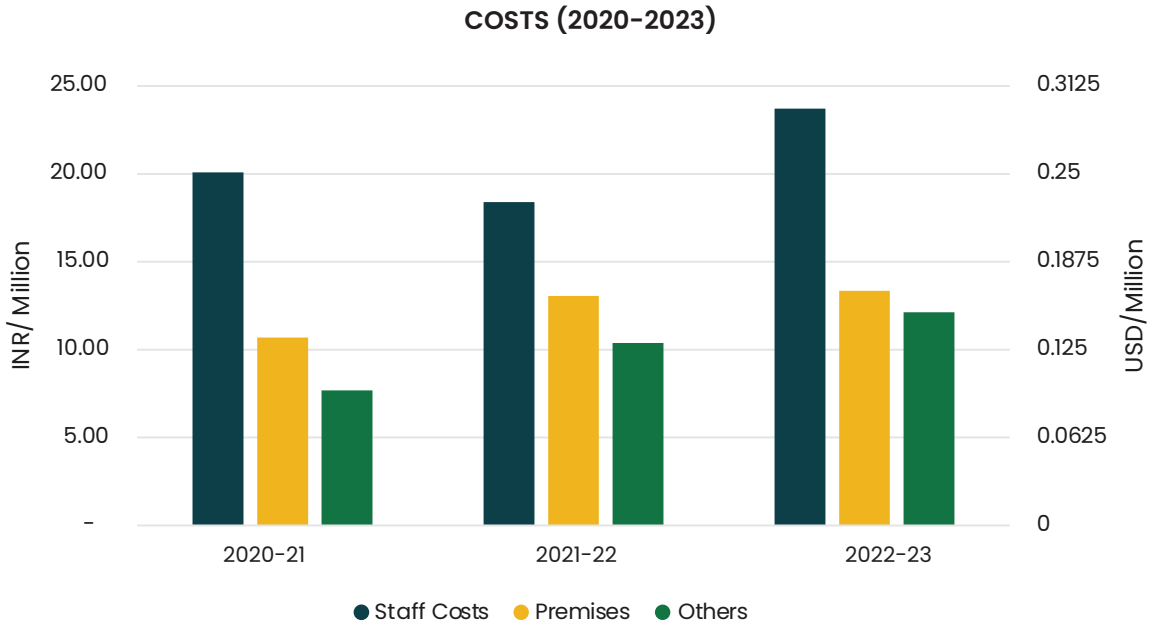




(C) Facility and Administrative Costs (2020-2023)							
S.No	Head	2020-21		2021-22		2022-23	
		(INR/ Million)	(USD/ Million)	(INR/ Million)	(USD/ Million)	(INR/ Million)	(USD/ Million)
1.	Staff Costs	20.08	0.27	18.39	0.25	23.71	0.30
2.	Premises	10.69	0.14	13.06	0.18	13.35	0.17
3.	Others	7.68	0.10	10.38	0.14	12.13	0.15
	TOTAL	**38.44**	**0.52**	**41.83**	**0.57**	**49.19**	**0.61**

I USD= 80 INR (2022-23); 74 INR (2020-21 & 2021-22)

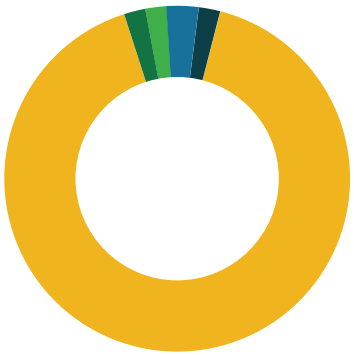




(D) Expenditures - IUSSTF Core Programs (2020-2023)							
S.No	Head	2020-21		2021-22		2022-23	
		(INR/ Million)	(USD/ Million)	(INR/ Million)	(USD/ Million)	(INR/ Million)	(USD/ Million)
1.	Bilateral Workshops	-1.09	-0.01	2.01	0.03	-	-
2.	Virtual Networked Centres	48.16	0.65	45.97	0.62	64.48	0.81
3.	Visitations	1.18	0.02	0.75	0.01	4.24	0.05
4.	US India Artificial Intelligence Initiative	0.78	0.01	0.86	0.01	3.17	0.04
5.	Solar Decathalon	-	-	1.54	0.02	3.36	0.04
6.	Direct Admin Expenses	1.64	0.02	1.00	0.01	0.56	0.01
	a) Governing Body Meetings	*0.36*	*0.00*	-	-	-	-
	b) Foundation Day Expenses	-	-	-	-	-	-
	c)Outreach Expenses etc	*1.27*	*0.02*	*1.00*	*0.01*	*0.56*	*0.01*
	TOTAL	**50.67**	**0.68**	**52.14**	**0.70**	**75.81**	**0.95**

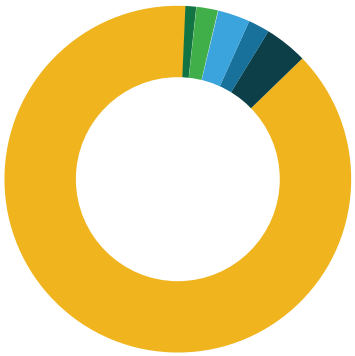
Core expenditure includes grants given in advance to grantees
I USD= 80 INR (2022-23); 74 INR (2020-21 & 2021-22)

EXPENDITURES (2020-21)



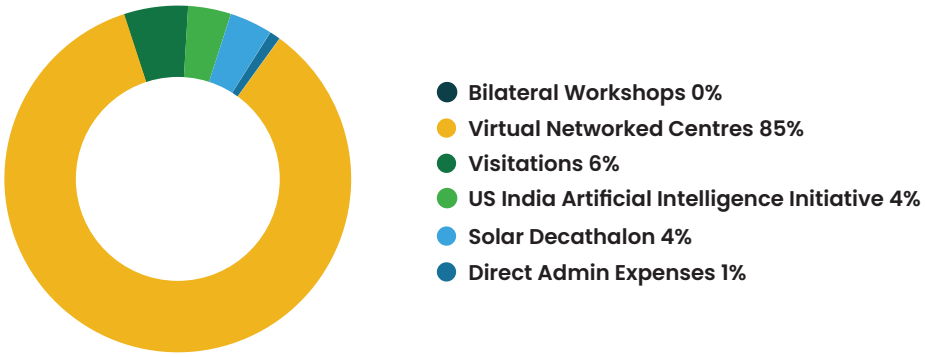
- Bilateral Workshops -2%
- Virtual Networked Centres 91%
- Visitations 2%
- US India Artificial Intelligence Initiative 2%
- Solar Decathalon 0%
- Direct Admin Expenses 3%

EXPENDITURES (2021-22)

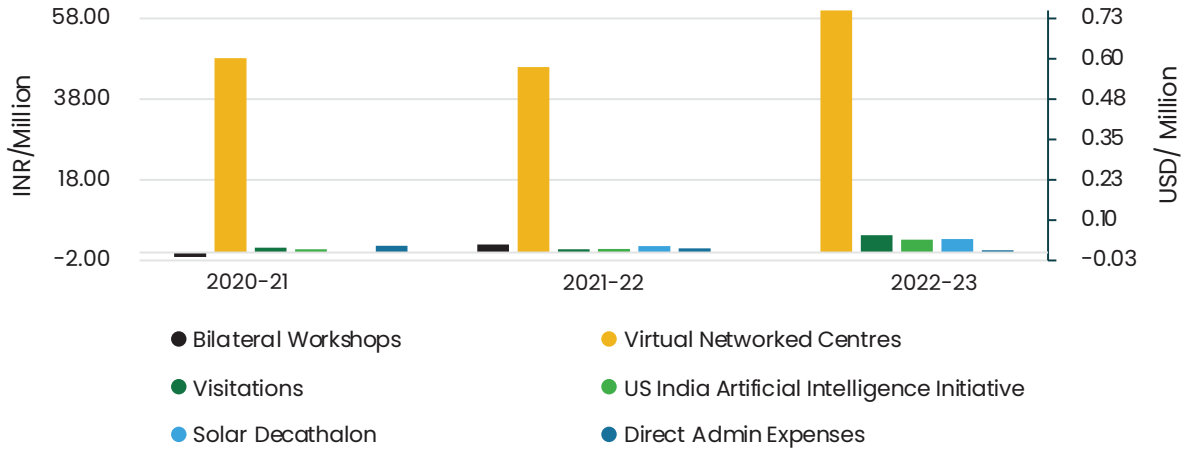


- Bilateral Workshops 4%
- Virtual Networked Centres 88%
- Visitations 1%
- US India Artificial Intelligence Initiative 2%
- Solar Decathalon 3%
- Direct Admin Expenses 2%

EXPENDITURES (2022-23)

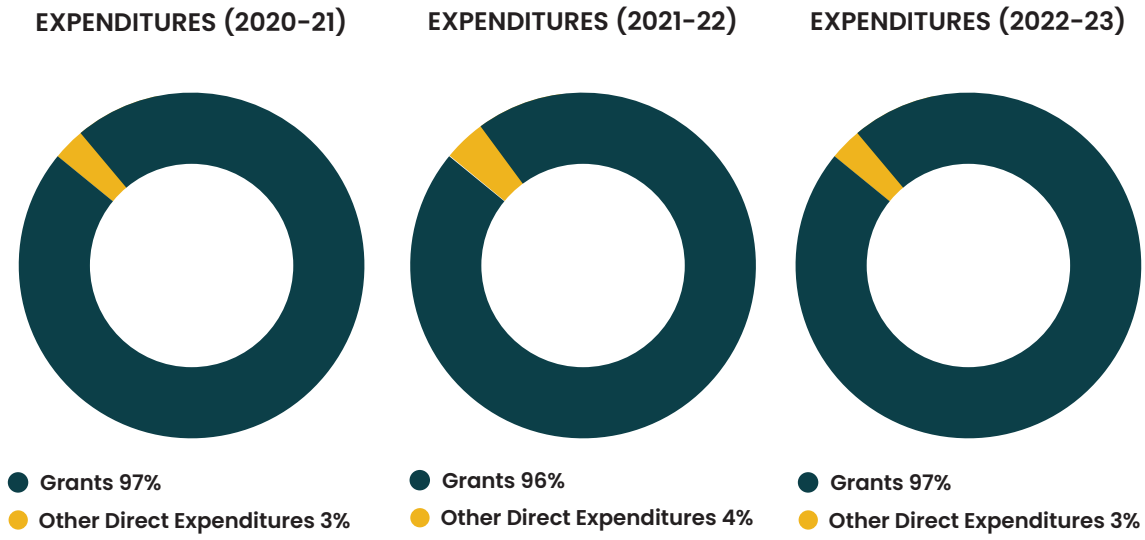


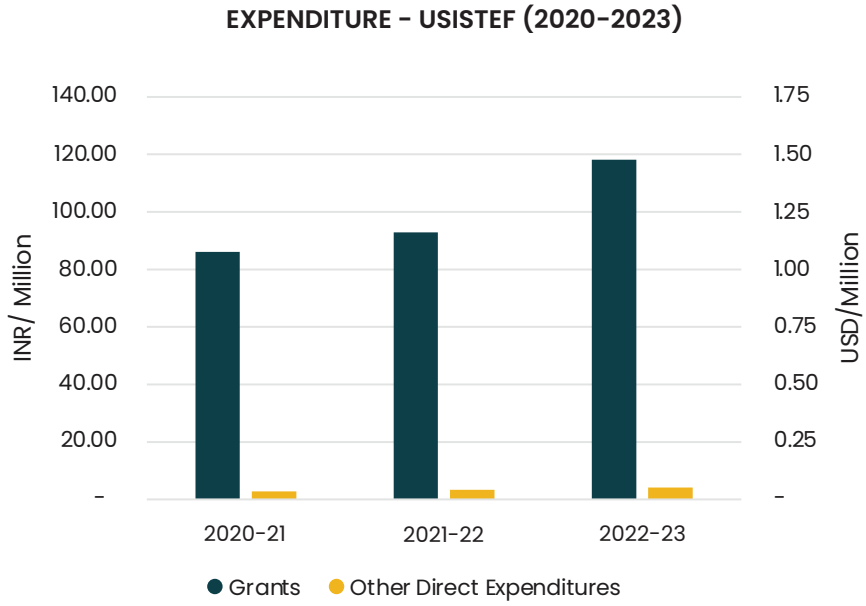
IUSSTF CORE PROGRAM EXPENDITURE (2020-2023)



(E) Expenditures - USISTEF (2020-2023)							
S.No	Head	2020-21		2021-22		2022-23	
		(INR/ Million)	(USD/ Million)	(INR/ Million)	(USD/ Million)	(INR/ Million)	(USD/ Million)
1.	Grants	86.07	1.16	92.93	1.26	118.10	1.48
2.	Other Direct Expenditures	2.84	0.04	3.41	0.05	4.17	0.05
	TOTAL	**88.91**	**1.20**	**96.33**	**1.30**	**122.27**	**1.53**

USISTEF expenditure includes grants given in advance to grantees
I USD= 80 INR (2022-23); 74 INR (2020-21 & 2021-22)





(F) Targeted Grants Payments - Extra Mural Programs (2020-23)							
S.No	Head	2020-21		2021-22		2022-23	
		(INR/ Million)	(USD/ Million)	(INR/ Million)	(USD/ Million)	(INR/ Million)	(USD/ Million)
1.	JCERDC	121.70	1.64	67.02	1.91	17.27	0.22
2.	IIGP	22.07	0.30	5.87	0.08	0.00	0.00
3.	Scholarships & Fellowships	49.80	0.67	3.41	0.05	2.35	0.03
4.	Other Programs	28.97	0.39	8.81	0.12	5.97	0.07
	TOTAL	**222.53**	**3.01**	**85.10**	**1.15**	**25.60**	**0.32**

I USD= 80 INR (2022-23); 74 INR (2020-21 & 2021-22)

EXPENDITURES (2020-21)

- JCERDC 55%
- IIGP 10%
- Scholarships & Fellowships 22%
- Other Programs 13%

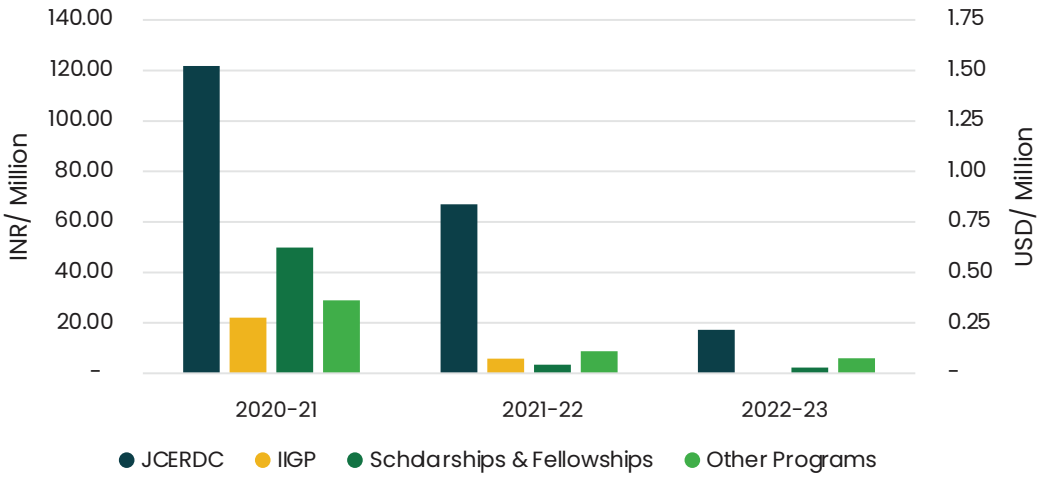
EXPENDITURES (2021-22)

- JCERDC 79%
- IIGP 7%
- Scholarships & Fellowships 4%
- Other Programs 10%

EXPENDITURES (2022-23)

- JCERDC 68%
- IIGP 0%
- Scholarships & Fellowships 9%
- Other Programs 23%

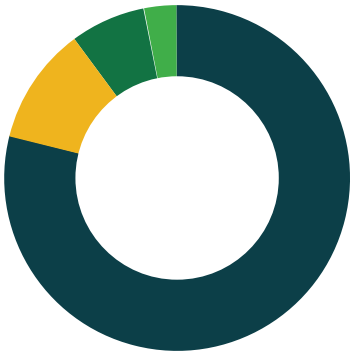
TARGETED GRANTS PAYMENTS - EXTRA MURAL PROGRAMS (2020-2023)



(G) Targeted Grants Receipts - Extra Mural Programs (2020-23)							
S.No	Head	2020-21		2021-22		2022-23	
		(INR/ Million)	(USD/ Million)	(INR/ Million)	(USD/ Million)	(INR/ Million)	(USD/ Million)
1.	JCERDC	105.14	1.42	90.69	1.23	94.94	1.19
2.	IIGP	14.10	0.19	-	0.00	-	0.00
3.	Scholarships & Fellowships	9.17	0.12	-	0.00	38.97	0.49
4.	Other Programs	4.21	0.06	-	0.00	3.23	0.04
	TOTAL	**132.63**	**1.79**	**90.69**	**1.23**	**137.13**	**1.71**

I USD= 80 INR (2022-23); 74 INR (2020-21 & 2021-22)

RECIEPTS (2020-21)



- JCERDC 79%
- IIGP 11%
- Scholarships & Fellowships 7%
- Other Programs 3%

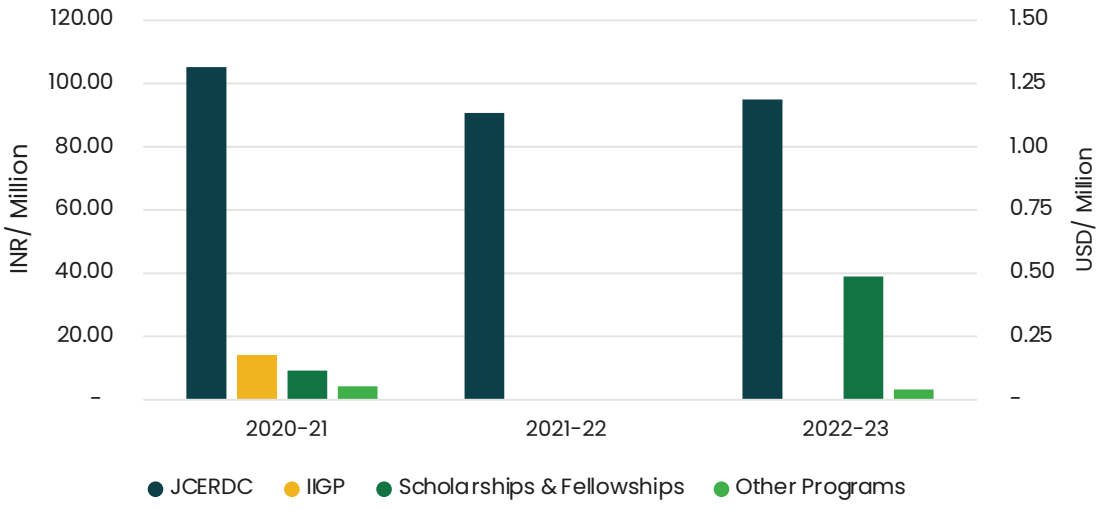
RECIEPTS (2021-22)

- JCERDC 100%
- IIGP 0%
- Scholarships & Fellowships 0%
- Other Programs 0%

RECIEPTS (2022-23)

- JCERDC 69%
- IIGP 0%
- Scholarships & Fellowships 29%
- Other Programs 2%

TARGETED GRANTS RECEIPTS - EXTRA MURAL PROGRAMS (2020-2023)



Annexure I

Virtual Networked Centres: Projects Ongoing in 2022-23

S. No	Proposal Title	Lead Indian PI	Lead U.S. PI
1.	*Acidification and Pteropod Dissolution in the Indian Ocean*	**V.V.S.S. Sarma** National Institute of Oceanography, Visakhapatnam	**Richard A. Feely** NOAA Pacific Marine Environmental Laboratory, Seattle
2.	*Center for Secure and Resilient Quantum Optical Networks*	**Vimal Bhatia** Indian Institute of Technology, Indore	**Byrav Ramamurthy** University of Nebraska, Lincoln
3.	*Center on Advanced Bio-based Energy and value added Commodity Production: Moving towards next generation feed based Biorefinerie*	**Vibha Dhawan** The Energy and Resources Institute, New Delhi	**Wei Liao** Michigan State University, East Lansing
4.	*Center in Chronobiology*	**Sangeeta Rani** University of Lucknow, Lucknow	**Erik Herzog** Washington University, St. Louis
5.	*Polynomials as an Algorithmic Paradigm*	**Anand Louis** Indian Institute of Science, Bengaluru	**Prasad Tetali** Georgia Institute of Technology, Atlanta
6.	*Center for Big Data and the Brain for Precision Mental Health*	**Ramkrishna Pasumarthy** Indian Institute of Technology, Madras	Vinod Menon Stanford University, Stanford
7.	*Understanding the CME propagation and its internal structure in the interplanetary space to predict Bz*	**Nandita Srivastava** Udaipur Solar Observatory, Physical Research Laboratory, Ahmedabad	**Natchimuthuk Gopalswamy** NASA Goddard Space Flight Center, Maryland
8.	*Centre for Integrative Cancer Biology and Therapeutics*	**Rana P. Singh** Jawaharlal Nehru University, New Delhi	**Sanjay Malhotra** Oregon Health & Science University, Portland
9.	*Centre for Gravitational-Physics and Astronomy*	**K. G. Arun** Chennai Mathematical Institute, Chennai	**B. S. Sathyaprakash** Pennsylvania State University, State College
10.	*Center for Self-powered Energy Harvesting and Storage Systems*	**Abha Misra** Indian Institute of Science, Bengaluru	**Apparao M. Rao** Clemson University, Clemson

Annexure II

Indo-U.S. Virtual Networks for COVID-19: Projects closed in 2022-23

S. No	Proposal Title	Indian Partner	U.S. Partner
1.	*Real time high-throughput cost-effective sequencing platform for 2019-nCOV detection and genotyping*	**Rajesh Pandey** CSIR-Institute of Genomics and Integrative Biology, Delhi	**Sarath Chandra Janga** Indiana University Purdue University, Indianapolis
2.	*Electron microscopy study to explore the effectiveness of HCQS on COVID-19 disease from ex vivo patient samples*	**Subhash Chandra Yadav** All India Institute of Medical Science (AIIMS), New Delhi	**Wah Chiu** Stanford University, Stanford
3.	*Lymphopenia in COVID-19: implication in pathogenesis and disease management*	**Jyotsna Agarwal** Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow	**Ankita Garg** University of Georgia, Athens
4.	*Development of Antiviral Coatings to Prevent the Transmission of SARS-CoV-2 Viruses*	**Jayanta Haldar** Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru	**Shiv Pillai** Ragon Institute of MGH, MIT and Harvard, Cambridge
5.	*Mitigating COVID19 Infection and Progression via Innate Immune Modulation*	**Suparno Chakrabarti** Dharamshila Narayana Superspeciality Hospital, New Delhi	**Sanjay V. Malhotra** Oregon Health & Science University, Portland
6.	*Occurrence and persistence of SARS-CoV-2 (COVID-19) along with known biological indicators in waste waters of Mumbai city*	**Sandhya Shrivastava** Bhavan's Research Center (Microbiology), Mumbai	**Joan Rose** Michigan State University, East Lansing
7.	*Leveraging reverse genetics strategies to study structure-function interplay of virus host attachment spike protein to design therapies for COVID-19*	**Jayasri Das Sarma** Indian Institute of Science Education and Research Kolkata, Nadia	**Maria Nagel** University of Colorado School of Medicine, Aurora
8.	*Establishment of an Indo-US Molecular Biomarker Knowledge Network for COVID-19*	**Shantikumar V. Nair** Amrita Centre for Nanosciences and Molecular Medicine, Kochi	**Mohit Jain** University of California, San Diego, La Jolla

Annexure III

The list of students who availed the internships both in-person and virtual under the IUSSTF-Viterbi program are listed below:

S. No	Name	Indian Parent Institute	Title of Project	U.S. Host Institute (Viterbi School of Engineering, University of Southern California)
In-Person Interns				
1.	Anchit Proch	Indian Institute of Technology, Roorkee	A 128x64 SRAM Macro for Embedded Matrix Vector Multiplication	U Mike Shuo-Wei Chen
2.	Debaditya Pal	ABV- Indian Institute of Information Technology and Management, Gwalior	Dialogue Systems and Natural Language Processing	David Traum
3.	Devansh Gupta	Indraprastha Institute of Information Technology, Delhi	Private Fair Learning	Meisam Razaviyayn
4.	Kaushiki Dixit	Indian Institute of Technology, Kharagpur	Neuromorphic Computing	J. Joshua Yang
5.	Visweswaran Baskaran	National Institute of Technology, Tiruchirappalli	Explicit estimation of Dynamics for a loaded quadruped to improve MPC	Quan Nguyen

S. No	Name	Indian Parent Institute	Title of Project	U.S. Host Institute (Viterbi School of Engineering, University of Southern California)
Virtual Interns				
1.	Aditya Sharma	Indian Institute of Technology, Roorkee	Delay Locked Loop based Time to Digital Converter for magnetic biosensors	Constantine Sideris
2.	Devadutta Dash	Indian Institute Technology, Banaras Hindu University, Varanasi,	Preconditioned Visual Language Inference with VL Models	Muhao Chen
3.	Karthik Desingu	Anna University	Finding Concrete Evidence of Unsafe Software Code	Mukund Raghothaman
4.	Pushpdeep Singh	National Institute of Technology, Hamirpur	Explanation Regularisation of NLP Models	Xiang Ren
5.	Samayan Bhattacharya	Jadavpur University	Multimodal analysis of brain images for detection of epilepsy biomarkers	Dominique Duncan
6.	Shashank Nag	Indian Institute of Technology, Chennai	Hardware Accelerator for Vision Transformer (ViT)	Peter Beerel
7.	Shivani Girish Dhok	Visvesvaraya National Institute of Technology, Nagpur	Energy Harvesting in Molecular Communication	Urbashi Mitra
8.	Sidharth Agarwal	Indian Institute of Technology, Delhi	Intelligent RL agents in Text World games	Xiang Ren
9.	Soundarya J	National Institute of Technology, Tiruchirapalli	High-performance parallel sorting on High Bandwidth Memory - enabled FPGA	Viktor Prasanna
10.	Vardaan Taneja	Indian Institute of Technology, Delhi	Computer Vision Interpretability	Yan Liu

Indo-U.S. Science and Technology Forum

Indo-U.S. Science and Technology Forum (IUSSTF)

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