

ANNUAL REPORT 2023-24



National Institute of Solar Energy
(An Autonomous Institute of Ministry of New and Renewable Energy, Government of India)

NATIONAL INSTITUTE OF SOLAR ENERGY

GOVERNING COUNCIL*		
1	Secretary, Ministry of New and Renewable Energy (MNRE)	President (Ex-officio)
2	Financial Advisor, MNRE	Member (Ex-officio)
3	Joint Secretary, MNRE	Member (Ex-officio)
4	Joint Secretary (Solar)/Advisor (Solar), MNRE	Member
5	Managing Director, Solar Energy Corporation of India (SECI)	Member
6	Director General, Central Power Research Institute (CPRI)	Member
7	Director, Rajasthan Renewable Energy Corporation Limited (RRECL)	Member
8	Director, Karnataka Renewable Energy Development Limited (KREDL)	Member
9	Shri Ravi Reddy, Chairman, National Solar Energy Federation of India (NSEFI)	Member
10	Shri Manoj Upadhyay, Founder and Chairman, ACME Solar	Member
11	Director General, National Institute of Solar Energy (NISE)	Member
12	Dr. Chandan Banerjee, Deputy Director General, NISE	Member
13	Dr. Avadhesh Yadav, Deputy Director General, NISE	Member
14	Prof. Nilanjan Senroy, Electrical Engineering Department, Power Grid Chair Professor, Indian Institute of Technology Delhi (IIT Delhi)	Member
15	Prof. Asheesh Kumar Singh, Professor and Former Head of Department, Department of Electrical Engineering, Motilal Nehru National Institute of Technology Allahabad (NIT Allahabad)	Member
16	Prof. Dinesh Kabra, Department of Physics, Indian Institute of Technology Bombay (IIT Bombay)	Member
17	Prof. Vamsi Krishna, Department of Energy Science and Engineering, IIT Delhi	Member
18	Dr. Jai Prakash, Deputy Director General, NISE	Member Secretary
Special Invitee: Representative nominated by Secretary, Department of Science & Technology (DST), New Delhi		

*Constituted by MNRE vide Order No. 354/8/2018-NSM dated 04.09.2024



प्रशांत कुमार सिंह, भा.प्र.से.
सचिव

P.K. SINGH, IAS
Secretary



भारत सरकार
नवीन और नवीकरणीय ऊर्जा मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF NEW AND RENEWABLE ENERGY



President's Message

As we celebrate the remarkable strides made in solar energy, I would like to commend NISE for its impressive achievements over the past year. NISE's journey aligns with the objectives of the National Solar objectives and the various initiatives of MNRE aimed at promoting solar energy across the country. The Institute has played a vital role in supporting the Ministry in implementation of several key schemes, including the Approved List of Models & Manufacturer (ALMM) of Module, the Production Linked Incentive (PLI) scheme, the PM Surya Ghar scheme, the Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan Yojana (PM KUSUM), as well as the Suryamitra and Varunmitra Skill Development Programs.

At its core, NISE serves as hub for research and development dedicated to driving innovation and addressing real-world challenges. Their work towards End-of-Life PV module - including the potential assessment for reusability and recycling of PV module, plant yield optimization for AgriPV, solar potential assessment, innovative product development, such as cooking systems and instant geyser, exemplifies their commitment to R&D. Additionally, NISE's work in testing & standardization of solar equipment, along with its consultancy projects and skill development programs, including both national and international training opportunities, are truly praiseworthy for the sector.

NISE has made significant strides in clean energy by establishing a Centre of Excellence for Hydrogen Energy, thereby prioritizing Green Hydrogen as a key area of its research. This Centre along with the newly established National Centre on Hydrogen Safety at NISE, is aligned with the National Green Hydrogen Mission (NGHM) and is expected to facilitate infrastructure development, R&D projects, skill development, and the formulation of a comprehensive policy framework for Green Hydrogen.

I am pleased to introduce the institute's Annual Report for the fiscal year 2023-24. It has been truly inspiring to witness the progress NISE has made this year, and I look forward to their continued success and the exciting developments in future.



(P. K. Singh)

From Director General's Desk

Our Path to Progress

As we reflect on the activities of NISE over the past year, I am pleased to share the progress we have made in advancing our mission and contributing to the growth of the renewable energy sector. With a clear mandate towards research and development, solar component testing, capacity building, and development of solar products and applications, we have reached several important accomplishments through our collective efforts.

Our collaboration with New and Renewable Energy (MNRE) continued to grow this year, especially in providing technical support for several key schemes, including Approved List of Models & Manufacturer (ALMM) of Module & Cell, the Production Linked Incentive (PLI) scheme, the Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan Yojana (PM KUSUM), and Suryamitra and Varunmitra Skill Development Programs.

During the year, we have taken up various activities in line with establishing our self as one of the world's premier referral leading institute in the field of Solar Energy. One of the significant milestones this year was the development of a methodology for ground-mounted solar potential assessment. Using this new approach, we successfully assessed the solar potential of four key states—Maharashtra, Rajasthan, Gujarat, and Karnataka. We also undertook a microscopic analysis on photovoltaic (PV) modules exceeding 20 years of age was performed to evaluate their potential for reuse and recycling. Additionally, we conducted a comprehensive study on the technological aspects of Agrivoltaic, a rapidly growing area that combines solar energy generation with agricultural production.

We continued our success in skill development programs that not only strengthens the workforce but also aligns with our commitment to making solar energy more accessible and sustainable. We organized a total of 11 national & international level trainings and facilitated training 4858 Suryamitras under the Suryamitra Skill Development programme. NISE imparted technical consultancy to 13 vendors and conducted a total of 79 ALMM inspections of Solar PV Module Manufacturing Plants, both adding considerable to our revenue generation initiatives.

On the research and development front, this year, we made important strides with the granting of 5 national patents and publication of multiple research papers in international journals and conferences. These achievements are a testimony of our commitment to technical excellence in the renewable energy sector.

As we look to the future, we remain focused on driving innovation, expanding our capabilities, and supporting government initiatives that accelerate India's transition to clean energy.



A handwritten signature in blue ink, appearing to read 'M. Rihan'.

(Dr. Mohammad Rihan)

Director General

CONTENTS

Chapters	Page No
1 Executive Summary	1
2 Introduction	3
3 Research & Testing Facilities	9
4 Key Research Outcomes	16
5 Industrial Research and Technical Consultancy	30
6 Testing and Standardization Activities	32
7 Implementation of Government Schemes and Programmes	39
8 National & International Training Programmes	41
9 Technical & Research Collaborations	44
10 Events & Workshops	45
11 Finance and accounts	53

Executive Summary

National Institute of Solar Energy (NISE) is an autonomous institute of Ministry of New and Renewable Energy (MNRE), Government of India, mandated for research and development, solar component testing, capacity building, and development of solar products and applications. NISE plays a vital role in supporting the Ministry in implementing several key schemes, including the Approved List of Models & Manufacturers (ALMM) of Module & Cell, the Production Linked Incentive (PLI) scheme, the Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan Yojana (PM KUSUM), as well as the Suryamitra and Varunmitra Skill Development Programs.

The major activities undertaken by NISE during FY 2023-2024 and the key achievements are outlined here:

- A microscopic analysis was performed on photovoltaic (PV) modules exceeding 20 years of age to evaluate their potential for reuse and recycling. This investigation included current-voltage (I-V) characterization, electroluminescence (EL) imaging, and identification of degradation losses across different layers within the module. These analyses yield detailed insights into the types and locations of significant degradation at the microscopic level, providing essential information for determining the suitability of modules for reuse or recycling.
- Conducted a comprehensive study on the technological aspects of Agrivoltaic, in order

to evaluate the feasibility of growing crops and generating solar energy on the same piece of land. This approach addresses the dual needs of food security and energy security. The study has identified several challenges related to crop yield and optimisation of energy generation, which require consideration of factors such as Photosynthetically Active Radiation (PAR) requirement of various crops and the optimum architecture of the PV power plant to achieve it.

- Developed the methodology for ground-mounted solar potential assessment and assessed the solar potential of four states (Maharashtra, Rajasthan, Gujarat and Karnataka).
- NISE provided technical support to MNRE for the development of new guidelines, test protocols, and best practices for the implementation of MNRE's PM KUSUM scheme.
- In collaboration with M/s. Spowdi, India, a solar-powered micro-irrigation farm has been set up at NISE. This project serves as a real-world demonstration of how renewable energy can enhance agricultural productivity while conserving vital resources like water.
- Designed lab prototype of Indoor Solar Cooker, Space Heating System and Instant Solar Geyser. These technologies use solar energy and stores heat energy efficiently in thermal energy storage systems for operating in off-sunshine hours.

- During the year, a new 10 Nm³/hr alkaline electrolyser was commissioned under MNRE funded project entitled “Setting Up of a Centre of Excellence on Hydrogen Energy at National Institute of Solar Energy (NISE), Gwal Pahari, Haryana.” The electrolyser will augment the capacity of the Green Hydrogen Production cum Dispensing Station at NISE to a total of 15 Nm³/hr (about 1.35 kg/hr).
- During the year, NISE conducted a total of 11 training programs (5 International & 6 National), wherein 277 (102 International & 175 National) participants were trained in various domains of solar energy.
- Under Suryamitra Skill Development programme, a total 4858 Suryamitras were trained in FY 2023-24. Also, NISE has invited an Expression of Interest (EoI) for the empanelment of Training partners/ Centres for imparting Suryamitra training for 12800 in FY 2024-25.
- During the year, a total of 13 technical consultancy assignments were carried out by NISE for various public and private companies including UNICEF, Solar Energy Corporation of India, etc. Technical support in the solarization of public health care facilities in the country is one of the major project having significant social impact.
- During the FY 2023-24, NISE conducted a total of 79 ALMM inspections of Solar PV Module

Manufacturing Plants corresponding to about 13GW/Year production capacity.

- During the year, 5 National Patents were granted to NISE. The research activities undertaken by NISE during the year resulted in publication of 14 research papers in reputable international journals, 2 papers at international conferences, and made contributions to 2 book chapters.

The details of all the activities undertaken by NISE during FY 2023-24 are presented in this Annual Report. Chapter 2 presents the introduction of the institute, its vision, thrust area, and its objectives. Chapter 3 showcases the Research & Testing Facilities available at NISE. Our key research outcomes for FY 2023-24 is detailed in the Chapter 4. Chapter 5 outlines the Industrial research and technical consultancies taken up by NISE. Chapter 6 represents the testing and standardisation activities of the various laboratories at NISE, such as Solar Cell Testing Lab, Solar PV Module Testing Lab, Solar Inverter Testing Lab, Battery Testing Lab, Solar Water Pump Testing Lab, Solar Light /LED Testing Lab, and Calibration Lab. NISE is the implementing agency for various Government Schemes and the same is detailed at Chapter 7. Chapter 8 showcases various National & International Training Programs carried out by NISE under our Skill Development and Capacity Building programs. Chapter 9 outlines the Technical & Research Collaborations taken up during the year. A glimpse of the significant Events and Workshops conducted at NISE are provided at Chapter 10. Finally, the audited financial accounts of NISE for FY 2023-24 have been presented in Chapter 11.



Introduction

National Institute of Solar Energy (NISE) is an autonomous institute of Ministry of New and Renewable Energy (MNRE), Government of India, mandated for research and development, solar component testing, capacity building, and development of solar products and applications. NISE is situated at Gwal Pahari on the Gurugram-Faridabad Road in Haryana. The institute is approximately 22 km away from the Indira Gandhi International Airport and 30 km from the New Delhi railway station. It has a 200-acre lush green campus registered as a society under the Haryana Registration and Regulation of Societies Act, 2012 (Registration No.: HR-018-2013-01092).

Figure 2.1 and 2.2 show the Surya Bhawan and Aditya Bhawan buildings of NISE.

The technical support of NISE complements the requirements of MNRE to become a self-reliable renewable power-producing nation and accept the series of challenges that intervened amidst the implementation of the National Solar Mission (NSM). NISE has established itself in the solar energy sector through continuous efforts by developing newer technologies and standards and catering to the changing needs of the industry. Furthermore, NISE envisions accelerating the proliferation of the renewable energy sector by intently working together with the Government of India.



Figure 2.1: Surya Bhawan Building of NISE



Figure 2.2: Aditya Bhawan Building of NISE

2.1 Vision of NISE

To establish itself as one of the world's premier referral leading institute in the field of Solar Energy through Resource Assessment; Research & Development; Design, Development, and

Demonstration of solar energy technologies for various applications; Testing, and Standardisation; Monitoring and Evaluation; Economics and Policy Planning; Human Resource Development and active collaborations with prominent National & International organisations.

2.2 Objectives

The main objectives of the NISE are as follows:

- (i) To function as a national research organisation for undertaking and supporting Research and Development Projects on various aspects of solar energy technologies.
- (ii) To act as an Apex Organisation for Testing, development of specifications, and standards.
- (iii) To create skilled manpower and offer consultancy services on Solar energy technologies.

2.3 Quality Policy of NISE

NISE is committed to provide performance evaluation and testing services for Solar Cells, PV Modules, Solar Water Pumping System, Inverters, Charge Controllers, Batteries, Advanced Lighting System and calibration services for Pyrheliometer and Pyranometer. The test facilities established at NISE meet the requirements to conduct the tests as per the National/International Standards.

This is being achieved by using the best engineering practices, continuous upgradation of the infrastructure, and updating of the state-of-the-art test facilities, test methods, testing personnel and continues improvement in the effectiveness of the Quality Management System as per International Standard ISO 17025:2017.

2.4 Thrust Areas

The basic function of NISE is to serve as a technical focal point in solar energy-related areas. NISE is committed to performing at its best in all spheres relating to solar energy and continually provides assistance and guidance with a high-quality standard in its work. NISE recognises the development process and continuously relates to significant and notable changes in the solar industry. NISE has the following thrust areas for its contribution and knowledge exploration:

- (i) To work increasingly in frontline areas that transcend discipline, the following thrust areas form part of this effort:

- Research and Development in Solar Photovoltaic and Solar thermal systems
- Solar Resources Assessment
- Testing of Solar Systems and devices (both large and small)
- Standardization
- Database Management and Information dissemination
- Capacity Building, Training, Teaching and Visitors Programme
- Development of Solar Energy Products & Hybrid System
- Consultancy Services, Monitoring, and Collaborations (National and International)
- Innovations, Solar Product Development & Commercialisation
- Green Hydrogen and Fuel Cell

- (ii) To have a perception and value system appropriate to the pursuit of high engineering science to meet the critically evaluated need of the industry.
- (iii) To maintain and foster interactive linkages with leading technological Institutions and Institutes of research in India and abroad.
- (iv) To act as an interface between Government, Industry, Academia, and Individuals.

2.5 Major Activities

The main activities of the institute include:

- (i) Assisting the Ministry in implementing the NSM objectives through appropriate mechanisms, evolving Science & Technology (S&T) programmes and projects, managing special projects, overseeing and coordinating with all relevant stakeholder agencies in the pursuit of the above objectives.
- (ii) The institute is responsible for providing thrust to R&D in solar energy and related technologies under the Mission. It would facilitate work related to demonstration and technology validation projects. The institute will also consider the sector-specific R&D needs to commercialise solar applications. These target sectors could be buildings, rural

areas, and industries for lighting and any other applications. The objective of solar application and R&D efforts should also target the replacement of kerosene and diesel used by the sectors stated above.

- (iii) The institute is responsible for R&D, resource assessment, training, testing/standardisation work assigned to the institute by the Ministry from time to time. It will maintain a data bank for use by industry and other institutions.
- (iv) The institute also undertakes R&D projects on different aspects of solar energy technologies, hybrid systems and storage techniques/systems.
- (v) The internal administrative functions, international cooperation projects on research, training, and testing, technology validation are also undertaken by the institute.
- (vi) The institute also works as the Secretariat for the work of the R&D Advisory Council. The Solar Research Advisory Council facilitates the development of a technology roadmap and provides inputs on all matters related to R&D and capacity building to the Mission Steering Group. The institute also works closely with the Solar Energy Corporation of India, set up by the Ministry for the implementation of the Mission.
- (vii) The institution, under the guidance of the Ministry and the Mission Steering Group, is responsible for Coordination with (i) other Centres of Excellence identified under the Mission, (ii) R&D projects funded in the field of solar energy in the country, (iii) other S&T Ministries/Organisations in the country.
- (viii) The institute strives to bridge the gap between existing R&D institutions and industry and get the industry on board through partnership programmes and projects.
- (ix) The institute collaborates with international S&T organisations for R&D and capacity-building activities in the areas of solar energy assigned to the institute by the Ministry from time to time.
- (x) The institute keeps track of the latest global developments based on technology forecasting and fore sighting relating to solar

energy and related technologies, including storage techniques, and provides inputs to the Ministry and the Mission Steering Group for the accelerated development of indigenous solar energy technologies and industry in the country.

- (xi) The institute also provides technical support to other R&D and testing organisations, as considered necessary.
- (xii) The institute assists the Ministry in the preparation of a technology roadmap and the related S&T policies for effective implementation of the S&T component of the Mission.
- (xiii) The institute also coordinates the work of technical monitoring of projects covered under the S&T roadmap for the Mission and undertakes technical studies and evaluations.
- (xiv) The institute is eligible to receive research grants from MNRE, and other Ministries/organisations, including international funding to carry out various assigned tasks and R&D activities.
- (xv) The institute also supports capacity building and supports students, teachers, and research personnel to work for higher degrees, including Ph.D. The institute would develop suitable linkage with various academic and research organisations for this purpose.
- (xvi) Any other tasks assigned by the Government from time to time.

2.6 Organisational Structure of NISE

The rules of affairs at NISE are managed by a Governing Council (GC), a Finance Committee (FC) and an Executive Committee (EC). The institute is headed by a Director General who is the Principal Executive Officer of the Society and is responsible for exercising general supervision over all scientific and industrial researches and other activities of the Institute. Various divisions of NISE are led by Deputy Director Generals for technical and administrative activities and are supported by Directors, Administrative Officer, Deputy Directors, Assistant Directors, and Executive Assistants-I. The organisational chart of the structure and management of NISE is shown in Figure 2.3.

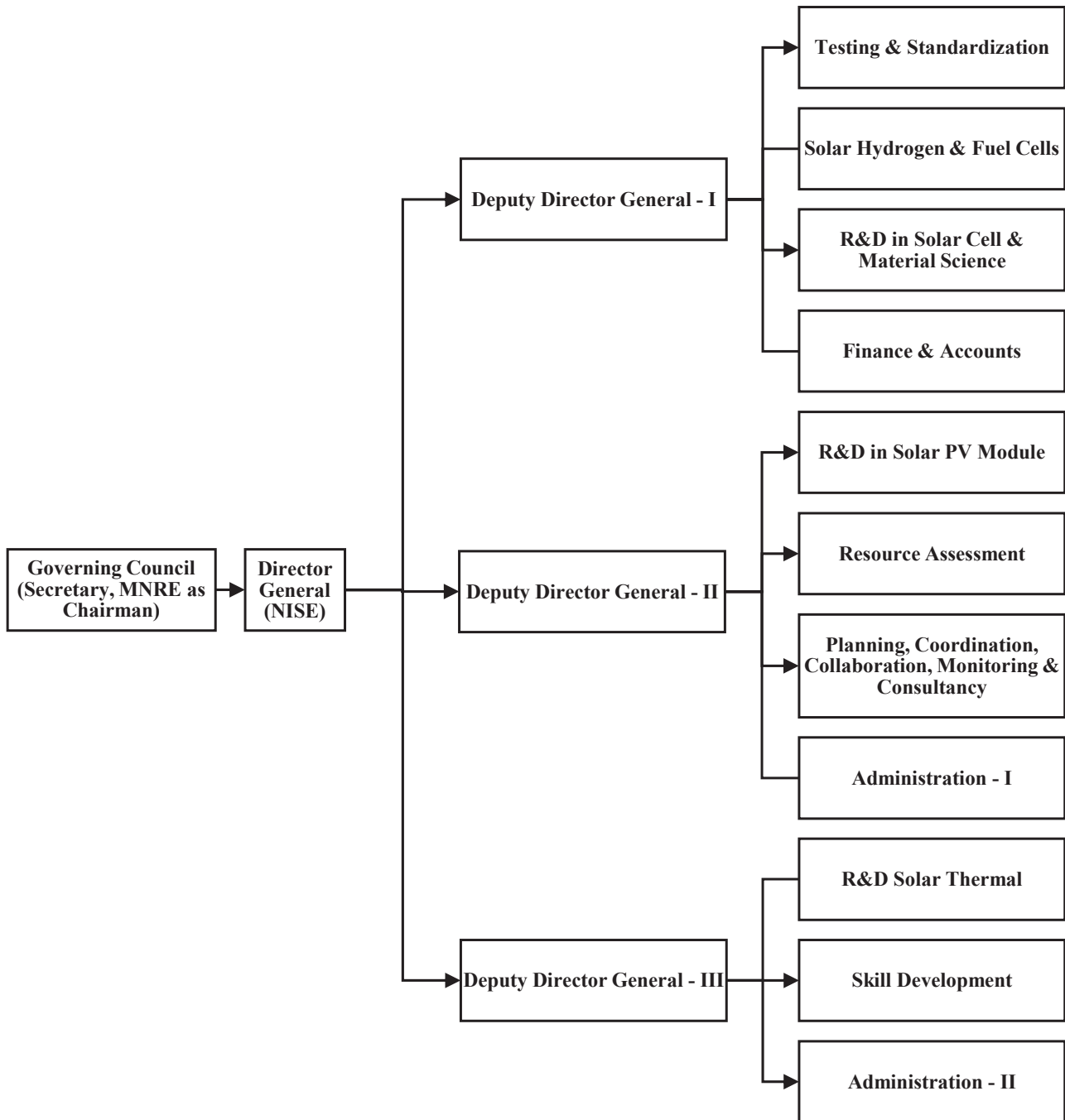


Figure 2.3: Organisational Structure of NISE

2.7 Governing Council

The affairs of NISE are managed by a Governing Council (GC), chaired by Secretary, MNRE (ex-officio President, NISE) and comprises of 18 members from MNRE, industry, premier research institutions, Government departments, and solar energy experts from reputed organisations.

2.8 Executive Committee

The Executive Committee (EC) of NISE takes decisions related to technical, administration, policy, finance & accounts-related matters and improves the overall functioning of NISE. EC has 5 members: DG, NISE as the Chairman, Deputy Director General-I, Deputy Director General-II, and Director as members, and Deputy Director (Administration)/ Administrative Officer as Member Convener.

2.9 Finance Committee

The Finance Committee (FC) of NISE approves the Annual Accounts of NISE before submission to the GC and Annual General Meeting (AGM). The FC is chaired by the Financial Advisor, MNRE and includes the Joint Secretary (Solar), MNRE, and DG, NISE as its members.

Table 2.1: Details of the meetings held during FY 2023-24

Committee	Meeting Dates
Governing Council	14 th GC held on 14.12.2023

Table 2.2: Name and Designation of the CPIOs and Appellate Authorities in NISE under Right to Information Act, 2005

S. No.	Subject	CPIO	First Appellate Authority (FAA)
1	All technical matters concerning Research and Development, Technology and Laboratory and Technology	Dr. Prasant Misra Director (Tech.)	Dr. Chandan Banerjee Deputy Director General
2	All Administrative Matters	Shri Rahul Kumar Administrative Officer	

Committee	Meeting Dates
Executive Committee	46 th EC held on 07.06.2023
	47 th EC held on 08.09.2023
	48 th EC held on 03.01.2024
	49 th EC held on 18.01.2024
	50 th EC held on 06.03.2024
Finance Committee	14 th FC held on 30.06.2023
	15 th FC held on 19.10.2023
	16 th FC held on 22.03.2024

2.10 Right to Information Act

Institute is implementing the Right to Information (RTI) Act, 2005, as per the guidelines issued by the Department of Personnel and Training (DoPT), Central Information Commission and Ministry of Home Affairs. The procedure/other details regarding seeking information under RTI Act, 2005 are available at the institute's website, www.nise.res.in.

The institute has designated CPIOs and appellate authorities to respond to the RTI applications and the first Appeals following subjects assigned to them. A list of CPIOs and first Appellate authorities is given in Table 2.2. Respective CPIOs and First Appellate Authorities replied to RTI applications/ Appeals within the stipulated timelines to the extent possible.

The progress report in terms of RTI application/First Appeals received, disposed-off, and pendency during the year (from 01.04.2023 to 31.03.2024) is hereby given in Table 2.3.

Table 2.3: Status of RTI Application received during 2023-24

Item	Received	Replied	Pending as on 31-03-2024
RTI Application	70	68	02
First Appeal Authority	07	07	0

* As per the Quarterly report submitted on RTI Portal.

2.11 Recruitment status

The recruitment status at NISE against the sanctioned posts as on 31st March 2024 is as under:

Sl. No	Name of the post	Level	No. of Posts		Total	Status
			Technical	Admin		
1.	Director General	14	01	00	01	1 Vacant* *Additional Charge of DG was given to Dr. Sangita M. Kasture, Scientist 'G', MNRE
2.	Deputy Director General	13A	03	00	03	All Posts Filled DDG:03 (UR)
3.	Director	12	02	01	03	All Posts Filled Director (Tech): 02 (UR) Director (Admin): 01 (UR)
4.	Deputy Director	11	06	02	08	All Posts Filled Dy. Director (Tech): 05 (UR), 01 (OBC) Dy. Director (Admin): 02 (UR)
5.	Administrative Officer	11	00	01	01	Post Filled AO:01 (UR)
6.	Assistant Director	10	07	02	09	All Posts Filled Assistant Director (Technical): 04 (UR), 01 (UR, PwD), 01 (OBC), 01 (SC) Assistant Director (Admin) : 02 (UR)
7.	Office Secretary	9	00	01	01	01 Post (UR) under process for Re-designation
8.	Office Secretary-I	8	00	03	03	Post under process for Re-designation: 02 (UR)
9.	Executive Officer	8	04	00	04	All posts not filled
10.	Executive Assistant-I	7	08	00	08	Post filled: 03 post (UR:01, OBC:01, SC:01)
			31	10	41	

Note:

1 post of DG-NISE advertised by MNRE.

28 posts filled.

9 posts advertisement is under process.

3 posts are under process for Re-designation of posts.

UR-Unreserved, SC-Schedule Caste, OBC-Other Backward Caste, PwD-Person with Disability.



Research & Testing Facilities

NISE has set up state-of-the-art laboratories with advanced equipment for carrying out Research & Testing in PV cell, PV module, Solar Thermal, Green Hydrogen and allied applications. Beyond standard testing, NISE is engaged in the research and standardization of solar energy systems, fostering innovation through experimental and theoretical projects that aim to enhance the performance and reliability of solar technology systems for the industry. Our facilities include Solar Cell Characterization Lab, Solar PV Module Testing (Indoor & Outdoor) Lab, Power Electronics Laboratory, Battery Testing & Characterization Lab, Advanced Solar PV system & lighting Lab, and Solar Water Pumping System Testing & R&D Facility. NISE also has a Green Hydrogen Production and Dispensing Station in its campus for undertaking Green Hydrogen based research and testing.

3.1 Solar Cell Characterization Facility

The state-of-the-art Advanced Solar Cell

Characterization Laboratory at NISE includes an ISO Class 8 cleanroom. The lab is equipped with advanced cell characterization tools, including: (i) Spectral Response Measurement System (QESRMS), (ii) Spectroscopic Ellipsometer, (iii) Optical Microscope, (iv) Semi-Automatic Four-Probe Resistivity Meter, (v) Electrochemical Capacitance Voltage (ECV) Profiler, (vi) Surface Profilometer, and (vii) Field Emission Scanning Electron Microscope (FESEM) with EDS capability. The lab is equipped with instruments for measuring the optical constants of textured and thin-film solar cells. It also features equipment for automatic single- and multi-point mapping of sheet resistance and resistivity in silicon wafers and solar cells. Additionally, the facility supports the measurement of film thickness, surface roughness, two-dimensional stress, and surface texture, as well as laser ablation and LBSF microstructure analysis of front-side metallization.



Figure 3.1: Advanced solar cell characterization laboratory with ISO class 8 cleanroom



Figure 3.2: Surface Profilometer



Figure 3.3: Field Emission Scanning Electron Microscope with EDAX



Figure 3.4: Spectroscopic Ellipsometer



Figure 3.5: Semi-Automated Four Point Probe System

3.2 Solar PV Module Testing Laboratory (Indoor)

The Solar Photovoltaic Module Testing Facility at NISE is dedicated to advancing research and testing of solar PV modules in alignment with both national

and international standards. This state-of-the-art facility boasts world-class infrastructure, skilled personnel, and advanced testing equipment, offering both in-house and on-site testing services to meet the comprehensive quality control needs of MNRE and facilitate new product development.



Figure 3.6: Solar PV Chamber



Figure 3.7: Solar PV module testing

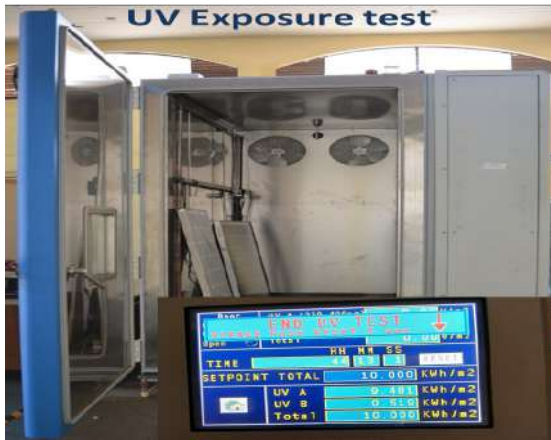


Figure 3.8: UV test chamber for performing tests as per IS 14286 and IS 61730



Figure 3.9: Peel testing of PV module as per IEC 61730

New additions during the year:



Figure 3.10: Salt mist chamber



Figure 3.11: Fire test facility

3.3 Solar PV Module Testing (Outdoor)

The PV module’s performance is evaluated through outdoor testing under real field conditions, with results translated to reference conditions as per IEC 60891: 2021. Long-term outdoor performance and reliability measurements are conducted to assess the durability and effectiveness of both grid-tied and off-grid PV systems. Additionally, on-site health and performance assessments are performed to ensure compliance with performance guarantees for solar power plants. This facility facilitates to evaluate the degradation and different failure modes of PV modules under different climatic conditions.



Figure 3.12: Health check-up of PV modules with IV characterization and IR thermography in outdoor field conditions

3.4 Power Electronics Laboratory

The Power Converter Test Laboratory at NISE specializes in testing power conditioning units (PCUs). This lab can assess hybrid, standalone, and grid-tied inverters as well as pump controllers, following IEC 61683:1999 standards. The lab also supports research on islanding prevention for utility-interconnected photovoltaic inverters. With its advanced capabilities, the lab provides a robust platform for innovation in power electronics, contributing to resilient and efficient renewable energy integration.



Figure 3.13: Power Electronics Laboratory setup

3.5 Battery Test & Characterization Laboratory

The Battery Test & Characterization facility offers extensive research potential in the evaluation of secondary battery storage technologies, focusing on performance, reliability, and life cycle analysis. Equipped with state-of-the-art tools such as deep-cycle battery testers, programmable power



Figure 3.14: Battery Test & Characterization Laboratory setup

supplies, advanced hardware and software, data loggers, and temperature-controlled water baths, the lab enables rigorous testing across various battery chemistries, including Lead-Acid, Nickel-Cadmium, and Lithium-Ion batteries. This infrastructure supports a wide range of experimental investigations, paving the way for advancements in battery technology for renewable energy storage.

3.6 Advanced Solar PV system & lighting Laboratory

The Solar Photovoltaic (SPV) and Lighting Laboratory offers significant research potential in advancing off-grid solar technologies through rigorous performance and reliability testing. Equipped to conduct tests according to different standards for electrical and photometric measurements of solid-state lighting products. The lab provides a robust platform for experimental research on improving efficiency, durability, and adaptability of solar lighting and other off-grid applications.



Figure 3.15: Advanced Solar PV system & lighting laboratory

3.7 Solar Water Pumping System Testing & R&D Facility

The Solar Water Pump test facility is a fully automated, state-of-the-art research facility designed for advanced performance testing of photovoltaic (PV)-based water pumps in alignment with national and international standards. This cutting-edge lab is now capable of testing systems up to 50 hp. Equipped with the latest testing technologies, it supports comprehensive research on a wide range of pump types, including submersible, surface, AC, and DC systems.



Figure 3.16: Solar Water Pump Test facility for up to 50 hp

3.8 Green Hydrogen Production and Dispensing Station

NISE had foreseen the potential of Hydrogen, especially Green Hydrogen as a fuel to replace fossil fuels in industry, clean transportation, decentralized power generation, aviation, and marine transport. With this foresight, NISE has established a Centre of Excellence on Hydrogen Energy, thereby adopting Green Hydrogen as a vertical and identified it as a thrust area of its research. NISE has a dedicated Hydrogen Energy and Fuel Cell Division to carry out R&D in green Hydrogen and Fuel Cells.

Our campus hosts India's first solar-based green hydrogen-generating and dispensing station. The facility comprises a dedicated 120 kWp Solar PV plant that powers two alkaline electrolyzers (KOH based) with a total green hydrogen production capacity of 15Nm³/hr. The Hydrogen is then purified to 99.999% for Fuel Cell grade applications. The low-pressure Hydrogen is then compressed to 550 bars and stored in high-pressure Hydrogen storage tank of about 60 kg capacity. The station has an H35 Hydrogen dispenser which can refuel Hydrogen at 350 bar to the vehicles at the rate of the rate of 1 kg/min.



Figure 3.17: India's first Solar based Green Hydrogen production cum dispensing station - 350 bar dispensing of fuel cell grade green hydrogen

Some of the major facilities available for testing and characterization of PV module and systems at NISE are shown in Table 3.1 below.

Table 3.1: List of major equipment available in PV module and system testing lab

Sl. No.	Name of the equipment	Purpose
1	IR camera	For measurement of heat signatures of PV module and BOS
2	Power Analyzer	To measure the electrical performance of the Solar PV systems
3	Digital Oscilloscope	To analyze the AC current, voltage & power of the solar PV converters
4	Anti-Islanding Testing Device	To test the islanding feature of the Solar PV inverters
5	Solar Array Simulator	To simulate the Solar PV plant for the performance assessment of the PV systems
6	Grid Simulator	To simulate the grid input for the performance of solar PV inverters
7	Electrical Safety Analyzer	Performance testing of Solar inverters
8	Battery Simulator	Performance testing of Solar hybrid inverters
9	Programmable AC / DC Electronic Load	Performance testing of Solar inverters
10	Magnetic Flow Meter Integral Type	For measurement of the water flow of the solar pumping systems
11	Gauge Pressure Transmitter	For measurement of the pressure of the solar pumping systems
12	Temperature sensor	For the measurement of the temperature of PV modules
13	Digital Insulation tester	For testing the insulation of PV modules
14	LUX Meter	For measuring the LUX of lighting systems
15	Integrating Sphere	For measuring the Photometric parameters of lighting systems
16	PV Performance analyzer IV tracer unit	For measuring the outdoor IV characteristics of the PV module
17	Junction box pull tester	For the measurement of the junction box pull strength of the PV module
18	Lap shear tester	For the measurement of junction box lap shear strength of the PV module
19	PV module susceptibility testing machine	For the measurement of the susceptibility strength of the PV module
20	Module breakage tester	For the measurement of the susceptibility strength of the PV module
21	Cord Anchorage pull Torsion testing machine	For measuring the Cord Anchorage susceptibility of the PV module
22	UV chamber	To test the performance of the PV module under UV stress
23	Environment Chamber	To test the performance of the PV module, inverter under temperature and humidity stress

Sl. No.	Name of the equipment	Purpose
24	Spire Simulator	For measuring the indoor IV characteristics of PV module
25	Ignitability test setup	For measuring the PV module susceptibility under ignitable stress
26	Spectrometer	For measuring the Spectrum of the Irradiation
27	EL imager	For measuring the Electroluminescence of the PV module
28	Impulse voltage tester	For measuring the PV module susceptibility under impulse stress
29	Deep Life Cycle Battery Tester	For measuring the battery capacity
30	Solar simulator for Solar cell	I-V testing of solar cells as per IEC 60904-3
31	Chemical lab	For the processing of cell/wafer
New test facility added in the FY 2023-24		
32	Mechanical load tester	For testing PV modules under dynamic and static load stress
33	Fire test setup	For measuring the PV module susceptibility under Fire stress
34	Solar simulator characterization	To measure the various parameters of solar simulator such as non-uniformity, temporal stability and spectral mismatch
35	Angle-of-incidence measurement	To measure the performance of the PV module at various angle of incidence
36	Salt mist test facility	To measure the performance of the PV module at various salt stress conditions



Key Research Outcomes

During the year, NISE has taken up 13 RD&D activities in various Solar Energy technologies through in-house, external funded and collaborative projects. These projects are identified in line with the mandate of NISE and having current relevance in catering the changing needs of the energy sector. Key research outcomes from various projects undertaken by NISE during the year is as detailed below:

4.1 Synthesis of Monosize Silica particles for fabrication of Silicon Microwire Arrays

In order to enhance nanostructure solar cell efficiency based on the concept of radial junction solar cells, the division has focused on the

synthesis of monosize silica particles in wide range of sizes from nano to micro range. A low-cost and simple semi-batch process has been developed and used based on the Stober method. The size and distribution have been controlled by simply controlling the rate of injection during the synthesis process (Figure 4.1 (a)-(b)). The silica particles were found to be surrounded by a thin shell with an average pore size of 5.8 nm (Figure 4.1 (c)). Thermogravimetric Analysis (TGA) and Differential Thermogravimetric Analysis (DTGA) showed good thermal stability of the particles (Figure 4.1 (d)). The silica particles show broad photoluminescence from the UV to the red region of the spectrum and sharp absorption in the UV region (Figure 4.1 (e)-(f)).

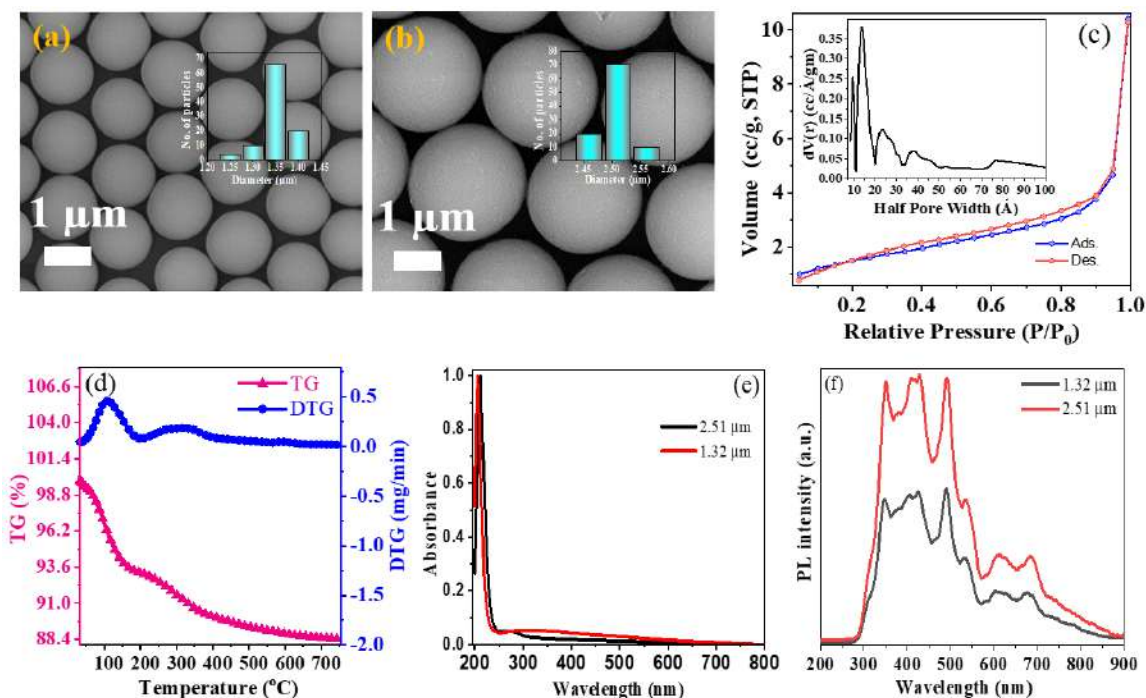


Figure 4.1: (a)-(b) FESEM images of monosized porous silica particles of sizes 1.32 μm and 2.51 μm respectively, (c) N_2 adsorption-desorption isotherms of the silica particles at 77 K and inset shows differential pore volume ($\times 10^{-2}$) as a function of half-pore width, (d) thermogravimetric and derivative thermogravimetric analysis of the silica particles, (e) UV-Vis absorption spectra, and (f) PL spectra of the silica particles.

4.2 Development of passivating and carrier-selective contacts using Transition Metal Oxide (TMO) Films

In order to reduce Solar cell efficiency losses due to carrier recombination at the electrodes, studies

on passivating and carrier selective contacts with improved opto-electronic characteristics using Transition Metal Oxide (TMO) films were carried out. In this direction, Molybdenum Oxide (MoO_x) films were deposited using reactive sputtering of Molybdenum (Mo) under varying oxygen flow in the plasma ambient (Figure 4.2).

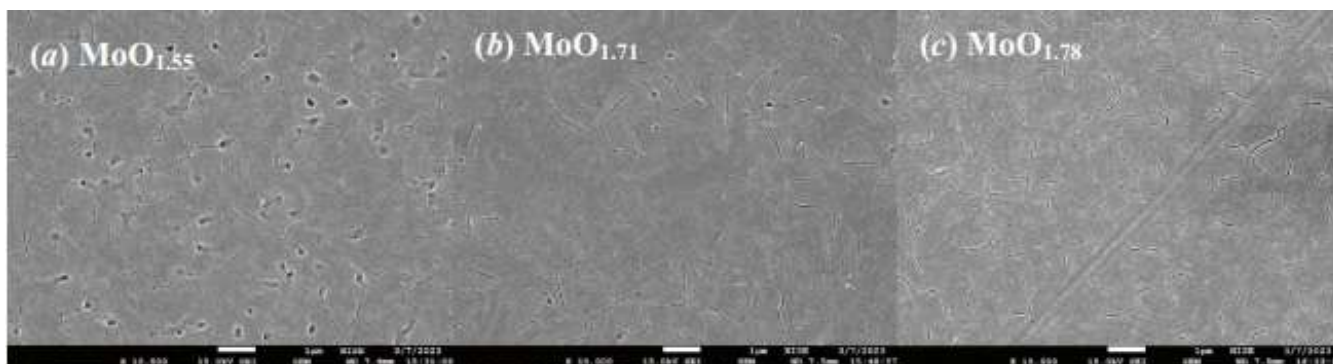


Figure 4.2: FESEM images of MoO_x films deposited on Si substrate at different oxygen flow rates

The surface morphology was found to be influenced significantly by the oxygen content in the plasma during the process of film deposition. The as-deposited films were porous at a lower oxygen flow rate (< 10 sccm), while they showed coarse structure at higher flow rates (> 15 sccm). The compositional analysis revealed that the films are sub-stoichiometric and the weight ratio of

O/Mo varied from 1.5 to 2 in the O_2 flow range of 5–25 sccm. The average refractive index (n) and extinction coefficient (k) evaluated from spectroscopic ellipsometry were found to be 2.03 and 0.0035, respectively at the wavelength of 600 nm, for the films deposited at the optimum conditions (Figure 4.3).

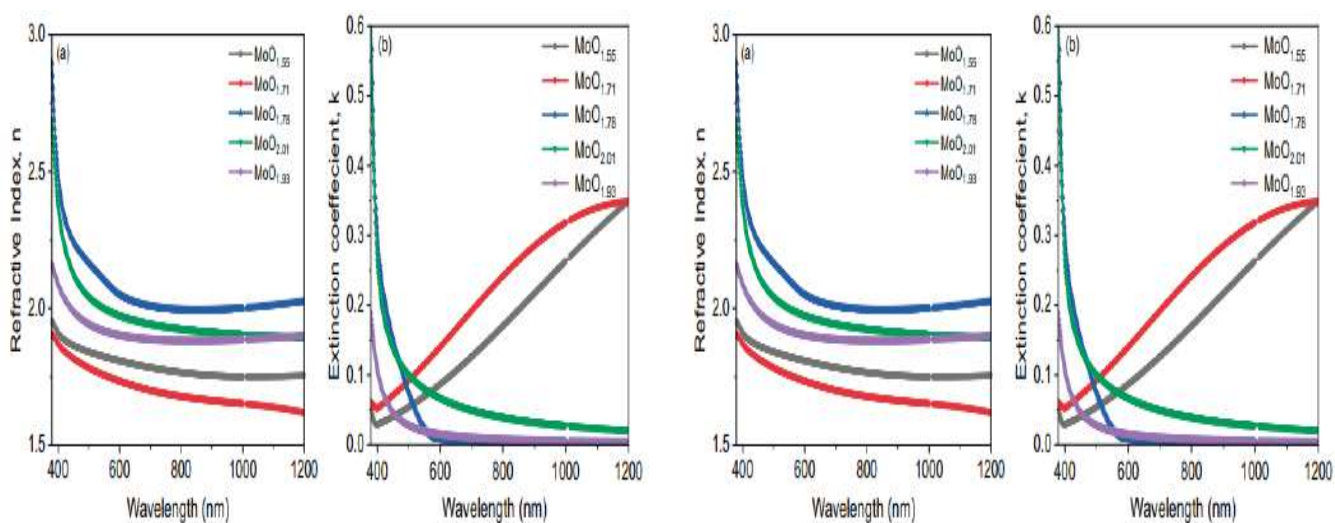


Figure 4.3: Dispersion of refractive index and extinction coefficient obtained from fitting of the spectroscopic ellipsometry data

4.3 Exploring the technological application of $TiO_2:ZrO_2$ thin films as a dielectric for the electronic industry

In search for low cost passivation material for perovskite and inorganic solar cells, $TiO_2:ZrO_2$ thin

films were deposited on TiN/Si wafers by Chemical Beam Vapour Deposition technique. Morphological characterization and elementary analysis (Figure 4.4 and Figure 4.5) confirmed that the average grain size increases as the atomic ratio of Ti/Zr increases.

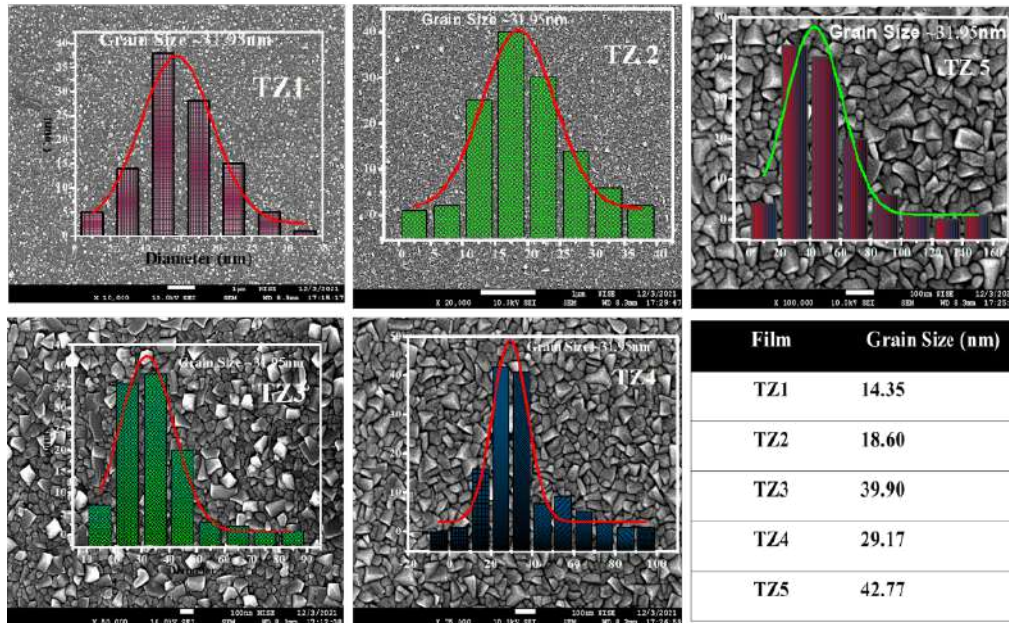


Figure 4.4: FESEM images of $TiO_2:ZrO_2$ thin films and corresponding grain size

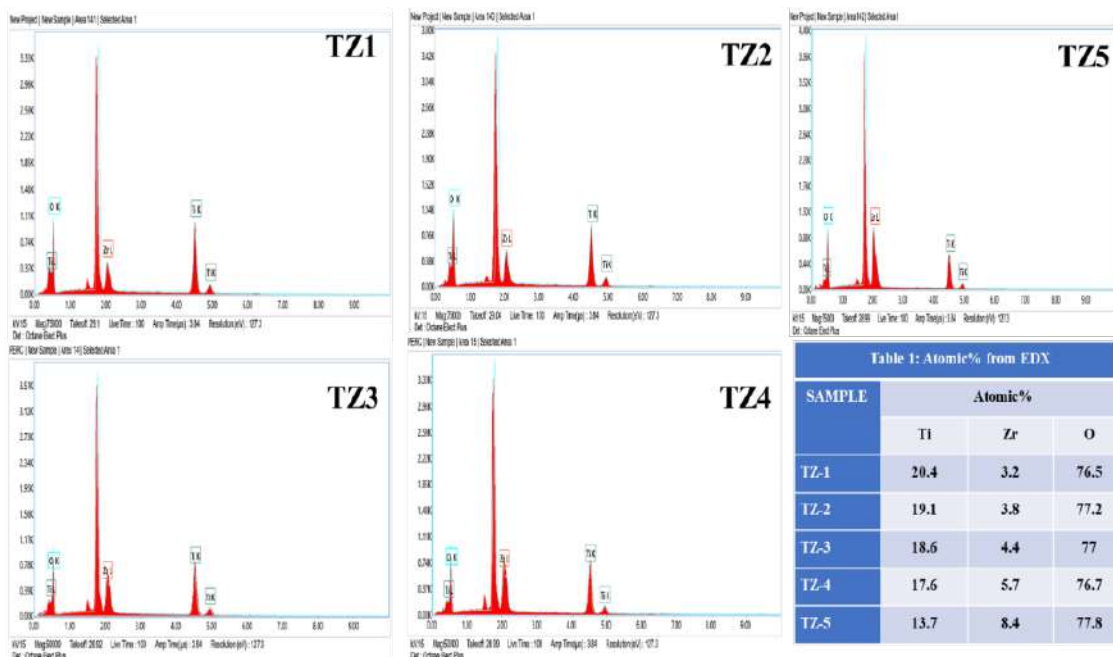


Figure 4.5: EDX spectra of the $TiO_2:ZrO_2$ thin films and table shows corresponding elementary analysis

The Energy Dispersive X-ray (EDX) spectroscopy of the films show the presence of titanium, zirconium, and oxygen in the synthesised samples. Table 4.1 shows the estimated thickness and

optical constants obtained through ellipsometric measurements of the thin films. The thickness of the thin films was found to be increased with an increase in the Ti/Zr ratio.

Table 4.1: Ti/Zr Atomic ratio, thickness, refractive index (n), extinction coefficient (k), ϵ_1 and ϵ_2 for $\text{TiO}_2\text{:ZrO}_2$ thin films

SAMPLE	Atomic% Ti/Zr	Thickness	n at 540	k at 540	ϵ_1 at 540	ϵ_2 at 540
TZ-1	6.375	431.02	2.495	0.000933	6.22640	0.00465
TZ-2	5.026	399.65	2.453	2.60E-04	6.01718	0.00128
TZ-3	4.227	379.65	2.452	0.015988	6.01530	0.07842
TZ-4	3.087	332.54	2.441	0.007986	5.95905	0.03899
TZ-5	1.630	295.96	2.425	0.000004	5.88498	0.00001

As the Ti/Zr atomic ratio increases, the real part of refractive index and dielectric constant increases and while the imaginary parts (absorption) first show a slight increase, after which it decreases as the Ti/Zr atomic ratio increases further (Figure 4.6). A similar trend is followed for the dielectric constant of all samples (real part ϵ_1 and imaginary

part ϵ_2). This research work established that by adjusting the thickness, surface texture, and permeability, the $\text{TiO}_2\text{:ZrO}_2$ thin films not only be employed for the surface passivation layer but also could be employed in the fabrication of sensors and diagnostic optical methodologies.

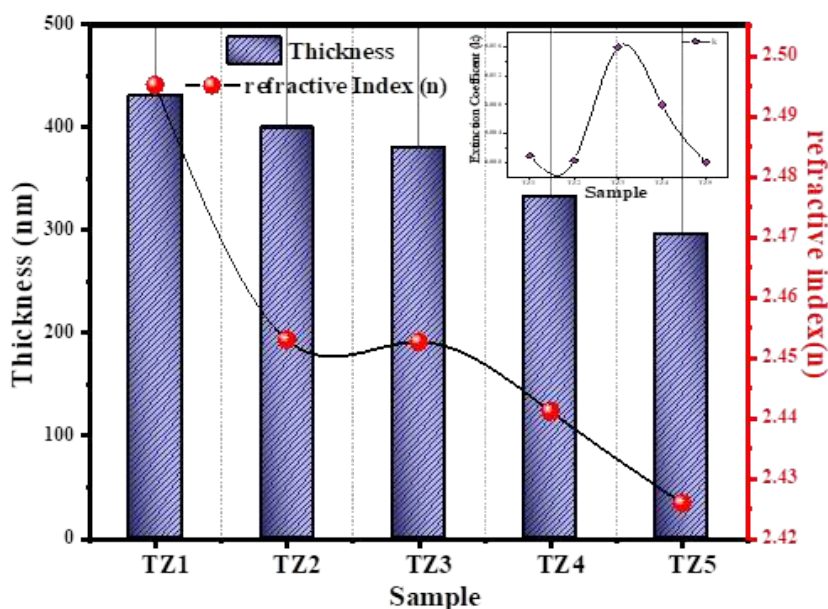


Figure 4.6: Variation of refractive index with thickness for the $\text{TiO}_2\text{:ZrO}_2$ thin films. Inset shows the variation of extinction co-efficient with thickness of the thin films

4.4 Design, Development and Qualification of Large Area (156 mm X 156 mm) Secondary Reference Solar Cells - sponsored by DST

The project aims to, design and develop a large-area (156 mm x 156 mm) secondary reference solar cell, conduct rigorous acceptance testing in line with international standards, and replicate

this process to produce at least ten additional reference solar cells. This initiative will support the Indian PV industry under the “Make in India” program, promoting import substitution and saving foreign exchange.

The team has designed and developed an anodized aluminum casing to house the reference solar cell. Figure 4.7 illustrates the reference solar cell developed at NISE.



Figure 4.7: Developed reference solar cell

As part of this project, a study is underway to optimize stabilization protocols for the reference solar cells, involving techniques such as illumination under load, biasing at the maximum power point (V_m), and exposure under open-circuit

conditions. Various stress tests are being applied to assess stability, with Figure 4.8 displaying the spectral response of four reference solar cells subjected to distinct stress conditions.

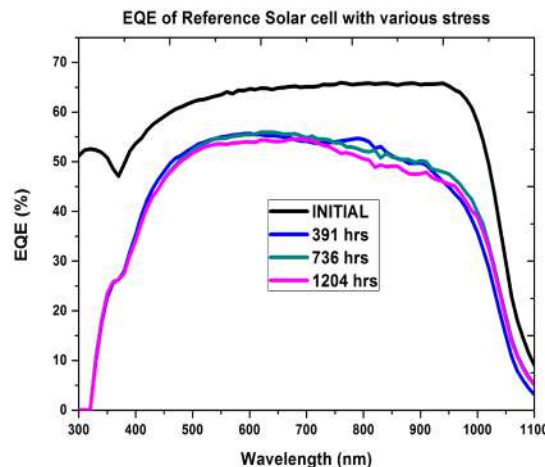


Figure 4.8: EQE of reference solar cells after different stresses

4.5 I-V translation of Bifacial PV module

The performance of bifacial photovoltaic (PV) modules is significantly impacted by a range of environmental parameters, including albedo, temperature, installation height, and related factors. To enable accurate health assessment of bifacial PV modules and reliable energy yield estimation within PV power plants, accurate translation procedures are essential. This process involves adjusting current-voltage (I-V) measurements acquired under varied irradiance conditions—capturing contributions from the front, rear, and combined sides of the bifacial PV module—alongside differing temperature scenarios in both outdoor and indoor environments. These measurements are subsequently standardized to STC (standard test conditions) or any other reference conditions to ensure consistency in performance evaluation and predictive modelling across diverse operational settings.

This study evaluates the performance of a bifacial PERC PV coupon module under indoor conditions with varied front and fixed rear irradiation levels. Deviations were observed when comparing measured results to calculated values following IEC TS 60904-1-2 standards, with 24% deviation at lower and 9% at higher irradiance levels. Recognizing real-world exposure to diverse spectrums, EQE and Spectral Mismatch Factor (MMF) were measured and incorporated, adjusting the calculation formula. This modification significantly reduced deviation to 10% at lower and 3% at higher irradiation, enhancing accuracy. Figure 4.9 presents comparative power generation results under the different formula adjustments.

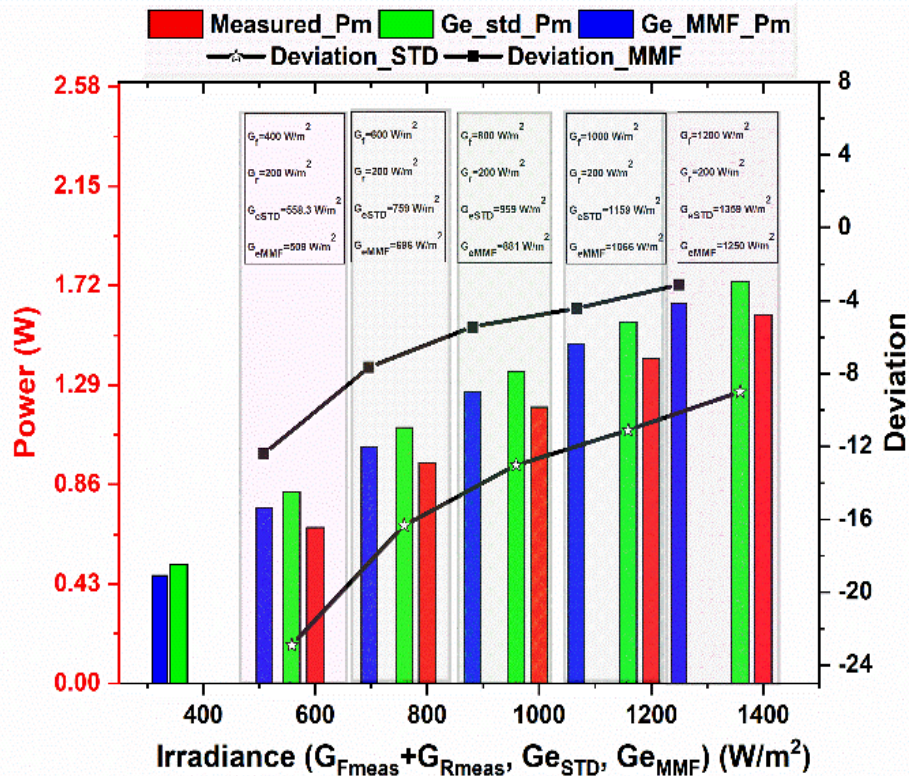


Figure 4.9: Power generation estimated with the GE defined in IEC 60904-1-2, modified GE including MMF and their comparison with power generated during simultaneous illumination.

4.6 Microscopic analysis of degraded module

A microscopic analysis of over 20-year-old PV modules has been conducted to evaluate their reusability and recyclability post-lifetime. This analysis involved peeling cells from the modules and examining I-V characteristics, transmission losses across various layers, and External Quantum Efficiency measurements. The study also compared the encapsulation material’s condition

after two decades to that of new encapsulant materials. These evaluations reveal detailed insights into the type and location of degradation at the microscopic level, essential for developing an effective PV module reuse and recycling policy. Figure 4.10 shows the adhesive strength between polymeric materials bonded to back sheet of the PV module. It has been observed that the peel strength reduced of the polymeric material with the time of exposure in the field.

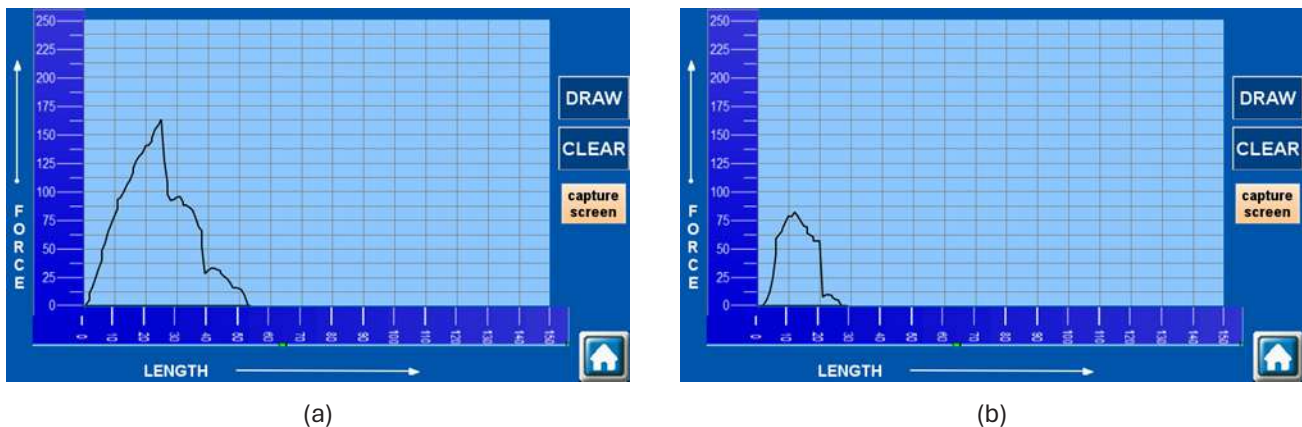


Figure 4.10. (a) Adhesion strength of encapsulant material of new module tested as per IEC 61730, (b) Adhesion strength of encapsulant material of old module tested as per IEC 61730

4.7 Formulation of re-using guideline for secondary use of PV module

Reusing PV modules can be a sustainable and cost-effective approach, especially in a country like India, where energy demand is increasing

rapidly. A methodology is formulated to choose the PV modules for reusing after its lifetime as declared by the manufacturer. A flow chart to choose the PV modules for reusing and recycling is shown in Figure 4.11.

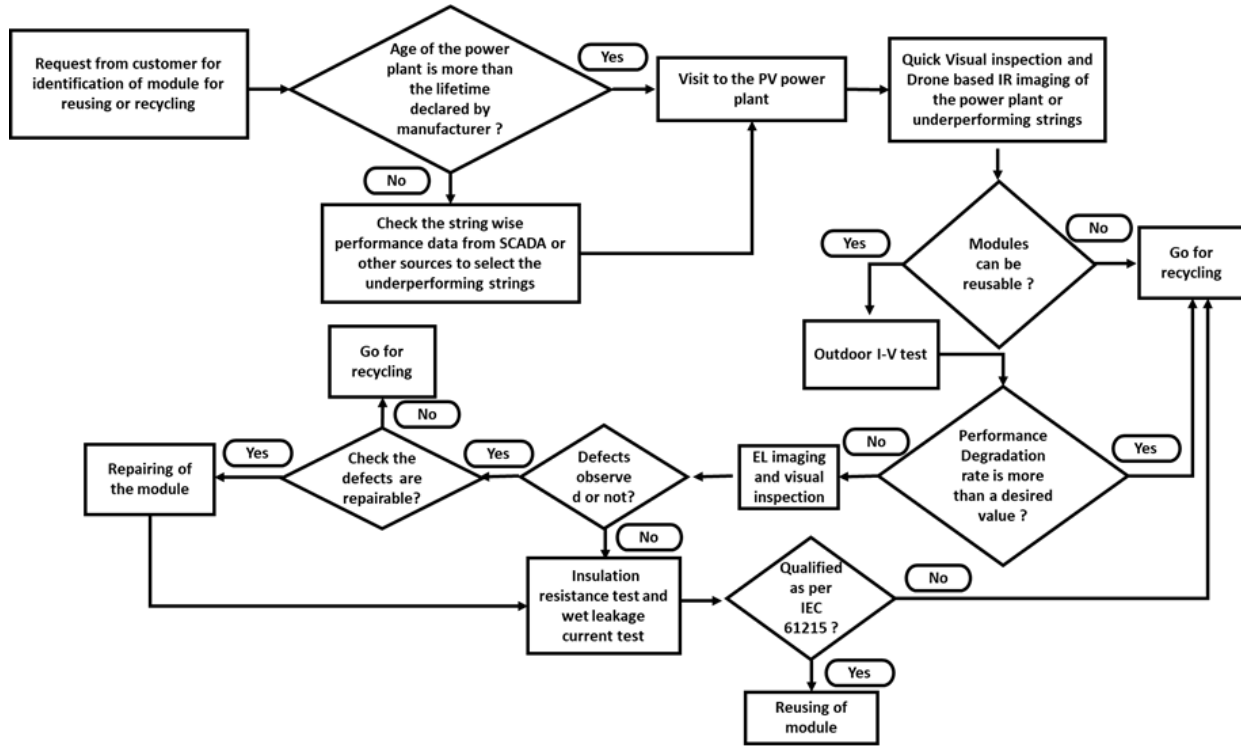


Figure 4.11: Flow chart of module selection methodology

4.8 Applications of machine learning for Solar Module Temperature Predictions

A simulation work has been carried out on the prediction of module temperature by using machine learning algorithms such as Linear Regression, Random Forest, and XGBoost. The study used historical data from three different solar technology modules such as crystalline silicon, HIT (Heterojunction with Intrinsic Thin-layer), and amorphous silicon installed at NISE. Figure 4.12 shows the feature importance of different meteorological variables on module temperature for amorphous Silicon module technology.

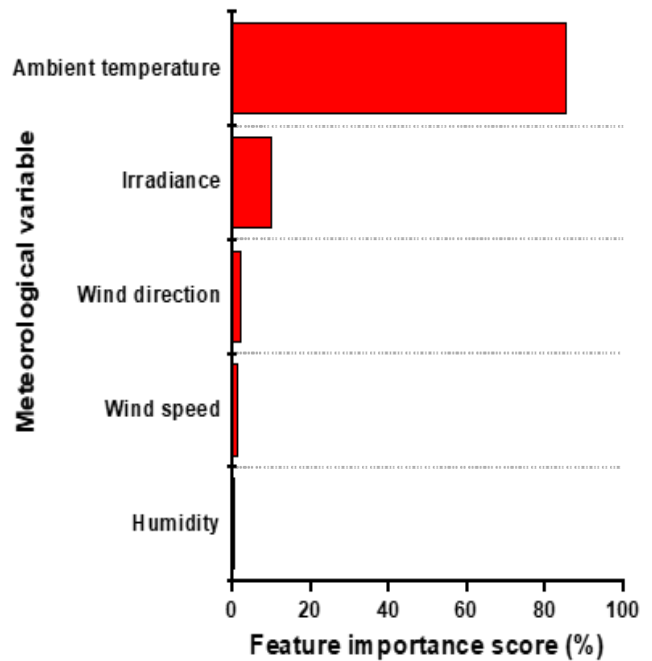


Figure 4.12: Feature importance on module temperature for amorphous Silicon

4.9 Ground Mounted Solar PV Potential Assessment

India is one of the world’s most promising regions for solar energy development considering its vast solar energy resource availability throughout the year. The country’s geographic location, spanning from the Himalayan foothills to the coastal plains, provides an extensive range of solar insolation levels, averaging between 3.5-5.9 kWh/m²/day. Recognizing this potential, NISE has developed an advanced methodology for assessing ground-mounted solar potential. This initiative is part of India’s broader efforts to achieve ambitious renewable energy targets, including 500 GW by 2030, and ultimately energy independence and net-zero carbon emissions by 2070.

Building on previous assessments of 2014, it incorporates new methodologies and more accurate data. The earlier solar potential assessment, conducted in 2014, was based on the assumptions and data available at that

time. Recognizing the need for a more accurate and updated analysis, NISE has adopted a new methodology for this assessment.

The updated approach leverages advanced tools and refined parameters to provide a more accurate and comprehensive analysis.

To study the terrain features, NISE worked on the digital elevation model data from the National Remote Sensing Centre (NRSC), based on which the slope and aspect maps of India have been developed and are shown in Figure 4.13 and Figure 4.14, respectively.

NISE is working on the rest of the data sets for feasibility assessment of the regions which includes solar irradiance, slope and aspect, infrastructural proximity, and land use to determine the overall viability of potential solar sites. This comprehensive approach ensures that selected sites are not only technically suitable but also economically and environmentally sustainable.

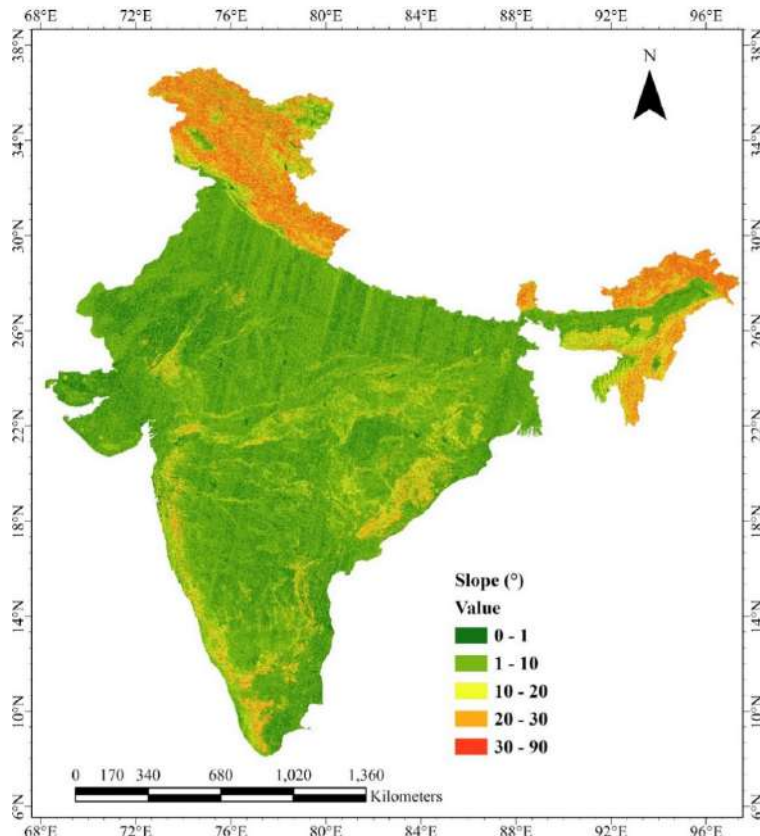


Figure 4.13: The map of the slope developed from the digital elevation model (DEM) of NRSC

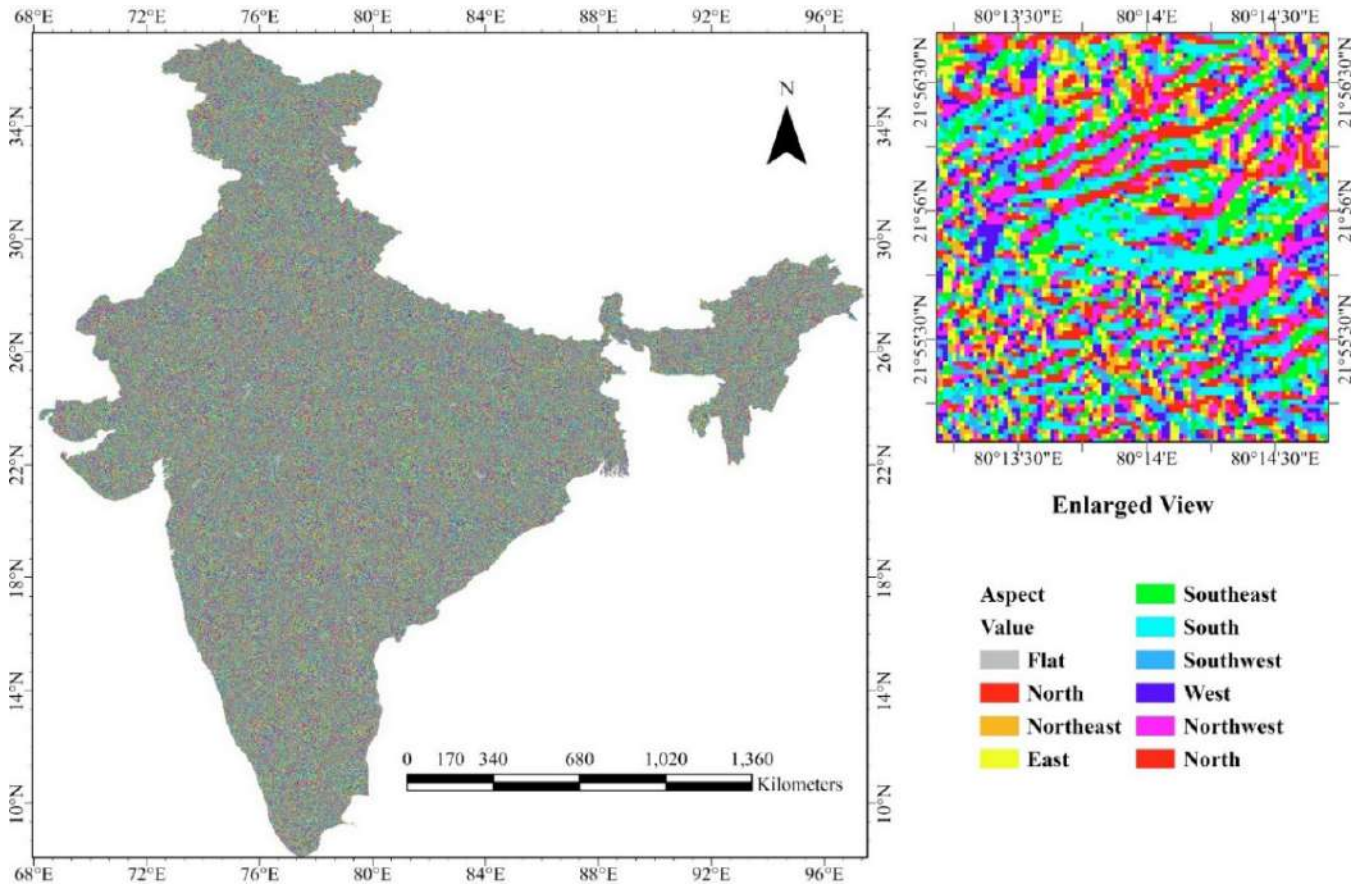


Figure 4.14: The map of the aspect developed from the digital elevation model (DEM) of NRSC

4.10 Solar cooking with Energy Storage System

The Indoor Solar Cooking System with Thermal Energy Storage is designed to support continuous cooking activities around the clock. This innovative system captures solar energy to cook meals efficiently during the day when sunlight is available. Excess thermal energy collected from the sun is stored in a thermal energy storage unit, which

retains heat for use during off-sunshine cooking hours. This approach ensures that cooking can be carried out at any time, regardless of weather conditions, and optimizes the use of solar energy (Figure 4.15)

By integrating solar energy with advanced thermal energy storage, the system provides a reliable and sustainable solution for indoor cooking needs, minimizing the dependency on conventional energy sources and reducing environmental impact.



Figure 4.15: (a) Indoor Solar Cooking System with Thermal Energy Storage developed at NISE, (b) Food prepared using the system (left to right: poha, porridge, rice, vegetable pulao)

4.11 Solar Cabin with Thermal Energy Storage

NISE is currently developing an advanced solar space heating system designed specifically for warming the rooms and cabins in the colder regions of Himalayan mountains. This technology harnesses the power of solar PV panels to generate heat, which is then stored in a cost-effective, sand-based thermal battery. During the day, the system collects and accumulates heat in the sand, which can later be released to provide warmth during the night or on cloudy days when sunlight is unavailable (Figure 4.16).

This innovative heating solution is notable for its environmental benefits, operating with zero greenhouse gas emissions and minimal air pollution. By utilizing renewable energy from

the sun, this system offers a sustainable and eco-friendly alternative to conventional heating methods.

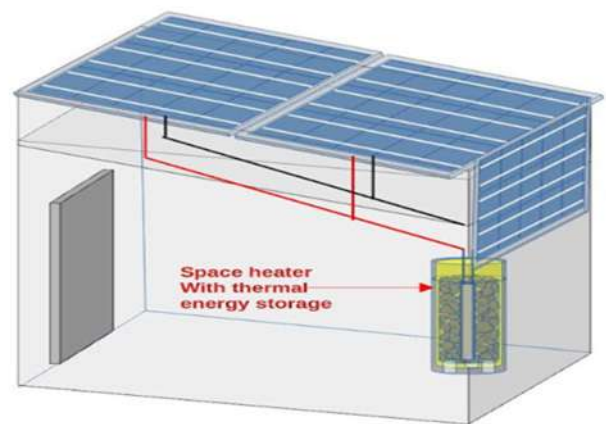


Figure 4.16: Schematic of Solar Cabin with Thermal Energy Storage

4.12 Solar Powered Micro-Irrigation

This innovative project aims to demonstrate the effectiveness of using solar energy to power micro-irrigation systems, promoting sustainable agricultural practices and efficient water usage. In collaboration with M/s. Spowdi, India, a solar-powered micro-irrigation farm has been set up at NISE. This project serves as a real-world demonstration of how renewable energy can enhance agricultural productivity while conserving vital resources like water. To evaluate system efficiency and collect information for next upgrades, real-time monitoring of water consumption, temperature, humidity, solar energy output, and multi-crop yield (including vegetables like cabbage, tomatoes, chilies, radish, turnips, okra, etc.) is being carried out. The average pump run time is 90 minutes to irrigate the complete cropping area 352 sq. meter. This system is ideal for farms with up to one-acre size because it is lightweight, portable, and simple to install.



Figure 4.17: Solar based micro-irrigation farm at NISE

4.13 Centre of Excellence on Hydrogen Energy at National Institute of Solar Energy (NISE), Gwal Pahari, Haryana sponsored by MNRE

An RD&D Project entitled “Setting Up of a Centre of Excellence on Hydrogen Energy at National Institute of Solar Energy (NISE), Gwal Pahari, Haryana” was sanctioned by MNRE on 28th

February 2019. The main objective of the project was to operate and maintain the existing solar powered green hydrogen generation and dispensing station already established at NISE campus. The project also included augmenting green hydrogen production capacity by setting up an additional 10 Nm³/hr electrolyser. With this NISE’s total hydrogen production capacity will increase to a total of 15 Nm³/hr (about 1.35 kg/hr). During the year, the new electrolyser has been commissioned and is being integrated to the existing dispensing station.

4.14 List of Publications

I. Journals:

1. **“A Mathematical Model of Threshold Solar Irradiance for Computing the Quality Hours of Sunshine,”** Nikhil P G, S.K. Singh, J Prakash, U Sahoo, M Ravi and C Banerjee: International Journal of Renewable Energy Research Vol.13, No.1, (2023) 344-357.
2. **“Tuning of structural and optical properties of reactively sputtered MoO_x films”,** A Kumar, M Dutta, S Tomer, P Rao, Vandana, SK Srivastava, SN Singh and P Pathi, Journal of Materials Science: Materials in Electronics 35 (8), (2024) 612.
3. **“Interface study of molybdenum oxide thin films on n-and p-type crystalline silicon surface”,** A Kumar, Vandana, M Dutta, SK Srivastava and P Pathi, Journal of Materials Science: Materials in Electronics 35 (7), (2024) 472.
4. **“Study of silicon surface passivation by ZnO_x/AlO_x stack prepared using super-cycle approach in Thermal ALD process”,** A Kumar, M Devi, S Tomer, M Dutta and P Pathi, Surfaces and Interfaces, (2024) 104127.

5. **“Effectual visible-driven photocatalytic performances on brilliant green dye by reduced graphene oxide–zinc oxide nanocomposite”**, P Yadav, I Kapil, M Dutta and A Bhaduri, *Ionics*, (2024) 1-11.
6. **“Optical Properties of One Pot Synthesized Porous, Monodisperse, Size-Controlled Silica Particles: Effect of Tetra Alkoxysilane Addition Rate”**, A Saini, H Negi, A Srivastava, SK Srivastava, P Pathi and M Dutta, *Silicon*, (2024) 1-12.
7. **“Diameter and gap controlled fabrication of periodic SiMW/SiNW arrays: A broadband absorber for high efficiency silicon solar cell”**, D Rani, A Kumar, A Saini, D Singh, N Joshi, RK Verma, M Dutta and A. Samanta, *Optical Materials* 145 (2023) 114483.
8. **“A novel analytical method for determination of diode parameters from the dark forward I–V characteristics of a silicon solar cell”**, A Kumar, SN Singh, S Tomer, SK Srivastava, M Dutta and P Pathi, *Physica Scripta* 98 (9), (2023) 090001.
9. **“Influence of outdoor conditions on PV module performance – an overview”**, Leqi Lin, B Bora, B Prasad, OS Sastry, S Monda, NM Ravindra, *Material Sci & Eng.* 7(2), (2023) 88-101.
10. **“Design and fabrication of a solar power operated cooking device for softening of tasar cocoons”**, ZMS Khan, D. Chattopadhyay, S. K. Behera, A. Kumar and U Sahoo. *Indian Journal of Fibre & Textile Research*, 48 (2023) 353-3581.
11. **“Mini-Review on Hybrid Solar Powered Adsorption Chiller for Cooling and Water Heating Application,”** Hitesh B, Bharat R, Siva Reddy V, *Tanz Research Journal* 10 (3), (2024) 126-133.
12. **“Experimental investigation of an innovative solar dryer integrated with the thermal energy storage system,”** Y Singh, V Yadav, U Sahoo, A Malan, S Kumar, AK Tripathi, R Kumar, *International Journal of Ambient Energy* 44 (1), (2023) 1969-1979.
13. **“Recent trends and applications of evacuated tube solar collector in food processing and air heating: a review,”** S Malakar, VK Arora, PK Nema, V Yadav, *Environmental Science and Pollution Research* 31 (12), (2024) 18119-18142, .

II. Conference

1. **“Secondary Batteries for Sustainable Energy: A Comprehensive Review of the Indian Landscape,”** D Bose, A Gupta, S Tiwari, D Yadav and V Sharma, 2024 International Conference on Social and Sustainable Innovations in Technology and Engineering (SASI-ITE), Tadepalligudem, India, 2024, pp. 413-417.
2. **“Scenario of Solar Photovoltaic Water Pumping System”**, Aravind Kumar M, C Stephen, R Parmar, and C Banerjee, Global Conference on Decarbonizing India, organized by PSG College of Technology, Coimbatore, December 15-16, 2023.
3. **“Tailoring of Interface Quality of MoOx/Si Solar Cells”**, A Kumar, S Tomer, SK Srivastava, M Dutta and P Pathi, *Silicon PV Conference Proceedings* 1, 2023.

III. Book Chapters

1. **“Challenges in Implementation of the Solar Water Pumps in Rural Agricultural Areas”** R Parmar, 2023, Handbook of Energy Management in Agriculture. Springer, Singapore.
2. **“Machine Learning for Renewable Energy”, Renewable Energy and AI for Sustainable Development**, A Dhanasekaran, C Stephen, R Parmar, J Vishnupriyan, AJ Paul, K Ibrahim Denka, CRC Press, pp. 161-196, 2023.

4.15 Patents

1. “Solar powered cooking system,” Patent No. 491539 granted on 29.12.2023
2. “Method to de-sulphate lead acid battery electrodes in a solar power charging circuit,” Patent No. 490382 granted on 28.12.2023
3. “Solar drier cum space heating system,” Patent No. 470844 granted on 21.11.2023
4. “Surface texturization of glass to improve the light management in superstrate type thin film solar cell,” Patent No. 461554 granted on 23.10.2023
5. “Textured glass substrate for thin film solar cell,” Patent No. 492596 granted on 01.01.2024.



Industrial Research and Technical Consultancy

Industrial Research and Technical Consultancy division at NISE, stands as a cornerstone for advancing solar technology implementation across industry, for private and government sectors. As a dedicated knowledge hub, NISE is committed to fostering widespread adoption of state of the art solar technologies through our tailored consultancy services with high standard of quality.

Our expert team supports solar industry professionals, developers, and technology users in various technical aspects, ensuring the best outcomes. The following are the technical services, not limited to, offered by NISE:

- **Feasibility studies:** Technical studies analysing the implementation of Solar PV, Solar thermal and Green Hydrogen projects to evaluate the project viability and success.
- **Performance Assessment & Troubleshooting:** Health check-up of existing solar PV power plants (with and without storage), including field level testing, measurements, calibrations and due diligence studies to optimize solar system performance.
- **Technical Audits:** Technical audit and quality control of solar PV power plants including the checks on the installation and commissioning. The technical audits also include manufacturing facilities for PV module.
- **Industrial Research Collaborations:** Research and developmental support to PV module and cell manufacturers in new and advance product development. Partner for research collaborations to solve industrial challenges, and also to address those challenges which have social impact.
- **Solar Energy Forecasting and Potential**

Assessment: Numerical approach for forecasting of solar energy can be provided. Technical support to assess the Solar PV potential for specific geographical boundary is also provided.

- **Solarization of Processes & Applications:** Innovative technology propositions for integrating solar thermal solutions into industrial processes.
- **Verification and Vetting:** NISE can be the technical partner in reviewing and vetting the technical submissions involved in the implementation of the solar projects, ensuring the required compliances as per the applicable standards.

In the year 2023-24, NISE has carried out field level inspection and testing for various solar projects (Figure 5.1, Figure 5.2 and Figure 5.4). A total of 12 number of technical consultancy assignments were carried out/ ongoing during the year 2023-24. Feasibility studies on solarizing government buildings were also carried out. A technical evaluation was also carried out for assessing the solarization in the Sanchi city.

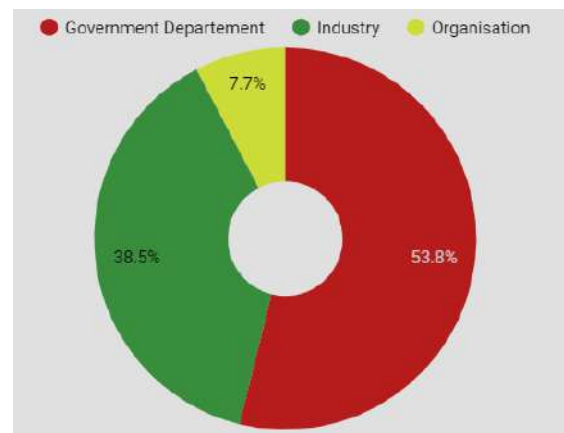


Figure 5.1: Percentage wise distribution of technical services offered to different clientele

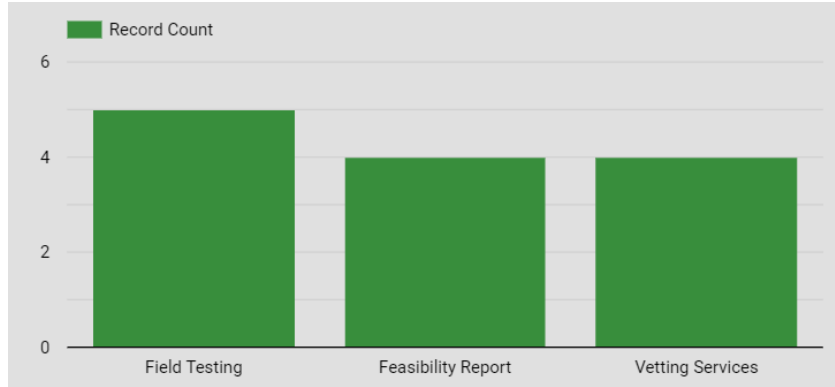


Figure 5.2: Type of technical services offered to different clientele

5.1 Key Projects

a. Development of green and climate resilient infrastructure through solarization in health care facilities (HCFs) in India

UNICEF has been exploring solar energy options to meet energy requirements in vaccine storage needs at various public health care facilities (PHFs) in India. NISE is partnering with UNICEF (India) for the implementation of solar based solutions for selected PHFs in India. The major specific objectives of this partnership include, a) Carrying out sample-based energy needs assessment of public health care facilities b) Providing technical assistance (to State Government/NCDC) for the implementation of solarization of select public health care facilities using the system designs developed. As a part of this project, field level data has been gathered for more than 100 PHFs. The project implementation is in progress at 60+ PHFs in the state of Uttar Pradesh. The implementation part is supported

under the scheme National Programme on Climate Change and Human Health (Ministry of Health and Family Welfare).

b. Implementation of qualitative requirements and technical acceptance for setting up of PV module manufacturing facility in India

Under this project, NISE extends technical support to Solar Energy Corporation of India (SECI) for verification and validating the qualitative and quantitative requirements of setting up 3000 MW solar PV cell and PV module manufacturing facility in India.

c. Technical Support in Solar PV parks

NISE has been providing technical support to Rewa Ultra Mega Solar Park Limited (RUMSL) for technical audit of the large scale ground mount solar PV power plants (approx. 1700 MW) during its commissioning stage. This activity includes verifications at the site, as well review of the technical documents submitted by various solar PV developers (Figure 5.3).



Figure 5.3: Technical audit of floating solar PV park



Figure 5.4: Field Testing of PV modules at Goa



Testing and Standardization Activities

6.1 Photovoltaic Testing and Calibration Facility

Testing of solar components and systems is essential for ensuring performance and safety by preventing electrical hazards such as shocks, short circuits, and fires. It verifies system efficiency and evaluates reliability under various environmental conditions, including extreme temperatures, humidity, and dust. Compliance testing ensures adherence to national and international safety standards, which is critical for market acceptance and legal approval. By identifying potential points of failure, testing enhances system robustness and design, ensuring consistent output and reliable performance. This process builds consumer confidence by validating product claims and supporting warranties, ultimately minimizing the risk of costly failures and maintenance issues.

The Photovoltaic Testing and Calibration Facility

at the National Institute of Solar Energy (NISE) is a laboratory dedicated to the testing of solar PV modules and system components in accordance with both national and international standards. Additionally, NISE is engaged in the standardization of various solar energy-related activities. Calibration of pyranometers, reference PV modules, and solar simulators are performed to enhance quality control in the country.

Our state-of-the-art facility is equipped with world class infrastructure, competent human resources, high-end test equipment and instruments. Both in-house and on-site facility is provided as per the requirement to further provide flexibility in terms of feasibility for overall quality control requirement of MNRE and product development. In addition to the routine testing the experimental and theoretical research projects with a view to promote development of quality solar allied products by the industry are also taken up.

Facilities:	Product categories:
<ul style="list-style-type: none"> • Qualification testing as per National (BIS), International standards (IEC/ EN/ ANSI/ LM), MNRE and In-house developed specifications • Quality benchmarking of Solar PV products • Environmental, Reliability, Ingress protection and Safety tests • Product developmental/ customised/ user-defined testing • Traceability measurement services • Pre and post Compliance Testing • Performance testing • Root-cause analysis 	<ul style="list-style-type: none"> • Radiation measurement devices • PV cells and module • Power Converters for use in Photovoltaic power systems • Batteries • Luminaries • Solar water pumping systems • Solar On-grid/ off-grid systems

6.2 Solar module testing facility

The performance and reliability testing of PV modules is crucial for several reasons:

- **Verification of nameplate and energy rating:** Testing PV modules at STC verifies their nameplate specifications and efficiency, helps estimate energy yield across various climates, and guides the selection of suitable module technology. The module test lab offers testing of PV modules of various technologies.
- **Long-term reliability testing:** PV module reliability tests simulate harsh environmental factors like UV radiation, temperature, humidity, and mechanical stress with accelerated conditions to assess durability, and this test lab has the capability to simulate these environmental stresses.
- **Safety assurance:** PV modules must operate safely without electrical hazards or physical risks, requiring checks for short circuits, ground faults, and structural integrity, all of which this test lab can perform according to various standards.
- **Customer confidence & warranty support:** By conducting performance and reliability tests while maintaining traceability per NABL/ BIS requirements, this lab instils customer confidence in PV modules for power plants, measures degradation rates for warranty assessments, and potentially facilitates warranty benefits from manufacturers in cases of significant degradation
- **Compliance as per QCO of MNRE and BIS:** This lab also has the capability of doing tests of PV modules as per the quality control order of MNRE/BIS for legal acceptance.

Table 6.1: List of test standards followed by Module test lab at NISE

IEC 61215-1-1: 2016/ IS 14286-1-1: 2019 & IEC 61215-1-1: 2021	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 1-1: Special requirements for testing of crystalline silicon photovoltaic (PV) modules
IEC 61215-1-2: 2016/IS 14286-1-2: 2019 & IEC 61215-1-2: 2021	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 1-2: Special requirements for testing of thin-film Cadmium Telluride (CdTe) based photovoltaic (PV) modules
IEC 61215-1-3: 2016/IS 14286-1-3: 2019 & IEC 61215-1-2: 2021	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 1-3: Special requirements for testing of thin-film amorphous silicon based photovoltaic (PV) modules
IEC 61215-1-4: 2016/IS 14286-1-4: 2019 & IEC 61215-1-2: 2021	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 1-4: Special requirements for testing of thin-film Cu(In,Ga)(S,Se) ₂ based photovoltaic (PV) modules
IS/IEC 61730-1: 2016 & IEC 61730-1: 2023	Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction
IS/IEC 61730-1: 2016 & IEC 61730-2: 2023	Photovoltaic (PV) module safety qualification - Part 2: Requirements for testing
IEC 61701: 2011 & IEC 61701:2020	Salt mist corrosion testing of photovoltaic (PV) modules

IEC 61853-1: 2011 & 61853-2: 2016, 61853-3: 2018, & 61853-4: 2018	Photovoltaic (PV) module performance testing and energy rating - Part 1, 2, 3 & 4: Irradiance and temperature performance measurements, power rating, Spectral responsivity, incidence angle and module operating temperature measurements, Energy rating of PV modules, Standard reference climatic profiles PAN file generation & IAM profile
IEC TS 62804-1:2015	Photovoltaic (PV) modules - Test methods for the detection of potential-induced degradation - Part 1: Crystalline silicon
IEC TS 62804-1-1:2020	Photovoltaic (PV) modules - Test methods for the detection of potential-induced degradation - Part 1-1: Crystalline silicon - Delamination
IEC TS 62804-2:2022	Photovoltaic (PV) modules - Test methods for the detection of potential-induced degradation - Part 2: Thin-film
IEC TS 60904-1-2:2019	Photovoltaic devices - Part 1-2: Measurement of current-voltage characteristics of bifacial photovoltaic (PV) devices
In-house test procedure	Testing of PV Module cleaning devices as per Test procedure developed by NISE
IEC TS 63342:2022	C-Si photovoltaic (PV) modules - Light and elevated temperature induced degradation (LETID) test - Detection
IEC 63202-1: 2019 (module also)	Photovoltaic cells - Part 1: Measurement of light-induced degradation of crystalline silicon photovoltaic cells
IEC TS 62782:2016	Photovoltaic (PV) modules - Cyclic (dynamic) mechanical load testing
In-house test procedure	Testing as per customer requirement for different products related to solar PV: Nano-coating, Quantum boost device
In-house test procedure	Long term field exposure test of PV modules
In-house test procedure	Qualification plus testing, Bankability testing of PV module in the lab as per customer requirement
IEC 60904-1: 2020	Photovoltaic devices - Part 1: Measurement of photovoltaic current-voltage characteristics
IEC 60904-1-1:2017	Photovoltaic devices - Part 1-1: Measurement of current-voltage characteristics of multi-junction photovoltaic (PV) devices
IEC 60904-7:2019	Photovoltaic devices - Part 7: Computation of the spectral mismatch correction for measurements of photovoltaic devices
IEC 60904-8: 2014	Photovoltaic devices - Part 8: Measurement of spectral responsivity of a photovoltaic (PV) device
IEC 60904-9: 2020	Photovoltaic devices - Part 9: Classification of solar simulator characteristics
IEC 60904-10: 2020	Photovoltaic devices - Part 10: Methods of linear dependence and linearity measurements
IEC 60529: 2013	Degrees of protection provided by enclosures (IP Code)

NISE is also capable of provide services for calibration of PV module as per IEC 60904 for different technologies. NISE has developed a portable facility and methodology for the calibration of Solar Simulators as per IEC 60904-9.

NISE has the capability of testing PV module in outdoor condition also. The following tests can be done by the module test lab:

- **Outdoor performance test of PV module:** The performance of the PV module is measured at different irradiance & temperature conditions and then translated to STC or any other reference conditions by following standard IEC 60891: 2021
- **Long term outdoor performance and reliability measurement of PV module:** NISE has the capability to do the long term performance & reliability testing of PV module technologies as per IEC 61724-1:2021, IEC TS 61724-2: 2016 & IEC 61724-3: 2016. Based on this analysis both initial degradation (how much performance drops right after installation) and long-term degradation rates

(ongoing efficiency loss due to factors like temperature, UV exposure, humidity, and other climatic stresses) can be estimated.

- **Grid-tied and Off-grid PV system on-field testing:** NISE has the capability to test both grid-tied and off-grid solar systems in the field, adhering to various applicable standards. This field testing evaluates the performance and reliability of solar power systems under real-world conditions, which is critical for assessing the power plant health and evaluation of performance guarantee.

6.3 Solar Photovoltaic Power Converter testing

NISE can test and evaluate the capacity of solar power conditioning units (PCUs) , ranging up to 100 kVA, for all the parameters mentioned above. All types of PCUs, hybrid, standalone, Grid-tied inverters (GI), MPPT, Solar Charge controllers and pump controllers, can be evaluated for their performance and reliability as per the following standards:

Table 6.2: List of test standards followed by Power converter testing lab at NISE

IEC/IS 61683: 1999	Photovoltaic systems-Power Conditioners-Procedure for measuring efficiency
IEC 62891:2020/ IS 17980/ EN 50530	Maximum power point tracking efficiency of grid connected photovoltaic inverters
IEC 62116: 2014/ IS 16169: 2014	Test procedure of islanding prevention measures for utility-interconnected photovoltaic inverters
IEC 62109-1: 2010/ IS 16221-1: 2016	Safety of power converters for use in photovoltaic power systems - Part 1: General requirements
IEC 62109-2: 2011/ IS 16221-2: 2015	Safety of power converters for use in photovoltaic power systems - Part 2: Particular requirements for inverters
IEC 62509: 2010/IS 16797: 2019	Battery charge controllers for photovoltaic systems - Performance and functioning
IEC 61727: 2004	Photovoltaic (PV) systems - Characteristics of the utility interface
IEC 60068-2-1: 2007	Environmental testing - Part 2-1: Tests - Test A: Cold
IEC 60068-2-2: 2007	Environmental testing - Part 2-2: Tests - Test B: Dry heat
IEC 60068-2-14; 2023	Environmental testing - Part 2-14: Tests - Test N: Change of temperature
IEC 60068-2-30: 2005	Environmental testing- Part 2-30: Tests - Test Db: Damp heat, cyclic (12 + 12 h cycle)
IEC 60529: 2013	Degrees of protection provided by enclosures (IP Code)

NISE is capable of doing performance testing complete off-grid systems such as Solar induction cooker, solar atta chakki, e-rickshaw, etc. The testing result will include the storage autonomy, battery pack testing, Safety & protection testing, & Control strategy as per different applicable standards.

6.4 Battery test lab

The battery testing and characterization facility is engaged in performance and reliability testing of major secondary battery technologies according

to relevant national and international standards for various capacities. Battery technologies including Lead Acid (All types), Lithium Ion (All salts), NiMH - Nickel Metal hydride, NiCd - Nickel Cadmium, and Nickel Iron can be tested by the lab as standards listed at Table 6.3.

6.5 Solar light testing facility

This test facility is engaged in the performance, reliability testing & validation of Solar Lighting & other systems as per National & International standards.

Table 6.3: List of test standards followed by Battery testing lab at NISE

IS 16270:2014	Secondary cells and batteries for solar PV application- general requirements and methods of test
IS 1651:1991	Stationary cells and batteries, lead-acid type (with tubular positive plates) - specification
IS 13369:1992	Stationary lead acid batteries (with Tubular positive plates) in Monobloc Containers
IS 15549:2005	Stationary Valve Regulated Lead Acid Batteries- Specification
IEC 61427-1: 2013	Secondary cells and batteries for renewable energy storage: General requirements and methods of test-Part-1: Photovoltaic off grid application
IS 16047 (Part3):2018 / IEC 61960-3: 2017	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for portable applications - Part 3: Prismatic and cylindrical lithium secondary cells and batteries made from them
IEC 60529: 2013	Degrees of protection provided by enclosures (IP Code)

Table 6.4: List of test standards followed by Solar light testing lab at NISE

MNRE specifications	MNRE Technical Specifications for White LED (W-LED) based Solar Photovoltaic Lighting systems (Lantern, Home lighting system, Street Lighting System, Torch and Task Light etc.).
Other SNA specifications	BREDA, JREDA, HREDA, PEDDA etc.
IEC 62509: 2010/ IS 16797: 2019	Battery charge controllers for photovoltaic systems - Performance and functioning
LM 79/IS 16106: 2012	Method of electrical and photometric Measurements of solid state Lighting (led) products
IEC 60529: 2013	Degrees of protection provided by enclosures (IP Code)

6.6 Solar Water Pump Test Facility

NISE is equipped to test a wide range of pumps, including both AC and DC models, as well as submersible and surface pumps, with capacities from 0.5 hp to 50 hp. This testing capability is supported by a versatile test rig that accommodates different pipe sizes, following BIS standards and MNRE guidelines. NISE operates two distinct pump testing facilities:

- Accommodates pipe sizes of 1, 2, 2.5, and 3 inches, with the pump head adjustable up to 100 meters.
- For 2-inch pipe sizes, the head can be maintained up to 150 meters, and for pipe sizes of 3, 4, and 6 inches, it can be adjusted up to 400 meters.

Table 6.5: List of test standards followed by Solar water pump testing lab at NISE

IS 17018 (PART 1): 2018	Solar photovoltaic water pumping systems- Centrifugal Pumps.
MNRE specification	Testing Procedure for Solar Photovoltaic Water Pumping System as per office memorandum of MNRE (F. No. 41/3/2018-SPV Division dated 02.02.2023)
IEC 60529: 2013	Degrees of protection provided by enclosures (IP Code)
IEC 62253: 2011	Photovoltaic pumping systems - Design qualification and performance measurements

6.7 Solar Cell Testing Facility

NISE can do testing of solar cells of different technologies up to size 6 inch X 6 inch by the following standards:

- IEC 60904-3: 2019 Photovoltaic devices - Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data
- IEC 60904-8: 2014 Photovoltaic devices - Part 8: Measurement of spectral responsivity of a photovoltaic (PV) device

6.8 Testing of Solar Powered Cold Storage:

The Solar Thermal Division possesses the capability to conduct testing of solar cold storage systems incorporating thermal energy storage. The division can assess the following parameters:

- Storage capacity of the thermal energy storage system (measured in kWh)
- Cooling rates and the minimum achievable temperature within the cold storage unit
- Power requirements of auxiliary loads

- Testing of solar components and their operational functionality
- Performance evaluation using a solar photovoltaic (PV) array simulator-based approach

6.9 Calibration of Radiation measurement devices

The radiation measurement is a crucial parameter to check the quality of Solar power plants. The accuracy of any radiation measurement device depends on the degradation of the sensor used in the long run with respect to the environmental stress. Based on the degradation value the conversion factor of any radiation devices changes with time. There are mainly two types of radiation measurement device exist in the market: Thermopile based (pyranometer) & Solar cell based such as silicon cell-based device

The test facility at NISE is able to calibrate both the thermopile and solar cell-based radiation measurement device. The laboratory was established following the World Meteorological Organisation (WMO) guidelines, where calibration

was performed as per the ISO standards. It has a highly precise reference standard sensors such as the primary standard sensor/Absolute Cavity Radiometer (Highest Solar Radiation Standard) and a number of secondary standard reference sensors for achieving radiometric calibration traceable to the World Radiometric Reference (WRR) scale with high accuracy and precision. NISE sensors have been calibrated with world standard group at National Renewable Energy Laboratory, Colorado during Sep 2022. The calibration facility at NISE can now transfer the latest radiometer calibration factors to the radiometric sensors from industry. This test facility also offers onsite outdoor Calibration services for thermopile and silicone based pyranometers as per ISO 9847 (2023), traceable to WRC (World Radiometric Centre).

6.10 Standardization

NISE has given input to the different ministry of Government of India to ensure consistency, compatibility, safety, and quality of products and services in the field of solar energy. The development of robust policies based on testing and research and development (R&D) is crucial for ensuring the efficacy, safety, and quality of products and services. NISE has all these capabilities to full fill the requirement. Some of the policy inputs given by NISE is given below:

- **Quality control Order for Solar Systems, Devices and Components Goods:** NISE has

given input to MNRE regarding the QCO and series guidelines for PV module testing to enhance the efficacy time to time.

- **Policy related to Agrivoltaic power plant:** Officials from NISE is a member of the committee for drafting policy related to Agrivoltaic power plant in India. NISE has given technical inputs to MNRE for drafting policy in this regard.
- **BEE star label rating of PV modules for India:** NISE along with MNRE and IIT Bombay has developed the procedure for estimating BEE star label rating of PV modules for India. The same has already implemented by Bureau of Energy Efficiency.
- **‘Regulations for Construction of Renewable Energy Power Plants’ by CEA:** NISE has given technical inputs to the committee constructed by CEA for drafting ‘Regulations for Construction of Renewable Energy Power Plants’.
- **Reuse guidelines for PV module for secondary use:** NISE prepared the first draft of reuse guideline for secondary use of PV module after its lifetime declared by manufacturer and presented to MNRE.
- **PM-KUSUM Policy Support:** Provided inputs and recommendations to MNRE for the effective implementation and scaling up of the Pradhan Mantri - Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) scheme.



Implementation of Government Schemes and Programmes

7.1 Suryamitra Skill Development Program

In view of India's enhanced target of 280 GW of solar power by 2030, the Suryamitra training programme initiated by MNRE in 2015 was continued further to create skilled manpower for employment in installing, operating, commissioning, and maintaining solar power projects. The eligibility of the trainees for the training programme is minimum 10th pass + ITI (Electrical, Electronics, Civil, Mechanical, Fitter, Instrumentation, Welder). Upon completion of the training program, Suryamitras were offered positions such as technician,



supervisor, and managers in Solar PV industries and also an opportunity to emerge as an entrepreneur in the Solar PV Industry.

NISE has been the implementing body for this scheme and since inception a total of 56,507 Suryamitras have been trained as on 31st March 2024. Out of this, 4,858 Suryamitras were trained during FY 2023-24, through empaneled Training partners/Centres spread all over the country.

For FY 2024-25, NISE has invited an Expression of Interest (EoI) for empanelment of Training partners/Centres with a target of training 12,800 Suryamitras.



Figure 7.1: Suryamitra training programme batches

7.2 Approved List of Models and Manufacturers (ALMM)

In order to ensure reliability of Solar PV products and to protect the consumer interests and ensure better energy security of the country, MNRE on 02.01.2019, has issued "Approved Models and Manufacturers of Solar Photovoltaic Modules (Requirements for Compulsory Registration) Order, 2019". The order provides for the enlistment of eligible models

and manufacturers of solar PV cells and modules complying with the BIS Standards and publishes the same in a list called the "Approved List of Models and Manufacturers" (ALMM). Only the models and manufacturers included in this list are eligible for use in Government/ Government assisted Projects/ Projects under Government Schemes & Programs installed in the country, including Projects setup for the sale of electricity to the Government. NISE had been designated as the implementation support

agency for processing applications and carrying out inspections, verifications, and quality checks on behalf of MNRE.

During FY 2023-24, NISE conducted a total of 79 ALMM inspections against different applications of new plants, renewals, and capacity/model additions. As on March 2024, ALMM list included 83 PV module manufacturing plants with a cumulative

manufacturing capacity of 37.7 GW_p per year. Out of these 83 manufacturing plants, 19 have an installed manufacturing capacity greater than 500 MW/Year, 22 plants have the capacity in the range of 100-500 MW/year, while the remaining 42 plants have below 100 MW/year capacity. The capacity wise distribution of ALMM enlisted companies is shown in Figure 7.2.

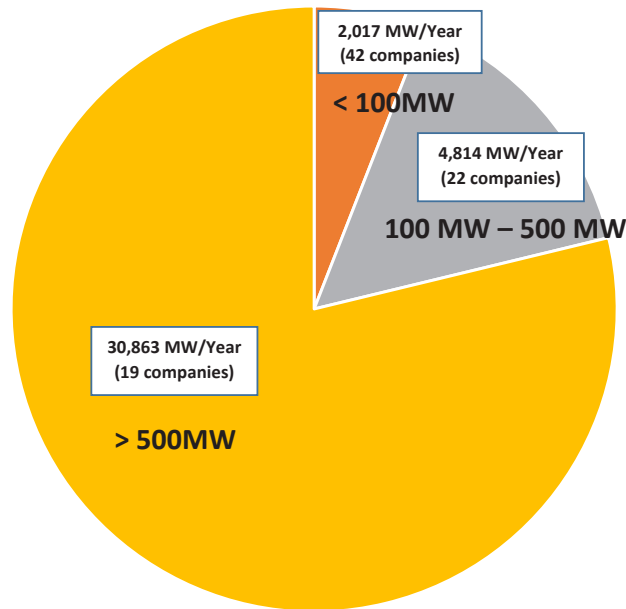


Figure 7.2: Capacity wise distribution of ALMM enlisted companies

7.3 Production Linked Incentive (PLI) Scheme: National Programme on High Efficiency Solar PV Modules

Tranche-II of the scheme is being implemented by Solar Energy Corporation of India (SECI) on behalf of MNRE. Under the scheme, NISE is providing support SECI in the validation and implementation of qualitative requirements and technical acceptance for setting up of Manufacturing facility in India.

Major scope of NISE includes:

- (a) To Review the submissions of manufacturers through monitoring and inspections for its compliance.
- (b) Technical visits after commissioning to verify and evaluate the fulfilment, Extent of Integration” and “Manufacturing capacity” established by the SMMs as on scheduled commissioning date.



National & International Training Programmes

Solar energy industry is rapidly expanding, leading to a significant demand for skilled manpower across various sectors. Keeping in view this, NISE organizes trainings on various aspects related to solar energy technologies. These training courses are designed in a way so as to meet the skilled manpower requirement of the solar energy industry and maintain quality manpower. NISE has organized numerous technical training programs for renowned academics, professionals, and members of the industry. The participants from both domestic and foreign countries have learned through the specific training curriculum introduced under various training programs in NISE.

NISE has provided short-term training courses that are tailored to the needs of the participants, these participants are from government departments, schools, colleges, military forces, nodal agencies, and public sector undertaking companies. These trainings have been delivered both online and

offline. NISE also intent to introduce new courses in the areas such as data analytics, electric vehicle design and development, and solar training programs that leverage artificial intelligence and machine learning. International training programs with improved hands-on instruction and organized modules will be arranged by NISE. In addition, NISE is planning to conduct a comprehensive course on energy storage, hydrogen storage, solar photovoltaic, and solar thermal technologies for the upcoming year. In the future, NISE intends to carry on hosting online training sessions.

During FY 2023-24, at total of 11 training programs (6 National & 5 International) on solar energy technologies and its applications were conducted by NISE. A total of 277 participants (102 International Participants and 175 National Participants) were trained at NISE. The details of the national level training program conducted at NISE for the FY 2023-24 are given in Table 8.1.

Table 8.1: Skill development programs conducted at NISE during FY 2023–24

S No.	Training/ Program	Number of Programs	Duration of Program (Days)	Date	Number of Participants
1	Engineer Trainees Azure Power Pvt. Ltd	1	5	10 th – 14 th July 2023	26
2	Engineer Trainees Renew Pvt. Ltd.	2	5	18 th – 22 nd Sep 2023 09 th to 13 th Oct 2023	34 36
3	NABL Training Program	1	3	17 th to 19 th Oct 2023	14
4	Military Engineer Services Training Program	1	5	20 th – 24 th Nov 2023	35
5	DRE Workshop	1	1	21 st Nov 2023	30
	TOTAL	6			175

8.1 Training programmes for industry & public sector units

NISE also provides training programs tailored to the employment roles, expertise, and needs of participants from business, academia, other organizations, and ministries who are willing to work in the field of solar energy technologies. These specially tailored training courses are created based on the individual skill requirements of the industry/organization and the participants of different experience level. These courses are made with the fundamental skill requirements

offering practical experience and theoretical concept knowledge. The start-up India initiative, solar photovoltaic applications, solar industry business models, prospects for entrepreneurs in the solar sector, and other topics were all covered in this tailored training session. NISE has held training sessions for Azure Power Pvt. Ltd., Renew Pvt. Ltd., MES officials, and NABL officers during FY 2023–2024. In all, 175 participants took part in the customized training course held at NISE. Figures 8.1 and 8.2 display the participants in the Renew Pvt. Ltd. Training Program and the NABL Training Program, respectively.



Figures 8.1: Participants in the Renew Pvt. Ltd. Training Programmes



Figures 8.2: Participants of NABL Training Programmes

8.2 International training programme of solar energy technologies and application under Indian Technical Economic Co-operation (ITEC)

The Indian Ministry of External Affairs funds NISE for conducting annual three-week Indian Technical and Economic Co-operation (ITEC) programs. In

FY 2023–2024, NISE conducted ITEC & e-ITEC program, training 102 participants from various countries. Additionally, the program offered a global forum for knowledge exchange among participants in the field of solar energy. Figure 8.3 displays the ITEC program participants. Table 8.2 provides a breakdown of the delegates' involvement in the ITEC and e-ITEC training program.

Table 8.2: International Participation of delegates in ITEC and e-ITEC for FY 2023-24

S No.	Program Name	Number of Programs	Duration of Program (Days)	Date	Number of Participants
1	ITEC Programme on Solar Energy Technologies & Application	4	21	07 th Aug – 27 th Aug 2023	16
				25 th Sep – 15 th Oct 2023	21
				28 th Nov – 18 th Dec 2023	30
				08 th Jan – 28 th Jan 2024	27
2	e-ITEC Programme on Solar Energy Technologies & Application	1	5	19 th – 23 rd Sep 2023	8
TOTAL		5			102



Figure 8.3: ITEC program participants



Technical & Research Collaborations

NISE promotes cooperation, collaboration, knowledge exchange, and research with National and International organisations. Through the partnership initiatives, NISE extends an access to innovative technologies, technical know-how, and assistance. NISE has collaborated on commercial, product development, and training initiatives with number of organisations. The relationship has resulted in new tasks and agreements. These opportunities encourage the development of new renewable energy technology and have granted licenses for the commercialization of a range of products.

9.1 MoU's signed by NISE

This year, NISE signed two Memorandums of Understanding (MoU) as listed in Table 9.1. These MoUs were exchanged (Figure 9.1) for undertaking various collaborative activities including (i) Research and Innovation; (ii) Skill-development Training Program; (iii) Knowledge Exchange for Product Development, Testing, and Project execution; (iv) Joint association for organizing Seminars, Conferences, Training, and Workshops.

Table 9.1: List of MoUs signed by NISE during the year

S. No.	MoU	Date of Signing	Validity (Years)
1.	NISE & NLC India Limited, Chennai	26 th May 2023	5
2.	NISE & International Solar Alliance (ISA)	6 th Sep 2023	3



Figure 9.1: NISE & International Solar Alliance (ISA)



Figure 9.2: NISE & NLC India Limited, Chennai



Events & Workshops

NISE organizes vibrant array of events and workshops fostering collaboration and knowledge sharing among the workforces. From hands-on workshops to inspiring speaker series, our events have not only provided valuable learning opportunities but have also strengthened connections among participants. Each gathering was designed to address the diverse needs of our community, ensuring that everyone could find a space to engage, learn, and grow.

This year also, we proudly celebrated a diverse range of events, including Hindi Pakhwada, Swachh Bharat Abhiyan, World Environment Day, International Women’s Day, Yoga Day, Independence Day, Republic Day, and many others. A glimpse from each of these significant events are provided below:

10.1 Promotion of Official Language

An Official Language Section has been set up in the Institute to implement the Official Language Policy of the Government of India. During the year, concerted efforts were made to ensure proper compliance of the provisions of the Official Language Act, 1963 and rules framed thereunder. To promote the Official Language Policy and to create a more conducive environment for officers to work more in Hindi, various programmes/schemes were initiated.

‘Hindi Pakhwada’ was organized from 14th September to 29th September, 2023 to create awareness and to increase the use of Hindi in official work. Various competitions like Hindi essay writing, poetry and dictation were organized among the officers and staff of the NISE. The officers and staff of NISE participated enthusiastically in these competitions. Mementoes, certificates and cash prizes were awarded to the participants.



Figure 10.1: Hindi Pakhwada organized from 14th September to 29th September, 2023



Figure 10.2: Feliciting winners in the Hindi Pakhwada

10.2 World Environment Day

'World Environment Day' was organized at NISE on 5th July 2023. On this occasion, various schools of

Gurugram came to NISE and participated in different events like drawing on environment topic, quiz on environment, Music & Play presentation on environment.



Figure 10.3: World Environment Day drawing competition for school children held at NISE.



Figure 10.4: Felicitating the winner of drawing competition honored by NISE



Figure 10.5: World Environment Day celebrations

10.3 International Yoga Day

International Yoga Day was organized at NISE on

21st June 2023. Special invitee, Sh. Dharmendra Singh (Yoga instructor) practiced yoga with NISE officers.



(a)



(b)

Figure 10.6: NISE officers during the International Yoga Day session at NISE

10.4 Independence Day Celebration

On 15th August, 2023, the Independence Day was celebrated with great enthusiasm at NISE. On this

auspicious occasion of Independence Day, the Sh. Lalit Bohra, IRTS, Joint Secretary & DG, NISE hoisted the tricolor.



Figure 10.7: Independence Day celebration at NISE

10.5 Celebration of Har-Ghar Tiranga

Har-Ghar Tiranga was celebrated at NISE by distributing the National Flags to all officers and

staffs of NISE for hoisting at their office as well as their home. All staff members participated in this program with full of enthusiasm.



Figure 10.8: Celebration of Har-Ghar Tiranga

10.6 Swachh Bharat Abhiyan

The third phase of Swachh Bharat Abhiyan was held at NISE from 1st November 2022 to 31st August 2023. In the third phase, the unnecessary scrap present in many rooms of Aditya Bhawan and

the simulator hall was vacated and cleaned. The cleaned and vacated rooms were given to new IP Lab. The process of auctioning the scrap is underway. All the personnel of the institute unitedly took a ‘cleanliness pledge’.



Figure 10.9: Celebration of Swachh Bharat Abhiyan

10.7 Vigilance Awareness Week

Like every year, this year also Vigilance Awareness Week was organized at NISE from 31st October to

05th November, 2023. Dr. Anil Kumar, Scientist-E & CVO NISE delivered the keynote address in the program. In the end, “Integrity Pledge” was taken by all the officers and employees of the Institute.



Figure 10.10: Celebration Vigilance Awareness Week was organised in NISE

10.8 National Constitution Day

NISE celebrated the National Constituion Day on 29th November 2023. To mark this, all the personnel

took oath on the occasion of Constitution Day at 03:00 pm in Prabhakar Conference Hall, First Floor, Surya Bhawan.



Figure 10.11: National Constitution Day Pledge

10.9 Republic Day

Like every year, Republic Day was celebrated with great enthusiasm at the NISE on 26th January 2024. The National flag was hoisted by the Chief

Guest Jeevan Kumar Jethani, Scientist-F, MNRE in the courtyard of Aditya Bhawan of the NISE. On this occasion, a parade was also organized by the security personnel of the NISE.



Figure 10.12: Republic Day celebrations

10.10 International Women's Day

In compliance with the order of the Ministry of Women and Child Development, International Women's Day was organized at the NISE on 08th

March 2024. This time the theme of International Women's Day 2024 was 'Invest in Women: Accelerate Progress'. International Women's Day was celebrated from 1st March to 8th March with various activities.



Figure 10.13: International Women's Day celebrations at NISE



Figure 10.14: Honouring the women officers of NISE



Finance and accounts

NISE has an Internal Finance Division (IFD) and a Finance & Accounts Division (F&A) which look after the concurrence and preparation of accounts, respectively. IFD scrutinises and provide financial concurrence to the proposal for payments, whereas the F&A division deals with budget preparation, maintenance of accounts and audit functions. NISE is registered with Income Tax as well as GST and

complies with all the statutory provisions of both the Act. The statutory auditor of NISE is appointed out of the panel of Chartered Accountants provided by CAG. The annual accounts are approved by the Finance Committee (FC) before submission of the same to the Governing Council (GC) and Annual General Meeting (AGM).





ROHITKC JAIN & CO
CHARTERED ACCOUNTANTS

INDEPENDENT AUDITOR'S REPORT

To the Members of NATIONAL INSTITUTE OF SOLAR ENERGY

Report on the Financial Statements

We have audited the financial statements of **NATIONAL INSTITUTE OF SOLAR ENERGY** ("The Institute"), which comprise the balance sheet as at 31st March 2024, and the statement of Income & Expenditure for the year ended and a summary of significant policies and other explanatory information.

Responsibility of Management for the Financial Statements

1. The Management is responsible for the preparation of these financial statements that give a true and fair view of the financial position and financial performance of the Institute in accordance with the accounting principles generally accepted in India. This responsibility also includes maintenance of adequate accounting records in accordance with the provisions of the Act for safeguarding of the assets of the Institute and for preventing and detecting frauds and other irregularities; selection and application of appropriate accounting policies; making judgments and estimates that are reasonable and prudent; and design, implementation and maintenance of adequate internal financial controls, that were operating effectively for ensuring the accuracy and completeness of the accounting records, relevant to the preparation and presentation of the financial statement that give a true and fair view and are free from material misstatement, whether due to fraud or error.

Auditor's Responsibilities for the Audit of the Financial Statements

1. Our responsibilities is to express an opinion to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with SAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.
2. As part of an audit in accordance with Standards on Auditing, we exercise professional judgment and maintain professional scepticism throughout the audit. We also:



Suite No. 11A-11B, Atma Ram House, 1 Tolstoy Marg, Connaught Place, New Delhi-110001

☎ +91-1149470000 - 49 ✉ rohit@rohitkcjain.com 🌐 www.rohitkcjain.com



ROHITKC JAIN & CO CHARTERED ACCOUNTANTS

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
 - Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
 - Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
3. Materiality is the magnitude of misstatement in the financial statements that, individually or in aggregate, makes it probable that the economic decision of a reasonably knowledgeable user of the financial statements may be influenced. We consider quantitative materiality and qualitative factors in (i) planning the scope of our audit works and in evaluating the results of our works; and (ii) to evaluate the effects of any identified misstatements in the financial statements.

Report on Other Legal and Regulatory Requirements

1. The internal control system of the Institute needs to be strengthened. During the course of our audit, some observations were found, which are given in the **Annexure A** attached in summarized form. The details of such observation were provided to the management separately which they have noted for the future compliance and kept on record along their comments.
2. We report that:
 - (a) We have sought and obtained all the information and explanation which to the best of our knowledge and belief were necessary for the purpose of audit;
 - (b) In our opinion, proper books of account as required by law have been kept by the Institute so far as it appears from our examination of those books.
 - (c) The Balance Sheet and the Statement of Income & Expenditure dealt with by this Report are in agreement with the books of accounts.
 - (d) In our opinion, the aforesaid balance sheet & Income & Expenditure dealt with by this report complies with the Accounting Standards issued by the Institute of Chartered Accountants of India.



Suite No. 11A-11B, Atma Ram House, 1 Tolstoy Marg, Connaught Place, New Delhi-110001

☎ +91-1149470000 - 49 ✉ rohit@rohitkcjain.com 🌐 www.rohitkcjain.com



ROHITKC JAIN & CO

CHARTERED ACCOUNTANTS

Opinion

In our opinion and to the best of information and according to the explanation given to us, the aforesaid financial statements, **read together with the annexure attached**, give the information required by the Act in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India.

- a) In the case of the Balance Sheet, of the state of affairs of the Institute as at 31-Mar-2024;
- b) In the case of the Statement of Income & expenditure, of the **excess of income over expenditure** for the year ended on that date;

For M/S Rohit KC Jain & Co,
Chartered Accountants
(FRN: 020422N)



(Ritesh Wahal)
Partner
M. No. 517197
UDIN: 24517197BKALDO6119

Place: New Delhi
Dated: September 25, 2024

Annexure -A

Annexure to the Independent Audit Report on the Financial Statement of National Institute of Solar Energy for the F.Y 2023-24 as referred in the said Report.

1. It has been observed that NISE has given advances of Rs. 7.35 Cr. to CPWD for capital expenditure but the advance amounts are still outstanding for settlement as on 31.03.2024. Details of opening balance as on 01.04.2022 and advance given in the FY 2022-23 & 2023-24 are given as follows:

Advances given to CPWD	
Date	Amount
As on 01 Apr 2022	4,31,39,540/-
08 Dec 2022	54,67,581/-
08 Dec 2022	52,95,780/-
14 Dec 2022	39,35,906/-
28 Mar 2023	32,26,178/-
28 Mar 2023	64,06,000/-
20 Mar 2024	57,22,500/-
27 Mar 2024	2,97,007/-
Total	7,34,90,492/-

As evident from above table, advances were given to CPWD are outstanding since last 03 years. It is recommended to obtain the current status of deposit work and follows up with CPWD for submission of UC's of work completed.

2. It has been observed that Income-Tax Refund for the AY 2016-17 & 2022-23 of Rs. 16.12 lakhs and Rs. 84 lakhs respectively are pending to be received. As, NISE is bearing interest loss on the said amount. It is suggested that NISE may consult to their consultant for recovery of the same.
3. It has been observed that an amount of Rs. 2,66,55,548/- has been received by NISE since long years on account of construction of World Museum but the amount received was not adjusted in books of accounts till date.
4. Following advances given under Surya Mitra training program in previous financial years and utilization certificates of the same were not submitted to NISE:-

Name	Date of Advance Given	Amount Outstanding
Chief Executive Odisha Renewable Energy OREDA	01 May 2018	4,17,600
Govt. Polytechnic College Kerala	13 Oct 2015	6,29,160
Rajasthan Renewable Energy Corporation	10 Feb 2017	6,42,000

Further, we had raised the same point in last year audit report but no actions have been taken till date. It is suggested that any form of advances should be settled timely and is supported by proper utilization certificate.



5. It has been observed that advance amount of Rs. 2,07,31,550/- given to C-DAC was outstanding from more than 3 years and the utilization certificate has not been received till date. It is suggested that if the advance amount is disputed than legal case has to be filed with the arbitration court.

Party Name	2020-21	2021-22	2022-23	2023-24
C-DAC	2,07,31,550/-	2,07,31,550/-	2,07,31,550/-	2,07,31,550/-

6. It has been observed that EMD of Rs. 6,63,930/- is outstanding as on 31.03.2024, It is suggested that EMD amount may be refunded to persons pertains with the completed work. Details are given below:

Particulars	Amount (Rs.)
Opening Balance of EMD as on 01.04.2023	17,03,460/-
Less: EMD Refunded during the year 2023-24	10,39,530/-
Closing Balance of EMD as on 31.03.2024	6,63,930/-

7. It has been observed that an advance amount of Rs. 27,54,59,339/- are appearing under ALMM Scheme but no revenue has been recognized in the books of accounts during the years.

Details are given below for major parties covering 80% of total advance amount:

Particulars	Opening Balance 01.04.23	Debit	Credit	Closing Balance 31.03.24
Canadian Solar International	1,77,00,000/-	-	-	1,77,00,000/-
Hangzhou Relno Standards Technical	31,25,923/-	-	-	31,25,923/-
JA Solar Tech. Yangzhou Co. Ltd.	70,70,617/-	-	-	70,70,617/-
JA Solar (XINGTAI) Co. Ltd.	45,78,590/-	-	26,95,010	72,73,600/-
Jinko Solar Co. Ltd. Shangrao	5,00,97,854/-	-	1,20,68,794	6,21,66,648/-
Longi Solar Technology Co. Ltd. ALMM	8,42,52,000/-	-	-	8,42,52,000/-
Trina Solar Energy	1,01,00,000/-	-	1,15,32,149	2,16,32,149/-
Yiwu JA Solar Technologies Co. Ltd.	1,67,42,139/-	-	-	1,67,42,139/-
Total Amount	19,36,67,123	-	2,62,95,953	21,99,63,076/-



NATIONAL INSTITUTE OF SOLAR ENERGY

(An Autonomous Institute of Ministry of New & Renewable Energy, Govt. of India)
Gurugram: Faridabad Road, Gwalpahari, Gurugram, Haryana-122003

BALANCE SHEET AS AT 31ST MARCH 2024

CORPUS/CAPITAL FUND AND LIABILITIES		AS AT MARCH 31, 2024		AS AT MARCH 31, 2023	
		TOTAL		TOTAL	
1	Corpus/Capital Fund				
	Gross Corpus/ Capital Fund	1,82,49,06,133		1,62,47,47,216	
	Less : Accumulated Depreciation	60,97,62,790		52,40,48,800	
	Net Corpus/ Capital Fund		1,21,51,43,343		1,10,06,98,416
2	Current Liabilities & Provisions	50,90,84,595		1,05,83,02,112	
	Total		1,72,42,27,937		2,15,90,00,528
ASSETS		AS AT MARCH 31, 2024		AS AT MARCH 31, 2023	
		TOTAL		TOTAL	
3	Fixed Assets				
	Gross Block	1,22,77,34,632		1,15,85,65,995	
	Less : Accumulated Depreciation	60,97,62,790		52,40,48,800	
	Net Block		61,79,71,842		63,45,17,194
4	Current Assets, Loans & Advances	1,10,62,56,096		1,52,44,83,334	
	Total		1,72,42,27,937		2,15,90,00,528
SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO ACCOUNTS		11			

As per our Audit Report of even date
For M/s Rohit KC Jain & Co.
Chartered Accountants
(F-RN-020422N)



(Ritesh Wahal)
(Partner)
M - No 517197
U D I N : 24517197BKALDC06119
Place: Gurugram
Dated: 25.09.2024



(Dr. Chandan Banerjee)
Dy. Director General

(Dr. Mohammad Riham)
Director General

For NATIONAL INSTITUTE OF SOLAR ENERGY

NATIONAL INSTITUTE OF SOLAR ENERGY

(An Autonomous Institute of Ministry of New & Renewable Energy, Govt. of India)
Gurugram-Faridabad Road, Gwalpahari, Gurugram, Haryana-122003



PARTICULARS	Amount in ₹	
	2023-24	2022-23
INCOME	TOTAL	TOTAL
Receipts from Testing & Operations	9,32,98,600	9,27,81,255
Grants/Subsidies utilised for Revenue Expenditure	20,75,69,395	17,78,36,114
Interest Earned	6,06,50,483	1,29,45,840
Other Income	10,05,193	27,98,158
Interest Earned on Grant Account	37,18,878	56,32,886
Interest Earned on CNA Account	1,93,68,462	30,27,522
Depreciation (As per Contra)	8,57,13,990	9,07,72,966
Provision Written back (F.Y. 2022-23)	5,41,441	5,20,070
Total (A)	47,18,66,443	38,63,14,911
EXPENDITURE		
Establishment Expenses	5,39,07,206	4,20,27,867
Other Administrative Expenses	7,51,94,656	7,05,66,571
Operational/Project Expenses	10,45,27,694	9,92,95,302
Interest on Grant & CNA Account	2,30,87,919	85,60,508
Depreciation (As per Contra)	8,57,13,990	9,07,72,966
Total (B)	34,24,31,466	31,14,23,214
Net Surplus/(Deficit) for the year (A-B)	12,94,34,977	7,48,91,697
Less: Provision for Taxation		
Balance being Surplus/(Deficit) for the year transferred to General Reserve	12,94,34,977	7,48,91,697

SIGNIFICANT ACCOUNTING POLICIES AND NOTES TO ACCOUNTS

As per our Audit Report of even date

For M/s Rohit KC Jain & Co.

Chartered Accountants

(FRN-020422N)

(Ritesh Wahal)

(Partner)

M. No.517197

UDJIN: 24517197B, KALDO6119

Place: Gurugram

Dated: 25.09.2024

For NATIONAL INSTITUTE OF SOLAR ENERGY

(Dr. Chandan Banerjee)

Dy. Director General

(Dr. Mohanmad Rihan)

Director General





NATIONAL INSTITUTE OF SOLAR ENERGY (An Autonomus Institute of Ministry of New & Renewable Energy ,Govt.Of India) Gurugram-Faridabad Road, Gwalpahari, Gurugram, Haryana-122003 RECEIPT AND PAYMENT ACCOUNT FOR THE YEAR ENDED ON 31ST MARCH 2024					
					Amount in ₹
RECEIPT	2023-24	2022-23	PAYMENT	2023-24	2022-23
Opening Bank Balances			Statutory Liabilities		
-In Saving bank accounts	9,61,428	1,36,90,676	-Goods and service tax	1,77,70,549	1,90,63,458
-In Sweep accounts	12,18,38,208	14,80,84,589	-TDS under Income Tax	1,22,52,884	1,70,95,621
-In Current bank accounts	7,08,784	8,69,751	-TDS Under GST	17,32,018	12,12,170
-In CNA accounts	65,76,54,009	-	-National Pension Scheme	76,29,473	64,38,519
Grant Received During the Year	35,25,88,790	25,07,86,937	Salary Expenses		
			-Salary to Contractual Manpower (net)	65,99,645	76,61,669
			-Salary to Regular Employees (net)	3,48,30,254	2,82,79,622
Received From Debtors			Deposit and Advances		
-Receipt For Guest House	9,59,945	6,95,647	Advance to CPWD	60,19,507	2,43,31,445
-Receipt From Recruitment fees	-	12,90,934	Refund of EMD	9,97,200	1,90,086
-Receipt From Processing Fees	48,000	12,81,000	Refund of UNICEF	-	47,70,748
-Receipt From Testing service	53,55,990	75,61,998	Refund of Security Deposit	1,77,432	1,12,850
-Receipt From Consultancy service	1,31,03,931	64,09,658			
-Receipt From Trainings	45,13,357	46,24,787	Payments from CNA Account		
-Receipt From ALMM	14,57,18,388	6,62,68,784	HRD Scheme-4110	5,17,35,805	4,96,62,090
-Others	15,000	20,045	R&D Scheme- 4112	30,86,39,070	-
Deposits and Advances			Refund to Ministries		
-Receipt For ISA Fellowship Prog.	-	4,50,30,745	Refund of Grant and Interest to MNRE	34,09,62,145	2,97,10,645
-Earnest Money Deposit	7,52,183	54,760	Refund to PAO DST	4,84,603	-
-Security Deposit	1,51,640	3,48,042	Refund to SERB (Incl. Interest)	6,64,684	-
-ITI		1,16,000			
Interest Received			Payment to Creditors		
-Interest on Income Tax Refund	15,07,859	13,45,157	Payment to creditors of capital goods	6,07,40,732	3,31,26,068
-Bank Interest on Revenue	29,68,644	23,95,229	Payment to creditors of goods and services	8,89,01,497	7,43,43,610
-Interest on CNA Account	1,93,68,462	30,27,522			
-Interest on Saving Bank Grant	1,26,093	2,66,523	Payment under ISA Fellowship	1,79,35,068	2,46,90,804
-Interest on Sweep	34,53,678	37,90,854	Creation of Fixed Deposit	34,29,77,605	4,99,29,920
Receipts From Fixed Deposit	33,14,20,117	2,98,45,581	Payment under Suryamitra Program	7,68,96,515	6,30,36,700
Amount Received in CNA Account			Other		
-HRD Scheme -4110	7,01,93,128	2,46,33,736	Refund of Recruitment fees	-	8,000
-R&D Scheme - 4112	1,96,00,000	59,13,91,939	Refund of Testing Fees	3,52,352	1,84,565
			Refund of Consultancy Fees	30,000	-
Refund From Income Tax	21,66,219	1,85,35,537	Refund of Training Fees	27,342	-
			Refund of ALMM Fees	9,06,67,627	-
Received from staff against adjustment of advances	3,44,355	3,22,603	Misc. Payments	2,048	2,16,161
			TDS Deduction by bank	7,06,015	9,87,925
Other Receipts	3,116	1,97,922	Tour & Travel - Staff (ALMM and others)	42,24,392	66,71,850
			ITEC training program	25,00,425	-
			Closing Bank Balance		
			-In Saving bank accounts	1,71,07,179	9,61,428
			-In Sweep accounts	11,53,63,638	12,18,38,208
			-In Current bank accounts	39,995	7,08,784
			-In CNA accounts	14,65,33,625	65,76,54,009
Total	1,75,55,21,325	1,22,28,86,756	Total	1,75,55,21,325	1,22,28,86,756

As per our Audit Report of even date
 For M/s Rohit KC Jain & Co.
 Chartered Accountants
 (FRN-020422N)

 (Ritesh Wahal)
 (Partner)
 M. No.517197
 UDIN: 24517197BKALD06119
 Place: Delhi
 Date: 25.09.2024



For NATIONAL INSTITUTE OF SOLAR ENERGY

 (Dr. Chandan Banerjee)
 Dy. Director General

 (Dr. Mohammad Rihan)
 Director General

NATIONAL INSTITUTE OF SOLAR ENERGY

(An Autonomous Institute of Ministry of New & Renewable Energy, Govt. of India)
Gurugram-Faridabad Road, Gwalpahari, Gurugram, Haryana-122003

SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH 2024

	AS AT MARCH 31, 2024		AS AT MARCH 31, 2023	
		Total		Total
SCHEDULE 1 - CORPUS/ CAPITAL FUND				
General Reserve				
Balance as at the beginning of the year	38,44,23,675		30,95,31,979	
Add : Excess of income over expenditure during the year	12,94,34,977	51,38,58,652	7,48,91,696	38,44,23,675
Corpus Fund				
Balance of Grant Received from Govt. Non-Refundable				
Opening Balance(Refer Grant Sheet)	1,00,00,000		1,00,00,000	
Add: Amount received during the Year	-		-	
Closing Balance	1,00,00,000	1,00,00,000	-	1,00,00,000
Capital Reserve				
Grants adjusted against purchase of assets				
Opening Balance	1,14,87,92,387		1,12,17,59,703	
Add : Addition during the period	6,02,77,427		2,70,32,684	
Closing Balance	1,20,90,69,814	1,20,90,69,814		1,14,87,92,387
Grant utilised for advances given during the year				
Opening Balance	8,15,31,154		5,66,25,827	
Add : Net Adjusted during the Year	1,04,46,513		2,49,05,327	
Closing Balance	9,19,77,667	9,19,77,667		8,15,31,154
Total		1,82,49,06,133		1,62,47,47,216




(Handwritten signature)

NATIONAL INSTITUTE OF SOLAR ENERGY
(An Autonomous Institute of Ministry of New & Renewable Energy, Govt. of India)
Gurgaon-Faridabad Road, Gwalpahari, Gurugram, Haryana-122003

SCHEDULE 3 - FIXED ASSETS & DEPRECIATION


PARTICULARS	Rate	GROSS BLOCK					DEPRECIATION					NET BLOCK				
		As at 01.04.2023	Addition before 180 days	Addition after 180 days	Sales/Adjustment during the year	As at 31.03.2024	As at 01.04.2023	Current Depreciation on M+C	Current Depreciation on D	Total Current Depreciation 31.03.2024	Total Depreciation (G+J)	WDV as on 31.03.2024 (F+K)	WDV as on 31.03.2023	L	M	
A																
Building-NISE	10.00%	69,43,65,378	-	19,37,373	-	62,63,02,751	28,15,80,320	3,42,78,556	66,869	3,43,15,374	31,59,55,994	31,03,47,057	34,27,85,058			
Desktop Computers	40.00%	1,45,78,372	-	-	-	1,45,78,372	1,11,01,790	13,91,033	-	13,91,033	1,24,32,823	20,86,549	34,77,582			
Printers and other IT Peripherals	15.00%	3,97,60,649	38,794	72,64,814	-	4,79,64,257	1,93,66,662	39,66,579	5,44,111	38,10,987	2,29,66,290	2,40,87,987	2,04,05,047			
Air Conditioner	15.00%	27,38,992	-	-	-	27,38,992	16,24,618	1,67,156	-	1,67,156	17,91,774	8,47,218	11,14,374			
Misc. Assets: Guest House/Office	15.00%	31,98,16,155	81,06,823	3,03,55,187	-	2,28,72,144	1,47,81,939	12,10,639	1,496	12,12,035	1,59,93,974	69,78,170	80,70,263			
Scientific & Laboratory Equipments	15.00%	9,15,351	-	-	-	35,59,78,165	13,81,58,712	2,81,34,840	22,76,639	3,04,11,279	16,85,69,990	18,75,08,175	18,14,57,443			
Vehicles	15.00%	1,66,18,856	-	-	-	9,15,351	5,11,027	60,650	-	60,650	5,71,677	3,43,684	4,04,334			
Furniture & Fixtures	10.00%	26,28,954	-	-	-	1,66,18,856	47,42,346	11,87,651	-	11,87,651	59,29,997	1,08,68,669	1,18,76,510			
Laptops	40.00%	85,02,190	-	-	-	26,28,954	17,25,438	3,60,606	-	3,60,606	20,86,044	5,40,910	9,01,516			
Other Assets (Training)	40.00%	78,41,636	8,91,000	4,65,674	-	86,02,190	54,21,362	4,77,121	-	4,77,121	58,98,503	27,03,987	31,80,808			
Softwares	15.00%	6,97,61,692	-	-	-	91,98,310	60,23,081	10,63,922	93,135	11,76,967	72,00,038	19,98,272	18,19,555			
500 KW Power Plant	15.00%	16,29,733	-	-	-	6,97,61,692	3,01,32,450	59,44,390	-	59,44,390	3,60,76,840	3,36,84,522	3,96,29,202			
Transformer	15.00%	1,99,16,715	-	-	-	16,29,733	7,03,938	1,39,869	-	1,39,869	8,42,807	7,88,026	9,25,795			
Assets under Solar Tower	40.00%	50,18,740	-	-	-	1,99,16,715	60,48,234	20,80,272	-	20,80,272	81,28,506	1,17,89,209	1,36,69,481			
Books/Standards and Periodicals	10.00%	2,30,400	-	-	-	50,18,740	19,30,110	12,35,462	-	12,35,462	31,65,662	18,53,178	30,86,630			
RO System	15.00%	14,91,000	-	-	-	2,30,400	95,680	20,163	-	20,163	1,16,143	1,14,257	1,34,420			
Scientific & Laboratory Equipments (DST Project)	15.00%	-	-	-	-	14,91,000	1,11,625	2,09,676	-	2,09,676	3,18,701	11,72,299	13,78,175			
Camera including fiber cable	15.00%	-	-	1,22,28,570	-	1,22,28,570	-	-	9,17,143	9,17,143	9,17,143	1,13,11,427	-			
Audio Video System	15.00%	-	-	98,70,460	-	98,70,460	-	-	7,40,285	7,40,285	7,40,285	91,30,178	-			
Total		1,15,85,65,995	70,36,617	6,21,32,020	-	1,22,77,34,632	52,40,48,900	8,10,44,314	46,89,676	8,57,13,990	60,97,62,790	61,79,71,842	63,45,17,193			



 NATIONAL INSTITUTE OF SOLAR ENERGY (An Autonomous Institute of Ministry of New & Renewable Energy, Govt. of India) Gurugram-Faridabad Road, Gwalpahari, Gurugram, Haryana-122003		Amount in ₹	
SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH 2024			
SCHEDULE 4- CURRENT ASSETS, LOANS & ADVANCES		AS AT MARCH 31, 2024	AS AT MARCH 31, 2023
		Total	Total
Current Assets			
Balances with Bank:			
-Saving & Current Accounts	1,71,47,175		16,69,634
-Auto Sweep Accounts	11,53,83,638		12,18,38,208
-Central Nodal Accounts	14,65,33,625	27,90,64,437	65,76,54,588
			78,11,62,430
Fixed Deposits:			
Fixed Deposits -Core & Project Grant	5,12,46,340		4,25,05,028
Fixed Deposits - Revenue	13,67,82,031		8,39,85,858
Fixed Deposits - ALMM	27,97,76,608		33,30,00,000
Fixed Deposits- Corpus Fund	19,81,34,806	66,59,39,785	14,25,78,505
			60,20,69,391
Sundry Debtors:			
Sundry Debtors			
-For 1 Year	16,01,704		60,060
-For More than 1 Year	67,10,831	83,12,535	67,26,662
			57,86,722
Debtors Under ALMM (For 1 Year)	72,540	72,540	53,020
			53,020
Loans & Advances & other assets			
Advances and other amounts recoverable in cash or in kind or for value to be received			
- Advances for capital assets			
-For 1 Year	7,566		2,43,31,445
-For More than 1 Year	9,42,22,032	9,42,29,598	6,38,71,080
			8,82,02,525
- Advances for training programs			
-For 1 Year	-		19,67,255
-For More than 1 Year	21,56,061	21,56,061	22,25,972
			41,93,227
- Advance to Vendors			
	1,02,48,375		73,05,130
- Balances with Staff (Incl. Imprest Accounts)	1,69,082	1,04,17,457	1,20,681
			74,25,811
Deposits			
- Security Deposits	2,50,262		3,10,985
- GST (Input Credit and GST Paid on Advance)	2,53,73,285		2,20,65,942
- TDS Recoverable (F.Y. 2022-23 & 2023-24)	1,88,27,520		84,34,468
- Advance Tax/Income Tax Refundable (F.Y. 2014-15)	16,12,815	4,60,83,682	37,78,834
			3,45,90,207
Total		1,10,62,56,096	1,52,44,83,334




[Handwritten Signature]

 NATIONAL INSTITUTE OF SOLAR ENERGY (An Autonomous Institute of Ministry of New & Renewable Energy, Govt. of India) Gurugram-Faridabad Road, Gwalpahari, Gurugram, Haryana-122003				
SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT AS AT 31ST MARCH 2024				
				Amount in ₹
SCHEDULE 5- RECEIPTS FROM TESTING AND OPERATIONS	2023-24		2022-23	
		Total		Total
Receipts from Testing				
- Testing of Solar Components	48,48,180	48,48,180	61,58,550	61,58,550
Receipts under ALMM				
- Application Fees	3,46,00,670		4,47,81,725	
- Inspection Fees	2,83,50,000	6,29,50,670	2,67,50,000	7,15,31,725
Other Operational Receipts				
- Receipts from Trainings and Seminars- For Domestic Participants	37,70,591		34,63,000	
-For International Participants	52,36,031		37,69,232	
- Administrative/Overhead Charges	34,89,888		39,13,378	
- Consultancy Fees	1,30,03,240	2,54,99,750	39,45,370	1,50,90,980
Total		9,32,98,600		9,27,81,255




Handwritten signature

 NATIONAL INSTITUTE OF SOLAR ENERGY (An Autonomous Institute of Ministry of New & Renewable Energy, Govt. of India) Gurugram-Faridabad Road, Gwalpahari, Gurugram, Haryana-122003				
SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH 2024				
			Amount in ₹	
SCHEDULE 6- GRANTS/SUBSIDIES	2023-24		2022-23	
		Total		Total
Grants Received during the year (Core Grants)	18,00,00,000		16,00,00,000	
Less : Grant Refunded	2,99,91,339		5,57,188	
Add: Grant Unutilised brought forward from Previous year	2,99,91,339	18,00,00,000	5,57,188	16,00,00,000
Grants Received during the year (Project Grants)	16,90,15,437		9,36,64,755	
Less : Grant Refunded	7,38,26,086		1,57,26,908	
Add: Grant Unutilised brought forward from Previous year	9,69,97,839	19,21,87,190	11,87,46,634	19,66,84,483
Grant Adjusted towards Revenue Expenditure :				
Current Year Expenditure-NISE	23,36,29,556		21,19,89,740	
Less : Expenses adjusted towards current year Revenue	2,10,01,322		2,59,74,100	
Less: Provision made against Revenue Expenditure	50,58,839		81,79,526	
	20,75,69,395		17,78,36,114	
Less: Expenses Adjusted against Previous Advances	25,67,827	20,50,01,568	60,87,224	17,17,48,890
Less : Grants utilised for purchase of Fixed Assets	6,02,77,427		2,66,41,244	
Less : Grants utilised for Advances against Capital Expenses	95,06,073		2,43,31,445	
Less : Grants utilised for Advances against projects	4,67,100		19,67,256	
Less: Grant utilised for Advance against General Expenses	30,85,712	7,33,36,312	50,06,467	5,79,46,412
Grants Payable to Government of India		9,38,49,310		12,69,89,181



(Handwritten signature)

 NATIONAL INSTITUTE OF SOLAR ENERGY (An Autonomous Institute of Ministry of New & Renewable Energy, Govt. of India) Gurugram-Faridabad Road, Gwalpahari, Gurugram, Haryana-122003				
SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31ST MARCH 2024				
SCHEDULE 7- OTHER INCOME	2023-24		2022-23	
	Credited in Revenue	Total	Credited in Revenue	Total
Bank Interest earned from Revenue				
- Interest earned on Saving accounts	57,754		77,362	
- Interest earned on Auto Sweep accounts	30,11,180		23,17,867	
- Interest earned on F.D	4,60,11,133		37,56,575	
- Interest earned on Corpus Fund	1,00,62,557		54,48,879	
Sub Total of Bank Interest	5,91,42,624		1,16,00,683	
Interest on Income Tax Refund	15,07,859	6,06,50,483	13,45,157	1,29,45,840
Miscellaneous Income				
- Guest House Charges	7,01,100		6,50,800	
- Other Income	3,04,093	10,05,193	21,47,358	27,98,158
Provision Written Back	5,41,441	5,41,441	5,20,070	5,20,070
Total		6,21,97,117		1,62,64,068




NATIONAL INSTITUTE OF SOLAR ENERGY

(An Autonomous Institute of Ministry of New & Renewable Energy, Govt. of India)
Gurugram-Faridabad Road, Gwalpahari, Gurugram, Haryana-122003

SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT AS AT 31ST MARCH 2024

SCHEDULE 8 - ESTABLISHMENT EXPENSES	2023-24						2022-23				Amount in ₹
	Adjusted with grant	Adjusted against Advances	Provision for Expenses	Charged to Revenue	Total	Total	Adjusted with Grant	Adjusted against Advances	Provision for Expenses	Charged to Revenue	
Consultancy Charges (Contractual Manpower)	15,28,580	-	-	33,75,433	49,04,013	49,04,013	18,95,517	-	-	22,42,442	41,37,959
Remuneration (Regular Employees)	4,49,86,020	-	-	40,17,173	4,90,03,193	4,90,03,193	3,78,89,908	-	-	-	3,78,89,908
Total	4,65,14,600	-	-	73,92,606	5,39,07,206	5,39,07,206	3,97,85,425	-	-	22,42,442	4,20,27,867



(Handwritten signature)

NATIONAL INSTITUTE OF SOLAR ENERGY

(An Autonomous Institute of Ministry of New & Renewable Energy, Govt. of India)
Gurugram-Faridabad Road, Gwalpahari, Gurugram, Haryana-122003

SCHEDULE 9- OTHER ADMINISTRATIVE EXPENSES

	2023-24					2022-23				
	Adjusted with grant	Adjusted against Advances	Provision for Expenses	Charged to Revenue	Total	Adjusted with Grant	Adjusted against Advance	Provision for Expenses	Charged to Revenue	Total
Electricity and Fuel Expenses	42,06,208	-	4,64,891	-	46,71,099	59,17,253	-	5,20,070	-	64,37,323
Outsourced Services	2,57,20,562	-	26,12,875	31,26,868	3,14,60,305	1,86,91,225	-	58,50,636	61,74,861	3,07,16,722
Security Services	1,18,14,519	-	12,61,710	7,97,080	1,38,73,309	77,84,323	-	11,12,016	35,73,079	1,24,89,418
Training Expense	-	-	-	12,02,818	12,02,818	-	-	-	2,48,236	2,48,236
Miscellaneous Exp./Contingency	-	-	-	10,51,466	10,51,466	57,520	-	-	4,66,833	5,24,353
Office Expenses	6,92,249	-	-	2,38,440	9,30,689	4,38,268	25,000	-	5,80,591	10,43,859
Refreshment/Hospitality	7,17,777	-	26,572	-	7,44,349	5,34,191	-	1,25,571	1,32,131	7,88,893
Legal & Professional Charges	6,41,138	-	87,910	-	7,29,048	5,77,742	-	64,900	3,37,025	9,79,667
Bank Charges	1,236	-	-	-	91,136	8,138	-	-	1,407	9,545
Gateway/Service charges	-	-	-	-	90,004	-	-	-	1,63,032	1,63,032
Horticulture Expenses	36,63,466	-	2,00,000	3,04,122	41,67,588	7,73,807	-	-	7,73,807	7,73,807
Advertisement Expenses	-	1,03,191	-	-	1,03,191	1,59,569	66,044	-	-	2,25,613
Guest House Expenses	-	-	-	-	83,616	-	-	-	-	89,450
IT Expenses (Facilitation Charges)	14,33,556	-	-	-	14,33,556	1,25,788	-	-	9,07,842	10,33,630
Seminars/Conferences/Training Programmes	84,506	-	-	3,06,494	3,91,000	5,24,765	-	-	28,500	5,53,265
Medical Reimbursement	-	-	1,88,889	4,40,337	6,29,226	-	-	1,34,836	3,81,924	5,16,760
Lab Expenses	8,86,643	-	-	-	8,86,643	8,86,126	-	-	5,70,643	14,56,769
Consumables/ Laboratory/Workshop Exp.	-	-	-	2,84,639	2,84,639	-	-	-	1,82,706	1,82,706
Electrical Consumables	1,76,581	-	-	71,403	2,47,984	3,89,982	-	-	54,788	4,44,770
Library Books, Periodicals and News paper	1,27,081	-	771	-	1,27,852	97,037	-	-	-	97,037
Postage, Courier, Printing and Stationery	6,64,596	-	-	44,619	7,09,215	8,66,336	-	-	1,16,215	9,82,551
Standard Subscription Exps. (Annual)	1,20,855	-	-	-	1,20,855	-	-	-	-	-
Recruitment Expenses	-	-	-	17,986	17,986	-	-	-	1,03,405	1,03,405
Interest & Penalty	-	-	-	859	859	-	-	-	-	-
Repairs & Maintenance Expenses (Building, Machinery & Computers)	8,80,821	24,700	-	13,873	9,19,394	14,17,136	64,900	2,06,906	4,16,106	21,05,048
Telephone & Lease line Expenses	27,24,411	-	29,264	2,26,089	29,79,764	21,51,919	-	29,849	3,29,796	25,11,584
Vehicle Running & Maintenance	2,56,810	-	44,771	-	3,01,581	68,089	-	-	4,860	73,949
Hiring of Vehicles Expenses	13,21,206	-	1,41,386	1,44,151	16,06,543	12,05,452	-	1,37,742	3,77,859	17,21,053
Tour / Travel & Transport	9,35,870	18,000	-	12,99,883	22,53,753	1,95,057	-	-	11,34,497	13,29,554
Tour / Travel & Transport - International	18,182	-	-	-	18,182	-	-	-	3,79,405	3,79,405
Tour / Travel & Transport - ALMM	-	-	-	29,52,727	29,52,727	-	-	-	25,06,245	25,06,245
Guard & Committee meeting	1,14,280	-	-	-	1,14,280	1,99,343	-	-	-	1,99,343
Total	5,72,02,553	1,45,891	30,58,839	1,27,87,373	7,51,94,656	4,30,69,666	1,55,944	81,79,526	1,92,61,435	7,06,66,571

श्री ॐ श्री गणेशाय नमः
NISE
National Institute of Solar Energy
गुरुग्राम

श्री ॐ श्री गणेशाय नमः
Rohit KC Jain & Co.
FR No. 020422N
Chartered Accountants

70

NATIONAL INSTITUTE OF SOLAR ENERGY

(An Autonomous Institute of Ministry of New & Renewable Energy, Govt. of India)
Gurugram-Faridabad Road, Gwalpahari, Gurugram, Haryana-122003

SCHEDULES FORMING PART OF INCOME AND EXPENDITURE ACCOUNT AS AT 31ST MARCH 2024

SCHEDULE 10 - OPERATIONAL/PROJECTS EXPENSES	2023-24					2022-23					Amount in ₹
	Adjusted with grant	Adjusted against Advances	Provision for Expenses	Charged to Revenue	Total	Adjusted with Grant	Adjusted against Advance	Provision for Expenses	Charged to Revenue	Total	
Released to State Nodal Agencies/ Training Partners for Skill Development Programme	8,47,98,222	24,21,936	-	-	8,72,20,158	6,92,85,280	59,31,280	-	28,77,818	7,80,94,378	
ITEC Training Programme Expenses (P11-TP MEA-ITEC)	1,40,47,029	-	-	4,45,285	1,44,92,314	1,59,83,632	-	-	7,17,426	1,67,01,058	
Hydrogen Project Expenses (P02- Hydrogen)	4,07,032	-	-	-	4,07,032	43,206	-	-	-	43,206	
BHEL R&D Project Expenses (P01- PERC) Department of Science and Technology Project Expenses (P06- WPDST-2)	-	-	-	-	-	8,76,753	-	-	-	8,76,753	
Solar Water Pumping System Project Expenses (P07-SWP)	20,32,132	-	-	-	20,32,132	11,69,870	-	-	-	11,69,870	
GIZ Project Expenses	-	-	-	-	-	14,15,098	-	-	-	14,15,098	
UNICEF Project Expenses	-	-	-	-	-	-	-	-	6,91,302	6,91,302	
Varunmitra Skill Development Programme Expenses (P10- TP VARUNMITRA)	-	-	-	3,76,058	3,76,058	-	-	-	1,83,677	1,83,677	
Total	10,12,84,415	24,21,936	-	8,21,343	10,45,27,694	8,88,93,799	59,31,280	-	44,70,223	9,92,95,302	



(Handwritten signature)

NATIONAL INSTITUTE OF SOLAR ENERGY

(An Autonomous Institute of Ministry of New & Renewable Energy, Govt. of India)
Gurugram-Fardelabad Road, Gwalpahari, Gurugram, Haryana-122003

STATEMENT OF GRANTS FOR THE FINANCIAL YEAR 2023-24

PARTICULARS	Opening Balance 01.04.2023	Refund/Transfer during the year 2023-24				Receipts/Transfer during the year 2023-24			Utilization against advances 2023-24	Utilization against Revenue Expenses 2023-24	Utilization against Admin Charges 2023- 24	Total Utilisation 2023-24	Closing Balance 2023-24
		Refund to Ministry	Transfer	Received in Bank	Received Through Transfer	Received in Bank	Received Through Transfer	Utilisation against Fixed Assets 2023-24					
National Institute of Solar Energy													
Grant for Creation of Capital Assets	2,78,52,897	2,78,52,897	-	7,00,00,000	-	60,19,507	-	6,02,77,427	-	-	-	6,62,98,934	37,03,966
Grant in aid- General	28,350	28,350	-	6,50,00,000	-	30,71,732	-	-	5,87,31,133	-	-	6,18,02,865	31,97,135
Grant in aid- Salaries	21,10,092	21,10,092	-	4,50,00,000	-	13,980	-	-	4,49,86,020	-	-	4,50,00,000	-
Grant for BHEL R&D Projects (P01- PERC)	7,35,810	-	-	-	-	-	-	-	-	-	-	-	7,35,810
Grant for Project Hydrogen (P02- Hydrogen)	5,03,16,907	4,03,16,906	-	-	-	-	-	-	4,07,032	-	-	4,07,032	95,92,959
Grant. Skill Development Programme (HRD-4110)	1,32,45,158	2,50,00,000	-	15,07,39,060	-	4,67,100	-	-	8,47,98,222	-	-	8,52,65,322	5,37,16,896
Grant for SERIUS (Indo US Project)	39,666	-	-	-	-	-	-	-	-	-	-	-	39,666
Grant. World Renewal Energy Museum	2,66,55,648	-	-	-	-	-	-	-	-	-	-	-	2,66,55,648
Grant. Solar Powered clean drinking water project (P05-SDWP)	-3,57,050	-	-	-	3,02,048	-	-	-	-	-	-	-	-56,002
Grant - Varunmitra Skill Development Programme (HRD-4110)	-	-	-	38,75,401	-	-	-	-	-	-	-	-	38,75,401
Grant - Department of Science & Technology (P06- WPDST-2)	95,58,695	85,09,180	-	43,01,297	-	34,66,586	-	-	20,32,132	-	-	55,18,698	-1,67,885
Grant-International Training Programme	-31,96,695	-	-	1,36,76,032	-	-	-	-	1,40,47,029	-	-	1,40,47,029	-35,67,692
Total Grant (Balance of Grant payable to Govt. of India)	12,99,89,178	10,38,17,425	-	35,25,88,750	3,02,048	1,30,58,885	6,02,77,427	20,50,01,568	-	-	-	27,83,37,890	9,77,24,711
Contributions for Corpus Fund													
Contribution by IREDA	1,00,00,000	-	-	-	-	-	-	-	-	-	-	-	1,00,00,000
Total Grant Received from Govt. Non-Refundable	1,00,00,000	-	-	-	-	-	-	-	-	-	-	-	1,00,00,000

Rohit KC Jain & Co.
FR No. 020422N
Chartered Accountants

श्री एन सी ई
National Institute of Solar Energy (NISE)
गुरुग्राम
Gurugram
(An Autonomous Institute of Ministry of New & Renewable Energy, Govt. of India)



B. Notes to Accounts

1. NISE has created the Corpus Fund as per the guidelines approved by MNRE vide letter No. 354/12/2017 – NSM dated 24.06.2019 during the year. The balance of Corpus Fund as on 31.03. 2024 is Rs. 1981.34/- lakhs (Previous year Rs. 1425.78/-).
2. The guidelines for enlistment under "Approved Models and Manufactures of Solar Photo voltaic Modules (Requirements for Compulsory Registration) Order, 2019" issued by MNRE, NISE has been designated as Implementation Support Agency. The inspection/application fee under the said scheme is considered as revenue of the Institute.
3. The accumulated depreciation amounting to Rs. 60,97,62,790/- (current year Rs. 8,57,13,990/-) has been charged to the Income & Expenditure account. Since the Institute is fully aided by the grant from Government of India, the same has been charged to the Grant in Aid (Capital) and is recognised in the Income & Expenditure account as a contra item.
4. The amount of interest earned on grants and payable to MNRE is Rs. 2,30,87,919/- (previous year Rs. 86,60,508/-) and has been shown as contra item in Income and Expenditure account.
5. The Institute has taken over the facilities consisting of 200 acres of land, administrative block, 3 Nos. technical block from erstwhile solar Energy centre (MNRE), the ownership of which is under process of transfer.
6. Addition made during the F.Y. 2023-24 in Capital Reserve (Purchase of Assets) amounting to Rs. 6,02,77,427/- (Previous Year Rs. 2,70,32,684/-).
7. The provision for expenses during the year has been made for an amount of Rs. 50,58,839/- (Previous year Rs 82,46,523/-).
8. An amount of Rs. 5,41,441/- out of the provision made in F.Y. 2022-23, has been written back during the year, as the same has been paid through the grant account.
9. The balances of sundry creditors and debtors are subject to confirmation.
10. Previous year figures have been regrouped and rearranged to make them comparable with those of current year.

For M/s Rohit KC Jain & Co.
Chartered Accountants
FRN 020422N




CA. Ritesh Wahal
Partner
M. No.: 517197
UDIN:24517197BKALDO6119

Place: New Delhi
Date: September 25, 2024





राष्ट्रीय सौर ऊर्जा संस्थान
(नवीन एवं नवीकरणीय ऊर्जा मंत्रालय, भारत सरकार के अधीन एक स्वायत्त संस्थान)
National Institute of Solar Energy
(An Autonomous Institute of Ministry of New and Renewable Energy)
गुरुग्राम - फरीदाबाद मार्ग, ग्वाल पहाड़ी, गुरुग्राम - 122 003, हरियाणा, भारत
Gurugram - Faridabad Road, Gwal Pahari, Gurugram -122 003, Haryana, India

To,

Dated: 25.09.2024

M/s Rohit KC Jain & Co.
Chartered Accountants
1, Tolstoy Marg, Connaught Place
New Delhi-110001

Subject:- Management Reply on observation of Audit for the FY 2023-24.

Sir,

In reference of observations mentioned in Annexure-1 of the Audit-report for the FY 2023-24, we are submitting the point wise reply: -

1. The various works, including repairing, renovation, re-carpeting, waterproofing, and construction, were assigned to CPWD on a deposit work basis. NISE has received an update on the status of these works via email dated 27.06.2024 from the CPWD Faridabad division, detailing the utilization of funds (expenditure status). Some of the works have been completed but are pending the issuance of a utilization certificate from CPWD, while other works are still in progress.
2. The TDS refund of ₹16.12 lakhs, along with interest, has been received in the current financial year (FY) 2024-25. The refund for the return of FY 2022-23 is still under process and will be released once the return is processed. NISE has also submitted a request on the income tax portal for the refund of income tax for FY 2022-23.
3. The matter was discussed during the 14th Governing Council (GC) meeting and the 16th Finance Committee (FC) meeting of NISE, where it was decided to modify the purpose of fund utilization in consultation with IREDA.
4. The advance of 50% fund was released to conduct the skill development program to the abovementioned training partner. The point wise reply is as follows:
 - i. The Training Partner submitted the Utilization Certificate (UC) and Statement of Expenditure (SOE) directly to NISE, even though the program was conducted through the State Nodal Agency (SNA), i.e., OREDA. The submitted UC and SOE have not been endorsed by OREDA. NISE has communicated this issue multiple times to both the Training Partner and SNA, seeking resolution. On 06.03.2024, NISE issued another letter, requesting either the submission of the counter-signed UC and SOE or the refund of ₹4,17,600/- along with interest. Otherwise, NISE will be compelled to initiate legal proceedings.

दूरभाष / Tel. No. : 0124-285 3060
ईमेल / Email : dgnise.mnre@nise.res.in, वेबसाइट/ Website : www.nise.res.in



ii. The advance of Rs. 6,29,160/- has been settled in the books of NISE in the FY 2024-25.

iii. NISE has sent multiple reminders to the Rajasthan Renewable Energy Corporation Limited (RRECL), but no response has been received. On 06.03.2024, another letter was issued to RRECL, requesting the refund of ₹6,42,000/- along with interest. In the event of failure to refund the said amount, NISE will be compelled to initiate legal proceedings.

5. The matter of C-DAC is currently under the MNRE audit observation and C-DAC had taken views of its legal & quality department and is in process of initiating sole arbitration for setting the issues.
6. The majority of the Earnest Money Deposit (EMD) related to training partners involved in the Skill Development Program (Suryamitra) has already been refunded. The remaining balance of ₹6,63,930/- pertains to existing vendors associated with NISE for their works and contracts.
7. The mentioned advances received pertains to ALMM application and inspection fees of foreign companies. The inspection of foreign companies is in process in the current FY 2024-25 and could not be completed in the previous FY 2023-24 due to revised guidelines of MNRE.

Kindly consider our representation.

Thanking You,



Yours Sincerely,



(Dr. Chandan Banerjee)

Dy. Director General



National Institute of Solar Energy

(An Autonomous Institute of Ministry of New and Renewable Energy, Government of India)
Gurugram - Faridabad Road, Gwal Pahari,
Gurugram - 122003 (Haryana)