



# ANNUAL REPORT 2019-20



**Ministry of New and Renewable Energy**  
Government of India



**AGRICULTURAL SOLAR PUMP SET**



*Hon'ble Prime Minister Shri Narendra Modi with Dr. Angela Merkel, German Federal Chancellor along with other dignitaries during 5<sup>th</sup> round of Inter-Governmental consultations at New Delhi (31<sup>st</sup> October - 1<sup>st</sup> November, 2019)*

# CONTENTS

<b>Chapter 1</b>	<b>Overview</b>	<b>1</b>
<b>Chapter 2</b>	<b>Introduction</b>	<b>11</b>
<b>Chapter 3</b>	<b>National Solar Mission</b>	<b>15</b>
<b>Chapter 4</b>	<b>Power from Other Renewables</b>	<b>47</b>
<b>Chapter 5</b>	<b>Renewable Energy for Rural Applications</b>	<b>67</b>
<b>Chapter 6</b>	<b>Renewable Energy for Urban, Industrial and Commercial Applications</b>	<b>75</b>
<b>Chapter 7</b>	<b>RD&amp;D in New and Renewable Energy</b>	<b>77</b>
<b>Chapter 8</b>	<b>Renewable Energy in North Eastern Region States</b>	<b>91</b>
<b>Chapter 9</b>	<b>Greening of Islands of Andaman &amp; Nicobar and Lakshadweep</b>	<b>101</b>
<b>Chapter 10</b>	<b>Specialised Institutions</b>	<b>105</b>
	A. National Institute of Solar Energy (NISE)	106
	B. National Institute of Wind Energy (NIWE)	120
	C. Sardar Swaran Singh National Institute of Bio-Energy (SSS-NIBE)	125
	D. Solar Energy Corporation of India (SECI)	129
	E. Indian Renewable Energy Development Agency Limited (IREDA)	135
<b>Chapter 11</b>	<b>Support Programmes</b>	<b>139</b>
<b>Chapter 12</b>	<b>International Cooperation in Renewable Energy</b>	<b>155</b>
<b>Chapter 13</b>	<b>Promotion of Official Language – Hindi</b>	<b>165</b>
<b>Annexure I</b>	<b>Staff Strength</b>	<b>170</b>
<b>Annexure II</b>	<b>Audit</b>	<b>172</b>
<b>Annexure III</b>	<b>Grants in Aid to States and Voluntary Organisations</b>	<b>173</b>



# OVERVIEW

## OVERVIEW

### INTRODUCTION

- 1.1 As nations contend with the increasingly devastating impact of climate change, largely caused by anthropocentric developmental activities, the role of renewable energy in the energy and electricity mix becomes primary. Across the world, many of the developed and developing countries have started giving primacy to rapidly increase the percentage of renewable energy in the overall energy mix of their economies. Renewable Energy has become one of the most important factors and hope for the world to preserve the pristine environment and the planet's resources for future generations. India has been leading the world on this front showing the developing nations of the world a way forward for socio-economic growth without degradation of the environment.
- 1.2 India is very ambitious in its targets for promoting renewable energy. In India, renewable energy has started playing an increasingly important role in the augmentation of grid power, providing energy access, reducing the consumption of fossil fuels and helping India pursue its low carbon development path. Ahead of COP 21, India submitted its Intended Nationally Determined Contribution (INDC) to the UNFCCC, outlining the country's post-2020 climate actions. India's INDC builds on its goal of installing 175 gigawatts (GW) of renewable power capacity by 2022 by setting a new target to increase the country's share of non-fossil-based installed electric capacity to 40 percent by 2030.
- 1.3 The INDC also commits to reduce India's GHG emissions intensity per unit GDP by 33 to 35 percent below 2005 levels by 2030 and to create an additional carbon sink of 2.5 to 3 billion tonnes of carbon dioxide through additional tree cover. Prime Minister Narendra Modi while addressing the 74th session of the United Nations General (UNGA) in New York said while from a historic and per capita emission perspective India's contribution to Global Warming is very low, India is one of the leading nations when it comes to taking steps to address this issue.

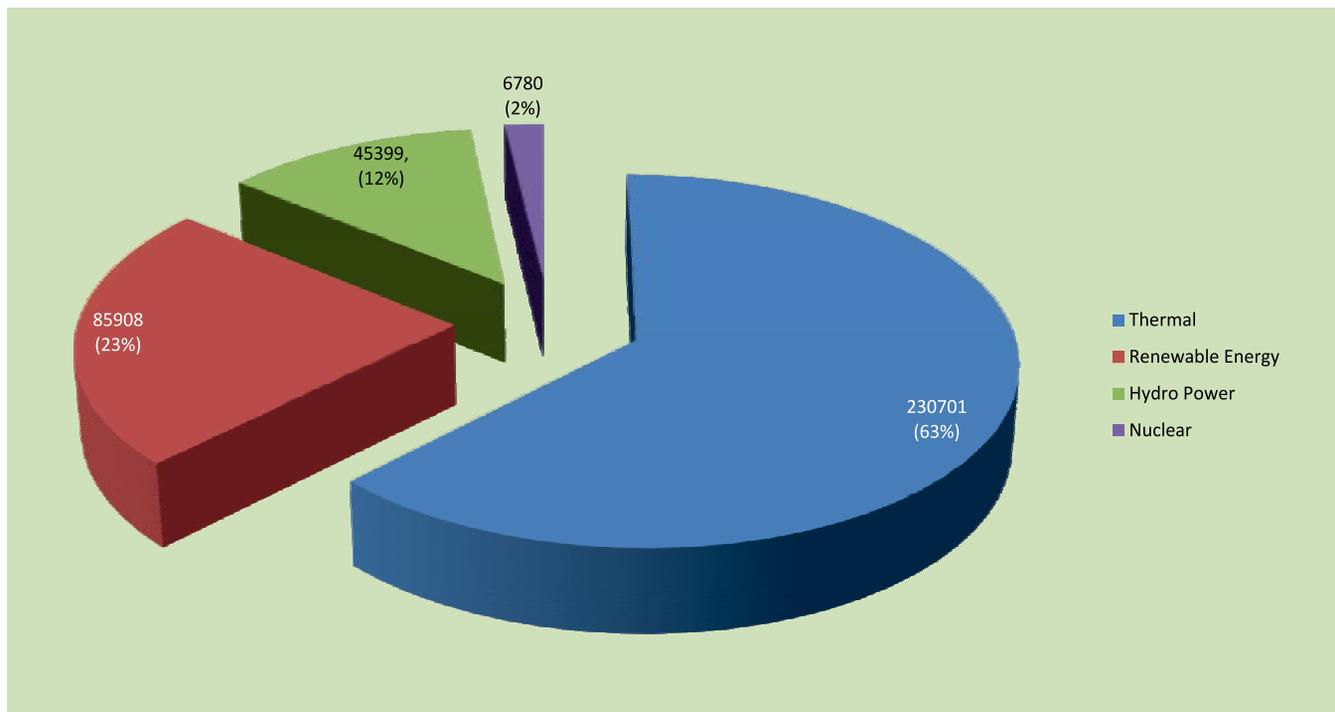
### MULTIPRONGED APPROACH FOR GROWTH OF THE SECTOR

- 1.4 To meet its ambitious targets and commitment to the entire world in the fight against climate change, India has been rolling out multiple initiatives, programs, policies and incentives to accelerate the development of the renewable energy sector. It has driven the growth of the sector by holistically driving investments, resolving industry issues proactively, including the perspective of the stakeholders in charting the growth story, addressing policy concerns, all the while generating employment for the nations burgeoning youth population and skilling them keeping the needs of the sector in mind.

### THE MISSION

- 1.5 Launched in January 2010, the National Solar Mission (NSM) was the first mission to be operationalized under the National Action Plan on Climate Change (NAPCC). Using a three-phase approach, the mission's objective is to establish India as a global leader in solar energy, by creating the policy conditions for solar technology diffusion across the country as quickly as possible. The initial target of the mission of installing 20 GW grid-connected solar power plants by the year 2022 was enhanced to 100 GW to be achieved by the same target year.

**Figure 1.1: India - Source Wise Installed Power Generation Capacity (MW) as on 31.12.2019**

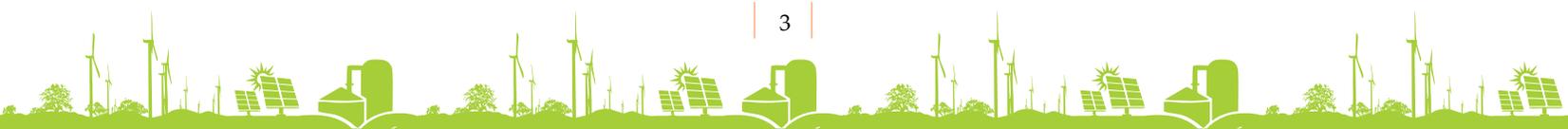


1.6 In 2015, the Government of India announced a target for 175 GW cumulative renewable power installed capacity by the year 2022. A capacity of 85.90 GW has been set up by December 2019 constituting more than 23 percent of the total installed capacity. India has 4th and 5th global positions in the wind and solar power deployment respectively. Since 2013-14 till December 2019, the renewable power deployment has more than doubled. Annually more than 10 million man-days employment is being created in the sector. Solar power capacity has increased by more than 14 times in the last five years from 2630 MW to 37505 MW in December 2019.

## POLICY INITIATIVES

1.7 A range of policy instruments has been adopted to implement this mission. The revised tariff policy requires all States to reach eight percent solar RPO by the year 2022. The first phase of the mission opted for a reverse bidding mechanism; reverse bids (discounts) on benchmark tariffs set by the Central Electricity Regulatory Commission (CERC) were invited from prospective project developers. Solar water heaters and rooftop systems have been promoted in certain government, commercial and residential areas through regulatory intervention such as mandates under building by-laws and its incorporation in the National Building Code. Off-grid and rooftop solar applications have been promoted through the provision of subsidies from the central government. Research and development is also being encouraged through approvals of R&D projects and the establishment of Centres of Excellence by the Ministry. These measures led to a decline in the purchase prices of solar power in India much more than expectations. Overall, NSM is proceeding well according to schedule.

1.8 Several policy measures were undertaken in the last five years including guidelines for procurement of solar and wind power through tariff-based competitive bidding process, repowering of wind power





projects, quality standards for deployment of Solar Photovoltaic systems and devices, provision of rooftop solar and 10 percent renewable energy as mandatory under Mission Statement and Guidelines for development of smart cities, amendments in building bye-laws for mandatory provision of rooftop solar for new construction or higher Floor Area Ratio, infrastructure status for solar projects, raising tax-free solar bonds, providing long tenor loans, incorporating measures in Integrated Power Development Scheme (IPDS) for encouraging distribution companies and introducing net-metering.

- 1.9 With an aim to enhance farmers' energy independence, income and de-dieselise the farm sector, the Government had announced a new scheme Pradhan Mantri – Kisan Urja Suraksha Evam Utthan Mahaabhiyan (PM-KUSUM).
- 1.10 Ministry is aware of the technological edge that India can provide in the key RE sector and has provided the necessary impetus for investments and incentivizing new technology. The availability of funds at the competitive price for further growth of the sector is another important challenge. This issue has been addressed by making fresh project finance available at competitive rates for all new projects, especially for SMEs.

## EMPLOYMENT GENERATION AND SKILLING

- 1.11 To support the Make in India policy and to create decent employment to the youth, improving the credit flow to the SMEs, Ministry brought manufacturing linked project development with suitable incentives. As the size of the development is increasing, the associated taxes, duties need special attention. Ministry has come up with timely recommendations to the Finance Ministry to create a conducive environment for orderly growth of the RE sector.
- 1.12 The focus of the promotion of renewable energy policies and initiatives taken in the last four years has led to large-scale penetration of and use of such technologies across the rural countryside. Such initiatives have created employment opportunities at multiple levels. Around 12 million man-days' employment is being created per annum in the sector. More than 40,000 Suryamitras have been trained in the last five years to cater to the growing needs of the solar energy sector and its service industry.

## TACKLING EMERGENT CHALLENGES AND BARRIERS PROACTIVELY

- 1.13 As the country is racing towards achieving the target of 175 GW of RE installed capacity, new challenges are emerging in the form of huge capital requirements, protection of foreign capital investments in RE projects from payment delays, providing adequate ISTS transmission & distribution infrastructure and developing suitable land resources. Ministry handled these issues with effective policy interventions and consultations with States. During the year, few of the major focus areas of action was to address barriers confronting large-scale adoption of renewable power, including available land, low-cost finance, domestic manufacturing capacity, and skilled manpower. Major areas of action remained to strengthen the planned infrastructure, protocols and power grid infrastructure.
- 1.14 To address the specific emergent issues, on 4 December 2019, Ministry of Power (MoP) was requested to amend the 13 February 2018 order: for ISTS waiver for sale of power from Government producers; to extend ISTS waiver for projects set up beyond RPO; waiver for hybrid power projects consisting of





*The Minister of State for Power, New & Renewable Energy (Independent Charge) and Skill Development & Entrepreneurship, Shri Raj Kumar Singh addressing the 68th meeting of Forum of Regulators, in New Delhi on June 20, 2019. The Secretary, MNRE, Shri Anand Kumar and the Chairperson CERC, Shri P.K. Pujari are also seen.*

wind and solar with or without battery storage; waiver of ISTS charges and losses for projects set up under UMREPP under EPC mode; and waiver for solar projects set up under manufacturing linked solar PV projects.

- 1.15 The Ministry continued to make concerted efforts for ensuring Renewable Purchase Obligation (RPO) compliance. State Electricity Regulatory Commissions (SERCs) were requested for ensuring RPO compliance and enforcing penal provisions against defaulting Obligated Entities. Ministry has also requested for APTEL’s intervention to direct defaulting SERCs to ensure RPO compliance through timely monitoring and invoking penal provisions for non-compliance; aligning RPO trajectory notified by the Ministry of Power (MoP) up to the year 2021-22, and not to permit carry forward or waiver of RPO. So far, Arunachal Pradesh, Delhi, Karnataka, and Sikkim have aligned with MoP trajectory and Chhattisgarh, Himachal Pradesh, Madhya Pradesh, Odisha, and Tamil Nadu have drafted notification as per MoP trajectory.

### **INCLUSIVE GROWTH: SABKA SATH SABKA VIKAS – INVOLVING THE INDUSTRY AND STAKEHOLDERS IN THE GROWTH STORY OF THE SECTOR**

- 1.16 A ‘Chintan Baithak’ with the stakeholders of Renewable Energy sector was held in May 2019, chaired by Secretary, MNRE, Shri Anand Kumar, saw good participation from Renewable Energy (RE) sector including the representatives of major RE developers, equipment manufacturers, financiers, regulators,





*The Secretary, MNRE, Shri Anand Kumar chairing 'Chintan Baithak' with the stakeholders of Renewable Energy Sector, in New Delhi on May 07, 2019.*

think-tanks, industry bodies, and skill developers. The meet deliberated upon various issues pertaining to the RE sector viz. solar, wind, bio-energy, small-hydro, regulatory issues, bidding & pricing, demand forecasting, financing of RE projects, energy storage, Make in India, Skilling India's RE workforce, etc. Various policy interventions were suggested for the sector by the stakeholders.

- 1.17 As a result thereof, the Ministry formed a three-member Dispute Resolution Committee to consider the unforeseen disputes between solar/wind power developers and SECI/NTPC, beyond contractual agreement. As a result of Chintan Baithak payment dues of renewable power developers from DISCOMs are reflected in PRAAPTI portal.

## RESEARCH AND DEVELOPMENT

- 1.18 R&D is a bedrock for sustaining the growth of any sector. MNRE has been extremely focussed on giving impetus to Renewable Energy R&D through various initiatives.
- 1.19 Research and Development efforts in renewable energy continued to make advances in making such technologies affordable and sturdy with assured quality. With this in mind, the government has notified the National Laboratory Policy on testing, standardization, and certification, with six laboratories being recognized by the Bureau of Indian Standards. Besides, Quality Control Order titled Solar Photovoltaics,





*The Minister of State for Power, New & Renewable Energy (Independent Charge) and Skill Development & Entrepreneurship, Shri Raj Kumar Singh addressing at the inauguration of the Elecrama 2020, at India Expo Mart, in Greater Noida on January 18, 2020.*

Systems, Devices, and Components Goods (Requirement for Compulsory Registration) Order 2017 for Solar PV systems and components under the BIS Act. New initiatives were also taken up for Quality Control Orders on Solar Thermal Collectors and Grid Tied Inverters.

## **ACHIEVEMENTS OF THE MINISTRY OF NEW AND RENEWABLE ENERGY**

1.20 New achievements have been made by the Ministry during the last year including:-

- i. SECI has awarded 1440 MW capacity after e-reverse auction under Solar – Wind Hybrid policy;
- ii. CPSU Scheme Phase II launched with VGF funding with 922 MW awarded under Tranche I and 1104 MW awarded under Tranche II;
- ii. Phase II of Grid Connected Solar Rooftop Programme launched in February 2019 with the target of 40000 MW capacity by the year 2022
- iv. Tender invited for setting up Solar PV manufacturing capacities linked with assured off-take of 10000 MW;





- v. Revised Tariff Policy mandating Renewable Purchase Obligation (RPO) and Renewable Generation Obligation (RGO);
- vi. Waiver of Inter-State Transmission charges for Solar and Wind Energy;
- vii. RPO trajectory for 2022 being enforced through CERC and SERC interventions;
- viii. Transparent bidding process continued – which has led to a significant reduction in per-unit cost of solar and wind power;
- ix. Three solar parks Kurnool (1000 MW) in Andhra Pradesh and Bhadla-II (680 MW) in Rajasthan and Pavagada (2000 MW) in Karnataka are fully operational;
- x. More than 74 lakh solar lanterns and study lamps; more than 17 lakh home lights have been distributed under the Off-Grid and Decentralised Solar Programme. Besides, more than 6.80 lakh street lights have been set up in the villages of India. More than 2.46 lakh Solar PV Pumps have been installed in the rural areas for irrigation and drinking water purposes.
- xi. The Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) Scheme has been launched in March 2019 consisting of three components namely Component-A: Setting up of 10,000 MW of Decentralized Grid Connected Solar or other Renewable Energy Power Plants on barren / fallow land; Component-B: Installation of 17.50 Lakh stand-alone solar agriculture pumps; and Component-C: Solarisation of 10 Lakh Grid Connected Agriculture Pumps.
- xii. The current annual manufacturing capacity of wind turbines in the country is about 10,000 MW;
- xiii. To enable Discoms of the non-windy States to fulfill their non-solar Renewable Purchase Obligation (RPO), through the purchase of wind power at a tariff determined by a transparent bidding process, MNRE through SECI has auctioned wind power capacity in 8 tranches. Further, NTPC and the states of Gujarat, Maharashtra and Tamil Nadu have also auctioned wind power capacities. The Cumulative commissioned capacity until 31/12/19 stands at 37.505 GW. Capacity under implementation is 9.355 GW.
- xiv. An online portal has been developed and launched in December 2019 by Ministry for issuing concessional custom duty exemption certificates (CCDC) to the manufacturers of wind operated electricity generators as per the Ministry of Finance tariff notification.
- xv. India's offshore wind potential has been recognized under the National Offshore Wind Policy under which NIWE has been authorized to allocate offshore wind blocks to developers based on open international competitive bidding. To formulate the required framework for regulating the lease of offshore areas within the EEZ of India for offshore wind energy development, Ministry is framing lease rules under the 'Territorial Waters, Continental Shelf, Exclusive Economic Zone, and Other Maritime Zones Act, 1976'. The draft offshore wind energy lease rules have already been circulated to stakeholders Ministries and Departments and their comments have been received.

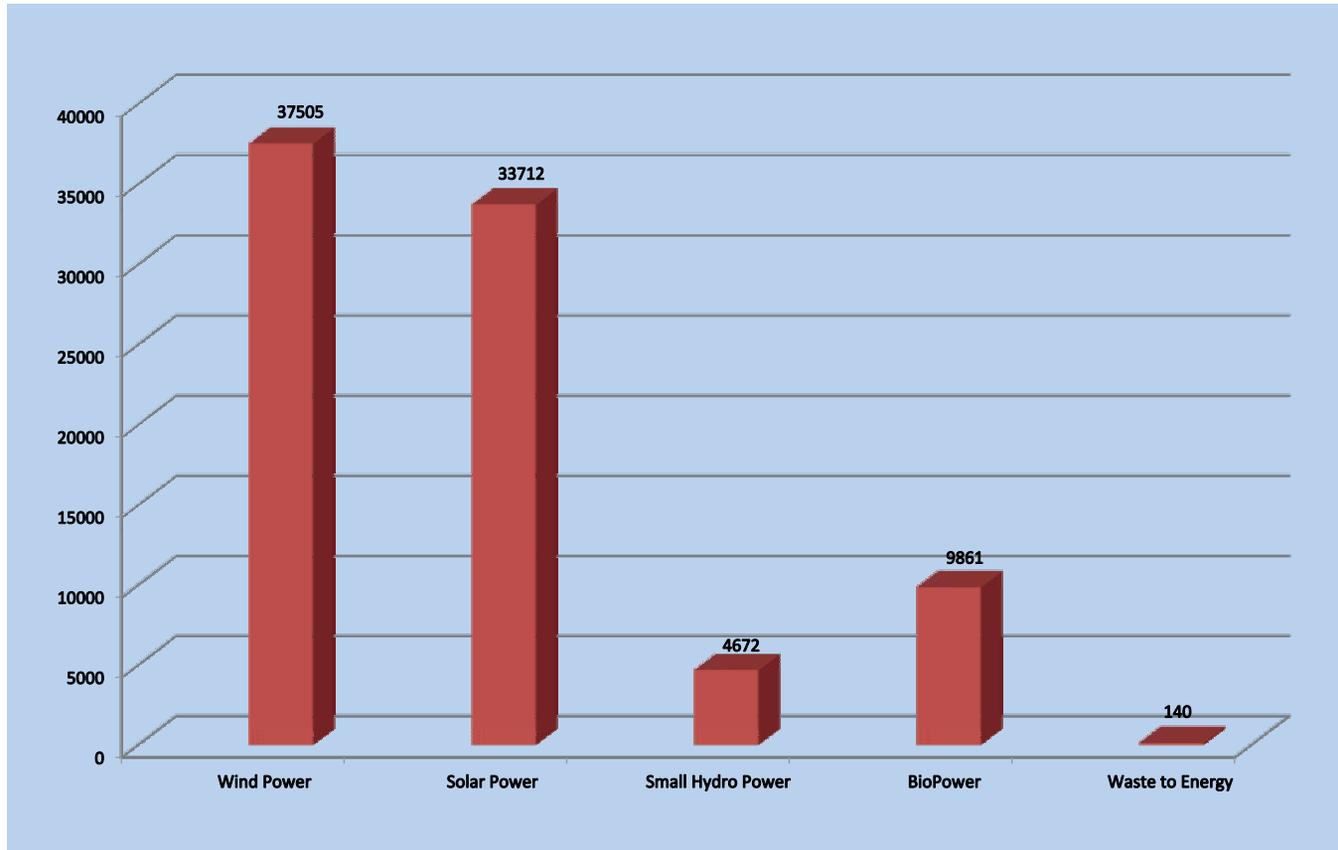




- xvi. 12 biogas based projects have been commissioned with a power generation capacity of 212 kW and corresponding biogas generation capacity of 1805 m<sup>3</sup> per day. With this, the cumulative total of 316 biogas based projects with a total power generation capacity of 7.166 MW with a cumulative total biogas generation of 69,500 m<sup>3</sup> per day has been set up in the country, up to 31.12.2019.
  - xvii. Under the Green Energy Corridor project, approx. Rs.2000 crore has been disbursed to the States from the Government of India share to cover projects awarded under it.
  - xviii. On 22 May 2018, the Ministry of New and Renewable Energy constituted RPO Compliance Cell to coordinate with States, SERCs and CERC on matters relating to RPO Compliance. A centralized online platform has been developed to monitor RPO compliance status for all states, enabling States to feed information on RPO compliance in the portal by Obligated Entities in respective States, and collation of data at the national level.
  - xix. Around 60.61 lakh solar study lamps were distributed to the students under 70 lakh solar study lamp scheme in the States of Assam, Bihar, Jharkhand, Odisha and Uttar Pradesh. Under the Scheme, over 7436 nos. of women were trained as solar lighting technicians, 1769 nos. of repair and maintenance centers were established, around 1896 people were trained in entrepreneurship development and 832 nos. of solar shops have been opened.
  - xx. Financing scheme developed jointly with IREDA and MNRE, to provide financial support to Concentrated Solar Thermal (CST) projects by bundling the MNRE's subsidy and a soft loan from IREDA, thereby providing upfront access to 75% of CST project cost;
  - xxi. NIWE has created an operational forecast system with simulation tools, to predict the wind power up to 7 days ahead. To improve the forecasting model, NIWE has signed MoU with ISRO SAC for Development of Wind and Solar Power Forecasting using High-Resolution Numerical Model. Currently, NIWE has developed the indigenous Intra-day forecasting model and also carrying out various activities to improve/fine-tune the day ahead model from the inputs received during the delivery of pilot operational forecasts to RE SLDCs.
  - xxii. NIWE has signed MoUs with SLDC's of Tamilnadu, Gujarat, Andhra Pradesh, Karnataka, Maharashtra & SRLDC for providing wind/solar power forecasting services. The Pilot Wind/Solar power forecasting services have been initiated for Tamilnadu, Gujarat, Karnataka, Andhra Pradesh, Maharashtra and SRLDC (NP Kunta Solar Park & Chandragiri wind farm).
  - xxiii. Under the Suryamitra program, Suryamitra Trainings are being organized through 223 training centers/organizations in different states across the country under the coordination by the National Institute of Solar Energy since March 2018. During the current year, i.e. 2019-20, 20,700 youth are targeted to be trained as Suryamitras in 690 batches across the country. Total 40,441 no. of Suryamitras have been trained cumulatively up to 31st December 2019.
- 1.21. During the year 2019-20 a total of 7,591.99 MW renewable energy capacity has been added in the country till 31.12.2019 as given in **Table 1.1**.

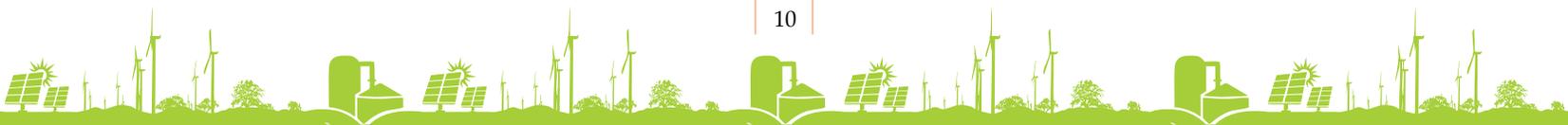


**Fig. 1.2: Sector Wise Renewable Energy Cumulative Achievements (MW as on 31.12.2019)**



**Table 1.1: Achievement in Grid Connected Renewable Power**

Sector	Achievement (April-Dec 2019)	Cumulative Achievements (on 31.12.2019)
Wind Power	1879.21	37505.18
Solar Power - Ground Mounted	5013.00	31379.30
Solar Power - Roof Top	536.88	2333.23
Small Hydro Power	78.40	4671.55
Bio Power (Biomass & Gasification and Bagasse Cogeneration)	83.00	9861.31
Waste to Power	1.50	139.80
<b>Total</b>	<b>7591.99</b>	<b>85908.37</b>





## INTRODUCTION

## INTRODUCTION

2.1 In 1982, a separate Department of Non-Conventional Energy Sources (DNES) was created in the Ministry of Energy to look after all the aspects relating to New and Renewable Energy. The Department was upgraded into a separate Ministry of Non-Conventional Energy Sources (MNES) in 1992 and was rechristened as Ministry of New and Renewable Energy (MNRE), in October 2006.

### 2.2 ALLOCATION OF BUSINESS RULES

2.2.1 Under the Allocation of Business Rules, the MNRE has been assigned the following specific items:

- Research and development of bio-gas and programmes relating to bio-gas units.
- Commission for Additional Sources of Energy (CASE).
- Solar Energy - including photovoltaic devices and their development, production and applications.
- All matters relating to small/mini/micro hydel projects of and below 25 MW capacity.
- Programmes relating to improved chulhas and research and development thereof.
- Indian Renewable Energy Development Agency.
- Research and development of other non-conventional/renewable sources of energy and programmes relating thereto.
- Tidal Energy.
- Integrated Rural Energy Programme (IREP).
- Geothermal Energy.

### 2.3 STRUCTURE OF THE MINISTRY

2.3.1 Shri Anand Kumar is the Secretary in Ministry of New and Renewable Energy with effect from 23rd June 2017. The Ministry has one Financial Adviser, three Joint Secretaries, one Economic Adviser, one Deputy Director General and 43 Scientists. Various programmes are being implemented by the Ministry through State Nodal Agencies (SNAs) and channel partners.

### 2.4 INSTITUTIONS UNDER THE MINISTRY

2.4.1 To support the Ministry, there are five institutions consisting of three autonomous bodies i.e. National Institute of Solar Energy (**NISE**), National Institute of Wind Energy (**NIWE**) and National Institute of Bio Energy (**NIBE**) and two public sector undertakings i.e. Indian Renewable Energy Development Agency (**IREDA**) and Solar Energy Corporation of India (**SECI**).



*National Institute of Wind Energy (NIWE), Chennai, Tamil Nadu*

NISE is located at Gurugram, Haryana and serves as the technical focal point for research & development in solar energy sector. NIWE is located at Chennai, Tamil Nadu and serves as the technical focal point for research & development in wind energy sector. NIBE is located at Kapurthala, Punjab and is focusing on research & development in bio-energy sector. IREDA, a Non-Banking Financial Institution under the administrative control of this Ministry, provides term-loans for renewable energy and energy efficiency projects. SECI is a Section 3 company under the Companies Act, situated in New Delhi. It functions as the implementing and executing arm of the Ministry for implementation of the National Solar Mission and Wind energy projects.



*National Institute of Solar Energy(NISE), Gurugram, Haryana*



*National Institute of Bio Energy (NIBE), Kapurthala, Punjab*

## 2.5 PUBLIC GRIEVANCES REDRESSAL

2.5.1 Grievances are received in the Ministry through President's Secretariat, Prime Minister's Office, Department of Administrative Reforms and Public Grievances (DARPG), other Ministries/Departments and from the individuals concerned on MNRE's Window of CPGRAMS portal of DARPG. With a view to deliver expedition redressal of grievances in a responsible and effective manner, the following measures have been put in place in the MNRE.

- i. Sh. K Salil Kumar, Deputy Secretary has been designated as Liaison Officer for SC/ST/OBC for implementation of scheme of reservation for persons of Schedule Caste (SC)/ Scheduled Tribe (ST)/ Other Backward Class (OBC) categories.
- ii. A committee has been constituted to enquire into the complaints of sexual harassment, if any, for the women working in this Ministry.
- iii. Grievances/petitions/complaints received are forwarded by Public Grievance Cell, MNRE to the Division Head concerned for redressal/taking necessary action and final disposal, with the request to send a final reply to the petitioner, as per time schedule provided. These petitions are monitored on regular basis to keep track of their disposal by reminders etc. The position regarding final disposal of petitions is also intimated to the authority from which the grievance was received, by post or through CPGRAMS and the individuals concerned.





iv. Time Frame for Redressal of the Grievance/petition:

Sl. No.	Subject	Time Frame
1.	Issue of acknowledgement to the petitioner	03 days
2.	Forwarding of the grievances/petition to the concerned authority	07 days
3.	Issue of interim reply to the petitioner or to send communication seeking additional information from petitioner.	15 days
4.	Final disposal of petition/grievance and time limit for informing the position of the outcome.	60 days

## 2.6 CITIZEN'S/CLIENTS' CHARTER OF MNRE

2.6.1 In order to ensure timely delivery of services to its Clients/Citizens and redressal of their grievances in a time-bound manner the Ministry has brought out a Citizens'/Clients' Charter(CCC), incorporating its mission, main services/transactions and commitment to its clients and the people of India in general, is available on MNRE's website. It aims at providing a mechanism for redressal of clients'/citizens' grievances. It also aims at addressing problems of interface between the Ministry and its clients'/citizens' and also continuously improving the quality of public services for the people at large to make them responsive to their needs and wishes.





## **NATIONAL SOLAR MISSION**



## NATIONAL SOLAR MISSION

### 3.1 INTRODUCTION

National Solar Mission (NSM), launched on 11th January, 2010, had set a target for development and deployment of 20 GW solar power by the year 2022. The Cabinet in its meeting held on 17/6/2015 had approved revision of target under NSM from 20 GW to 100 GW.

### 3.2 1000 MW CAPACITY GRID-CONNECTED SOLAR POWER PROJECTS IMPLEMENTED THROUGH NTPC VIDYUT VYAPAR NIGAM LIMITED (NVVN) UNDER NATIONAL SOLAR MISSION (NSM) PHASE-I:

This scheme covered large solar power plants of total 1,000 MW capacity connected to grid at 33 kV and above - 500 MW capacity each based on Solar Thermal (ST) and Solar Photovoltaic (SPV) technologies. It included three stages: (i) Migration Scheme (ii) NSM Phase-I, Batch-I and (iii) NSM Phase-I, Batch-II.

### 3.3 MIGRATION SCHEME

With a view to facilitate quick start-up to NSM and also speedier implementation of the then on-going projects under advanced stage of implementation in different States, this scheme was introduced in Feb 2010 to allow the migration of such projects to NSM. A total of 16 projects of 84 MW capacity (54 MW SPV and 30 MW ST) were approved under this scheme for long-term procurement of power by NVVN at Central Electricity Regulatory Commission (CERC) notified tariff for 2010-11 viz. Rs.17.91/unit for SPV and Rs.15.31/unit for ST. Eleven SPV projects of 48 MW capacity were commissioned under this scheme.

### 3.4 NSM PHASE-I, BATCH-I & BATCH-II

- (i) Under NSM Batch-I and Batch-II of NSM, solar power projects were allotted through a process of reverse bidding. Bids for same were invited in two batches: Batch-I of 150 MW SPV and 470 MW ST in Aug 2010 and Batch-II of 350 MW SPV in Aug 2011.
- (ii) In Batch-I the eligible project capacities were 5 MW for SPV and upto 100 MW for ST. 28 SPV Projects with an aggregate capacity of 140 MW and 7 ST Projects with an aggregate capacity of 470 MW were allotted. The bid tariffs for SPV projects were in the range of Rs.10.95-12.76 per unit, with average of Rs.12.12 per unit and for ST projects in the range of Rs.10.49-12.24 per unit, with average of Rs.11.48 per unit. 28 SPV projects of aggregate 140 MW capacity and 3 ST projects of aggregate 200 MW capacity have been commissioned under NSM Phase-I, Batch-I.
- (iii) In Batch-II for SPV, the project capacity fixed was 5-20 MW. 27 SPV projects with an aggregate capacity of 340 MW were allotted at tariff ranging between Rs.7.49-9.44 per unit, with average of Rs.8.77 per unit. 26 SPV projects of aggregate 330 MW capacity have been commissioned under NSM Phase-I, Batch-II.
- (iv) A 5 MW SPV project by Delhi Mumbai Industrial Corridor Development Corporation Limited (DMICDC) and a 10 MW SPV project by Solar Energy Corporation of India (SECI) has also been set up under the MNRE bundling scheme of NSM Phase-I.
- (v) Thus, under NSM Phase-I, 533 MW solar PV projects and 200 MW solar thermal power projects have been commissioned under the bundling scheme.
- (vi) Power generated from the commissioned plants is being purchased by the NVVN and being sold to State Utilities/ Discoms under a mechanism of bundling with power from unallocated quota of power from coal



based stations of NTPC on equal capacity basis to effectively reduce the average per unit cost of bundled solar power to the purchasing Utilities. A Payment Security Mechanism involving a revolving fund of Rs.486 crore has been put in place to ensure timely payments to developers in the event of delays/ defaults in payments by the purchasing State Utilities to NRVN.

### 3.5 FOCUS AREA UNDER PHASE-II OF NSM

#### A) Grid connected Projects

- (i) Unlike Phase-I, NSM Phase-II aim for achieving significantly higher scales of targets of 100 GW. Hence, Ministry has contemplated all possible options for implementation of the Mission. Selection of capacity for Phase-II, grid connected projects is being done via different schemes such as Bundling, Generation Based Incentive (GBI), Viability Gap Funding (VGF). This allocation of target capacity may be altered depending upon the availability of resources. The Government has finalized tendering trajectory in order to achieve the Mission target of 100 GW by 2022 with the details as given in **Table 3.1**

Year	Tendering target (MW)
2019-20	30,000
2020-21	30,000

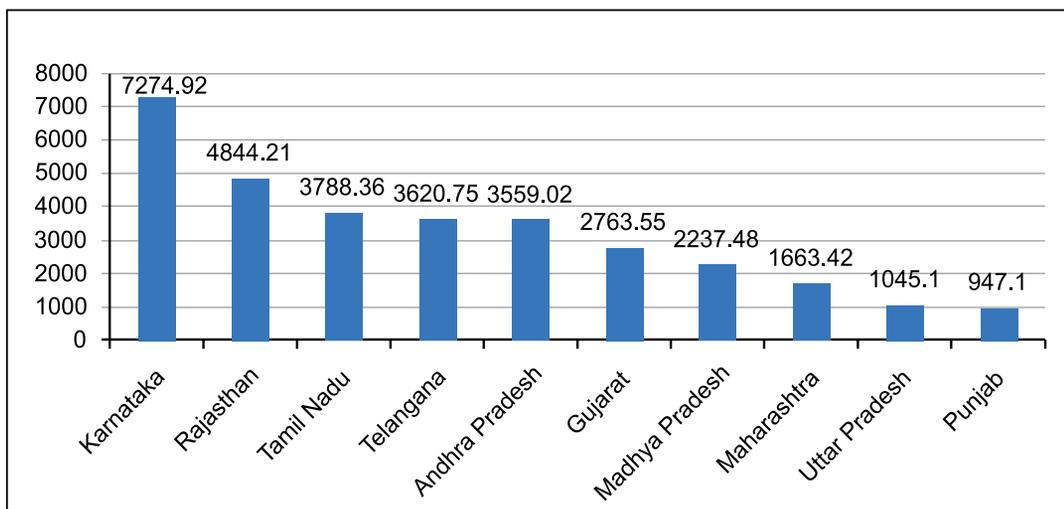
#### (ii) Solar Energy Potential and Achievements

As on 31-12-2019, a total solar power capacity installed is 33,730 MW. In addition, tenders of around 22,839 MW are in pipeline for which LoI has been issued but not commissioned and for around 28,578 MW tender issued but LoI yet to be issued. Based upon availability of land and solar radiation, the potential solar power in the country has been assessed to be around 750 GWp. State-wise details of estimated solar energy potential in the country and the cumulative installed capacity (as on 31-12-2019) are given in **Table 3.2** and **Table 3.3** respectively.

#### (B) CUMULATIVE CAPACITY OF SOLAR POWER INSTALLED TILL 31-12-2019

Expected Achievements till 31.03.2020: It is expected that a capacity of around 40000 MW will be installed under different solar programmes by end of Financial Year 2019-20.

**Figure 3.1: Top 10 States in Solar Installation (capacity in MW as on 31-12-2019)**



<b>Table 3.2: State-wise estimated Solar Energy Potential in the Country</b>		
<b>Sr. No.</b>	<b>State/UT</b>	<b>Solar Potential (GWp) #</b>
1	Andhra Pradesh	38.44
2	Arunachal Pradesh	8.65
3	Assam	13.76
4	Bihar	11.20
5	Chhattisgarh	18.27
6	Delhi	2.05
7	Goa	0.88
8	Gujarat	35.77
9	Haryana	4.56
10	Himachal Pradesh	33.84
11	Jammu & Kashmir	111.05
12	Jharkhand	18.18
13	Karnataka	24.70
14	Kerala	6.11
15	Madhya Pradesh	61.66
16	Maharashtra	64.32
17	Manipur	10.63
18	Meghalaya	5.86
19	Mizoram	9.09
20	Nagaland	7.29
21	Odisha	25.78
22	Punjab	2.81
23	Rajasthan	142.31
24	Sikkim	4.94
25	Tamil Nadu	17.67
26	Telangana	20.41
27	Tripura	2.08
28	Uttar Pradesh	22.83
29	Uttarakhand	16.80
30	West Bengal	6.26
31	UTs	0.79
<b>TOTAL</b>		<b>748.98</b>

# Assessed by National Institute of Solar Energy



**Table 3.3: Commissioning Status of Grid Connected Solar Projects as on 31-12-2019**

Sr. No.	State/UT	Cumulative Capacity till 31-03-2019 (MW)	Capacity added in 2019-20 till 31-12-2019 (MW)	Cumulative Capacity till 31-12-2019 (MW)
1	Andaman & Nicobar	11.73	0.46	12.19
2	Andhra Pradesh	3085.68	473.34	3559.02
3	Arunachal Pradesh	5.39	0.22	5.61
4	Assam	22.40	18.83	41.23
5	Bihar	142.45	6.90	149.35
6	Chandigarh	34.71	2.28	36.99
7	Chhattisgarh	231.35	0.00	231.35
8	Dadra & Nagar Haveli	5.46	0.00	5.46
9	Daman & Diu	14.47	2.09	16.56
10	Delhi	126.89	29.23	156.12
11	Goa	3.89	0.89	4.78
12	Gujarat	2440.13	323.42	2763.55
13	Haryana	224.52	24.75	249.27
14	Himachal Pradesh	22.68	9.89	32.57
15	Jammu & Kashmir	14.83	4.47	19.30
16	Jharkhand	34.95	3.45	38.40
17	Karnataka	6095.55	1179.37	7274.92
18	Kerala	138.59	3.16	141.75
19	Lakshadweep	0.75	0.00	0.75
20	Madhya Pradesh	1840.16	397.33	2237.48
21	Maharashtra	1633.54	29.88	1663.42
22	Manipur	3.44	1.14	4.58
23	Meghalaya	0.12	0.00	0.12
24	Mizoram	0.50	1.02	1.52
25	Nagaland	1.00	0.00	1.00
26	Odisha	394.73	3.11	397.84
27	Puducherry	3.14	2.37	5.51
28	Punjab	905.62	41.48	947.10
29	Rajasthan	3226.79	1617.42	4844.21
30	Sikkim	0.01	0.06	0.07
31	Tamil Nadu	2575.22	1213.14	3788.36
32	Telangana	3592.09	28.66	3620.75
33	Tripura	5.09	4.32	9.41
34	Uttar Pradesh	960.10	85.00	1045.10
35	Uttarakhand	306.75	8.74	315.49
36	West Bengal	75.95	33.46	109.41
<b>Total</b>		<b>28180.66</b>	<b>5549.87</b>	<b>33730.53</b>





### 3.6 SCHEMES UNDER NATIONAL SOLAR MISSION

#### 3.6.1 NTPC STATE SPECIFIC BUNDLING SCHEME

A scheme namely State Specific Bundling Scheme was introduced in the year 2015. Under the scheme, generation from solar power projects was allowed to bundle with coal based power projects in the ratio of 2:1 to bring the tariff at lower rate. Out of target capacity of 3000 MW under this scheme, 2750 MW has been commissioned in previous years and 200 MW was commissioned in current financial year at Kadapa Ultra Mega Solar Park, Andhra Pradesh. Remaining 50 MW is ready for commissioning.

#### 3.6.2 SCHEME FOR DEVELOPMENT OF SOLAR PARKS AND ULTRA MEGA SOLAR POWER PROJECTS

- (i) The Scheme for Development of Solar Parks and Ultra Mega Solar Power Projects was rolled out on 12-12-2014 with aggregate capacity 20,000 MW. Further, the capacity of the Solar Park Scheme was enhanced from 20,000 MW to 40,000 MW on 21-03-2017 to set up at least 50 solar parks by 2021-22.
- (ii) The capacity of the solar parks is generally 500 MW and above. However, smaller parks (up to 20 MW) are also considered in States/UTs where there is shortage of non-agricultural land. Approximately 4 to 5 acres per MW of land is required for setting up of solar parks. The total central grants approved under the Scheme is Rs.8100 crore (Rupees Eight Thousand and One Hundred Crore).
- (iii) Under the scheme, the Ministry provides Central Financial Assistance (CFA) of up to Rs.25 lakh per solar park for preparation of Detailed Project Report (DPR). Beside this, CFA of up to Rs.20.00 lakh



*Solar Panel with Robot Cleaning Technology at 2000 MW Pavagada Solar Park, District Tumkur, Karnataka*





per MW (Rs.12 Lakh/MW for development of internal infrastructure of solar park and Rs.8 Lakh/MW for development of external power evacuation infrastructure of solar park) or 30% of the project cost, including Grid-connectivity cost, whichever is lower, is also provided on achieving the milestones prescribed in the scheme. The approved grant is released by Solar Energy Corporation of India Ltd. (SECI) as per milestones.

- (iv) The target of the Solar Park Scheme is to develop at least 50 solar parks with aggregate installed capacity of 40,000 MW of solar power by 2021-22.
- **Capacity approved:** Based on the proposals received from the States, 39 solar parks of aggregate capacity 22,879 MW have been approved to 17 States up to December 2019. These solar parks are at different stage of development.
  - **Land:** Over 1,31,000 lakh acres of land identified for various solar parks out of which over 82,600 acres have been acquired.
  - **Commissioned capacity inside solar parks:** Solar projects of aggregate capacity 7767 MW have been commissioned inside various solar parks as given in the **Table 3.4**.
- (v) Expected Achievements till 31.03.2020:- It is expected that a capacity of around 10,000 MW will be installed under the scheme by end of Financial Year 2019-20.

### 3.6.3 SCHEME FOR SETTING UP OVER 300 MW OF GRID-CONNECTED SOLAR PV POWER PROJECTS BY DEFENCE ESTABLISHMENTS UNDER MINISTRY OF DEFENCE AND PARA MILITARY FORCES WITH VIABILITY GAP FUNDING UNDER PHASE-II/III OF NSM.

- (i) The Cabinet had approved the Scheme in its meeting held on 10th December, 2014. The Ministry issued Administrative Approval on 07th January, 2015.

Table 3.4: Solar Projects commissioned inside Solar Parks till 31.12.2019			
Sl. No.	Solar Park	Capacity Approved (MW)	Capacity Commissioned (MW)
1	Ananthapuamu SP, AP	1500	887
2	Kadapa SP, AP	1000	200
3	Kurnool SP, AP	1000	1000
4	Ananthapuamu-II SP, AP	500	400
5	Kasargod SP, Kerala	200	50
6	Pavagada SP, KA	2000	2000
7	Neemuch-Mandsor SP,MP	750	250
8	Rewa Solar Park, MP	750	735
9	Bhadla-II SP, Raj	680	680
10	Bhadla-III SP, Raj	1000	900
11	Bhadla-IV SP, Raj	500	500
12	UP Solar Park, UP	440	165
	<b>Total</b>	<b>10320</b>	<b>7767</b>



- (ii) In-principle approval of 241 MW has been given to different Defence Organisations. Out of this, 128 MW is already commissioned and balance capacities are under implementation stage. **Table 3.5** shows the present status of Defence Scheme as on 31.12.2019.

<b>Table 3.5: Present Status of Defence Scheme (as on 31-12-2019)</b>				
<b>Sl. No.</b>	<b>Ministry</b>	<b>Org.</b>	<b>Capacity Approved (MW)</b>	<b>Capacity Commissioned (MW)</b>
1	Department of Defence Production (116.5 MW)	OFB, Kolkata	7	7
2		BEL	75.5	62.5
3		BDL	10	10
4		HAL, Nashik	15	15
5		OF, Kanpur	5	5
6		MIDHANI	4	4
7	Department of Defence	DOD/MES	125.45	25
		<b>Total</b>	<b>241.95</b>	<b>128.5</b>

Expected Achievements till 31.03.2020:- It is expected that a capacity of around 200 MW will be installed under the scheme by end of Financial Year 2019-20.

### **3.6.4 PILOT-CUM-DEMONSTRATION PROJECT FOR DEVELOPMENT OF GRID CONNECTED SOLAR PV POWER PLANTS ON CANAL BANKS AND CANAL TOPS.**

The Scheme is closed for new sanctions. Under this Scheme, based on the allocation requests received from different States, MNRE has sanctioned net capacity of 50 MW canal-bank and 44 MW canal-top solar PV power projects to 7 different States. As on 30.11.2019, full net sanctioned capacity of 50 MW canal-bank solar PV projects and 44 MW canal-top solar PV projects have been commissioned.

### **3.6.5 SCHEME FOR SETTING UP OF 1000 MW OF GRID CONNECTED SOLAR PV POWER PROJECTS BY CPSUS AND GOVT. ORGANIZATIONS UNDER VARIOUS CENTRAL/ STATE SCHEMES/SELF USE/3RD PARTY SALE/MERCHANT SALE WITH VIABILITY GAP FUNDING (VGF) UNDER PHASE-II OF JNNSM.**

- (i) The Ministry launched the above scheme in January 2015, the Scheme is closed for new sanctions. Under this Scheme, MNRE has sanctioned around 882 MW grid-connected solar PV power plant capacity to 9 CPSUs/Govt. Organizations. As of 31.12.2019, all the sanctioned 882 MW capacity solar PV projects have been commissioned.
- (iii) As on 31.12.2019, VGF of around Rs. 795 crores (including SECI's charges) has already been released to SECI for onward disbursement to CPSUs/Govt. Organisations who have set up solar PV power projects under the Scheme.

### **3.6.6 CPSU SCHEME PHASE-II FOR SETTING UP 12,000 MW GRID-CONNECTED SOLAR PHOTOVOLTAIC (PV) POWER PROJECTS BY CPSUS/ STATE PSUS/ GOVERNMENT ORGANISATIONS, WITH VIABILITY GAP FUNDING (VGF) SUPPORT FOR SELF-USE OR USE BY GOVERNMENT/ GOVERNMENT ENTITIES, EITHER DIRECTLY OR THROUGH DISTRIBUTION COMPANIES (DISCOMS)**





- (i) Government of India, through Ministry of New & Renewable Energy (MNRE), on 05.04.2019, has approved Implementation of CPSU Scheme Phase-II for setting up 12,000 MW grid-connected Solar Photovoltaic (PV) Power Projects by CPSUs/ State PSUs/ Government Organisations, with Viability Gap Funding (VGF) support over 4 years 2019-20 to 2022-23 for self-use or use by Government/ Government entities, either directly or through Distribution Companies (DISCOMS).
- (ii) The VGF fund requirement over the four years 2019-20 to 2022-23 will be Rs.8580 crore, subject to a maximum of Rs.0.7 crore/MW, to be decided through bidding amongst Government organizations. The VGF content will be reviewed by MNRE, for downward revision if required. The savings thereby achieved is to be used for additional capacity.
- (iii) **Usage Charge:** To be mutually agreed between Government organizations producing and consuming, subject to limit of Rs.3.50/unit.
- (iv) **Domestic Content Requirement (DCR):** both Solar cells & modules to be domestically manufactured and MNRE can prescribe DCR for upstream components also such as domestically manufactured wafers/ ingots/ polysilicon or for higher efficiency cells.
- (v) **Total Investment envisaged:** Cost of the project: Rs.48,000 crore for 12,000 MW capacity, @ Rs.4 crore/MW.
- (vi) **Implementation Agency:** Solar Energy Corporation of India Limited (SECI).
- (vii) **Role of SECI:** SECI will handle the Scheme, on behalf of MNRE, by way of Bidding on VGF among prospective Government Producers; Scrutiny of project proposals for WTO compliance; Project progress monitoring including site inspection; Ensuring compliance of Domestic Content Requirement (DCR) by way of site inspection/ field visits; and handling of funds under the Scheme. For these activities, SECI will be given a fee of 1% of VGF disbursed.
- (viii) The Scheme empowers MNRE to
  - increase the scope of DCR to include wafers, ingots & polysilicon or higher efficiency cells/ modules;
  - empowers MNRE to reduce VGF if cost difference comes down
  - to make amendments or relaxation in provisions of the Scheme with no increase in fund requirement and VGF limit.

### 3.6.7 STATUS OF IMPLEMENTATION

- (i) As of 31.12.2019 SECI has issued two tenders under the Scheme, the status / details of which are as under:

#### Tranche-I:

- (ii) Against the 2000 MW capacity offered, the final capacity awarded was 922 MW as given in **Table 3.6.**

#### Tranche-II: Tender issued for 1500 MW solar PV projects

- (iii) Against the 1500 MW capacity offered, the final capacity awarded was 1104 MW as given in **Table 3.7.**



**Table 3.6 Capacity awarded under Tranche I of CPSU Scheme Phase II**

Sl. No.	Bidder's Name	VGF per MW, quoted by the bidder/ Govt. Producer (INR)	Allotted Capacity (MW)	Total VGF eligible for the project (INR)	VGF amount released till 31.12.2019
1	NHDC Ltd.	55,00,000	25	13,75,00,000	6,87,50,000
2	The Singareni Collieries Company Limited	60,00,000	90	54,00,00,000	27,00,00,000
3	Assam Power Distribution Company Limited	68,00,000	30	20,40,00,000	10,20,00,000
4	Delhi Metro Rail Corporation Limited	69,75,000	3	2,09,25,000	1,04,62,500
5	Nalanda University	69,95,555	5	3,49,77,775	1,74,88,888
6	NTPC Limited	70,00,000	769	538,30,00,000	269,15,00,000
	<b>Total</b>		<b>922</b>	<b>632,04,02,775</b>	<b>316,02,01,388</b>

**Table 3.7 Capacity awarded under Tranche II of CPSU Scheme Phase II**

Sl. No.	Bidder's Name	VGF per MW, quoted by the bidder/ Govt. Producer (INR)	Allotted Capacity (MW)	Total VGF eligible for the project (INR)	VGF amount released till 31.12.2019
1	The Singareni Collieries Company Limited	68,00,000	81	55,08,00,000	0
2	Indore Municipal Corporation	68,80,000	100	68,80,00,000	0
3	NTPC Limited	70,00,000	923	646,10,00,000	0
	<b>Total</b>		<b>1104</b>	<b>769,98,00,000</b>	<b>0</b>

### 3.6.8 VIABILITY GAP FUNDING (VGF) SCHEME

- (i) Under VGF Schemes, 750 MW, 2000 MW and 5000 MW of Grid connected Solar Power Projects have been taken up. Solar Energy Corporation of India Limited (SECI) has been designated as an implementing agency for these schemes. A fund of Rs. 500 crore for creating Payment Security Mechanism (PSM) at SECI for 750 MW, 2000 MW and 5000 MW VGF Schemes has been provided. Details of each of three VGF scheme are given below:

### 3.6.9 750 MW VGF SCHEME UNDER NSM PHASE-II, BATCH-I

- (i) The scheme provides for the setting up of large scale ground-mounted solar PV projects on pan-India basis for 750 MW capacity. After a transparent selection and award process, projects of capacity 680 MW could successfully achieve financial closure and were commissioned. All these projects are under commercial operation.
- Total VGF Disbursement by SECI to SPDs, for the period from 01.01.2019 to 31.12.2019 is Rs. 131.88 Cr.
  - No further capacity likely to be added under the scheme.





### 3.6.10 2000 MW VGF SCHEME OF NSM PHASE II, BATCH III

- (i) Scheme for Setting up of over 2000 MW Grid connected solar PV Projects with VGF under NSM Phase-II, Batch-III.
- Guidelines issued on dated 04th August 2015. Power purchased by SECI @ Rs.4.43/kWh (PPA) and sold to buying utilities @ Rs.4.50/kWh (PSA).
  - Bidding has been carried out amounting to Rs.1515 crore out of the total approved scheme allocation of Rs.2100 crore.
  - 2 categories: DCR (250 MW) & Open (1750 MW). Minimum Project Size 10 MW.
  - State-specific tenders based on the demand from State. Projects could be set up either in the Solar Parks and or outside the solar park.
  - VGF up-to Rs.1.31 crore per MW (DCR) and Rs.1 crore per MW (Open).
  - Average bid for VGF under the open category was Rs.63.27 lakh/MW and DCR category was Rs.1.11 crore/MW.
  - Total capacity awarded 2155 MW (as on 31.12.2019).
  - Total 2295 MW Capacity reported as commissioned in the states of **Andhra Pradesh, Chhattisgarh, Karnataka, Maharashtra, and Uttar Pradesh** at both solar park and non-solar park locations (as on 31.12.2019).
  - Total VGF Disbursement by SECI to SPDs, for the period from 01.01.2019 to 31.12.2019 is Rs. 356.62 Cr.

### 3.6.11 5000 MW VGF SCHEME BATCH IV PHASE II

- (i) Scheme for Setting up of over 5000 MW Grid Connected Solar PV Projects with VGF under NSM Phase-II, batch-IV
- The Scheme was launched in 2015-16, to be implemented in 4 years (at least 1250 MW in each year).
  - Initial provision was that power will be purchased by SECI @ Rs.4.43/kWh and sold @ Rs.4.50/kWh. Now onwards the bidding under the scheme will be carried out at discounted tariff below from bench mark tariff Rs.4.43/kWh with zero VGF option.
  - Project Size is Minimum 10 MW upto 50 MW (in multiples of 10 MW).
  - VGF support of Rs.1.25 crore per MW (DCR) & Rs.1.00 crore per MW (Open)
  - Projects could be set up either in the Solar Parks or out-side locations. The tenders will be state-specific based on the demand from particular state. Inter-state solar power transmission is permissible under the scheme.
  - Total capacity awarded 3420 MW (as on 31.12.2019).
  - Total 2470 MW Capacity has been commissioned in the State of Gujarat, Odisha, Maharashtra, Rajasthan, U.P, Andhra Pradesh (Kadapa Solar Park), and Karnataka (Pavagada Solar Park) (as on 31.12.2019).
  - Total VGF Disbursement by SECI to SPDs, for the period from 01.01.2019 to 31.12.2019 is Rs. 155.48 Cr.





### 3.6.12 GENERATION BASED INCENTIVES PROGRAMME FOR SMALL SOLAR POWER GENERATION

#### 3.6.13 DEMO SOLAR GBI

MNRE had announced the Demonstration Programme on Grid Interactive Solar PV Power Generation (Demo Solar GBI) in the FY 2008-09 before the starting of JNNSM.

Salient features are as under:

- a) Scheme was formulated for 25 MW for Demonstration of MW capacity of solar PV plants in the country. Projects of capacity from 1 MW to 5 MW were commissioned.
- b) MNRE provides Generation Based Incentive (GBI) to these projects. The GBI is being released directly to the project developer through IREDA.
- c) Seven projects were commissioned from FY 2009-10 to 2011-12.
- d) Against the target capacity of 25 MW, a total of 19 MW from seven project developers could be commissioned in six states (Andhra Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu, and West Bengal) with a capacity ranging from 1 MW to 5 MW each.
- e) Ministry releases GBI to Developers through IREDA maximum upto Rs.12/kWh for maximum period of 10 years.
- f) Tentative Annual budget requirement by MNRE under Demo Solar GBI scheme is approx. Rs.33.00 crores (including IREDA service charges @ 1% or maximum limit of Rs. 5.0 lacs/annum/project).

#### 3.6.14 ROOFTOP PV AND SMALL SOLAR POWER GENERATION PROGRAMME (RPSSGP)

- a) After successful demonstration of MW projects in Demo Scheme, Ministry launched a Generation Based Incentives (GBI) programme on 16th June 2010 to give a thrust to rooftop PV and other small solar power plants connected to grid under Phase I JNNSM. Implementing Agency is IREDA.
- b) 100 MW Solar capacity was allocated and 91.8 MW from 72 projects in 13 States were commissioned. GBI is applicable for 25 years from the commissioning date and payable to the distribution utility.
- c) Ministry provides fixed GBI from Rs.8.69 to 12.24 /kWh to the State utilities at a rate equal to the difference of the CERC tariff for 2010-11 (Rs.17.91 per kWh) and a base rate of Rs.5.50 per kWh. However, base rate for the projects commissioned during each subsequent year shall also be modified at escalation factor of 3% p.a. and such escalated base rate shall remain constant over duration of 25 years.
- d) Annual budget requirement by Ministry under RPSSGP scheme is approx. Rs. 180.00 crore for 91.8 MW (inclusive of IREDA's Service Charges @ 2%).
- e) IREDA has disbursed GBI of Rs. 125.93 Crore to State utilities (from 01.01.2019 to 31.12.2019), under the scheme based on the claims received from respective State utilities.

#### 3.6.15 GRID CONNECTED ROOFTOP SOLAR PROGRAMME: PHASE-II

- (i) Phase II of the Grid connected rooftop solar programme was approved for with a target for achieving a cumulative capacity of **40,000 MW** from Rooftop Solar (RTS) Projects by the year **2022** in





**February 2019.** The programme will be implemented with the total central financial support of Rs 11,814 crore through DISCOMs.

- (ii) In the Phase-II Programme Central Financial Assistance (CFA) for the residential sector has been restructured with the availability of **40%** CFA for RTS systems up to 3 kW capacity and **20%** for RTS system capacity beyond 3 kW and up to 10 kW. For Group Housing Societies/Residential Welfare Associations (GHS/RWA), CFA will be limited to **20%** for RTS plants for supply of power to common facilities. However, the capacity eligible for CFA for GHS/RWA will be limited to 10 kW per house with maximum total capacity upto **500 kWp**, inclusive of RTS put in individual houses in the GHS/RWA. Central financial support will not be available for other categories i.e. institutional, educational, social, government, commercial, industrial, etc.
- (iii) Rooftop Phase-II Programme is being implemented through DISCOMs.
- (iv) Performance based incentives will be provided to DISCOMs based on RTS capacity achieved in a financial year (i.e. 1st April to 31st March every year till the duration of the scheme) over and above the base capacity i.e. cumulative capacity achieved at the end of previous financial year.
- (v) Model operating procedure along with suggested timelines developed for implementation of rooftop solar projects.
- (vi) Aggregate capacity of **410.96 MW** in residential sector has been allocated for **49** DISCOMs/Electricity Departments as on **31/12/2019**.
- (vii) An amount of Rs.6.67 crore has also been released under this phase-II of the rooftop solar programme as on 31/12/2019.

### **3.6.16 GRID-CONNECTED ROOFTOP AND SMALL SOLAR POWER PLANTS PROGRAMME: PHASE-I**

- (i) Earlier, Ministry has been implementing Grid Connected Rooftop and Small Solar Power Plants Programme which is providing subsidy upto **30%** of benchmark cost for the general category states and upto **70 %** of benchmark cost for special category states, i.e. North Eastern States including Sikkim, Uttarakhand, Himachal Pradesh, Jammu & Kashmir and Lakshadweep, Andaman & Nicobar Islands for installation of grid connected rooftop solar power plants in building of residential, institutional and social sector for the sanctioned projects under phase-I. For Government sector achievement linked incentives upto 25% of the benchmark cost in general category States/UTs and 60 % of the benchmark cost for special category States/UTs has been provided for the sanctioned projects under phase-I.
- (ii) About 2098 MW solar rooftop systems have been sanctioned/approved under the scheme. Aggregate 1889.30 MW have been reported as installed in the country as shown in **Table 3.8**. Projected capacity to be commissioned - 3000 MW by 31<sup>st</sup> March 2020.
- (iii) Model Power Purchase Agreement (PPA), Memorandum of Understanding and CAPEX Agreement for government sector projects have been developed which were duly vetted by Department of Expenditure, Ministry of Finance and Department of Legal Affairs, Ministry of Law & Justice.
- (iv) Solar Rooftop Calculator has also been developed for financial calculations of grid connected solar rooftop projects on PAN India basis. SPIN (<http://solarrooftop.gov.in>) is an e-governance initiative of the Ministry. It is an online system designed to monitor almost all activities involved in Solar Rooftop programme. Online portal of 24 States has been developed by various state agencies out of which 10 nos. of portals have been integrated with spin portal.





- (v) The State Rooftop Solar Attractiveness Index (SARAL) has been developed. It is an index to assess and evaluate various States for their preparedness to support rooftop solar deployment. It also ranks States based on parameters that are critical for establishing strong solar rooftop markets.
- (vi) MNRE developed a panel of expert PSUs to facilitate Ministries/State Governments in bidding process. Ministry/ State Government may also choose to implement RTS projects through their own PSUs/ other notified designated agencies in the scheme such as State Nodal Agencies, DISCOM, Government departments and their own PSUs. These PSUs are expected to survey potential, submit brief feasibility report, collate RTS projects of various Departments, undertake bidding in model chosen by Department and facilitate signing of agreement between selected developer and the Department. The 3% service/ Project Management Consultancy (PMC) charges for such PSUs/designated agencies are being provided by MNRE. Rs.1832.94 crore has been released as Central Financial Assistance to different implementing agencies for installation of grid connected rooftop projects of which Rs.254.95 crore has been released in FY 2019-20 up to 31/12/2019.

### 3.6.17 INITIATIVES FOR LOANS AND INTERNATIONAL FUNDING

- i. Reserve Bank of India has included renewable energy projects under priority sector lending for which bank loans up to a limit of Rs.15 crore to borrowers will be available for renewable energy projects including grid connected solar rooftop systems. For individual households, the loan limit is Rs. 10 lakh per borrower.



30 kWp Rooftop Solar PV Power Plant at Nagar Nigam, Ajmer, Rajasthan



**Table 3.8: State-wise Solar Rooftop Systems Capacity Commissioned as on 31.12.2019**

S.No.	State /UTs	Subsidized (MW)	Non Subsidized (MW)	Total (MW)
1	ANDAMAN and NICOBAR ISLANDS	4.59	0.00	4.59
2	ANDHRA PRADESH	71.02	17.01	88.03
3	ARUNACHAL PRADESH	0.22	4.12	4.34
4	ASSAM	16.17	14.39	30.56
5	BIHAR	5.59	1.36	6.94
6	CHANDIGARH	24.76	5.22	29.98
7	CHHATTISGARH	8.84	1.55	10.39
8	DADRA and NAGAR HAVELI	0.00	0.48	0.48
9	DAMAN and DIU	0.00	0.39	0.39
10	GOA	3.23	0.61	3.83
11	GUJARAT	220.83	80.88	301.71
12	HARYANA	57.76	60.70	118.47
13	HIMACHAL PRADESH	13.24	2.22	15.46
14	JAMMU and KASHMIR	10.22	0.59	10.81
15	JHARKHAND	11.95	1.62	13.57
16	KARNATAKA	23.70	108.12	131.83
17	KERALA	23.46	18.29	41.75
18	LAKSHADWEEP	0.00	0.00	0.00
19	MADHYA PRADESH	35.95	13.45	49.40
20	MAHARASHTRA	95.69	120.42	216.11
21	MANIPUR	3.09	1.46	4.55
22	MEGHALAYA	0.04	0.08	0.12
23	MIZORAM	1.32	0.10	1.43
24	NAGALAND	0.08	0.00	0.08
25	NCT OF DELHI	95.33	14.47	109.80
26	ORISSA	12.48	1.79	14.27
27	PUDUCHERRY	0.92	1.00	1.92
28	PUNJAB	28.89	38.95	67.85
29	RAJASTHAN	59.54	59.96	119.50
30	SIKKIM	0.06	0.01	0.07
31	TAMIL NADU	60.53	95.25	155.78
32	TELANGANA	48.83	23.81	72.64
33	TRIPURA	2.94	0.02	2.96
34	UTTAR PRADESH	89.69	51.18	140.87
35	UTTARAKHAND	30.48	45.23	75.71
36	WEST BENGAL	29.21	13.91	43.12
<b>Total</b>		<b>1090.67</b>	<b>798.64</b>	<b>1889.30</b>





*494 kWp Rooftop Solar PV Power Plant at University of Lucknow, Uttar Pradesh*

- ii. Department of Financial Services has advised all Public Sector Banks to provide loans for grid connected rooftop solar systems as home loan/ home improvement loans.
- iii. Concessional loans of around US \$ 1125 million from World Bank (WB) and Asian Development Bank (ADB) have been made available to State Bank of India (SBI) and Punjab National Bank (PNB) for solar rooftop projects.
- iv. Multilateral grant of USD 5 million by ADB, USD 1.8 million from USAID, € 15 million from GIZ, € 2 million from EU and USD 28.8 million from World Bank has been approved for solar rooftop programme.
- v. Indian Renewable Energy Development Agency has formulated a scheme of low-cost financing with an interest rate of 9.9% to 10.75 % per annum.
- vi. The Central Electricity Authority (CEA) has also notified the Installation and Operation of Meters guidelines vide its amendment regulation on 3rd December 2014.
- vii. Demand aggregation exercise for government buildings of various States has been initiated for installation of rooftop solar projects under technical assistance programme.

### **3.6.18 OFF GRID AND DECENTRALISED SOLAR PV APPLICATIONS PROGRAMME**

- (i) Under Off-Grid and Decentralized Solar PV Applications Programme, Ministry has been providing Central Financial Assistance (CFA) for deployment of Solar Street lights, Solar Study Lamps, Standalone Solar Pumps, Solar Power Packs and other off-grid solar applications to meet out the electricity, water pumping





*5 HP solar pump installed in Sambhar, Jaipur District, Rajasthan*

and lighting needs of the local communities/institutions/individuals in the rural areas. Programme is being implemented mainly through State Nodal Agencies (SNAs).

- (ii) Over 2.46 lakh solar pumps have been installed under the programme till 31.12.2019.
- (iii) A total of 212 MW capacity solar PV off-grid power packs / power plants have been installed till 31.12.2019.
- (iv) Some major Off Grid Solar PV projects under implementation during 2019-20 are as follows:
  - Around 61.60 lakh solar study lamps have been distributed to school going children, in the states of Assam, Bihar, Jharkhand and Uttar Pradesh, where household electrification was less than 50%.
  - Out of 96,376 pumps sanctioned during 2017-18, state-wise details of the pumps installed are shown in **Table 3.9**.
  - Under Atal Jyoti Yojana: Phase-I, cumulatively 1.34 lakh Solar Street Lights have been installed till 31.12.2019.
  - Under Atal Jyoti Yojana: Phase-II, cumulatively 16,389 Solar Street Lights have been installed till 31.12.2019.
- (v) Cumulative numbers/capacity of the off-grid solar applications installed in various States as on 31.12.2019 is as given in **Table 3.10**.
- (vi) Capacity installed in various States during 2019-20 (as on 31.12.2019) is as given in **Table 3.11**.



Table 3.9: State-Wise Details of Solar PV Pumps		
S.No.	State	Pumps Installed (Nos.)
1	Andhra Pradesh	15000
2	Bihar	931
3	Chhattisgarh	15000
4	Gujarat	3537
5	Jharkhand	1180
6	Karnataka	1077
7	Madhya Pradesh	14000
8	Maharashtra	6022
9	Orissa	754
10	Punjab	2556
11	Rajasthan	7134
12	Tamilnadu	1000
13	Uttar Pradesh	9669
<b>Total</b>		<b>77860</b>

**3.6.19 PRADHAN MANTRI KISAN URJA SURAKSHA EVAM UTTHAAN MAHABHIYAAN (PM-KUSUM) SCHEME**

- (i) Administrative approval of the PM-KUSUM Scheme was issued on 08.03.2019 and Implementation Guidelines for the Scheme were issued on 22.07.2019, up to the year 2022. The scheme consists of 3 components:



*Solar Street Light at a village in District Nalanda, Bihar under Atal Jyoti Yojana*



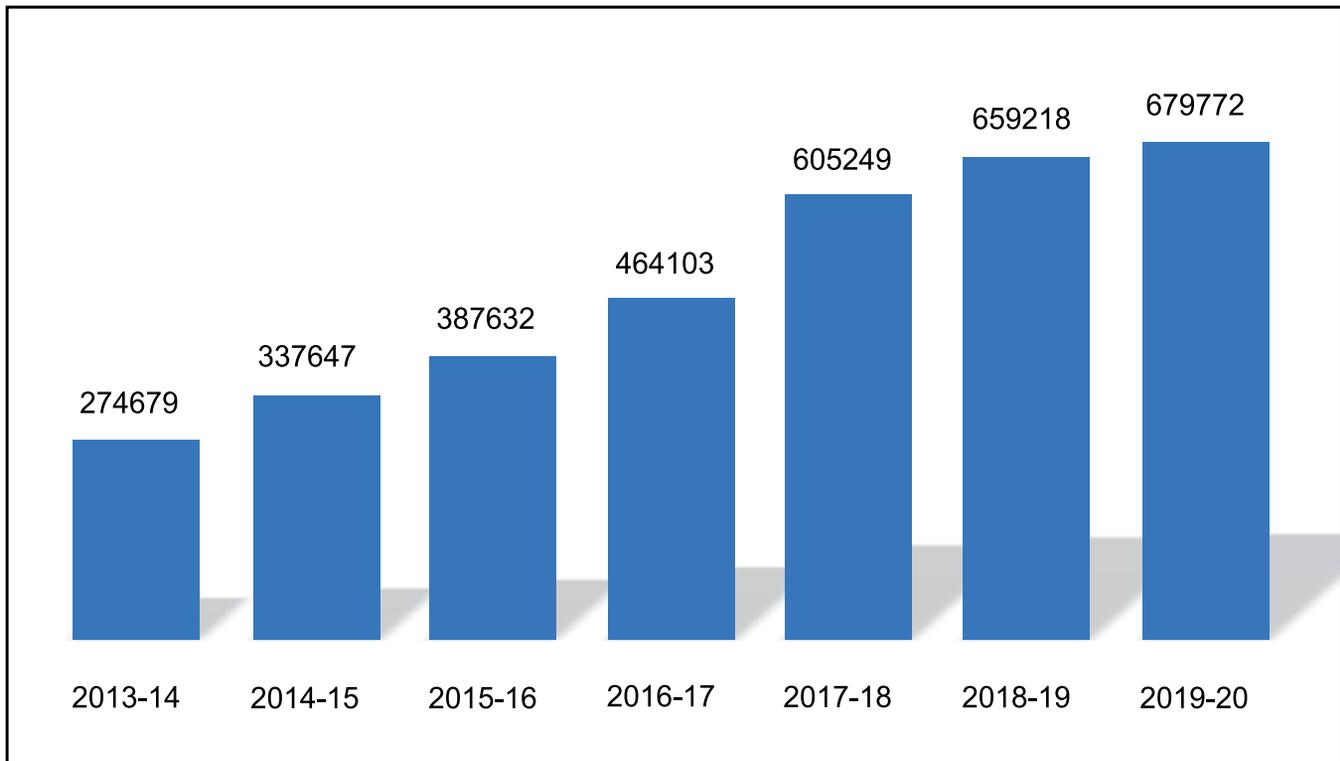
**Table 3.10: State-wise Cumulative Capacity installed under Off-grid SPV Programme**

S.No.	Agencies	Solar Home Light (Nos)	Solar lamp (Nos)	Solar Street Light (Nos)	Solar Pump (Nos)	Solar Power Plant (kW)
1	Andhra Pradesh	22972	77803	8992	34045	3815.595
2	Arunachal Pradesh	35065	18551	5008	22	963.200
3	Assam	46879	642996	9554	45	1605.000
4	Bihar	12303	1725478	34468	2813	6770.000
5	Chhattisgarh	42232	3311	2042	61970	31249.900
6	Delhi	0	4807	301	90	1269.000
7	Goa	393	1093	707	15	32.720
8	Gujarat	9253	31603	3267	11522	13576.600
9	Haryana	56727	93853	34625	1293	2321.250
10	Himachal Pradesh	22592	33909	78000	6	1905.500
11	Jammu & Kashmir	144316	51224	14156	39	8129.850
12	Jharkhand	9450	790515	12286	4670	3769.900
13	Karnataka	52638	7781	2694	7420	7754.010
14	Kerala	41912	54367	1735	818	15825.390
15	Madhya Pradesh	7920	529101	11496	17813	3654.000
16	Maharashtra	3497	239297	10420	9337	3857.700
17	Manipur	24583	9058	11205	40	1580.500
18	Meghalaya	14874	40750	5800	19	2004.000
19	Mizoram	12060	10512	5325	37	2955.600
20	Nagaland	1045	6766	6235	3	1506.000
21	Odisha	5274	99843	17111	9551	567.515
22	Punjab	8626	17495	42758	4413	2066.000
23	Rajasthan	187968	225851	7114	48175	30349.000
24	Sikkim	15059	23300	504	0	850.000
25	Tamil Nadu	296505	16818	39419	5459	12752.600
26	Telangana	0	0	1958	424	7450.000
27	Tripura	32723	64282	1199	151	867.000
28	Uttar Pradesh	235909	2284425	264179	20546	10638.310
29	Uttarakhand	91595	163386	25168	26	3145.030
30	West Bengal	145332	17662	8726	653	1730.000
31	Andaman & Nicobar	468	6296	390	5	167.000
32	Chandigarh	275	1675	898	12	730.000
33	Lakshadweep	600	5289	2465	0	2190.000
34	Puducherry	25	1637	417	21	121.000
35	Others	24047	125797	9150	609	23885.000
36	NABARD (2015 onwards)	116226	0	0	4012	0.000
<b>Total</b>		<b>1721343</b>	<b>7426531</b>	<b>679772</b>	<b>246074</b>	<b>212054.170</b>

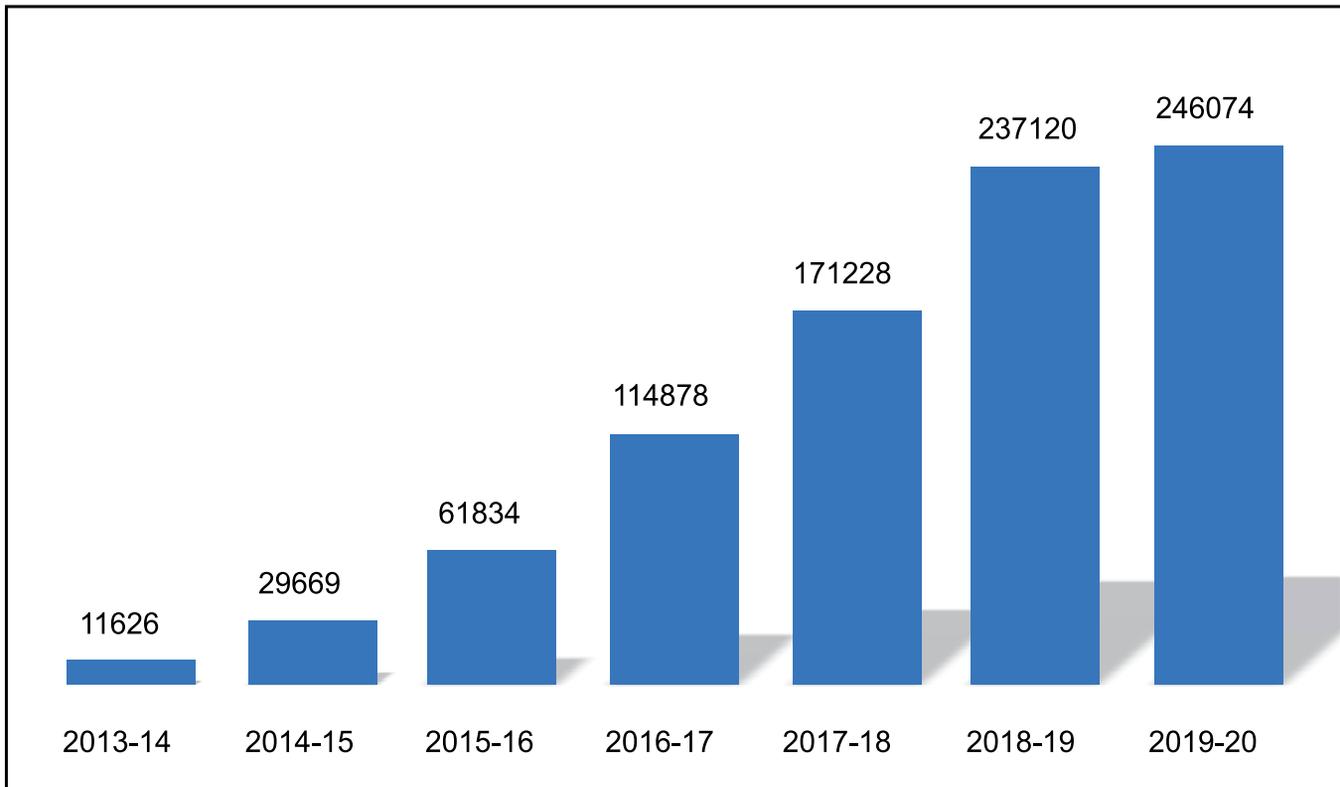


Table 3.11: Capacity installed under Off-grid SPV Programme during 2019-20					
S.no.	Agencies	Solar Home Light (Nos)	Solar lamp (Nos)	Solar Street Light (Nos)	Solar Pump (Nos)
1	Assam	0	144725	7	0
2	Bihar	0	467184	4610	706
3	Gujarat	0	0	1263	0
4	Jharkhand	0	43220	1985	813
5	Karnataka	0	0	0	1077
6	Madhya Pradesh	0	0	663	0
7	Maharashtra	0	0	0	5022
8	Odisha	0	0	2544	224
9	Punjab	0	0	0	556
10	Rajasthan	0	0	262	0
11	Tamil Nadu	6129	0	0	475
12	Telangana	0	0	855	0
13	Uttar Pradesh	0	947692	5316	81
14	Uttarakhand	0	0	3049	0
<b>Total</b>		<b>6129</b>	<b>1602821</b>	<b>20554</b>	<b>8954</b>

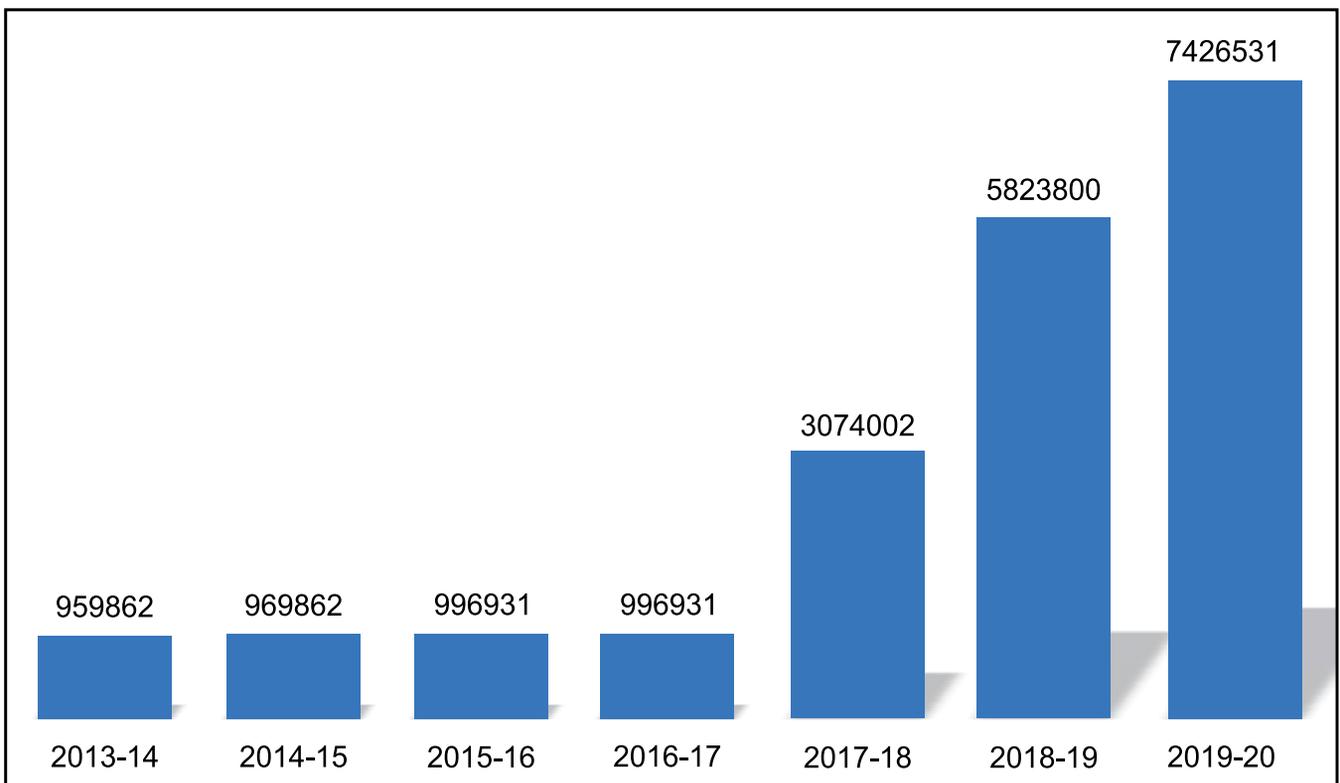
Figure 3.2: Cumulative Solar Street Lights installed YoY for last 7 Years



**Figure 3.3: Cumulative Solar Pumps installed YoY for last 7 Years**



**Figure 3.4: Cumulative Solar Lanterns/Lamps distributed YoY for last 7 Years**



<b>Cumulative systems installed up to 31.12.2019</b>	
<b>SPV Systems System</b>	<b>Cumulative up to 31.03.2019</b>
Lanterns and Study lamps (No.)	74,26,531
Home Lights (No.)	17,21,343
Street Lights (No.)	6,79,772
Solar Pumps (No.)	2,46,074
SPV Plants (MWp)	212.05

- **Component-A:** Setting up of 10,000 MW of Decentralized Grid Connected Solar or other Renewable Energy Power Plants on barren/fallow land;
  - **Component-B:** Installation of 17.50 Lakh stand-alone solar agriculture pumps; and
  - **Component-C:** Solarisation of 10 Lakh Grid Connected Agriculture Pumps.
- (ii) All three components combined, the scheme aims to add a solar capacity of 25,750 MW by 2022. The total central financial support provided under the scheme would be Rs. 34,422 crore including service charges to state implementing agencies. Part of central financial support i.e. Rs.10,000 Cr. will be provided through GBS and balance Rs. 24,422 Cr will be raised through EBRs by IREDA as Government Guarantee Bonds.
- (iii) The Component-A and Component-C will be implemented on pilot mode for 1000 MW capacity and one lakh grid connected agriculture pumps respectively and thereafter, will be scale-up on success of pilot run. Component-B will be implemented in full-fledged manner.
- (iv) Under Component A, Renewable power plants of capacity 500 KW to 2 MW will be setup by individual farmers/ cooperatives/panchayats /farmer producer organisations (FPO) on their barren or cultivable lands. The power generated will be purchased by the Discoms at Feed in tariffs determined by respective SERC. The scheme will open a stable and continuous source of income to the rural land owners. Performance Based Incentives (PBI) @ Rs. 0.40 per unit for first five years to be provided to Discoms.
- (v) Under Component B, individual farmers will be supported to install standalone solar pumps of capacity up to 7.5 HP. Installation of solar pump of capacity higher than 7.5 HP is also allowed, however, the central support in such cases will be limited to that applicable for 7.5 HP capacity pumps.
- (vi) Under Component C of the scheme, individual farmers will be supported to solarise pumps of capacity up to 7.5 HP. Solar PV capacity up to two times of pump capacity in kW is allowed under the scheme. The farmer will be able to use the generated energy to meet the irrigation needs and the excess available energy will be sold to DISCOM. This will help to create an avenue for extra income to the farmers, and for the States to meet their RPO targets.
- (vii) For both Component-B and Component-C, central financial assistance (CFA) of 30% of the benchmark cost or the tender cost, whichever is lower, will be provided. The State Government will give a subsidy of 30%; and the remaining 40% will be provided by the farmer. Bank finance may be made available for meeting 30% of the cost. The remaining 10% will be provided by the farmer. Higher CFA of 50% will be provided for North Eastern States, Sikkim, Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Lakshadweep and A&N Islands.





- (viii) For FY 2019-20, a target of 1000 MW has been kept under Component-A, 1.75 lakh standalone solar pump under Component-B and solarisation of 1 lakh grid-connected agricultural pumps under Component-C. Based on the demand received from various States, the allocations made under the three Components of PM-KUSUM Scheme are given in **Table 3.12**.

### 3.6.20 OFF-GRID & DECENTRALISED SOLAR PV APPLICATIONS SCHEME: PHASE-III

- (i) Phase-III of Off-grid and Decentralised Solar PV Applications Programme was launched in August, 2018 with target of 3,00,000 solar street lights, 25,00,000 solar study lamps and 100 MW capacity of off-grid solar power plants. Scheme is available till 31.03.2020.
- (ii) Under the scheme, CFA of 30% of the benchmark cost or tender cost, whichever is lower, of the system is available for General category States and 90% of the benchmark cost or tender cost, whichever is lower, of the system is available for NE States, Hilly States/UTs and Island UTs. Solar study lamps for students are being provided in North-eastern States and Left Wing Extremism (LWE) affected areas with 85% financial support from the Central Government.

<b>Table 3.12 Allocations made to States under the Components of PM-KUSUM Scheme</b>				
<b>S. No.</b>	<b>State</b>	<b>Component-A Sanctioned Capacity (MW)</b>	<b>Component-B Sanctioned Quantity (Nos)</b>	<b>Component-C Sanctioned Quantity (Nos)</b>
1	Chhattisgarh	-	20000	-
2	Delhi	10	-	-
3	Haryana	25	15000	468
4	Himachal Pradesh	-	550	-
5	Jharkhand	10	10000	500
6	Gujarat	-	4000	-
7	Karnataka	50	6000	-
8	Kerala	10	-	5200
9	Madhya Pradesh	100	25000	15000
10	Maharashtra	300	30000	9000
11	Meghalaya	10	1700	60
12	Odisha	-	2500	-
13	Punjab	30	4500	3900
14	Gujarat	40	-	-
15	Himachal Pradesh	10	-	-
16	Rajasthan	325	25000	12500
17	Tamil Nadu	-	17500	20000
18	Tripura	5	1300	1300
19	Uttar Pradesh	75	8000	1000
<b>Total</b>		<b>1000</b>	<b>171050</b>	<b>68928</b>



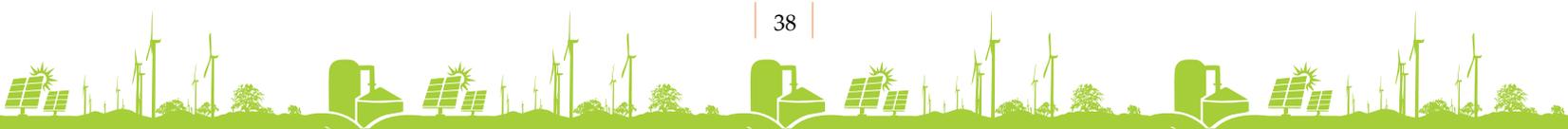
- (iii) Projects are being implemented by State Nodal Agencies. Centralised tendering has been done for procurement of solar streetlights and solar study lamps.
- (iv) Sanctions issued for various States under the scheme is given in **Table 3.13**..

### 3.6.21 ATAL JYOTI YOJANA (AJAY): PHASE-II

- (i) Under Atal Jyoti Yojana (AJAY) Phase-I Scheme for installation of Solar Street Lights (SSLs) which was available in the States of Assam, Bihar, Jharkhand, Odisha and Uttar Pradesh over 1.34 lakh solar street lights have been installed.
- (ii) Considering the success of the AJAY Phase-I scheme, coverage of the scheme in Phase-II launched in December, 2018 has been expanded for implementation in North Eastern States including Sikkim and hilly States/UTs of Jammu & Kashmir, Ladakh, Himachal Pradesh and Uttarakhand and Island UTs and

**Table 3.13: Sanctions issued to States under Off-grid & Decentralised Solar PV Applications Programme: Phase-III**

S. No.	State/UT	Capacity/ Numbers Sanctioned		
		Solar Street Lights (Nos)	Solar Study Lamps (Nos)	Off-Grid SPV Power Plants (kWp)
1	Andhra Pradesh	12,000	2,59,754	-
2	Andaman & Nicobar	1,100	-	-
3	Arunachal Pradesh	20,000	2,00,000	-
4	Assam	20,000	2,32,342	-
5	Bihar	-	-	240
6	Himachal Pradesh	20,000	-	-
7	Jammu & Kashmir	20,000	-	-
8	Kerala	-	-	2,000
9	Manipur	20,000	75,000	25
10	Meghalaya	-	1,02,000	-
11	Mizoram	20,000	1,50,000	939
12	Nagaland	9,810	24,000	415
13	Odisha	-	1,00,000	9,558
14	Punjab	19,000	-	-
15	Sikkim	-	43,034	-
16	Telangana	-	2,00,000	-
17	Tripura	12,000	3,00,000	-
18	Uttarakhand	19,665	-	-
19	Uttar Pradesh	-	21,122	-
<b>Total</b>		<b>1,93,575</b>	<b>17,07,252</b>	<b>13,177</b>





also in the aspirational districts of other States. A total of 3,04,500 Solar Street Lights (SSLs) are proposed to be installed.

- (iii) Under Phase-II, 2000 numbers of SSLs will be provided in each of the Parliamentary Constituencies of NE States, Hilly States/UTs and Island UTs as mentioned above. In the five States covered under AJAY Phase-I, 1000 numbers of SSLs will be provided in each of the Parliamentary Constituencies, which will be irrespective of number of SSLs already installed in Phase-I of AJAY scheme. Further, out of total 115 aspirational districts, 67 districts are lying in the states/UTs mentioned above and hence are automatically covered. Parliamentary constituencies lying in uncovered balance 48 aspirational districts, will also be provided with up to 2000 numbers of SSLs based on the extent the Parliamentary Constituency lies in the aspirational district.
- (iv) Under Phase-II, SSLs with improved LED capacity of 12 W are being provided. 75% of the cost of the system is provided through MNRE budget and the remaining 25% to be provided from MPLADS fund.
- (v) Under Phase II, consent for allocation of funds from MPLADS fund has been received for 140 parliamentary constituencies for installation of 1.58 lakh SSLs, against which DM's sanction has been received for 85,532 nos. of SSLs. Out of this, 16,389 nos. of SSLs have been reported installed as on 31.12.2019.

### **3.6.22 SCHEME FOR DISTRIBUTION OF 70 LAKH SOLAR STUDY LAMPS**

- (i) A scheme to provide Solar Study Lamps to 70 lakh school-going children was available in the five states of Assam, Bihar, Jharkhand, Odisha and Uttar Pradesh, where less than 50% of the households are electrified. About 60.61 lakh solar study lamps have been distributed under the Scheme.
- (ii) The scheme is jointly implemented by IIT Bombay and Energy Efficiency Services Limited (EESL) with separate responsibilities on deliverables wherein IIT Bombay is the central coordinating agency and EESL is the chief procurement agency. At the grassroots, the State Rural Livelihood Mission (SRLM) are involved in implementing the scheme.
- (iii) Local women are involved in assembly & distribution, and repair & maintenance of the solar study lamps. Under the Scheme, over 7436 nos. of women were trained as solar lighting technicians, 1769 nos. of repair and maintenance centers were established, around 1896 people were trained in entrepreneurship development and 832 nos. of solar shops have been opened.

### **3.6.23 'OFF-GRID AND DECENTRALIZED CONCENTRATED SOLAR THERMAL (CST) TECHNOLOGIES FOR COMMUNITY COOKING, PROCESS HEAT AND SPACE HEATING & COOLING APPLICATIONS IN INDUSTRIAL, INSTITUTIONAL AND COMMERCIAL ESTABLISHMENTS' SCHEME**

- (i) Ministry has been implementing the 'Off-Grid and Decentralized Concentrated Solar Thermal (CST) Technologies for Community Cooking, Process Heat and Space Heating & Cooling Applications in Industrial, Institutional and Commercial Establishments' scheme for the promotion of renewable energy for thermal applications.
- (ii) The benchmark cost of the different CST technologies is given in table below:



Type of Solar Collector	Benchmark Cost (Rs./m <sup>2</sup> )
Concentrator with manual tracking (dish solar cookers)	7000
Solar collector systems for direct heating and drying and non-image/ Compound Parabolic Concentrators (NIC/CPC)	12000
CSTs with single axis tracking (including Scheffler dish)	15000
CSTs with single axis tracking, solar grade mirror, reflector and evacuated tube collectors	18000
CST based on double axis tracking	20000

- (iii) Subsidy rate:
- @ 30% of the bench mark cost or actual cost whichever is less to all beneficiaries in all states
  - @ 60% of the bench mark cost or actual cost whichever is less to Non-profit making bodies and institutions in special category states, viz., NE states, Sikkim, J&K, Himachal Pradesh, Uttarakhand and islands.
  - The subsidy rates were revised to 20% & 40% for the Financial Year 2019-20
- (iv) In 2019, Ministry has sanctioned eight projects with a cumulative collector/reflector area of about 1630 m<sup>2</sup> for various applications in different parts of the country. It is expected that projects having a cumulative collector/reflector area of about 5000 m<sup>2</sup> will be completed by 31.03.2020.

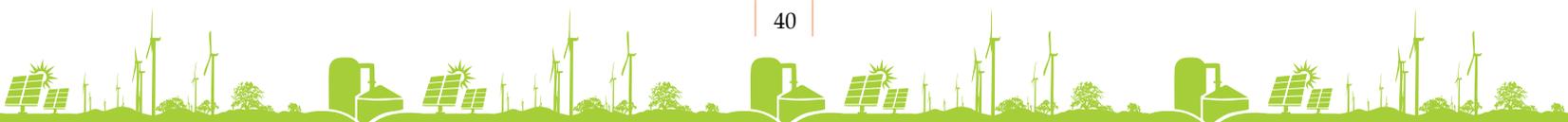
### 3.6.24 SUCCESS STORIES

(i) **M/s. Asian Paints Ltd., Khandala, Maharashtra**

A CPC based pressurized solar hot water system having a collector area of 369.6 m<sup>2</sup> was successfully installed and commissioned at M/s. Asian Paints Ltd., Khandala, Maharashtra for process heat



*CPC based pressurized hot water system installed at Asian Paints Ltd., Khandala, Maharashtra*





*CST Installation at Youth and Sports Hostel, Una, Himachal Pradesh*

application. The CPC system, installed with a total cost of Rs.77.89 lakh, delivers pressurized hot water at rate of about 6 lakh kcal/day and saving of about 70 Litres of HSD/day benefiting a saving of about Rs.5,000/ day.

**(ii) Youth and Sports Hostel, Una and Bilaspur, Himachal Pradesh**

HIMURJA implemented a CST based cooking project having an individual reflector area of 48 m<sup>2</sup> in the Youth and Sports Hostel in Una and Bilaspur districts of Himachal Pradesh. The scheffler dishes with reflector area of 16 m<sup>2</sup> are used and the project was completed with a total cost of Rs.18.72 lakh. The system was used to cook food for the inmates saving about 9kg/day of LPG, benefitting a savings of about Rs.750/day.



*CST Installation at Natco Pharma Ltd., Telangana*





*CST Installation at NIF, Kanpur, U. P.*

**(iii) Natco Pharma, Telangana**

A Parabolic Dish based CST system was installed at Natco Pharma Limited, Nagarjunsagar, Telangana for process heating application. The system with a total reflector area of 380 m<sup>2</sup> comprising of 4 Nos. of dual-axis tracking paraboloid dishes each of 95 m<sup>2</sup> concentrator area. The CST system, installed with a total cost of Rs.82.19 lakh, generates about 8 lakh kcal/day, saving 120 kg of Furnace Oil per day and benefitting a saving of about Rs.1 Lakh per Month.

**(iv) Namaste India Foods Pvt. Ltd., Kanpur, U. P.**

NIF Pvt. Ltd., which is one of the largest milk processing companies in India, was using wood for steam generation for milk processing and storage equipment. Two dual-axis tracking Paraboloid dish concentrator system of 95 m<sup>2</sup> each were installed at two Milk Chilling centres of NIF located near Kanpur, U.P. The CST system was installed with a total cost of Rs.40.10 lakh producing thermal output of about 4.5 lakh kcal/day, saving about 150 kg of wood per day on both sites with a saving of about Rs.3500/day.

**(v) Vidya Dairy, Anand, Gujarat**

NDDDB implemented a Concentrating Solar Thermal based pressurized hot water system at Vidya Dairy, Anand University campus, Gujarat with a total cost of Rs.72,22,438/-. The CST system having 19 Nos. of modules of Paraboloid Dish with dual axis tracking a total reflector area of 380 m<sup>2</sup> delivers pressurized hot water at the rate of 1.85 lakh Kcal/day. Through these 66 liters of Furnace Oil is being saved per day which equivalent to a savings of about Rs.950/day.



*CST Installation at Vidya Dairy, Anand*





*A beneficiary with her 200 LPD SWH and CGH.*

### 3.6.25 IMPLEMENTATION OF LADAKH RENEWABLE ENERGY INITIATIVE (LREI) IN LADAKH REGION.

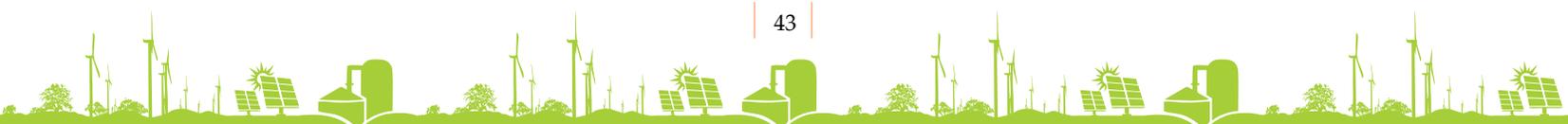
- (i) MNRE implemented the Ladakh Renewable Energy Initiative (LREI) in the Ladakh region with the objective of minimizing use of fossil fuels and to meet energy requirement of the region through renewable energy. Under this, Ladakh Renewable Energy Development Agency (LREDA) completed the implementation of the 500 Nos. of Commercial Green Houses (CGHs) in the Leh region with a total cost of Rs. 10.34 crores. Also Kargil Renewable Energy Development Agency (KREDA) has implemented the following projects/installations in Kargil region:

Sl. No.	Component	Units
1	Solar Water Heating Systems	10005 Sq. m.
2	Dish Cookers	600 Nos.
3	Solar Steam Cooking Systems	1 No.
4	Domestic Green House	3000 Nos.
5	Commercial Green House	375 Nos.



*Different fruits & vegetables are grown inside the CGHs.*

- (ii) CGHs implemented under LREI have a very positive impact on the community in the far flung areas of the Ladakh region. It has also been noticed that hundreds of families have been benefited and have become self-sufficient in terms of availability of green vegetables during long winter (From November to April) thereby improving the health condition of the people. Annual income from the CGHs range between Rs. 40,000 to Rs. 50,000.





*CST installation at Jawahar Navodaya Vidyalaya Campus, Khumbathang, Kargil*

- (iii) Under LREI, KREDA implemented the first Steam Cooking System with a cumulative reflector area of 64 m<sup>2</sup> (4 Dish of 16 m<sup>2</sup> each) at Jawahar Navodaya Vidyalaya Campus, Khumbathang. The CST installation helps the school for saving 70 kg of LPG per day. The project has been proved to be a beneficial in saving the environment and helping the school administration in saving money by minimizing the consumption of nos. of cylinders per year. The system has also become a model project of renewable energy for the students at the JNV.

### **3.6.26 MNRE-GEF-UNIDO PROJECT**

The GEF-UNIDO project on Promoting Business Model for increasing penetration and scaling up of solar energy was designed to complement the Ministry's CST support programme by helping to remove barriers associated with Concentrating Solar Thermal (CST) technologies, its awareness, capacity building, market and financial barriers.

The project has undertaken following activities:

- The project has promoted two new CST technologies during 2018-19– (i) A single largest paraboloid dish of 576 m<sup>2</sup> collector area is being installed in Thane, Maharashtra for cooling and other applications in the CMC Hospital. The project has been supported by UNIDO under its MNRE-IREDA-UNIDO financing scheme; (ii) A highly efficient and low weight Compound Parabolic Concentrator (CPC) to generate steam for various applications is being considered for support by UNIDO.
- The project has in past organized 20 workshop/conference /business meets to create awareness across the 14 identified industrial sectors in cooperation with SNAs, Industrial associations and cluster associations. In addition, 18 visits to CST project sites were also organized in different parts of the country.
- UNIDO has partnered with National Institute of Solar Energy to develop and implement a CST skill development program for training for trainers and training for technician.





*Launch of CST Road Map, Sun Focus Magazine and CST e-Newsletter in the National CST Workshop*

- A quarterly CST e-magazine 'Sun Focus' and CST e-Newsletter were launched on 23 August 2019 during the National CST Workshop in New Delhi. The publications cover information on latest updates on solar concentrator technologies, current events, case studies - local & global and innovations.
- A project website on CST [www.steia.in](http://www.steia.in) has been developed to provide relevant information related to CSTs and also the activities of MNRE-GEF-UNIDO Project.
- UNIDO presented the advantages of using solar energy for thermal applications in industries at Indian Pulp & Paper Technical Association (IPPTA) Workshop in Rajahmundry, Andhra Pradesh (08 & 09 November 2019) and at the LK Memorial Workshop in New Delhi (15 & 16 November 2019).

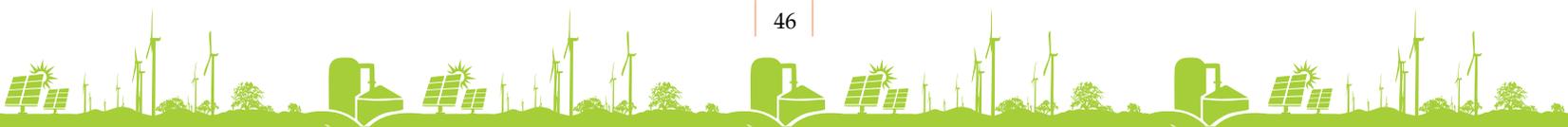
### 3.7 GREEN ENERGY CORRIDOR

- (i) In order to facilitate integration of large scale renewable generation capacity addition, the Cabinet Committee of Economic Affairs (CCEA) in FY 2015-16, approved the creation of Intra-state Transmission System in the states of Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu, rich in renewable resource potential and where large capacity renewable power projects are planned, at an estimated cost of Rs.10,141.68 crore with Government of India contribution of Rs.4056.67 crore. The activities envisaged under the project includes establishment of Grid sub-stations of different voltage levels with aggregate transformation capacity of approx. 22600 Mega Volt Ampere (MVA) and installation of approx. 9700 circuit kilometres (ckm) of transmission lines in these eight states. The creation of the Intra-State Transmission System will facilitate the evacuation of over 20 GW of power from renewable energy generation stations to load centres.
- (ii) The project is anticipated to be completed by 2021 with funding mechanism consisting of 40% Central Grant, 40% KfW loan (Euro 500 million) and the remaining 20 percent as State contribution. As on 31.12.2019, a total of approx. Rs. 2000 crore has been disbursed to the States from the Government of India contribution, and works related to installation of transmission towers and their stringing for an aggregate 6258 ckm and 6812 MVA have been completed. The following works, mentioned in the States below, have been completed in 2019-20:
  - a) **Gujarat:** (i) 160 MVA transformer commissioned in 220 KV Moti Gop substation in Jamnagar district, (ii) 400 KV Hadala – Shapar line, (iii) 220 KV D/C Chorania – Salejada line.





- b) Karnataka:** (i) 400/220 kV S/s in Jagalur (Hiremallanahole), Davanagere district, (ii) 400 kV DC line from Rampura limits (400 kV MC line from BPS) upto Anchor point 39/0 near proposed 400/220 kV S/s at Jagalur (Hiremallanahole), (iii) 220/66 kV and 66/11kV substation at Shivanasamudra, Malavalli taluk, Mandya district, (iv) 220 kV Double DC line on MC towers tapping from existing 220 kV DC T.K.Halli-Madhuvanahally line to the sub-station at Shivanasamudra.
- c) Madhya Pradesh:** (i) 220kV Double Circuit Double Strung line from Betul 220kV S/s to Gudgaon 220kV S/s, (ii) 132kV Interconnector between Gudgaon 220kV S/s and Gudgaon 132kV S/s.
- d) Tamil Nadu:** (i) 400 kV SS at Thennampatti, (ii) 400 KV Thenampatti - Kayathar line.
- e) Maharashtra:** (i) 2nd ckt. stringing of 132 kV Shevgaon - Bhenda D/C line with bays, (ii) 2nd ckt. stringing of 132 kV Manmad - Yeola SCDC line with bays, (iii) 132 kV Kavthemahankal - Savlaj SCDC line with bays.
- f) Himachal Pradesh:** (i) Providing additional 400/220 kV, 1x315 MVA transformer in the 400/220 kV substation at Gumma in Shimla district, (ii) 220 kV Snail-Hatkoti line.





## **POWER FROM OTHER RENEWABLES**

## POWER FROM OTHER RENEWABLES

### 4.1 GRID INTERACTIVE AND OFF-GRID RENEWABLE POWER

- (i) India has large renewable energy potential from sources such as wind, solar, biomass, small hydro, etc. As per estimates, India has a wind potential of more than 300 GW at a hub height of 100 metre, solar potential of ~750 GW, assuming 3% wasteland is made available, small hydro potential of ~ 20 GW, and bio-energy potential of 25 GW. Further, there exists significant potential from decentralized distributed applications for meeting the hot water requirement for residential, commercial and industrial sector through solar energy and also meeting cooking energy needs in the rural areas through biogas. Renewable energy also has the potential to usher in universal energy access. In a decentralized or standalone way renewable energy is appropriate, scalable and a viable solution for providing power to un-electrified or power deficient villages and hamlets.
- (ii) In December 2019, the cumulative renewable power installed capacity was 84.84 GW. Capacity addition of 7.59 GW has been achieved during the current year 2019-20 (upto 31.12.2019)

### 4.2 GRID INTERACTIVE RENEWABLE POWER

#### 4.2.1 WIND ENERGY PROGRAMME

India's wind energy sector is led by indigenous wind power industry and has shown consistent progress. The expansion of the wind industry has resulted in a strong ecosystem, project operation capabilities and manufacturing base of about 10,000 MW per annum. The country currently has the fourth highest wind installed capacity in the world with total installed capacity of 37.50 GW (as on 31st December, 2019) and 62.036 Billion Units were generated from wind power during 2018-19.

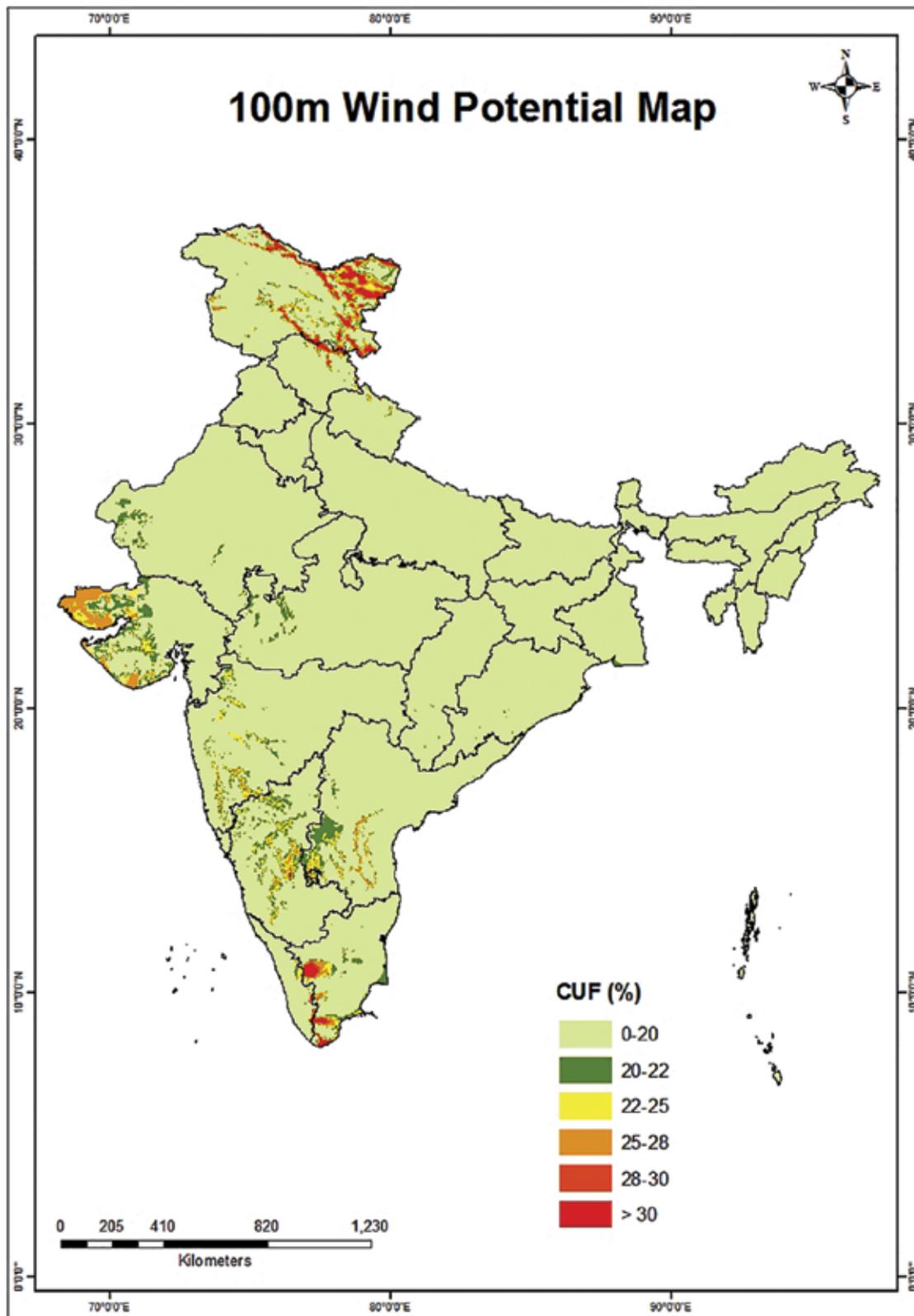
#### 4.2.2 POTENTIAL OF WIND ENERGY IN INDIA

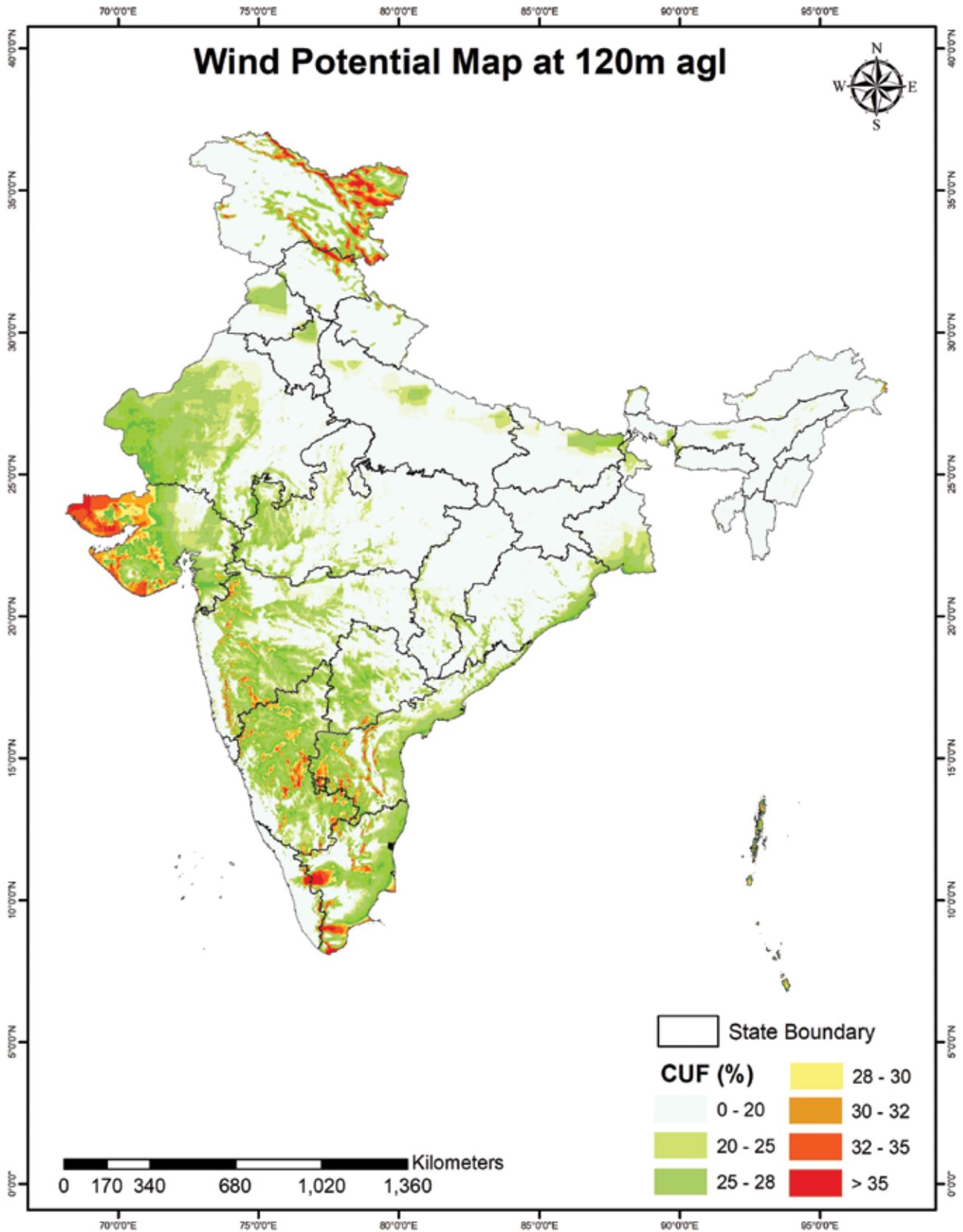
- (i) Wind is an intermittent and site-specific source of energy and therefore, an extensive Wind Resource Assessment is essential for the selection of potential sites. The Government, through National Institute of Wind Energy (NIWE), has installed over 800 wind-monitoring stations all over the country and issued wind potential maps at 50 m, 80 m, 100 m and 120 m above ground level. The latest assessment indicates gross wind power potential of 302.25 GW and 695.50 in the country at 100 meter and 120 meter respectively, above ground level. Most of this potential exists in seven windy States is given in **Table 4.1**.

<b>Table 4.1 Wind Power Potential in India at 100 meter and 120 meter, above ground level</b>			
<b>S. No.</b>	<b>State</b>	<b>Wind Power Potential at 100 mtr agl in GW</b>	<b>Wind Power Potential at 120 mtr agl (GW)</b>
1	Andhra Pradesh	44.23	74.90
2	Gujarat	84.43	142.56
3	Karnataka	55.86	124.15
4	Madhya Pradesh	10.48	15.40
5	Maharashtra	45.39	98.21
6	Rajasthan	18.77	127.75
7	Tamil Nadu	33.80	68.75
	<b>Total (7 windy States)</b>	<b>292.97</b>	<b>651.72</b>
	Other States	9.28	43.78
	<b>All India Total</b>	<b>302.25</b>	<b>695.50</b>



- (ii) The wind atlas is available on the NIWE website [www.niwe.res.in](http://www.niwe.res.in) and wind potential map at 100 m and 120 m above ground level is given below:





### 4.2.3 INSTALLED CAPACITY OF WIND POWER IN THE COUNTRY

- (i) The installed capacity of grid-interactive wind power in the country as on 31.12.2019 is 37.50 GW and state-wise installed capacity (in MW) is shown in **Table 4.2**.

**Table 4.2: State wise Wind Power installed as on 31.12.2019**

S. No.	STATE	Wind Power (MW)
1	Andhra Pradesh	4092.450
2	Gujarat	7359.220
3	Karnataka	4753.400
9	Kerala	62.500
4	Madhya Pradesh	2519.890
5	Maharashtra	5000.330
6	Rajasthan	4299.720
7	Tamil Nadu	9285.265
9	Telangana	128.100
10	Others	4.300
	<b>Total (MW)</b>	<b>37505.175</b>



*Installation site of 300MW wind turbine with blades at Mulanur site Tirupur Distt. Tamil Nadu of wind power project under SECI Tranche IV bid*





*A wind mill of 2.1MW capacity established at a 250 MW wind farm at Chandragiri in Tamil Nadu, India under SECI Tranche-I*

(ii) The year-wise electricity generation from wind energy source is shown in **Table 4.3**.

<b>Table 4.3: Year wise Electricity Generation from wind energy sources</b>		
<b>Sr. No.</b>	<b>Year</b>	<b>Wind (MU)</b>
1	2014-15	33768
2	2015-16	33029
3	2016-17	46004
4	2017-18	52666
5	2018-19	62036
6.	2019-20 (upto 31.10.2019)	47729

#### **4.2.4 TECHNOLOGY DEVELOPMENT AND MANUFACTURING BASE FOR WIND POWER**

The Wind Turbine Generator technology has evolved and state-of-the-art technologies are available in the country for the manufacture of wind turbines. Around 70-80% indigenisation has been achieved with strong domestic manufacturing in the wind sector. All the major global players in this field have their presence in the country and over 31 different models of wind turbines are being manufactured by more than 15 different companies, through (i) joint ventures under licensed production (ii) subsidiaries of foreign companies, and (iii) Indian companies with their own technology. The unit size of machines has gone up to 3.00 MW. The current annual production capacity of wind turbines in the country is about 8000 MW to 10000 MW.





#### 4.2.5 TENDER/BIDDING IN WIND ENERGY SECTOR

- (i) Government issued Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected Wind Power Projects vide resolution notified on 8th December, 2017. This was done with an objective to provide a framework for procurement of wind power through a transparent process of bidding including standardization of the process and defining of roles and responsibilities of various stakeholders. These Guidelines aim to enable the Distribution Licensees to procure wind power at competitive rates in a cost effective manner.
- (ii) Based on experience of bidding and after consultation with stakeholders, the standard bidding guidelines for wind power projects were amended on 16th July, 2019 to reduce the investment risks related to the land acquisition and CUF and to provide incentives for early part commissioning of project. The subjectivity in penalty provisions has been removed and the penalty rate has been fixed. The risk of wind power developers in case of delay in signing of PSA has been mitigated by starting timeline of execution of project from date of signing of PPA or PSA, whichever is later.

#### 4.2.6 STATUS OF TENDERS FOR WIND POWER PROJECTS

To enable Discoms of the non-windy States to fulfil their non-solar Renewable Purchase Obligation (RPO), through purchase of wind power at a tariff determined by transparent bidding process, MNRE through SECI has auctioned wind power capacity in 8 tranches. Further, NTPC and the states of Gujarat, Maharashtra and Tamil Nadu have also auctioned wind power capacities.

- (1) Cumulative commissioned capacity till 31/12/19: 37.505 GW  
 (2) Capacity under implementation: 9.355 GW

**Total (1+2): 46.86 GW**

The Minimum Tariffs discovered from tenders auctioned for Wind Power are shown in **Table 4.4**.

<b>Table 4.4: Minimum Tariffs discovered from tenders auctioned for Wind Power</b>				
<b>Sl. No.</b>	<b>Bid</b>	<b>Capacity Awarded (MW)</b>	<b>Type</b>	<b>Min. Tariff (Rs./kwh)</b>
1.	SECI-I	1049.9	Central	3.46
2.	SECI-II	1000	Central	2.64
3.	SECI-III	2000	Central	2.44
4.	SECI-IV	2000	Central	2.51
5.	Tamil Nadu	450	State	3.42
6.	Gujarat (GUVNL)	500	State	2.43
7.	Maharashtra (MSEDCL)	500	State	2.85
8.	SECI-V	1190	Central	2.76
9.	NTPC	850	Central	2.77
10.	SECI-VI	1200	Central	2.82
11.	SECI-VII	480	Central	2.79
12.	SECI-VIII	440	Central	2.83
13.	Gujarat (GUVNL)	202.6	State	2.80
	<b>Sub Total</b>	<b>11862.5</b>		





#### 4.2.7 INCENTIVES AVAILABLE FOR WIND SECTOR

- (i) The Government is promoting wind power projects in entire country through private sector investment by providing various fiscal and financial incentives such as Accelerated Depreciation benefit; concessional custom duty exemption on certain components of wind electric generators. Besides, Generation Based Incentive (GBI) Scheme was available for the wind projects commissioned up to 31st March 2017.
- (ii) In addition to fiscal and other incentives as stated above, following steps also have been taken to promote installation of wind capacity in the country:
  - Technical support including wind resource assessment and identification of potential sites through the National Institute of Wind Energy, Chennai.
  - In order to facilitate inter-state sale of wind power, the inter-state transmission charges and losses have been waived off for wind and solar projects to be commissioned by March, 2022.

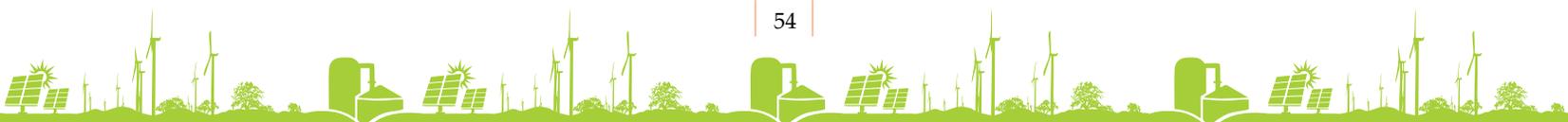
#### 4.2.8 NATIONAL WIND-SOLAR HYBRID POLICY

The Ministry issued National Wind-Solar Hybrid Policy on 14th May, 2018. The main objective of the policy is to provide a framework for promotion of large grid connected wind-solar PV hybrid system for optimal and efficient utilization of wind and solar resources, transmission infrastructure and land. The wind - solar PV hybrid systems will help in reducing the variability in renewable power generation and achieving better grid stability. The policy also aims to encourage new technologies, methods and way-outs involving combined operation of wind and solar PV plants. The major highlights of this policy are as under:

- i. A wind-solar plant will be recognized as hybrid plant if the rated power capacity of one resource is at least 25% of the rated power capacity of other resource.
- ii. Both AC and DC integration of wind solar hybrid project are allowed.
- iii. The power procured from the hybrid project may be used for fulfilment of solar RPO and non-solar RPO in the proportion of rated capacity of solar and wind power in the hybrid plant respectively.
- iv. Existing wind or solar power projects, willing to install solar PV plant or WTGs respectively to avail benefit of hybrid project, may be allowed.
- v. All fiscal and financial incentives available to wind and solar power projects will also be made available to hybrid projects.
- vi. The Central Electricity Authority (CEA) and Central Electricity Regulatory Commission (CERC) shall formulate necessary standards and regulations including metering methodology and standards, forecasting and scheduling regulations, REC mechanism, grant of connectivity and sharing of transmission lines, etc., for wind-solar hybrid systems.
- vii. Storage may be added to the hybrid project to ensure availability of firm power for a particular period.

#### 4.2.9 WIND SOLAR HYBRID PROJECTS

- (i) In order to implement the National Wind Solar Hybrid Policy, a scheme for setting up of 2500 MW Inter State Transmission System (ISTS) connected wind-solar hybrid projects was sanctioned on 25.05.2018. The Solar Energy Corporation of India (SECI) was nodal agency for implementation of the scheme through tariff based transparent competitive bidding process.



- (ii) Under this scheme, SECI has awarded 1440 MW capacity of wind solar hybrid projects after e- reverse auction, as shown in **Table 4.5**.

<b>Table 4.4: Minimum Tariffs discovered from tenders auctioned for Wind Power</b>					
<b>Sr. No.</b>	<b>Bidder's Name</b>	<b>Project Capacity (MW)</b>	<b>Tariff (INR/kWh)</b>	<b>Project Location</b>	<b>Scheduled Commissioning Date</b>
1	Mahoba Solar (UP) Private Limited	390	2.69	Rajasthan	03.12.2020
2	SBE Renewables Ten Private Limited	450	2.67	Tamil Nadu	03.12.2020
3	Adani Renewable Energy (Park) Gujarat Limited	600	2.69	Rajasthan	17.02.2021
	<b>Total</b>	<b>1440</b>			

#### **4.2.10 ISSUANCE OF DUTY EXEMPTION CERTIFICATES FOR MANUFACTURING OF WIND TURBINES**

Ministry is issuing concessional custom duty exemption certificates (CCDC) to the manufacturers of wind operated electricity generators as per Ministry of Finance tariff notification no. 50/2017-customs dated 30.06.2017. For this purpose the eligible turbine and component manufacturers need to get the bill of material for RLMM listed turbine models approved and then apply in prescribed formats to Ministry for a CCDC certificate for their import consignments. In order to make the entire process fast and transparent, an online portal has been developed and launched from Dec, 2019 which is running successfully.

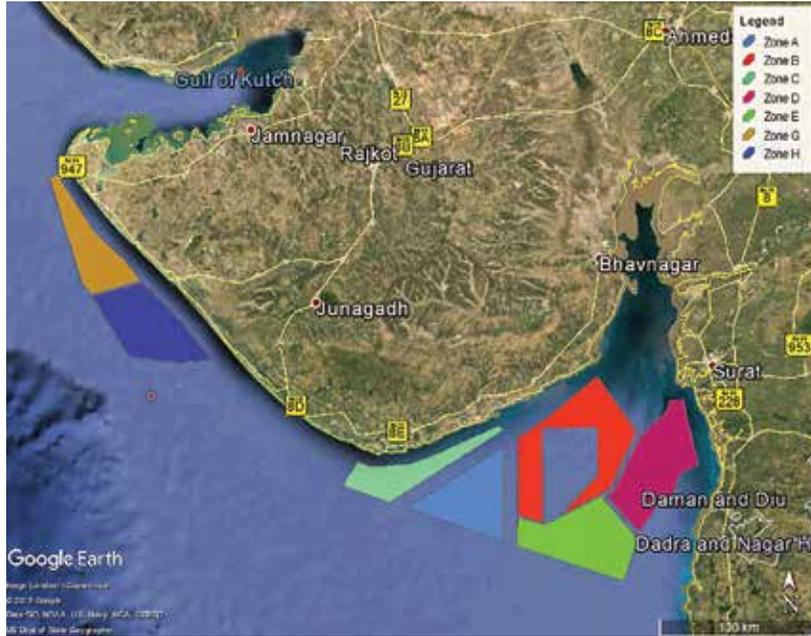
#### **4.2.11 OFFSHORE WIND DEVELOPMENT IN INDIA**

India is blessed with a coastline of about 7600 km surrounded by seawater on three sides and has tremendous power generation potential from offshore wind energy. Considering this, the Government had notified the National Offshore Wind Energy Policy as per the Gazette Notification dated 6th October 2015. As per the policy, Ministry of New and Renewable Energy will act as the nodal ministry for development of Offshore Wind Energy in India and work in close coordination with other government entities for Development and Use of Maritime Space within the Exclusive Economic Zone (EEZ) of the country in an effective manner for production of enormous quantity grid quality electrical power for national consumption. National Institute of Wind Energy (NIWE), Chennai has been designated as the nodal agency to execute various pre-feasibility activities relating to resource assessment, surveys and studies within EEZ (Exclusive Economic Zone), demarcation of offshore potential blocks and facilitating offshore wind energy project developers for setting up offshore wind energy farms.

#### **4.2.12 PRESENT STATUS**

- (i) Based on the preliminary assessment from satellite data and data available from other sources, 8 (eight) zones each in Gujarat and Tamil Nadu have been identified as potential offshore zones for exploitation of offshore wind energy potential. Initial assessment of offshore wind energy potential within the identified zones has been estimated to be about 70 GW off the coast of Gujarat & Tamil Nadu only.
- (ii) Offshore wind energy development is a very capital intensive project and the initial investment is very high. In order to attract the large investment for development of the sector in India, Government of India has already announced its intention of developing 5 GW of offshore wind energy project by 2022 and 30 GW by 2030.





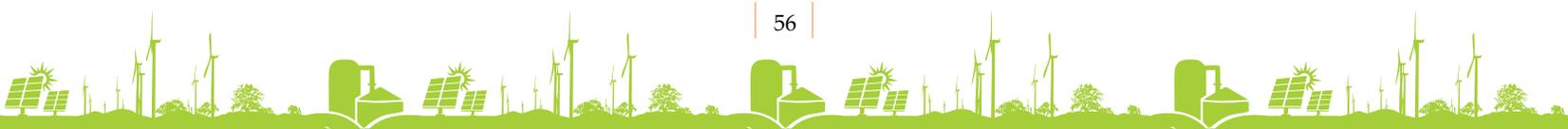
Gujarat Offshore Wind Potential Zone

**a. Offshore measurements off Gujarat coast**

LiDAR based offshore wind potential measurements for 2 years have been completed at Gulf of Khambhat off Gujarat coast. The offshore LiDAR wind data measurement report for the first year has been published for benefit of stakeholder and the second year LiDAR wind data measurement report is under examination before its publication. Raw data files (time series) of two years of LiDAR measurement carried out at Gulf of Khambhat has also been uploaded at NIWE website.



Tamil Nadu Offshore Wind Potential Zone





**b. Geophysical investigation at Gulf of Khambhat off Gujarat coast**

In order to ascertain the nature of sub sea surface and soil profile available at recommended depths for the design of foundation of offshore structures, a detailed geophysical survey is required to be carried out. Onsite Geo-physical investigation (single beam bathymetry survey, side scan sonar, sub-bottom profiling, and magnetometer survey and sediment samples) covering an area of 365 sq. km for 1GW offshore project in Gulf of Khambhat off Gujarat Coast has been completed.

**c. Geotechnical Investigation at Gulf of Khambhat off Gujarat coast**

Based on the Geo-physical results, five bore-hole locations for geotechnical studies were identified in zone- B and zone –A off the cost of Gujarat. The Geotechnical work will cover Cone Penetration Test / Borehole studies for proposed 1GW offshore wind farm area and two LiDAR locations depth of 60 meters The Geo-technical work and the field data collection has been completed by NIWE and the draft geotechnical report is under examination.

**d. Rapid Environmental Impact Assessment for 1 GW offshore wind farm project at Gulf of Khambhat off Gujarat coast**

(i) The Rapid EIA work has been completed by National Institute of Oceanography (NIO) covering the following aspects:

- Air modelling and wind wake studies,
- Baseline data collection & noise and vibration study.
- Hydrodynamic modelling studies.
- Physiochemical characteristic of seawater and sediment,
- Assess the fish diversity zone, Abundance and biomass,
- Status and occurrence of mangroves, corals, seaweeds, sea grasses, sea turtles & marine mammals (kg/haul) in the study area,
- Socio-economic studies pertaining to the fisheries.
- Assessment of impacts due to the proposed 1GW offshore wind farm project.

(ii) NIO has completed the field studies and investigations in July 2019 and draft report was submitted. Stakeholders' consultation on the said report has been completed. The views and opinions expressed by various stake holders have been communicated to the NIO for incorporation in the final report.

**e. Offshore wind energy Lease Rules**

In order to formulate the required framework for regulating the lease of offshore areas within the EEZ of India for offshore wind energy development, Ministry is framing Lease Rules under the 'Territorial Waters, Continental Shelf, Exclusive Economic Zone and Other Maritime Zones Act, 1976'. The draft offshore wind energy lease rules have already been circulated to stakeholders Ministries and Departments and their comments have been received.

**f. Offshore Wind Turbine Research cum Test Centre at Dhanushkodi, Tamil Nadu**

In order to strengthen the domestic capacity for design and development of new offshore wind energy turbines, a testing cum research facility was necessary and the Ministry has already identified the suitable site at Dhanushkodi, Tamil Nadu for establishment of the testing cum research centre. The required land for the purpose has been allotted by Govt. of Tamilnadu. NIWE is in the process for preparing a detailed project report for the centre.





#### 4.2.13 BIOMASS POWER / BAGASSE BASED CO-GENERATION (UPTO MARCH 2020) GRID - CONNECTED

- 4.2.14 Ministry has been promoting Biomass Power and Bagasse Co-generation Programme with the aim to recover energy from biomass including bagasse, agricultural residues such as shells, husks, de-oiled cakes and wood from dedicated energy plantations for power generation. A new scheme to support promotion of biomass based cogeneration in sugar mills and other industries (up to March 2020) has been notified on 11.05.2018. The potential for power generation from agricultural and agro-industrial residues is estimated at about 18,000 MW. With progressive higher steam temperature and pressure and efficient project configuration in new sugar mills and modernization of existing ones, the potential of surplus power generation through bagasse cogeneration in sugar mills is estimated at around 8,000 MW. Thus the total estimated potential for biomass power is about 26,000 MW.
- 4.2.15 Over 500 biomass power and cogeneration projects with aggregate capacity of 9186.50 MW have been installed in the country up to December 2019.
- 4.2.16 Sugar industry has been traditionally practicing incidental cogeneration by using bagasse as a fuel for meeting the steam and power requirements of sugar processing and sugar mill complex. With the advancement in the boiler and turbine technologies for generation and utilization of steam at high temperature and pressure, sugar industry has been producing electricity and steam for their own requirements and selling surplus electricity to the grid by optimally utilizing the bagasse. The sale of surplus power generated through optimum cogeneration is helping a sugar mill to improve its viability and profitability, apart from crating additional power generation capacity in the country.
- 4.2.17 The Programme has the following component:
- Bagasse based cogeneration in sugar mills for export of surplus power to grid



28 MW Grid Connected Bagasse Cogeneration Plant of Rajarambapu Patil SSKL, Sangli, Maharashtra





4.2.18 The programme has the following objectives:

- i. To promote efficient and economic use of surplus biomass for power generation.
- ii. To maximize surplus power generation from sugar mills using improved technologies.
- iii. To promote technologies of co-generation for supplementing conventional power.

4.2.19 For the purpose of biomass based cogeneration programme following nomenclature are broadly adopted

**a. Biomass Resources**

The programme will provide CFA for projects utilizing biomass like bagasse, agro-based industrial residue, crop residues, wood produced through energy plantations, weeds, wood waste produced in industrial operations, etc. Municipal Solid Waste is not covered under the programme.

**b. Financing Institutions**

All registered financial Institutions development / investment corporations; all nationalized bank, private banks, Central & State Cooperative Banks, State/Public Sector Leasing and Financing corporations.

**c. Promoters**

Promoters include individual / independent registered companies, Joint Sector / public sector companies / state agencies and private and public sector investors having technical and managerial capabilities for implementing Bagasse cogeneration projects.

**d. Central Financial Assistance (CFA)**

As per new scheme to support biomass based cogeneration in sugar mills and other industries (up to March 2020) notified on 11.05.2018, Central Financial Assistance (CFA) will be provided at the rate of Rs.25 Lakh / MW for bagasse cogeneration projects on surplus exportable capacity under the scheme. CFA will be calculated on surplus exportable power as mentioned in Power Purchase Agreement (PPA) / Appraisal Report. The CFA will be back-ended and will be released in one installment after successful commissioning and commencement of commercial generation and performance testing of the plant. The CFA will be released to the term loan account to reduce the loan component of the promoter. No advance CFA will be released under the scheme. CFA will be provided only for projects which will be installing new boiler and turbines.

**e. Achievements**

A cumulative capacity of 9186.50 MW has been commissioned so far mainly in the states of Tamil Nadu, Uttar Pradesh, Karnataka, Andhra Pradesh, Maharashtra, Chhattisgarh, West Bengal and Punjab.

**4.2.20 SMALL HYDRO POWER**

4.2.21 The Ministry of New and Renewable Energy (MNRE) is vested with the responsibility of developing hydro power projects of capacity up to 25MW, categorized as Small Hydro Power (SHP) Projects. These projects have potential to meet power requirements of remote and isolated areas in a decentralized manner besides providing employment opportunity to local people. Small Hydro Power projects are further categorized into small, mini and micro hydel projects based on their capacity as follows:

Micro hydel  $\leq 0.1$  MW

Mini hydel  $> 0.10$  MW to  $\leq 2.00$  MW

Small Hydel  $> 2.00$  MW to  $\leq 25.00$  MW



- 4.2.22 The estimated potential of small/mini/micro hydel projects in the country is 21133.65 MW from 7133 sites located in different States of India. The SHP projects in the country are being set-up both in public and private sectors. Setting up of SHP projects normally require about 3-4 years depending upon its size and location. The national target for SHP is to achieve a cumulative capacity of 5000 MW by 2022, under overall targets of achieving a cumulative grid connected Renewable Energy Power Projects of 175,000 MW. Against this target of achieving an aggregate capacity of 5000 MW by the year 2022, an aggregate capacity of 4671.557 MW been achieved by 31st December 2019 through 1127 small hydropower projects. In addition, 109 projects of about 529.24 MW are in various stages of implementation. **Table 4.6** provides state-wise details of identified potential, projects completed and those under execution.
- 4.2.23 For the year 2019-20, a target of commissioning of 100 MW small hydro projects was set. Against this target, 12 projects of aggregate capacity of 78.402 MW have been synchronized to the grid by 31st December 2019 (**Table 4.7**). In addition to commissioning of these 12 projects, two old projects (**Table 4.8**) have been renovated by introducing more efficient electrical and mechanical equipment in the State of Mizoram. Actual physical achievement from 01.01.2019 to 31.12.2019 and estimated physical achievement from 01.01.2020 to 31.03.2020 is given in **Table 4.9**.
- 4.2.24 Under the ‘Ladakh Renewable Energy Initiative (LREI)’, one mini hydel project namely, Chamsen MHP (450 kW) in in village Chamsen in Leh was commissioned during current financial year. In addition, two Mini Hydro Power Projects in Kargil district, namely, Matayeen (550 kW) and Khandi MHP (1000 kW) are currently under testing stage.
- 4.2.25 Ministry also supported setting up of 259 watermills in Karnataka and 40 water mills in Nagaland. These watermills are used for electrical and mechanical applications in remote and far flung areas of the country. These watermills are being operated by the individuals or local community to meet the power requirements of local community in decentralized manner.

**Table 4.7: List of SHP projects commissioned during 2019-20 (till 31.12.2019)**

S.No.	State	Name of the project	Capacity (MW)	Name of the Agency/Developer
1	Gujarat	SHP -1 on Vadodara Branch canal	1.052	SSNNL Gujarat
2	Himachal	Jeori	9.600	Technology House Pvt Ltd.
3	Himachal Pradesh	Salun	9.000	Swadeshi Distributors LLP
4	Himachal Pradesh	Kuwarsi	15.000	Jagdambey Hydro Projects LLP
5	Himachal Pradesh	Kinur	5.000	Snowdew Hydroelectric Power Projects (P) Ltd.
6	Himachal Pradesh	Hysrund	3.300	Vardaan Cottage
7	Himachal Pradesh	Balh Padhar	4.000	USP Hydro Enrgy Limited
8	Karnataka	Anthargange	2.000	Antharagange Power Pvt. Ltd.
9	Karnataka	Aniyur SHP	24.000	SLV Power Pvt. Ltd.
10	Ladakh	Chamsen	0.450	Ladakh Renewable Energy Development Agency
11	Ladakh	Chilong	1.000	Kargil Renewable Energy Development Agency
12	Maharashtra	Temghar	4.000	Laxmi Organic Industries Ltd
<b>Aggregate capacity</b>			<b>78.402</b>	



**Table 4.6: State wise list of potential sites, installed projects and on-going projects in SHP sector (as on 31.12.2019)**

State	Total Potential		Projects Installed						Projects under Implementation	
	Nos.	Total Capacity (MW)	Upto 2018-19		2019-20		Total		Nos.	Capacity (MW)
			Nos.	Capacity (MW)	Nos.	Capacity (MW)	Nos.	Capacity (MW)		
Andhra Pradesh	359	409.32	44	162.110	0	0	44	162.110	0	0
Arunachal Pradesh	800	2064.92	156	131.105	0	0	156	131.105	10	7.05
Assam	106	201.99	6	34.110	0	0	6	34.110	1	2
Bihar	139	526.98	29	70.7	0	0	29	70.700	0	0
Chhattisgarh	199	1098.2	10	76	0	0	10	76.000	0	0
Goa	7	4.7	1	0.05	0	0	1	0.050	0	0
Gujarat	292	201.97	12	61.3	1	1.052	13	62.352	9	48.81
Haryana	33	107.4	9	73.5	0	0	9	73.500	0	0
Himachal Pradesh	1049	3460.34	189	860.61	6	45.9	195	906.510	18	179.60
Jammu & Kashmir	302	1707.45	44	179.03	2	1.45	46	180.480	16	47.10
Jharkhand	121	227.96	6	4.05	0	0	6	4.050	0	0
Karnataka	618	3726.49	168	1254.73	2	26	170	1280.73	3	13.000
Kerala	238	647.15	34	222.02	0	0	34	222.02	8	80.500
Madhya Pradesh	299	820.44	12	95.91	0	0	12	95.91	2	7.600
Maharashtra	270	786.46	69	375.575	1	4	70	379.575	9	10.400
Manipur	110	99.95	8	5.45	0	0	8	5.45	0	0.000
Meghalaya	97	230.05	5	32.53	0	0	5	32.53	2	25.500
Mizoram	72	168.9	18	36.47	0	0	18	36.47	4	8.700
Nagaland	98	182.18	12	30.67	0	0	12	30.67	1	1.000
Odisha	220	286.22	10	64.625	0	0	10	64.625	3	57.000
Punjab	375	578.28	56	173.55	0	0	56	173.55	7	4.900
Rajasthan	64	51.67	10	23.85	0	0	10	23.85	0	0
Sikkim	88	266.64	17	52.11	0	0	17	52.11	1	3.000
Tamil Nadu	191	604.46	21	123.05	0	0	21	123.05	0	0
Telangana	94	102.25	30	90.87	0	0	30	90.87	0	0
Tripura	13	46.86	3	16.01	0	0	3	16.01	0	0
A&N Islands	7	7.27	1	5.25	0	0	1	5.25	0	0
Uttar Pradesh	251	460.75	9	25.1	0	0	9	25.1	2	25.500
Uttarakhand	442	1664.31	102	214.32	0	0	102	214.32	13	7.580
West Bengal	179	392.06	24	98.5	0	0	24	98.5	0	0
<b>Total</b>	<b>7133</b>	<b>21133.62</b>	<b>1115</b>	<b>4593.155</b>	<b>12</b>	<b>78.402</b>	<b>1127</b>	<b>4671.557</b>	<b>109</b>	<b>529.240</b>



Table 4.8: List of R&M projects completed during 2019-20				
Sr.No.	Name of the project	Capacity (MW)	Name of the Agency	State
1	Tuirivang SHP	0.3	Power & Electricity Dept., Mizoram	Mizoram
2	Teirei SHP	3.0	Power & Electricity Dept., Mizoram	Mizoram

Table 4.9: Actual physical achievement from 01.01.2019 to 31.12.2019 and estimated physical achievement from 01.01.2020 to 31.03.2020.	
Actual physical achievement from 01.01.2019 to 31.12.2019	Estimated physical achievement from 01.01.2020 to 31.03.2020
154.10 MW	25 MW

### SUCCESS STORY

Dikshi Small Hydro Power Project (SHP) of 24 MW capacity is the first SHP to be commissioned in the private sector in the State of Arunachal Pradesh. It is located in Dikshi Village in West Kameng District of Arunachal Pradesh. It is a Run-of-River project constructed on the river Phudung, a tributary of Kameng River by M/s Devi Energies Private Limited, Hyderabad. Power needs of West and East Kameng districts and also the power requirements of Defence establishments in the area would be addressed with the green power generated from this project. The project was inaugurated by Shri Pema Kandu, Hon'ble Chief Minister of Arunachal Pradesh on 13.09.2019 heralding a new era in harnessing the huge hydro power potential of Arunachal Pradesh.



Control Panels



DIKSHI 24 MW SHP-Power House



Inauguration of the project by Sri Pema Khandu, Hon'ble Chief Minister of Arunachal Pradesh





#### 4.2.25 WASTE TO ENERGY

#### 4.2.26 PROGRAMME ON ENERGY FROM URBAN, INDUSTRIAL & AGRICULTURAL WASTES/RESIDUES

- i. The Programme on Energy from Urban, Industrial and Agricultural Waste/Residues aimed at generation of biogas, BioCNG and Power from different wastes, such as vegetable and other market wastes, slaughterhouse waste, agricultural residues and industrial wastes & effluents continued during the year 2019-2020. About 100 tons/day of cow dung can generate about 1600 kgs of Bio-CNG per day. In addition to Bio-CNG/Biogas, biogas plants generate organic fertilizer as a by-product which is valuable for agricultural fields.
- ii. Such projects are being set up in a number of industry sectors namely distillery, paper and pulp solvent extraction, dairy, starch industries, sugar mills, pharmaceutical industries, etc., and sewage treatment plants.

#### 4.2.27 OBJECTIVES OF THE SCHEME

- a. To promote setting up of projects for recovery of energy in the form of Biogas / BioCNG/Enriched Biogas/ Power from urban, industrial and agricultural wastes; and captive power and thermal use through gasification in industries.
- b. To promote Biomass Gasifier based power plants for producing electricity to meet the unmet demand of captive power and thermal needs of rice mills and other industries and villages for lighting, water pumping and micro-enterprises.
- c. To create conducive conditions and environment, with fiscal and financial regime, to develop, demonstrate and disseminate information on recovery of energy from waste and residues.

#### 4.2.28 SUBSIDY/GRANT/INCENTIVE PROVIDED UNDER THE SCHEME

- (i) Central Financial Assistance (CFA) for projects of different categories is given in the form of capital subsidy to the promoters and in the form of Grants-in-Aid for other activities, as given below:
  - a. Biogas generation : Rs 1.0 crore per 12000 cum/day (Max. Rs 10 Crore/project) ;
  - b. BioCNG generation (including setting of Biogas plant): Rs 4.0 Crore per 4800Kg/day (Max. Rs 10 Crore/project) ;
  - c. Power generation based on Biogas (including setting of Biogas plant): Rs.3.0 Crore per MW (Max. Rs.10 Crore/project).
  - d. Biomass Gasifier:
    - Rs. 2,500 per kWe with duel fuel engines for electrical application
    - Rs. 15,000 per kWe with 100% gas engines for electrical application
    - Rs. 2 lakh per 300 kWth for thermal applications.
- (ii) Other Incentives and Support Measures available to Waste to Energy the sector are –
  - a. Concessional Customs Duty and GST at rate of 5% for initial setting up of grid connected projects for power generation or production of Bio-CNG from wastes;
  - b. Preferential Tariff announced by the CERC /SERC;





- c. Incentives to State Nodal Agencies - Service Charge @ 1% of the Subsidy restricted to Rs.5.00 lakh per project;
- d. According to the amended Tariff Policy, Distribution Licensee(s) shall compulsorily procure 100% power produced from all the Waste-to-Energy plants in the State, in the ratio of their procurement of power from all sources including their own, at the tariff determined by the Appropriate Commission under Section 62 of the Act.

#### 4.2.29 PROGRESS DURING THE YEAR 2019-20

- (i) During the year 2019-20, 4 Biogas generation projects with cumulative installed capacity of 37900 m<sup>3</sup> per day in states of Andhra Pradesh, Madhya Pradesh, Uttar Pradesh and Telangana, 4 MW of power projects in states of Punjab, Karnataka and Maharashtra and 6 BioCNG generation projects with cumulative installed capacity of 25731 kg/day were installed as on 30.12.2019.
- (ii) 139.80 MW capacity Grid interactive power projects, 114.93 MW capacity Off-grid power projects, 7,02,508 m<sup>3</sup> per day of Biogas generation capacity and 84759 kg per day generation capacity of BioCNG have been set up in the country as on 30.12.2019.

### 4.3 OFF-GRID RENEWABLE POWER

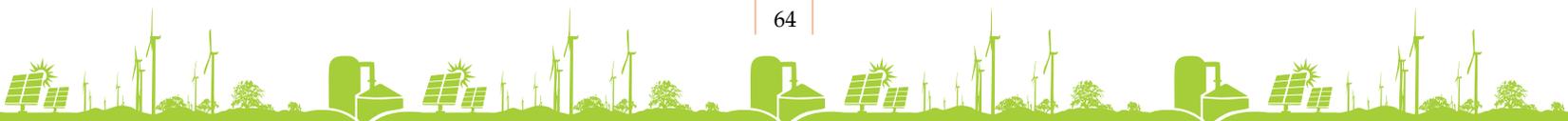
#### 4.3.1 BIOGAS POWER

#### 4.3.2 BIOGAS POWER (OFF-GRID) GENERATION AND THERMAL APPLICATION PROGRAMME (BPGTP)

- (i) The Ministry is implementing biogas based scheme/ Programme for promoting biogas generation for Off-grid/ distributed and decentralized Renewable Power applications in the capacity range of 3 kW to 250 kW and also for thermal energy applications having biogas generation capacity in the corresponding matching size range of 30 m<sup>3</sup> to 2500 m<sup>3</sup> per day. The organic bio-degradable wastes from various sources such as cattle dung/ animal wastes, food & kitchen waste, poultry dropping waste, agro-industry waste etc., are the feed stock for Biogas plants.



*Biogas plant of 650 m<sup>3</sup> / 75 kW Biogas Power (Off-Grid) project at M/s. Bhagya Laxmi Dairy Farm, Village Sultanpur, Post-Manchar, Taluka- Ambegaon, District - Pune (Maharashtra)*





*Biogas Power Generation (Off-grid) Project at site of beneficiary Sri Ramji Gupta, Vill- Bhatauli, Post- Rura, Dist- Kanpur Dihat (Biogas Capacity 140 m<sup>3</sup> / 16 KW)*

#### **4.3.4 IMPLEMENTATION OF BPGTP**

- (i) The Biogas based Power Generation and Thermal Application Programme (BPGTP) is implemented through the Agriculture and Rural Development Departments of the States, Dairy Co-operatives, State Nodal Agencies (SNAs), Biogas Development and Training Centres (BDTCs), Khadi and Village Industries Commission (KVIC) and National Dairy Development Board (NDDB) from the year, 2018-19.

#### **4.3.5 CENTRAL FINANCIAL ASSISTANCE (CFA) FOR BPGTP**

- (i) The CFA under the programme is provided varying from Rs.25,000 /- per kW to Rs.40,000 /- per kW for power generation as per the generation capacity slab and Rs.12,500 /- per kW to Rs.20,000 /- per kW for thermal applications respectively. The CFA rates also vary depending upon the category of beneficiaries and regions/ States such as SC and ST categories and North Eastern Region States.

#### **4.3.6 ACHIEVEMENTS**

During the year 2019-20, 12 projects have been commissioned with power generation capacity of 212 kW and corresponding biogas generation capacity of 1810 m<sup>3</sup> per day. With this, the cumulative total of 316 biogas based projects with a total power generation capacity of 7.207 MW with a cumulative total biogas generation of 69,381 m<sup>3</sup> per day have been set up in the country, up to 31.12.2019. Further against a target of sanction for setting up 50 new projects, 12 projects have been sanctioned for installation / implementation up to 31.12.2019.

#### **4.3.7 SCHEME TO SUPPORT PROMOTION OF BIOMASS BASED COGENERATION IN SUGAR MILLS AND OTHER INDUSTRIES OTHER THAN SUGAR MILLS (UPTO MARCH 2020) OFF-GRID**

- (i) Industrial sector consumes approximately 35% of total electricity generated in the country. In the absence of quality and reliable power from the grid, the sector is increasing its own power generation capacity





mainly through captive power plants based on fossil fuels such as coal, oil or natural gas. Several industries require electrical as well as thermal energy for their operations, which can either be met through different energy sources or through co-generation. The power and steam generated from such co-generation plants can be used for meeting the captive requirements and the surplus power produced can be exported to the grid. Such projects are being set up in a number of industries like distillery, paper and pulp industry, solvent extraction units, rice mills, textiles, pharmaceutical industries, etc.

- (ii) A new scheme to support promotion of biomass based co-generation in sugar mills and other industries (effective up to March 2020) has been notified on 11.05.2018 for exploiting the vast potential of biomass power in the form of thermal energy and power for captive use in industry.
- (iii) Under the scheme a Central Financial Assistance (CFA) @ Rs. 50 Lakhs per MW on installed capacity will be provided. CFA in both cases will be on reimbursement basis. Availing loan from any financial institution is mandatory for promoters to avail CFA.

#### 4.3.8 ACHIEVEMENTS

A cumulative capacity of 675 MW has been commissioned so far mainly in the states of Tamil Nadu, Uttar Pradesh, Haryana, Karnataka, Andhra Pradesh, Uttarakhand, Punjab and Rajasthan.

#### 4.4 RENEWABLE PURCHASE OBLIGATION (RPO)

- (i) The Ministry continued to make concerted efforts for ensuring RPO compliance. The RPO Cell followed up with states on regular basis. Further, State Electricity Regulatory Commissions (SERCs) were requested for ensuring RPO compliance and enforcing penal provisions against defaulting Obligated Entities. Ministry has also requested for APTEL's intervention to direct defaulting SERCs to ensure RPO compliance through timely monitoring and invoking penal provisions for non-compliance; aligning RPO trajectory notified by Ministry of Power (MoP) up to the year 2021-22; and not to permit carry forward or waiver of RPO.
- (ii) Further, in view of the increasing quantum of inter-state renewable power transactions, the Ministry requested all State Load Dispatch Centres (SLDCs) to collate the information on energy consumed at the state level. SLDCs were also requested to designate nodal officers for coordination of the activity. In response, 15 SLDCs have designated officers for coordinating the activity, and 13 SLDCs have already provided the information in the prescribed format.
- (iii) RPO Portal, a centralized online platform for RPO compliance monitoring developed under a MNRE project by TERI, is now operational ([www.rpo.gov.in](http://www.rpo.gov.in)). Following National workshop of State Nodal Officers for RPO Compliance held on 18 September 2018, three regional workshops, one each at Bangalore, Ahmedabad and New Delhi were organised to provide hands-on training to the Obligated Entities for the RPO provisions, and populating the RPO portal on a regular basis. As an outcome, user IDs and passwords have been created for state nodal officers. Details of major Obligated Entities have been compiled and data for 5 States have been updated on RPO portal.





## **RENEWABLE ENERGY FOR RURAL APPLICATIONS**

## RENEWABLE ENERGY FOR RURAL APPLICATIONS

- 5.1 The MNRE is implementing and supporting Biogas Schemes for dissemination and deployment of biogas plants in remote, rural and semi-urban areas of the country. Biogas production is based on the anaerobic digestion of organic wastes/materials. Biogas is cheap, clean and environment friendly gaseous fuel for cooking, lighting and running biogas engines for motive power & electricity generation on farms. The biogas plant digested slurry contains enriched organic Nitrogen, Phosphorus and Potash (NPK) and also other major plant micronutrients free from weed seeds, smell and pathogens. The application of recommended dose of biogas slurry increase the yield by 12% to 35% of all types of crops fruits and vegetables. The Biogas slurry can be used in any form viz. liquid, semi-solid or dried and in any type of soils for any crop.

### 5.2 NEW NATIONAL BIOGAS AND ORGANIC MANURE PROGRAMME (NNBOMP)

The NNBOMP scheme, a central sector scheme aims for setting up small Biogas Plants in the size range varying from 1 m<sup>3</sup> to 25 m<sup>3</sup>. The objectives of the scheme are to provide green and clean renewable gaseous fuel for cooking, lighting and small power needs of the potential farmers, cattle farmers/ users including individual households and to facilitate management and utilization of biogas plant produced slurry as an organic enriched Solid Biogas Fertilizer (SBF) / Biogas Liquid Fertilizer (BLF). The potential of the generation of Biogas and biogas slurry in the country is immense, when considered a large number of organic decomposable wastes through the Anaerobic Digestion (A.D.). In India, Biogas plants have generally used cattle dung with the option of linking with sanitary toilets. The estimated potential production of biogas based on combined population of cattle and buffaloes which stands at about 302.23 million heads (Cattle census-2019) comes to about 33000 million M<sup>3</sup>/year, considering 75% collection recovery of the cattle dung wastes alone.

#### 5.2.1 PROGRAMME IMPLEMENTING AGENCIES (PIAS) OF NNBOMP 2019-20

- (i) The NNBOMP is being implemented through multi-agency approach by designating the following as the Programme Implementing Agencies (PIAs) of the Scheme in the States/ UTs –
- State Rural Development Departments (SRDDs)
  - State Renewable Energy Agencies/Departments.
  - Khadi and Village Industries Commission (KVIC).
  - Biogas Development and Training Centres (BDTCs).
  - National Dairy Development Board (NDDB).
- (ii) The new scheme Guidelines have been made effective since 01.04.2018, to make it reachable to all states/ UTs making life style changing for remote, rural and semi-urban households/dairy farmers/Agriculture farmers etc., as far as the supply of clean and renewable gaseous fuel for cooking/lighting and biogas digested slurry is concerned. The biogas plant digested slurry is an excellent organic fertilizer /manure offering alternatives to replace costly chemical fertilizers such as Urea & DAP and have sustainable agriculture with good soil health.
- (iii) Biogas being a clean cooking fuel. produced from the wastes available at the doorsteps of the potential beneficiaries along with simultaneous production of organic nutrients enriched slurry provide opportunity to have reduction in cost/saving on an average by Rs.9000/- to Rs. 12,000/- per year, considering the



plant size of 1 to 4 M<sup>3</sup>. Higher the size of biogas plant higher the income generation for the beneficiary and livelihood opportunities. The efforts of setting up biogas plants across the country are contributing towards doubling the income of Farmers.

### 5.2.2. SUBSIDY AND OTHER CENTRAL FINANCIAL ASSISTANCE FOR SETTING BIOGAS PLANTS UNDER NEW NATIONAL BIOGAS AND ORGANIC MANURE PROGRAMME (NNBOMP)-

Under the NNBOMP, the Central Subsidy is being provided for installing biogas plants of size 1 M<sup>3</sup> to 25 M<sup>3</sup>, which varies from Rs. 7500/- per plant of 1 M<sup>3</sup> to Rs. 35,000/- per plant of size 20-25 M<sup>3</sup>. The subsidy amount depends upon the size of a biogas plant installed, States or Regions, beneficiary category and North Eastern Region States. Separate CFA is provided as Biogas Turn Key Job Fee for construction & commissioning supervision and also providing 5 year's free warranty for trouble free operation and maintenance of the biogas plants. In addition, the States/UTs implementing the scheme are also provided Administrative charges as well as trainings and publicity & technical supports through Biogas Development and Training centres (BDTCs). The component- wise details of the CFA are given in the **Table 5.1**.



*biogas plants (size 3 M<sup>3</sup>) at village Amlighat, Jagiroad, district Morigaon, (Assam) installed by Forest Development Agency, Assam for beneficiary Shri Lilanath Bajgain*



**Table 5.1:- Central Financial Assistance under the New National Biogas and Organic Manure Programme, (NNBOMP) w.e.f. 01.04.2018 for the Medium Term Plan of 14th Finance Commission up to March, 2020 for Biogas Plant size from 1 cu.m. to 25 cu.m. per day.**

Sl. No.	Particulars of Central Financial Assistance (CFA) and States / UTs, Regions & Categories of beneficiaries	Biogas Plants under NNB OMP (size 1 to 25 cubic metre biogas per day) (In Rupees per plant )				
		1 Cubic Metre	2-6 Cubic Metre	8-10 Cubic Metre	15 Cubic Metre	20 - 25 Cubic Metre
<b>A</b>	<b>Central Subsidy Rates Applicable (In Rs. per plant)</b>					
1	NER States, including Sikkim and including SC and ST Categories of NER.	17,000	22,000	24,000	25,000	35,000
2	Special Category States (Jammu & Kashmir, Himachal Pradesh, Uttarakhand, and Andaman & Nicobar Islands) and Scheduled Castes / Scheduled Tribes of all other States.	10,000	13,000	18,000	21,000	28,000
3	All other States (General Category)	7,500	12,000	16,000	20,000	25,000
<b>B</b>	<b>Additional Subsidy for cattle dung based biogas plants if linked with sanitary toilets, only for individual households (Rs. Per Biogas Plant) fixed amount.</b>	1,600	1,600	1,600	Nil	Nil
<b>C</b>	<b>Turn-Key Job Fee for construction, supervision, commissioning, and free O&amp;M warranty for five years trouble free operations of plant including quality control at all levels.</b>	<p>Rs. 2500/- per biogas plant for fixed dome design construction based plants such as Deenbandhu and floating gasholder KVIC type brick masonry models from 1 to 10 M<sup>3</sup> and Rs. 4500/- per plant for 15 to 25 M<sup>3</sup> plant size. Turn Key Job Fee will also be provided for eligible biogas plants for pre-fabricated plants as per above mentioned models involving part construction work either for digester or dome.</p> <p>Turn Key Job Fee at the flat rate of Rs. 1000/- per plant will be also eligible for biogas plants of size ranging from 1 to 25 M<sup>3</sup> which are completely pre-fabricated / manufactured biogas plants and made up of standard quality material FRP / HDPE / PVC etc. as already approved or as and when approved by MNRE. However, no Turn Key Job Fee will be payable for bag type digesters made of rubberized nylon fabric (flexi model) plants as it does not involve higher construction techniques and any supervision of construction. The manufacturers and developers of such biogas plants for implementation under this scheme will have to provide a free warranty and guarantee of five years for all plants for post installation trouble free operations under the terms and conditions of Turn –Key Job Work Scheme applicable including for all those who are implementing the scheme on bidding basis.</p>				
<b>D.</b>	<b>Administrative Charges– for physical target achievement range of biogas plants (Amount in Rs.)</b>					
1	100-3,000 nos. of Biogas Plants	1,00,000 <sup>^</sup>				
2	3,001-7,000 nos. of Biogas plants	10,50,000 <sup>^^</sup>				
3	Above 7,000 nos. of Biogas plants	24,50,000 *				
<b>E</b>	<b>Support for Training courses including skill development Programme for Biogas Mitras</b>					
1	Users Course	4,000				



2	Staff Course	10,000
3	Construction-cum Maintenance / Refresher Course	50,000
4	Turn-key Workers & Management Course/ Skill Development for TKWs / RETs / SHGs/ Officials of SND and KVIC	75,000
<b>F</b>	<b>Biogas Development &amp; Training Centres. Financial support for set functions and roles of BDTCs would be provided towards staff, conducting training courses, skill development courses, pilot plant demonstration, TA/DA, consumables and contingencies as per allocated targets.</b>	As per the pattern of CFA and staff strength / positions conveyed vide Ministry's sanction letter No. 19- 3/2011-BE (Pt.) dated 16th November, 2011, dated 2nd March, 2012 and continued vide sanction No 19-4/2017-BG/ R&D/Biogas dated 14th July, 2017. The annual outlay allocated year-wise shall be based on the yearly Plan of work & targets as approved activities by the MNRE.
<b>G</b>	<b>Support for Communication &amp; Publicity as per the physical achievement range of Biogas Plants (Amount in Rs. )</b>	The financial support would be provided on lump - sum basis which is linked with the physical achievements as per the range/slab of biogas plants achievements. The publicity and information charges would be limited to the actual expenditure claimed and supported by copies of vouchers which would be subject to the maximum limits as given below.
1	Up to 1,000 plants	Rs. 2,00,000/-
2	1,001- 10,000 plants	Rs. 4,00,000/-
3	More than 10,000 plants	Rs. 6,00,000/-
<b>H</b>	<b>Incentive for saving fossil fuels (diesel, petrol, kerosene, electricity etc.) to farmers by using biogas in 100% Biogas engines.</b>	Incentive is eligible for purchase of 100% biogas engines and transportation of biogas from the site of the biogas plant to the site of biogas engine. The fixed CFA of Rs. 3000/- per 100% Biogas based Generator set / Biogas engine water Pumping System (BPS) for water pumping and meeting other small farm power needs from biogas, subject to a maximum of Rs. 4000/- per plant for plants of 15 to 25 Cubic Metre would be provided. The annual target for this will be approved by the Ministry based on the proposals received from the States and targets allocated by the MNRE.

**Additional incentive to PIAs for implementation of NNBOAMP , biogas plants size 1 to 25 M3 ( under the component 2.2 D above)**

<sup>^</sup> Extra Rs.400 per plant in excess of 100 biogas plants installed.

<sup>^^</sup> Extra Rs.350 per plant in excess of 3000 biogas plants.

\* Extra Rs.300 per plant in excess of 7,000 biogas plants subject to maximum of Rs.60.00 lakh (Rupees Sixty Lakhs only).

### 5.2.3 CENTRAL FINANCE ASSISTANCE FOR BIOGAS PLANTS UNDER NEW NATIONAL BIOGAS AND ORGANIC MANURE PROGRAMME (NNBOAMP).

- (i) Under the programme the CFA is being provided for setting up of biogas plants of size from 1 m<sup>3</sup> to 25 m<sup>3</sup>. The CFA being provided is in the range of Rs.7,500/- per plant of 1 m<sup>3</sup> to Rs.35,000/- per plant of 20-25 m<sup>3</sup> depending upon the size of plants, location States or regions, category etc. Besides this, financial support is also provided for turnkey job fee for construction, supervision etc. It also provides support for skill development programme for Biogas Mitras and to BDTCs for conducting training courses. The details of the CFA are given in **Table 5.1**.





#### 5.2.4 BIOGAS DEVELOPMENT AND TRAINING CENTERS (BDTCS)

Under the National Biogas and Organic Manure Programme, eight Biogas Development and Training Centers (BDTCs) have been established with the objective to set up good quality biogas plants as per established technical criteria and to generate sustained trained manpower in the sector of Biogas Technology. Their main functions are to extend Technical, Training and Publicity support required by the States/ UTs for the beneficiaries, including training and skill development in Biogas sector, dissemination of knowledge and publicity of biogas schemes in close co-ordination with the State Programme Implementing Agencies of NNBOAMP.

#### 5.2.5 ACHIEVEMENTS UNDER THE NATIONAL BIOGAS PROGRAMME

A target of setting up 76000 small Biogas Plants has been allocated to the States/ UTs for the year 2019-20. The progress under the New National Biogas and Organic Manure Programme (NNBOAMP); the State/ UT-wise estimated potential and cumulative achievements of small biogas plants under the NNBOAMP up to 31.12.2019 and cumulative achievements under both NBOAMP & NNBOAMP as on 31.12.2019 are given in **Table 5.2**.



*MNRE Officers inspecting a biogas plants (size 3 M3) at village Amlighat, Jagiroad, district Morigaon, (Assam) installed by Forest Development Agency, Assam*





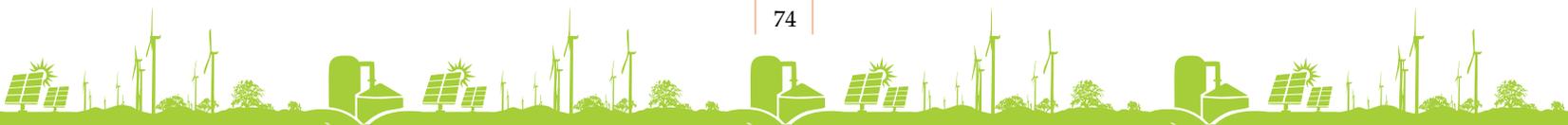
**Table 5.2: State-wise estimated potential and State/ UT wise achievements for family type/ small biogas plants, from 1981-82 to 2017-18 under the National Biogas and Manure Management Programme (NBMMP) and Targets and achievements under NNBMMP during the year 2018-19 and 2019-20 (up to 31st December, 2019).**

State/ Union Territories	Estimated potential	Cumulative total achievement up to 31/03/2019 (2018-19)	Targets and achievements under national Biogas Programme (Nos. of Biogas Plants)	
			Target (2019-20)	Total achievements of 2019-20 as on 31.12.2019
1	2	3	4	5
Andhra Pradesh	1065000	555294	4000	2556
Arunachal Pradesh	7500	3591	200	18
Assam	307000	138423	5000	0
Bihar	733000	129905	1000	0
Chhattisgarh	400000	58908	5500	411
Goa	8000	4235	300	0
Gujarat	554000	434995	2600	0
Haryana	300000	62825	3200	117
Himachal Pradesh	125000	47680	400	0
Jammu & Kashmir	128000	3195	400	0
Jharkhand	100000	7823	700	0
Karnataka	680000	503935	7000	3106
Kerala	150000	152019	2500	417
Madhya Pradesh	1491000	372929	5800	1061
Maharashtra	897000	918201	8500	1765
Manipur	38000	2128	200	0
Meghalaya	24000	10659	500	0
Mizoram	5000	5838	400	18
Nagaland	6700	7953	300	0
Odisha	605000	271691	1500	30
Punjab	411000	183931	4500	912
Rajasthan	915000	72132	3300	198
Sikkim	7300	9044	300	0
Tamil Nadu	615000	223618	1000	126
Telangana	0	19694	1000	0
Tripura	28000	3663	500	20
Uttar Pradesh	1938000	440385	1500	301
Uttarakhand	83000	363615	1300	407
West Bengal	695000	972	800	0
A&N Islands	2200	97	200	0
Chandigarh	1400	169	0	0
Dadra & Nagar Haveli	2000	681	200	0
Daman and Diu		0	0	
Lakshadweep		0	0	
Delhi/ New Delhi	12900	578	0	0
Puducherry	4300	17541	200	0
KVIC	-		7200	651
NDDB, Anand	-	-	4000	0
<b>TOTAL :</b>	<b>12339300</b>	<b>5028347</b>	<b>76000</b>	<b>12019</b>





- 5.2.6 The Progress of implementation and review at National Level was done in 3 meetings of the States/UTs held in the Ministry. One Regional Review meeting for North Eastern States including Sikkim and also for West Bengal was held in IIT-Guwahati (Assam).





**RENEWABLE ENERGY FOR URBAN,  
INDUSTRIAL AND COMMERCIAL  
APPLICATIONS**

## RENEWABLE ENERGY FOR URBAN, INDUSTRIAL AND COMMERCIAL APPLICATIONS

6.1 The programmes being implemented during the year include: i) Energy Efficient Solar /Green Building Programme.

### 6.2 ENERGY EFFICIENT SOLAR/GREEN BUILDINGS PROGRAMME

Ministry had implemented a Scheme on 'Energy Efficient Solar/Green Buildings' since 2009 with the aim to promote energy efficient solar/ green buildings in the country through a combination of financial and promotional incentives mainly for capacity building, awareness, seminar and workshops and other promotional activities, etc. Though, the scheme got over in March, 2017 with the end of 12th Plan period, the balance payments/ settlements for already sanctioned projects have been taken up during the year. The details of the buildings which were awarded GRIHA rating under this program during this financial year are in **Table 6.1**.

### 6.3 DEVELOPMENT OF SOLAR CITIES PROGRAMME

- (i) 'Development of Solar Cities' programme was launched with the aim to reduce the energy demand of the city through a combination of energy efficiency measures and enhancing use of renewable energy. Urban Local Bodies and Municipal Corporations were given financial assistance of upto Rs.50 lakh for the Preparation of the Master Plan along with DPRs (up to Rs.10 lakh), Oversight of its implementation (up to Rs.10 lakh), setting up of Solar City Cell and its functioning in the city (up to Rs.10 lakh) and organizing promotional activities (up to Rs.20 lakh).
- (ii) Ministry sanctioned 60 cities/towns to development as 'Solar/ Green Cities'. Of which, 5 cities were identified as Model Solar City and an additional CFA upto Rs.9.50 crore were allotted for renewable energy projects to each Model Solar City. Similarly 13 cities identified as Pilot Solar Cities and an additional financial support upto Rs.2.50 crore were allotted for them. As per this, Ministry had sanctioned various renewable energy projects comprising of about 9.03 MWp SPV projects and 7894.5 m<sup>2</sup> Solar Water Heating systems.
- (iii) Under this programme, Ministry also sanctioned financial assistance of Rs.5.00 lakh each to 52 institutions (technical/educational institution) for preparation of Master Plan/DPR for developing their campuses as green campuses.
- (iv) The scheme was not continued beyond the 12th Five Year Plan. In this Financial Year, Shimla, a Pilot Solar City, has completed 35 kWp SPV project and also supplied 1300 Nos. of Solar Home Lighting systems for slum areas around Shimla with a financial assistance of Rs.1,46,87,337/- from the ministry. Rs.21,81,462/- was released in this Financial Year.

**Table 6.1: Details of the buildings which were awarded GRIHA rating during this F.Y.**

Sl. No.	Name of the Building	Rating awarded
1	Power Grid Regional Headquarter Office Building, Bangalore	4 stars
2	Madanjeet School of Renewable Energy, Pondicherry University, Puducherry	3 stars
3	New Girls Hostel, IIT Madras	4 stars
4	New Boys Hostel, IIT Madras	4 stars
5	Punjab National Bank Head Quarters, Dwarka	5 stars
6	EI Complex, Gurugram	5 stars



**RESEARCH, DEVELOPMENT AND  
DEMONSTRATION (RD&D) IN NEW AND  
RENEWABLE ENERGY**

## **RESEARCH, DEVELOPMENT AND DEMONSTRATION (RD&D) IN NEW AND RENEWABLE ENERGY**

7.1 Research, design, development and technology demonstration for its validation are one of the core requirements for the growth of New & Renewable Energy. Ministry of New & Renewable Energy (MNRE) supports Research, Development and Demonstration (RD&D) to develop new and renewable energy technologies, processes, materials, components, sub-systems, products & services, standards and resource assessment so as to indigenously manufacture new and renewable energy systems and devices. The objective of the programme is to make the industry globally competitive and renewable energy generation and supply, self-sustainable/profitable and thereby contribute to increased share in total energy mix in the country.

7.2 RD&D Projects received from R&D institutions /universities, industries and NGO's etc. in the field of solar, wind, solar-wind hybrid, storage, small hydro power, biogas, hydrogen and fuel cells, geothermal, etc. are considered by the Ministry for financial support.

### **7.3 POLICY AND GUIDELINES**

(i) A comprehensive policy framework on RD&D is in place to support RD&D in new and renewable energy sector, including associating and supporting RD&D earned out by industry for market development. Ministry provides up to 100% financial support to Government/non-profit research organizations/NGOs and up to 50% to industry.

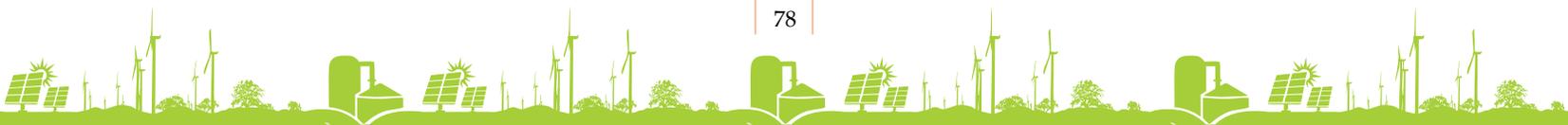
(ii) The policy framework provides guidelines for project identification, formulation, monitoring, its appraisal, approval and financial support. The RD&D projects received from R&D/academic institutions, industries, etc. are evaluated through subject experts. The qualifying projects are appraised by R&D Project Appraisal Committees. The projects recommended by the committees are sanctioned to prospective implementing agencies. The projects are monitored by Monitoring Committees. Projects on completion are reviewed in Project Appraisal Committee Meetings for their achievements.

### **7.4 RD&D FOCUS**

The RD&D efforts are continued with emphasis on cost reduction, reliability and efficiency improvement of renewable energy systems, components and BOS. Projects in accordance with the R&D thrust areas of the ministry in solar thermal, SPV, biogas, wind, wind-hybrid, storage, small Hydro Power, hydrogen and fuel cells, geothermal, etc. are supported for RD&D Activity. The projects in other areas not covered under the R&D thrust areas are also considered for financial support based on their applications and practical importance.

### **7.5 INSTITUTIONAL MECHANISM**

The Ministry is supporting creation of enabling conditions for institutional mechanisms to enhance collaboration for faster development and demonstration of technology for commercialization. The Ministry has taken initiatives for strengthening its institutions, namely, National Institute of Solar Energy (NISE), Gurgaon, National Institute of Bio-Energy (NIBE), Kapurthala and National Institute of Wind Energy (NIWE), Chennai with their functions for pursuing RD&D, testing, standardization and certification in solar, bioenergy and wind energy systems, respectively. In addition, the MNRE is also partnering with MHRD for implementation of research projects in NRE under IMPRINT and UAY initiatives. These initiatives envisage supporting projects in consortia including industry for technology development on cost sharing basis by partner ministries/departments/industries.





## 7.6 SOLAR R & D

### 7.6.1 SOLAR PHOTOVOLTAICS

(i) The Ministry's flagship project in solar photovoltaics being implemented at IIT Bombay and christened National Centre for Photovoltaic Research and Education (NCPRE) Phase II, had several major areas. The progress made in each of these areas is briefly described below.

- **Education and Training:** Various courses, workshops and training sessions have been organized to extend the knowledge gathered at NCPRE to people from academia and industry. Four familiarization workshops and two Hands-on training sessions were organized to familiarize other academia and promote their interaction with NCPRE investigators through the PUMP initiative which also saw submission of 67 new project proposals on PV.
- **Crystalline Si Solar Cells:** LIP set up established for 6 in x 6 in solar cells. Ni plating to be used as a barrier for Cu diffusion into Si. With all processes carried out at NCPRE, the champion cell on mono-Si wafers had an efficiency of 19.4% (VOC = 634 mV, ISC = 37.11 mA/cm<sup>2</sup>, FF = 81.2%). For mc-Si wafers, efforts are directed at reducing surface reflections through metal assisted chemical etching and additive-less alkaline texturing. PERC cell development saw further optimisation of sprayed Al<sub>2</sub>O<sub>3</sub> and joint development with industry a laser ablation process for dielectric films. For IBC solar cells, co-diffusion of B and P into silicon was studied with screen-printed diffusion source. For carrier selective contacts, an improved MoO<sub>3</sub>/n-Si solar cell with efficiency of 13.6% (active area efficiency of 15.24%) was demonstrated.
- **Thin Film Materials and Devices:** Multi-cation perovskite solar cells in n-i-p and p-i-n configurations have been fabricated with efficiencies 14.3% and ~17% respectively. Screen printed carbon based perovskite solar cells in order to reduce the cost and easiness in scaling up have been fabricated by two step drop cast method with efficiencies ~13.36% on 0.09cm<sup>2</sup> and 5.9% over 4cm<sup>2</sup> device area. A mini module of 10cm<sup>2</sup> with ~4V open circuit voltage has been fabricated by interconnecting 2cm<sup>2</sup> solar cells in series.
- **Energy Storage:** 20 Li-ion cells of 2.5 Ah capacity with LCO-graphite chemistry, having cycle life of more than 100 cycles has been successfully demonstrated. Along with this, a new chemistry C-LTO/LFP have been under investigation for long cycle life (10K). Also, a Prototype-Battery fabrication facility for demonstration of 7 Ah, 10 Ah stacked pouch cells, 2.5 Ah jelly rolled pouch cell and cylindrical cells has been established. The team has been also able to demonstrate an ultrahigh specific Na-ion full cell with a doped ammonium vanadium oxide (NVO) cathode against hydrogenated sodium titanium oxide (NTO) The cell is capable of retaining 94% capacity after 400 cycles, having a high energy density of 467 Wh/kg at a very high rate of 0.2 A/g
- **Power Electronics:** The power supply part of the high power inverter test setup has been completed. Five prototype, standalone 500 VA inverters for rural off-grid application have been fabricated and testing is carried out upto 125W power level. A 1 kVA inverter which can be operated in the presence or absence of grid is implemented and the detailed report along with BOM submitted to MNRE. A 2 HP BLDC motor which is driven from solar PV, and is used for surface mounted pumping application has been designed in-house. A 5 kVA solar PV based inverter with integrated 2.5 kW battery storage has been fabricated that can be operated in grid connected as well as in standalone mode.
- **Module Reliability:** Field Assessment of Reliability of PV Modules of Various Technologies in Different Climatic Zones of India in 2016, 2018 and 2020 covering 500-1200 modules is under





process and report upto 2018 has been completed. IIT Bombay trying to develop the new test standards for PV modules, BOS and components based on the findings during the survey.

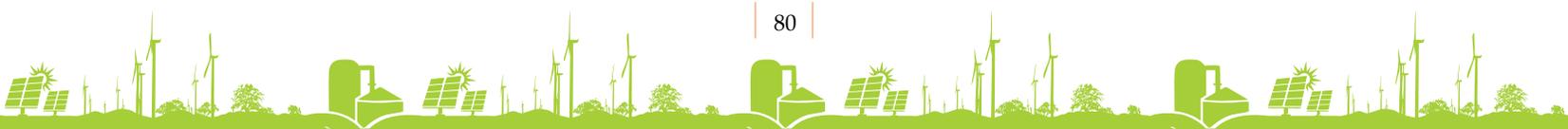
- (ii) The MNRE sponsored project on perovskite based thin film solar cells being implemented at IIT Bombay and showed 18% efficiency and sustained 1000 bending cycles. In another phase in the area of Flexible Perovskite Solar Cells and Intermediate Module with an target of Laminated Roll to Roll devices with >18% efficiency with T80>10000 hrs.
- (iii) In the on-going project on development of high efficiency solar cells using n-type Si wafers at the Meghnad Saha Institute of Technology (MSIT), Kolkata, base line solar cells have been fabricated on small (76 mm x 76 mm), n-type mono-Si wafers with champion efficiency of 16.8 %. The project has been continued to achieve 20-22% efficiency on 6 inch x 6 inch wafer.
- (iv) NISE has completed a R&D project with Surya Enertec, a Gurugram-based private company in developing Solar-powered Clean Drinking Water Systems suitable for various locations in the country. Five machines have been designed and fabricated. The controller and remote monitoring system have been developed and fabricated in-house. Third water purification machine of 500 LPH capacity is installed in a village: Khurampur, Distt Gurgaon. Fourth water purification machine of 200 LPH capacity is installed at Safdarjung Hospital Delhi. Fifth machine of 200 LPH capacity is installed at Civil Hospital, Gurgaon.
- (v) The MNRE has sponsored the PERC cell project is being implemented jointly by BHEL-ASSCP and NISE and the facility for primary reference is coming up at NPL, Delhi. In the PERC cell project, BHEL has the responsibility of cell processing while NISE has the responsibility of device simulation as well as complete characterization of solar cells. The process and the test equipment has been identified, the specification finalized and is under procurement.
- (vi) The MNRE has sanctioned new R&D projects entitled Design and Development of 'High Efficiency Solar Water Pumping Systems implemented by NISE, Gurugram and Flexible Perovskite Solar Cells and Intermediate Module by IIT Bombay.

### 7.6.2 SOLAR THERMAL

- (i) The MNRE has also sponsored for Development of Supercritical CO<sub>2</sub> Turbomachinery for Solar Thermal Power Plants to IISc Bangalore. Under this project, turbomachinery of different design configurations suitable for testing and analysis on the existing test loop at IISc have been designed.
- (ii) The Ministry has sanctioned a R&D project entitled System Design, Erection, Testing & Commissioning of 40 kWth and 10 kWe pilot plant aiming at the Feasibility Study of MWe Scale Concentrated Solar Thermal Plant integrated with 24 x 7 Thermal Energy Storage by Dr. V K Sethi, Ram Krishna Dharmarth Foundation University, Bhopal and RPI USA. The project is aimed to develop the high energy density solar thermal storage and its integration with solar thermal technologies.

### 7.6.3 SOLAR RADIATION RESOURCE ASSESSMENT (SRRA) STATIONS

In order to strengthen the solar resource assessment and to meet the requirement of availability of Solar Radiation data, In Phase- I program, 51 SRRA stations and in Phase- II, 60 SRRA stations and 4 Advanced Measurement Stations are installed at selected locations spread all over the country. This exercise has been coordinated by National Institute of Wind Energy (NIWE), Chennai an autonomous institution of the Ministry. A central server facility for data collection from all these stations has been set up at NIWE. The data so collected will be useful in developing a solar atlas for the country. In addition, all the solar power projects selected under the Mission have also set up radiation monitoring equipment at their project sites.





*Round robin testing of Primary Standard Reference sensor from Calibration laboratory at NISE, NIWE & IMD Pune March 2018*

Data collection from all the 111 SRRA stations and 4 AMS stations and its quality control has been going on and Operation and maintenance along Online monitoring with of the 111 SRRA stations is continued. Calibration of 38 pyranometers and 19 pyrhelimeters from Karnataka, Kerala, Andhra Pradesh, Assam, Madhya Pradesh, Odisha, Gujarat, Punjab, Haryana, Himachal, Jharkhand, Goa and Chandigarh states/ UT under Phase-II program has been completed. Calibration of 12 pyranometers and 1 pyrhelimeter under commercial has also been completed.

## 7.7 BIOGAS RESEARCH, DESIGN AND DEVELOPMENT

7.7.1 RD&D project on Biogas sector continued during the year. The work on the following projects was continued during the year:-

- i) **Development & Performance evaluation of a 3 KW biogas based power generation system utilizing Lignocellular Biomass**, at IIT-Guwahati. Under this project, the 4 objectives of the project have been completed with the optimization of operating parameters of a 5 hp gasoline engine along with the performance study by a performance study by a 16 m<sup>3</sup> of biogas produced per day from lignocellulosic





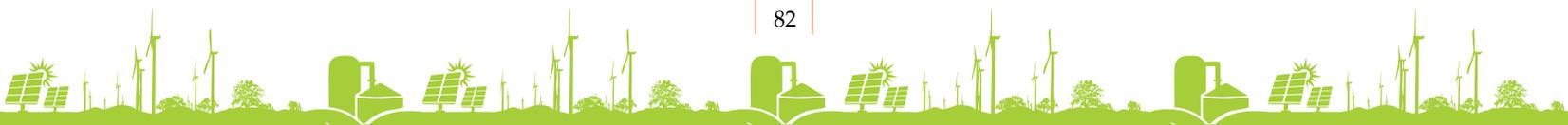
feed stock materials mainly cow dung, rice straw, duck weed and switch grass and to produce 3 kWe biogas power generation has been successfully installed and maintained by IIT Guwahati at Auaniati Satara, North Guwahati, Assam under this project. All the objectives, of the assigned project have been achieved including performance studies with the modified engine and comparative results with 100 % Gas engine. The project completion report has been received and comments of experts on the same have been received for finalization and acceptance.

- ii) **Development of Hybrid-High rate bio-methanation reactor using locally available media for treating waste water and solid waste** at Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu). Under this project, three lab scale hybrid reactors with acrylic sheet one of which served as control and the other two reactors with different packed media were fabricated. The stability of the reactors attained with affluent pH of 7 to 7.5 and the biogas production observed 250-300 ml in each reactor. The performance evaluation of high rate reactor and hybrid high rate reactor with community wastewater was completed and HRT was optimized. The efficient waste water treatment system through high rate and hybrid high rate biomethanation reactor was developed, which is economic over adopting aerobic waste water treatment systems, which generates biogas and is being utilized for power generation and thermal energy applications. The R&D project incorporated the scrubber design and for upgrading the biogas produced from waste water of TNAU hostel premises. In 4 different combinations, the molecular sieve 100 % showed the best results in terms of both high CO<sub>2</sub> adsorption percent and high performance index for two design of scrubbers columns. Maximum Methane content of 96.8% has been obtained in 2 metre scrubbing column with molecular sieve (100 %) material in the pressure of 7 bar. It has been concluded that molecular sieve is the best material for Biogas purification and height of the scrubbing column should not be less than 2 metre. A low cost activated charcoal CO<sub>2</sub> scrubber has been developed under this project for biogas purification and upgradation.

Comparative results of HRR and HHRR: As per the norms of Central Pollution Control Board the permissible discharge limit for waste water is 250 mg/l. The comparison of High Rate Reactor (HRR) and Hybrid High Rate Reactor (HHRR) designed, installed for the project and comparative studies were done. By comparing the removal efficiencies of both the reactors, the HHRR with lower HRT showed the higher removal efficiencies of TS, VS, BOD and COD in the order of 81.46 %, 83.44%, 84.33% and 86.41% respectively. The UASB reactor comparatively worked at low organic loadings, while the hybrid reactor could work on higher organic loadings and hence works very efficiently with good removals of COD/BOD. The overall efficiencies of HRR and HHRR showed that the performance of HHRR was higher than the performance of HRR. The project has been completed by TNAU and the Project Completion Report has been received.

- iii) **Development of suitable pre-treatment system for paddy straw disintegration for biogas generation leading towards commercialization of technology**

A research project was awarded by MNRE entitled Development of suitable pre-treatment system for paddy straw disintegration for biogas generation leading towards commercialization of technology to the Indian Institute of Technology, Delhi, to address the issue in-field burning of paddy straw stubble in northern Indian states and provide a sustainable solution for the same. In the project a laboratory scale hydrothermal reactor has been developed for pre-treatment of paddy straw at different temperature and reactor loading rates. Further, a field scale hydrothermal reactor having 50 L capacity has also been fabricated for performing field scale experiment for performance evaluation of the model. Two of the 3 major objectives of the project have been completed. A Project Monitoring Committee (PMC) has visited the project site in IIT, Delhi on 02.12.2019. The report of the PMC has been received and continuation of the project will achieve the remaining one major objective.





## 7.8 HYDROGEN ENERGY AND FUEL CELLS

- (i) The Ministry has been supporting a broad based Research, Development and Demonstration (RD&D) Programme on different aspects of hydrogen energy technologies that includes production of hydrogen, its storage and utilisation for stationary, motive and portable power generation applications using internal combustion engine and fuel cells and also for other applications. As on 31.12.2019, a total of 12 RD&D projects on different aspects of hydrogen energy and fuel cells are under implementation.
- (ii) Two new projects were sanctioned during the year, these are 'Design and development of 20kW Low Temperature Polymer Electrolyte Membrane (LT-PEM) fuel cell with high indigenous content' to Centre for Fuel Cell Technology, International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI-CFCT); and 'Setting Up of a Centre of Excellence on Hydrogen Energy' at National Institute of Solar Energy (NISE), Gwal Pahari, Haryana.
- (iii) MNRE had invited preliminary proposal for 'Demonstration of fuel cell powered buses in Delhi-NCR region'. The proposals received are currently under evaluation.
- (iv) IISc Bangalore conducted a two-day 'National Workshop on Hydrogen Production Technologies' on 19-20 December 2019. Leading researchers and industry participated in the event and elucidated cutting edge technologies and cost trends for hydrogen production in the country.
- (v) A Committee has been constituted under the Chairmanship of Secretary MNRE to examine relative advantages of hydrogen fuel cells and batteries for energy storage and transport applications. The first meeting of the Committee was held on 12 September 2019. Further, on 19 December 2019, major automobile sector OEMs were invited to discuss the prospects and challenges for commercialization of hydrogen fuel cells technology for transportation.

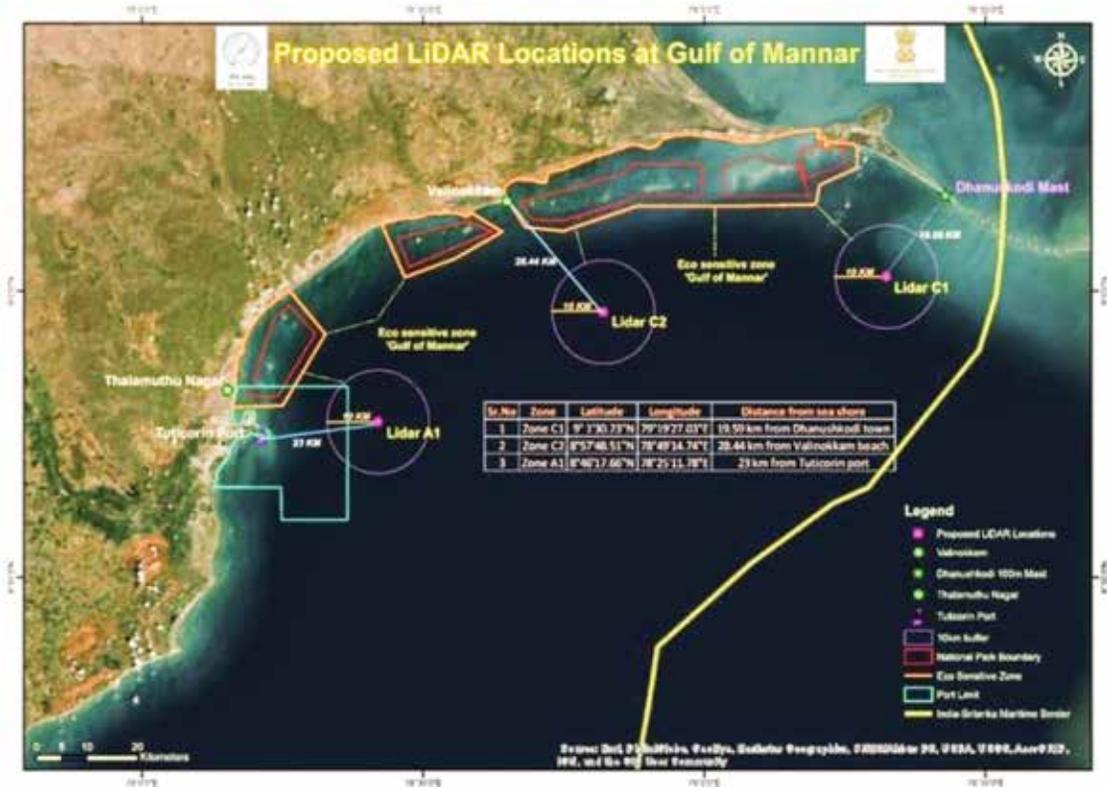
## 7.9 ENERGY STORAGE

- (i) Ministry continued to provide inputs to NITI Aayog on Mission on Transformative Mobility and Battery Storage that focusses on promotion of electric mobility and phased manufacturing programme for battery storage. Ministry has undertaken initiatives for energy storage demand aggregation for grid connected renewables; for diesel replacement in islands, remote locations; and for commercial and industrial applications. Tenders for solar power deployment coupled with storage (SECI tender), and a plan for fossil fuel free Lakshadweep are already under implementation.
- (ii) Ministry solicited the proposal for technology developments in energy storage and a meeting of the R&D Project Appraisal Committee (RDPAC) to consider R&D proposals on Energy Storage was held on 26 November 2019. Two project proposals were considered and are currently under approval process.
- (iii) In addition, Ministry as a Inter-Ministerial steering committee member for scheme Faster Adoption and Manufacturing of Electric Vehicles in India (FAME-II) continued to provide inputs on different aspects of electric mobility. Ministry also requested Ministry of Power to amend the guidelines dated 1st October 2019 or issue a supplementary guidelines stating that no permission is required for setting up of renewable energy based charging stations that are operating in off-grid and decentralized mode.

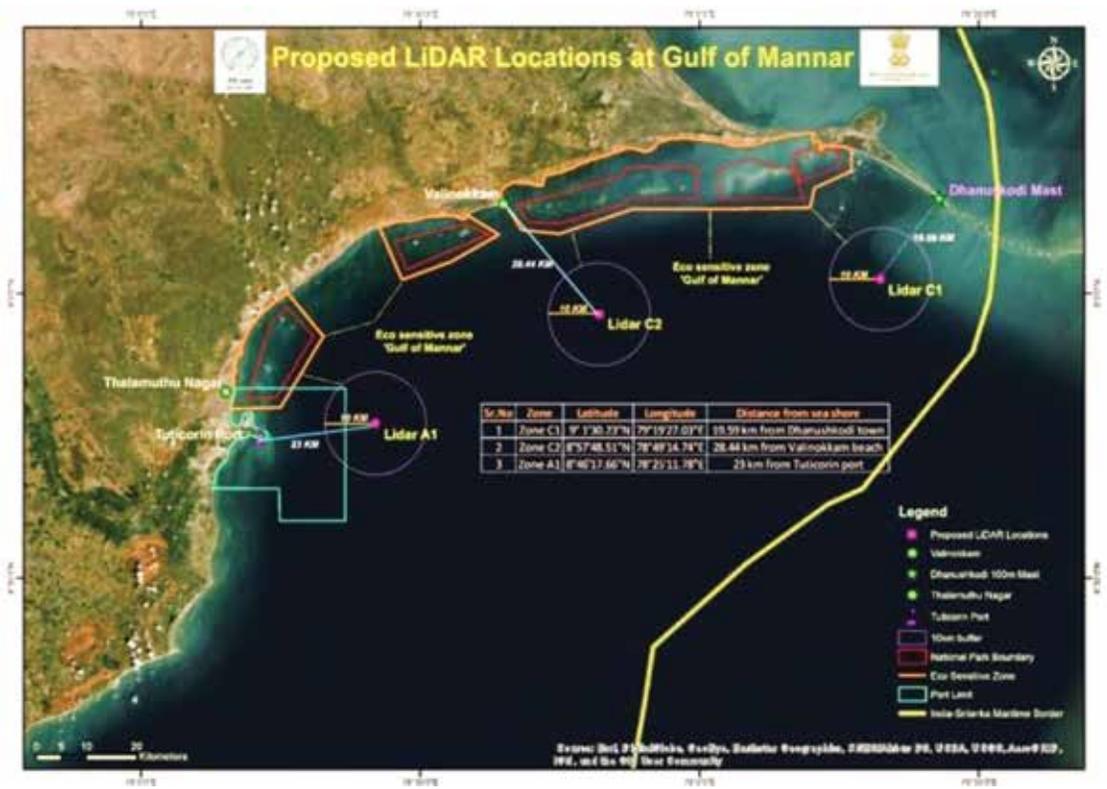
## 7.10 WIND R & D

- (i) Ministry has sanctioned 20 R & D projects from 2014-15 onwards in wind energy related projects. The closure reports for seven R & D projects have been reviewed by the PMC and recommended for formal closure.





*Proposed met-ocean locations in Gulf of Khambhat, Gujarat*



*Proposed met-ocean locations in Gulf of Mannar, Tamil Nadu*





- (ii) The activities carried out on the two R & D projects sanctioned to NIWE in 2017-18 are given as under;
- a. Met-Ocean measurements (Wind, Wave, Tide, Current, Water level, etc) at Gulf of Khambhat and Gulf of Mannar for fostering the growth of offshore wind in the country**
- (i) With an objective to identify the potential subzones / blocks for promotion of offshore wind farm development in the country, NIWE has entrusted with carrying out a detailed offshore wind resource measurement along with geophysical, geotechnical and oceanographic studies under this project. For the purpose, NIWE is going to install & commission Four LiDARs (two for Gujarat and two for Tamil Nadu) to carry out extensive wind resource assessment both off the coast of Gujarat & Tamil Nadu. In addition to this, NIWE will carry out the Oceanographic / Hydrographic measurements, which include Water level, Wave Height and period, Current speed and direction and other derived parameters such as Significant Wave Height, Wave period, etc., in and around the wind LiDAR platforms or suitable locations off the Gujarat coast and Tamil Nadu coast to understand the sea-state conditions, which are necessary to design the foundation of the Offshore wind turbines.
  - (ii) Based on the multi-criteria analysis the locations for installation of LiDARs have been finalized. The geotechnical studies for designing the LiDAR structure off Gujarat coast have been completed. NIWE is in the process of initiating the geophysical and geotechnical studies off the coast of Tamil Nadu for this purpose.
- b. Integrated wind & solar resource assessment through mapping and measurements**
- (i) Mapping and measurements envisages the deployment of dedicated 100 m integrated wind-solar monitoring stations at carefully chosen sites in different parts of the country. Under this project, 50 numbers 100 m tall integrated wind-solar monitoring stations (in two phases) with 5 levels of instrumentation are to be installed in the country over a period of three years.
 

Wind resource measurements will also be carried out using SODAR along with measurements from integrated wind-solar monitoring stations concurrently for the period of approximately 3 months for the vertical extrapolation of the mast data. The measurements carried out using integrated wind-solar measurements and the SODAR will be used to estimate the wind solar power potential of the country at 150 m level and for the preparation of 150 m wind-solar hybrid map.
  - (ii) Multi criteria suitability analysis based on the available data sets has been completed to identify 25 Nos. of suitable locations for the installation of integrated measurement stations. The details of identified locations for measurement through installation & commissioning of mast is given in **Table 7.1**.
  - (iii) Map showing the proposed Wind Solar Monitoring stations
  - (iv) Under this project the wind energy potential assessment at 120 m high is carried out at a spatial resolution of 500 m, using the advanced meso-micro coupled numerical wind flow model with the corroboration from 406 actual measurement sites spread across the country. Based on the analysis, the indicative wind potential of India is estimated as 695 GW at 120 m agl.

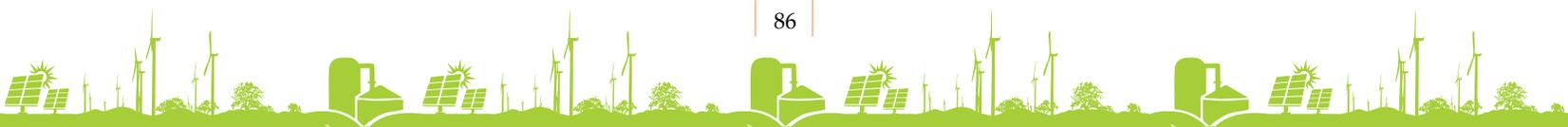
## 7.11 STANDARDS & QUALITY CONTROL IN RENEWABLE ENERGY SECTOR

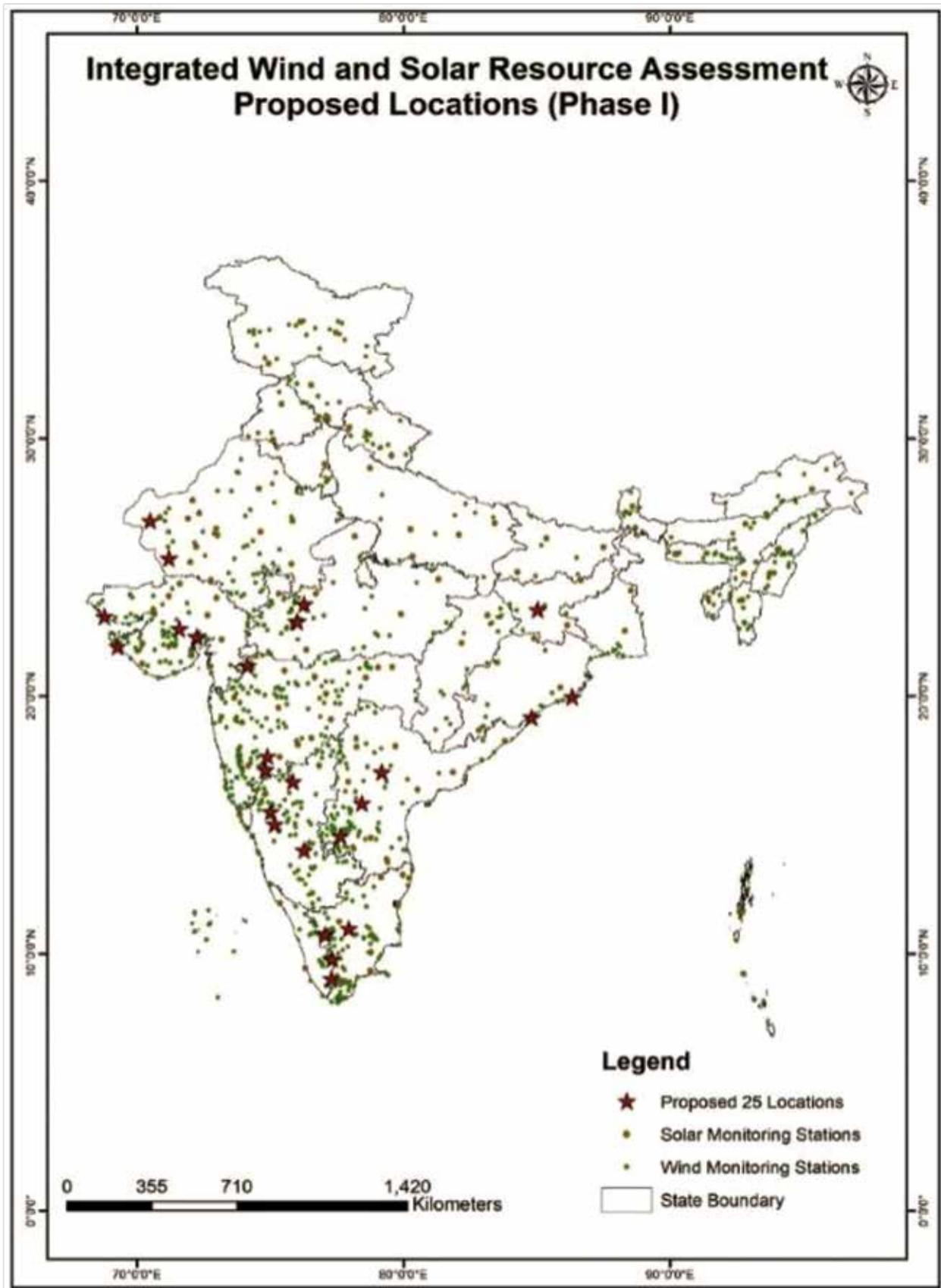
As part of R&D Programme of MNRE increased interaction was made with experts, test labs and industry for quality control of the renewable energy systems/components. Active interaction was made with the Bureau of Indian Standards(BIS) through various committee's meetings for updating standards matching Indian climatic conditions. Interactions were also made with National Accreditation Board for Testing



**Table 7.1: Identified Locations for Measurement Through Installation & Commissioning of Mast**

Sl. No	Site Id	Latitude °N	Longitude °E	State
1	IWS OD1	19.16	84.79	ODISHA
2	IWS TN 2	9.02	77.30	TAMIL NADU
3	IWS TN3	9.78	77.33	TAMIL NADU
4	IWS TN 4	10.73	77.06	TAMIL NADU
5	IWS TN 5	10.97	77.94	TAMIL NADU
6	IWSF KA6	14.01	76.26	KARNATAKA
7	IWS KA7	15.01	75.16	KARNATAKA
8	IWS KA8	15.50	75.01	KARNATAKA
9	<b>IWS KA9</b>	<b>16.68</b>	<b>75.84</b>	<b>KARNATAKA</b>
10	<b>IWS JH10</b>	<b>23.35</b>	<b>85.01</b>	<b>JHARKHAND</b>
11	<b>IWS AP 11</b>	<b>15.83</b>	<b>78.44</b>	<b>ANDHRA PRADESH</b>
12	<b>IWS TE12</b>	<b>17.04</b>	<b>79.17</b>	<b>TELANGANA</b>
13	<b>IWS MH13</b>	<b>17.14</b>	<b>74.81</b>	<b>MAHARASHTRA</b>
14	<b>IWS OD14</b>	<b>19.96</b>	<b>86.32</b>	<b>ODISHA</b>
15	<b>IWF AP15</b>	<b>14.57</b>	<b>77.63</b>	<b>ANDHRA PRADESH</b>
16	<b>IWS MH16</b>	<b>17.66</b>	<b>74.89</b>	<b>MAHARASHTRA</b>
17	<b>IWS MP17</b>	<b>22.88</b>	<b>76.01</b>	<b>MADHYA PRADESH</b>
18	<b>IWS MH18</b>	<b>21.17</b>	<b>74.14</b>	<b>MAHARASHTRA</b>
19	<b>IWS GJ19</b>	<b>22.29</b>	<b>72.24</b>	<b>GUJARAT</b>
20	<b>IWS GJ20</b>	<b>21.91</b>	<b>69.27</b>	<b>GUJARAT</b>
21	<b>IWS GJ21</b>	<b>23.08</b>	<b>68.78</b>	<b>GUJARAT</b>
22	<b>IWS GJ22</b>	<b>22.60</b>	<b>71.59</b>	<b>GUJARAT</b>
23	<b>IWS RJ23</b>	<b>26.79</b>	<b>70.49</b>	<b>RAJASTHAN</b>
24	<b>IWS RJ24</b>	<b>25.34</b>	<b>71.20</b>	<b>RAJASTHAN</b>
25	<b>IWS MP25</b>	<b>23.56</b>	<b>76.26</b>	<b>MADHYA PRADESH</b>







& Calibration Laboratories(NABL) for proper assessment of technical competence for accreditation of test labs for specified standards. A meeting was held on 27th November 2019 in MNRE under the chairmanship of Shri Anand Kumar, Secretary, MNRE regarding discussion on various issues pertaining to standards development, standards implementation, lab accreditation and implementation of Quality Control Order on SPV (Compulsory Registration Scheme). The meeting was attended by the concerned MNRE officers, test labs, BIS officers and SPV module industry associations. In the meeting, various actions points were decided for streamlining standard development and implementation in renewable energy sector in the country.

### 7.11.1 QUALITY CONTROL OF SPV SYSTEMS/COMPONENTS

The technical regulation for quality control of SPV Systems, Components and Devices as per Quality Control (Requirement for Compulsory Registration under BIS Act) Order 2017, which was notified by MNRE vide Government of India Gazette Notification No. 2561 dated 5th September 2017 was implemented as per schedules notified time to time. Active interaction was made with industry, test labs, and BIS for preparing for implementation of the said quality control order, which includes SPV Modules, Inverters and battery storage used in SPV power projects. All products listed in the aid order should conform to specified Indian Standard/corresponding IEC, and products qualifying the standards tested in BIS recognized test labs are required to be registered by the respective manufacturers with BIS. Only products registered with BIS are allowed for deployment in projects. The Quality Control Order involves preparation of guidelines for series approval of samples for submitting to test labs for testing for granting registration by BIS as the products have different sizes, ratings, varieties, etc. The products are subjected to field surveillance to ensure the quality of products in field as per performance certification done by test labs.

### 7.11.2 TEST LABS FOR PERFORMANCE TESTING

- (i) The preparedness of test labs was reviewed periodically under the chairmanship of Shri Anand Kumar, Secretary, MNRE for fulfilling the requirements of performance testing of identified products as per Quality Control Order. Test labs are key requirement for performance testing as per standard for quality assurance. The labs are required to get their technical competence validated by laboratory accreditation bodies which use ISO/IEC 17025 as tool for the purpose. Once the labs are accredited by NABL, the BIS grants lab recognition.
- (ii) Active interaction was made with test labs and BIS for streamlining the process of testing with quality and reliability, issuing test reports and registration of products by BIS. Interaction with NABL and BIS was also made to ensure the labs are properly assessed for their technical competence for delivering testing services efficiently with reliable test results. In this regard, Dr. B. S. Negi, Adviser (Quality Control), MNRE chaired a meeting with concerned representatives of BIS, NABL and Department of Promotion of Industry and Internal Trade(DPIIT) on 3rd January 2010 at 3PM in MNRE. In the meeting, a transparent and robust process of assessment of technical competence of test labs and efficient actions on the proposals by NABL and BIS was discussed. The updated list of test labs actively engaged in testing of products is given in **Table 7.2**.

### 7.11.3 IMPLEMENTATION OF QUALITY CONTROL ORDER

#### SERIES GUIDELINES FOR TESTING PRODUCTS

- (i) A Technical Advisory Committee set up to oversee the implementation of the Quality Control Order in its meetings discussed various issues including finalizing series guidelines for SPV Modules, Inverters and Battery Storage. Guidelines for series approval of SPV Modules (both types crystalline and thin film)

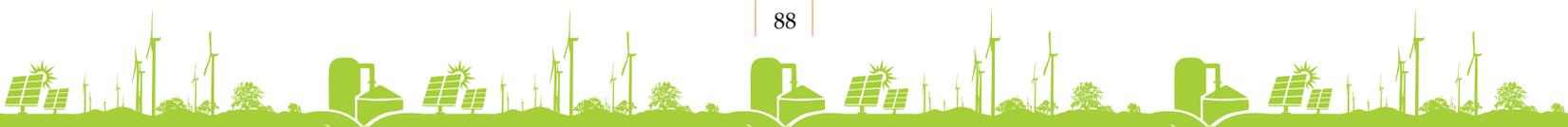




Table 7.2: Updated List of Test Labs				
Sl. No.	Product	Indian Standard Number	Title of India Standard	Test Labs Recognized by BIS
1.	Crystalline Silicon Terrestrial Photovoltaic (PV) Modules (Si Wafer based)	IS-14286	Crystalline Silicon Terrestrial Photovoltaic (PV) Modules - Design Qualification and type Approval	1. Hi Physix Laboratory India Pvt. Ltd., Pune 2. UL India Pvt. Ltd., Bangalore 3. TUV Rheinland, Bangalore
2.	Thin-Film Terrestrial Photovoltaic (PV) Modules (a-Si, CiGs and CdTe)	IS-16077	Thin-Film Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval	1. Hi Physix Laboratory India Pvt. Ltd., Pune 2. UL India Pvt. Ltd., Bangalore
3.	PV Module (Si Wafer and Thin Film)	IS/IEC 61730 (Part-1) IS/IEC 61730 (Part-2)	Photovoltaic (PV) Module Safety Qualification Part-1 Requirements for Construction Photovoltaic (PV) Module Safety Qualification Part-2 Requirements for Testing	1. Hi Physix Laboratory India Pvt. Ltd., Pune 2. UL India Pvt. Ltd., Bangalore. 3. TUV Rheinland, Bangalore
4.	Power Inverters for use in Photovoltaic Power System	IS 16221 (Part-2)	Safety of Power Converters for use in Photovoltaic Power Systems Part-2 – Particular Requirements for Inverters	1. CPRI, Bangalore 2. Hi-Physix Laboratory India Pvt. Ltd., Pune
5.	Utility – Interconnected Photovoltaic Inverters	IS-16169	Test Procedures of Islanding Prevention Measures for Utility-Interconnected Photovoltaic Inverters	1. CPRI, Bangalore 2. Hi-Physix Laboratory India Pvt. Ltd., Pune 3. UL India Pvt. Ltd., Bangalore
6.	Storage Battery	IS-16270	Secondary Cells and Batteries for Solar Photovoltaic Application General - Requirements and Methods of Test	1. CPRI, Bangalore 2. CECRI, Karaikudi, Tamil Nadu 3. Hi Physix Laboratory India Pvt. Ltd., Pune

for testing in test labs were notified on 9th July 2018. Active interaction was made with industry and test labs for quality assurance and for delivering efficient testing services by test labs. The guidelines were monitored for improvement in implementation. The revised series guidelines for SPV Modules developed in consultation with test labs, industry and BIS were notified on 16th April 2019 for implementation.

- (ii) The series guidelines for battery storage were notified by MNRE on 27/6/2019 for implementation. The series guidelines for inverters were notified by MNRE on 26/9/2019 for implementation.

#### 7.11.4 SURVEILLANCE

The Quality Control Order has a provision for inspection and surveillance of products in field for quality check on products manufactured by industry and deployed in field after performance certification by test labs. The sample of goods of the registered user shall be drawn from the manufacturing unit or from the market by the appropriate authority for ascertaining whether they conform to the specified standard. A surveillance system was developed and the same is being worked out by the National Institute of Solar Energy (NISE), Gurugram for implementation.

#### 7.11.5 BIS REGISTRATION

The technical regulation has given boost to not only quality control of SPV Modules but also domestic manufacture of SPV Modules. Bureau of Indian Standards (BIS) has accorded approval and registration





for 250 manufacturers for their products based on performance testing reports issued by three test labs, which include 167 manufacturers from India and 83 from China and other countries. Thus, the regulation has brought a major breakthrough in domestic production of SPV Modules. It has been decided that only SPV Modules with BIS Mark will be used in SPV Power Projects in the country.

#### **7.11.6 NEW INITIATIVE ON STANDARD ON GRID TIE INVERTER**

At present two standards on inverters have been specified for quality control. These standards cover safety requirements as per IS-1622-Part II and for islanding prevention measures for utility inter-connected photovoltaic inverter as per IS 16169. It was felt standards on efficiency, grid integration and environmental tests also need to be followed for complete performance testing of inverters. A meeting was held on 21.08.2019 at CPRI, Bangalore with experts for test labs and select inverter industries for discussion on IEC Standards on efficiency (IEC 61683), grid interaction (IEC 61727) and environmental tests (IEC 60068). In the meeting, which was chaired by Dr. B. S. Negi, Adviser (Quality Control), MNRE, it was discussed that these standards need to be perused for developing an inclusive standard on Grid Tie Inverter for Indian climatic conditions. A draft document prepared in consultation with test labs and industry was discussed in the subsequent meeting held on 26th September, 2019 in MNRE, which was attended by concerned officers from MNRE, BIS and CEA. Further interaction is going on the subject.

#### **7.11.7 NEW INITIATIVE FOR QUALITY CONTROL ORDER ON SOLAR THERMAL COLLECTORS**

Looking at considerable potential for solar water heating in the country, interactions were initiated with solar thermal industries engaged in manufacture of solar flat plate collectors, evacuated tube collectors and concentrating collectors and BIS to review the Indian standards available on these products for bringing out technical regulation for quality control. A draft Quality control order was prepared in consultation with BIS and the related stakeholders. A view was taken to adopt the latest international standards for quality control of solar flat plate collectors and solar evacuated tube collectors. In the BIS Meeting on the subject held on 17th December 2019 in BIS, the latest ISO Standards on solar thermal collectors and ETC were perused for modification for Indian conditions. Once the standards are revised and notified, the same will be considered for implementation for quality control of these products.

#### **7.11.8 STAR LABELLING BY BEE**

BEE initiated a scheme for star-labelling on Solar Water Heating Systems and SPV Modules in order to encourage industry for producing efficient solar thermal collectors and SPV Modules. The MNRE participated in Technical Committee meetings of BEE for finalising the scheme framework including deciding Star Labelling of these systems. The Star Labelling has been classified in five categories with Five Star rating for solar/thermal collector given for system efficiency more than 65%. The Star rating for SPV Module is under consideration. A rigorous process has been stipulated for star rating. The testing will be conducted in NABL accredited test labs approved by BIS. Only products fulfilling the MNRE Quality Control Orders will be eligible for participation in Star Labelling Programme of BEE.





## **RENEWABLE ENERGY IN NORTH EASTERN REGION STATES**

## RENEWABLE ENERGY IN NORTH EASTERN REGION STATES

- 8.1 Special attention is being given to the development of renewable energy in the entire North Eastern region through a separate budgetary allocation of 10% under various renewable energy programs for deployment of grid & off-grid solar energy systems, wind energy systems, small hydro projects, bio-gas plants, etc. in the region.
- 8.2 A total of estimated potential in for renewable energy in the North Eastern Region from solar, small hydro and bio-energy is around 65,838 MW, a substantial part of which is suitable for grid connected applications. State-wise details are given in **Table 8.1**.

**Table 8.1 State wise details of Estimated Renewable Energy Potential in North Eastern Region**

S. No.	STATES / Uts	Small Hydro Power (MW)	Bio-Energy		Solar (MW)	Total (MW)
			Biomass Power (MW)	Waste To Energy (MW)		
1	Arunachal Pradesh	2064.92	8		8650	10723
2	Assam	201.99	212	8	13760	14182
3	Manipur	99.95	13	2	10630	10745
4	Meghalaya	230.05	11	2	5860	6103
5	Mizoram	168.90	1	2	9090	9261
6	Nagaland	182.18	10		7290	7482
7	Sikkim	266.64	2		4940	5209
8	Tripura	46.86	3	2	2080	2132
	<b>Total</b>	<b>3261.49</b>	<b>261</b>	<b>16</b>	<b>62300</b>	<b>65838</b>

- 8.3 The state wise status of grid connected installed renewable energy capacity as on 31st December, 2019 in the region is given in **Table 8.2**.

**Table 8.2: State-wise installed capacity of Grid Interactive Renewable Power (on 31.12.2019)**

S. No.	STATES / Uts	Small Hydro Power	Bio-Power	Solar Power	Total Capacity	Capacity Addition during 2019-20
		(MW)	(MW)	(MW)	(MW)	(MW)
1	Arunachal Pradesh	131.105		5.61	136.72	0.52
2	Assam	34.11		41.23	75.34	18.83
3	Manipur	5.45		4.58	10.03	1.14
4	Meghalaya	32.53	13.80	0.12	46.45	0
5	Mizoram	36.47		1.52	37.99	1.02
6	Nagaland	30.67		1.00	31.67	0
7	Sikkim	52.11		0.07	52.18	0.06
8	Tripura	16.01		9.41	25.42	4.32
	<b>Total (MW)</b>	<b>338.455</b>	<b>13.80</b>	<b>63.54</b>	<b>415.8</b>	<b>25.89</b>

## 8.4 SMALL HYDRO POWER PROGRAMME

- (i) North Eastern States have a fairly good potential to develop small hydro power projects. Among the NE States, Arunachal Pradesh has the highest potential followed by Sikkim, Meghalaya and Mizoram. MNRE has been giving special emphasis for the development of small hydro projects in the NE region. SHP projects can provide energy almost uninterrupted without any major maintenance or dependence on weather. The region, which is beleaguered by large energy deficits and poor quality of energy services, can benefit from greater decentralization and accountability associated with Small Hydro Power Projects. Small Hydro Power Projects can generate sufficient electricity to power domestic household, schools and clinics in rural areas and trigger entrepreneurship activities. The State-wise installed capacity vis-a-vis potential in North Eastern States & Sikkim is given in **Table 8.3**.

<b>Table 8.3: State wise list of potential sites and installed projects SHP Projects in NER (as on 13.12.2019)</b>					
Sl. No.	State	Total Potential		Total Installed	
		Nos.	Capacity (MW)	Nos.	Capacity (MW)
1	Arunachal Pradesh	800	2064.92	156	131.105
2	Assam	106	201.99	6	34.11
3	Manipur	110	99.95	8	5.45
4	Meghalaya	97	230.05	5	32.53
5	Mizoram	72	168.9	18	36.47
6	Nagaland	98	182.18	12	30.67
7	Sikkim	88	266.64	17	52.11
8	Tripura	13	46.86	3	16.01
<b>Total</b>		<b>1384</b>	<b>3261.49</b>	<b>225</b>	<b>338.455</b>

### SUCCESS STORY

Nuranang Small Hydro Power Project Phase-II (1.00MW) : - Nuranang SHP (1MW) project is located at Nuranang in Tawang district of Arunachal Pradesh. This project has been implemented under Prime Minister's announced package for Arunachal Pradesh. Ministry of New and Renewable Energy has provided 100% financial support for the project.



*Inauguration of Nuranang SHP (1MW) under Prime Minister's announced package for Arunachal Pradesh by Shri Kiren Rijiju, Hon'ble Minister of State (IC) of the Ministry of Youth Affairs and Sports.*



- (ii) The major Small Hydro Power Projects which are currently under implementation is given in **Table 8.4**.

## 8.5 PM PACKAGE FOR ARUNACHAL PRADESH

The Hon'ble Prime Minister had announced a package of Rs.550.00 crore to electrify/ illuminate border villages of Arunachal Pradesh. Accordingly, a plan was made to electrify / illuminate 1053 un-electrified villages of all border districts of Arunachal Pradesh by installation of 5758 nos. of SPV Home Lighting Systems and 153 numbers of Micro Hydel/Small Hydel Projects. The project is completed except commissioning of five numbers of Small Hydro Power Projects by the Department of Hydro Power Development.

<b>Table 8.4: Small Hydro Power Projects which are currently under implementation in NE Region</b>			
<b>Sr. No.</b>	<b>Name of the Project</b>	<b>Capacity (MW)</b>	<b>Implementing Agency</b>
<b>Arunachal Pradesh</b>			
1	Namachik – I in Changlang District	0.5	Department of Hydro Power Development
2	Tirru nallah in Longding District	0.1	Department of Hydro Power Development
3	Fure in Kurukungme District	0.05	Department of Hydro Power Development
4	Pakhankha in Changlang District	0.5	Department of Hydro Power Development
5	Payu at Pinchi in Kurung Kumey District	0.5	Department of Hydro Power Development
6	Khajalong in West Kameng district	2.0	Department of Hydro Power Development
7	Sumbachu SHP in Tawang District	3	Hydro Power Development Corporation of Arunachal Pradesh
8	Taksang Chu SHP in Tawang district	3.4	Hydro Power Development Corporation of Arunachal Pradesh
9	Kinmey Gompa in Tawang District	0.1	Department of Hydro Power Development
<b>Meghalaya</b>			
10	Ganol SHP West Garo Hills District	22.50	Meghalaya Power Generation Corporation Limited
11	Riangdo SHP in West Garo Hills District	3.0	Meghalaya Power Generation Corporation Limited
<b>Mizoram</b>			
12	Kawlbem in Champhai District	3.50	Power & Electricity Deptt., Government of Mizoram
13	Tlawva SHP in Champhai District	5.00	Power & Electricity Deptt., Government of Mizoram
<b>Nagaland</b>			
14	Ponglefo SHP in Kiphire District	1.00	Department of Power, Government of Nagaland
<b>Sikkim</b>			
15	Chatten Stage-II in North Sikkim District	3.00	Sikkim Power Development Corporation Limited



## 8.6 SOLAR PARKS

Ministry is implementing a Scheme for Development of Solar Parks and Ultra Mega Solar Power Projects. The main objective of Scheme is to scale up setting up of solar projects in a short span of time. Under the Scheme, it is proposed to set up at least 50 solar parks targeting setting up of 40,000 MW of solar power projects by 2021-22. All the States and Union Territories are eligible for getting benefit under the scheme. The capacity of the solar parks shall be 500 MW and above. However, smaller parks are also considered in States where there is shortage of non-agricultural land. The following solar parks have been approved in the under mentioned States of NE region with a total Capacity of 113 MW in five states as given in **Table 8.5**.

<b>Table 8.5: Solar Parks approved in the States of NE region</b>				
<b>Sl. No.</b>	<b>State</b>	<b>Capacity (MW)</b>	<b>Name of the Solar Power Parks Developer (SPPD)</b>	<b>Land identified at</b>
1.	Arunachal Pradesh	30	Arunachal Pradesh Energy Development Agency (APEDA)	Tezu township in Lohit district
2.	Manipur	20	Manipur Tribal Development Corporation Ltd. (MTDCL)	Bukpi village, Pherzawl District
3.	Meghalaya	20	Meghalaya Power Generation Corporation Ltd. (MePGCL)	Thamar, West Jaintia Hills & Suchen, East Jaintia Hills districts
4.	Mizoram	20	Power & Electricity Department	Vankal, Champhai district, Mizoram
5.	Nagaland	23	Directorate of New & Renewable Energy, Nagaland (DNRE)	Ganeshnagar, Dimapur district and Jalukie, Parem district

*The Amguri solar park (70 MW) in Assam was cancelled due to its slow progress.*

## 8.7 GRID CONNECTED ROOFTOP SOLAR PROGRAM IN NORTH EASTERN STATES

(i) Grid Connected Solar Rooftop Programme is being implemented in the Country including North Eastern States.

- During the year 2019-20, a total of 1.50 MW capacity has been sanctioned to Electricity Departments /DISCOMS of 2 States (i.e. 1 MW to Electricity Department of Nagaland and 0.5 MW to Electricity Department of Manipur), thereby leading to overall sanctioned capacity of 56.55 MW to 7 North Eastern States as on 31.12.2019 under the programme
- Aggregate capacity of 23.12 MW has been reported as installed in FY 2019-20, thereby leading to overall installed capacity of 44.04 MW (with or without central financial assistance) as on 31.12.2019 as given in **Table 8.6**.
- Over Rs. 16.85 crore have been released in FY 2019-20 to implementing agencies for implementation of the programme to the state of Assam, Manipur and Meghalaya.

(ii) With effect from 20th August, 2019 the phase II of Rooftop Solar programme has been launched which is being implemented in all States including North East Region states. Major feature of phase-II programme includes:

- Phase II of the Grid connected rooftop solar programme was approved for with a target for achieving a cumulative capacity of 40,000 MW from Rooftop Solar (RTS) Projects by the year 2022 in





*10 kW Residential Grid Connected Solar Rooftop Plant at Koirengei, Imphal, Manipur*

February 2019. The programme will be implemented with the total central financial support of Rs 11,814 crore through DISCOMs.



*40 kW Grid Connected Solar Rooftop Plant at Kharupetia College, Distt. Darrang, Assam*





<b>Table 8.6: Statewise Physical progress under Grid Connected Rooftop Solar Power Plants Program in North Eastern States</b>			
<b>S. No.</b>	<b>State</b>	<b>Cumulative capacity sanctioned</b>	<b>Cumulative Installed Capacity (with/without CFA)</b>
1	Arunachal Pradesh	10.00 MW	4.34 MW
2	Assam	23.48 MW	30.56 MW
3	Manipur	6.22 MW	4.55 MW
4	Meghalaya	8.00 MW	0.12 MW
5	Mizoram	7.35 MW	1.43 MW
6	Nagaland	1.00 MW	0.08 MW
7	Tripura	0.50 MW	2.96 MW
<b>Total</b>		<b>56.55 MW</b>	<b>44.04 MW</b>

- In the Phase-II Programme Central Financial Assistance (CFA) for the residential sector has been restructured with the availability of 40% CFA for RTS systems up to 3 kW capacity and 20% for RTS system capacity beyond 3 kW and up to 10 kW. For Group Housing Societies/Residential Welfare Associations (GHS/RWA), CFA will be limited to 20% for RTS plants for supply of power to common facilities. However, the capacity eligible for CFA for GHS/RWA will be limited to 10 kW per house with maximum total capacity upto 500 kWp, inclusive of RTS put in individual houses in the GHS/RWA. Central financial support will not be available for other category i.e. institutional, educational, social, government, commercial, industrial, etc.
- Performance based incentives will be provided to DISCOMs based on RTS capacity achieved in a financial year (i.e. 1st April to 31st March every year till the duration of the scheme) over and above the base capacity i.e. cumulative capacity achieved at the end of previous financial year.
- Model operating procedure along with suggested timelines developed for implementation of rooftop solar projects.

## 8.8 OFF GRID SOLAR PV PROGRAMME

- (i) Solar Off-grid Programme has been strengthened in the North Eastern States through introduction of new scheme viz., Atal Jyoti Yojana (AJAY) Phase-II and PM KUSUM Scheme. Further, under Off-grid and Decentralised Solar PV Applications Programme Phase-III, new projects have been sanctioned as shown in **Table 8.7**.
- (ii) Under PM KUSUM Scheme following allocations have been made in the States of Meghalaya and Tripura :

<b>State</b>	<b>Component-A Grid-connected Power Plants up to 2 MW</b>	<b>Component-B Standalone Solar Pumps (Nos.)</b>	<b>Component-C Solarization of existing grid based agricultural pumps (Nos.)</b>
Meghalaya	10 MW	1700	60
Tripura	5 MW	1300	1300



S. No.	State/UT	Capacity/ Numbers Sanctioned		
		Solar Street Lights (Nos)	Solar Study Lamps (Nos)	Off-Grid SPV Power Plants (kWp)
1	Arunachal Pradesh	20,000	2,00,000	-
2	Assam	20,000	2,32,342	-
3	Manipur	20,000	75,000	25
4	Meghalaya	-	1,02,000	-
5	Mizoram	20,000	1,50,000	939
6	Nagaland	9,810	24,000	415
7	Sikkim	-	43,034	-
8	Tripura	12,000	3,00,000	-

- (iii) Under Phase-I of the AJAY Scheme, which was available in the State of Assam, 6659 nos. of solar street lights have been installed in that State. Under the Atal Jyoti Yojana (AJAY): Phase-II, 2000 nos. of solar street lights are available for installation in each of the Lok Sabha constituencies of the North Eastern States including Sikkim. As on 31.12.2019, consent have been received for installation of 16,000 solar street lights and sanction from MPLADS has been received for 10,125 solar street lights.
- (iv) Details of all SPV systems and standalone SPV power plants in the North Eastern region states as on 31.12.2019 is given in **Table 8.8**.

S.no.	Agencies	Solar Home Light (Nos)	Solar lamp (Nos)	Solar Street Light (Nos)	Solar Pump (Nos)	Solar Power Plant (kW)
1	Arunachal Pradesh	35065	18551	5008	22	963.2
2	Assam	46879	642996	9554	45	1605
3	Manipur	24583	9058	11205	40	1580.5
4	Meghalaya	14874	40750	5800	19	2004
5	Mizoram	12060	10512	5325	37	2955.6
6	Nagaland	1045	6766	6235	3	1506
7	Sikkim	15059	23300	504	0	850
8	Tripura	32723	64282	1199	151	867



## 8.9 BIOGAS PROGRAMME

- (i) The New National Biogas and Organic Manure Programme (NNBOMP) is being implemented for providing clean gaseous fuel mainly for cooking, lighting and organic manure to rural and semi-urban households in the North Eastern Region States through State Government Nodal Departments/ State Nodal Agencies. MNRE has allocated targets to the State Rural Development Departments for implementing the NNBOMP in the States of Assam, Arunachal Pradesh, Manipur Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura during the year. A target of 7,400 number of biogas plants has been set in the North Eastern region for the year 2019-20.
- (ii) A Biogas Development and Training Centre for all the NE States for providing training and technical support under the NNBOMP has been continued and functional at Department of Mechanical Engineering, Indian Institute of Technology, Guwahati, Assam.
- (iii) The progress of implementation of the Biogas Programmes i.e. New National Biogas and Organic Manure Programme (NNBOMP); Biogas based Power Generation (Off-Grid) Programme ; and Activities & Targets of Biogas Development and Training Centre in North Eastern Region States during the year 2019-20 has been reviewed under the Chairmanship of Joint Secretary MNRE, on 8th November, 2019 at Indian Institute of Technology, Guwahati (Assam).

## 8.10 WIND ENERGY PROGRAMME

- (i) National Institute of Wind Energy (NIWE) in collaboration with RISO DTU, Denmark had prepared the Indian Wind Atlas for the country including NE Region during the year 2010. According to this Indian Wind Atlas, the wind potential of NE at 50 m level is estimated to be 406 MW. The State-Wise break-up is shown in **Table 8.9**.

<b>Table 8.9: State-wise break-up of Wind Energy Potential in North Eastern States</b>		
<b>S.No</b>	<b>States</b>	<b>Estimated potential (MW) @ 50 m</b>
1.	Arunachal Pradesh	201
2.	Assam	53
3.	Manipur	7
4.	Meghalaya	44
5.	Nagaland	3
6.	Sikkim	98
<b>Total</b>		<b>406</b>

- (ii) In NE States, there are scattered potential pockets available for wind farm development due to the localized wind flows and hence, Ministry decided to carry out extensive wind resource assessment studies in NE regions including Sikkim. Accordingly, as on 31.12.2019, Wind Resource Assessment has been carried out using cumulative 97 nos. of met masts at 25 m & 50 m in NE regions and currently 26 nos. of Wind Resource Assessment stations are operational and the remaining stations were closed down after completion of requisite data collection. The State-Wise break-up is shown in **Table 8.10**.



<b>Table 8.10: State-wise break-up of Met Masts for Wind Resource Assessment in North Eastern States</b>			
<b>State</b>	<b>No. of Stations installed &amp; commissioned</b>	<b>Level of Wind Resource Assessment stations</b>	<b>No. of Stations in operation</b>
Arunachal Pradesh	17	25 m & 50 m	8
Assam	18	25 m & 50 m	4
Tripura	11	25 m & 50 m	3
Manipur	14	25 m & 50 m	3
Mizoram	9	25 m & 50 m	2
Nagaland	6	25 m & 50 m	Nil
Meghalaya	18	25 m & 50 m	6
Sikkim	4	25 m	Nil
<b>Total</b>	<b>97</b>		<b>26</b>

- (iii) In addition, Wind Resource Assessment are also carried out at NE region using the existing telecom towers and as on 31.12.2019, a total 73 nos. of telecom towers of heights ranging from 40m to 60 m were utilized for this purpose. The details are shown in **Table 8.11**

<b>Table 8.11: State-wise break-up of Wind Resource Assessment using existing Telecom Towers in North Eastern States</b>			
<b>State</b>	<b>No. of Stations commissioned</b>	<b>Level of telecom tower stations</b>	<b>No. of Stations in operation</b>
Meghalaya	15	50 m & 60 m	11
Mizoram	5	40 m & 60 m	3
Tripura	6	50 m & 60 m	3
Arunachal Pradesh	5	40 m & 50 m	5
Nagaland	7	50 m	7
Manipur	9	40 m & 60 m	9
Assam	26	50 m & 60 m	26
<b>Total</b>	<b>73</b>		<b>64</b>





**GREENING OF ISLANDS OF ANDAMAN &  
NICOBAR AND LAKSHADWEEP**

## GREENING OF ISLANDS OF ANDAMAN & NICOBAR AND LAKSHADWEEP

### 9.1 SCHEME FOR SETTING UP OF 52 MW DISTRIBUTED GRID-CONNECTED SOLAR PV POWER PROJECTS IN ANDAMAN & NICOBAR & LAKSHADWEEP ISLANDS WITH CAPITAL SUBSIDY FROM MNRE

9.1.1 MNRE, on 05.04.2016 had issued the Administrative Approval for Implementation of a scheme for setting up Distributed Grid-Connected Solar PV Power Projects of an aggregate capacity of 40 MW (now increased to 52 MW) in Andaman & Nicobar (A&N) and Lakshadweep Islands with an estimated Central Financial Assistance (CFA) of Rs.192.20 crore.

#### 9.1.2 OBJECTIVE

The objective of the scheme is to develop carbon free islands by phasing out use of diesel for generation of electricity and to contribute to the National Action Plan on Climate Change. The initiative will also help in reduction in cost of electricity generation.

#### 9.1.3 SPATIAL COVERAGE

Distributed grid-connected solar PV power projects of an aggregate capacity of 52 MW would be established in different islands in Andaman & Nicobar Islands and Lakshadweep Islands.



*SECI 1 MW solar project in Andaman & Nicobar*





#### 9.1.4 TYPE OF PROJECTS SUPPORTED

The Scheme supports setting up of standalone Solar PV Power Project, standalone Battery Energy Storage System (BESS), Solar PV plant with Battery Energy Storage System (BESS), Transmission System for Solar PV Power Plant and Floating Solar PV power plants (with or without Battery Energy Storage System) in Andaman & Nicobar Islands and Lakshadweep Islands.

#### 9.1.5 IMPLEMENTATION ARRANGEMENT

- (i) The scheme will be implemented through Central Public Sector Undertakings (CPSUs) viz., NTPC Limited (NTPC), NLC India Limited (NLC), Rajasthan Electronic & Instruments Ltd. (REIL), Solar Energy Corporation of India Limited (SECI) etc. or by UT Administration on Build, Own and Operate (BOO) basis.
- (ii) Procurement of all Services and Hardware for setting up the power plants by Implementing Agencies (IAs) viz. NTPC, NLC, REIL, SECI etc. or UTs would be done through competitive bidding process.
- (iii) The total project cost will include cost of solar power plant, battery storage of upto six hours and cost of infrastructure development such as land development, evacuation & transmission etc.
- (iv) A&N and Lakshadweep Administrations will buy the electricity from the Implementing Agencies at a tariff determined by JERC/CERC by taking into account the Central Financial Assistance (CFA).

#### 9.1.6 CENTRAL FINANCIAL ASSISTANCE (CFA)

- (i) Total eligible Financial Assistance and its release pattern will be as under:
  - Ministry will provide 40% of the project cost discovered through competitive bidding process as grant;
  - No additional grant for the preparation of DPR, conducting field survey, fund handling / service charge will be provided
  - The Capital Subsidy will be released in three tranches as mentioned below:
    - 15% on completion of site development and civil works at site;
    - 60% on successful commissioning of the plant; and
    - Balance 25% after one year of operation of the plant.
- (ii) The release pattern mentioned above can be modified if felt necessary during implementation with the approval of the Competent Authority.

#### 9.1.7 STATUS OF PROJECTS UNDER IMPLEMENTATION (AS OF 31.12.2019)

- (i) A 20 MW SPV Plant with 8 MWh Battery Energy Storage System (BESS) at Attampahad & Dollygunj in UT of Andaman & Nicobar Islands is under advanced stage of implementation and 2.5 MW SPV capacity of this project has been commissioned.
- (ii) SECI has issued tender for Design, Engineering, Supply, Construction, Erection, Testing &





Commissioning of cumulative 1.95 MW (AC) Solar PV Power Plant with 2.15 MWh BESS having 10 years Plant O&M at four different Islands of Union Territory of Lakshadweep, as per following details:

Sl. No.	Island	Solar PV Capacity (kWp)	BESS Capacity (kWh)
1.	Agatti	300	0
2.	Kavaratti	1400	1400
3.	BangaRam	150	450
4.	Thinnakara	100	300
	<b>Total</b>	<b>1950</b>	<b>2150</b>





## **SPECIALIZED INSTITUTIONS**

## SPECIALIZED INSTITUTIONS

### 10.1 NATIONAL INSTITUTE OF SOLAR ENERGY

10.1.1 National Institute of Solar Energy (NISE), an autonomous institution of Ministry of New and Renewable (MNRE), is the National Research and Development (R&D) institution in the field of Solar Energy. NISE supports the Ministry of New and Renewable Energy (MNRE) in implementing the National Solar Mission (NSM), R&D activities in Solar Energy and various Skill Development Programmes.

10.1.2 NISE has established itself as a leading Institute in the field of Solar Energy through Resource Assessment, Research & Development, Design, Development and Demonstration of Solar Energy Technologies for various applications such as, testing, certification and standardization, monitoring and evaluation, economic and policy planning, human resource development and active collaborations with prominent National & International organisations, etc.

10.1.3 NISE is maintaining an NABL accredited Solar Photovoltaic module testing laboratory, lighting system test laboratory, battery testing facility and solar water pumping system test rig and outdoor test facilities. The institute has fully developed testing facility for small and large size Solar Thermal Systems and Solar Resource Assessment equipment.

#### 10.1.4 SOLAR RADIATION RESOURCE ASSESSMENT (SRRA)

The Solar Radiation Calibration Laboratory (SRCL) at NISE has been calibrating the solar radiation measuring sensors of the solar radiation resource assessment (SRRA) network of the country to create reliable, accurate solar radiation data base for the country. During the year, SRCL has calibrated sensors from 13 SRRA station from different regions indicated in the table below. A total of 39 sensors from 2 SRRA stations consisting of 26 Pyranometer sensors and 13 Pyrheliometer sensor were successfully calibrated as per International Standards. A total of 8 number of Pyranometer sensors from the various other organizations were calibrated under commercial mode program. Depending on the availability of suitable local climatic conditions at facility, further calibration of 6 SRRA is proposed to be achieved till March 2020.

#### 10.1.5 R&D ACTIVITIES

##### (i) PERC Project

NISE has completed the procurement process and have procured six equipment in this FY 2019-20 under the Passivated Emitter Rear Cell (PERC) Project. The commissioning of all equipment is expected to be completed by March 2020. The ISO class 8 clean room construction for testing and characterisation was completed while maintaining the quality of



*ISO class 8 clean room for Testing and Characterisation*

this laboratory. Quokka Software for PERC Solar Cell simulation was acquired and an extensive literature search was also carried out to stay abreast of the latest developments in PERC Solar Cells. NISE has joint venture with BHEL-ASSCP, Gwal Pahari, Gurugram for this project and as a course of action two process equipment were commissioned at BHEL. The cell fabrication and testing is expected to be initiated by the next financial year.

**(ii) Solar Product Development**

**a) Solar Dryer**

NISE has designed and developed an innovative solar drier cum space heating system (SolDry). In 2019 based on the satisfactory performance of the system, Horticulture department of J&K requested NISE to supply and install 670 Units (300 units in phase 1 and remaining in phase 2) of Solar Dryer cum space heating system (335 units in Kargil and 335 units in Leh). NISE has taken-up the project on turnkey basis and is presently carrying out supply and installation of systems under phase 1.



*Installation of Solar Apricot Dryer cum Space Heating System at Minjee Village, Kargil District*

**b) Solar Cold Storage**

National Institute of Solar Energy (NISE) along with M/s. Inficold India Pvt. Ltd has started the R&D on solar powered cold storage from the beginning of 2016. With continuous joint R&D efforts the performance of the product was improved by 40%. NISE in the year 2019-20 has installed 7 pilot solar cold storage systems under Mission for Integrated Development of Horticulture (MIDH) scheme of Ministry of Agriculture and Farmer Welfare at various states like Karnataka, Tripura, Kerala and Uttar Pradesh.



*Installation of Solar Cold Storage at Udaipur, Chhataria, District Gomati, Tripura*





*A solar powered cold storage system installed Bilascherra Kamalpur, Tripura*

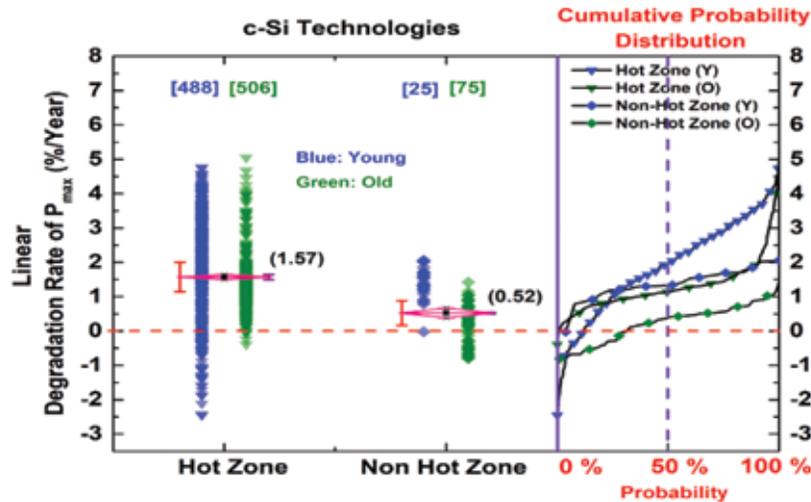
**c) Solar thermal based Space Heating System**

National Institute of Solar Energy (NISE) is working on development of solar thermal based space heating solutions for colder regions. The R&D focuses on the design of radiant floor heating systems with use of solar thermal technology with storage tank for non-sunshine hour requirement. This will help in offering sustainable solutions for energy demand in Ladakh and other Himalayan regions with cold climate.

**d) All India Survey of Solar PV Module (2019-20) – Joint Project between NISE and NCPRE, IIT Bombay**

This is a joint project between the Solar Photovoltaic division, NISE, and NCPRE, IIT Bombay to study the field performance and reliability of SPV modules installed in different climatic conditions of India. The 2018 All-India Survey of Photovoltaic Module Reliability is the fourth in a series of such Surveys conducted in different parts of India. It was carried out from March to May of 2018. The modules in the Cold & Sunny climate of Ladakh were surveyed in the month of September 2018. The report of the All India survey of PV module reliability was published and is available on the website of NISE. Some of the observations from the survey are: (i) due diligence should be exercised while selecting and procuring modules. (ii) The tender specifications need to be much more elaborate than currently being used. (iii) Cases of ‘over-rating’ of modules have been observed. It is recommended that a field-based electroluminescence (EL) study be performed after receiving the modules at the site and after installation to reveal micro-cracks which may have been caused during the transport and installation phases. The installation of the power plant, as well as module, should be PID free. The degradations of PV modules are high in the Hot climate, so special attention is required for this. It is felt that some of the quality issues seen especially in the young modules are the result of aggressive pricing and timelines and improper handling/installation.

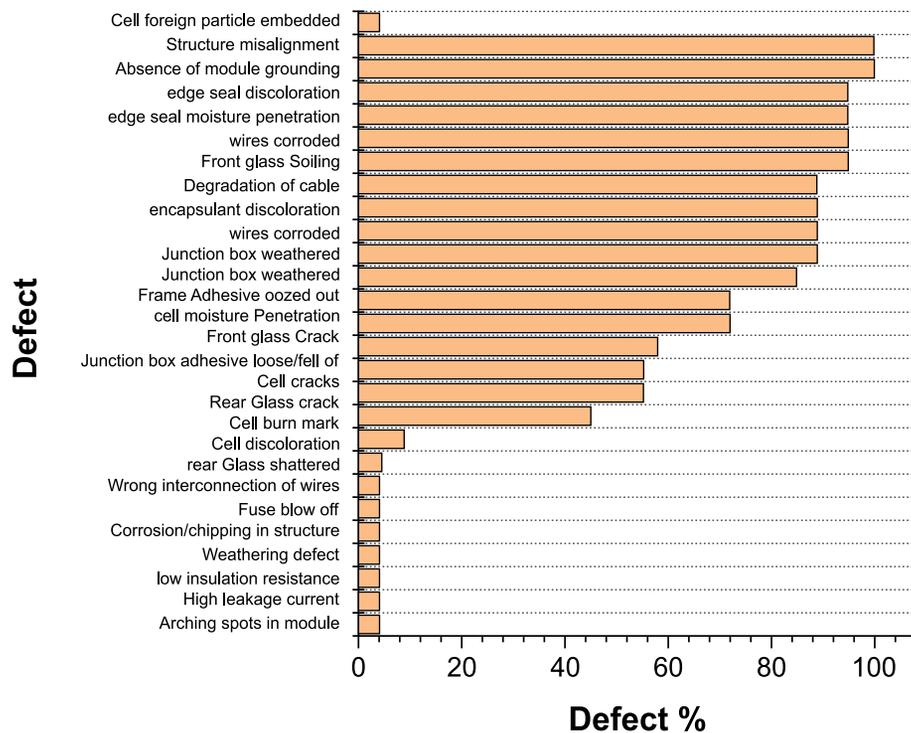




Comparison of the Linear Degradation Rate of Pmax in Hot and Non-Hot climatic zones. The blue and green symbols represent Young (<5 year) and Old (>5 year) modules.

e) **Cost Priority number and its methodology for assessing the economic impact of PV system failures of photovoltaic power plant**

NISE has developed a methodology to assess the economic impact of technical risks occurring in the PV system located in different climatic zones of India based on the method of assigning Cost Priority Number (CPN) unlike conventional Failure Mode Effect Analysis (FMEA) approach. This will help to address various PV system failures that occur due to the different reasons in the field in different climatic zones and geographical locations of India. The impact on return on investment of PV system of different failure modes has been assessed so that people can easily estimate the cost of PV power plant after long term operation in the field.



Defects observed in a 2 MW thin film PV power plant





**(f) Design and Development of High efficiency Solar Water Pumping System**

The Government has launched the scheme Kisan Urja Suraksha Evam Utthaan Mahaabhiyan (KUSUM) to provide 7.5 lakh solar pumps for irrigation purpose. This scheme has led to the development of highly efficient & reliable as well as cost effective Solar Water Pumping System with improvement in their performance. This enhanced performance in terms of higher daily water discharge (around 10%) would essentially mean the additional benefit (i.e. proportionate reduction in the overall costing) to the farmers. NISE was sanctioned a project entitled Design and Development of High Efficiency Solar Water Pumping Systems by MNRE on 28th February 2019 for the development of improved solar water pumping controllers, motors, pump sets and SCADA solar pump testing system. NISE has associated with industry including reputed indigenous pump manufacturers and Indian Pump Manufacturers Association (IPMA) for study, research, development and analysis under this project. The project envisages the following activities, (i) design and development of low cost high efficiency controllers, (ii) design and development of variable frequency drive to work optimally under summer and winter profiles, (iii) to increase the overall wire to water efficiency of the solar water pumping systems up to 45%, (iv) to improve daily water discharge of solar water pumping system by at least 10%, (v) The test facility of Solar Pumping System established at NISE is in redesigned process and a new state of the art facility for testing of solar PV Pumps is developed at NISE which includes the following facilities: (i) simultaneous testing of multiple Solar Water Pumps under real time conditions, as well as with Solar Array Simulators, (ii) 'SCADA' would be installed to control and log the performance, (iii) Remote Monitoring Arrangement would also be configured, (iv) Development of testing procedures as per IEC, (v) Test Setup configuration, (vi) Test procedure for both AC & DC Solar Water Pumping Systems.

**(g) Supply of Clean Drinking Water through IoT based solar powered station at a large village in Haryana through automated dispensing while improving the water table: Pilot- Faridpur**

- (i) Ground water year book of Haryana state published by Central Ground Water Board in 2016 has studied 964 ground water observations points throughout the state and listed the quality of water and impurities.
- (ii) National Institute of Solar Energy (NISE) and M/s. Saurya Eneritech. Pvt. Ltd. have jointly developed solar powered water purification system. Five prototype of such systems ranging from 100 LPH to 500 LPH capacity were installed and are functional in various locations. Encouraged by the success of these prototypes. Now, NISE along with M/s. Saurya Eneritech. Pvt. Ltd. is installing a full scale pilot project to test the solar powered drinking water station at village community level.
- (iii) The Project envisages to provide safe drinking water to the entire population of Faridpur village in district Gurgaon, Haryana. It employs Solar Power to operate the water purification system. Quality of raw water has been tested and found to have a TDS of 1973 (mg/l). Water has large amount of Chlorine (990 mg/l) in addition to many other impurities. Based on the quality of raw water including a factor of safety, the membrane based purification system has been designed. Energy efficient membranes have been selected. Pumps with SS fittings are selected in view of large quantity of Chlorine in the water. A 30 kW solar system has been designed to take care of water needs of the population. A battery bank of desired size is designed for an autonomy of two days. An IoT based remote monitoring has been designed.





## 10.1.6 TESTING AND PERFORMANCE EVALUATION

### 10.1.7 SOLAR PHOTOVOLTAIC TESTING LABORATORY

The Photovoltaic module test lab is a NABL (National accreditation board for testing & calibration laboratories) accredited laboratory as per standard IS 17025:2005 for qualification testing of PV module. This lab got accreditation by BIS for PV module testing as Type 2 lab. During the year, the laboratory has capability of testing these IEC/IS standards i.e. (i) IEC 61215/ BIS 4186, (ii) IEC 61701, (iii) IEC 61730-1, 61730-2 (partial, accreditation process going on), (iv) IEC 61853/IS 16170: Part 1 (accreditation process going on), (v) IEC TS 62804/MNRE specifications (accreditation process going on). Presently Lab has also started testing of the bifacial module as per IEC TS 60904-1-2:2019 and Energy rating of PV module for different climatic zones as per IEC 61853-1, 2, 3 and 4. Upgradation of the lab set up is also going on for full testing set up for IEC 61730-1, 2 (including fire test also). The lab has completed the testing of the PV module along with other laboratories of the world for LETID testing of the PV module as IEC 61215. This new methodology of module testing will be going to add up in the newer version of IEC 61215. The commercial LETID testing of PV module at NISE will be initiated in the upcoming financial year. A total of 379 Modules of different technologies were tested and certified by NISE.

### 10.1.8 ELECTROLUMINESCENCE (EL) TEST & CHARACTERIZATION LABORATORY

Electroluminescence (EL) test and characterization facility for PV modules at NISE is used to identify micro cracks and other invisible defects in solar cells and PV modules which are invisible to the human eyes. The greateyes LumiSolar Professional BL 16Mpx (Bottom Load) System is a high resolution Electroluminescence module inspection utility to in PV module. The Laboratory follows the standard DIN IEC 60904-Part 13 (Electroluminescence of photovoltaic IEC 82/1062/CD: 2016) for Electroluminescence study of PV module.

### 10.1.9 MOBILE TEST SET UP

Mobile Solar testing facility developed at NISE continues to conduct the PV power plant inspection, reliability testing of crystalline silicon as well as thin film PV modules & power plant as per International standards and user specifications.

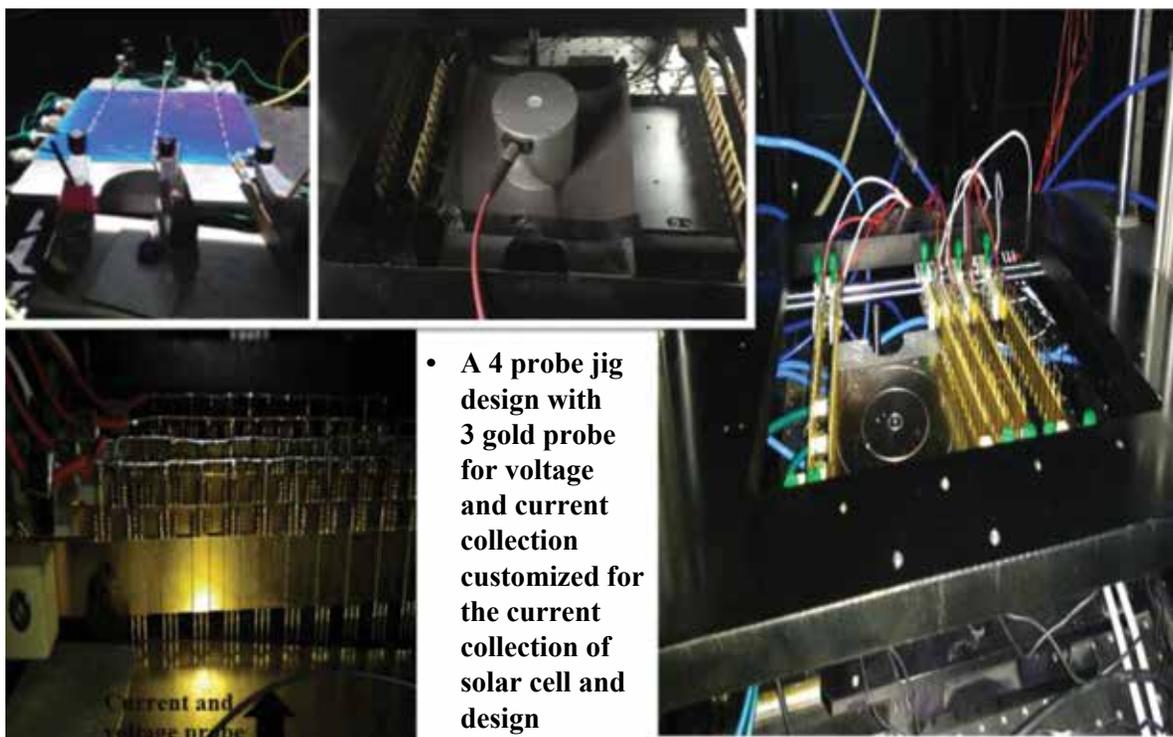
### 10.1.10 SOLAR CELL CHARACTERIZATION & OUTDOOR MODULE TESTING FACILITY

Solar cell characterization group at NISE has added a new spectro-radiometer facility for testing spectral content of light for different wavelength. The lab is now capable of estimating mismatch current factor of solar cell with known spectral response data. The spectral response system installation in solar cell is under process. NISE is undertaking a process to incorporate new advanced testing facility for different solar cells. Presently, NISE has a 6 inch 6 bus bar customized solar jig is introduced in the design structure for the development solar cell testing for the proper collection of current and fill factor and reduce a shading losses due to the bus bar.

### 10.1.11 POWER ELECTRONICS LABORATORY

NISE has established facilities for testing and evaluation of Solar Inverters/ power conditioning Units (PCU) of capacity ranging up to 100 KVA. All types of PCUs, hybrid, standalone, Grid-tied inverters (GI) pump controllers and Charge Controller can be tested. A total of 15 inverters were tested as per International standards and MNRE specifications.





- A 4 probe jig design with 3 gold probe for voltage and current collection customized for the current collection of solar cell and design

Development of solar jig for solar cell testing design

### 10.1.12 ADVANCED SPV SYSTEMS AND LIGHTING LABORATORY

In the FY 2019-2020, lighting system Laboratory has initiated testing for Solar Home Cooking System and has put through a new Integrating Sphere with temperature controlled system specifically designed to test photometric and colorimetric performance as per IES LM-82 and LM-79 recommended practices. NISE has revised the technical specifications and design guidelines for various MNRE Advanced SPV Systems and Lighting Laboratory at NISE programmes. This lab has tested and certified 52 different samples for various indoor and outdoor application such as Solar Street light, Solar Home lighting system, Solar Power Pack (DC & AC model) and Charge controllers as per MNRE, User specifications and Standards.

### 10.1.13 BATTERY TEST & CHARACTERIZATION

The Battery Test & Characterization laboratory has applied for the NABL accreditation for different tests under different standards. The battery test & characterization laboratory is engaged in different analysis, performance evaluation & research work as follows: (i) Development of Testing Profile/Test Methodologies for emerging battery technologies, (ii) Life Cycle Tests on different secondary battery, (iii) Exploring Battery health analysis technique, (iv) Degradation Analysis of secondary battery/Effect of different parameter on the degradation of battery. A total of 8 batteries were tested as per different National/International Standards.

### 10.1.14 SOLAR WATER PUMPING TEST FACILITY

NISE has a fully Automated SPV Water pump system testing facility for 0.5 HP to 10 HP pump capacity for both submersible and surface pump. A total of 41 solar water pumps Submersible AC/DC and Surface AC/DC pumps have been tested in the year 2019-20. An enhancement of testing capacity of Solar Water





*Advanced SPV Systems and Lighting Laboratory at NISE*

Pump from 100 meters head to 400 meters head was developed in this solar water pumping test facility at NISE.

#### **10.1.15 SOLAR THERMAL TECHNOLOGIES, RESEARCH, TESTING & CERTIFICATION**

NISE has undertaken various research projects on solar thermal energy for cooking, heating, cooling, power generation, process heat applications, desalination, thermal storage, bulk milk chilling system using thermal storage, cold storage facility with thermal storage and in-house research and development etc. In the area of Solar Thermal Power Generation Technologies, various RD&D Projects have been setup in the campus of NISE with financial assistance from the Ministry of New and Renewable Energy. During the FY 2019-20, a total of 4 solar thermal technologies were tested and certified at NISE.

#### **10.1.16 SOLAR THERMAL RESEARCH AND DEVELOPMENT PROJECTS**

An R&D Project was sanctioned by MNRE for completion of the pending works and achieving the objective of a project on 'Central Receiver Facility' during March, 2018. NISE undertook repair, overhauling and refurbishment of the major sub-systems and preliminary operation of 50 kW<sub>th</sub> receiver for focusing on the target as well as cavity of the receiver.

#### **10.1.17 HYDROGEN ENERGY CENTRE & FUEL CELL TESTING**

A R&D Project entitled Setting up of a Centre of Excellence on Hydrogen Energy at National Institute of Solar Energy (NISE), Gwal Pahari, Gurugram, supported by the Ministry of New and Renewable



Energy on 28th February, 2019 was initiated with the objectives of (i) operating and maintaining the existing hydrogen production cum dispensing station, (ii) augmenting its hydrogen production capacity by installing another electrolyser, (iii) facilitating completion of field trials and demonstration of hydrogen fueled vehicles at NISE, and (iv) organizing workshops, training and awareness programmes on different aspects of hydrogen energy. The following activities have been undertaken during 2019-20 (up to 31.12.2019); (i) Recruitment of the sanctioned manpower under the project; (ii) Placing an order for Annual Maintenance Contract on the supplier of the existing hydrogen production cum dispensing facility for acceptance based on the offer received from then for this purpose; (iii) Placing an order for supply of recommended spares for the facility based on an offer received from the supplier; and (iv) Issuing an International Competitive Bid for procurement of an electrolyser of 10 Nm<sup>3</sup>/hr capacity for augmenting hydrogen production capacity of the existing facility.

#### 10.1.18 TRAINING AND SKILL DEVELOPMENT

NISE is organizing various skill development programmes throughout the country in the field of solar energy at NISE in association with partner institutes across India. The focus of these programmes is on technology development, system design, installation, commissioning, operation & maintenance and repair, etc. NISE is also organizing training programmes for start-ups, solar PV roof top projects, SPV pumps, solar thermal technologies, hydrogen energy and fuel cells. A dedicated training programme on Renewable Energy Technologies for senior defence officers is conducted every year. NISE has also started a long term programme for solar professionals for six months duration 13th August 2019 to 12th February 2020. A total of 10 training programs on various aspects of Solar Energy were conducted for imparting training to 244 participants at NISE.



*Renewable Energy Training Program for Armed Force Officials conducted at NISE*





*International Training Programme on Solar Energy Technologies & Application (ITEC) conducted at NISE*

#### 10.1.19 INTERNATIONAL TRAINING PROGRAM

The Ministry of External Affairs, Govt. of India has identified NISE as a premier institute to conduct Indian Technical and Economic Cooperation (ITEC) Programme every year for international participants along with other international programmes like Indo African Forum Summit (IAFS). NISE has conducted five International Programmes in FY 2019-20. A total of 156 participants from 55 countries have participated in these International Training Programmes. These programmes are for duration of three-weeks, focused on latest Solar and Renewable Energy Technologies. NISE targets to complete three more International Training Programmes (30 participants each) in the FY 2019-20.

#### 10.1.20 SURYAMITRA TRAINING & PLACEMENT

NISE is implementing Suryamitra training program to train the ITI/diploma holders as a skilled workforce/field technicians for installation, commissioning, operation and maintenance of solar technology to execute National Solar Mission (NSM) programme across the country. A network of institutions through Training Partners help conduct these training programmes. Since inception, a cumulative number of 1,079 programmes have been conducted by NISE and other implementing agencies approved by it and a total of 31,092 Suryamitras have been imparted trainings under this programme up to 31-03-2019. A number of 11,646 Suryamitras have been trained at 228 Training Centres (TCs) across different States during 2019-20 till 31-12-2019. The state-wise progress is given in **Table 10.1**.



**Table 10.1: Progress of Suryamitra Skill Development Programme**

Sl. No.	State/UTs	Number of Suryamitras Trained till 31.03.2019	Number of Suryamitras Trained during 01.04.2019 to 31.12.2019	Total Suryamitras trained as on 31.12.2019
1	Andhra Pradesh	1308	414	1722
2	Arunachal Pradesh	30	0	30
3	Assam	833	387	1220
4	Bihar	1139	453	1592
5	Chandigarh	148	60	208
6	Chhattisgarh	1227	526	1753
7	Delhi	432	180	612
8	Goa	174	90	264
9	Gujarat	2136	680	2816
10	Haryana	937	420	1357
11	Himachal Pradesh	324	90	414
12	Jammu & Kashmir	244	90	334
13	Jharkhand	517	179	696
14	Karnataka	1371	256	1627
15	Kerala	495	180	675
16	Lakshadweep	30	0	30
17	Madhya Pradesh	2522	1090	3612
18	Maharashtra	2933	999	3932
19	Manipur	150	0	150
20	Nagaland	60	0	60
21	Orissa	1766	270	2036
22	Puducherry	62	0	62
23	Punjab	323	30	353
24	Rajasthan	2006	826	2832
25	Tamil Nadu	2142	929	3071
26	Telangana	1914	956	2870
27	Tripura	148	30	178
28	Uttar Pradesh	2608	1084	3692
29	Uttarakhand	680	206	886
30	West Bengal	2433	1221	3654
	<b>Total</b>	<b>31,092</b>	<b>11,646</b>	<b>42,738</b>





*Suryamitra Trainees at Synchro Serve Global Solutions Pvt. Ltd., Hyderabad, Telangana*



*Suryamitra Trainees at Mahindra Susten, Maharashtra*

#### **10.1.21 DESIGN, INSTALLATION & COMMISSIONING OF SOLAR WATER PUMPING SYSTEM – VARUNMITRA TRAINING PROGRAMME**

Solar Water Pumping System is anticipated to attain an impressive growth in Global market and while witnessing to its allied activities in irrigation, farming, drip irrigation, drinking, cooking, etc. NISE has aimed to impart a trained manpower for solar water pumping system. NISE, under the sponsorship of MNRE has started a solar water pumping course known as Varunmitra Training Program. The main objective of the programme is to impart knowledge in understanding of site feasibility, water table, efficiency and different types of heads, solar water pumping components such as DC- DC converter, inverter, battery, motors, pump – motor set etc. This course provides a hands on practise for Solar PV





Water Pumping System. During the year, a total of 20 programmes were started at various institutions. NISE has allocated 15 institutions in 13 states for implementation of this programme. A total of 425 participants were trained in the Varunmitra Training programme on PAN India Basis. The course shall follow SGJ/Q0112 (SGJ/N0134) Qualification Pack of SCGJ.

#### **10.1.22 SOLAR ANALYTICS SKILL DEVELOPMENT PROGRAMME**

The Solar Analytics programme aims to develop Centre of Excellence (CoE) on analytics for organization as well as developing skills for managing the same. The program encompass the combination of solar domain with the technology like Internet of Things (IOT), Machine Learning, predictive modelling, forecasting, optimization which has to be understood by utility/solar plant engineers and decision makers to carve differentiator for their utility operations in resolving day to day problems. NISE has completed one Solar Analytics Skill Development Programme and shall complete further two more solar analytics training programme in NISE.

#### **10.1.23 ADVANCED PROFESSIONAL COURSE & ROOFTOP GRID PROGRAMME**

- (i) NISE is organising a flagship training program for young professionals. This advanced solar professionals course is a new job oriented and technologically advanced training program. The Advanced Solar Professional Course was launched on 6th Feb 2018. This course aims for a trained manpower readily available to the Indian Solar Power sector in line with its present and future requirements. This course profile covers the solar energy concepts for both technical and non-technical individuals (business persons). During the year, 32 participants were awarded certificates on successful completion of 2nd batch (8th October 2018- 7th April 2019) for this course. The Third Batch with 20 Participants was started on 13th August 2019 at NISE Campus in which 22 nos. of candidates have joined the course.
- (ii) During 2019-20, two Rooftop Solar Grid Engineer training programmes were organised by NISE to improve knowledge and enhance skills of professionals and businessmen in the field of Solar Rooftop Grid-tied systems which is based on National Skill Development Corporation (NSDC) approved / certified Qualification Pack (QP) SGJ/0106. In the FY 2018-19, NISE has conducted 22 Rooftop Solar Grid Engineer Training Programme across the country. These training programmes were fully funded by MNRE. A total of 923 participants were trained & imparted knowledge across different states for rooftop solar grid tied system.

#### **10.1.24 FIVE – DAY SKILL DEVELOPMENT PROGRAM ON SOLAR PV SYSTEM DESIGN USING PVSYST & PVSOL SOFTWARE WITH COST ECONOMICS AND POLICIES**

NISE has organized three training program (20th edition, 21st edition and 22nd edition) on Solar PV System Design Using PVSYST & PVSOL Software with Cost Economics and Policies under simulation lab. The total 60 Participants register this training program and all are successfully completed this. This program basically skill the participants in solar application and designing of solar power plant on grid as well as off grid.

#### **10.1.25 SOLAR ENERGY INTERNSHIP PROGRAM**

NISE is implementing solar energy internship program for B.Tech/M.Tech/M.Sc/Ph.D students for their research project in various Testing and R&D laboratory. A total 11 number of B.Tech/M.Tech/M.S. students were completed their thesis/project research work in various Testing and R&D laboratory at NISE in the financial year 2019-20.





### 10.1.26 COORDINATION ACTIVITIES

NISE has signed Memorandum of Understanding (MoU) with various organisations to operate a collaborative venture for development and dissemination of solar energy in the country and to ensure a clean energy environment. During 2019-20, NISE signed 11 MoUs with National Organisation/Agencies & 3 MoUs with International Organisation/Agencies. The list of MoUs are given in **Table 10.2** and **10.3**.

### 10.1.27 CONSULTANCY SERVICES

NISE is extending various consultancy services such as site survey, preparation of Detailed Project Report, Solar System Design, vetting of tender documents and specifications, Project management &

**Table 10.2: List of MoUs Signed with National Organizations/Agencies**

S. No.	MoU	Date of MoU Signed	Date of MoU valid up to
1.	NISE & GERMI, Gandhinagar	8th April, 2019	--
2.	NISE & RTPL (Ruchi Telecom Private Limited), New Delhi	15th May, 2019	14th May, 2022
3.	NISE & University of Lucknow, Lucknow	4th July, 2019	3rd July, 2024
4.	NISE & National Productivity Council (NPC), New Delhi	24th July, 2019	23rd July, 2024
5.	NISE & Ministry of New & Renewable Energy (MNRE)	25th July, 2019	31st March, 2020
6.	NISE & Shri Mata Vaishno Devi University, J&K	2nd August, 2019	1st August, 2024
7.	NISE & Gautam Buddha University, Greater Noida	29th August, 2019	28th August, 2024
8.	NISE & MSIT Kolkata (Meghnad Saha Institute of Technology, Nazirabad, Kolkata)	23rd September 2019	22nd September 2024
9.	NISE & IISc Bangalore	9th October, 2019	8th October, 2024
10.	NISE & NSDC- Schneider Electric- Power Sector Skill Council for Setting up of Centre of Excellence at NISE	6th November, 2019	5th November, 2024
11.	NISE & Department of Horticulture, J&K Government	13th November, 2019	(up to the completion of project)

**Table 10.3: List of MoUs Signed with International Organizations/Agencies**

S. No.	MoU	Date of MoU Signed	Date of MoU valid up to
1.	NISE & UNIDO, Vienna, Austria United Nations Industrial Development Organization	7th August, 2019	-----
2.	Memorandum of Agreement between NISE & CEA-INES, France on cooperation in Hydrogen Technology	22nd August, 2019	-----
3.	Implementation Agreement PTB & NISE	26th November, 2019	(up to the completion of project i.e. August 2019 to July 2022)



**Table 10.4: Projects completed by NISE consultancy during 2019-20**

S. No.	Vendor Name/Company Details	Description of the Project and Capacity in (MW)
1	M/s Vivaan Solar Pvt. Ltd. Garrison Engineer I, Air Force, MES Lohegaon, Pune, Maharashtra, 411032	1 MW ( MES, Nagpur Project)
2	M/s Vivaan Solar Pr.t. Ltd. Mauja Mahavan Khadar, Mauja Mahavan Khadar, Tehsil Mahavan, Mathura, Uttar Pradesh, 281001	1 MW (MES, Chakeri Project)
3	M/s Vivaan Solar Pvt. Ltd. Garrison Engineer I, Air Force, MES Lohegaon, Pune, Maharashtra, 41 1032	1 MW (MES Ojhar Project)
4	M/s Phoenix Infra No. 15B, 2nd Floor, 4th Cross T. Aswathnarayana Road Thirumala Nagar, yelahanka, Bangalore-560064	MMS Drawing for Vetting LEH Air Force Project
5	M/s Perfect House Pvt. Ltd. M-7, Addl, Midc, Satara-415004, Dist-Satara, Maharashtra	500 KW (Air Force Station, Deoli, Nagpur)
6	M/s Lumos Infra Pvt.Ltd. 44-A, Laxmi Plaza, Cantt. Road, Lucknow-226001	Design and Drawings vetting of 600 KW (AC) Solar Power plant, MES Bamrauli at Allahabad
7	M/s SM Renergy Pvt. Ltd., Flat # 4A/1, D.No.9-14-6, 3rd Floor, Balaji's Mangalagiri Chambers, VIP Road, Siripuram, Visakhapatnam-530003.	Design and Drawings vetting of 450 KW Solar Power Plant at MES Meerut
8	M/s SM Renergy Pvt. Ltd., Flat # 4A/1, D.No.9-14-6, 3rd Floor, Balaji's Mangalagiri Chambers, VIP Road, Siripuram, Visakhapatnam-530003.	Design and Drawings vetting of 100 KW Solar Power Plant at NCS Vishakhapatanam
9	M/s Lumos Infra Pvt.Ltd. 44-A, Laxmi Plaza, Cantt. Road, Lucknow-226001	Design and Drawings vetting of 2 MW Solar Power Plant at MES, Meerut
10	M/s Lumos Infra Pvt.Ltd. 44-A, Laxmi Plaza, Cantt. Road, Lucknow-226001	Design and Drawings vetting of 2 MW Solar Power Plant at MES, Meerut
11	M/s Reva Ultra Mega Solar Limited, Urja Bhawan, Link Road No. 2, Shivaji Nagar, Bhopal-462016	Consultancy Services
12	M/s Phoenix Infra No. 1, Zangskar Dambuchan, Leh Ladaka, Jammu, Jammu and Kashmir -194101	Design and Drawings vetting (1.5 MW)

EPC advisory, Solar Feasibility Report on Solar Photovoltaic & Solar Thermal Technologies, solar power plant performance, evaluation & monitoring in the field, and testing & performance of the solar systems with the help of Mobile Lab facilities etc. The Projects completed by NISE consultancy (2019-2020) is given in **Table 10.4**.

## 10.2 NATIONAL INSTITUTE OF WIND ENERGY (NIWE)

10.2.1 NIWE's main activities include Wind & Solar Radiation Resource Assessment; preparation of standards for wind turbines; testing and certification of wind turbine and associated systems; information dissemination; human resource development; and offer various consultancy services to customers. The major activities of NIWE during this period are given below:





### 10.2.2 WIND SOLAR & OFFSHORE RESOURCE MEASUREMENTS DIVISION

- (i) Wind Resource Assessment (WRA) programme data is being used widely to establish wind farms in the country. The wind farms established in the country is generally based on the reference data collected under the WRA programme. Under this program of the Ministry, 889 dedicated wind monitoring stations have been established with the support of State Nodal Agencies. In addition, the division has initiated Wind Resource Assessment studies using 90 nos. of existing telecom towers of M/s. Airtel & M/s. BSNL in the North Eastern region and data collection from these towers are under progress. As on date, 133 Wind monitoring stations are under operation. In the current year, 14 nos. of 50 m wind monitoring Stations, 12 nos. of 100 m wind monitoring stations were established and 72 nos. of telecom towers in NE region are mounted with wind sensors and data loggers for collecting the wind data.
- (ii) Further, during this year, 18 sites have been registered for wind measurement by private sector from various States in India. The wind data from over 14 private Wind Monitoring stations have been analysed. Three consultancy projects focused in various wind farm developmental needs were undertaken for a variety of clients from public/government/private sector during this period.

### 10.2.3 GEO-TAGGING OF WIND TURBINES INSTALLED ACROSS THE COUNTRY

At present, the installed capacity of wind generation in India stands at about 37000 MW with equivalent number of wind turbines. However, there was no centralized system for maintaining this vast database. Considering the requirements of the centralized system, under the directions of MNRE, NIWE has developed a geo-tagged data base / online registry web portal of wind turbines already installed and proposed to be installed across the country with the support of central and state agencies. With the continuous efforts, NIWE has collated wind turbine details to the tune of 34 GW (which includes both full data, partial data and the double entries) as on date. NIWE has also developed a web portal for data management and the collected data is quality controlled and loaded into the portal.

### 10.2.4 120M WIND POTENTIAL MAP

Wind Turbine technology has evolved significantly over the last decade with emphasis on greater energy capture and improved capacity utilization factor. Modern turbines have larger rotor diameter and higher hub heights. Hence, it became necessary to identify areas which have wind potential at higher heights. Considering this and using advancements of mapping techniques, wind potential assessment of the country at 120m hub height was undertaken by NIWE under the directions of MNRE. Based on the analysis, the indicative wind potential of India is estimated as 695 GW at 120m agl. The high wind potential regions with better CUF is distributed in the States of Andhra Pradesh, Gujarat, Karnataka, Maharashtra and Tamil Nadu and scattered potential areas are observed to be in Kerala, Madhya Pradesh, Telangana and Rajasthan.

### 10.2.5 OFFSHORE MEASUREMENTS OFF GUJARAT COAST

- (i) LiDAR based measurements for 2 year have been completed at Gulf of Khambhat off Gujarat coast. Raw data files (time series) of LiDAR measurement carried out at Gulf of Khambhat has been uploaded in NIWE website. NIWE has completed Geo-physical investigation (single beam bathymetry survey, side scan sonar, sub-bottom profiling, magnetometer survey and sediment sampling) covering the entire area 369 Sq km for developing 1GW offshore project at Gulf of Khambhat off Gujarat Coast and the final report is under process. Based on the Geo-physical results, the recommended five bore-hole locations for geotechnical studies have been finalized.





- (ii) Rapid Environmental Impact Assessment for developing 1 GW offshore wind farm project at Gulf of Khambhat is being carried out by NIWE through National Institute of Oceanography (NIO). Field data collection was completed by July 2019 and draft report has been submitted and comments are sought from the stakeholders for the finalization of the report.

#### 10.2.6 WIND TURBINE TEST STATION (WTTS)

Wind Turbine Research Station is having cumulative installed capacity of 6400 kW wind turbine for conducting various R&D related activities in addition to type testing facilities of large WEG and Small Wind Turbine performance testing facilities at the Test Beds created with all infrastructure facilities at the Research Station. The testing facilities are certified as per the requirements of ISO 9001:2015 and accredited as per the requirements of ISO / IEC 17025:2017. During the year, WTTS was reaccredited by NABL per the requirements of ISO/IEC 17025:2017 for both Electrical and Mechanical parameters with validity from 07.03.2019 to 06.03.2021. Further during the year, Power curve measurements of two numbers of 2000 kW WTG, two numbers of power performance test, type testing of a 750 kW was completed. Type testing of a 5.5 kW Small wind turbine was also carried out during this year.

#### 10.2.7 RESEARCH & DEVELOPMENT

- (i) NIWE carries out in-house R&D through networking in research relevant areas with a mutually beneficial interdisciplinary approach for most of the projects. Strategic collaboration that could assist in most suitable technological developments for our country is nurtured by funding and technical support. During the year, NIWE has taken three in-house R&D projects namely Design and Development of Indigenous Grid Emulator and LVRT Facilities, IoT Based Smart wind farm to enable the real-time remote monitoring and control and Development of Long-term Wind Speed Forecasting using Hybrid Model. In addition, research proposals are solicited from various research / academic institutions, universities, industries, research scholars and consultancy organizations to support Research and development programs by promoting the reliable and novel cost-effective technologies in wind power systems. 14 Research proposals received during this financial year. Based on the novelty executed by the PI the project will be funded based on the NIWE's research council's recommendations.
- (ii) During 2019-20, 132 graduate and post graduate students/faculties have completed their internship / project work and twenty graduate and post-graduate students are presently pursuing Internship and project work at NIWE in the field of Wind and Solar energy mentored by various subject matter experts. As per the Research Council guidelines, NIWE had initiated a sustained discussion with various industry and premier academia groups for conducting workshop to identify R&D Areas and to create the hub of synergy for all wind related research in India. In order to establish this amalgamation and have a good number of collaborative R&D funded projects, the 2nd PAN India research meet was conducted during 6th January, 2020 at MNIT Jaipur.
- (iii) The activities for Hybridize, a research project approved by DST-IFD (Department of Science and Technology and Innovation Fund Denmark) a kick off meeting has been completed. The activities as per schedule of the project are under progress. The draft MOU with IIT-KGP is under preparation.
- (iv) The Ministry of Foreign Affairs of Denmark (MFA) has awarded a project Maintenance and Repair Strategy for Wind Energy Development with a grant of Danish Kroner 4,682,078 from DANIDA/ Danish Development Foundation under Danish-Indian joint development projects, wherein NIWE is collaborating with DANIDA for the said project. Signing of collaboration agreement between NIWE and DANIDA will be carried out during 2020.





### 10.2.8 WIND AND SOLAR FORECASTING

NIWE has developed indigenous wind and solar power forecasting model along with in-house Data management system, Monitoring System, Web portal, forecast simulation tools and security system. NIWE has created an operational forecast system with simulation tools, to predict the wind power up to 7 days ahead. In order to improve the forecasting model, NIWE has signed MoU with ISRO SAC for Development of Wind and Solar Power Forecasting using High Resolution Numerical Model. Currently, NIWE has developed the indigenous Intra-day forecasting model and also carrying out various activities to improve/fine-tune the day ahead model from the inputs received during the delivery of pilot operational forecasts to RE SLDCs. NIWE has signed MoUs with SLDC's of Tamilnadu, Gujarat, Andhra Pradesh, Karnataka, Maharashtra & SRLDC for providing wind/solar power forecasting services. The Pilot Wind/Solar power forecasting services have been initiated for Tamilnadu, Gujarat, Karnataka, Andhra Pradesh, Maharashtra and SRLDC (NP Kunta Solar Park & Chandragiri wind farm).

### 10.2.9 SOLAR RADIATION RESOURCE ASSESSMENT

As part of SRRA program of the Ministry for solar radiation assessment in the country 125 SRRA stations are set-up. Under this program, NIWE had earlier prepared the Solar Radiation Atlas, a first of its kind combining satellite-derived data and the world's largest high quality network of simultaneously measured solar ground data. During the year, NIWE had developed a mobile app SWurja featuring the Wind, Solar and Hybrid maps of India with relevant wind and solar data in each map. By selecting a location on the map, wind and solar data can be retrieved and viewed. The app also features a solar AEP calculator. The app is a green energy tool which provides information to the user on the Wind, Solar & Hybrid (wind & solar) resource data of any given location including roof top across the country. During the year, NIWE has carried out calibration of 30 Pyranometers and 15 Pyrhelimeter under SRRA mode and 31 Pyranometers under commercial mode.

### 10.2.10 CERTIFICATION & IT DIVISION

- (i) During the year, NIWE has successfully submitted application along with requisite documentation as per IS/IEC 17065 standard requirement with National Accreditation Board for Certification (NABCB), Quality Council of India in connection with obtaining accreditation for the certification services. Interactions with M/s. TUV Rheinland Industrie Service GmbH and M/s. TUV Rheinland (India) Private Ltd. in connection with the cooperation agreement have been completed and the activities are under progress.
- (ii) Establishment of new IT infrastructure such as N-computing, Desktops & Workstations, Servers, Networks, Storage, Data Centre, Disaster Recovery System, Biometric System and upgradation of fire wall have been completed. The IT infrastructure monitoring tool and IT policy are under progress.

### 10.2.11 STANDARDS AND REGULATION DIVISION

- (i) NIWE is entrusted with the preparation of Indian Standards on wind turbines under the Committee, viz., Wind Turbines Sectional Committee (ETD 42) and NIWE, which is a part of BIS ETD 42 committee, provides the technical support to BIS in all the standards related work. Based on the contribution, nine Indian standards on wind turbines have already been finalized, so far. During the year (April to November 2019), one Indian standard has been finalized. Further, NIWE provides the technical support to BIS regularly on the works related to International Electrotechnical Commission (IEC) standards including voting for draft IEC standards at IEC TC 88 Committee. IEC has formulated a separate system for the





renewable energy sector viz., IEC System for Certification to Standards relating to Equipment for use in Renewable energy Applications (IECRE system). Based on the efforts taken by NIWE and MNRE, BIS has already obtained the membership for India in IECRE system. NIWE is providing the technical support regularly to Central Marks Department (CMD) of BIS on IECRE related works.

- (ii) Considering the need to formulate a new certification scheme for India which takes into account of the latest standards etc., as per the directions of the Ministry, NIWE has prepared an Indian Wind Turbine Certification Scheme. A comprehensive certification scheme viz., Indian Wind Turbine Certification Scheme (IWTCS), which is the first of its kind covering various aspects of certification till the disposal of wind turbines. The scheme covers Prototype Certification & Type Certification for wind turbines; Project Certification, Failure reporting of installed wind turbines, Safety and Performance assessment and De-commissioning. The draft document has been submitted to MNRE.
- (iii) During the year, NIWE has successfully undergone the recertification audit of quality management system as per ISO 9001:2015 and the ISO certificate for NIWE has been issued with the extended validity. Further, during the year, S&R division has issued recommendation letters in connection with grid synchronization for four (4) prototype wind turbine models for the purpose of Type Testing with the rated capacity from 750 kW to 2600 kW. NIWE will be hosting IEC TC 88 and IECRE meetings during 16-17 March 2020 and 18-20 March 2020 respectively.

#### 10.2.12 SKILL DEVELOPMENT AND TRAINING DIVISION

- (i) During the year 2019, the following training courses have been conducted successfully.
  - 04th Special International Training course on Wind Resource Assessment and Wind Farm Planning for ITEC countries held from 28.08.2019 to 20.09.2019 with 16 participants from nine countries.
  - 03rd Special International Training Course on Design Installation & Maintenance of Small Wind Turbine held from 28.08.2019 to 24.09.2019 with 26 participants from nine countries.
  - 24th International Training Course on Wind Turbine Technology and Applications for ITEC Countries scheduled from 23.10.2019 to 19.11.2019 with 28 participants from 18 countries.
  - 07th Special international training course on Wind Turbine Technology and Applications especially for African Countries held from 24.10.2019 to 21.11.2019 with 26 participants from 16 countries.
  - Special International Training Course on Solar Resource Assessment and Development of Solar Power Plant under ITEC programme from ISA Member Countries held from 27.11.2019 to 20.12.2019 with 21 participants from 20 countries.
  - 25th International Training Course on Wind Turbine Technology and Applications for ITEC partner countries under ITEC program with 30 participants.
  - Scaling up of Renewables (Wind and Solar) Generation with Focus on Policy Initiatives specially for BIMSTEC Countries under ITEC program with 25 participants.
- (ii) The third IREDA-NIWE Annual Award ceremony for wind energy will be conducted during March, 2020. The award is to promote innovation, research & development, manufacturing, developing & harnessing wind energy at the State and National levels and to motivate individuals, stakeholders to strive for the best in the field.





### 10.2.13 GLOBAL WIND DAY CELEBRATIONS 2019

Global Wind Day is a worldwide event that is supported by Global Wind Energy Council (GWEC) jointly with the European Wind Energy Association (EWEA) on June 15 every year. It is a day for discovering wind, its power and the possibilities it holds to change our world. On 15th June, hundreds of public events are organized all over the world, to create awareness on Wind Power. Similarly, the Global Wind Day 2019 was celebrated at NIWE. As part of the Celebration, NIWE has announced competitions for School Students and also a capacity building workshop for School Teachers towards creating awareness among school level. Accordingly, the following events were conducted on 12th June 2019 at NIWE with support of National Green Corps (NGC), Chennai.

- **Drawing** competition on the title Use of Renewable Energy Sources for Sustainable Environment.
- **Elocution** competition on the title: Wind Energy Development in India.
- **Capacity building Workshop** on Wind Energy Technology for School Teachers.

### 10.3 SARDAR SWARAN SINGH NATIONAL INSTITUTE OF BIO-ENERGY (SSS-NIBE)

10.3.1 Sardar Swaran Singh National Institute of Bio-Energy (SSS-NIBE) earlier known as SSS-NIRE, Kapurthala (Punjab), an autonomous Institution of the Ministry of New and Renewable Energy, Govt. of India, is a centre of excellence in the field of bio energy. The objectives of the Institute is to carry out and facilitate research, design, development, testing, standardization & technology demonstration eventually leading to commercialization of RD&D output with a focus on bioenergy, biofuels & synthetic fuels in solid, liquid and gaseous forms for transportation, portable & stationary applications, development of hybrid/integrated energy systems, to undertake & facilitate human resource development and training in the area of bioenergy. The Institute has drafted a vision plan for next 10-years and submitted a comprehensive project proposal Establishing pilot scale testing facility in the broad spectrum of bioenergy to emerge as Global Centre of Excellence in Bioenergy.

10.3.2 Several projects on different R&D processes for biofuels and bioenergy are in progress in different divisions:

#### 10.3.3 THERMOCHEMICAL CONVERSION DIVISION

(i) The Institute has developed the biomass cookstove testing laboratory as per revised BIS@2013 and testing of commercial cookstove is ongoing as per request from different commercial entity. Biomass cookstove testing centre is equipped for testing of different parameters such as  $\text{CH}_4$ ,  $\text{NO}$ ,  $\text{SO}_2$ ,  $\text{CO}$ ,  $\text{CO}_2$ ,  $\text{O}_2$ , particulate matter, temperature, etc. The testing of Biomass Cookstove is carried out as per BIS Standards.

(ii) During FY 2019-20, an improved biomass cookstove (IBC) was designed and tested out by using woody fuel to reduce carbon emissions with higher efficiency. The performance of IBC was evaluated in terms of energy efficiency, power output and emission reduction potential. For the experimentation, two different designs of IBC were taken with varying insulation material (one using Plaster of Paris and the other using glass wool) in between. It was concluded that the glass wool based IBC performed better in terms of efficiency and emissions. An article based on the research work was presented in International Conference on Advances in Energy Research, held in IIT Bombay during December 2019.





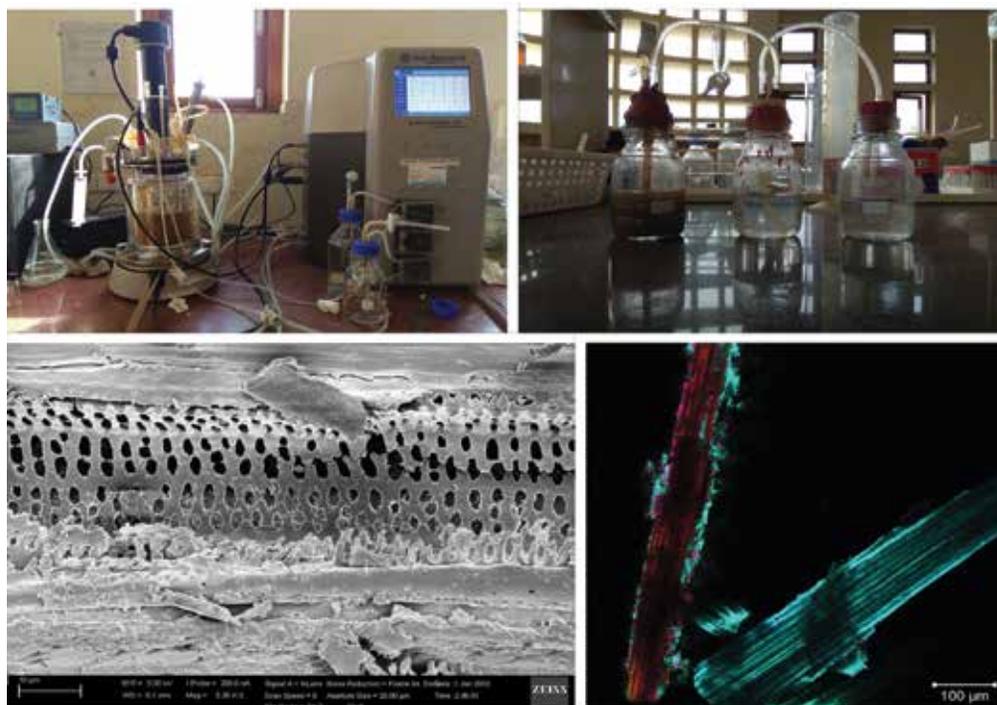
*Working at biomass cookstove testing lab at National Institute of Bio-Energy*

### 10.3.4 BIOCHEMICAL CONVERSION DIVISION

Biochemical Conversion Division has various research projects funded by the Department of Biotechnology that are going on:

### 10.3.5 BIOREFINING OF SUGARCANE BAGASSE FOR PRODUCTION OF BIOETHANOL AND VALUE-ADDED PRODUCTS

A project entitled ‘Biorefining of sugarcane bagasse for production of bioethanol and value-added products’ under Indo-Brazil bilateral collaboration with IFSC/USP, Brazil and GNDU, Amritsar, funded by the Department of Biotechnology (DBT), Ministry of Science and Technology is going on since May 2016. The project cost from Indian side is INR 129.264 lakhs. Till now, optimized pretreatment studies of SCB have been conducted successfully followed by enhanced production of bioethanol via optimized



*Bio-refinery Laboratory at National Institute of Bio-Energy*



conventional and developed fermentation (SHF & SSF) processes. Biophysical characterization had been conducted successfully in our collaborator's lab at IFSC/USP, Brazil during the 18 months visit of research fellow (May 10, 2018-November 9, 2019). During the same visit, process of simultaneous isomerisation and fermentation (SIF) was also developed for enhanced pentose (xylose) utilization by external xylose isomerase to the fermentation medium rather than complicated, time and energy consuming pre-isomerisation followed by fermentation.

### 10.3.6 BIOREFINERY APPROACH FOR GENERATION OF PLATFORM CHEMICALS AND BIOETHANOL FROM INDIGENOUS LIGNOCELLULOSIC AGROWASTE BIORESOURCES

- (i) A project entitled 'Biorefinery approach for generation of platform chemicals and bioethanol from indigenous lignocellulosic agrowaste bioresources' has been sanctioned by DBT. The project cost is INR 69.60 lakhs. The project was taken up with effect from Oct 26, 2017.
- (ii) The objective of project is to process lignocellulosic waste specially grown in North East region i.e. Saccharum spontaneum (Kans) grass and banana pseudostem for bioethanol and platform chemicals. This project is to be performed in collaboration with Tezpur University, Assam. Our institute has to take care of bioethanol production from lignocellulosic wastes and characterization of end products. The pre-treatment of kans grass using different chemicals acid or alkali has been optimized. Further, the pre-treated biomass under optimized conditions will be used for ethanol production by simultaneous saccharification and fermentation (SSF) method using in-house thermos-tolerant yeast and commercial cellulases enzymes.

### 10.3.7 CHEMICAL CONVERSION DIVISION

Many possibilities have been explored so far for replacing petro-diesel with biodiesel and hybrid fuel, but none of these bio-fuels could completely substitute the petro-diesel with or without modification in the CI engine. Keeping all the alternative options open following R & D studies were conducted during the year in Chemical Conversion laboratory.

- (1) An investigation was carried out for the production of green diesel from waste cooking oil (WCO) by hydro-processing and TBP distillation. The fuel properties of the green diesel thus produced were estimated using ASTM/EN standards and thereafter green diesel (G100) and its blends (G10, G20, G30 & G50) were used as fuel in a CI engine to analyze the effect on engine combustion, performance and emission characteristics. The results obtained were compared with petro-diesel, optimized biodiesel blend B30 and hybrid fuel (HB-1) to explore its efficacy under same experimental test rig and operating conditions.
- (2) A comparative analysis of production, chemical structure, fuel properties, and cost estimation of waste cooking oil-based bio-diesel, hybrid fuel, and hydro-processed fuels was carried out. Biodiesel was produced by transesterification process; hybrid fuel was prepared by three-phase micro-emulsion process, while hydro-processed fuels were produced via hydro-processing followed by true boiling point distillation as per ASTM D2892 and ASTM D5236 specifications.
- (3) An experimental investigation on production of biodiesel and hybrid fuels from waste cooking oil and analysis of its behavior in an existing CI engine without the alteration of fuel injection settings was carried out. Biodiesel blend B30 showed higher brake thermal efficiency, lower brake specific energy consumption, and lower exhaust emissions (except NO<sub>x</sub> level), whereas, hybrid fuels showed a significant reduction in NO<sub>x</sub> level and comparable other exhaust emissions (except unburnt hydrocarbon) at the cost of lower brake thermal efficiency when compared with diesel.



- (4) An investigation was carried out to study the effects of cetane improver (2-Ethylhexyl nitrate) (2-EHN) on performance, combustion and emission characteristics of a constant speed, single cylinder CI engine fuelled with E20 (bioethanol (20%) – petrodiesel (80%)). A cetane improver, 2-EHN was used at concentration of 1000 ppm and 2000 ppm with the test fuel (E20) and the results were compared to petrodiesel. From the results, it is clearly unveiled that E20 with 1000 ppm of 2-EHN showed better results than E20, E20EHN2000 and petrodiesel.

### 10.3.8 PUBLICATIONS

During 2019-20, 16 publications across various journals, conferences, books, etc. were brought out by scientists from the three divisions of the Institute.

### 10.3.9 VISIT OF FOREIGN DELEGATION

A delegation of Brazilian collaborators including Prof. Igor Polikarpov, PI of the project from Brazilian side along with group members of Prof. Francisco Eduardo Gontijo Guimares and Dr. Vanessa Arnoldi, Postdoc Fellow, visited the Institute during Jul 22-26, 2019 and discussed continuation of our on-going collaboration in biomass enzymatic deconstruction and valorisation of the obtained products. They also used this opportunity to discuss future collaboration between the SSS-NIBE, and the University of São Paulo (USP) in biotechnology and bioproducts aiming to explore synergies between Brazil and India and discussed concrete steps towards submission of joint grant applications, and students and researchers exchanges.

### 10.3.10 TRAINING PROGRAMMES

SSS-NIBE has organized training and skill development programmes to impart knowledge and skills on biogas technologies, a four days National Training Programme on Biogas Technology: Demonstration and its Implementation was organized at the institute during November 5 - 8, 2019. Training covered several areas related to biogas technology and basics of anaerobic digestion, production of bio CNG, problems faced by investors, in-situ and ex-situ management of biogas and various other aspects. A total of 22 participants including entrepreneurs, academicians, research scholars and master's students from all over the country actively participated in the training program.



*Intracive session with foreign delegation regarding on-going collaboration at SSS-NIBE*





*Group photograph during the national training program on 'Biogas Technology' at SSS-NIBE*

## **10.4 SOLAR ENERGY CORPORATION OF INDIA LIMITED (SECI)**

10.4.1 Solar Energy Corporation of India Ltd. (SECI) is a Section- 3 Company under the Companies Act, 2013, with 100 percent Government ownership, under the administrative control of the Ministry of New and Renewable Energy (MNRE).

10.4.2 The company was set up as an implementing and executing arm of the Jawaharlal Nehru National Solar Mission (JNNSM) for development, promotion and commercialization of solar energy technologies in the country. In 2015, the mandate of the company has been broadened to cover all segments of renewable energy, pursuant to the approval of the Government of India.

10.4.3 During FY 2018-19, it registered a total revenue of Rs.3264.26 crore and profit after tax (PAT) of Rs.129.40 crore.

### **10.4.4 BUSINESS ACTIVITIES**

#### **10.4.5 IMPLEMENTATION OF SOLAR TENDERS UNDER NATIONAL SOLAR MISSION**

- (i) SECI is the MNRE's implementing agency for promotion of solar projects under the National Solar Mission (NSM). In this role, SECI floats tenders on pan-India/state-specific basis for selection of developers for setting up of solar projects, who are selected through a transparent tariff-based e-bidding and e-reverse auction process.
- (ii) SECI also signs long term power purchase agreements (PPA) with the developers for the selected projects and long term power sale agreements (PSA) with various DISCOMs for offtake of power, as a trading intermediary.





*250 MW solar project in Rajasthan commissioned in FY 2019-20 (I)*

- (iii) As on 31.12.2019, SECI has cumulatively awarded capacities of 20331 MW, of which 5305 MW capacity of projects have been commissioned.
- (iv) During FY 2019-20, SECI has issued tenders for 11675 MW capacity and projects totaling 750 MW capacity were commissioned in Rajasthan and Karnataka (till 31.12.2019). Notice inviting tender (NIT) for 1200 MW ISTS connected solar power projects in India (ISTS VIII) has been issued.



*250 MW solar project in Rajasthan commissioned in FY 2019-20 (II)*





#### 10.4.6 MANUFACTURING LINKED SOLAR

With the objective to strengthen India's domestic manufacturing base in solar photovoltaic (PV) technology, SECI has brought out tender for selection of developers for setting up of 7 GW of solar projects combined with 2 GW solar manufacturing facilities. Under the tender, capacity of 4 GW of solar projects with 1 GW of manufacturing plant has been awarded.

#### 10.4.7 IMPLEMENTATION OF ISTS-CONNECTED WIND POWER TENDERS

- (i) SECI is MNRE's nodal agency for implementing large-scale wind power projects in the country. On cumulative basis, SECI has awarded capacities of 9360.54 MW in eight tranches, of which about 1791.6 MW has been commissioned and balance capacities are under various stages of implementation (till 31.12.2019).
- (ii) During the FY 2019-20, two tenders have been issued (tranches-VIII & IX) for setting up of 3000 MW capacity. Total awarded capacity is 2120.64 MW during the year (including from previous tenders).

#### 10.4.8 SCHEME FOR SETTING UP OF GRID CONNECTED ROOF-TOP SOLAR PROJECTS

- (i) SECI implements MNRE's schemes for setting up of grid-connected rooftop solar projects in the country. Under this segment, various tenders brought out by SECI in previous years in CAPEX (investment by roof owner) and RESCO (PPA with roof owner) models have resulted in competitive procurement mechanisms and rapid expansion of the sector.
- (ii) During FY 2019-20, SECI has launched a tender under the Achievement Linked Incentive Scheme of MNRE for setting up 97.5 MW grid connected rooftop solar projects on buildings of Central/State Government ministries, departments etc. Under this scheme, there is provision for incentives of up to Rs. 12,000/- per kW (for general category states) and up to Rs. 31,800/- per kW (for special category states).



*Wind Turbine in SECI tendered project in Tamil Nadu*





#### 10.4.9 SOLAR PARKS SCHEME

SECI is the implementation agency for the scheme for development of solar parks, for providing infrastructural support, viz. developed land and power evacuation facilities, to solar project developers. Under the scheme, 39 solar parks have been sanctioned by MNRE in 17 states with total capacity of 22,879 MW till 31.12.2019.

#### 10.4.10 CPSU SCHEME

Under the scheme (phase-I) being implemented by SECI, projects of 881.76 MW were commissioned (till 31.03.2019). Under phase-II of the scheme, SECI has floated tenders for 2000 MW and 1500 MW capacity of solar projects (Tranches I and II respectively), of which 2026 MW have been awarded (as on 31.12.2019).

#### 10.4.11 SCHEME FOR DEFENCE ESTABLISHMENTS

Under the scheme for setting up of over 300 MW of grid connected and off grid solar PV projects by defence establishments, 117 MW has been commissioned (as on 31.12.2019).

#### 10.4.12 EMERGING TECHNOLOGY AREAS

**10.4.13 Floating Solar-** During FY 2019-20, SECI has awarded capacity of 150 MW floating solar project to be set up in Rihand dam, Uttar Pradesh. SECI has signed PSA with Uttar Pradesh Power Corporation Limited (UPPCL) and PPA with the successful bidders.

SECI is also planning to develop floating solar projects with own investment in Lakshadweep, Uttarakhand and Jharkhand. Technical and environmental due-diligence are in progress.

**10.4.14 Solar wind hybrid-** Under tenders for selection of developers for setting up solar-wind hybrid projects issued by SECI in previous year, 600 MW capacity has been awarded during FY 2019-20, thereby bringing cumulative awarded capacity to 1440 MW. NIT for 1200 MW Connected Wind-Solar Hybrid Power Projects Tranche-III has been issued.

**10.4.15 RE with Energy storage-** SECI is planning to deploy several energy storage systems to address the challenges of grid stability due to increasing penetration of intermittent RE generation. Several systems are being planned under CAPEX projects, and tenders for setting up of RE projects, incorporating energy storage systems, have also been issued:

- **Round the Clock (RTC) RE-** SECI has issued tender for supply of 400 MW Round the Clock (RTC) RE Power to New Delhi Municipal Council (NDMC) & Dadra and Nagar Haveli (DNH) in October, 2019. These tenders are expected to address the base-load requirements of the off-takers through RE, as well as providing generation flexibility to meet the peak demand.
- **RE with peak power supply-** SECI has floated a tender for selection of developers for setting up of 1200 MW ISTS-connected renewable energy (RE) projects with assured peak power supply. This is expected to enable Discoms to meet their peak energy demand at economical rates.

#### 10.4.16 PROJECT DEVELOPMENT

Apart from creating large scale solar and wind capacities of BOO basis through tenders, SECI also engages in development of solar and wind capacities through its own investment and as a project management consultant (PMC). Some of the initiatives are listed below:





*5 MW Solar PV Project in Ibrahimpatnam*

- (i) **Projects under PMC-** SECI is implementing about 350 MW of projects for various entities under PMC mode, of which over 90 MW has been commissioned. Some of the major projects under execution during FY 2019-20 are as follows:
- **300 MW for SCCL-** SECI is undertaking PMC of 300 MW aggregate capacity of solar projects in different locations of Telangana, on behalf of Singareni Collieries Company Ltd. (SCCL). The power plants are being developed in spare land in coal mines for their captive use. The projects of capacity 219 MW are under execution, and for balance 81 MW capacity, detailed project report (DPR) is being prepared.
  - **5 MW for BDL, Ibrahimpatnam** – A 5 MW solar project at Bharat Dynamics Limited (BDL), Ibrahimpatnam has been successfully commissioned by SECI in April, 2019.
  - **6.2 MW for BHU-** SECI is undertaking development of 6.2 MW rooftop solar projects at Banaras Hindu University (BHU), Varanasi. The project is under execution.
  - **50 MW Solar project for THDC-** A 50 MW solar project is being developed in Kasargod, Kerala. The project is under execution.





- (ii) **CAPEX Projects-** SECI has operational projects of 11 MW capacity under its ownership and the company is looking to expand its portfolio in renewable energy. Details of existing and ongoing projects are as follows:
- **10 MW Badi Sid, Rajasthan-** The first solar PV project of 10 MW capacity of SECI was commissioned in Badi Sid, Jodhpur district of Rajasthan on 31.03.2016. The plant has generated about 12.6 MU in FY 2019-20 (till 30.11.2019).
  - **1 MW Andaman & Nicobar (A&N)-** SECI has installed 1 MW rooftop solar power projects in Andaman & Nicobar Islands. The project was commissioned in June, 2017 and is under operation.
  - **160 MW Solar-wind hybrid Project at Ramagiri, Andhra Pradesh-** SECI is planning to develop a 160 MW solar-wind hybrid project with 20 MWh battery storage system (BESS) with World Bank funding. Investment approval of the Government has been obtained. Discussions with the state government for offtake of power are underway.
  - **10 MW Solar PV Project at Karnataka (DRDO) –** A 10 MW solar project is being set up at DRDO, Kolar (Karnataka) for meeting their internal demand. The project is under execution.
  - **Solarization of Lakshadweep islands:** As an initiative towards diesel replacement in island regions, SECI has floated tender for setting up 1.95 MW Solar PV Power Plants with 2.15 MWh BESS. Bidding is in progress. Technical feasibility studies and Environmental and social impact studies (ESIA) are under progress for 20 MW floating solar project with 60 MWh battery storage system.
  - **150 MW Floating solar project in Jharkhand-** SECI is proposing to develop a 150 MW floating solar plant in Getalsud Dam, Jharkhand. Project is under feasibility assessments.
  - **200 MW Floating solar project in Uttarakhand-** SECI is planning to develop a 200 MW floating solar plant in Baur dam in Uttarakhand. DPR and ESIA are under progress.
  - **100 MW Solar PV Project with BESS 150 MWh in Chhattisgarh-** SECI is proposing to develop a 100 MW solar plant with 150 MWh BESS in Rajnandgam, Chhattisgarh. DPR is being finalized.
  - **10 MW Solar PV Project at Hyderabad (DRDO) –** A 10 MW solar PV project is planned to be set up at DRDO, Hyderabad. Feasibility studies are under progress.
  - **20 MW BESS projects in Delhi:** SECI has signed a MoU with BSES Rajadhani Power Limited for developing a 20 MW BESS project in Delhi.
  - **100 MW BESS projects in Delhi:** SECI is planning to develop a 100 MW BESS project in Delhi for improving the grid stability.

#### 10.4.17 POWER TRADING

- (i) SECI is mandated to purchase power from projects set up under RE tenders issued by the company, as a power trading intermediary, and in-turn supplying it to various DISCOMs through long term PPAs/ PSAs.
- (ii) For this role, SECI has a Category-I interstate power trading license from Central Electricity Regulatory Commission (CERC) and is actively trading RE power on both intra-state and inter-state levels.





- (iii) In FY 2019-20, 8049 million units (MU) of electricity have been traded across states and union territories (till 31.12.2019).

## 10.5 INDIAN RENEWABLE ENERGY DEVELOPMENT AGENCY LIMITED

10.5.1 Indian Renewable Energy Development Agency Limited (IREDA) is a Mini Ratna (Category-I) Government of India Enterprise under the administrative control of Ministry of New and Renewable Energy (MNRE). IREDA is a Public Limited Government Company established as a Non -Banking Financial Institution in 1987 engaged in promoting, developing and extending financial assistance for setting up projects relating to new and renewable sources of energy and energy efficiency / conservation with the motto: ENERGY FOR EVER.

### 10.5.2 LENDING OPERATIONS

- (i) During the Financial Year 2018-19, IREDA has sanctioned loans to the tune of Rs. 11941.87 crore (corresponding previous year Rs. 12130.01 crore) and disbursed Rs. 9385.37 crore (corresponding previous year Rs. 8328.38 crore) against the annual target of Rs.15000 crore and Rs. 9315 crore for sanction & disbursements respectively. The above said sanctioned loan (includes co-financed projects/ takeover loans) would support capacity addition of 3266.37 MW. The sector wise breakup of sanctions and disbursements for the said period and the calendar year 2019 are given below in **Table 10.5**.
- (ii) The sector-wise break-up of cumulative sanctions and disbursements up to 31.12.2019 and projected sanctions and disbursements for the period from 01.01.2020 to 31.03.2020 are given in **Table 10.6**.

### 10.5.3 MOU WITH MNRE

Based on the audited accounts of financial year 2018-19, the Memorandum of Understanding (MoU) rating is Very Good. IREDA has also signed MoU with the MNRE for the year 2019-20.

### 10.5.4 RESOURCE MOBILIZATION

Paid up capital of IREDA is Rs. 784.60 crore with a net worth of Rs. 2563.77 crore based on the financial results for the period ended March 31, 2019. During 2018-19, IREDA has raised Rs. 2256.01 crore through International lines of credit.

### 10.5.5 DISSEMINATION OF INFORMATION

IREDA has continued to create awareness of Renewable Energy Technologies, Energy Efficiency & Conservation (EEC) and also its financial assistance schemes by hosting all its publications on its website.

### 10.5.6 HUMAN RESOURCE DEVELOPMENT

- (i) Human Resource is the most important asset of an organization. IREDA gives utmost importance to capacity building and well-being of its employees. In this direction, Training and HR policy of the Company aims to strengthen the business skills and competence of the employees for better performance and productivity. For FY 2019-20, IREDA has achieved 266 training man-days up to 31.12.2019. The MoU target of One week training in premier institutions within India to 15% Executives has been achieved. Also, the web learning programs (15 Nos.) have been rolled out to 15 employees. IREDA has also taken a number of measures to improve performance culture in the Company through policy interventions and improvement of systems and processes. In this regard, Career Path for all employees has been drawn ensuring the career growth of each employee upto E-5 level; IREDA has introduced periodical review of



<b>Table 10.5: IREDA – Sector-Wise Break-up of Loan Sanctions and Disbursements During FY 2018-19</b>				
<b>IREDA – Sector-Wise Break-up of Loan Sanctions and Disbursements During FY 2018-19</b>			<b>Sector-Wise Break-up of Loan Sanctions and Disbursements from 01.01.2019 to 31.12.2019</b>	
<b>(Rs. in crore)</b>				
<b>Sector</b>	<b>Sanction</b>	<b>Disbursement</b>	<b>Sanction</b>	<b>Disbursement</b>
Wind Power	1524.94	1557.16	1841.60	1440.14
Hydro Power	134.36	352.65	328.07	251.28
Biomass and Cogeneration	24.87	46.83	53.87	61.69
Energy Efficiency & Conservation	0	2.47	0	2.00
Solar Energy	5748.62	3828.47	5572.35	3624.11
Waste to Energy	327.14	143.79	376.97	109.38
Biomethanation from Industrial Effluents	0	0	0	0
Biomass Briquetting	0	0	0	0
Biomass Gasification	0	0	0	0
National Clean Energy Fund (NCEF)	0	0	0	0
Bill Discounting	102.35	92.03	32.53	32.53
Bridge Loan	4.79	4.78	90.29	10.61
Lines of Credit and Short Term Loan	3830.00	3327.54	5630.00	3959.09
Miscellaneous (Guarantee Scheme + Energy Access + Manufacturing +Ethanol)	244.80*	29.65**	821.71***	79.70****
<b>TOTAL</b>	<b>11941.87</b>	<b>9385.37</b>	<b>14747.39</b>	<b>9570.53</b>

\* Miscellaneous (Guarantee Scheme + Energy Access + Ethanol)

\*\* Miscellaneous (Manufacturing +Ethanol)

\*\*\* Miscellaneous (Guarantee Scheme + Energy Access + Manufacturing)

\*\*\*\* Miscellaneous (Manufacturing +Guarantee Scheme+ Ethanol)

employee performance under FR-56(j) in its Service Rules, and; compliance of DPE guidelines regarding SPARROW system introduced for performance appraisal of Board Level Executives has been done.

- (ii) In addition to the above, total number of employees, as on 31st December, 2019 is 161 excluding Board Level Executives.

### **10.5.7 CORPORATE SOCIAL RESPONSIBILITY/ SUSTAINABLE DEVELOPMENT/ R&D ACTIVITIES**

- (i) The Company spent Rs.4.22 crore during the FY 2019-20 (till 31.12.2019) on CSR activities for the project which were completed/ongoing during the year (including Rs.2.00 Crore paid for the projects



**Table 10.6: IREDA Sector-Wise Break-up of Cumulative Loan Sanctions and Disbursements up to 31.12.2019**

IREDA – Sector-Wise Break-up of Cumulative Loan Sanctions and Disbursements up to 31.12.2019			Projected Sanctions and disbursements from 01.01.2020 to 31.03.2020	
(Rs. in crore)				
Sector	Cumulative Sanction	Cumulative Disbursement	Sanction	Disbursement
Wind Power	25497.22	17250.36	650.00	500.00
Hydro Power	8423.78	4807.26	50.00	80.00
Biomass Power and Cogeneration	5336.76	3414.99	125.00	14.00
Energy Efficiency & Conservation	1271.10	342.50	0	0
Solar Energy	24693.15	13129.50	600.00	1730.00
Waste to Energy	868.28	257.96	20.00	50.00
Biomethanation from Industrial Effluents	19.47	57.60	0	0
Biomass Briquetting	12.43	9.99	0	0
Biomass Gasification	72.47	5.12	0	0
National Clean Energy Fund (NCEF)	156.57	127.14	0	0
Bill Discounting	181.97	161.76	0	0
Lines of Credit & Short Term Loan	14706.39	11148.09	1150.00	1600.00
Bridge Loan	213.05	152.14	0	0
Miscellaneous	1321.94*	188.53**	0	0
<b>TOTAL</b>	<b>82774.58</b>	<b>51052.94</b>	<b>2595.00</b>	<b>3974.00</b>

\* Miscellaneous (Guarantee Scheme + Energy Access + Ethanol + Manufacturing)

\*\* Miscellaneous (Manufacturing + Ethanol)

which were sanctioned during the year 2019-20). Projects aggregating to Rs.14.43 Crore were sanctioned during the year and were in progress and few completed at the end of the year. The unspent amount on CSR initiative shall be spent upon the completion of the project. As a socially responsible corporate, IREDA is committed to increase its CSR impact and spend over the coming years, with its aim of playing a large role in India's sustainable development by embedding wider economic, social and environmental objectives.

- (ii) During the period April 2019 – December 2019, following activities/projects were undertaken by the Company under its CSR initiatives as shown in **Table 10.7**.





**Table 10.7: CSR Initiatives undertaken by IREDA during 2019-20**

S. No.	Description	Rs. (Lakhs)
1.	Contribution to Swachh Bharat Kosh and Clean Ganga Fund	200.00
2.	Supply & Installation of 350 No. Solar PV Based Induction Cook-stoves for Providing Clean Cooking to Households / Consumers in Aspirational Districts	262.50
3.	Transformation of the Aspirational Districts Balrampur and Chandauli in Uttar Pradesh by providing Solar PV Systems, 50 LPH RO Water System and Medical Equipment for Government Schools and Primary Health Centers.	804.00
4.	Providing Solar Powered Equipment (Home Lighting Systems, Street Lighting Systems, RO Water Systems and SPV Plants on Schools / Primary Health Centers) for Transformation of Yadgir Aspirational District in Karnataka	96.52
5.	Providing Solar Water Heating Systems in Govt. Residential Schools towards Development of Raichur Aspirational District in Karnataka	80.60
<b>Total Sanctioned Amount in FY 2019-20</b>		<b>1443.62</b>

Projected Sanction for CSR from 01.01.2020 to 31.03.2020 : Rs. 5.00 Crores

Projected Disbursement for CSR from 01.01.2020 to 31.03.2020 : Rs. 11.50 Crores





## SUPPORT PROGRAMMES

## SUPPORT PROGRAMMES

### 11.1 INFORMATION AND PUBLIC AWARENESS PROGRAMME

11.1.1 In terms of renewable energy capacity, India stands among the top five countries in the world. The Ministry has implemented various policies and programmes for achieving the goals in renewable energy sector. Waiver of Inter-state transmission charges for sale of solar and wind power; Renewable Purchase Obligation trajectory, competitive bidding guidelines for procurement of solar and wind power; flexibility in generation and scheduling of thermal power stations; solar cookers programme; solar-wind hybrid policy; solar PV manufacturing linked with assured take-off; Atal Jyoti Yojana and standards for deployment of Solar PV systems are some of the major initiatives. In order to percolate all these initiatives, benefits and usage of renewable to the masses, information dissemination and publicity is essential. In this background, I&PA programmes for renewable energy are conceptualized and developed for implementation.

11.1.2 The Programme is implemented using Government channels viz. (i) Directorate of Advertising & Visual Publicity (DAVP); (ii) National Films Development Corporation (NFDC); (iii) Doordarshan; (iv) All India Radio (AIR); (vi) State Nodal Department/ Agencies for renewable energy; and (vii) NGOs/ Academic institution, etc., and participation in exhibitions of national importance by the Ministry and also through other relevant Institutions/Organization. It is also providing information and awareness through its three autonomous Institutions i.e. NISE, NIWE and SSS-NIBE and two PSUs i.e. IREDA and SECI extensively.

11.1.3 During the year, following I&PA activities were developed and implemented under the overall framework of the media strategy for renewables:-

i. Ministry of New and Renewable Energy in association with Indian Institute of Technology (IIT), Bombay organized the Global Student Solar Ambassador Workshop on 2nd October 2019 at Indira Gandhi Stadium



*The Minister of State for Power, New & Renewable Energy (Independent Charge) and Skill Development & Entrepreneurship, Shri Raj Kumar Singh addressing the Global Student Solar Assembly where students made Guinness Book World Record by assembling their own solar lamps and lighting them together to commemorate 150th Birth Anniversary of Mahatma Gandhi, at Indira Gandhi Indoor Stadium, New Delhi on October 02, 2019.*



Complex Main Arena, New Delhi, wherein 10,000 students were given hands-on training on how to assemble their own solar study lamps, and created a Guinness World Record. Students also took a pledge of non-violence to Environment and adopt Renewable Energy. Wide range publicity was given for the same through print, electronic and outdoor media.

- ii. Publicity using electronic and print media was made for the Second Assembly of the International Solar Alliance (ISA) on 30th and 31st October 2019 at New Delhi.
- iii. A short video film competition has been organized by the Ministry to create awareness about renewable energy across the country.
- iv. Publishing the Ministry's bi-monthly newsletter 'Akshay Urja' continued in English and Hindi.
- v. Logo Supports were extended to different organizations for different events/exhibitions on Renewable Energy.
- vi. Programmes, schemes, achievements are regularly posted on Social Media through Ministry's three Institutes and two PSUs.

## 11.2 PLANNING AND COORDINATION

- (i) The Planning and Coordination Division is responsible for overall planning and coordination for all matters related to various schemes/programmes being implemented, various policy & fiscal reforms being undertaken, etc. by the Ministry. Its work involves maintaining a close liaison with different Programme Divisions of the Ministry and with other concerned Ministries/Departments i.e. PMO/NITI Aayog/MEA/Cabinet Secretariat, PIB etc. and State Government Agencies i.e. State Nodal Agencies, etc. on a regular basis.
- (ii) The activities handled by the division during the year 2019-20 majorly includes compilation and regular updation of data base for achievements made in grid and off grid renewable power, preparation of reports for Standing Committee on Energy related to Demand for Grants and other specific subjects selected for examination, monthly reports of major achievements/ initiatives, action taken notes and monthly DO letter for PMO/Cabinet Secretariat/PIB etc, multi-sectoral inputs/briefs for various meetings, inputs for speeches of Hon'ble President/Hon'ble Prime Minister/ Hon'ble Finance Minister/ Hon'ble Minister/ Secretary, replies to VIP ,other references/ questionnaires/ Parliament Questions involving multiple schemes/ programmes, updation of various portals such as PMG, E-samiksha, Pragati, etc., time-bound compilation of comments on various draft Cabinet notes, EFC/SFC, etc. received from other ministries/ departments, preparation of Output-Outcome framework for budget, etc.

## 11.3 HUMAN RESOURCES DEVELOPMENT

- (i) Human Resource Development (HRD) scheme of MNRE supports trainings for manpower at all levels including promoting higher studies/research courses in R&D/academic institutions in renewable energy by providing fellowships to students/scholars. Support is also provided to R&D/academic institutes for up-gradation of their libraries and labs for conducting higher degree courses such as M.Sc, M.Tech, and Ph.D in new and renewable energy. Under short term training programmes of HRD programme, a Skill Development Programme named *Suryamitra* was introduced in 2015 to train 50,000 skilled manpower and to create trained workforce for installation, commissioning, operation and maintenance of solar projects.
- (ii) The following are the various components of the HRD scheme:



- a. Support to educational and other organizations for conducting short-term trainings on various aspects of renewable energy with focus on skill development at all levels;
- b. Suryamitra Skill Development Programme;
- c. Fellowships:
  - National Renewable Energy Fellowship (NREF) Scheme for pursuing M.Sc./M.Tech/ PhD/ PDF degree courses.
  - National Renewable Energy Science Fellowship Scheme for eminent scientists working in research institutes with an innovative idea in solar energy;
- d. Support to higher educational institutions for laboratory and library upgradation;
- e. Development of course/ study materials through experts/expert institutions; and
- f. Internships.

### 11.3.1 NATIONAL RENEWABLE ENERGY FELLOWSHIP SCHEME

- (i) Ministry continued its support to students/scholars for pursuing higher studies such as M.Sc, M. Tech, Ph.D, courses in renewable energy in 12 selected educational institutions by way of providing fellowships/stipend under NREF Scheme. In the beginning of 2019-20, 34 Ph.D, 29 M.Tech/M.E and 20 M.Sc fellowships were being provided under NREF programme out of which 5 fellows completed Ph.D, 7 students got M.Tech/M.E degree and 10 students got M.Sc (Renewable Energy) degree in 2019-20. During 2019-20, 28 M.Tech, 41 for JRF/SRF and 20 for M.Sc fellows are continuing under NREF programme out of which 6 M.Tech, 12 Ph.D and 10 M.Sc fellowships are awarded in the year 2019-20. The NREF fellows/students have published 10 research papers in the national and international journals of repute, besides presenting 5 papers in seminars totalling to the scientific output of NREF fellows to 568 research papers and 171 papers in seminars and 3 filed patents. The list of supported institutes is given in **Table 11.1**.

<b>Table 11.1: Institutions allotted Fellowships by MNRE under NREF scheme, 2019-20</b>	
<b>S.No.</b>	<b>Institutions allotted Fellowships for M. Sc, M.Tech, JRF/SRF (Ph.D)</b>
1.	Indian Institute of Technology, Kharagpur
2.	Indian Institute of Technology, Roorkee
3.	Anna University, Tamilnadu
4.	Pune University, Pune, Maharashtra.
5.	Pondicherry University, Pondicherry.
6.	Shri Mata Vaishno Devi University, Katra, J&K.
7.	Jadavpur University, Kolkata
8.	Cochin University of Science and Technology, Cochin
9.	Indian Institute of Engineering Science & Technology, Shibpur, West Bengal.
10.	University of Lucknow, Lucknow.
11.	National Physical Laboratory (NPL), CSIR, New Delhi
12.	Central University of Jharkhand , Ranchi



### 11.3.2 ENHANCEMENT OF LIBRARY AND LABORATORIES

Gandhigram Rural Institute, Tamilnadu was supported for upgradation of laboratory facilities in the year 2019-20. Up-gradation activities of the laboratory and library facilities supported by the Ministry in the previous year in Pandit Deendayal Petroleum University, Gandhi Nagar and Tezpur University, Assam are undergoing.



*Bio Energy Laboratory - M. Tech., Renewable Energy Students The Gandhigram Rural Institute - Deemed to be University*



*Solar PV Laboratory - B. Voc., Renewable Energy Students The Gandhigram Rural Institute - Deemed to be University*





*Solar Thermal Laboratory - M. Tech., Renewable Energy Students, The Gandhigram Rural Institute - Deemed to be University*



*Wind Energy Laboratory - Renewable Energy Simulation Laboratory, The Gandhigram Rural Institute - Deemed to be University*



### 11.3.3 TRAININGS

#### 11.3.4 SURYAMITRA TRAINING

Ministry launched Suryamitra Skill Development Programme in the year 2015 to train 50,000 Suryamitras by the year 2020 and set a target to provide 20900 Suryamitras training in the year 2019-20. For the current year, Suryamitra Trainings are being organized through 223 training centres/ organisations in different states across the country empanelled through Expression of Interest (EOI) floated by National Institute of Solar Energy in the month of March, 2018. During the current year 2019-20, 20700 no. Suryamitra training is allocated in 690 batches in 223 training centres throughout the country against the target of 20900 for the year 2019-20. Total 40,441 no. of Suryamitras have been trained up to 31st December, 2019. The state wise progress of the Suryamitra programme is shown in **Table 11.2**.

#### 11.3.5 NATIONAL RENEWABLE ENERGY INTERNSHIP SCHEME (NREI)

Ministry of New and Renewable Energy has launched a new scheme The National Renewable Energy Internship (NERI) Scheme for students and young researchers working in Renewable Energy sector in October 2019. Under the scheme MNRE will provide internship opportunity to facilitate students pursuing under graduate/graduate/post graduate degrees or research scholars enrolled in recognized institutes/ universities with in India or abroad, as Interns. Those pursuing graduate or post graduate degree course



Glimpse of Suryamitra Programmes at various locations across the country



**Table 11.2: Progress of Suryamitra Training in different States 2015-19 & 2019-20  
(till 31st December, 2019)**

S. No.	State/UTs	Targets of Suryamitras to be trained by march 2020	No. of Suryamitras Trained in 2015-2019	No. of Suryamitras training in 2019-2020		Total No. of Suryamitras
				Trained	On-going	
1	Andaman & Nicobar	100	0	0	0	0
2	Andhra Pradesh	2000	1308	268	146	1722
3	Arunachal Pradesh	200	30	0	0	30
4	Assam	2500	833	357	30	1220
5	Bihar	2500	1139	298	155	1592
6	Chandigarh	100	148	60	0	208
7	Chhattisgarh	2000	1227	409	117	1753
8	D. & N. Haveli	10	0	0	0	0
9	Daman & Diu	10	0	0	0	0
10	Delhi	500	432	180	0	612
11	Goa	400	174	60	30	264
12	Gujarat	2000	2136	530	150	2816
13	Haryana	1000	937	330	90	1357
14	Himachal Pradesh	500	324	90	0	414
15	Jammu & Kashmir	700	244	60	30	334
16	Jharkhand	2000	517	179	0	696
17	Karnataka	2500	1371	256	0	1627
18	Kerala	2000	495	120	60	675
19	Lakshadweep	100	30	0	0	30
20	Madhya Pradesh	4000	2522	882	208	3612
21	Maharashtra	4000	2933	686	313	3932
22	Manipur	500	150	0	0	150
23	Meghalaya	250	0	0	0	0
24	Mizoram	200	0	0	0	0
25	Nagaland	200	60	0	0	60
26	Orissa	2500	1766	240	30	2036
27	Puducherry	50	62	0	0	62
28	Punjab	2000	323	30	0	353
29	Rajasthan	2500	2006	706	120	2832
30	Sikkim	200	0	0	0	0
31	Tamil Nadu	2500	2142	687	242	3071
32	Telangana	2000	1914	698	258	2870
33	Tripura	250	148	30	0	178
34	Uttar Pradesh	5000	2608	862	222	3692
35	Uttarakhand	500	680	176	30	886
36	West Bengal	2500	2433	1155	66	3654
<b>Total</b>		<b>50270</b>	<b>31092</b>	<b>9349</b>	<b>2297</b>	<b>42738</b>
<b>Total trained by 31st December 2019</b>		-	<b>40441</b>	-	-	





in Engineering Management/ Law/ Science stream (Physics/ Chemistry/ Renewable energy/ Energy/ Biotechnology/ Biological Science/ Environmental Science, etc.) in recognized University/institution within India or abroad and the persons working in RE area in National, International, Non-Governmental Institutes/organisations will be eligible to apply under the scheme. The internship will be on unpaid basis. No stipend will be provided to interns. It will be available throughout the year as per the MNRE requirement and applications are invited through online. Every year, the internship will be provided to a maximum of 40 interns, with not more than 20 interns being in position at any point of time, the ministry added. Detailed guidelines and application link can be obtained from the website [www.mnre.gov.in](http://www.mnre.gov.in). The registration for internship under the scheme was formally thrown open on 29 Nov. 2019 with MNRE inviting online applications under the scheme from eligible candidates. The scheme has evoked an enthusiastic response as so far 286 applications have been received online till 31st December 2019 in which 156 applied for MNRE, 53 for NIWE, 38 for NISE, 13 for SECI, 9 for NIBE and 17 for IREDA. The applications for the internship will be finalised soon.

## **11.4 ADMINISTRATION – E-GOVERNANCE, VIGILANCE, LIBRARY, RIGHT TO INFORMATION**

### **11.4.1 E-GOVERNANCE (NIC)**

National Informatic Centre (NIC) is the IT backbone of GOI. NIC spearheaded Informatics-Led-Development by implementing ICT applications in social and public administration and facilitates electronic delivery of services to the government (G2G), business (G2B), citizen (G2C) and government employee (G2E). NIC, through its ICT Network, NICNET, has institutional linkages with all the Ministries /Departments of the Central Government and state governments.

### **11.4.2 SOLAR ROOFTOP INSTALLATION (<https://solarrooftop.gov.in> SPIN)**

Solar rooftop is one of the schemes monitored by the PMO. NIC has developed an online portal namely SPIN (<https://solarrooftop.gov.in>). The basic purpose of SPIN is to monitor the installation of Solar Rooftop all over the country. The stake holders of this application are State Nodal Agencies/ SECI, Developers, General Public and MNRE Officials. Through this application proposals are submitted; sanctions and submission of project completion reports and release of subsidy is completely online.

### **11.4.3 SOME OF HIGHLIGHTS OF SPIN**

SPIN new version is on the way to launch with the new technologies' integration.

1. 10 New States portal has been integrated with SPIN and 12 other states are on the way. Which will help states entities to avoid double entry of the data in state as well as SPIN portal as now when they will enter in the state portal it will automatically reflect in the Centre SPIN portal.
2. Integration with DARPAN and DBT portal.
3. Paperless monitoring of Rooftop installation through SPIN.
4. Managing proposals, sanctions, targets of SNA, PSU's.
5. Communication with stakeholders through NIC Email & SMS.
6. This year we generated many more MIS report.





#### 11.4.4 MINISTRY WEBSITE (<http://mnre.gov.in>)

Ministry of New and Renewable Energy (MNRE) website was designed in-house using latest ICT tools. The site is being updated regularly in both English and Hindi. This is one of the high hit Website of GOI.

#### 11.4.5 E-OFFICE

It is a web-based system implemented and maintained for effective online monitoring of movement of files and receipt in the ministry. The e-Office product aims to support governance by ushering in more effective and transparent inter and intra-government processes. The vision of e-Office is to achieve a simplified, responsive, effective and transparent working of all government offices. NIC's e-Office product is based on an Open Architecture Framework that contains the required flexibility for scaling and meeting the dynamic needs of the Government. E-Office is being implemented in all Government Offices / PSU's. E-Office in the ministry was started during June 2016 and till the end of December 2019 around 14050 files and 128015 receipts have been generated. E-Office implementation has been 100% in MNRE.

#### 11.4.6 EHRMS

**Manav Sampada** application is a common application tool for personnel management activities like monitoring, planning, recruitment, posting, promotion, transfer, maintenance of service history etc. It is developed, maintained and hosted by NIC and available at <http://ehrms.gov.in>. It is a G to E application. This year leave module is implemented and the service book part is still in the process.

#### 11.4.7 CUSTOMS DUTY EXEMPTION FOR SOLAR THERMAL AND PHOTOVOLTAICS

- (i) Ministry is issuing customs duty exemptions and excise duty exemptions for various developers based on various conditions. An online system namely CCMS has been designed, developed and implemented to assist the ministry to issue concessional custom duty and Excise duty certificate for Solar Thermal and Photovoltaic projects located throughout the country.
- (ii) This year a new domain namely [scms.gov.in](http://scms.gov.in) has been registered and hosted on the cloud. As of now around 31790 certificates were approved since the inception in 2017.

#### 11.4.8 RENEWABLE ENERGY (RE) PORTAL (<http://akshayurja.gov.in>)

Akshay Urja portal has been developed for demonstration of overall potential available, total capacity addition and monthly generation for each energy including grid connected and off grid. These data are demonstrated state wise. This portal gives an overall picture of the physical achievement of the Ministry. This portal is updated every month by collecting the capacity addition data from P&C division and generation data from CEA.

#### 11.4.9 ACTIVITY MONITORING DASHBOARD (<http://pams-mnre.gov.in>)

Activity Monitoring Dashboard has been developed to closely monitor the on-going activities of the Ministry and subordinate autonomous bodies and PSUs. In this portal, key activities and their sub activities along with responsible officer and likely date of commissioning are entered and then as per the progress of the activities, comments are entered by concerned officer by using their login ids.





#### 11.4.10 INDIAN RENEWABLE ENERGY IDEA EXCHANGE (<http://irix.gov.in>)

IRIX is a multi-stakeholder collaborative platform to exchange and catalyze ideas on Renewable Energy. This platform aims to bring together industry experts, renewable energy community, relevant entrepreneurs and policy makers to drive exponential adoption of innovation in the renewable energy space. It will provide a medium to promote the exchange of ideas among energy conscious Indians and global diaspora that further leads to actionable insights and facilitate the development and deployment of renewable energy in India.

#### 11.4.11 INTERNSHIP PROGRAMME

MNRE is in the process of developing a new portal for Human resource division. This year ministry has started a new scheme called Internship mainly for students. As a part of HRD portal the submission of the internship form has been started. The full portal will be launched soon.

#### 11.4.12 CONCESSIONAL CUSTOM DUTY EXEMPTION CERTIFICATE (CCDC)

In order to promote the local manufacturing of the wind energy turbine and its components Ministry issues CCDC certificates to the recognized manufacturers as per the Ministry of Finance guidelines. For ensuring quality and safety of the wind turbines and components only Type Certified wind energy turbines which are empanelled in the RLMM list of the Ministry are considered for issuance of CCDC. Besides, the imported parts/components must be adhered to the design/suppliers as per valid type certificate only. An application namely <http://ccdcwind.gov.in> has been developed and hosted and is being widely used by all the stake holders.

#### 11.4.13 VIGILANCE

- (i) The Vigilance Division of the Ministry of New and Renewable Energy (MNRE) is entrusted with taking anti-corruption measures in accordance with various rules, guidelines and instructions issued by the Government of India and the Central Vigilance Commission. The Vigilance Wing of the Ministry looks after vigilance work within the Ministry and its three autonomous bodies, namely National Institute of Solar Energy (NISE), National Institute of Wind Energy (NIWE) and National Institute of Bio-Energy (NIBE). The Division is also entrusted with the upkeep of Annual Performance Appraisal Reports (APARs) and Immovable Property Returns (IPRs) of officials of the Ministry.
- (ii) The complaints received in the Vigilance Division during the year 2019 were examined as per Rules & guidelines and necessary action was taken wherever there was violation of Rules.
- (iii) The Vigilance Awareness Week was observed in the Ministry from 28th October, 2019 to 2nd November, 2019. Following activities were undertaken as part of Vigilance Awareness Week:
  - a. The Integrity Pledge was administered to all the staff and officers by the Special Secretary in MNRE.
  - b. An Expert lecture was conducted on Preventive Vigilance for the Ministry officials.
  - c. Essay competition for the officials of the Ministry was organized.
  - d. Slogans on curbing corruption and preventive vigilance with banners were placed in the premises of the Ministry.
  - e. A Poster Making Competition was organised on Vigilance Issues.





- (iv) As part of preventive vigilance, a list of sensitive and non-sensitive posts of the Ministry has been prepared and Administration Division of the Ministry has been sensitized to follow the rotation policy in postings.
- (v) Probity related matters on e-portal was uploaded in respect of this Ministry and its Autonomous Organizations and vigilance related information in respect of Board Level Officers is being updated monthly on e-portal SOLVE. Officers of this Ministry are also constantly reviewed under 56(j), as per Rules.

#### 11.4.14 LIBRARY

- (i) The Library of the Ministry of New and Renewable acts as a reference centre and knowledge house in the field of renewable energy. At present about 15378 books (including gifted books) are available in the library covering very diverse areas including the subjects such as Renewable Energy, Climate Change, Natural Sciences, Sustainable Development, History, Sociology, Indian Literature, Computer Science, etc. The collection in the library also includes books of general interest like food, cooking, sculpture, painting, mountaineering etc.
- (ii) The Library Committee constituted in the Ministry scrutinizes and recommends the books for procurement by the library. Presently, this committee has given its approval for purchase of about 60 Hindi books, 90 administrative books, 20 general and technical books in the library, which will be purchased before 31 March 2020.
- (iii) The library is currently subscribing to 40 periodicals in Hindi and English languages. Besides, as per requirement, a total number of 24 newspapers in Hindi and English languages are also being subscribed by the library. The library is providing current awareness service through news clippings among its users. This library has started working smoothly in the cloud based library software e-granthalaya version 4.0, working towards automation to provide better services to its users.

#### 11.4.15 RIGHT TO INFORMATION

- (i) The Ministry is implementing the Right to Information (RTI) Act, 2005 as per the laid down guidelines of 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 MNRE website [www.mnre.gov.in](http://www.mnre.gov.in).
- (ii) The Ministry has designated Central Public Authority (CPIO) and First Appellate Authorities (FAA) to respond the RTI applications and first Appeals in accordance with subjects assigned to them. A list of CPIOs and First Appellate Authorities is given in Table 11.3. The RTI Unit of this Ministry headed by Ms. Alka Joshi, Dy. Secretary coordinates all the physical and online applications and persuades to CPIOs and First Appellate Authorities to reply them within the stipulated time lines to the extent possible.
- (iii) The progress report in terms of RTI applications/First Appeals received, disposed-off as well as pendency during the period (01.01.2019 – 31.12.2019) is given in **Table 11.3**.





**Table 11.3: List of Designated Central Public Information Officers (CPIOs) and Appellate Authorities based on re-allocation of Work (As on 11/10/2019) at Ministry of New and Renewable Energy**

S. No	Subject	CPIO	Appellate Authority
1	Climate Change related initiatives including Clean Development Mechanism (CDM), Renewable Purchase Obligations (RPO) related issues, REC Policy, INSPA, NCEF, Hydrogen, Fuel Cell and IREP, Electrical Vehicle and National Board of Electric Mobility, New Technology, Specific references of Information & Public Awareness and Renewable Energy Policy and Regulations.	Shri Dipesh Pherwani, Scientist 'B'	Dr. P.C. Maithani, Scientist 'G'
2	Planning and Coordination	Shri Anubhav Uppal Scientist 'B'	Dr. Pankaj Saxena, Scientist 'F'
3	Green Energy Corridor , Geothermal, Ocean / Tidal	Shri Rohit Thakwani, Scientist 'B'	Shri Girish Kumar, Scientist 'E'
4	Information Technology, Development of Re-Portal	Shri Vikram Dhaka, Scientist 'B'	Shri Bhanu Pratap Yadav JS
5	Solar Thermal Group-Solar Conc. and Solar Cookers	Shri Aravindh MA, Scientist 'B'	Shri J. K. Jethani, Scientist 'E'
6	NTPC-Bundling Scheme, NTPC-EPC Scheme, Solar City Programme, Green Buildings	Shri Aravindh MA, Scientist 'B'	Shri A. Narvane, Scientist E
7	Biomass Power Schemes and Policies, Bio Energy Mission, Biomass Gassifier, Cookstove,	Ms. Priya, Scientist 'B'	Shri K.Salil Kumar, DS
8	Waste to Energy	Shri Vijay Kumar Bharti Scientist 'B'	Shri K. Salil Kumar, DS
9	Biogas Power, National Biogas Programme, Biogas Training Centres and Biogas R&D	Shri S.R. Meena, Scientist 'C'	Shri G. L. Meena, Scientist 'G'
10	Lab Policy, Standards and Quality Control	Ms. Rohini Subramanyam SO	Shri B. S. Negi, Scientist 'G'
11	IREDA, All Administrative matters of SECI	Shri Arvind Sahadev Gholap, SO	Dr. Pankaj Saxena, Scientist F
12	Off-Grid Solar, Agri Pump Scheme, Street Light, Home Light, SADP, Akshay Urja Shop, KUSUM	Shri Shobhit Srivastava Scientist 'C'	Shri Jeevan Kumar Jethani, Scientist 'E'
13	VGF Scheme, GBI, Demonstration Scheme	Shri Neeraj Kumar, Scientist 'C'	Shri Dilip Nigam, Scientist 'G'





14	Energy Storage, E-Mobility and International Solar Alliance and Specific references of Renewable Energy Policy and Regulations	Shri Tarun Singh Scientist 'C'	Dr. P.C. Maithani, Scientist 'G'
15	Solar Rooftop Top, External aid under Rooftop Scheme, TA under RT Scheme	Shri Hiren Borah, Scientist 'C'	Shri Aujender Singh, DS
16	Small Wind, Wind Energy (Off – Shore), Wind R&D	Shri P.K Dash Scientist 'C'	Shri B.K Panda Scientist 'E'
17	Wind Energy (On-shore)	Shri Rahul Rawat, Scientist 'B'	Shri G Upadhyay Scientist 'F'
18	Solar (R&D) (ST&SPV), Solar Water Heater, Solar Thermal Group – Flat Plate/ Evacuated	Shri Anil Kumar, Scientist 'D'	Shri Rajesh Kumar, Scientist 'F'
19	Grid Connected PV&ST-I (HVVA related & all others), Greening of Islands	Shri Sanjay Karndhar, Scientist 'C'	Shri Ruchin Gupta, Director
20	EFM Division	Shri Sanjay Prakash, Scientist 'C'	Shri P. C. Maithani, Scientist 'G'
21	Organization of RE – Invest	Dr. P.C. Pant, Scientist 'F'	Shri Bhanu Pratap Yadav, JS
22	DBT Cell	Shri Arun Kumar, Scientist 'C'	Shri Bhanu Pratap Yadav, JS
23	GST related to Biogas	Shri S.R Meena, Scientist 'C'	Shri Ruchin Gupta, Director
24	GST related to Wind CDC/EDE	Shri S K Khurana, US	Shri Ruchin Gupta, Director
25	GST related to Solar CDC/EDE	Shri Arun Kumar, Scientist 'C'	Shri Ruchin Gupta, Director
26	GST related to Grid Solar	Shri Sanjay Karandhar, Scientist 'C'	Shri Ruchin Gupta, Director
27	GST related to Off Grid Solar	Shri Shobhit Srivastava Scientist 'C'	Shri Ruchin Gupta, Director
28	GST related to Biomass	Ms. Priya, Scientist 'B'	Shri Ruchin Gupta, Director
29	Financial Sanctins, Manufacturing of Wind Turbine, (CCDC) (Concessional Custom Duty Certificate)	Shri S.K Khurana	Shri B.K Panda, Scientist 'E'
30	I& PA and Seminar & Symposia,	Shri D.K Pandey, US	Shri N. B Raju, Scientist 'E'





31	Vigilance	Ms. Sunita Dhewal, US	Dr. Pankaj Saxena, Scientist 'F'
32	National Solar Mission, Solar Park, Defence Schemes,	Shri Devendra Singh, US	Shri Dilip Nigam, Scientist 'G'
33	International Relations (IR)	Shri Chalapathi Rao, Scientist 'C'	Ms. Veena Sinha, Director
34	O/o Minister of State (IC), NRE	Shri D.K Pandey, US	Shri Amitesh Kumar Sinha, JS
35	Parliament Work,	Shri A.K. Singh, US	Dr. Pankaj Saxena, Scientist 'F'
36	Public Grievances	Shri A.K. Singh, US	Ms. Alka Joshi, DS
37	Administration	Shri Arvind Pokhriyal, US	Shri G Upadhyay, Scientist 'F'
38	All matters of SSS-NIBE	Shri Yoginder Singh, US	Shri K. Salil Kumar, DS
39	IFD	Shri K G Suresh Kumar, US	Shri Sandeep Mukherjee DS
40	HRD, Hydro Projects	Shri Birbal Singh Negi, US	Dr. P.C Pant, Scientist 'F'
41	CCDC Solar Power	Shri N. P Shukla, US	Shri Rajesh Kumar Scientist 'F'
42	RTI Matters, Hindi, Library, Budgeting, Expenditure monitoring, Audit & Statistical analysis	Ms. Sunita Sajwan, US	Ms. Alka Joshi, DS
43	PAO, Budget	Shri Pratap Singh Sr. AO	Shri Avtar Singh Sandhu Controller of Accounts
44	All administrative and financial matters of NISE	Shri Devendra Singh, US	Shri K. Salil Kumar, DS
45	All administrative and financial matters of NIWE	Shri Rahul Rawat, Scientist 'B'	Shri K. Salil Kumar, DS



<b>Table 11.4 Progress Report of RTI Applications/First Appeals</b>			
<b>Item</b>	<b>Received</b>	<b>Disposed off</b>	<b>Pending as on 31.12.2019</b>
RTI Applications	1130	1058	72
First Appeals	42	38	04

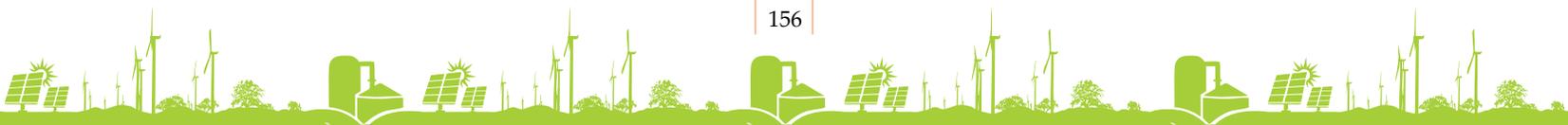




## INTERNATIONAL COOPERATION IN RENEWABLE ENERGY

## INTERNATIONAL COOPERATION IN RENEWABLE ENERGY

- 12.1 The International Relations (IR) Division of the Ministry has been continuously engaging with DEA, MEA, Embassies of various countries, multilateral international organizations and missions of India abroad for cooperation in the field of New & Renewable Energy.
- 12.2 During the current year also Ministry took several initiatives to promote New & Renewable Energy cooperation by signing Memorandum of Understanding (MoUs) / Implementation Agreements (IAs) / Supplementary Agreements (SAs)/ Letter of Intent (LoI) etc. Ministry also convened Bilateral/ Multilateral / Joint Working Group (JWG) Meetings through physical and Direct Video Conference (DVC) modes. The Delegations were led at the level of Hon'ble Minister and senior officers of the Ministry for the purpose of these meetings, signing of MoUs/Agreements etc.
- 12.3 MNRE has signed Memorandum of Understanding (MoUs) / Agreements / Letter of Intent (LoI) with different countries in the field of New and Renewable Energy. Under these, Joint Working Groups (JWGs) were set up for identification, selection and formulation of joint activities for implementation. Interactions with various countries were also undertaken through Joint Commission Meetings (JCMs), Joint Working Group (JWG) meetings, Joint Trade Committee (JTC) Meeting being setup by the other Ministries such as Ministry of External Affairs (MEA), Ministry of Environment, Forests and Climate Change (MoEFCC), Ministry of Commerce & Industry (MoCI), Ministry of Power (MoP), NITI Aayog etc. Mutually agreed projects and activities for cooperation are also established with many countries at bilateral level, even though no specific MoU has been signed with them.
- 12.4 In addition, MNRE has been collaborating under various multilateral cooperation frameworks like South Asian Association for Regional Cooperation (SAARC), Association of South-East Asian Nations (ASEAN), Brazil-Russia-India-China-South Africa (BRICS), India-Brazil-South Africa (IBSA), G20 etc.
- 12.5 The Ministry also engages with various international / multinational agencies, like World Bank, KfW, European Union (EU), USAID, United Nations Development Programme (UNDP), Asian Development Bank (ADB), United Nations Industrial Development Organization (UNIDO), GIZ, etc., who are providing project based assistance for renewable energy projects in India.
- 12.6 The Ministry also facilitates specialized training programmes in African and other developing countries in the fields of Solar Energy, Wind Energy, Small Hydro Power & Biomass at Indian through apex institutes, viz., National Institute of Solar Energy (NISE), Gurgaon, National Institute of Wind Energy (NIWE), Chennai, Alternative Hydro Electric Centre (AHEC), IIT, Roorkee under ITEC programme of Government of India.
- 12.7 During 2019, the following Memoranda of Understandings (MoUs)/Cooperation Agreement/LoI have been signed:
- A Cooperation Agreement was signed between Ministry of New and Renewable Energy of the Republic of India and Ministry of Energy, Utilities and Climate of the Kingdom of Denmark. A Letter of Intent (LoI) to establish an Indo-Danish Centre of Excellence for Integrated Renewable Power in India was signed on 6th March, 2019 in New Delhi.
  - A Memorandum of Understanding was signed between Ministry of New and Renewable Energy of





the Republic of India and The Ministry of Energy of the Government of the Republic of Guinea on 02<sup>th</sup> August, 2019 in Conakry.

- A memorandum of understanding was signed between Ministry of New and Renewable Energy of the Republic of India and the Ministry of Energy of the Kingdom of Saudi Arabia on 29<sup>th</sup> October, 2019 in Riyadh.

12.8 During 2019, various meetings were held at MNRE, New Delhi as part of Bilateral / Multilateral cooperation, in the field of New and Renewable Energy with Hon'ble Minister, Secretary and senior officials of the Ministry.

12.9 During 2019, the following foreign visits have been undertaken by senior officials of the Ministry: -

- i. Shri Raj Kumar Singh, Hon'ble Minister of State (IC) for Power and New and Renewable Energy, Shri Anand Kumar, Secretary, Ministry of New and Renewable Energy and Shri Manoj Kumar Singh, Private Secretary to Hon'ble Minister visited Abu Dhabi, UAE on 13-14, January, 2019 to participate in the 9<sup>th</sup> Session of the IRENA Assembly meeting, Abu Dhabi Sustainable Week (ADSW) and other related events/meetings.
- ii. Shri Anand Kumar, Secretary and Shri Anjani Nandan Sharan, Joint Secretary, Ministry of New and Renewable Energy visited to Washington DC, USA from 25-28<sup>th</sup> February, 2019 to participate in the meeting proposed by the US side and the first meeting of Joint Working Group Meeting on Clean and Renewable Energy under India-US Strategic Energy partnership.
- iii. Shri J. K. Jethani, Scientist 'E' Ministry of New and Renewable Energy visited Thimphu, Bhutan from 25-26<sup>th</sup> February, 2019 to participate in the Workshop on Sustainable Access to Clean Energy for Hindu Kush Himalaya organized by the ADB.
- iv. Shri PNBV Chalapathi Rao, Scientist 'C' and Shri Manish Singh Bisht, Scientist 'B' Ministry of New and Renewable Energy visited to Berlin, Germany from 25<sup>th</sup> February to 01<sup>st</sup> March, 2019 to participate in 'Training on grid integration of Renewables at Renewable Academy (RENAC) organized by the GIZ.
- v. Shri Tarun Singh, Scientist 'C' Ministry of New and Renewable Energy visited Cape Town, South Africa from 25-26<sup>th</sup> February, 2019 to participate in the conference on 'Renewables Energy and Storage Systems organized by the World Bank.
- vi. Shri B.K. Panda, Scientist, 'E', Ministry of New and Renewable Energy, visited Denmark from 25-29, March, 2019 to participate in a Study tour on off-shore Wind.
- vii. Shri Tarun Singh, Scientist, 'C' and Shri Anubhav Uppal, Scientist, 'B' Ministry of New and Renewable Energy visited Paris, France, on 11-15 March, 2019 to participate in the 17<sup>th</sup> International Energy Agency (IEA) Energy Statistics Course.
- viii. Shri A.N. Sharan, Joint Secretary, Ministry of New and Renewable Energy, visited Paris, France from 2-4, April, 2019 to participate in the 75<sup>th</sup> meeting of the IEA Working Party on Renewable Energy Technologies (REWP) and Renewable Industry Advisory Board (RIAB) meeting.
- ix. Shri Praveen Kumar, Additional Secretary and Mrs. Veena Sinha, Director, Ministry of New and Renewable Energy visited Toyama, Japan, on 18-19 April, 2019 to participate in the 2<sup>nd</sup> meetings of the Energy Transitions Working Group (ETWG) and Environment Senior Official meeting (ESOM) for G-20.





- x. Shri A.N. Sharan, Joint Secretary, Ministry of New and Renewable Energy, visited Paris, France on 27-29, May, 2019 to participate in the 10th Clean Energy Ministerial (CEM-10) and 4th Mission Innovation (MI-4) Meetings.
- xi. Shri J.N. Swain, Managing Director, Solar Energy Corporation of India Ltd. (SECI), Shri J.K. Jethani, Scientist, 'E' and Shri Anil Kumar, Scientist, 'C', Ministry of New and Renewable Energy visited Munich, Germany, on 15-18th May, 2019 to participate in the official Subgroup-2 meeting under the Indo-German Energy Forum and Inter-solar EUROPE-2019.
- xii. Shri Dilip Nigam, Scientist, 'G' and Shri A. S. Parira, Scientist 'C', Ministry of New and Renewable Energy, visited Belgium, Italy and UK from 8-16th June, 2019 to participate in a EU organized Study Tour programme under Clean Energy Cooperation with India (CECI) visiting solar parks.
- xiii. Shri Anand Kumar, Secretary, Ministry of New and Renewable Energy, visited Japan from 13-16th June, 2019 to participate in the G-20 Ministerial meeting on Energy Transitions and Global Environment for Sustainable Growth.
- xiv. Shri Sanjay G. Karndhar, Scientist, 'C' Ministry of New and Renewable Energy, visited Japan from 16th June to 27th July, 2019 to participate in the knowledge Co-creation programme on Renewable Energy in Grid-mainly Photovoltaic under the technical cooperation program of the Government of Japan.
- xv. Shri Rahul Rawat, Scientist, 'B' Ministry of New and Renewable Energy, visited Philippines from 17-21st June, 2019 to participate in the Asia Clean Energy Forum 2019 (ACEF) meeting.
- xvi. Dr. P. C. Maithani, Scientist, 'G' Ministry of New and Renewable Energy, visited Bonn, Germany from 17-27th June, 2019 to participate in the Bonn Climate Change Conference of UNFCCC.
- xvii. Dr. Rajesh Kumar, Scientist, 'F' Ministry of New and Renewable Energy, visited Taiwan from 20-21st June, 2019 to attend the 12th India-Taiwan Secretary-vice Ministerial Level Consultations.
- xviii. Shri Bhanu Pratap Yadav, Joint Secretary, Ministry of New and Renewable Energy, and Shri J.N. Swain, Managing Director, Solar Energy Corporation of India, visited London, UK from 24-28th June, 2019 to attend the first offshore Wind Round-table event.
- xix. Shri Anand Kumar, Secretary and Shri A. N. Sharan, Joint Secretary, Ministry of New and Renewable Energy visited Abu Dhabi, UAE from 24-26th June, 2019 to participate in the 17th International Renewable Energy Agency (IRENA) Council meeting and other related events.
- xx. Shri K. Salil Kumar, Deputy Secretary and Shri K.G. Suresh, Under Secretary, Ministry of New and Renewable Energy, visited Austria, Germany and Sweden from 14-21st July, 2019 to participate in the International Group Training and Study Tour under UNIDO project.
- xxi. Shri Parveen Kumar, Addl. Secretary, MNRE and Chairman and MD, IREDA, visited Singapore, from 2-3rd September, 2019 to meet institutional investors' group in Singapore in connection with the upcoming IPO launch of IREDA.
- xxii. Shri Amitesh Kumar Sinha, Joint Secretary, Ministry of New and Renewable Energy, visited Helsinki, Finland from 10-11th September, 2019 to attend the 76th meeting organized by IEA on Renewable Energy working party (REWP).





- xxiii. Shri J. K. Jethani, Scientist, 'E' Ministry of New and Renewable Energy, visited Kathmandu, Nepal, from 10-11th September, 2019 to participate in the Regional Dialogue on strengthening Institutional capacities for sustainable management of Solar Powered irrigation systems organized by ICIMOD.
- xxiv. Shri Tarun Singh, Scientist, 'C' and Shri Sanjay G. Karndhar, Scientist, 'C' Ministry of New and Renewable Energy, visited Germany and France from 24-29th September, 2019 to participate in the 'Study Tour on Energy Storage systems and Floating Solar' organized by GIZ.
- xxv. Shri Anil Kumar, Scientist, 'D' Ministry of New and Renewable Energy, visited Singapore from 30th September to 4th October, 2019 to participate in the course on 'Clean Energy and Emission Reduction' under the Singapore Cooperation Programme Training Award (SCPTA) .
- xxvi. Shri Amitesh Kumar Sinha, Joint Secretary, Ministry of New and Renewable Energy, visited Berlin, Germany from 6-12th October, 2019 to participate in the Renewable Energy and Efficiency Week (REEW)-2019.
- xxvii. Shri PNBV Chalapathi Rao, Scientist, 'C' and Shri Rohit Thakwani, Scientist, 'B', Ministry of New and Renewable Energy, visited Paris, France from 14-18th October, 2019 to participate in the 18th Energy Statistics Course organized by IEA.
- xxviii. Shri Dipesh Pherwani, Scientist, 'B' Ministry of New and Renewable Energy, visited Seoul, South Korea from 22-25th October, 2019 to participate in the 32nd Steering Committee Meeting of the International Partnership for Hydrogen and Fuel Cell in the Economy (IPHE).
- xxix. Shri Vijay Kumar Bharti, Scientist, 'B' Ministry of New and Renewable Energy, visited Wisconsin, USA from 28-31st October, 2019 to participate in the Global Methane Initiative Biogas Subcommittee meeting and Bio Cycle REFOR-2019.
- xxx. Shri Amitesh Kumar Sinha, Joint Secretary, Ministry of New and Renewable Energy, visited Brasilia, Brazil on 11th November, 2019 to participate in the 4th meeting of the BRICS Ministers of Energy.
- xxxi. Shri Prabir Kumar Dash, Scientist, 'C', Ministry of New and Renewable Energy, visited Japan from 18th November to 2nd December, 2019 to participate in Knowledge Co-creation programme for Young Leaders (Renewable Energy Course) by JICA.
- xxxii. Smt. Sutapa Majumdar, Economic Advisor, Shri Rahul Rawat Scientist, 'B' Shri Vikram Dhaka, Scientist 'B', Ministry of New and Renewable Energy, visited Netherlands and Denmark from 22-29th November, 2019 to participate in the EU-India Clean Energy and Climate partnership Study Tour on offshore Wind Energy.
- xxxiii. Dr. P.C. Maithani, Scientist, 'G', Advisor, Ministry of New and Renewable Energy, visited Madrid, Spain from 2-13th December, 2019 to participate in the 25th Session of the Conference of Parties (COP25) of the UNFCCC.
- xxxiv. Shri Anand Kumar, Secretary, Ministry of New and Renewable Energy, visited Madrid, Spain from 9-10 December, 2019 to participate in the 25th Session of the Conference of Parties (COP25) of the UNFCCC.





*Awardees of the second round of PACEsetter fund programme with Shri Anand Kumar, Secretary, MNRE and Mr. Kenneth Ian Juster, the U.S. Ambassador to India*

12.10 A facilitation ceremony was organized on 20th September, 2019 by the Ministry of New and Renewable Energy and USA Embassy to the awardees of the second round of PACEsetter fund programme. The event was co-chaired by Shri Anand Kumar, Secretary, MNRE and Mr. Kenneth Ian Juster, the U.S. Ambassador to India. In the second round, four projects were selected for award of grants. The awardees include Society for Economic and Social Studies, New Delhi, Customized Energy Solutions India Pvt. Ltd., Pune, The Energy & Resources Institute (TERI), New Delhi and Raghavendra Suntech Systems Pvt Ltd (RSSPL), Bengaluru.

## 12.11 **ENGAGEMENT WITH INTERNATIONAL RENEWABLE ENERGY AGENCY (IRENA)**

- (i) India is one of the Founder Members of the International Renewable Energy Agency (IRENA) which is an intergovernmental organization that supports countries in their transition to a sustainable energy future, and serves as the principal platform for international cooperation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bio-energy, geothermal, hydro power, ocean, solar and wind energy in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity.





- (ii) IRENA encourages governments to adopt enabling policies for renewable energy investments, provides practical tools and policy advice to accelerate renewable energy deployment, and facilitates knowledge sharing and technology transfer to provide clean, sustainable energy for the world's growing population.
- (iii) India regularly participates in the meetings of council and General Assembly of IRENA and provides constructive suggestions.

## 12.12 INTERNATIONAL TRAINING PROGRAMMES

- (i) The autonomous institutions of the Ministry, National Institute of Solar Energy (NISE) and National Institute of Wind Energy (NIWE) conducts various International training programmes for delegates from different countries under Indian Technical and Economic Cooperation (ITEC) of MEA.
- (ii) The primary objective of these training programmes is to acquaint the participants with the latest developments in Solar and Wind Technologies, Policy Aspects, Quality Control and Utilization Aspects of Renewable Energy. The knowledge acquired during the training can be utilized by the participants while deploying Renewable Energy Technologies in their respective countries.
- (iii) NIWE organized the International Training Courses as given in **Table 12.1**:
- (iv) NISE organized International Training programmes as given in **Table 12.2**

## 12.13 INTERNATIONAL SOLAR ALLIANCE (ISA)

- (i) ISA is a reflection of India's commitment for accelerating the development and deployment of solar energy for achieving universal energy access at affordable rate. India considers ISA as an alternative paradigm for international co-operation - one that is based on collaboration and leveraging strengths of individual countries to collectively effect change to address the biggest challenges confronting humanity - sustainable energy, energy poverty and climate change.
- (ii) Recognizing that ISA has a major role in achieving Sustainable Development Goals, and objectives of the Paris Agreement on Climate Change, and that the ISA initiative would benefit the world at large, during the first Assembly of the ISA an Indian resolution to extend the Membership of the organisation to all countries that are Members of the United Nations was adopted. ISA is now perceived as key to achieving the 2030 Sustainable Development Goals and objectives of the Paris Agreement on Climate Change. As on date 84 countries have signed the Framework Agreement of the ISA. Of these, 62 countries have ratified the same.
- (iii) India has been providing all out support for realizing ISA's vision and objectives. The Government of India has allotted 5 acres of land to the ISA in National Institute of Solar Energy (NISE) campus, Gurugram and has released a sum of Rs. 160 crore for creating a corpus fund, building infrastructure and meeting day to day recurring expenditure of the ISA upto the year 2021-22. As per commitment, India will release additional Rs. 15 crore in the year 2020-21. In addition, various Public Sector Enterprises of Government of India have contributed US\$ 8 million for augmenting ISA corpus fund. Apart from these, India has set aside US\$ 2 Billion for solar projects in Africa out of Government of India's US\$10 billion concessional Line of Credit (LOC) for Africa. Exim Bank of India is implementing this line of credit in close coordination with ISA countries in Africa. On the 24 September 2019, on the side-lines of the 74th UN General Assembly, India announced allocation of US\$ 12 million grant, and a concessional LOC of US\$ 150 million for Pacific Islands Developing States for undertaking solar, renewable energy and climate related projects.



<b>Table 12.1: International Training Courses and Workshops organized by NIWE</b>				
<b>S. No.</b>	<b>Name of the programme/ Course Conducted</b>	<b>Duration</b>	<b>No. of participants</b>	<b>No of countries</b>
1.	04th Special International Training Course on WIND RESOURCE ASSESSMENT AND WIND FARM PLANNING for ITEC Partner Countries under ITEC programme	28.08.2019 To 20.09.2019	16	9
2.	03rd Special International Training Course on DESIGN INSTALLATION & MAINTANENCE OF SMALL WIND TURBINE for ITEC Partner Countries under ITEC programme	28.08.2019 To 24.09.2019	26	9
3	24th International Training Course on WIND TURBINE TECHNOLOGY AND APPLICATIONS for ITEC Partner Countries under ITEC programme	23.10.2019 To 19.11.2019	28	18
4	7th Special International Training Course on WIND TURBINE TECHNOLOGY AND APPLICATIONS for African Countries under IAFS-III programme	24.10.2019 To 21.11.2019	26	16
5	Special International Training Course on SOLAR RESOURCE ASSESSMENT AND DEVELOPMENT OF SOLAR POWER PLANT specially for ISA Member Countries under ITEC programme	27.11.2019 To 20.12.2019	34	21
6	Prof. Annamani International Conference on WIND AND SOLAR RESOURCE ASSESSMENT	29.11.2019 To 30.11.2019	211	22
<b>Scheduled</b>				
7	25th International Training Course on WIND TURBINE TECHNOLOGY AND APPLICATIONS for ITEC Partner Countries under ITEC programme	29.01.2020 To 25.02.2020		
8	SCALING UP OF RENEWABLES (WIND AND SOLAR) GENERATION WITH FOCUS ON POLICY INITIATIVES Specially for BIMSTEC Countries under ITEC programme	26.02.2020 To 03.03.2020		

Table 12.2: International Training Courses and Workshops organized by NISE				
S. No.	Name of the programme/ Course	Duration	No. of participants	No of countries
1	Renewable Energy Capacity Building Programme for African Countries under India -Africa Forum Summit-III	12.08.2019 To 30.08.2019	40	12
2	International Training Programme on Solar Energy Technologies and Applications	16.09.2019 To 04.10.2019	33	19
3	ITEC Programme on Solar Energy for Master Trainers from ISA Member Countries	04.11.2019 To 22.11.2019	21	12
4	International Training Programme on Solar Energy Technologies and Applications	25.11.2019 To 13.11.2019	29	21

- (iv) The Ministry of New and Renewable Energy hosted the second Assembly of ISA on 30 and 31 October 2019 New Delhi. While on 30 October 2019, coordination and consultation meetings on different aspects of ISA programmes and initiatives were held, the Assembly met on 31 October 2019. Delegations from 78 countries participated in the Assembly, this includes 29 Ministerial delegations of which 25 are from ISA member countries, 2 from signatory countries, and further 2 from prospective member countries.
- (v) Shri R.K. Singh, Minister of New & Renewable Energy, Power and Skill Development Entrepreneurship, Government of India & ex-Officio President of ISA Assembly opened the Assembly. The Assembly deliberated upon ISA’s activities and new proposals for accelerating development and deployment of



*The Minister of State for Power, New & Renewable Energy (Independent Charge) and Skill Development & Entrepreneurship, Shri Raj Kumar Singh and other dignitaries at the 2nd International Solar Alliance Assembly, in New Delhi on October 31, 2019.*





solar energy in ISA member countries, and approved Rules and Procedure of the Assembly, Manual of Regulations of ISA, and Work Programme and Budget for the year 2020.

- (vi) ISA has initiated many activities and programmes. Demand for over 1000 MW solar power and 300000 solar water pumps has been aggregated from ISA member countries. Some of the major activities for building domestic capacity of the ISA member countries include ITEC Master Trainers Programme at NISE Gurugram; M.Tech programme for mid-career professionals at IIT, Delhi; STAR-C programme, and development of the INFOPEDEIA. In order to understand the challenges and issues ‘on the ground’ and to strengthen support for ISA programmes, the ISA sent country missions to eight countries over the course of 2019 – to Benin, the Democratic Republic of the Congo, Guinea, Malawi, Mali, Niger, Togo, and Uganda. ISA has significantly extended outreach and have partnered with over 40 organizations. These broadly include UN, Multilateral Development Banks (MDBs), Development Finance Institutions (DFIs), international and regional organizations and foundations, and private sector players.





## PROMOTION OF OFFICIAL LANGUAGE – HINDI



## PROMOTION OF OFFICIAL LANGUAGE – HINDI

- 13.1 With a view to implement the Official Language Policy of the Government of India, a Hindi Section has been set up in the Ministry. Its functions are as under:-
- (I) Translation work; and
  - (II) Implementation of the Official Language policy of the Govt. of India.
- 13.2 During the year 2019-20 concerted efforts were made to ensure proper compliance of the provisions of Official Language Act 1963 and Rules framed thereunder.
- 13.3 For promotion of Official Language Policy and to create more conducive environment for the officials to do more work in Hindi, various programmes/schemes are being undertaken which include the following :
- (i). Website of the Ministry has been made bilingual and it is being updated from time to time.
  - (ii). A digital board has been installed at the entrance of the Ministry with new Hindi Word being displayed on daily basis. Inspirational quotes are also displayed.
  - (iii). Standard Drafts and Standard Forms have been prepared in Hindi and placed on the Website of the Ministry for convenience of officers/staff.
  - (iv). Hindi books are purchased in the Ministry and efforts are made to achieve the targets laid down by the Department of Official Language.
  - (v). Addresses of Nodal Agencies have been prepared in Hindi.
  - (vi). All documents coming under section 3(3) of the O.L. Act 1963, eg. Press Release, Tender Notices, Rules, General Orders, Notifications, Cabinet Notes, Parliament Questions and other Documents to be laid in the Parliament are presented bilingually.
  - (vii). Letters received in Hindi are invariably replied in Hindi and Rule (5) of the Official Language Rules 1976 is fully complied with.
  - (viii). First working day of every month is celebrated as Hindi Divas in the Ministry. On this day the work is done mostly in Hindi.
- 13.4 During the year 2019-20, various measures were taken for effective implementation of Official Language Policy in the Ministry. As per the Quarterly Progress Report for the quarter ended on 31st December, 2019, the percentage of Hindi correspondence with offices in Regions 'A' 'B' and 'C' was 78.58%, 67.60% and 64.51% respectively.
- 13.5 In Order to review the progress made in the implementation of Official Language policy, quarterly meetings of Official Language Implementation Committee were held regularly. Discussions were held on quarterly progress reports received from various Sections/Divisions of the Ministry, and IREDA, SECI, NIWE, NISE and NIBE. The Sections/Divisions and other Organizations were advised to achieve the targets specified by the Department of Official Language.

### 13.6 HINDI FORTNIGHT

With a view to create awareness and to increase the use of Hindi in official work, a 'Hindi Fortnight' was observed in the Ministry during 13th to 27th September, 2019. During the fortnight, messages from



Hon'ble Minister of Home Affairs and Hon'ble Minister (NRE) regarding progressive use of Hindi were read out. A number of competitions were held and there was good participation by officers and staff of the Ministry. 39 officers and staff members belonging to Hindi and non-Hindi speaking categories were given cash awards and certificates based on their performances. Hindi Fortnight was also observed in various offices/undertakings of the Ministry.

- 13.7 Hindi Noting & Drafting Incentive Scheme of the Department of Official Language was continued during the year and ten officers/staff were awarded under this Scheme.
- 13.8 Re-constitution of Hindi Salahkar Samiti is under process.

### 13.9 PRAKARTIK URJA PURASKAR YOJNA

To promote original book writing in Hindi or translated in Hindi related to the subjects of Non-Conventional Energy, Prakartik Urja Puskar Yojna is being implemented in the Ministry, since 1988. Under this scheme, there is a provision to award a first prize of Rs.1,00,000/-, second prize of Rs. 60,000/- and third prize of Rs. 40,000/- for the books originally written in Hindi. For the books translated into Hindi the amount of first, second and third prize is Rs. 50,000/-, Rs.30,000/- and Rs.20,000/- respectively. An appreciation letter signed by the Secretary, MNRE is also given to the awardees.



*Hindi Pakhwara-2019 - Prize Distribution Ceremony*



### 13.10 ORGANIZATION OF HINDI WORKSHOPS

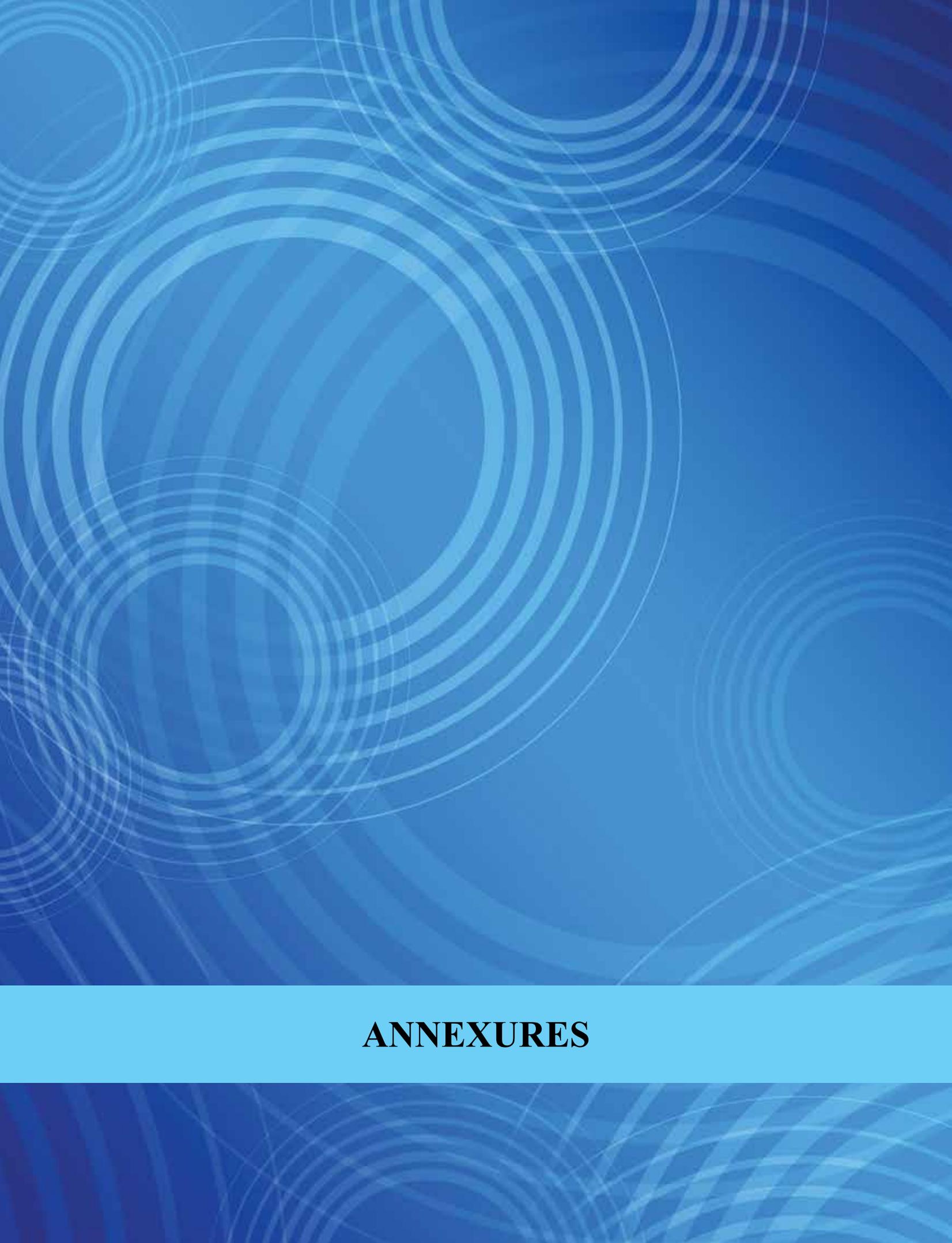
With a view to encourage the officers/staff to do their official work in Hindi, Hindi workshop is organized in every quarter for the officers and staff of different categories. During the year, four Hindi workshops were organized. A number of officers/staff from the Ministry participated in these workshops.

### 13.11 INSPECTION OF SUBORDINATE OFFICES AND SECTIONS

With a view to assess the status regarding progressive use of Official Language, inspection of various offices and Autonomous Institutions/ PSU etc. was carried out from time to time by the officials of Hindi Section. Inspections of IREDA, SECI and NISE were carried out during the year under report.



*Hindi Pukhwa-2019 - Prize Distribution Ceremony*

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# **ANNEXURES**

## ANNEXURE I

Present Sanctioned Strength and in Position Strength of MNRE As on 01.01.2020:-

Group	A	B	C	Total
SANCTIONED	141	85	88	314
IN POSITION	84	55	63	202
SC	13	12	20	45
ST	3	2	4	9
OBC	7	12	9	28
PH	0	1	1	2

## IREDA

Employees Staff strength of IREDA as on 31.03.2020 are as under:-

Classifications	Board Level	Group A	Group B	Group c	Group D	Total
In position	03*	134**	05	22	---	164
SC	---	17	---	06	---	23
ST	---	08	---	01	---	09
OBC	---	24	---	03	---	27
Physically Handicapped	---	03	---	01	---	

Total Sanctioned Strength (below Board level) is 213.

\* Shri Praveen Kumar handled the additional charge of CMD, IREDA till 31.12.2019

\*\* Shri Vinayak Garg is handling the additional charge of CVO, IREDA w.e.f. 12.12.2019

## NIWE

Group-wise details of posts in National Institute of Wind Energy as on 31.03.2020 are as under:-

No. of Posts	Group**			Total
	A	B	C	
Sanctioned	18	13	17	48
In Position	18	11	17	46
SC	2	2	2	6
ST	1			1
OBC	3	2	2	7
PH	-	-	-	-

\*\* Classification of posts as per the G.I., Dept of Per.& Trg., O.M. No. F.No.11012/10/2016 – Estt. A-III dated 8.12.2017



## SSS-NIBE

Information pertaining to the staff of Sardar Swaran Singh National Institute of Bio-Energy (SSS-NIBE):-

Group	Board Level	A	B	C	D	Total
Sanctioned	1	20*	1	4	-	26
In Position	-	3	1	4	-	8
SC	-	-	-	-	-	-
ST	-	-	-	-	-	-
Physically Handicapped	-	-	-	-	-	-

\* The recruitment of group A is under process.

## NISE

Information pertaining to the staff of National Institute of Solar Energy (NISE), an autonomous Institute functioning under the administrative control of Ministry of New and Renewable Energy as 31-03-2020 are as under:-

Group	A	B	C	D	Total
Sanctioned	25	16	0	0	41
In Position	6	0	0	0	6
SC	0	0	0	0	0
ST	0	0	0	0	0
OBC	0	0	0	0	0
PH	0	0	0	0	0

Note: Recruitment is under process for the vacant post and shall be completed by 31-03-2020.

## SECI

SECI Staff strength as on 31.12.2019 :-

GROUP	A	B	C	D	Total
SANCTIONED	101	10	NIL	NIL	111
IN POSITION	76	08	NIL	NIL	84
SC	03	02	NIL	NIL	05
ST	02	NIL	NIL	NIL	02
OBC	12	02	NIL	NIL	14
PH	01	01	NIL	NIL	02



## PAY AND ACCOUNTS OFFICE, MINISTRY OF NEW AND RENEWABLE ENERGY

Sanctioned strength and in-position in respect of Pay & Accounts Office, Ministry of New & Renewable Energy as on 31.03.2019 :-

GROUP	A	B	C	D	TOTAL
SANCTIONED	1	6	9	-	16
IN POSITION	1	4	7	-	12
SC	-	1	-	-	1
ST	-	-	1	-	1
OBC	-	-	2	-	2
PH	-	-	-	-	-

## ANNEXURE II

### AUDIT PARA

Year	Report No.	Chapter No.	Para No.	Action	Subject	Stage
2018	2 OF 2018	II	II		Review of Outcome Budget of Ministry of New and Renewable Energy#	Revised ATN Uploaded
2018	2 OF 2018	IX	9.1	Add Revised ATN	Non-utilisation of Solar Thermal Power Plant*	Draft ATN Returned for Further Clarification

# no action pending from the side of this Ministry

\* This is PAC para now





## ANNEXURE III

### GRANTS IN AID TO STATES AND VOLUNTARY ORGANISATIONS

Fund Released to Implementing Agencies Under HRD Programme in FY 2019-20				
Sr. No.	Sanction Number	Agency Name	Sanction Date	Amount ( Rs.)
1	342-11/36/2017-HRD	Indian Institute of Technology Roorkee, Uttarakhand	04.06.2019	27,08,258/-
2	10/1(26)/2015-P&C	National Institute of Solar Energy (An Autonomous Institute of New And Renewable Energy) ,Gurgaon	30.08.2019	14,93,65,769/-
3	10/1(26)/2015-P&C		27.09.2019	3,00,00,000/-
4	10/1(26)/2015-P&C		27.09.2019	2,00,00,000/-
5	10/1(26)/2015-P&C		30.09.2019	33,44,91,894/-
6	342-14/1/2019-HRD	Gandhigram Rural Institute(Deemed University) Tamil Nadu	14.05.2019	25,50,000/-
7	342-14/1/2019-HRD		27.12.2019	16,60,292/-

Grant given to State PIAs of more than 50 lakh in Green Energy Corridor from 01.01.2019 to 31.12.2019					
S. No.	Sanction No.	Project/Organization Name	State	Fund released	
				Date	"Amount (Rs. in lakh)"
1	1/7/2015-EFM	Gujarat Energy Transmission Corporation	Gujarat	27.02.2019	6839.00
2	367-11/1/2019-GEC	Maharashtra Electricity Transmission Corporation Limited	Maharashtra	28.02.2019	3556.59
3	367-11/1/2019-GEC	Maharashtra Electricity Transmission Corporation Limited	Maharashtra	08.05.2019	611.20
4	367-11/26/2017-GEC	Himachal Pradesh Power Transmission Corporation Limited	Himachal Pradesh	26.09.2019	2060.00
5	1/7/2015-EFM	Transmission Corporation of Andhra Pradesh Limited	Andhra Pradesh	26.09.2019	2433.96
<b>Total (A)</b>					<b>15500.75</b>

Grant given to State PIAs of more than 50 lakh in Green Energy Corridor from 01.01.2019 to 31.12.2019					
S. No.	Sanction No.	Project/Organization Name	State	Fund released	
				Date	"Amount (Rs. in lakh)"
1	367-11/26/2017-GEC	Himachal Pradesh State Electricity Board Limited	Himachal Pradesh		155.84
<b>Total (B)</b>					<b>155.84</b>
<b>Total (A) + (B)</b>					<b>15656.59</b>





<b>CFA released under the Solar Park Scheme by SECI to various Solar Power Park Developers (SPPDs), State Transmission Utilities (STUs) and Central Transmission Utility (CTU) as on 31.10.2019</b>			
<b>(in Rs. Lakh)</b>			
<b>Sl. No.</b>	<b>State</b>	<b>Solar Park</b>	<b>Total CFA disbursed</b>
1	Andhra Pradesh	Ananthapuramu-I Solar Park	13525.00
2		Kurnool Solar Park	12625.00
3		Kadapa Solar Park	5425.00
4		Ananthapuramu-II Solar Park	5124.80
5		Solar-Wind Hybrid Park	25.00
6		Ext Trans. PGCIL- Ananthapuramu-I solar park	10955.54
7		Ext Trans. APTRANCO- Ananthapuramu-II solar park	2000.00
8		Ext Trans. APTRANCO-Kurnool solar park	7400.00
9	Arunachal Pradesh	Lohit Solar Park	19.65
10	Chhattishgarh	Rajnandgaoun Solar Park	15.00
11	Gujarat	Radhnesada Solar Park	3311.35
12		Ext Trans PGCIL-Radhnesada solar park	2800.00
13	Karnataka	Pavagada Solar Park	18525.44
14		Ext Trans PGCIL-Pavagada solar park	12000.00
15	Kerala	Kasargod Solar Park	200.00
16	Madhya Pradesh	Rewa Solar Park	7633.51
17		Neemuch-Mandsaur Solar Park	2548.50
18		Ext Trans PGCIL-Rewa solar park	6000.00
19	Maharashtra	Sai Guru Solar Park (Pragat)	435.00
20		Patoda Solar Park (Paramount)	25.00
21		Dondaicha Solar Park	625.00
22		Latur Solar Park	10.00
23		Washim solar park	15.00
24		Yavatmal Solar Park	10.00
25		Kacharala solar park	15.00
26	Manipur	Bukpi Solar Park	10.00
27	Meghalaya	Solar park in Meghalaya	3.07
28	Mizoram	Vankal Solar Park	10.00





29	Nagaland	Solar Park in Nagaland	10.00
30	Rajasthan	Bhadla-II Solar Park	6120.00
31		Bhadla-III Solar Park	9614.16
32		Bhadla-IV Solar Park	5125.00
33		Phalodi-Pokaran Solar Park	1825.00
34		Fatehgarh Phase-1B Solar Park	25.00
35		Nokh Solar Park	25.00
36		RVPN- Bhadla Phase-II, III and IV solar parks	10747.10
37		PGCIL- Bhadla Phase-III IV, Phalodi-Pokaran and Fatehgarh Ph-1B solar parks	6000.00
38	Tamil Nadu	Kadaladi solar park	25.00
39	Telangana	Gattu Solar Park	25.00
40	Uttar Pradesh	Solar Park in UP	2081.80
41		Ext Trans. UPPTCL- UP solar park	1719.15
42	Uttarakhand	Solar park in Uttarakhand	8.25
43	West Bengal	Solar park in West Bengal	25.00
<b>Total</b>			<b>154667.32</b>

### Funds released under 750 MW, 2000 MW, 5000 MW VGF Scheme, Solar Demo GBI Scheme and RPPSGP Scheme to SECI from 01.01.2019 to 31.12.2019.

750 MW VGF Scheme				
Sl. No.	Sanction Number	Agency Name	Sanction Date	Amount (Rs.)
1	F. No. 32/7/2017-Solar Energy Group	SECI	28/09/2019	111,56,03,315/-

2000 MW VGF Scheme				
Sl.No.	Sanction Number	Agency Name	Sanction Date	Amount (Rs.)
1	F. No. 283/70/2017-Grid Solar	SECI	29/06/2019	131,67,20,059/-
2	F. No. 283/70/2017-Grid Solar	SECI	31/12/2019	110,70,87,644/-



5000 MW VGF Scheme				
Sl.No.	Sanction Number	Agency Name	Sanction Date	Amount (Rs.)
1	F. No. 283/69/2017- Grid Solar Part -1	SECI	29/06/2019	95,13,11,288/-

RPSSGP Scheme				
Sl.No.	Sanction Number	Agency Name	Sanction Date	Amount (Rs.)
1	F. No. 32/6/2017-Solar Energy Group	IREDA	30/03/2019	13,42,31,062/-
2	F. No. 32/6/2017-Solar Energy Group	IREDA	29/06/2019	75,89,76,504/-
3	F. No. 32/6/2017-Solar Energy Group	IREDA	27/09/2019	15,66,16,656/-

Solar Demo GBI VGF Scheme				
Sl.No.	Sanction Number	Agency Name	Sanction Date	Amount (Rs.)
1	283/61/2018-GRID SOLAR	IREDA	28/09/2019	10,58,57,200/-

**A. ‘Pilot-cum-demonstration project for development of grid connected solar PV power plants on canal banks and canal tops’**

Funds released in FY 2019-20 (till 31st Dec 2019) under ‘Pilot-cum-demonstration project for development of grid connected solar PV power plants on canal banks and canal tops’:

- (till 31st Dec 2019): NIL
- Expected releases from 01.01.2020 to 31.03.2020: 27.5 Crs. to Solar Energy Corporation of India Limited (SECI) (subject to availability of funds)

**B. ‘CPSU Scheme Phase-I’**

Funds released in FY 2019-20 (till 31st Dec 2019) under ‘CPSU Scheme Phase-I’:

- (till 31st Dec 2019):

Sl. No.	Sanction Number	Agency name	Sanction Date	Amount released (Rs.)
1.	302/3/2017-GRID SOLAR	Solar Energy Corporation of India Limited (SECI)	30.09.2019	3,03,00,000/-

- Releases / expected releases from 01.01.2020 to 31.03.2020: NIL

**C. ‘CPSU Scheme Phase-II’**

Funds released in FY 2019-20 (till 31st Dec 2019) under ‘CPSU Scheme Phase-II’:

- (till 31st Dec 2019):



Sl. No.	Sanction Number	Agency name	Sanction Date	Amount released (Rs.)
1.	302/4/2017-GRID SOLAR	Solar Energy Corporation of India Limited (SECI)	30.09.2019	319,18,03,402/-

- Releases / expected releases from 01.01.2020 to 31.03.2020: NIL

#### D. Scheme for setting up of Distributed Grid-connected Solar PV Power Projects in Andaman & Nicobar & Lakshadweep Islands with Capital Subsidy from MNRE

Funds released in FY 2019-20 under 'Scheme for setting up of Distributed Grid-connected Solar PV Power Projects in Andaman & Nicobar & Lakshadweep Islands with Capital Subsidy from MNRE':

- (till 31st Dec 2019):

Sl. No.	Sanction Number	Agency name	Sanction Date	Amount released (Rs.)
1.	No. 283/109/2018-Grid Solar	NLC India Limited (NLCIL)	10.10.2019	6,77,24,832/-

- Releases / expected releases from 01.01.2020 to 31.03.2020: NIL

#### Solar Photovoltaic (Off-grid Solar Division) Fund released above 50 lakh upto 31.12.2019

S. No.	Sanction No.	Project/ Organisation	State	Funds Releases	
				Date	(Rs. in Lakh)
1	32/90/2017-SPV Division	Manipur Renewable Energy Development Agency	Manipur	07-05-2019	70,22,600
2	32/271/2017-SPV Division	Orissa Renewable Energy Development Agency	Orissa	10-05-2019	78,73,875
3	32/81/2017-SPV Division	Orissa Renewable Energy Development Agency	Orissa	10-05-2019	79,24,000
4	32/659/2017-SPV Division	Rajasthan Renewable Energy Corporation Ltd	Rajasthan	10-05-2019	83,71,853
5	32/25/2018-SPV Division	Uttar Pradesh New And Renewable Energy Development Agency	Uttar Pradesh	10-05-2019	5,47,04,975
6	32/25/2018-SPV Division	Uttar Pradesh New And Renewable Energy Development Agency	Uttar Pradesh	10-05-2019	12,11,25,750
7	32/25/2018-SPV Division	Uttar Pradesh New And Renewable Energy Development Agency	Uttar Pradesh	10-05-2019	27,58,44,275
8	32/4/2019-SPV Division	Karnataka Renewable Energy Development Limited	Karnataka	16-05-2019	1,35,90,012
9	32/4/2019-SPV Division	Karnataka Renewable Energy Development Limited	Karnataka	16-05-2019	2,04,12,000
10	32/5/2019-SPV Division	Maharashtra Energy Development Agency	Maharashtra	16-05-2019	3,76,42,500



11	32/5/2019-SPV Division	Maharashtra Energy Development Agency	Maharashtra	16-05-2019	3,76,42,500
12	32/4/2019-SPV Division	Karnataka Renewable Energy Development Limited	Karnataka	16-05-2019	4,56,84,000
13	32/5/2019-SPV Division	Maharashtra Energy Development Agency	Maharashtra	16-05-2019	6,00,00,000
14	32/83/2017-SPV Division	Orissa Renewable Energy Development Agency	Orissa	16-05-2019	6,28,48,380
15	32/7/2018-SPV Division	New And Renewable Energy Development Corporation of Andhra Pradesh Limited	Andhra Pradesh	27-05-2019	51,97,261
16	32/12/2018-SPV Division	Arunachal Pradesh Energy Development Agency	Arunachal Pradesh	26-06-2019	2,83,06,080
17	32/39/2018-SPV Division	Nagaland Renewable Energy Development Agency	Nagaland	26-06-2019	4,90,01,349
18	32/31/218-SPV Division	Jharkhand Renewable Energy Development Agency	Jharkhand	27-06-2019	53,80,000
19	32/8/2019-SPV Division	Assam Energy Development Agency	Assam	27-06-2019	84,36,030
20	32/31/2018-SPV Division	Jharkhand Renewable Energy Development Agency	Jharkhand	27-06-2019	1,88,30,000
21	32/652/2017-SPV Division	Punjab Energy Development Agency	Punjab	27-06-2019	7,12,68,900
22	32/644/2017-SPV Division	Nagaland Renewable Energy Development Agency	Nagaland	29-06-2019	2,21,50,500
23	32/27/2016-17/PVSE (Part-II)	Tripura Renewable Energy Development Agency	Tripura	29-06-2019	2,24,85,120
24	32/132/2017-SPV Division	Jharkhand Renewable Energy Development Agency	Jharkhand	02-09-2019	2,56,83,904
25	32/542/2017-SPV Division	Zoram Energy Development Agency	Mizoram	27-09-2019	89,73,616
26	32/20/2016-17-SPV Division (Pasrt-5)	Zoram Energy Development Agency	Mizoram	27-09-2019	1,70,02,763
27	32/62/2017/SPV Division	Uttarakhand Renewable Energy Development Agency	Uttarakhand	28-09-2019	79,97,908
28	32/62/2018-SPV Division	Orissa Renewable Energy Development Agency	Orissa	28-09-2019	2,30,31,625
29	32/64/2018-SPV Division	Karnataka Renewable Energy Development Limited	Karnataka	30-09-2019	1,62,50,000



30	32/60/2018-SPV Division	Arunachal Pradesh Energy Development Agency	Arunachal Pradesh	30-09-2019	1,98,00,000
31	32/60/2018-SPV Division	Assam Energy Development Agency	Assam	30-09-2019	2,30,02,000
32	32/60/2018-SPV Division	Tripura Renewable Energy Development Agency	Tripura	30-09-2019	2,97,00,000
33	32/60/2018-SPV Division	Nagaland Renewable Energy Development Agency	Nagaland	30-09-2019	5,71,58,000
34	32/60/2018-SPV Division	Tripura Renewable Energy Development Agency	Tripura	30-09-2019	6,78,78,000
35	32/60/2018-SPV Division	Himachal Pradesh Energy Development Agency	Himachal Pradesh	30-09-2019	8,08,77,000
36	32/60/2018-SPV Division	Uttarakhand Renewable Energy Development Agency	Uttarakhand	30-09-2019	9,33,60,000
37	32/60/2018-SPV Division	Manipur Renewable Energy Development Agency	Manipur	30-09-2019	11,05,00,000
38	32/60/2018-SPV Division	Zoram Energy Development Agency	Mizoram	30-09-2019	11,37,60,000
39	32/60/2018-SPV Division	Arunachal Pradesh Energy Development Agency	Arunachal Pradesh	30-09-2019	11,86,20,000
40	32/60/2018-SPV Division	Assam Energy Development Agency	Assam	30-09-2019	12,05,25,000
41	32/5/2019-SPV Division	Maharashtra Energy Development Agency	Maharashtra	30-09-2019	21,23,79,800
42	42/19/2018-SPV Division	India Tourism Development Corporation	New Delhi	26-11-2019	85,37,054
43	32/61/2018-SPV Division	UM Green Lighting Pvt. Ltd.	Bangalore	06-12-2019	75,85,713
44	32/16/2017-18/PVSE (Part-I)	M.P. Urja Vikas Ltd., Bhopal	Madhya Pradesh	26-12-2019	18,74,99,498
45	32/27/2019/SPV Division	Zoram Energy Development Agency	Mizoram	30-12-2019	1,26,00,000
46	32/29/2019-SPV Division	New And Renewable Energy Development Corporation of Andhra Pradesh Limited	Andhra Pradesh	30-12-2019	2,18,00,000
47	32/652/2017-SPV Division	Punjab Energy Development Agency	Punjab	31-12-2019	5,09,90,130
48	32/659/2017-SPV Division	Rajasthan Renewable Energy Corporation Ltd.	Rajasthan	31-12-2019	17,89,83,115



## The Private, voluntary organization and State PIAs received grant of more than Rs. 50.00 lakh during the year 2019-20 (up to 31.12.2019)

### (A) State Project Implementing Agencies -

S. No.	Sanction No.	Project/ Organisation	State	Organization / Agency	Funds Releases		Remarks
					Date	(Rs. in Lakh)	
1	286/55/2017-SHP	Setting up of 3 new SHP projects on Saurashtra Branch canal: i. SHP -1 (15 MW) ii. SHP - 2 (15 MW) iii. SHP -3 (15 MW)	Gujarat	Sardar Sarovar Narmada Nigam Limited (SSNNL) Gujarat	28.06.2019	600.00	Release of balance of 3rd instalment.
2	286/23/2017-SHP	Setting up of 3 SHP projects on Kachchh Branch Canal: i. SHP - I (9.99MW) ii. SHP - II (6.66MW) iii. SHP-III (6.66MW)	Gujarat	SSNNL, Gujarat	30.08.2019	2100.00	Release of 3rd instalment.
3	6/4/2015- SHP	Setting up of 6 nos. of SHPs totalling to 12 MW capacity on Migyam Branch Canal in Gujarat	Gujarat	SSNNL, Gujarat	27.12.2019	1942.50	Release of part of 2nd and 3rd instalment combined.
4	286/1/2017-SHP	Upper Kallar (2MW) SHP	Kerala	KSEBL	27.09.2019	210.00	Release of 2nd instalment
5	290/53/2017-SHP	Development & Upgradation of 233 Watermills in Karnataka.	Karnataka	Karnataka Renewable Energy Development Limited (KREDL), Karnataka	24.10.2019	159.45	Release of 2nd and final instalment.
6	3(70)(2)2008(Vol II)-SHP	Setting up of : i. Kidding SHP (0.5 MW) ii. Payu SHP (1 MW)	Arunachal Pradesh	Department of Hydro Power Development	12.12.2019	345.49	Release of final instalment.
7	286/7/2017-SHP	Dunao SHP (1.50 MW)	Uttrakhand	UJVNL Uttrakhand	28.09.2017	52.50	Release of 4th & final instalment.
<b>Total</b>						<b>5409.94</b>	
<b>(B) Private Sector -</b>							
1	287/95/2017-SHP	Leond SHP	Himachal Pradesh	M/s Leond Hydro Power Pvt. Ltd.	12.04.2019	150.00	Release of 2nd and final instalment of subsidy.



2	287/7/2017-SHP	Serai SHP (2MW)	Himachal Pradesh	M/s Pinnacle Hydro Pvt. Ltd.	17.10.2019	105.00	Release of 2nd and final instalment of subsidy.
3	287/4/2018-SHP	Sarju- III SHP (9.0MW)	Uttarkhand	M/s Uttar Bharat Hydro Power pvt. Ltd.	29.08.2019	197.50	Release of 2nd and final instalment of subsidy.
4	287/170/2017-SHP	Vanala SHP (15MW)	Uttarkhand	M/s HIMURJA Pvt. Ltd.	13.09.2019	620.00	Release of final subsidy
5	287/44/2017-SHP	Sarju- II SHP (10.5MW)	Uttarkhand	M/s Uttar Bharat Hydro Power pvt. Ltd.	06.12.2019	185.00	Part release of 2nd instalment of eligible subsidy.
6	287/4/2018-SHP	Yettinahole SHP (3.0MW)	Karnataka	M/s Mysore Mercantile Co. Ltd.	12.09.2019	80.00	Release of 2nd and final instalment of subsidy.
<b>Total</b>						<b>1337.50</b>	

**Fund released to Implementing Agencies under “Off-Grid and Decentralized Concentrated Solar Thermal (CST) Technologies for Community Cooking, Process Heat and Space Heating & Cooling Applications in Industrial, Institutional and Commercial Establishments” Programme in 2019**

Sl. No.	Sanction Number	Agency Name	Release Date	Amount (Rs.)
1.	271/97/2017-CST	Vidya Dairy	20.01.2019	13,68,000
2.	271/138/2017-CST	LREDA	29.03.2019	3,62,02,500
3.	271/138/2017-CST	KREDA, Kargil	25.04.2019	75,17,759
4.	271/8/2019-CST	M/s Ultra Conserve P. Ltd.	28.08.2019	13,30,560
5.	271/1/2019-CST	M/s Megawatt solutions	13.11.2019	22,80,000
6.	271/2/2018-CST	Savitri Bai Phule University	20.11.2019	16,52,000
7.	271/3/2019-CST	M/s Megawatt solutions	26.11.2019	11,40,000
8.	271/138/2017-CST	KREDA, Kargil	06.12.2019	3,38,32,781



<b>Agency Wise release of funds under Grid Connected Rooftop Solar Photovoltaic Programme in 2019</b>			
<b>No.</b>	<b>Sanction Number</b>	<b>Amount (in Rs)</b>	<b>Agency name</b>
1	318/69/2019-Grid Connected Rooftop	3,33,62,640.00	Madhya gujarat vij co. Limited - mgvcl-[mgvcl]
2	318/20/2018-Grid Connected Rooftop-Part(2)	12,10,38,042.00	Gujarat energy development agency-[geda]
3	318/65/2019-GCRT	1,32,50,000.00	Nhpc ltd.-[nhpc]
4	318/23/2019-GCRT	1,45,44,000.00	Ntpc vidyut vyapar nigam ltd.-[nvvn]
5	318/234/2017-GCRT	78,84,45,653.00	Solar energy corporation of india limited-[seci]
6	318/82/2017-GCRT	1,48,65,000.00	Pec limited-[peclimited]
7	318/19/2019-GCRT	2,52,00,000.00	Manipur renewable energy development agency (manireda)-[manireda]
8	318/15/2019-GCRT	4,72,66,687.00	India sme technology services limited-[dlne00000933]
9	318/30/2017-GCRT	7,66,78,350.00	Uttarakhand renewable energy development agency (ureda)-[ureda@2521387]
10	318/62/2019-Grid Connected Rooftop	20,23,33,034.00	Telangana new & renewable energy development corporation limited-[tnredcl]
11	318/57/2019-Grid Connected Rooftop	5,49,63,369.00	Punjab energy development agency-[peda]
12	318/71/2019-Grid Connected Rooftop	52,87,08,581.00	Gujarat energy development agency-[geda]
13	318/69/2019-Grid Connected Rooftop	3,33,62,640.00	Dakshin gujarat vij company ltd - dgvccl-[dgvccl]
14	318/67/2017-Grid Connected Rooftop	36,89,501.00	Manipur renewable energy development agency (manireda)-[manireda]
15	318/28/2019-GCRT	3,46,50,000.00	Meghalaya non conventional & rural energy development agecny-[mnreda]
16	318/46/2019-GCRT	2,29,50,000.00	Jharkhand renewable energy development agency-[jreda]
17	318/4/2017-GCRT	5,40,43,020.00	West bengal renewable energy development agency-[wbreda]
18	318/19/2019-GCRT	1,26,00,000.00	Manipur renewable energy development agency-[manireda]
19	318/33/2018-GCRT	13,05,98,413.00	Haryana renewable energy development agency-[hareda]
20	318/90/2018-GCRT	6,52,99,013.00	Jammu & kashmir energy development agency-[jakeda]
21	318/343/2017-GCRT	2,82,51,405.00	West bengal renewable energy development agency-[wbreda]
22	318/7/2019-GCRT	2,47,03,319.00	Solar energy corporation of india limited-[seci]
23	318/35/2018-GCRT	3,97,62,565.00	Indian oil corporation ltd.-[iocrandd]
24	318/23/2019-GCRT	2,53,61,417.00	Ntpc vidyut vyapar nigam ltd.-[nvvn]
25	318/14/2018-GCRT	2,66,89,727.00	Chhatisgarh state renewable energy development agency-[creda]
26	318/1/2019-GCRT	4,98,10,800.00	Central electronics ltd.-[celt]
27	318/27/2019-GCRT	9,24,00,000.00	Assam energy development agency-[aeda]
28	318/38/2019-GCRT	5,14,80,218.00	West Bengal renewable





<b>Fund release to implementing agencies (State Nodal Agency, State Nodal Department, KVIC, NDDB Anand Gujarat etc.) under New National Biogas Organic Manure Programme (NNBOMP) &amp; Biogas Power (off-grid) Generation and Thermal programme (BPGTP) for the FY 2019-20 as on 15.01.2020.</b>					
<b>S. No</b>	<b>Name of Project</b>	<b>Executing Agency</b>	<b>Sanction</b>	<b>Sanction Date</b>	<b>Amount released By MNRE UP TO 15.01.2020</b>
1.	NNBOMP	NEDCAP, Andhra Pradesh	253/29/2019-BG	28.08.2019	1,50,00,000
2.	NNBOMP	NEDCAP, Andhra Pradesh	253/44/2019-BG	28.06.2019	24,41,000
3.	NNBOMP	MPSAIDC, Madhya Pradesh	253/25/2019-BG	26.08.2019	2,40,00,000
4.	NNBOMP	MPSAIDC, Madhya Pradesh	253/27/2019-BG	05.09.2019	48,00,000
5.	NNBOMP	MPSAIDC, Madhya Pradesh	253/28/2019-BG	04.09.2019	60,00,000
6.	NNBOMP	MPSAIDC, Madhya Pradesh	253/24/2019-BG	31.07.2019	51,07,500
7.	NNBOMP	Dir. Of Agriculture Kerala	253/37/2019-BG	27.09.2019	60,00,000
8.	NNBOMP	OREDA, Bhubneshwar	253/44/2019-BG	27.09.2019	48,00,000
9.	NNBOMP	RD&PRD Karnataka	253/29/2019-BG	05.09.2019	3,60,00,000
10.	NNBOMP	RD&PRD Karnataka	253/35/2019-BG	30.09.2019	6,84,000
11.	NNBOMP	RDD Maharashtra	253/34/2019-BG	27.09.2019	3,90,00,000
12.	NNBOMP	RDD Maharashtra	253/36/2018-BG	28.06.2019	90,00,000
13.	NNBOMP	RDD Maharashtra	253/34/2018-BG	28.06.2019	60,00,000
14.	NNBOMP	TREDA, Tripura	253/33/2019-BG	05.09.2019	10,00,000
15.	NNBOMP	TREDA, Tripura	253/45/2019-BG	25.11.2019	20,00,000
16.	NNBOMP	TREDA, Tripura	253/47/2019-BG	19.11.2019	3,65,000
17.	NNBOMP	PEDA, Punjab	253/36/2019-BG	30.09.2019	2,40,00,000
18.	NNBOMP	UREDA, Uttarakhand	253/5/2019-BG	29.06.2019	24,00,000
19.	NNBOMP	UREDA, Uttarakhand	253/65/2019-BG	08.06.2019	67,20,000
20.	NNBOMP	UREDA, Uttarakhand	253/4/2019-BG	29.06.2019	6,00,000
21.	NNBOMP	UREDA, Uttarakhand	253/66/2017-BG	29.06.2019	7,40,000
22.	NNBOMP	UREDA, Dehradun Uttarakhand	253/57/2019-BG	26.12.2019	6,00,000
23.	NNBOMP	RDD, Pauri, Uttarakhand	253/53/2019-BG	10.12.2019	36,00,000
24.	NNBOMP	RDD, Pauri, Uttarakhand	253/54/2019-BG	12.12.2019	6,00,000
25.	NNBOMP	RDD, Pauri, Uttarakhand	253/55/2019-BG	10.12.2019	6,00,000



26.	NNBOMP	BDTC, PAU, Ludhiana	253/17/2019-BG	28.06.2019	20,74,687
27.	NNBOMP	BDTC, UAS, Bangalore	256/4/2019-BG	08.05.2019	2,83,155
28.	NNBOMP	BDTC, CESR, Indore	256/2/2019-BG	29.05.2019	10,00,000
29.	NNBOMP	KVIC, Mumbai	253/8/2017-BG	27.09.2019	13,17,650
30.	NNBOMP	NDDB, Anand , Gujarat	253/46/2019-BG	16.10.2019	1,80,00,000
31.	NNBOMP	NDDB, Anand , Gujarat	253/48/2019-BG	26.11.2019	30,00,000
32.	NNBOMP	NDDB, Anand , Gujarat	253/49/2019-BG	27.11.2019	30,00,000
33.	NNBOMP	BDTC, TNAU, UAS Bangalore, PAU, Ludhiana, CESR Indore	256/8/2019-BG	29.07.2019	96,87,808
34.	NNBOMP	BDTC, IIT Guwahati, MPUAT Udaipur	256/8/2019-BG	11.09.2019	41,06,036
35.	NNBOMP	BDTC,, KIIT	256/8/2019-BG	11.09.2019	26,25,224
36.	BPP	MEDA, Maharashtra	343/14/2017-BG	29.05.2019	27,25,000
37.	BPP	UPNEDA, Uttar Pradesh	343/10/2019-BG	29.08.2019	11,44,000
38.	BPP	UPNEDA, Uttar Pradesh	343/9/2017-BG	03.09.2019	18,48,000
<b>TOTAL</b>					<b>25,28,69,060</b>

**The following private and voluntary organization received grant of more than Rs. 10 lakh but less than Rs. 50 lakh under Research and Development Programme during the year 2019-20 (31.12.2019)**

S. No.	Sanction No.	Project/ Organization Name	State	Fund Released	
				Date	Amount (In Lakhs)
1.	07/04/2008-09/ST	RTC, Indore	Madhya pradesh	27.06.2019	26,31,923/-
2.	15/27/2016-17/ST	C.S.M.C.R.I	Gujarat	17.07.2019	9,20,000/-
3.	10/1/2013-SHP	IIT Roorkee	Uttar pradesh	19.08.2019	4,21,000/-
4.	7/1/2009-10/ST	RTC Madurai	Tamilnadu	30.08.2019	15,45,000/-
5.	7/3/2012-13/ST	RTC Murthal	Haryana	30.08.2019	14,99,512/-
6.	7/5/2008-09/ST	RTC Spreri	Gujarat	20.09.2019	10,26,000/-
7.	15/22/2012-13/ST	NISE Gurugram	Haryana	05.11.2019	40,00,000/-
8.	07/04/2009-10	RTC, Pune	Maharashtra	08.11.2019	3,68,000/-



**The following private and voluntary organization received grant of more than Rs. 10 lakh but less than Rs. 50 lakh under Hydrogen and Fuel Cell Programme during the year 2019-20 (31.12.2019)**

S.no	Name	Fund Released (INR)
1.	Indian Institute of Science Bangalore	8000000
2.	Vivekananda Global University	1100000
3.	Indian Institute of Technology Kharagpur	900000
4.	SRM University	500000
5.	International Advanced Research Centre For Powder Metallurgy and New Metariles	61500000
6.	International Advanced Research Centre For Powder Metallurgy And New Metariles	17400000
7.	International Advanced Research Centre For Powder Metallurgy And New Metariles	78900000







**CHINNASWAMY STADIUM,  
BENGALURU**



सत्यमेव जयते

## Ministry of New and Renewable Energy

Government of India

Block-14, CGO Complex, Lodhi Road, New Delhi-110 003  
website : [www.mnre.gov.in](http://www.mnre.gov.in)