

4: NATIONAL SOLAR MISSION





NATIONAL SOLAR MISSION

Introduction

4.1 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.

Focus area under Phase-II of NSM

A) Grid connected Projects

4.2 As on 31st December 2017, the total solar power capacity installed is 17052.37 MW. Based upon availability of land and solar radiation, the potential of 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 are given in **Table –4.1** and **Table – 4.2** respectively:



50 MW commissioned under 200 MW capacity solar park at Kasargod, Kerala

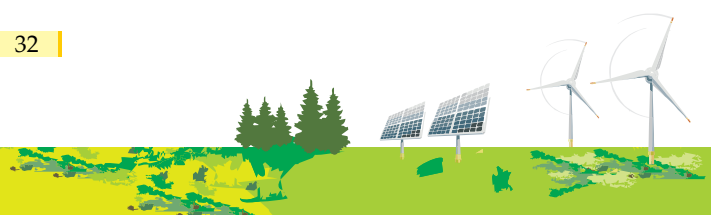
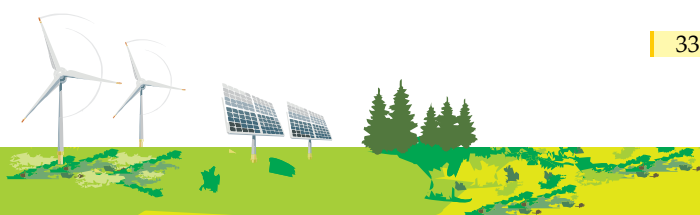



Table – 4.1 State-wise estimated Solar Energy Potential in the Country

Sr. No.	State/UT	Solar Potential (GWp)#
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
Total		748.98

Assessed by National Institute of Solar Energy



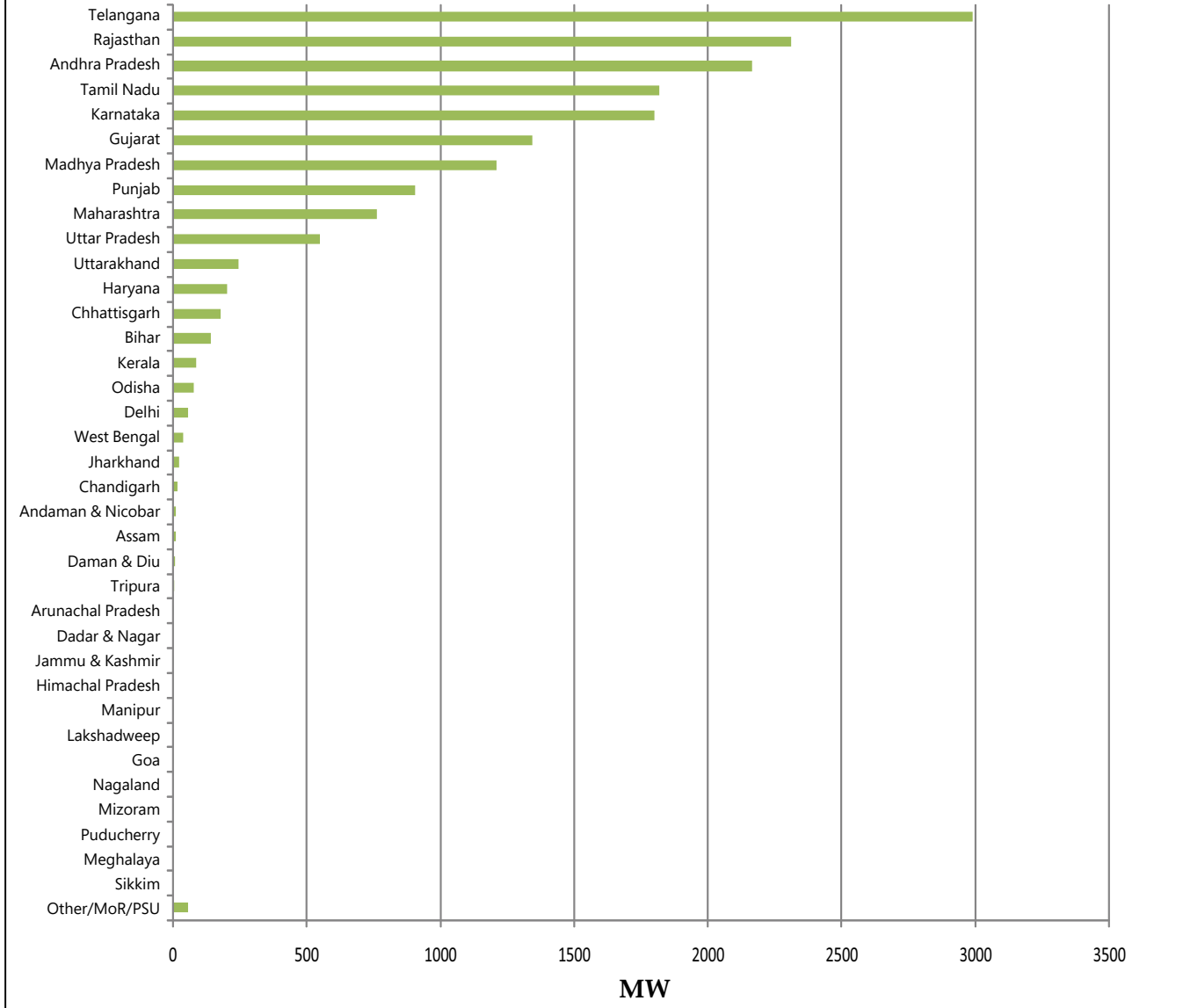
**Table-4.2 Commissioning Status of Grid Connected Solar Projects**

Sr. No.	State/UT	Total cumulative capacity (MW) as on 31-03-2017	Capacity commissioned in 2017-18 (MW)	Total cumulative capacity (MW) as on 31-12-2017
1	Andaman & Nicobar	6.56	6.05	12.61
2	Andhra Pradesh	1867.23	297.99	2165.21
3	Arunachal Pradesh	0.27	4.12	4.39
4	Assam	11.78	0.00	11.78
5	Bihar	108.52	33.00	141.52
6	Chandigarh	17.32	1.57	18.89
7	Chhattisgarh	128.86	50.52	179.38
8	Dadar & Nagar	2.97	0.00	2.97
9	Daman & Diu	10.46	0.00	10.46
10	Delhi	40.27	17.75	58.02
11	Goa	0.71	0.00	0.71
12	Gujarat	1249.37	95.32	1344.69
13	Haryana	81.40	122.45	203.85
14	Himachal Pradesh	0.73	0.75	1.48
15	Jammu & Kashmir	1.36	1.00	2.36
16	Jharkhand	23.27	0.00	23.27
17	Karnataka	1027.84	773.01	1800.85
18	Kerala	74.20	14.00	88.20
19	Lakshadweep	0.75	0.00	0.75
20	Madhya Pradesh	857.04	353.07	1210.11
21	Maharashtra	452.37	310.71	763.08
22	Manipur	0.03	1.30	1.33
23	Meghlya	0.01	0.05	0.06
24	Mizoram	0.10	0.10	0.20
25	Nagaland	0.50	0.00	0.50
26	Odisha	79.42	0.09	79.51
27	Puducherry	0.08	0.03	0.11
28	Punjab	793.95	111.69	905.64
29	Rajasthan	1812.93	497.53	2310.46
30	Sikkim	0.00	0.01	0.01
31	Tamil Nadu	1691.83	127.59	1819.42
32	Telangana	1286.98	1703.09	2990.07
33	Tripura	5.09	0.00	5.09
34	Uttar Pradesh	336.73	213.65	550.38
35	Uttarakhand	233.49	13.40	246.89
36	West Bengal	26.14	13.70	39.84
37	Other/MoR/PSU	58.31	0.00	58.31
TOTAL		12288.83	4763.54	17052.37



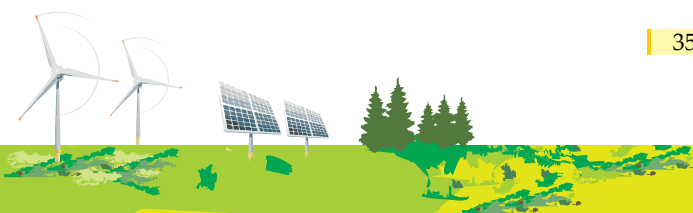


Total cumulative Grid Connected Solar Power Capacity (MW) till 31-12-2017



4.3 The Government has finalized tendering trajectory in order to achieve the Mission target of 100 GW by 2022 with the details as under:-

Year	Tendering target (MW)
2017-18	20,000
2018-19	30,000
2019-20	30,000





Scheme for Development of Solar Parks and Ultra Mega Solar Power Projects:-

- 4.4 The scheme for development of Solar Parks and Ultra Mega Solar Power Projects was rolled out by Ministry of New & Renewable Energy in December, 2014. The Scheme has been conceived on the lines of the “Charanka Solar Park” in Gujarat which is a first-of-its-kind large scale Solar Park in India with contiguous developed land and transmission connectivity.
- 4.5 This scheme envisages supporting the States in setting up solar parks at various locations in the country with a view to create required infrastructure for setting up of Solar Power Projects. The solar parks will provide suitable developed land with all clearances, transmission system, water access, road connectivity, communication network, etc. This scheme facilitates and speeds up installation of grid connected solar power projects for electricity generation on a large scale. All the States and Union Territories are eligible for benefitting under the scheme.

Salient Features

- i. It was planned to set up at least 25 Solar Parks and Ultra Mega Solar Power Projects targeting over 20,000 MW of solar power installed capacity within a span of 5 years starting from 2014-15.(revised in 2017 with the approval of Cabinet to setup at least 50 solar parks with aggregate capacity of 40,000 MW)
- ii. The capacity of the Solar Parks is normally 500 MW and above. However, smaller parks considered in Himalayan Region & other hilly States where contiguous land may be difficult to acquire in view of difficult terrain and in States where there is acute shortage of non-agricultural land.
- iii. The solar parks are developed in collaboration with the State Governments and their agencies. The choice of implementing agency for developing and maintaining the park is left to the State Government.
- iv. The implementing agency is sanctioned a grant of upto Rs.25 Lakh/Park for preparing Detailed Project Report (DPR) of the Solar Park.
- v. Thereafter, application is sent by the implementing agency to Solar Energy Corporation of India (SECI) for the grant of up to Rs. 20 lakh/MW or 30% of the project cost including Grid-connectivity cost, whichever is lower. The approved grant is released by SECI as per milestones prescribed in the scheme.
- vi. In-principle approval has been accorded to 35 Solar Parks of aggregate capacity of 20,514 MW planned to be set up in 21 States/UTs. Details given in the attached **Table 4.3**.

Table-4.3 Details of Solar Parks Sanctioned					
Sl. No.	State	Name of the Solar Park	Capacity (MW)	Name of the Solar Power Parks Developer (SPPD)	Land identified at
1.	Andhra Pradesh	Ananthapuramu-I solar park	1500	AP Solar Power Corporation Pvt. Ltd.,	NP Kunta of antpuramu & Galiveedu of Kadapa Districts
2.	Andhra Pradesh	Kurnool solar park	1000	JVC of SECI, APGENCO and NREDCAP	Gani and Sakunala Village of Kurnool District



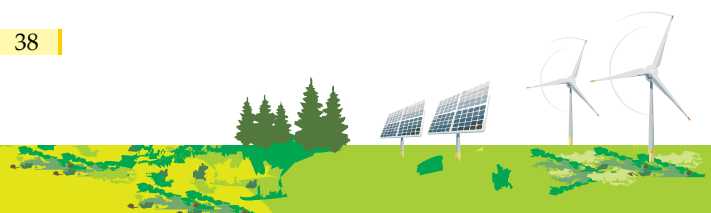


3.	Andhra Pradesh	Kadapa solar park	1000	AP Solar Power Corporation Pvt. Ltd., JVC of SECI, APGENCO and NREDCAP	Vaddirala, Thalamanchi, Pannampalli, Ramachandrayapalli, Konna Ananthapuram and Dhidium villages in Mylavaram Madal, Kadapa district
4.	Andhra Pradesh	Ananthapuramu-II solar park	500	APGENCO and NREDCAP	Talaricheruvu & Aluru Villages, Tadipatri Mandal, Ananthapuramu District of Andhra Pradesh
5.	Arunachal Pradesh	Lohit solar park	30	Arunachal Pradesh Energy Development Agency (APEDA)	Tezu township in Lohit district
6.	Assam	Solar park in Assam	80	APGCL	Amguri in Sibsagar district
7.	Chhattisgarh	Rajnandgaon solar park	250	Chhattisgarh Renewable Energy Development Agency	Dhaba, Rengakathera, Amlidih, Dundera and Kohka villages of (100 MW) and Tolagaon, Odarband, Gatatola, Girgaon, Gugwa, Salhe villages of Dongargadh Tehsil, Rajnandgaon Dist
8.	Gujarat	Radhnesada solar park	700	Gujarat Power Corporation Limited	Radhnesada, Vav, Distt. Banaskantha
9.	Gujarat	Harsad solar park	500	Gujarat Power Corporation Limited	Villages-Harsad and Navapara, Taluka-Suigam, District-Banaskatha
10.	Haryana	Solar park in Haryana	500	Saur Urja Nigam Haryana Ltd (SUN Haryana)	Bugan in Hisar district, Baralu and Singhani in Bhiwani district and Daukhera in Mahendergarh district
11.	Himachal Pradesh	Solar park in Himachal Pradesh	1000	HP State Electricity Board Ltd.	Spiti Valley of Lahaul & Spiti District
12.	Jammu & Kashmir	Solar park in J&K	100	Jammu and Kashmir Energy Development Agency	Mohagarh and Badla Brahmana, District-Samba





13.	Karnataka	Pavagada solar park	2000	Karnataka Solar Power Development Corporation Pvt. Ltd.	Villages- Valluru, Rayacharlu, Balasamudra, Kyathaganacharlu, Thirumani of Pavagada Taluk, Tumkur dist.
14.	Kerala	Kasargod solar park	200	Renewable Power Corporation of Kerala Limited	Paivalike, Meenja, Kinanoor, Kraindalam and Ambalathara villages of Kasargode district
15.	Madhya Pradesh	Rewa solar park	750	Rewa Ultra Mega Solar Limited	Gurh tehsil, District Rewa, MP
16.	Madhya Pradesh	Neemuch-Mandsaur solar park	700	Rewa Ultra Mega Solar Limited	Neemuch site: Under identification; and Mandsaur site: Runija and Gujjarkhedi villages in Suwasra Tehsil, Mandsaur district
17.	Madhya Pradesh	Agar-Shajapur-Rajgarh solar park	1050	Rewa Ultra Mega Solar Limited	Agar, Shajapur and Rajgarh district
18.	Madhya Pradesh	Morena (Chambal) solar park	250	Rewa Ultra Mega Solar Limited	Morena, (Chambal)
19.	Maharashtra	Sai Guru solar park	500	M/s Sai Guru Mega Solar Park Pvt. Ltd. (formerly M/s Pragat Akshay Urja Ltd.)	Bhamer Village, Taluka-Sakri, Dhule District
20.	Maharashtra	Dondaicha solar park	500	Maharashtra State Electricity Generating Company Ltd. (MAHAGENCO)	Villages- Vikhran & Methi, Taluka-Dondaicha, district Dhule, Maharashtra
21.	Maharashtra	Patoda solar park	500	M/s Paramount Solar Power Pvt. Ltd. (formerly M/s K. P. Power Pvt. Ltd.)	Villages Tambarajuri, and Wadzari, Taluka Patoda, Dist. Beed.
22.	Meghalaya	Solar park in Meghalaya	20	Meghalaya Power Generation Corporation Ltd (MePGCL)	Thamar, West Jaintia Hills & Suchen, East Jaintia Hills districts





23.	Mizoram	Vankal solar park	20	Zoram Energy Development Agency (ZEDA)	Vankal, Mizoram
24.	Nagaland	Solar park in Nagaland	23	Directorate of New & Renewable Energy, Nagaland	Ganeshnagar (12 MW) of Dimapur and Jalukie (11 MW) of Peren districts
25.	Odisha	Solar park in Odisha	1000	Green Energy Development Corporation of Odisha Limited	Balasore, Keonjhar, Deogarh, Boudh, Kalahandi and Angul
26.	Rajasthan	Bhadla-II solar park	680	Rajasthan Solar Park Development Company Ltd.	Village-Bhadla, Jodhpur Dist, Rajasthan
27.	Rajasthan	Bhadla-III solar park	1000	Surya Urja Company of Rajasthan Ltd	Village-Bhadla, Jodhpur Dist, Rajasthan
28.	Rajasthan	Phalodi-Pokaran solar park	750	M/s Essel Surya Urja Company of Rajasthan Limited	Villages Ugraas, Nagnechinagar & Dandhu, tehsil Phalodi, dist Jodhpur (450 MW) and villages Lavan & Purohitar, tehsil Pokaran, dist Jaisalmer (300 MW)
29.	Rajasthan	Bhadla-IV solar park	500	M/s Adani Renewable Energy Park Rajasthan Limited	Village-Bhadla, Jodhpur Dist, Rajasthan
30.	Rajasthan (421 MW through support of GoI out of 1500 MW)	Fatehgarh Phase-1B solar park	421	M/s Adani Renewable Energy Park Rajasthan Limited	Fatehgarh&Pokaran, Jaisalmer, Rajasthan
31.	Rajasthan	Nokh solar park	1000	Rajasthan Solar Park Development Company Ltd.	Village-Nokh, Pokaran, Jaisalmer, Rajasthan
32.	Tamil Nadu	Solar park in Tamil Nadu	500	To be finalized	Initially proposed in Ramanathapuram district. Site under revision.
33.	Uttar Pradesh	Solar park in UP	440	Lucknow Solar Power Development Corporation Ltd.	Orai&kalpi Tehsils of Jalaun, Meja tehsil of Allahabad, Chaanbe tehsil of Mirzapur and Akbarpur tehsil in Kanpur Dehat districts





34.	Uttarakhand	Solar park in Uttarakhand	50	State Industrial Development Corporation Uttarakhand Limited (SIDCUL)	Sitarganj and Khurpia farm in US Nagar district
35.	West Bengal	Solar park in West Bengal	500	West Bengal State Electricity Distribution Company Ltd.	East Mednipur, West Mednipur, Bankura
Total			20514		

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:

4.6 Potential of Solar Energy in cantonment and Military Stations are approximately 5000 MW and in Ordnance Factory Boards (OFB) are around 950 MW. Ordnance Factory Board (OFB) and other Defence Establishments agreed to set up solar power projects on the large tracts of land and vacant rooftops which they own. The Ministry has issued Administrative Approval of a scheme for Defence establishments on 07th January, 2015.



Bhadla-II solar park in Rajasthan of capacity 680 MW commissioned





- 4.7 The broad guidelines of the scheme are as under:
- i. A capacity of 300 MW is to be set up in various Establishments of Ministry of Defence i.e. Establishments of Army, Navy, Air Force, Ordnance Factory Board, Defence Laboratories and Defence PSUs etc. Para Military Forces also to be covered under this scheme.
 - ii. Minimum size of the project to be 1 MW.
 - iii. The projects under this Scheme are to mandatorily use solar cells & modules which are made in India.
 - iv. The aforesaid Establishments identifies locations for developing solar projects, anywhere in the country including border areas from time to time.
 - v. Project Implementation Schedule is 5 years period i.e. from 2014-19
 - vi. The following two modes may be used for tendering
 - a) Developer Mode: This is mode under which the project is given to developer, who makes the investment, own the project and supplies power to Defence Establishments.
 - b) EPC Mode: This is applicable when project is built through EPC contractor and investment is made by the Defence establishment/Para Military Forces.
 - vii. The Defence Organisations/Establishments are free to own the power projects i.e. get a EPC contractor to build the project for them or get a developer who makes the investment and supplies power at a fixed tariff of Rs.5.50 per unit for 25 years (or Rs. 4.75 with AD). EPC has been recommended by MHA, Planning Commission and MoD.
 - viii. The solar project developers are provided VGF based on the bid. The bidders are selected on the basis of bids for minimum VGF requirement for the project with commitment to supply solar power at Rs. 5.50/KWh for 25 years. However, the upper limits of the VGF are as follows:

Category-I: Rs.2.5 Cr./MW for project capacity upto 5 MW or 30% of the project cost whichever is lower;

Category-II: Rs. 2 Cr./MW for project capacity greater than 5 MW upto 25 MW or 30% of the project cost whichever is lower; and

Category-III: Rs. 1.5 Cr./MW for project capacity greater than 25 MW or 30% of the project cost whichever is lower.

Amendment in Scheme:

- 4.8 An amendment of the scheme was issued vide OM dated 17.02.2017. Major changes under scheme were as;
- a) The VGF limit is revised from upto Rs 2.5 Cr/MW to Rs 1.1 Cr/MW irrespective of sizes for all projects for which tenders have not yet been brought out.
 - b) The tariff of solar power is reduced from Rs 5.50 per unit to Rs 4.50 per unit.





- c) The projects under developer mode will be free to procure solar cells/modules under open category (indigenous or imported).
- d) The projects for which tenders have already been brought out before 17th February, 2017, will have provisions as per administrative approval dated 07.01.2015.

4.9 **Physical Achievement :** In-principle approval of 357.5 MW has been given to different Defence Organisations (**Table 4.4**). Out of this, 22 MW has been commissioned so far.

3000 MW Grid connected solar PV power projects under NSM Phase-II, Batch-II, Tranche-I – ‘state specific bundling scheme’

4.10 Under this Scheme, which is part of Tranche-I of Batch-II of Phase-II of National Solar Mission, 3 GW capacity of solar PV power plants are being set up based on the mechanism of bundling of solar power (3 GW) with unallocated thermal power (1500 MW) in the ratio of 2:1 (in MW terms), for which the required 1500 MW unallocated thermal power has been made available by the Ministry of Power.

Mechanism for implementation

4.11 The mechanism of operation of 3 GW capacity Solar PV plants under Tranche-I of Batch-II of Phase-II of NSM, is as follows:-

- a. The eligible plant capacities are minimum 10 MW and maximum may be fixed for each State lot of projects.
- b. The bidding is State specific and conducted through e-bidding.
- c. It is based on fixed levellised tariffs. The developers have submitted bids quoting a fixed levellised tariff for the entire project duration of 25 years.
- d. The selection of bids has been done based on the tariff quoted by the bidders. Selection has been based on lowest quoted levellised tariffs. The tariff bid cannot be higher than the Applicable Tariff on the day bids are received as may be fixed by the State Electricity Regulatory Commission (SERC) for the State where the projects are to be set up/ Central Electricity Regulatory Commission (CERC).
- e. The bidders are free to avail fiscal incentives like Accelerated Depreciation, Concessional Customs and Excise Duties, Tax Holidays, etc. as available for such projects. The same does not have any bearing on comparison of bids for selection.
- f. NTPC Ltd. / NVVN will purchase the Solar Power generated from the selected Solar PV plants at the quoted tariffs and Thermal Power at the Tariff as determined by CERC as per Regulations from time to time for power from the respective Thermal Power Plant from which power is allocated. NTPC Ltd. / NVVN will bundle the Solar Power with unallocated Thermal Power from Coal based stations of NTPC Ltd. on 2:1 basis (2 MW of Solar with 1 MW of Thermal), and sell the Bundled Power to willing State Utilities under 25 years Power Sale Agreements (PSAs), at Weighted Average Tariff of the Solar and Thermal components plus Trading Margin of Paisa Seven (7) per kWh. The weighted average tariff will be separately calculated for each State for the solar Power.





Table-4.4 Present status of 357.50 MW solar PV power projects under different Defence Organisations

Ministry	Organisations	Capacity Allocated (MW)	Date of in principle approval	Tender Issued (MW)	Order placed (MW)	Construction started (MW)	Commissioned (MW)
Department of Defence Production (207.5 MW)	OFB, Bhandara	2	17.03.2015	2	2	2	2
	OFB, Ambajhari	5	17.03.2015	5	5	5	5
	Bharat Electronics Limited (BEL)						
	OF, Medak, Telangana	16	11.08.2015/ 25.04.2016	16	16	16	15
	OF, Itarsi, MP	10		10	10	10	
	OF, Bolangir, Odisha	7.5		7.5	7.5	7.5	
	HMV, Avadi, TN	16		16		16	
	Gun Carriage Factory, Jabalpur, MP	10		10	10	10	
	Vehicle Factory, Jabalpur, MP	10		10	10	10	
	OF, Khadi	3					
	OF, Muradnagar	2					
	OF, Nalanda	1					
	Other Locations	74.5					
	Bharat Dynamics Limited (BDL)	25	26.11.2015	5	5	5	
	HAL, Nasik	15	21.04.2016	15	15	15	
	Ordnance Factory, Kanpur	5	25.07.2016	5	-	-	
	MIDHANI	4	30.08.2016	4	4	4	
OF, Ambajhari	1.5	06.01.2017					
Department of Defence (150 MW)	Department of Defence		16.02.2016/ 06.04.2016				
	Army Locations	94		50.6	31	17.5	
	Navy Locations	19					
	Air Force Locations	32.7		11.5	6	4	
	Others	4.3					
Total		357.5		162.6	121.5	122	22





- g. Excess power whether generated in normal course or through repowering will be purchased at a notional support price of Rs. 3/kWh only. It will be at the option of the developer to offer it (excess power) to NTPC/ NVVN or sell in open market. Further, the developer will be free to sell power to any one for period beyond 25 years of firm PPA offered by NTPC Ltd. / NVVN.

Current Status (as on 30.11.2017):

Allocation:

- 4.12 Based on the requests received from various States for allocation of solar power under the 3000 MW State Specific Bundling Scheme under NSM Phase-II, Batch-II, State-wise allocations have been given in **Table 4.5**.

Table - 4.5 State-wise allocations of 3000 MW State Specific Bundling Scheme under NSM Phase-II, Batch-II						
Sl. No.	State/ UT	Capacity allotted in OPEN category (MW)	Capacity allotted in Domestic Content Requirement (DCR) category (MW)	In Solar Parks	Outside Solar Parks	Total Capacity allotted (MW)
1	Andhra Pradesh	1100	150	1250	0	1250
2	Karnataka	500	100	600	0	600
3	Rajasthan	550	100	420	230	650
4	Telangana	350	50	0	400	400
5	Uttar Pradesh	100	00	0	100	100
	TOTAL	2600	400	2270	730	3000

Implementation (as on 30.11.2017):

- 4.13 Notice Inviting Tender Published for full Tranche-I of 3,000 MW.
- Reverse auction completed: 3000 MW.
 - Power Sale Agreement (PSA) Signed with State Discoms: 2750 MW
 - Letter of Intent issued to successful bidders: 2750 MW
 - Power Purchase Agreements (PPAs) signed: 2750 MW.
 - Project Commissioned : 2050 MW as on 30.11.2017; Break-up is as follows in **Table 4.6**

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

- 4.14 Under National Solar Mission (NSM), "Pilot-cum-Demonstration Project for Development of Grid Connected Solar PV Power Plants on Canal Banks and Canal Tops" is under implementations.



**Table-4.6 Break-up of 2050 MW Project Commissioned as on 30.11.2017**

State	Solar PV Projects Allotted (MW)	Solar PV Projects Commissioned (MW)
Andhra Pradesh	1250	1000
Rajasthan	650	650
Uttar Pradesh	100	100
Karnataka	600	0
Telangana	400	300
Total	3000	2050

- 4.15 Based on the requests received from various States for allocation of canal-top/canal-bank solar power projects in-principle approval given for setting up full targeted capacity of 50 MW canal-top and 50 MW canal-bank solar PV power projects, as follows in **Table 4.7** and **Table 4.8** respectively.
- 4.16 CFA of Rs. 69.0 crore already released to SECI for onward disbursement to Project Implementing Agencies of the respective States.

Table-4.7 State-wise Allocation of 50 MW Canal-Top Solar PV projects

Sl. No.	State	Implementing Agency in the State	Capacity for which in-principle approval has been given (MW)	Commissioned as on 31.12.2017
1	Andhra Pradesh	New and Renewable Energy Development Corporation of Andhra Pradesh (NREDCAP)	1 MW canal-top	1 MW
2	Gujarat	SardarSarovar Narmada Nigam Limited (SSNNL)	10 MW canal-top	10 MW
3	Karnataka	Krishna BhagyaJala Nigam Limited (KBJNL)	10 MW canal-top	-
4	Kerala	Kerala State Electricity Board Limited (KSEB)	2 MW canal-top	2 MW
5	Punjab	Punjab Energy Development Agency (PEDA)	20 MW canal-top	5 MW
6	Uttarakhand	UttarakhandJalVidyut Nigam Limited	1 MW canal-top	-
7	Uttar Pradesh	Uttar Pradesh Irrigation Department	6 MW canal-top	-
	Total		50 MW canal-top	18 MW





Table-4.8 State-wise Allocation of 50 MW Canal-Bank Solar PV Projects				
Sl. No.	State	Implementing Agency in the State	Capacity for which in-principle approval has been given (MW)	Commissioned as on 31.12.2017
1	Andhra Pradesh	Andhra Pradesh Power Generation Corporation Limited (APGENCO)	5 MW canal-bank	5 MW
2	Gujarat	SardarSarovar Narmada Nigam Limited (SSNNL)	15 MW canal-bank	15 MW
3	Kerala	Kerala State Electricity Board Limited (KSEB)	1 MW canal-bank	1 MW
4	Uttarakhand	UttarakhandJalVidyut Nigam Limited	19 MW canal-bank	-
5	West Bengal	West Bengal State Electricity Distribution Company Limited (WBSEDCL)	10 MW canal-bank	10 MW
	Total		50 MW canal-bank	31 MW



1000 MW solar park, Kurnool, Andhra Pradesh





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 NSM.

- 4.17 The Ministry launched the above scheme in January 2015 to set up 1000 MW of Grid Connected Solar PV Power Project by CPSUs and Govt. Organizations with VGF. Under the Scheme, MNRE, as on 15.12.2017, has allocated about 963 MW capacity to 12 different CPSUs/ Govt. Organisations within the sanctioned funds of Rs.1000 Crore for this scheme.
- 4.18 The details of physical and financial progress under this Scheme is as follows in **Table 4.9**

1000 MW Capacity Grid-Connected Solar Power Projects implemented through NVVN under National Solar Mission (NSM) Phase-I

- 4.19 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 includes three stages: (i) Migration Scheme (ii) NSM Phase-I, Batch-I and (iii) NSM Phase-I, Batch-II.

Migration Scheme

- 4.20 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 (54MW SPV and 30MW ST) were approved under this scheme for long-term procurement of power by NVVN at CERC notified tariff for 2010-11 viz. Rs.17.91/unit for SPV and Rs.15.39/unit for ST. 11nos. SPV projects of 48 MW capacity have been commissioned under this scheme.

NSM Phase-I, Batch-I & Batch-II

- 4.21 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.
- 4.22 In Batch-I the eligible project capacities were 5 MW for SPV and upto 100 MW for ST. 28 nos. SPV Projects with an aggregate capacity of 140 MW and 7 nos. of 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/ unit, with average of Rs.12.12/unit and for ST projects in the range of Rs.10.49-12.24/unit, with average of Rs.11.48/unit. 26 nos. SPV projects of aggregate 140 MW capacity and 3 nos. ST projects of aggregate 200 MW capacity have been commissioned under NSM Phase-I, Batch-I.
- 4.23 In Batch-II for SPV, the project capacity fixed was 5-20 MW. 27 nos. SPV projects with an aggregate capacity of 340 MW were allotted at tariff ranging between Rs.7.49-9.44/unit, with average of Rs.8.77/ unit. 26 nos. SPV projects of aggregate 330 MW capacity have been commissioned under NSM Phase-I, Batch-II.



**Table - 4.9 Status of Projects under 1000 MW CPSU Scheme (as on 15.12.2017)**

Sl. No.	Name of Agency	Capacity sanctioned (MW)	Year of sanction	Capacity Commi-ssioned (MW)	VGF required (Cr. Rs.)	VGF released (by MNRE)
1	NTPC Limited	250 MW (Ananthapur, A.P.)	2014-15	250	250	250
2	NTPC Limited	180 MW (Bhadla, Rajasthan)	2015-16	180	180	180
3	NTPC Limited	229.5 MW (Mandsaur, M.P.)	165 MW in 2015-16; 64.5 MW in 2016-17	229.5	229.5	114.75
4	NTPC Limited	20.5 MW (Pavagada, Karnataka)	2015-16	0	20.5	0
5	BHEL	1.5 MW (Trichy, TN)	2015-16	1.5	1.5	1.5
6	BHEL	5 MW (RC Puram, Hyd. TG)	2015-16	5	5	5
7	BHEL	7.5 MW (Trichy, T.N.)	2017-18	0	7.50	3.75
8	BHEL	2.5 MW (Jhansi, U.P.)	2017-18	0	2.50	1.25
9	BHEL	5 MW (Haridwar, U.P.)	2017-18	0	5	0
10	Rashtriyaspat Nigam Ltd.	5 (Visakhapatnam, A.P)	2015-16	5	5	5
11	NHPC Limited	50 (Tamil Nadu)	2015-16	0	25	12.5
12	ONGC	6	2016-17	0	3	0
13	GAIL	5.76	2015-16	0	2.88	1.44
14	Scooters India Ltd.	1 (Lucknow, UP)	2015-16	1	0.5	0.5
15	Sambhar Salts	1 (Sambhar, Rajasthan)	2015-16	0	1	0
16	Dadra & Nagar Haveli PDCL	3 Dadra Nagar haveli (UT)	2015-16	3	3	1.5
17	Paradip Port Trust	10 (Paradip Port, Odisha)	2015-16	0	10	5
18	THDC	50 (Kerala)	2016-17	0	25	0
19	NLC India Ltd.	130 (Neyveli, Tamil Nadu)	2017-18	90	97.50	0
	TOTAL	963		765	874	582





- 4.24 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.
- 4.25 Thus, under NSM Phase-I, 533 MW solar PV projects and 200 MW solar thermal power projects have been commissioned under the bundling scheme.
- 4.26 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 NVVN.

VIABILITY GAP FUNDING (VGF) SCHEME

- 4.27 Under VGF Scheme, 750 MW, 2000 MW and 5000 MW of Grid connected Solar Power Projects have been taken up. Solar Energy Corporation of India (SECI) has been designated as an implementing agency for these schemes. Details of each of three scheme are given below:

750 MW VGF Scheme under NSM Phase-II, Batch-I

- 4.28 Solar Energy Corporation of India (SECI) is implementing the first VGF scheme of 750 MW, under NSM Phase-II, Batch-I for setting up large scale ground-mounted solar PV projects on pan-India basis. After a transparent selection and award process, project capacity of 680 MW could successfully achieve financial closure. This entire capacity has been commissioned and projects are under commercial operation. Other salient points are as follow.
- Power is purchased by SECI @ Rs. 5.45/kWh and sold @ Rs. 5.50/kWh.
 - DCR (375 MW) & Open (375 MW).
 - VGF support of Rs. 2.5 Crore per MW (30% of Project cost, whichever is lower).
 - Total VGF Disbursement :Rs 704.69 crore.
 - Rs. 500 crore for Payment Security Mechanism (PSM) to SECI for 750 MW, 2000 MW and 5000 MW VGF Scheme initially.
 - Total 680 MW capacity of SPV plants have been commissioned in 7 States (Rajasthan, Gujarat, Maharashtra, Madhya Pradesh, Karnataka, Tamil Nadu & Odisha).
 - Total VGF Disbursement, as on 31.12.2017 is Rs. 704.69 crore
 - No further capacity likely to be added under the scheme.

- 4.29 State-wise details of commissioned projects are given in **Table 4.10**

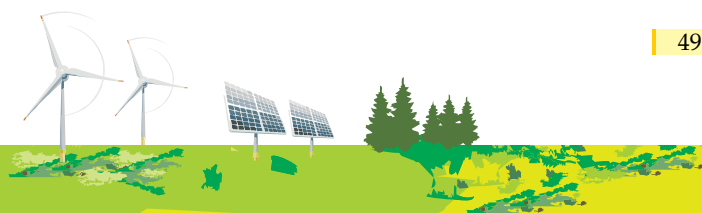




Table-4.10 State-wise details of commissioned projects under 750 MW VGF Scheme under NSM Phase-II, Batch-I	
State	Capacity
Rajasthan	355 MW
Gujarat	40 MW
Maharashtra	25 MW
Madhya Pradesh	220 MW
Karnataka	10 MW
Tamil Nadu	10 MW
Odisha	20 MW
Total	680 MW

2000 MW VGF Scheme of NSM Phase II, Batch III

4.30 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 have 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). Project Size is Minimum 10 MW up-to 50 MW (in multiples of 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) is being provided. Average bided VGF under the open category is 63.27 lakh/MW and DCR category is 1.11 Crore/MW.
- RfS have been issued for 2410 MW capacity in 7 States/UTs (Maharashtra, Uttar Pradesh, Andhra Pradesh, Chhattisgarh, Karnataka, Puducherry and Himachal Pradesh), LoI placed: 2295 MW, PPA signed: 2295 MW & PSA signed: 2425 MW (As on 31.12.2017).
- Total 300 MW Capacity reported as commissioned in Maharashtra, at non-solar park locations.

5000 MW VGF Scheme Batch IV Phase II

4.31 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). Project Size is Minimum 10 MW up-to 50 MW (in multiples of 10 MW).



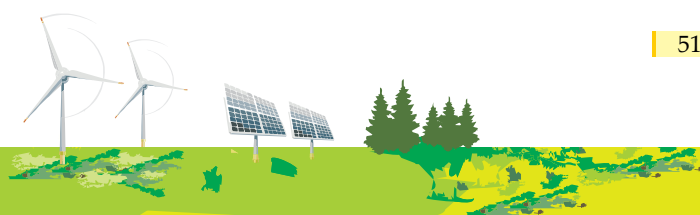


- Initial provision was that power will be purchased by SECI @ Rs. 4.43/kWh and sold @ Rs. 4.50/kWh. Now onwards the bidding under the scheme will be carried out at discounted tariff below from bench mark tariff Rs. 4.43/kWh with zero VGF option.
- Project Size is Minimum 10 MW upto 50 MW (in multiples 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.
- For 2015-16 and 2016-17, RfS has been issued for 2620 MW capacity in 6 States (Gujarat, Odisha, Andhra Pradesh, Maharashtra, Karnataka and Rajasthan), LoI placed: 1720 MW, PPA signed: 970 MW, PSA signed: 1720 MW (As on 31.12.2017).
- **Ever lowest discovered tariff of Rs. 2.44/kWh arrived in Solar discounted tariff bidding.**
- Discovery of solar power tariff of Rs. 2.47-2.48 per kWh (in Dec, 2017, post introduction of GST)
- Total 250 MW Capacity has been commissioned in the State of Gujarat, in Charanka solar park locations (As on 31.12.2017).

4.32 State-wise tendering/projects status for the FY 2016-17 & 2017-18 (upto 31.12.2017) is given in **Table 4.11.**

Table- 4.11 State-wise status of tendering under 5000 MW VGF Scheme			
Sl. No.	State	NIT issued	LoI issued & PPA signed
1	Gujarat	400 MW	250 MW
2	Odisha	270 MW	270 MW
3	Maharashtra	450 MW	450 MW
4	Rajasthan	1500 MW	750 MW
5	Uttar Pradesh	275 MW	-
6	Karnataka	200 MW	-
7	Andhra Pradesh	750 MW	-
8	Pan-India	2000 MW	-
	Total	5845 MW	1720 MW

4.33 In the FY 2017-18 (up to 31.12.2017), NIT has been issued for 3975 MW capacity. LoI have been issued for 750 MW and PPAs have been signed for the same capacity. Financial Closures have been achieved for 445 MW capacity and 250 MW has been commissioned.





Demonstration Programme on Grid Interactive Solar PV Power Generation

4.34 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 NSM. Salient features are as under:
- Initially the scheme was formulated for 25 MW for Demonstration of MW capacity solar PV plants. Projects of capacity from 1 MW to 5 MW and commissioned.
- MNRE provides Generation Based Incentive (GBI) to these projects. The GBI is being disbursed directly to the project developer through IREDA.
- Total 07 numbers of Projects were commissioned from FY 2009-10 to 2011-12
- Against the target capacity of 25MW, a total of 19 MW for seven project developers could be commissioned by in 6 states (**Punjab, Maharashtra, Rajasthan, Tamil Nadu, Andhra Pradesh, West Bengal**) with a capacity ranging from 1MWp to 5MWp each.
- Ministry releases GBI to Developers through IREDA maximum upto Rs.12/kWh for period of 10 years.
- GBI was fixed based on the difference of the State PPA rate and notational tariff of Rs. 15/kWh maximum up-to Rs.12/kWh. Total GBI released so far is Rs. 150 cr.

Generation Based Incentives (GBI) Programme for Small PV Solar Power Plants

4.35 Rooftop PV and Small Solar Power Generation Programme (RPSSGP)

- 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 NSM. Implementing Agency is IREDA.
- 100 MW Solar capacity was allocated and 91.8 MW of 72 projects in 12 States was commissioned. GBI is applicable for 25 years from the commissioning date and payable to the distribution utility.
- 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.
- Annual budget requirement by Ministry under RPSSGP scheme is approx. Rs.180.00 crore for 91.8 MW.
- Although initially Solar tariff was Rs. 17.91/Unit, however after adopting different mechanism to lower the tariff, now solar tariff arrived at Rs.2.44/Unit.

Grid Connected Rooftop and Small Power Plants Programme

- 4.36 The Ministry is 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





Grid connected solar rooftop plants of 300 kWp installed by SECI at SS College of Engineering, Udaipur, Rajasthan

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 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 are being provided. About 4200 MW is being targeted under this scheme (2100 MW with subsidy and 2100 MW without subsidy) by year 2019-20.

- 4.37 So far, 1810 MWp solar rooftop systems have been sanctioned/ approved under the scheme. Aggregate 982.30 MWp have been reported as installed in the country. Solar rooftop projects are being implemented by State Nodal Agencies (SNA's), Solar Energy Corporation of India (SECI), Public Sector Undertakings (PSUs) and other Multi Government Agencies (MGAs), Private Developers etc..
- 4.38 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.
- 4.39 Solar Energy Corporation of India has tendered 500 MWp for Social, Institutional and Residential Sector and 500 MWp tender for Government Sector including PSUs.
- 4.40 Commitment Certificate of about 3890 MWp has been received from different Ministries/ Departments. In addition, the following reference documents have been developed :-
- Compendium of policies and regulations of GOI, State/UTs
 - Best Practice Guide on Solar Rooftop





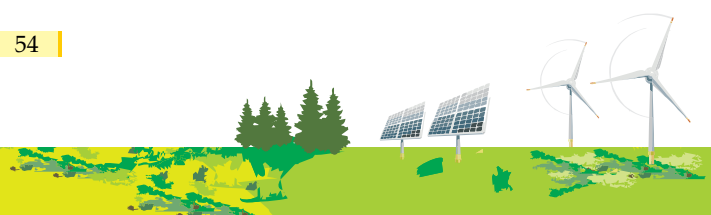
Grid connected solar rooftop plants of 387 kWp installed at Mukundpur Metro Station of Delhi Metro Rail Corporation Ltd.

- Working paper on international solar alliance: nurturing possibilities
- Solar Rooftop Calculator has also been developed for financial calculations of grid connected solar rooftop projects on PAN India basis.

4.41 An online platform namely SPIN has been developed for submission of online proposal, project completion reports, data management, communications etc. SPIN stands for Solar Photovoltaic Installations is an e-governance of initiative of the Ministry. It is an online system designed to monitor almost all activities involved in Solar Rooftop programme. It contains a useful tool for calculating the rooftop area or estimate for installation of rooftop for a lay man and provision for entering his request for installing the SPV system. SPIN is also inbuilt with the utilities like email and SMS for communicating to various stake holders. The SPIN is designed and developed by National Informatics Centre (NIC).

Mobile App ARUN has also been developed for Solar Rooftop Project

4.42 MNRE has developed a panel of expert PSUs for facilitating 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, DISCOMS, 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.

- 4.43 Rs.1118.06 Crore has been released as Central Financial Assistance to different implementing agencies for installation of grid connected rooftop projects of which Rs. 144.77 crore has been released in FY 2017-18.

Initiatives by States/UTs

- 4.44 Electricity Regulatory Commissions of all States/UTs have notified net metering regulations / tariff orders .
- 4.45 So far, 20 States namely Andhra Pradesh, Chhattisgarh, Delhi, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir ,Jharkhand, Karnataka, Kerala, Madhya Pradesh, Manipur, Punjab, Puducherry, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, Uttarakhand and West Bengal have come out with Solar Policy supporting grid connected rooftop systems.
- 4.46 Govt. of Haryana, Chhattisgarh, Uttar Pradesh and Chandigarh has issued mandatory notification for installation of solar rooftop plants for certain categories of buildings.
- 4.47 Chief Electrical Inspector to Government (CEIG) inspection has been made optional by States of Andhra Pradesh, Tamil Nadu, Karnataka, Gujarat, Madhya Pradesh, Odisha, Haryana, Delhi, Maharashtra and Rajasthan for solar rooftop plants upto certain capacity.



Grid connected solar rooftop plants of 650 kWp installed by SECI at BAPS Swaminarayan Sanstha, Pandav Nagar, New Delhi





Initiatives for loans and International funding

- 4.48 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.
- 4.49 Department of Financial Services has advised all Public Sector Banks to provide loans for grid connected rooftop solar systems as home loan/ home improvement loan.
- 4.50 Department of Expenditure has reduced the Guarantee fee from 1.2 % to 0.5 % for multilateral loan of USD 1370 million including World Bank loan of USD 620 million through State Bank of India , Asian Development Bank loan of USD 500 million through Punjab National Bank and New Development Bank loan USD 250 million through Canara Bank . SBI has sanctioned concessional loans of aggregate Rs.2021.85 Crore for aggregate capacity of 517.6 MW capacities and PNB has sanctioned concessional loan of aggregate Rs. 113.89 crore for aggregate capacity of 32.39 MW under this multilateral loan programme.
- 4.51 Multilateral grant of USD 5 million by ADB, USD 1.8 million from USAID and USD 28.8 million from World Bank has been approved for solar rooftop programme.
- 4.52 Indian Renewable Energy Development Agency has formulated a scheme of low cost financing with interest rate of 9.9% to 10.75 % per annum.
- 4.53 The Central Electricity Authority (CEA) has also notified the “Installation and Operation of Meters” guidelines vide its amendment regulation in 3rd December 2014.

OFF GRID SOLAR PHOTOVOLTAICS

- 4.54 Under the Off-Grid and Decentralized Solar PV Programme for 2017-18, Ministry is providing Central Financial Assistance (CFA) to implementing agencies for deployment of SPV home lighting systems, Solar street lights, Solar pumps, power packs and other solar applications to meet out the electricity and lighting needs of the individual in the rural areas. State Nodal Agencies (SNAs) are the primary implementing agency through which CFA of 30% was being provided. NABARD was one of the implementing agencies for pumps and lighting systems through which CFA of 40% of the benchmark cost was being provided.
- 4.55 More than 96,000 pumps have been sanctioned during 2017-18 under Off-grid solar pumps. Overall, about 2.4 lakh pumps have been sanctioned and 1.47 lakh solar pumps installed under the programme till 31.12.2017. A total of 182 MWp capacity solar PV off-grid systems / power plants have been installed till 31st December 2017 as shown in **Table 4.12** State-wise system installation during 2017-18 (up to 31.12.2017) is shown in **Table 4.13**. Some major Off Grid Solar PV projects sanctioned during 2017-18 are as follows:
- 70,00,000 Solar Urja Lamps (SoUL) for school going children have been distributed in selected states by Indian Institute of Technology, Bombay.
 - State Wise details of the pumps sanctioned during the year 2017-18 are given in **Table 4.14**
- 4.56 During the year, the solar systems having total capacity of 104.41 MWp which includes solar study lamps, solar home lights, solar street lights, solar pumps, Mini/micro grids and power



**Table-4.12 State wise cumulative installation of SPV systems as on 31.12.2017**

S. No.	State/UT	Lanterns & Lamps Nos.	Home Lights Nos.	Street Lights Nos.	Pumps Nos.	Stand Alone Power Plants (KWp)
1	Andhra Pradesh	51360	22972	7812	19526	3785.595
2	Arunachal Pradesh	14433	18945	1671	22	650.1
3	Assam	13379	6926	318	45	1605
4	Bihar	210391	12303	955	1882	4168.6
5	Chhattisgarh	3311	7754	2042	26673	28660.04
6	Delhi	4807	0	301	90	1269
7	Goa	1093	393	707	15	32.72
8	Gujarat	31603	9253	2004	8010	13576.6
9	Haryana	93853	56727	22018	1243	2321.25
10	Himachal Pradesh	33909	29342	58718	6	1905.5
11	Jammu & Kashmir	51224	65319	5806	39	7719.85
12	Jharkhand	138723	9450	787	3598	3639.9
13	Karnataka	7334	52638	2694	4118	7754.01
14	Kerala	54367	41912	1735	818	15825.39
15	Madhya Pradesh	529101	4016	9378	5584	3654
16	Maharashtra	239297	3497	10420	3315	3857.7
17	Manipur	4787	3900	1888	40	1241
18	Meghalaya	24875	7844	4900	19	1084.5
19	Mizoram	9589	6801	5056	37	2019
20	Nagaland	6766	1045	6235	3	1506
21	Odisha	99843	5274	5834	8570	567.515
22	Punjab	17495	8626	42758	1857	2066
23	Rajasthan	225851	166978	6852	41377	10850
24	Sikkim	23300	15059	504	0	850
25	Tamil Nadu	16818	273015	39235	4459	12752.6
26	Telangana	0	0	351	424	6643
27	Tripura	64282	32723	1199	151	667
28	Uttar Pradesh	104791	235909	185091	10877	10041.46
29	Uttarakhand	93927	91595	21905	26	2365.03
30	West Bengal	17662	145332	8726	653	1730
31	Andaman & Nicobar	6296	468	390	5	167
32	Chandigarh	1675	275	898	12	730
33	Lakshadweep	5289	600	2465	0	2190
34	Puducherry	1637	25	417	21	121
35	Others	125797	24047	9150	0	23885
36	NABARD	0	116226	0	4012	0
	Total	2328865	1477189	471220	147527	181901.36



**Table-4.13 State wise SPV system installation during 2017-18 as on 31.12.2017**

S. No.	State/UT	Lanterns & Lamps Nos.	Home Lights Nos.	Street Lights Nos.	Pumps Nos.	Stand Alone Power Plants (KWp)
1	Andhra Pradesh	0	0	0	8907	0
2	Arunachal Pradesh	0	0	0	0	50
3	Assam	12258	0	0	0	0
4	Bihar	160274	0	0	0	200
5	Chhattisgarh	0	0	0	15203	216
6	Delhi	0	0	0	0	0
7	Goa	0	0	0	0	0
8	Gujarat	0	0	0	0	0
9	Haryana	0	0	0	700	0
10	Himachal Pradesh	0	0	6860	0	52
11	Jammu & Kashmir	0	0	0	0	0
12	Jharkhand	115349	0	0	452	0
13	Karnataka	0	0	0	641	0
14	Kerala	0	0	0	8	1931
15	Madhya Pradesh	519657	0	0	1771	0
16	Maharashtra	170614	0	0	1287	0
17	Manipur	0	0	0	0	0
18	Meghalaya	0	0	3627	0	200
19	Mizoram	0	0	0	0	300
20	Nagaland	0	0	0	0	0
21	Odisha	89961	0	0	1491	0
22	Punjab	0	0	0	0	0
23	Rajasthan	221135	11709	0	187	0
24	Sikkim	0	0	0	0	0
25	Tamil Nadu	0	42695	2433	0	0
26	Telangana	0	0	107	0	1269
27	Tripura	0	0	0	0	10
28	Uttar Pradesh	42776	0	0	17	0
29	Uttarakhand	0	0	0	0	826
30	West Bengal	0	0	0	0	0
31	Andaman & Nicobar	0	0	0	0	0
32	Chandigarh	0	0	0	0	0
33	Lakshadweep	0	600	740	0	0
34	Puducherry	0	0	0	0	0
35	Others	0	0	0	0	0
36	NABARD	0	8226	0	1985	0
	Total	1332024	63230	13867	32649	5054





Table-4.14 State wise pumps sanctioned during the year 2017-18

Sr No	State	Number of Solar Pumps Sanctioned
1	Andaman and Nicobar	20
2	Andhra Pradesh	15,000
3	Bihar	3,300
4	Chhattisgarh	15,000
5	Gujarat	5,000
6	Jharkhand	2,000
7	Karnataka	1,500
8	Madhya Pradesh	14,000
9	Maharashtra (for Drinking water)	1,000
10	Maharashtra (for Irrigation)	7,000
11	Odisha	1,500
12	Punjab	2,556
13	Rajasthan	7,500
14	Tamil Nadu	1,000
15	Uttar Pradesh	20,000

plants were installed in various states. Some of the highlights of the completed projects during the financial current year are given below:

- 150 kWp of SPV power plants has been installed at various hospitals and Primary Health Centres in Arunachal Pradesh.
- A total of 7,920 solar home lighting systems and 8,793 number of solar street lights has been installed in the state of Madhya Pradesh.
- SPV power plants having aggregated capacity of 153 kWp has been installed at police stations in Andhra Pradesh
- 2,000 number of Solar pumps for the purpose of drinking water has been installed in Odisha



Solar PV street lights installed in Himachal Pradesh

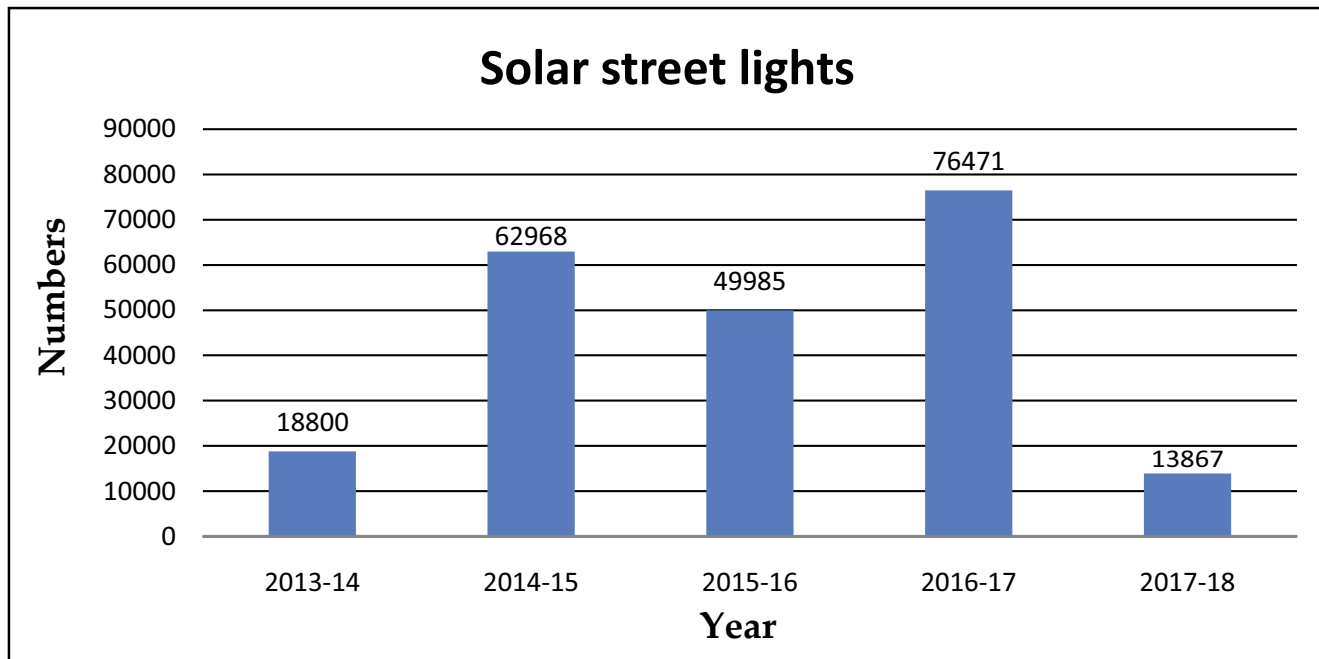




- SPV power plants of capacity 500 kWp has been installed in Chhattisgarh
- 9 Mini grids having capacity of 210.4 kWp has been installed in nine villages of Gumla districts in Jharkhand.
- Along the road side from Deogarh to Basukinath Temple, in Jharkhand, the electrification has been done with SPV power plant of 500 kWp.
- 12,890 number of solar pumps has been installed in Chhattisgarh
- SPV power plants of capacity 134 kWp have been installed in Rajasthan.
- SPV power plant of capacity 25 kWp and 700 number of Solar street lights have been installed in Manipur.

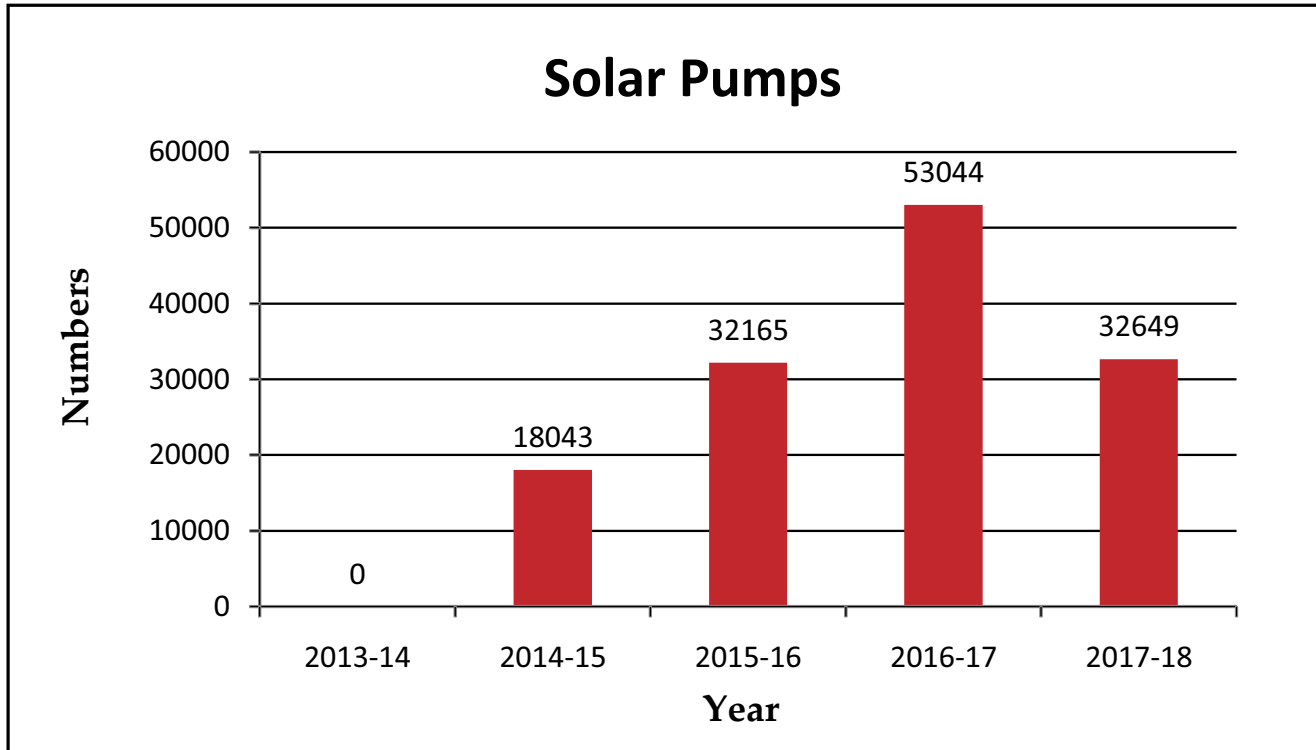
Cumulative Systems Installed		
SPV Systems		Cumulative up to 31.12.2017
Lanterns and Study lamps (No)		23,28,865
Home Lights (No)		14,77,189
Street Lights (No)		4,71,220
Solar Pumps (No)		1,47,527
SPV Plants (MW)		182

Solar street lights installed during last five years including current year (31.12.2017)

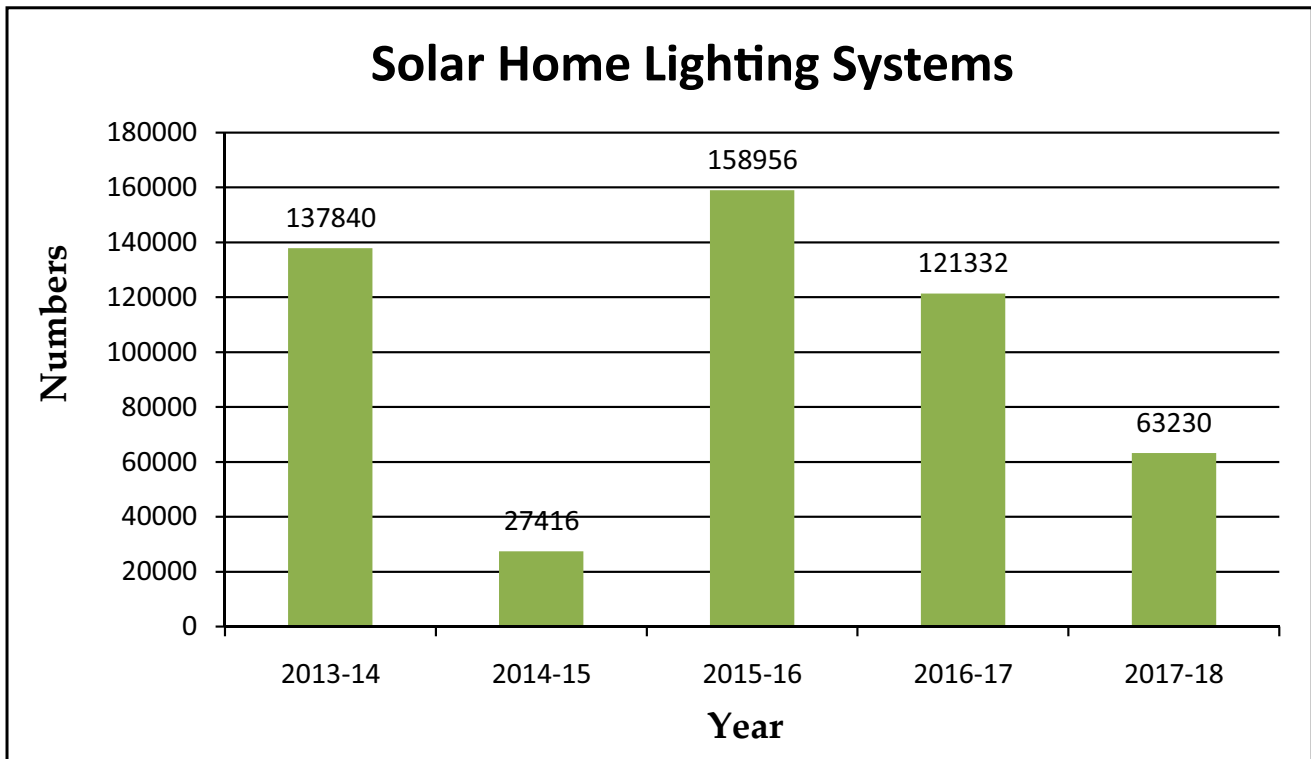




Solar pumps installed during last five years including current year (31.12.2017)



Solar home lighting systems installed during last five years including current year (31.12.2017)





Atal Jyoti Yojana

4.57 Under the Atal Jyoti Yojna (AJAY) programme Solar Street Lights are to be installed in rural, semi-urban and urban areas which don't enjoy adequate coverage of power grid in the states of Uttar Pradesh, Assam, Bihar, Jharkhand and Odisha.



Installation of 60kWp Floating Pond Top Solar Power Plant at Hon'ble Governor House in Bihar

4.58 The total cost of the scheme is Rs 499.30 crore. MNRE is providing provide 75% of the cost of street lights and remaining 25% comes through from Member of Parliament Local Area Development Scheme (MPLADS) funds, Panchayat funds or Municipalities and other Urban Local Bodies (ULBs) Funds.

4.59 As on 31st December 2017, the consent from 109 nos. of Hon'ble MP has been obtained out of total 169 Lok Sabha Constituencies.



Decentralised distributed solar mini-grid in Himachal Pradesh





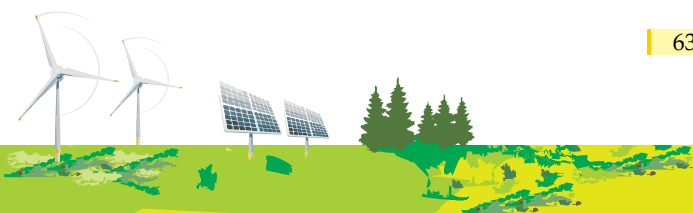
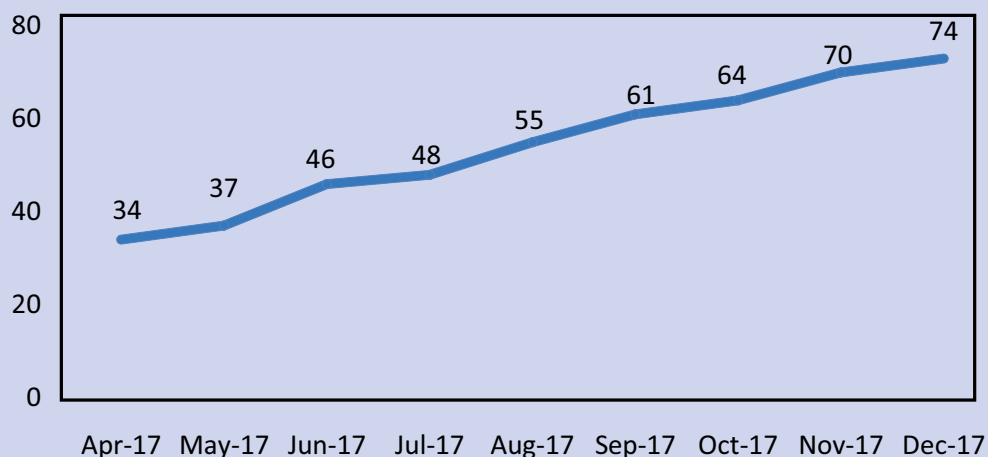
4.60 As on 31st December 2017, the implementing agency (EESL) has received sanctions letters from DMs from 74 constituencies which includes 1,05,217 nos. quantity to be installed in all 5 states out of which 47 are from Uttar Pradesh, 11 are from Bihar, 5 are from Odisha, 7 are from Jharkhand and 4 are from Assam.

4.61 Physical Progress (as on 31.12.2017)

- Total nos. of lights installed is 68,628
- Current rate of installation by EESL is 1000 lights/day.
- Work is in progress in all 5 States.
- Out of 74 sanctions received from District Authorities, work is in progress in 71 locations.
- Work at 13 nos. of constituencies is completed.

State-wise Division of total Sanction Letters received		
States	Sanctioned letters (No)	Progress as on 31.12.2017
Uttar Pradesh	67417	47414
Bihar	14638	10828
Assam	6165	2317
Jharkhand	9267	3946
Odisha	7730	4123

Atal Jyoti Yojana- Monthly Progress of Sanction Letters





2 HP Solar Water Pumping Systems installation under irrigation scheme in Bihar

MNRE's Scheme of 70 Lakh Solar Study Lamps

4.62 Ministry of New and Renewable Energy (MNRE), Government of India has sanctioned a scheme proposed by IIT Bombay (IITB), which aims to provide 70 Lakh students in rural India with high quality, affordable clean light through solar study lamp in cheapest and fastest possible way. The scheme covers 5 states of Assam, Bihar, Jharkhand, Odisha & Uttar Pradesh, which have more than 50% un-electrified households (Census 2011). This scheme is being implemented in the mission mode over a span of two years, from January 2017 to December 2018. The objectives of the scheme are:

- Supporting education of school students in un-electrified rural households by providing them solar study lamp
- Employment/livelihood generation through localization of solar energy empowers local communities through imparting skill & knowledge about solar technology
- Reaching out marginalized communities is achieved through targeting most remote and backward regions of the country
- Providing adequate light Intensity for Studying Purpose by providing the recommended level of light for casual reading.
- Awareness & Confidence on Solar Technology is built through a first-hand experience of solar products to rural communities

4.63 The blocks have been selected for implementation on the basis of criteria given by MNRE, which are 1) Blocks having more than 50% kerosene consumption at house hold level as main source of lighting and 2) Percentage of marginalized population. A total of 1495 blocks got qualified the criteria across the intervention states, out of which around 325 blocks are selected for the operations under the project covering around 70 lakh lamp targets. The target beneficiaries in block are considered as 60% of the school going students enrolled.





Community Solar Pump Systems installed at Kulhadighat Distt. Gariyabandh, Chhattisgarh

Implementing Agency

- 4.64 EESL being chief procurement agency handles the procurement of the lamp kit as well as tool kits along with monitoring of vendors, Zonal Execution Agencies (ZEAs) & Block Execution Agencies (BEAs) and coordination with IITB, Vendors, Zonal & Block level execution agencies with regards to supply as per timeline & schedule. IITB being Chief Implementation Agency is handling overall execution. It's main responsibilities include overall planning, process standardization, training, quality check of process & product, documentation, Technical assistance, developing IT system etc. It coordinates with ZEAs, BEAs & EESL on regular basis towards timely completion of the project activities. The State Rural Livelihood Missions (SRLM) as Zonal Execution Agencies (ZEAs) in intervention states are empanelled. These ZEAs establishes Block level Execution Agencies (BEAs) for grassroots level implementation. The BEAs are mainly SRLM promoted Cluster level Federation/Block level Federations/Village Organizations of women self-help groups. BEAs have further set up Assembly & Distribution Centres (ADCs) at block level. These ADCs employ local rural people for the purpose of assembly, distribution & after sales services.

Training

- 4.65 The project puts emphasis on local skill development by introducing appropriate capacity building activities under 3 sets of training viz. (1) Technical Skills (2) Soft Skills (3) Business Skills. At a Block Execution Centre these training are designed to be completed in 20 days across project duration at a BEA (14 months).





GLIMPSE OF THE SOLAR STUDY LAMPS PROJECT



Women at the Assembly & Distribution Centre in Gurua, Bihar



A lamp assembly line at an Assembly and Distribution centre in Sisai, Jharkhand



Training of women self trainees at Latehar, Jharkhand



Assembly & Distribution Centre, BillimarKundi, Uttar Pradesh



Solar Study Lamps distribution in schools of Dhudhi, Sonabhadra, Uttar Pradesh



Students Studying under Clean Light of Solar Study Lamp at Khajuri, Uttar





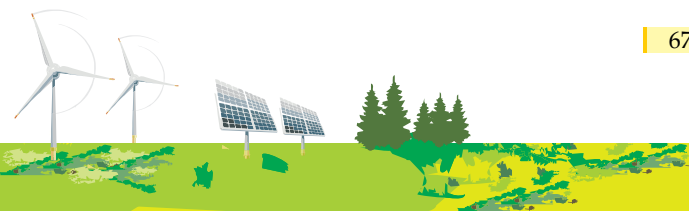
OFF-GRID SOLAR THERMAL PROGRAMME

Concentrating Solar Thermal (CST) Technologies for Community Cooking, Process Heat and Cooling applications:

- 4.66 National Programme on Solar Thermal is being implemented by Ministry of New and Renewable Energy aimed to promote the use of Renewable Energy sources to meet the thermal energy requirements in industrial, institutional and commercial sectors. Even with huge improvements in industrial sector, most of the thermal energy requirements are met using fossil fuels. Not only in industries, even for community cooking, space cooling etc. where there is requirement for huge thermal energy are still based on fossil fuels.
- 4.67 Concentrated Solar Technologies (CSTs) is one of such technology which can be used as sustainable source of thermal energy. CST works like a concave mirror, which focuses the Incoming Solar Radiation (INSOLATION) onto a receiver. The receiver gets heated up and the heat will be transfer to the working fluid, which can be used for various processes. Using this technology, a temperature of 90-350 OC can be reached, which is the temperature range required for most industrial and commercial applications. Industries having good potential for implementation of CST are food processing, dairy, paper and pulp, chemicals, textiles, fertilizer, breweries, electroplating, pharmaceutical, rubber, desalination and tobacco sectors. Any industrial/commercial establishments currently using steam/hot water for process applications can also employ CSTs with a minimum modifications/tinkering to the existing setup which can help in reduce conventional fuels which in turn will help in reducing Green House Gases (GHGs) emissions. Some of the emerging concentrated solar technologies are Scheffler Dish, Fresnel Reflector based dish, Paraboloid dishes, Parabolic Troughs, Linear Fresnel, and Non-Imaging Concentrator (NIC/CPC).
- 4.68 During the financial year 2017 – 18, **11 Nos. of CST systems with 3130.2 m2 collector/ reflector area** were installed and commissioned and **48 Nos. of CST projects with 16555 m2 collector/ reflector area is under installation** for process heating, air conditioning and steam cooking requirements in industrial, institutional and commercial establishment against the physical target of 20,000 m2 collector/reflector area.
- 4.69 BIS National Standards for various CSTs & Test methods were developed and Parts 1 to 3 & Part 5 were already published and Part 4 is in process of publication:-
- IS 16648 Part 1: Dish Technology- Requirements and Specifications.
 - IS 16648 Part 2: Scheffler Technology – Requirements and Specifications.
 - IS 16648 Part 3: Parabolic Trough Concentrator – Requirements and Specifications.
 - IS 16648 Part 4: Non Imaging Concentrator – Requirements and Specifications.
 - IS 16648 Part 5: CSTs-Test Methods.

Some success stories of the F.Y 2016-17:

- 4.70 Shree Krishnayan Ganga Desi Gowraksha Gaushala, Haridwar is having 2500 cows with 80 staffs. In order to run the Goushala, they generated revenue by selling processed cow urine.





Electric heaters were used to heat the urine to 70 OC and are allowed to cool for removing Urea and then it is again heated to 160 OC converting it to steam. It is then condensed to the final product, Cow urine arak. To make this process more cost effective and to promote Renewable Energy, Parabolic Dish based Concentrated Solar Thermal (CST) System of 700 m² was installed by M/s. Green life Solutions Pvt. Ltd (Fig. 1). On an average the system delivers 160/kg/day steam with a saving of about 128kWh of electricity benefiting a saving of approximately ₹ 5000/- per day.



Fig. 1.Paraboloid dishes

4.71 M/s Uttarakhand Cooperative Resham Federation Premnagar, C/o Directorate of Sericulture, Premnagar, Dehradun has three numbers of Silk reeling units which requires 8000 LPD hot water for degumming of silk cocoon and silk yarn reeling process (Fig. 2). They are initially operated by using steam generated using 875 kg of firewood per day. In order to reduce the use of fire wood 295.5 m² of Non-Imaging Concentrator (NIC/CPC) were installed. The installed system is providing 8000 LPD hot water at the temperature of 85-90 OC. After installation of this system, use of firewood is reduced by 417 kg per day and approximately ₹ 2500 is being saved perday.



Fig. 2.Silk Reeling process

4.72 Gujarat State Electricity Corporation Limited (GSECL) has initiated its activities in the field of Generation of Power and has constructed solar and wind power projects including World's 1st Canal Top Solar PV project near Sanand. Similarly, the CST based air conditioning system is installed at Gandhinagar Thermal Power Station (GTPS) is one of the largest in India. Gujarat Energy Research & Management Institute (GERMI) developed and supervised this installations carried out by M/s. VSM Solar Pvt. Ltd. In this project, 1575 m² of NIC were installed for providing hot water at 90° C to the Vapour Absorption Machine (VAM) having 150 TR full load capacity (Fig. 3). Chilled water from VAM is circulated through three Air Handling Unit (AHU) providing conditioned air to all blocks. This VAM can reduce the





water temperature up-to 7° C in the summer. There are two coils namely (1) Heating coil and (2) Cooling coil arranged inside the AHUs for winter air conditioning and summer air conditioning respectively. System is designed to provide space heating, space cooling and dehumidification and hence, year round utilization of solar thermal energy. Also buffer tanks help storing water during the non-working days to further enhance comfort next day. Back-up electrical heaters ensures smooth operation of the system during non-sunny periods. The solar thermal AC plant of GTPS is the largest operational project of India. System is expected to deliver annual savings of INR 34 lakhs towards savings on electricity consumption and a payback of less than 6 years.

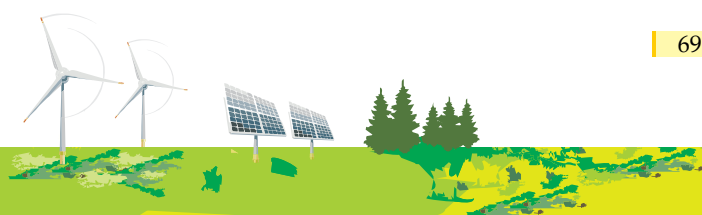


Fig. 3. CPC Collectors at GTPS, Gujarat and HUL, Amli

- 4.73 Hindustan Unilever Limited, Amli factory was using diesel (HSD) hot water generators (HWGs) to meet its daily demand (~50 kL/ day) of hot water for its process & cleaning needs. After considering the location of factory, having an average solar irradiation of 5.1 kWh/ hr/ m² and unused shadow free RCC roof top of 2300 sq. m, compound parabolic collectors (CPC/NIC) were selected and were installed in two phases by M/s. Thermax Ltd. (Phase – I: 136 m² & Phase – II: 816 m²). The CST system (Phase – I and Phase – II combined) delivers hot water at the rate of 8 kl per hour at saving about 200 litres of Diesel (HSD) with a savings of approximately ₹ 12,000 per day. Installation of 163 m² is planned under the third phase.

Externally Funded projects

- 4.74 UNDP-GEF-CSH project 'Market development of concentrated solar technologies for industrial process heat applications was started in 2012 with a GEF support of USD 4.40 Million (Approx. ₹ 28.60 Cr.). Major objective of the project was to develop market of Concentrated Solar Heat (CSH) systems through public awareness, removing barriers and developing knowledge documents for various types of stakeholders.
- 4.75 During the current year following activities were undertaken in the project
- 2 issues of 'SUNFOCUS', quarterly magazine were published and dispatched to 1000 stakeholders.





- Around 50 field projects were completed and commissioned with accounts settled by releasing the sanctioned UNDP support to beneficiaries
- 4 video films (One of community cooking, 2nd on industrial process heat, 3rd on space cooling and 4th on all applications were prepared for use to various stakeholder)
- A Compendium pending 5 SUNFOCUS magazine was prepared and kept for use. Earlier a Compendium of 10 previous magazines was prepared.
- A booklet of 19 Case studies appeared in all the 15 SUNFOCUS magazine was prepared for use.
- 24 video clipping each of about 40-60 seconds on various field projects were prepared and are in process of uploading on CSH website.
- Two documents as per following were prepared on media activities as per the details given below:
 - o Development and implementation of a Communication Strategy aimed at public relation activities about CSTs in Mainline Dailies and Regional Papers – Anchor Stories on various Applications
 - o Development and implementation of a Communication Strategy aimed at public relation activities about CSTs in Regional Papers – Regional Stories on various Applications
 - o A booklet on 50 field systems visited by APITCO, Hyderabad with 2 page write up on each was prepared. Detailed report on GHG emission for 40 systems in the field was also prepared.

4.76 The project has ended on 31.12.2017. Major achievement were as follows:-

Field projects & Awareness

- 4.77 Level of awareness & interest on CSTs increased significantly through awareness workshops/ business meets & publicity campaign through newspapers and industrial/ commercial magazines (over 70 workshops/ business meets & 7 advertisement each in 3 Newspapers and 12 magazines done)
- 4.78 Number of installations & CST area almost doubled (50,000 sq. m. as compared to 25,000 sq. m. before start of project). Installations have spread to Industrial & Commercial establishments for various applications (Increased to around 50% as compared to 20% in 2012). Applications include milk pasteurization, medicine preparation, metal phosphating, flavoring of tobacco leaves, heat storage for use on non-sunshine hours etc.
- 4.79 Newer & better technologies have been introduced
- 4.80 First time the project proposals have started coming for implementation in ESCo. mode. 4 projects supported under CSHP.
- 4.81 800 state wise & sector wise potential assessment reports for various establishments in 20 States for generation of proposals.
- 4.82 A total of 130 projects with 35,000 sq. m. area were sanctioned with additional direct support of 10-20% from the project towards performance monitoring, O & M etc. including installation besides MNRE subsidy. All the projects have been commissioned with accounts settled.





Test Set Ups, Standards & Capacity Development

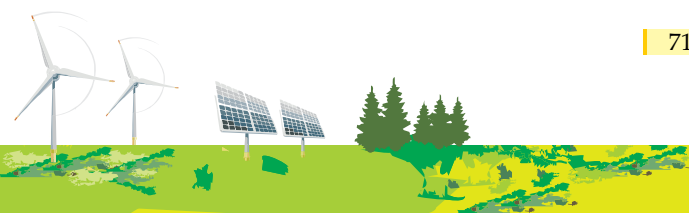
- 4.83 1st time in country, National & Regional Test Centers (Mobile & Immobile) has been established at NISE & UoP.
- 4.84 Booklets on component & material specifications of 6 CSTs are in place for quality guidance to suppliers & beneficiaries
- 4.85 On line performance monitoring made mandatory for all field projects supported under CSHP. Data started coming from 40 installations.
- 4.86 Training-cum-Awareness center established with WRST, Mount Abu. A total of around 20 training programmes organized with over 500 entrepreneurs/ ITI students trained.

Knowledge Documents

- 4.87 Over 25 knowledge documents have been developed in the project which include National Toll Free Helpline on Solar Energy, dedicated CSH website (www.cshindia.com) , monthly newsletter (electronic), booklets on component & material specifications, magazines, Case studies on different projects, Technology assessment report etc.
- 4.88 United Nations Industrial Development Organization (UNIDO), in association with the Ministry of New and Renewable Energy (MNRE), Government of India, is implementing a project entitled “Promoting Business Models for Increasing Penetration and Scaling up of Solar Energy” in India to promote deployment of CST technologies and support its commercialization by removing the barriers associated with them such as awareness, capacity building, as well as market barriers. The initiative also aims at standardization of CST performance measurement and spreading technology related information and knowledge.

Achievements

- 4.89 Financial support in the form of soft loan is being offered in partnership with IREDA:
- Loan for up to 75% of the project cost is available.
 - Bridge loan against subsidy and at normal interest rate would be available
 - Soft loan with an interest subvention of 5% is available for about 45% of the project cost. The funds under the UNIDO project would be used for subvention of the interest rate.
- 4.90 A nation-wide awareness generation initiative by the UNIDO project in form of focused workshops in twelve states, engaging the respective State Nodal Agencies and the local industry associations attracted participation by over 1300 representatives from the industry. As a part of this campaign, 18 visits to various CST sites were conducted to impart better understanding on the utility of the solar systems for various applications.
- 4.91 Partnership with National Institute of Solar Energy (NISE) has been formalized; as well as with International Expert/ Organization to ensure that the skill development trainings provided would be of international standards.





GREEN ENERGY CORRIDOR

- 4.92 In order to facilitate integration of large scale renewable generation capacity addition, the Cabinet Committee of Economic Affairs (CCEA) in Financial Year 2015-16 approved 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 from National Clean Energy Fund (NCEF) 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. 19000 MVA (Mega Volt Ampere) and installation of over 8500 ckt-kms (Circuit kilometres) of transmission lines in these eight states. The creation of the Intra-State Transmission System will facilitate the evacuation of renewable power from generation stations to load centres.
- 4.93 The project is scheduled to be completed by Financial Year 2019-20 with funding mechanism consisting of 40% NCEF Grant, 40% KfW loan (EUR 500 Million) and the remaining 20 percent as State contribution. As on 31.12.2017, a total of approx. Rs. 1389 crores has been disbursed to the States from the Government of India contribution, and works related to installation of transmission towers and its stringing for aggregate 1100 ckt-kms have been completed:
- Andhra Pradesh: 400kV Quad Moose DC line from 400 kV Uravakonda Substation to 400 kV Hindupur Substation.
 - Tamil Nadu: (i) Rasipalayam - Palavadi 400 kV transmission line and (ii) 230 KV Transmission lines: Kayathar 400 kV Substation – Tuticorin Auto D/C line, Veeranam-Tirunelveli (PGCIL) Substation S/C line, Veeranam- Kodikurichi S/C line, Ingur- Arasur 400 kV Substation (PGCIL) S/C line, Arasur 400 kV Substation (PGCIL) – Gobi Substation S/C line and Cuddalore- SP Koil (Veerapuram) D/C line.
 - Karnataka: 400kV LILO line with twin Moose ACSR conductor from 400 kV Guttur-Guddadahalli S/C line to 400/220 kV Substation at Gadag (Doni).
 - Gujarat: (i) LILO of both circuits of 220 KV D/C Jamanvada – Varsana line at 220 KV Bhachunda M/C line and (ii) 220 KV D/C Radhanpur – Sankhari line.

