28

STANDING COMMITTEE ON ENERGY

(2016-17)

SIXTEENTH LOK SABHA

MINISTRY OF NEW AND RENEWABLE ENERGY

NATIONAL SOLAR MISSION - AN APPRAISAL

TWENTY EIGHTH REPORT

LOK SABHA SECRETARIAT
NEW DELHI

July, 2017/Shravana,1939 (Saka)

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Presented to Lok Sabha on July 31, 2017

Laid in Rajya Sabha on July 31, 2017

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CONTENTS

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INTRODUCTION

I, the Chairperson, Standing Committee on Energy, having been authorized by the Committee to present the Report on their behalf, present this Twenty Eighth Report on 'National Solar Mission - An Appraisal' relating to the Ministry of New and Renewable Energy.

2. The Committee had a briefing on the subject by the representatives of the Ministry of New and Renewable Energy on 19th May, 2017. The Committee, with a view to examining the subject in detail, had evidence of the representatives of the Ministry of New and Renewable Energy on 30th June, 2017 and 7th July 2017. The Committee wish to express their thanks to the representatives of the Ministry of New and Renewable Energy for appearing before the Committee and furnishing the desired information in connection with the issues relating to the subject.

3. The Report was considered and adopted by the Committee at their sitting held on 28th July, 2017.

4. The Committee place on record their appreciation of the valuable assistance rendered to them by the officials of the Lok Sabha Secretariat attached to the Committee.

5. For facility of reference and convenience, the observations and recommendations of the Committee have been printed in bold letters in Part-II of the Report.

NEW DELHI
July 28, 2017
Shravana 06, 1939 (Saka)

DR. VIRENDRA KUMAR
Chairperson,
Standing Committee on Energy

REPORT

PART I
NARRATION ANALYSIS

CHAPTER I

INTRODUCTORY

1.1 It is a known fact that conventional sources of energy have their own limitations. With ever growing demand for energy, alternative sources of energy have to be explored so as to reduce our dependence on fast depleting conventional sources. India is endowed with a very vast solar energy potential. More than 750 GW potential has been estimated from Solar Energy. Most parts of the country have about 300 sunny days. Average solar radiation incident over the land is in the range of 4-7 kWh per day.

1.2 The solar energy can be utilized through solar photovoltaic technology which enables direct conversion of sunlight into energy and solar thermal technologies which utilizes heat content of solar energy into useful applications. Over the last three decades several solar energy based systems and devices have been developed and deployed in India which are successfully providing energy solutions for lighting, cooking, water heating, air heating and cooling, and electricity generation. The research and development efforts have also helped in better efficiency, affordability and quality of the products. As a result many solar energy systems and devices are commercially available with affordable cost in the market.

1.3 National Solar Mission (NSM), as submitted by the Ministry of New and Renewable Energy (MNRE), was launched on 11th January, 2010. The Mission was to be implemented in three phases. The Mission targets included:

(i) deployment of 20,000 MW of grid connected solar power by 2022,

(ii) 2,000 MW of off-grid solar applications including 20 million solar lights by 2022,

(iii) 20 million sq. m. solar thermal collector area,

(iv) to create favourable conditions for developing solar manufacturing capability in the country; and

(v) support R&D and capacity building activities to achieve grid parity by 2022.

1.4 The then Prime Minister had emphasized the importance of the mission as:

> "*The importance of this Mission is not just limited to providing large-scale grid connected power. It has the potential to provide significant multipliers in our efforts for transformation of India's rural economy. Already, in its decentralized and distributed applications, solar energy is beginning to light the lives of tens of millions of India's energy-poor citizens. The rapid spread of solar lighting systems, solar water pumps and other solar power-based rural applications can change the face of India's rural economy. We intend to significantly expand such applications through this Mission. As a result, the movement for decentralized and disbursed industrialization will acquire an added momentum, a momentum which has not been seen before.*"

1.5 Now the Government has revised cumulative targets under NSM from 20,000 MW by 2021-22 to 1,00,000 MW by 2021-22 for Grid Connected Solar Power Projects. The revised target of 1,00,000 MW is planned to be achieved in 7 years period (2015-16 to 2021-22) and broadly consist of 40 GW Grid connected Rooftop projects and 60 GW large and medium size land based solar power projects. The total target has been envisaged to be divided into Rooftop and medium & large scale grid connected projects as follow:

Category-I	**Proposed Capacity (MW)**	**Category-II**	**Proposed Capacity (MW)**
Rooftop Solar	40,000	Scheme for Decentralized Generation of Solar Energy Projects by Unemployed Youths and Farmers (Small Scale Grid connected projects)	10,000
		Public Sector Undertakings	10,000
		Large Private Sector/IPPs	5,000
		SECI	5,000
		Under State Policies	20,000
		Ongoing programmes including past achievements	10,000
Total	**40,000**		**60,000**

This breakup may change depending upon the requirement.

1.6 With this new initiative, India will emerge as a major country utilizing the Solar Energy on such a large scale. This 100 GW will result in abatement of millions of tonnes of CO_2 per year and will help to fulfill India's commitment towards mitigating the effect of Climate Change.

CHAPTER II

GRID CONNECTED SOLAR POWER

2.1 Given below are the year wise targets, as furnished by the Ministry, to achieve 100 GW Grid Connected Solar Power by 2022:

Category	**Year-wise Targets (in MW)**							
	2015-16	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**Total**
Rooftop Solar	200	4,800	5,000	6,000	7,000	8,000	9,000	40,000
Large Scale Solar Power Projects	1,800	7,200	10,000	10,000	10,000	9,500	8,500	57,000
Total	**2,000**	**12,000**	**15,000**	**16,000**	**17,000**	**17,500**	**17,500**	**97,000 ***

** Around 3000 MW was already commissioned before 2015-16*

2.2 On being asked about the steps taken by the Ministry to achieve the above mentioned target, the Ministry stated that:

> "The Government has been promoting solar energy through fiscal and promotional incentives such as capital and/or interest subsidy, generation based incentive, accelerated depreciation, viability gap funding (VGF), financing solar rooftop systems as part of home loan, concessional excise and custom duties, preferential tariff for power generation from renewables, and Foreign direct investment up to 100 per cent under the automatic route etc.
>
> This apart, The Government has also been supporting solar manufacturing through a Modified Special Incentive Package Scheme (M-SIPS) of Ministry of Electronics & Information Technology (MeitY).
>
> The Ministry of Power has issued the RPO trajectory up to 2019, however, the state regulators have to issue necessary orders in their respective states. The Ministry is also implementing, through PGCIL and state governments, an ambitious scheme of Green Energy Corridors where in dedicated transmission system is being created for power from renewable energy projects. A World bank loan financing arrangement of US $ 100 million is being worked out for creation of internal infrastructure of solar parks."

2.3 On being asked about the financial demand of the Solar Energy Sector, the Ministry stated as under:

> "Keeping in view the normative cost of Rs. 5 crore per MW, the total investment for commissioning of 100 GW solar power has been estimated to Rs. 5

lakh crore. Since most of the investment for projects come from Private sector, Ministry is providing a facilitative role in land acquisition, loan at affordable rates, 100% FDI in RE sector through automatic route. Further many issues of land acquisition, power evacuation, transmission etc. have been sorted out through scheme for development of solar parks and Ultra mega solar power projects for setting up of 40,000 MW solar projects. In addition, Government is in process of arranging with World Bank, in consultation with Ministry of Finance, for US $ 100 million loan assistance for creating internal infrastructure of solar parks".

2.4 When further queried about the details of investment attracted so far, the Ministry stated that most of the investment in solar sector is done by private entities and getting finance has not been a major issue so far. No financial targets have been set by the Ministry.

2.5 The Ministry has also formulated a range of schemes for achieving the aspirational target of 100 GW. The schemes, as furnished by the Ministry, are given below:

a) "Scheme for setting up 300 MW of Grid connected Solar PV Power Projects by Defense Establishments under Ministry of Defense and Para Military Forces with viability Gap Funding under Batch-IV of Phase-II/III of JNNSM.
b) Scheme for Development of Solar Parks and Ultra Mega Solar Power Projects.
c) Scheme for Development of Solar PV Power Plants on Canal Banks/ Canal Tops.
d) Implementation of scheme for setting up 1000 MW of Grid- Connected Solar PV Power Projects by CPSUs with Viability Gap Funding under Batch-V of Phase-II of JNNSM.
e) Implementation of Scheme for Setting up of 15000 MW of Grid connected Solar PV Power Projects under Batch II of Phase II of National Solar Mission (by NTPC/NVVN)
f) Schemes for setting up of 750 MW, 2000 MW, and 5000 MW Grid connected solar power with Viability Gap Funding through Solar Energy Corporation of India (SECI)
g) Development of Solar Cities Programme
h) Installation of Grid Connected Solar Rooftop Power Plants."

Scheme for setting up over 300 MW of Grid-Connected Solar PV Power Projects by Defense Establishments:

2.6 Detailing about the Scheme for setting up over 300 MW of Grid-Connected Solar PV Power Projects by Defense Establishments under Ministry of Defense and Para Military Forces, the Ministry furnished following information:

"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 Defense Establishments agreed to set up solar power projects on the large tracts of land and vacant rooftops which they

own. The Cabinet has approved the Scheme in its meeting held on 10th December, 2014. The Ministry has issued Administrative Approval on 07th January, 2015.

The broad guidelines of the scheme are as under:

i) A capacity of 300 MW will be set up in various Establishments of Ministry of Defense i.e. Establishments of Army, Navy, Air Force, Ordnance Factory Board, Defense Laboratories and Defense PSUs etc. Para Military Forces would also be covered under this scheme. Minimum size of the project shall be 1 MW.

Government has also given permission for Right to Use the Defense Land by the Developers chosen by Defense Establishments by way of lease and otherwise or for self-use of the same by Defense Establishments themselves for the purpose of setting up of Solar Power Projects and sale of excess power to the Distribution Companies.

ii) The projects under this Scheme will mandatorily use solar cells/modules which are made in India.

iii) The aforesaid Establishments would identify locations for developing solar projects, anywhere in the country including border areas from time to time.

iv) The following two modes may be used for tendering

A) Developer Mode: Under this mode, 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 Defense establishment/Para Military Forces.

v) The Defense organizations/Establishments will be free to own the power projects i.e. get an 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.

vi) The solar project developers will be provided VGF based on the bid. The bidders will be 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.

vii) Domestic Content Requirement (DCR): The entire capacity of 300 MW will be kept for bidding in phases, with DCR. Under DCR, the solar cells and modules used in

the solar PV power plants must both be made in India as per specification and testing requirement by MNRE.

viii) Project Implementation Schedule: A total of 300 MW capacity to be added in 5 years from 2014-19.

ix) Subsequently, in view of falling prices of solar tariff and other considerations, following major changes were made vide OM No 30/69/2013-14/NSM dated 17th February, 2017. A Brief of amendments in existing scheme is as given below:

a. The projects for which tenders have already been brought out will have these provisions as per administrative approval dated 07.01.2015.
b. The amendment made herein shall come into force with immediate effect and this Addendum may be read as part of this Ministry's administrative approval dated 7th January, 2015.
c. The VGF limit may be 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.
d. The tariff of solar power may be reduced from Rs 5.50 per unit to Rs 4.50 per unit.
e. To keep the provisions of scheme WTO compliant, the capacity under EPC mode of the scheme will use solar cells and modules in the solar PV power plants made in India. The projects under developer mode will be free to procure solar cells/modules under open category (indigenous or imported)."

2.7 The Ministry also furnished that, as on date, 357.5 MW has been allocated under the above mentioned scheme. A table regarding the same is given below:

Sl. No.	Name of Organisation	Capacity Sanctioned (MW)	Status
1.	Ordnance Factory Board	7	Commissioned.
2	Bharat Electronics Ltd.	150	35 MW: Order placed, under construction 36 MW: Tendering under process
3	Bharat Dynamics Limited	25	5 MW: Order placed, under construction
4	Department of Defence	150	26 MW: Order placed, under construction
5	Hindustan Aeronautics Ltd., Nasik	15	5 MW: Tender issued, order to be placed by 30th May,2017
6	Ordnance factory	05	Tendering for 15 MW to be done by June,2017
7	MIDHANI	4	Tendering in process
8	Ordnance Factory, Ambajhari	1.5	Tender will be issued by June,2017
Total		**357.5**	

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

2.8 Regarding the scheme for Development of Solar Parks and Ultra Mega Solar Power Projects, the Ministry furnished that:

"The scheme for development of Solar Parks and Ultra Mega Solar Power Projects 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.

The salient features of the scheme are as under:

i) The scheme for "Development of Solar Parks and Ultra Mega Solar Power Projects" has been rolled out by the Ministry of New & Renewable Energy on 12/12/2014.

ii) Under this scheme, it was proposed 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.

iii) 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 will facilitate and speed up installation of grid connected solar power projects for electricity generation on a large scale.

iv) All the States and Union Territories are eligible for getting benefit under the scheme.

v) The capacity of the solar parks shall be 500 MW and above. However, smaller parks may be 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.

vi) The solar parks will be 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.

vii) 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 per MW 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.

viii) SECI has been entrusted with the responsibility of administering the Scheme."

2.9 On being asked about the financial requirement to provide Central Financial Assistance (CFA) for Development of Solar Parks and Ultra Mega Solar Power Projects, the Ministry stated as under:

"The total fund requirement to provide CFA is estimated as Rs. 4050.00 crore with the following year-wise break up":

Year	Disbursement of funds (Rs. in Crore)
2014-15	500.00
2015-16	550.00
2016-17	600.00
2017-18	1000.00
2018-19	1400.00
Total	4050.00

The details of CFA released are as under:

(Rs. in crore)

2014-15	2015-16	2016-17	Total CFA released
172.50	365.72	367.90	906.12

2.10 The Ministry enumerated the following specific advantages of Solar Parks and Ultra Mega Solar Power Projects:

i) "Solar parks will enable development of solar power in remote areas where land is inexpensive.

ii) As transmission system will be developed for the entire park, developers will not have to set up their own transmission lines. This will not only save money but will also avoid damaging the landscape of the area as only limited transmission lines would be laid.

iii) The developers would be able to set up projects very fast as they will not have to get statutory and other clearances.

iv) India will emerge as a major solar power producing country as nowhere in the world solar parks are being developed on such a large scale."

2.11 In response to a query regarding per MW efficacy of solar power *vis-a-vis* thermal and hydro power, the Ministry furnished the following information:

"The Solar power plants work at an average 19% Capacity Utilization Factor (CUF). Thus on average 1MWp solar power plant would generate 1.67 million units of electricity per year. However, the actual generation in the field would depend on solar radiance at the location, technology deployed, ambient temperature etc.

As per CEA generation overview report for the year 2016-17, the average all India PLF for thermal power plant and the Hydro power plants works out to 60.01 % and

31 % respectively. Thus on an average, 1MW thermal and hydro plants produced 5.25 million and 2.71 million units of electricity per year respectively".

2.12 When asked to compare per MW efficacy of solar power *vis-a-vis* thermal and hydro power in India with other countries especially National Solar Alliance Countries, the Ministry stated as under:

> "Generation from any power plant depends mainly upon input fuel supply. As in case of thermal power and hydro power basic input fuel i.e. coal and water is in our hands, CUF of these plants is high. Whereas in case of solar power, we are dependent upon nature. Solar energy is available for limited hours in a day.
> Country specific data of International Solar Alliance countries is not available, however, CUF of solar power projects is similar in other countries as India being a tropical country gets good solar radiance as compared to other countries".

2.13 On being queried about the achievements in development of Solar Parks and Ultra Mega Solar Power Projects, the Ministry stated as under:

> "Based on the proposals received from the States, 34 solar parks of aggregate capacity 20,000 MW has been approved in 21 States as on date. State wise approval is given in the Table below":

Sl. No.	State	Capacity (MW)	Name of the Solar Power Parks Developer (SPPD)	Land identified at
1.	Andhra Pradesh	1500	AP Solar Power Corporation Pvt. Ltd., JVC of SECI, APGENCO and NREDCAP	NP Kunta of Anantpuramu & Galiveedu of Kadapa Districts
2.	Andhra Pradesh	1000		Gani and Sakunala Village of Kurnool District
3.	Andhra Pradesh	1000		Mylavaram Mandal, Kadapa district
4.	Andhra Pradesh	500		Talaricheruvu & Aluru Villages, Tadipathri Mandal, Anathapuramu District of Andhra Pradesh
5.	Arunachal Pradesh	100	Arunachal Pradesh Energy Development Agency (APEDA)	Tezu township in Lohit district
6.	Assam	69	JVC of APDCL & APGCL	Amguri in Sibsagar district
7.	Chhattisgarh	500	Chhattisgarh Renewable Energy Development Agency	Rajnandgaon, Janjgir Champa districts
8.	Gujarat	700	Gujarat Power Corporation Limited	Radhnesada, Vav, Distt. Banaskantha
9.	Haryana	500	Saur Urja Nigam Haryana Ltd (SUN Haryana)	Bugan in Hisar district, Baralu and Singhani in Bhiwani district and Daukhera in Mahindergarh district
10.	Himachal Pradesh	1000	HP State Electricity Board Ltd.	Spiti Valley of Lahaul & Spiti District

Sl. No.	State	Capacity (MW)	Name of the Solar Power Parks Developer (SPPD)	Land identified at
11.	Jammu & Kashmir	100	Jammu and Kashmir Energy Development Agency	Mohagarh and Badla Brahmana, District-Samba
12.	Karnataka	2000	Karnataka Solar Power Development Corporation Pvt. Ltd.	Pavagada taluk Tumkur dist.
13.	Kerala	200	Renewable Power Corporation of Kerala Limited	Paivalike, Meenja, Kinanoor, Kraindalam and Ambalathara villages of Kasargode district
14.	Madhya Pradesh	750	Rewa Ultra Mega Solar Limited	Gurh, Rewa, MP
15	Madhya Pradesh	500	Rewa Ultra Mega Solar Limited	Neemuch and Mandsaur
16.	Madhya Pradesh	500	Rewa Ultra Mega Solar Limited	Agar and Shajapur
17.	Madhya Pradesh	500	Rewa Ultra Mega Solar Limited	Chhattarpur
18.	Madhya Pradesh	500	Rewa Ultra Mega Solar Limited	Rajgarh—Morena
19.	Maharashtra	500	M/s Sai Guru Mega Solar Park Pvt. Ltd. (formerly M/s Pragat Akshay Urja Ltd.)	Sakri, Dhule district of Maharashtra
20.	Maharashtra	500	Maharashtra State Electricity Generating Company Ltd. (MAHAGENCO)	Dondaicha, district Dhule, Maharashtra
21.	Maharashtra	500	M/s Paramount Solar Power Pvt. Ltd. (formerly M/s K. P. Power Pvt. Ltd.)	Taluka Patoda, district Beed, Maharashtra
22.	Meghalaya	20	Meghalaya Power Generation Corporation Ltd (MePGCL)	West Jaintia Hills & East Jaintia Hills districts
23.	Nagaland	60	Directorate of New & Renewable Energy, Nagaland	Dimapur, Kohima and New Peren districts
24.	Odisha	1000	Green Energy Development Corporation of Odisha Limited	Balasore, Keonjhar, Deogarh, Boudh, Kalahandi and Angul
25.	Rajasthan	680	Rajasthan Solar Park Development Company Ltd.	Bhadla Phase II, Bhadla, Rajasthan
26.	Rajasthan	1000	Surya Urja Company of Rajasthan Ltd	Bhadla Phase III, Bhadla, Rajasthan
27.	Rajasthan	750	M/s Essel Surya Urja Company of Rajasthan Limited	Villages Ugraas, Nagnechinagar & Dandhu, tehsil Phalodi, dist Jodhpur (450 MW) and villages Lavan & Purohitsar, tehsil Pokaran, dist Jaisalmer (300 MW)
28.	Rajasthan	500	M/s Adani Renewable Energy Park Rajasthan Limited	Bhadla Phase IV, Bhadla, Jodhpur Rajasthan
29.	Rajasthan (421 MW through support of GoI out of 1500 MW)	421	M/s Adani Renewable Energy Park Rajasthan Limited	Fatehgarh & Pokaran, Jaisalmer, Rajasthan
30.	Telangana	500	Telangana New & Renewable Energy Development Corporation Ltd. (TNREDC)	Gattu, Mehboob Nagar Distt.

Sl. No.	State	Capacity (MW)	Name of the Solar Power Parks Developer (SPPD)	Land identified at
31.	Uttar Pradesh	600	Lucknow Solar Power Development Corporation Ltd.	Jalaun, Allahabad, Mirzapur and Kanpur Dehat districts
32.	Uttarakhand	50	State Industrial Development Corporation Uttarakhand Limited (SIDCUL)	Industrial Area, Sitarganj (Phase I), Industrial Area, Sitarganj (Phase II) and Industrial Area, kashipur
33.	West Bengal	500	West Bengal State Electricity Distribution Company Ltd.	East Mednipur, West Mednipur, Bankura
34.	Tamil Nadu	500	To be finalized	Initially proposed in Ramanathapuram district. Site under revision.
TOTAL		**20000**		

2.14 The status of Solar Projects inside Solar Parks, as furnished by the Ministry, is given in the table below:

Sl. No.	Particulars	Capacity (MW)
1	Solar Projects already commissioned inside Solar Parks during 2016-17	1516
2	Solar Projects likely to be commissioned inside Solar Parks during 2017-18	2229
3	Capacity already tendered out but may be commissioned in 2018-19	2100
4	Capacity expected to be tendered out in 2017-18	6425
5	Capacity Expected to be tendered out for setting up of Solar Projects inside the Solar Parks in 2017-18, where activities are yet to be started	7730
Total		**20000**

2.15 The Ministry submitted that in view of good response to solar park scheme from the states, the target capacity under the scheme has been enhanced, with the approval of the Cabinet, from 20,000 MW to 40,000 MW. The revised scheme has been launched on 21.03.2017.

2.16 It was submitted that large scale Solar Projects will be using Photovoltaic (PV) cells to generate electricity. When asked about other more efficient technologies which can be used to generate electricity through Solar Energy, the Ministry stated as under:

> "Apart from solar PV, solar thermal technologies are also available, but PV is currently the most widely used technology for generating solar power worldwide. There are many variants of this technology, such as mono-crystalline, poly-crystalline, thin films etc. with different efficiency levels that are used for power generation. Solar thermal route is not cost effective nationally as well internationally".

2.17 When further queried about the best technique in Indian context and asked whether solar thermal system with concentrated solar power technique is more efficient way to generate energy from the sun, the Ministry furnished that:

"USA has around 1.7 GW solar thermal capacity out of 35 GW total solar power capacity. Spain has around 2.3 GW of solar thermal out of 7.2 GW total solar power capacity. USA and Spain jointly have around 4.0 GW solar thermal power capacity against total global capacity of around 4.8 GW**.** So rest of world has only around 0.8 GW**.**

Solar thermal technology for power generation, when coupled with thermal storage, has several advantages over solar PV for power generation, like ability to cater to the base load, reliability, flexibility, improved despatchability of power, absence of DC to AC conversion losses, reduced harmonics etc. However, solar thermal has also several disadvantages compared to solar PV like non-viability for small capacity, not modular in nature like solar PV, difficult and costlier to maintain compared to solar PV, works on Direct Normal Irradiance (DNI) and not on Global Horizontal Irradiance (GHI) like PV, therefore generation drops in dusty conditions.

As mentioned above, solar thermal technology is not cost effective at present. Central Electricity Regulatory Commission (CERC) has notified tariff of Rs. 12.07/kWh for solar thermal and Rs. 5.68/kWh for solar PV power plants, for 2016-17. Further, in recent bids, the lowest solar PV tariff discovered is Rs. 2.44/kWh. Thus, in India, the cost of electricity generated from solar thermal power plants is much higher than the cost of electricity generated from Solar PV power plants".

The Viability Gap Funding (VGF) Scheme:

2.18 Regarding the Viability Gap Funding (VGF) Scheme, the Ministry stated as under:

"750 MW VGF Scheme under JNNSM Phase-II, Batch-I

Solar Energy Corporation of India (SECI) has implemented the first VGF scheme of 750 MW, under JNNSM Phase-II, Batch-I for setting up large scale ground-mounted solar PV projects. 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. State-wise details of commissioned projects are given in Table below":

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

The second batch of VGF scheme of 2000 MW capacity (JNNSM Phase II, Batch III) is under implementation by SECI. Tenders are being brought out on state-specific basis, either in solar parks being developed in the states or outside solar parks.

Under this scheme, developers would be paid tariff of Rs. 4.43 per kWh or the discounted tariff discovered through e-reverse auctioning, for 25 years by entering into a PPA with SECI. Power from these projects would be sold to various DISCOMs/Bulk consumers/state utilities by SECI at Rs.4.50 per kWh or discounted tariff discovered (including trading margin of 7 paisa per unit).

SECI has issued RfS for 2410 MW capacity in 7 states/UTs. LoI has been issued for 2295 MW. PPAs have been signed for 2295 MW. State-wise status as on date is given in Table below":

State-wise status under 2000 MW VGF Scheme of NSM Phase II, Batch III				
Sl. No.	State	RfS issued	LoI issued	PPA signed
1	Maharashtra	500 MW	500 MW	500 MW
2	Uttar Pradesh	325 MW	325 MW	325 MW
3	Andhra Pradesh	400 MW	400 MW	400 MW
4	Chhattisgarh	100 MW	100 MW	100 MW
5	Karnataka	1000 MW	970 MW	970 MW
6	Puducherry	35 MW	-	-
7	Himachal Pradesh	50 MW	-	-
Total		**2410 MW**	**2295 MW**	**2295 MW**

"5000 MW VGF Scheme Batch IV Phase II

On the lines of the 2000 MW VGF Scheme, another VGF scheme of 5000 MW capacity has been announced. First and second parts are being taken up at present for FY 2015-16 and FY 2016-17 for 2500 MW.

The scheme is proposed to be implemented by SECI in four tranches of 1250 MW each, spread over four years, up to FY 2018-19. This scheme also provides for purchase of solar power by SECI from selected developers at a fixed tariff of Rs. 4.43 per kWh or discounted tariff discovered for 25 years and supply to DISCOMs at Rs. 4.50 per kWh or discounted tariff discovered (including trading margin of 7 paise per unit). The projects are being set up either in the solar parks being developed by states or outside the solar parks.

RfS has already been issued for 2850 MW capacity in 6 states. LoI has been issued for 970 MW. PPAs have been signed for 970 MW. State-wise tendering status as on date is given below":

State-wise tendering status under 5000 MW VGF Scheme Batch IV Phase II				
Sl. No.	State	RfS issued	LoI issued	PPA signed
1	Gujarat	400 MW	250 MW	250 MW

2	Odisha	300 MW	270 MW	270 MW
3	Andhra Pradesh	750 MW	-	-
4	Maharashtra	450 MW	450 MW	450 MW
5	Karnataka	200 MW	-	-
6	Rajasthan	750 MW	-	-
Total		**2850 MW**	**970 MW**	**970 MW**

2.19 On being asked to explain the discounted tariff discovered for 25 years as mentioned above, the Ministry stated that:

"5000 MW VGF scheme is having the provision of e-reverse bidding on VGF amount of Rs. 1.00 crore per MW. As per the approved guidelines on 5000 MW VGF scheme, the VGF bidding may be negative also. In the case of negative VGF bidding, the bidders has to pay/provide fund on per MW basis which will be adjusted by reducing the tariff for 25 years on the approved tariff rate of Rs. 4.50 per KWh and VGF is considered as zero. In general, at tariff bidding, the VGF is considered as zero and discount on tariff is bided out by developer to adjust the fund equivalent to the amount which the developer would have been liable to pay in case of negative VGF bidding. Recently, the tariff bidded in Bhadla solar park Rajasthan has resulted tariff Rs.2.44 per unit (KWh)**.** The new discovered tariff will be treated as discounted tariff for whole life of the plant i.e 25 years for which SECI will enter into Power Purchase Agreement (PPA) with developer and simultaneously Power Sale Agreement (PSA) with DISCOMs"**.**

2.20 When asked why the DISCOMs would buy power at Rs. 4.50 when the solar power is now available at much lower prices, the Ministry replied that:

"In present scenario, DISCOMs will not have to buy at Rs. 4.50. It will be decided through bidding process. In the recent bid in Bhadla-III, the tariff discovered was Rs. 2.44 per kWh. There may be some other new discovered tariff in future at which DISCOMs have to buy to complete their RPO."

2.21 In response to a query regarding the developers who have been selected under this scheme till date and the Solar Projects which have been commissioned/sanctioned under this scheme, the Ministry furnished that:

"Details of the list of the developers who have been selected under this scheme till date and the list of the Solar Projects which have been commissioned/ sanctioned under this scheme are given below":

List of developers/ projects under 5000 MW VGF scheme

Sl. No.	**Bidder Name**	**Bidder's Quantity (MW)**	**Applicable Tariff INR/kWh)**	**VGF Sought by Bidder(INR/ MW)**
GUJARAT Solar Park at Charanka - 225 MW under Part-B				
1	Gujarat Industries Power Company Limited (P1)	40	4.43	69,75,000.00
2	Gujarat Industries Power Company Limited (P3)	40	4.43	67,99,000.00

3	Mahindra Renewables Private Limited (P4)	40	4.43	77,77,777.00
4	Mahindra Renewables Private Limited (P7)	25	4.43	74,98,256.00
5	Orange Renewable Power Private Limited (P5)	40	4.43	70,25,049.00
6	ReNew Solar Power Private Limited (P2)	40	4.43	70,19,884.69
Total		**225**		
Odisha Non Solar Park - 270 MW under Part-B				
1	Jyoti Infrastructure Pvt. Ltd.	10	4.43	49,15,000
2	IBC Solar Ventures India B.V.	20	4.43	49,25,000
3	Essel Green Energy Private Limited	240	4.43	49,50,000
Total		**270**		
Maharashtra Non Solar Park - 450 MW under Part-B				
1	Vijay Printing Press Private Limited	10	4.42	-
2	Solar Edge Power and Energy Private Limited	130	4.43	19,00,000.00
3	Light source Renewable Energy Holdings Ltd.	50	4.43	19,60,000.00
4	Neel metal products limited	100	4.43	19,98,989.00
5	Sukhbir agro energy limited	20	4.43	19,99,500.00
6	Canadian solar energy holding singapore pvt. Ltd.	80	4.43	19,99,999.90
7	Essel Green Energy Private Limited	60	4.43	19,99,999.95
Total		**450**		
Gujarat 25 MW under Part-A (Charanka Solar Park)				
1	Tata Power Renewable Energy Limited (P6) - DCR	25	4.43	1,22,00,000
Total		**25**		
250 MW Bhadla Phase-IV Solar Park Rajasthan				
1	Phelan Energy Group Limited	50	2.62	
2	Avaada Power Pvt. Ltd	100	2.62	
3	SBG Clean tech Three Ltd	100	2.63	
Total		**250**		
500 MW Bhadla Phase-III Solar Park Rajasthan				
1	ACME Solar Holding Limited	200	2.44	-
2	SBG Clean tech One Ltd	300	2.45	-
	Total	**500**		

2.22 When asked to explain if this scheme should be discontinued in view of dwindling Solar Tariff, the Ministry stated as under:

"In the beginning of the Solar Mission during 2009-10, the tariff offered was Rs. 17.91 per kWh. Due to various mechanisms including the reverse bidding on VGF

as well as on tariff the discovered tariff has reduced from Rs. 17.91 to Rs. 2.44 per kWh which may further be reduced due to competitive e-reverse bidding on VGF/ tariff. VGF Scheme provides comfort to developers to produce and sell solar power through SECI to DISCOMs by paying 7 paise per unit along with the benefit of Payment Security Mechanism as approved by Cabinet Committee on Economic Affairs (CCEA), where developer's future business is assured for 25 years. Even on the higher tariff offered by States, developers are not confident and comfortable to get return till 25 years. Here involvement of SECI between developer and DISCOM ensures the payment to developers".

Scheme for setting up of 1000 MW of Grid connected Solar PV power projects by CPSUs and Govt. organizations

2.23 Detailing about the scheme for setting up of 1000 MW of Grid connected Solar PV power projects by CPSUs and Govt. organizations under Viability Gap Funding (VGF), the Ministry furnished that:

"The Ministry launched the above mentioned scheme in January 2015 to set up 1000 MW of Grid Connected Solar PV Power Project by CPSUs and Govt. Organizations with VGF. The broad guidelines of the scheme are as under:

(i) The duration of implementation of the Scheme is 2015-18.
(ii) The project is to be owned by GOI Organizations/CPSUs.
(iii) The Project can be set up on land/rooftops.
(iv) The power so generated can be for self-use/third party sale/merchant sale or sale to Discoms on applicable tariff.
(v) GOI will provide VGF as under:
    a) Rs.1 Cr. /MW, if Cells and Modules for the project are manufactured indigenously.
    b) Rs.50 Lakh /MW, if Modules for the project are manufactured indigenously.
(vi) VGF will be released in two tranches as follows:
    a) 50% on LoI and start of installation work at plant; and
    b) Balance 50% on successful commissioning of the full capacity of the project (CoD)".

2.24 On being asked about the performance of the Ministry under the above mentioned scheme, the Ministry stated that:

"Under the above Scheme, MNRE has allocated 1037.26 MW capacity to following 15 CPSUs/Govt. Organizations within the sanctioned funds of Rs. 1000 Crore for this scheme as shown in table below":

Sl. No.	Name of PSU/Govt. organisations	Capacity sanctioned (MW)	VGF Amount (in crore Rs.) Required	Released	Remarks
1	NTPC	680.00	680.00	422.50	430 MW – Commissioned
2	BHEL	16.50	16.50	8.25	6.5 MW Commissioned
3	Rashtriya Ispat Nigam Ltd.	5.00	5.00	5.00	5 MW commissioned
4	Coal India Ltd.	200.00	200.00	0.00	Under implementation
5	NHPC Ltd.	50.00	25.00	0.00	Under implementation
6	ONGC	6.00	3.00	0.00	Under implementation
7	GAIL (India) Ltd	5.76	5.76	1.44	Under implementation
Under Ministries/Departments Quota @ 1 MW each					
8	(i) Scooters India Ltd;	1.00	1.00	0.50	Under implementation
9	(ii) Sambhar Salts Ltd	1.00	1.00	0.00	Under implementation
10	(iii)Dadra Nagar Haveli Power Distribution Corporation Ltd.	3.00	3.00	1.50	3 MW commissioned
11	(iv) PEC Ltd.	1.00	1.00	5.00	Under implementation
12	Paradip Port Trust	10.00	10.00	0.00	Under implementation
13	NVVN Ltd.	6.00	6.00	0.00	Under implementation
14	THDC India Ltd.	50.00	25.00	0.00	Under implementation
15	NIFTEM	2.00	2.00	0.00	Under implementation
16	**Total**	**1037.26**	**984.26**	**447.44**	
17	SECI's fund handling charge @ 1% of funds disbursed		9.84	3.11	
18	**Total**	**1037.26**	***994.10**	**450.55**	**444.50 MW Commissioned**

Installation of 15000 MW Grid-Connected Solar PV power plants through NTPC Ltd.

2.25 Regarding the installation of 15000 MW Grid-Connected Solar PV power plants through NTPC Ltd., the Ministry furnished the following information:

"The Government of India *(through Cabinet approval on 25.02.2015)* has approved the Implementation of Scheme for setting up of 15,000 MW of Grid-connected Solar PV Power projects under National Solar Mission through NTPC/ NVVN in three tranches as follows:

Tranche-I : 3,000 MW: 2014-15 to 2016-17
Tranche-II : 5,000 MW: 2015-16 to 2017-18
Tranche-III : 7,000 MW: 2016-17 to 2018-19

Currently Tranche-I, is under implementation. In Tranche-I, which is Batch-II of Phase-II of National Solar Mission, 3000 MW capacity of solar PV power plants will be based on bundling of solar power (3000 MW) 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.

The mechanism of operation of 3,000 MW capacity Solar PV plants under Tranche-I of Batch-II of Phase-II of NSM, is as follows:

a) The eligible plant capacity will be minimum 10 MW and maximum may be fixed for each State's lot of projects.

b) The bidding will be State specific and conducted through e-bidding.

c) It will be based on fixed levellised tariffs. The developers will submit bids quoting a fixed levellised tariff for the entire project duration of 25 years.

d) There will be State specific tenders. The selection of bids will be done based on the tariff quoted by the bidders. Selection will be 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 will be free to avail fiscal incentives like Accelerated Depreciation, Concessional Customs and Excise Duties, Tax Holidays, etc. as available for such projects. The same will 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.

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".

2.26 The Ministry furnished the following information regarding the Current Status of Tranche-I (as on 31.03.2017):

"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, the following State-wise allocations have been made:

Sl. No.	State/ UT	Capacity allotted in OPEN category (MW)	Capacity allotted in DCR category (MW)	Whether in Solar Park on not?	Total Capacity allotted (MW)
1	Andhra Pradesh	1100	150	Solar Park	1,250
2	Karnataka	500	100	Solar Park	600

3	Rajasthan	550	100	420 MW in Solar Park; 230 MW outside solar park	650
4	Telangana	350	50	Outside Solar Park	400
5	Uttar Pradesh	100	00	Outside Solar Park	100
	TOTAL	**2600**	**400**		**3,000**

- Notice Inviting Tender Published for full Tranche-I of 3,000 MW.
- Reverse auction completed: 3000 MW.
- Power Sale Agreement Signed with State DISCOMs: 2750 MW
- PPAs signed with solar power developers: 2750 MW.
- Capacity commissioned till 31.03.2017: 1040 MW
- Lowest bid for solar power under the scheme: Rs. 3.15/unit, received for 250 solar PV power plant to be set up in Kadapa Solar Park in Andhra Pradesh".

Pilot-cum-demonstration Scheme for development of grid connected solar PV power plants on Canal Banks and Canal Tops:

2.27 Detailing about the Pilot-cum-demonstration Scheme for development of grid connected solar PV power plants on Canal Banks and Canal Tops, the Ministry stated as under:

"With the objective of achieving gainful utilization of the unutilized area on top of canals and also the vacant land along the banks of canals wherever available, the Government of India has approved the implementation of a "Pilot-cum-Demonstration Project for Development of Grid-connected Solar PV Power Plants on Canal-banks and Canal-tops" under National Solar Mission (NSM) announced by the Government of India. The administrative approval for the Scheme was issued on 5th December, 2014.

Target: 100 MW Grid Connected Solar PV Power Plants on Canal Banks and Canal Tops (50 MW on Canal Tops and 50 MW on Canal Banks)

Central Financial Assistance under the scheme**:**

- Rs.3 crore/MW or 30% of the project cost, whichever is lower, for Canal Top SPV projects and Rs. 1.5 crore/MW or 30% of the project cost, whichever is lower, for Canal Bank SPV projects.
- CFA of upto Rs.225 crore for *100 MW (50 MW on Canal Tops and 50 MW on Canal Banks)* to be disbursed over a period of maximum 2 years post sanctioning of the plants as under:

– Upto 40% on sanctioning of the projects.
– 60% on successful commissioning of the projects.

- Service charge to SECI @1%: Rs.2.25 crore".

2.28 Regarding the Current Status (as on 31.03.2017) of Pilot-cum-demonstration Scheme for development of grid connected solar PV power plants on Canal Banks and Canal Tops, the Ministry furnished that:

"Based on the requests received from various States for allocation of canal-top/ canal-bank solar power projects under the "Pilot-cum-demonstration project for development of grid connected solar PV power plants on canal banks and canal tops", in-Principle approval has been given for setting up full targeted capacity of 50 MW canal-top and 50 MW canal-bank solar PV power projects, as follows":

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)
1	Andhra Pradesh	New and Renewable Energy Development Corporation of Andhra Pradesh (NREDCAP)	1 MW canal-top
2	Gujarat	Sardar Sarovar Narmada Nigam Limited (SSNNL)	10 MW canal-top
3	Karnataka	Krishna Bhagya Jala Nigam Limited (KBJNL)	10 MW canal-top
4	Kerala	Kerala State Electricity Board Limited (KSEB)	2 MW canal-top
5	Punjab	Punjab Energy Development Agency (PEDA)	20 MW canal-top
6	Uttarakhand	Uttarakhand Jal Vidyut Nigam Limited	1 MW canal-top
7	Uttar Pradesh	Uttar Pradesh Irrigation Department	6 MW canal-top
Total			**50 MW canal-top**

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)
1	Andhra Pradesh	Andhra Pradesh Power Generation Corporation Limited (APGENCO)	5 MW canal-bank
2	Gujarat	Sardar Sarovar Narmada Nigam Limited (SSNNL)	15 MW canal-bank
3	Kerala	Kerala State Electricity Board Limited (KSEB)	1 MW canal-bank
4	Uttarakhand	Uttarakhand Jal Vidyut Nigam Limited	19 MW canal-bank
5	West Bengal	West Bengal State Electricity Distribution Company Limited (WBSEDCL)	10 MW canal-bank
	Total		**50 MW canal-bank**

2.29 Regarding Commissioning Status (as on 31.03.2017) of Pilot-cum-demonstration Scheme for development of grid connected solar PV power plants on Canal Banks and Canal Tops, the Ministry furnished the tables given below:

Canal-Top Solar PV projects

Sl. No.	State	Implementing Agency in the State	Capacity Commissioned (MW)
1	Andhra Pradesh	New and Renewable Energy Development Corporation of Andhra Pradesh (NREDCAP)	1 MW canal-top
2	Kerala	Kerala State Electricity Board Limited (KSEB)	2 MW canal-top
3	Punjab	Punjab Energy Development Agency (PEDA)	5 MW canal-top
Total			**8 MW canal-top**

Canal-Bank Solar PV Projects

Sl. No.	State	Implementing Agency in the State	Capacity commissioned (MW)
1	Andhra Pradesh	Andhra Pradesh Power Generation Corporation Limited (APGENCO)	5 MW canal-bank
2	West Bengal	West Bengal State Electricity Distribution Company Limited (WBSEDCL)	10 MW canal-bank
3	Kerala	Kerala State Electricity Board Limited (KSEB)	1 MW canal-bank
Total			**16 MW canal-bank**

Grid-Interactive Rooftop & Small SPV Power Plants Programme

2.30 Regarding the Grid-Interactive Rooftop & Small SPV Power Plants Programme, the Ministry stated that:

> **"**The 'Grid Connected Rooftop and Small Solar Power Plants Program' of the Ministry aims to promote installation of grid connected solar rooftop systems in residential, social, institutional and government sectors in the country. Out of 100 GW solar power, 40 GW is to be achieved from grid connected solar rooftops.
>
> The capital subsidy of 30% (70 % for special category Sates and Andaman & Nicobar and Lakshadweep Islands) is available for residential, institutional (hospitals, educational institutions etc.) and social sectors. For the Government Institutions/Public Sector Undertakings (PSUs), achievement-linked incentives/awards are being provided. There is no subsidy for commercial and industrial establishments in the private sector as they are eligible for other benefits such as accelerated depreciation, custom duty concessions, excise duty exemptions and tax holiday etc.
>
> 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 and ground mounted systems. For individual households, the loan limit is Rs. 10 lakh per borrower.
>
> 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.
>
> Loans are also available from IREDA and other FIs."

2.31 On being queried about budget allocation for the Grid-Interactive Rooftop & Small SPV Power Plants Programme, the Ministry stated as under:

> "The Government is focusing on 40 GW solar rooftops and has scaled-up budget from Rs. 600 crore during the 12th Five Year Plan to Rs. 5000 crore for Grid Connected Rooftops systems to be installed up to 2019-20. This will provide financial support /central financial assistance for installation of about 4200 MW Solar Rooftops in the country (2100 MW with Subsidy and 2100 MW without subsidy)".

2.32 In response to a query regarding progress made so far in the Roof-top Solar Programme, the Ministry furnished that:

"Government of India has set the target of installing 40,000 MW of Rooftop Solar (RTS) Power by the year 2022. Accordingly, as per the CCEA approval, Ministry of New and Renewable Energy (MNRE) is implementing Grid Connected Rooftop and Small Solar Power Plants Programme for developing 4200 MW of RTS power. Out of 4200 MW capacity, 2100 MW capacity has to be installed through CFA/ incentive in the residential, social, Government / PSU and Institutional sectors. The balance 2100 MW is to be implemented without any CFA in the industrial and commercial sectors.

Till now, MNRE has sanctioned projects of cumulative capacity of 2032 MWp under the programme to various State Nodal Agencies (SNAS) and Public Sector Undertakings / Authorities (SECI, CEL, REIL, Railways, AAI, etc). About 661 MW of RTS capacities have been installed including subsidised and non-subsidised projects as on 30.04.2017. A table showing the status and achievements with regard to Roof-top Solar is placed below":

S.No	State/Entity	Total under RTS scheme + NCEF (A+B)		Installations without subsidy (MW)	Overall Commissioned capacity (MW)
		Sanction (MW)	Achievement (MW)		
1.	Andhra Pradesh	39.00	11.29	6.95	18.24
2.	Bihar	0.00	0.00	3.52	3.52
3.	Chhattisgarh	11.20	2.80	10.23	13.03
4.	Delhi	92.00	2.80	35.15	37.43
5.	Gujarat	81.75	8.60	31.98	40.58
6.	Haryana	25.00	1.89	48.11	50.00
7.	Himachal Pradesh	11.11	0.02	0.71	0.73
8.	Jammu & Kashmir	7.00	0.00	1.36	1.36
9.	Jharkhand	55.00	0.57	6.06	6.62
10.	Karnataka	10.94	0.00	61.34	61.34
11	Kerala	15.28	3.44	34.76	38.20
12	Madhya Pradesh	45.00	4.91	6.25	11.16
13	Maharashtra	100.00	0.00	73.12	73.12
14	Odisha	8.00	0.22	3.14	3.36
15	Punjab	25.00	4.96	65.04	70.00
16	Rajasthan	36.00	5.95	22.88	28.82
17	Tamil Nadu	112.09	9.28	80.77	90.05
18	Telangana	74.00	2.96	13.43	16.38
19	Uttarakhand	51.00	11.73	5.31	17.04
20	Uttar Pradesh	12.00	2.10	39.63	41.73
21	West Bengal	7.69	1.98	13.11	15.09
22	Arunachal Pradesh	0.00	0.00	0.00	0.00
23	Assam	30.00	0.00	1.78	1.78
24	Manipur	8.40	0.00	0.03	0.03
25	Meghalaya	0.00	0.00	0.01	0.01
26	Mizoram	0.00	0.00	0.00	0.00
27	Nagaland	0.00	0.00	0.50	0.50
28	Sikkim	0.00	0.00	0.00	0.00
29	Tripura	0.00	0.00	0.09	0.09
30	Chandigarh	30.00	5.29	6.99	12.28

31	Goa	2.00	0.00	0.71	0.71
32	Dadra & Nagar Haveli	0.00	0.00	2.97	2.97
33	Daman & Diu	0.00	0.00	0.46	0.46
34	Puducherry	5.02	0.00	0.05	0.05
35	Andaman & Nicobar Islands	1.00	1.00	0.46	1.46
36	Lakshadweep	1.00	0.00	0.00	0.00
A1	**Sub-Total**	**896.48**	**81.26**	**576.88**	**658.14**
37	State Bank of India	60.00	0.00	0.00	0.00
38	Railway Board, Ministry of Railway	179.50	2.50	1.20	3.70
39	Solar Energy Corporation of India	1049.60	90.70	0.00	90.70
40	Delhi Metro Rail Corporation Limited	50.00	15.05	0.00	15.05
41	REIL	21.44	0.00	6.74	6.74
42	Delhi Jal Board	16.00	0.00	0.00	0.00
43	Other Govt. Department /PSU	74.81	11.14	0.00	11.14
A2	**Sub Total**	**1451.35**	**119.39**	**7.94**	**127.33**
A1+ A2	**Total**	**2347.83**	**200.65**	**461.19**	**661.84**

2.33 On being asked about the reasons for non-achievement of target with respect to Roof-top Solar (against a target of 4800 MW during 2016-17, only 661 MW has been installed as on 30.04.2017), the Ministry in its reply stated as under:

"The reasons for slow progress are as follows:

- Involvement of multiple approval process (e.g. connectivity, met metering, Chief electrical inspection (CEI), limitation in sanctioned load/DT capacity etc.)
- Reluctance of DISCOMs to operationalize net-metering regulations as RTS systems may reduce their income from high paying customers
- Skill and knowledge gaps
- Withdrawal of subsidy/CFA in private industrial and commercial sector
- Non-uniformity of Power Purchase Agreement (PPA) and Engineering, Procurement and Construction (EPC) agreements
- Slow progress of Implementing agencies
- Lack of consumer awareness
- Non-uniform regulations across states
- Tedious process for project commissioning and subsidy disbursement
- Frequent changes in Government Policies
- Lack of policies addressing grid connected rooftop solar (RTS)".

2.34 In response to a further query about the steps taken by the Ministry to alleviate these above mentioned reasons for slow progress, the Ministry furnished as following:

"The following initiatives have been taken for promotion of RTS projects:

i. MNRE has pursued all States/ UT Governments and their SERC/ JERC for issue of Gross / Net metering regulations as these are key regulatory support for RTS

segment. By now, all the 36 States/ UTs have notified such regulations and/or tariff orders.

ii. MNRE has developed Scheme Guide, Best Practices Guide and the Compendium on Policies and Regulations for ready reference of all States/ UTs.

iii. MNRE has also empanelled Developers / Channel Partners based on their technical expertise and financial strength. Till now, over 1933 such firms have been empanelled.

iv. To collate demand in Residential, Institutional and Social sectors and to get higher cost efficiencies, Solar Energy Corporation of India (SECI) issued the largest RTS tender for 500 MW on 25.4.2016. The project is now under execution. MNRE/ SECI have developed call centre for supporting consumers in installing RTS projects.

v. MNRE pursued Ministry of Urban Development (MoUD) for requesting all Smart cities for initiating RTS and for participating in SECI project as MoUD Guidelines for Smart City Mission mandate that SMART Cities must have 10% of their energy needs from solar energy.

vi. MNRE is also working on proposal for involving ULBs in implementation of RTS projects by integrating approval processes for Building Plans under PMAY / AMRUT/SMART Cities plans and for RTS plants.

vii. MNRE pursued all States/ UTs to make RTS compulsory on new buildings by making changes in building byelaws. Thus 4 State/ UTs of Chhattisgarh, Haryana, Jharkhand and Chandigarh have notified such mandates.

viii. As financial CFA has been withdrawn for projects in Industrial & Commercial sectors, MNRE made efforts to provide concessional loans to developers in these segments. Thus multilateral concessional loans of about USD 1375 Million (Approx. 9316 crore) have been approved from the World Bank, Asian Development Bank and New Development Bank to State Bank of India (SBI), Punjab National Bank (PNB) and Canara Bank respectively for RTS development in Industrial & Commercial sectors.

ix. For expediting RTS development in Government/PSU sectors, 8 meetings were held in the Cabinet Secretariat with 81 Ministries/ Departments to increase awareness on RTS potential and benefits. SECI and CPWD have started the pilot project in January 2016 for 50 MW RTS projects for Government buildings. To support Ministries/ Departments, CPSUs have been empanelled for undertaking project management consultancy (PMC) and for ensuring cost efficiencies through collation of RTS projects. As per direction of the CoS, MNRE also prepared model EPC agreement / PPA which have been duly vetted by Ministry of Finance and Ministry of Law and Justice.

x. MNRE has also pursued all Ministries/ Departments to proactively pursue RTS projects. Thus 35 Ministries/ Departments have submitted Commitment Certificates (about 3890 MW capacity) for RTS development. SECI has issued the largest RTS tender for 1000 MW on 08.12.2016 for buildings in Government/PSU sectors to collate such demand, to get higher cost efficiencies and to facilitate realization of the Commitments.

xi. To further speed up the process of RTS deployment in Government sector, MNRE is working with Directorate General of Supplies and Disposals (DGS&D) for developing rate contracts for standard RTS packages.

MNRE has initiated programmes for training 50000 Surya Mitras and over 10000 officers of DISCOMs and SNAs".

2.35 On being asked about the details regarding the cost of Roof-top Solar, the Ministry stated as under:

"The benchmark cost for grid connected rooftop solar projects has been arrived with based on cost details received from different implementing agencies including State Nodal Agencies, Solar Energy Corporation of India etc. The present benchmark cost is as follows:

- 1-10 kW: Rs. 70 per watt
- above 10kW to 100kW : Rs. 65 per watt
- above 100kW to 500 kW: Rs. 60 per watt

The average payback period of such projects varies from 5-6 years and the expected life is upto 25 years. Roof top programme is remunerative for consumers. However discoms' non-cooperation is limiting the scope of programme".

2.36 When the Committee desired to know about the policy of the Government to incentivize Roof-top Solar, the Ministry furnished the following information:

"As financial CFA has been withdrawn for projects in Industrial & Commercial sectors, MNRE made efforts to provide concessional loans to developers in these segments. Thus multilateral concessional loans of about USD 1125Million have been approved from the World Bank to State Bank of India (SBI), Asian Development Bank Punjab National Bank (PNB) and another 250 million USD from New Development Bank to Canara Bank is in pipeline, for RTS development in Industrial & Commercial sectors.

The guarantee fee has been reduced from prevailing 1.2 % to 0.5 % for these loans. This will allow the solar rooftop project developers to get loans at lower interest rates for solar rooftop projects in commercial and industrial sectors".

2.37 When the Committee asked the Ministry if the target of 40 GW through Roof-top Solar needed relook and how the Ministry would convince people to install Roof-top Solar, the Ministry stated as under:

"The target of 40 GW by year 2022 through rooftop solar projects may be reduced. The Ministry is regularly conducting the capacity building and public awareness programme through electronic and print media to popularize grid connected solar rooftop projects. An online platform **SPIN** and mobile app **ARUN** has also been developed".

2.38 The Ministry furnished the following information regarding best practices adopted by some states for Roof-top Solar development:

"Among the State/ UT Nodal Agencies, Punjab (Single window system for RTS), Maharashtra (Dedicated Fund through Cess), Gujarat (Innovative Model based on Gross Metering), Chandigarh (City wide RTS), Uttarakhand (Feed In Tariff), Haryana, Chandigarh, Uttar Pradesh & Chhattisgarh (Compulsory RTS for new buildings), Kerala (RTS for BPL households) have undertaken major initiatives for RTS development.

DISCOMs, like BESCOM (Bengaluru), TANGENDCO (Tamil Nadu), MPMKVVCL (Madhya Pradesh), TPDDL (Tata – North Delhi), SPDCTL (Telangana – South) are very progressive in RTS sector".

2.39 Given below is a table showing status of schemes launched under NSM:

Sl. No.	Policies/Programmes	Capacity	Status
1.	Grid-Connected Solar PV Power Projects by Defence Establishments under Ministry of Defence and Para Military Forces	300 MW (with DCR)	Sanctioned : 357.5 MW Tendered : 128 MW Order placed :52 MW Commissioned: 7 MW
2.	Grid Connected Solar PV Power Projects by central Public Sector Undertakings (CPSUs)	1000 MW (with DCR)	Sanctioned: 1037.26 MW Commissioned: 669 MW
3.	Setting up of Solar Parks and Ultra Mega Solar Power Parks (at least 25 Nos.)	20,000 MW	Approved: 34 Solar parks in 21 States with 20 GW capacity Land acquired : 71,000 MW Tendered capacity : 7300 MW Commissioned: 1.5 GW in 4 parks
4.	Scheme for Enhancement of capacity from 20,000 MW to 40,000 MW for "Development of Solar Parks and Ultra Mega Solar Power Projects"	20,000 MW	Parks not yet approved under the enhanced capacity.
5	Installation of Grid Connected Rooftop and small solar power plants programme	Allocation of 5000 Crore for 4200 MW With subsidy 2100 MW & without subsidy 2100 MW	2032 MW sanctioned under scheme & 315 MW sanctioned under NCEF Overall commissioned: 661 MW
6	Grid Connected Solar PV Projects under Bundling Mechanism with unallocated Conventional power	15000 MW (2500 MW with DCR) (Tranche-I: 3000; Tranche-II: 5000; Tranche-III: 7000)	Tranch-I: 3000 MW tendered PPA signed: 2750 MW Commissioned: 1090 MW
7	Scheme for setting up of 100 MW Grid Connected Solar PV Power Projects on Canal Top/ Canal Banks	100 MW	Sanctioned : 100 MW Commissioned: 24 MW
8	Grid Connected Solar PV Power Projects with VGF	2000 MW+5000 MW	Tender issued for 5860 MW PPA signed: 3265 MW Commissioned: 80 MW

2.40 The Ministry also submitted that the Electricity Regulatory Commissions of all the 36 States/UTs have notified regulations/tariff orders for net metering/feed-in-tariff mechanism.

2.41 When asked to explain the views of the concerned agencies i.e. Regulators and DISCOMs with respect to the implementation of Net Metering, the Ministry furnished that:

> "Although all the 36 State/Joint Electricity Regulatory Commission has issued net metering regulation/tariff orders but various DISCOMs have diverse views. The revenue erosion, tariff increase for non RTS-consumers revenue loss of DISCOMs in long run, backing down of conventional power etc. are few of the concerns of the DISCOMs. From the users point of view the availability of net meters, time taken for net metering connections by DISCOMs, inspection by CEI etc. are few concerns. Rooftop system will result in low Techno-Commercial losses. Moreover, RPO targets also need to be fulfilled".

CHAPTER III

OFF-GRID SOLAR APPLICATIONS

3.1 The Ministry furnished that under the Off-grid and Decentralized Solar Applications for the year 2017-18, the Ministry provides 30% subsidy on the cost of the system ranging from Rs. 18/- per watt peak to Rs.142.5/- depending upon the capacity of the modules and configuration of the solar photovoltaic systems/plants in General Category States in the country.

3.2 The Ministry also provides subsidy of 40% of the capital cost limited to Rs. 136/Wp (LED based) upto 40 Watt peak & Rs. 80/Wp for system above 40 Wp limited to 300 Wp through NABARD, Regional Rural Banks and other Commercial Banks. For balance of the cost, the banks extend credit facility to the beneficiary at usual commercial rates. 300 Wp to 1 KWp systems are also covered under the scheme but the subsidy is limited to 300 Wp only. The RRBs and other Commercial Banks extended the loan for balance cost of the systems at normal interest rates. Regional Rural Banks and Commercial Banks extends loans to the consumers and directly disburses subsidy for solar home lighting systems and small Capacity PV systems under the financing of Off-grid Solar Applications Programme. Banks have extended loans for 6549 solar lighting systems during the year 2016-17.

3.3 For installation of stand-alone SPV power plants by Central and State Government Bodies and their establishments in Special Category States and North East States and Islands, the Ministry provides 90% subsidy ranging from Rs.63/- to Rs.306/- for off-grid solar PV applications. For Solar Water Pumping system, the capital subsidy ranges from Rs.25,560 per Hp to Rs. 36,000 per Hp depending upon category and capacity.

3.4 DST has initiated a concept on Micro Solar Dome (MSD) which is based on the Principle of passive as well as active solar device and gives day and night lighting solution. The PV Integrated Micro Solar Dome has been included as a product for off grid solar lighting applications by the Ministry of New and Renewable Energy and is eligible for subsidy at par with other solar lighting products. Attempts are being made to integrate Surya Jyoti for subsidy in rural and urban housing schemes, MP Local Area Development Schemes and corporate social responsibility activities of public sector enterprises.

3.5 In response to a query regarding achievements in Off-grid and Decentralized Solar Applications Sector, the Ministry stated as under:

"A total of 150 MWp capacity solar PV off-grid systems/power plants have been sanctioned during 2016-17. Some major Off-grid Solar PV projects sanctioned during 2016-17 are as follows:

- 16 Solar power plants with aggregate capacity of 440 kWp and 400 Solar Street Lights (LED) at various locations in Rangia Sub Division in the state of Assam.
- 102 x 1.6 kWp Solar power plant each at police stations in the state of Andhra Pradesh.
- 4,900 solar home systems in various districts of Bihar.
- 250 SPV Power plants of with aggregate capacity of 600 kWp at individual households/schools/offices in the state of Chhattisgarh.
- 4,000 Solar Pumps in the state of Gujarat.
- 21,000 solar home systems in various districts in the state of Haryana.
- 10,110 SPV Street Lighting Systems (LED) in scheduled cast concentrated villages in the state of Himachal Pradesh.
- 19,013 solar street lighting systems in various districts of Jammu & Kashmir.
- 9 Mini-grid solar power plants with aggregate capacity of 219 kWp at nine villages in Gumla district of Jharkhand.
- 5,00,000 Solar Urja Lamps (SoUL) for school going children in various states by Indian Institute of Technology, Bombay.

During the year 2016-17, the solar systems having total capacity of 155.50 MWp which includes solar lanterns, solar home lights, solar street lights, solar pumps, mini/micro grids and power plants were installed in various States. Some of the highlights of the completed projects during the current financial year are given below-

- Solar power plants having total capacity of 2,467 kWp have been installed at various places including industries in Chhattisgarh.
- 12,100 solar street lights have been installed at villages of Himachal Pradesh.
- 4000 no. of solar pumps installed in the state of Gujarat at various places.

MNRE has strengthened standards to manage the quality of Off Grid systems and prepared detailed specification for major Off Grid applications such as solar lantern, homelight, street light, inverter, modules, solar pumps etc. MNRE has also accredited 12 labs for testing of various Off Grid applications following MNRE technical specifications".

Given below is a table showing target and status of the schemes for Off-Grid Applications:

SI. No.	Policies/Programmes	Capacity/Target	Details/Status
1.	Off-Grid Solar PV Applications	NSM 1st & 2nd Phase target : 800 MW (sanctions)	Sanctioned: 965.5 MW Installed: 462.5 MW
2.	Atal Jyoti Yojna (AJAY)	Installation of 2,97,440 street lights in 169 constituencies in Uttar Pradesh, Bihar, Jharkhand, Odisha and Assam by 2018	9401 street lights installed so far
3.	Solar Water Heating System	Cumulative Target: upto 2017: 15 million sq. meter upto 2022: 20 million sq. meter	Subsidy discontinued w.e.f. 01.10.2014 12 million sq mt. installed so far
4.	Concentrating Solar Thermal (CST) Technologies for Community Cooking, Process Heat and Cooling applications		30 % subsidy of benchmark cost Installed & commissioned till March,2017: 52448 Sq m (35 MW) Projects sanctioned & under installation: 28524 sq m(19 MW)

Atal Jyoti Yojana (AJAY):

3.6 The Government of India is committed to providing quality & reliable power supply at reasonable prices through its policies and programmes. The Ministry of New and Renewable Energy has launched Atal Jyoti Yojna which is one such programme. The installation of Solar LED Street Lights will ensure ample light in major roads, markets, public conveniences etc. in remote areas and would help the citizens of our country lead a safe and secure life. Under this programme, Solar LED Street Lights in rural, semi-urban and urban areas will be installed across states of Uttar Pradesh, Assam, Bihar, Jharkhand and Odisha where the household electrification is less than 50% as per 2011 Census, by March 2018. Energy Efficiency Services limited (EESL) has been appointed as the Implementing Agency by MNRE. EESL, a Joint Venture of four Public Sector Undertakings (PSUs) of Ministry of Power (MoP), Government of India, was established in 2009 as the implementation arm of MoP and Bureau of Energy Efficiency (BEE), Govt. of India.

3.7 The Ministry submitted that under Atal Jyoti Yojana, there is a target of installation of 2,97,440 street lights in 169 constituencies in Uttar Pradesh, Bihar, Jharkhand, Odisha and Assam by 2018. However, 9401 street lights have been installed so far. The State-wise achievements are as follows:

State	No. of Lights installed
Uttar Pradesh	9179
Bihar	Under Process
Jharkhand	222
Odisha	Under Process
Assam	Under Process

The Ministry assured the Committee that it will achieve the said target by March 2018. When asked about the constraining factors in this regard, the Ministry stated as under:

> "The main constraining factor is availability of batteries which are needed to be imported. EESL, which is the implementing agency, has tendered the project again to empanel more suppliers to increase the pace of implementation".

3.8 On a query about the steps taken by the Ministry for proper functioning and maintenance of installed solar street lights, the Ministry replied:

> "These are compact street lights which require low maintenance. The maintenance and proper working of street lights is responsibility of supplier who has to repair and maintain against any defect upto five years after handing over street lights to panchayats or ULBs".

Solar Water Heating System

3.9 The Ministry submitted that the gross potential for solar water heating systems in India has been estimated to be about 140 million sq. m. of collector area. However, we have achieved about 12 million sq.m collector area. There is a lot of potential for Solar Water Heating Systems in the country. A 100 LPD Solar Water Heating (SWH) System having 2 square meter of collector area, can replace an electric geyser of 2 kW capacity for residential use and may save upto 1,500 units of electricity and up to 1.5 tons of CO_2 per year depending upon the location of installation.

3.10 The cumulative targets set for installing Solar Collector area under National Solar Mission (NSM), are 15 million square meters up to 2017 and 20 million square meter up to 2022 respectively. Under this, around 1 million square meter collector area has been installed by 31/03/2016 against the total target of 15 million square meters. Residential sector dominates among others and contributed around 85% of the total installations.

> *Note: The scheme has been discontinued w.e.f. 01.10.2014 onwards because the market of the Solar Water Heating System has reached a level to sustain with own technology and competency due to vigorous Research & Development and nation-wide publicity through print and electronic media.*

(i) Only special projects and successful schemes may be continued.

(ii) Subsidy will continue for solar driers and space heating.

(iii) The Channel Partners as well as SNAs will be free to continue to deploy solar water heaters at their end without MNRE subsidy.

3.11 MNRE has a system of testing and certification of products through accredited labs. It is also working on five star rating for solar water heaters so that the customers get quality product. MNRE supports the entrepreneurs in this regard for further development of the sector. Bureau of Indian Standards (BIS) has established standards for Flat Plate Collectors (FPC). BIS has also notified standards for Evacuated Tube Collector (ETC) Solar Water Heating Systems.

3.12 The Ministry informed the Committee that extensive publicity and awareness campaigns have been taken up through print and electronic media in a large number of cities in various States where potential for installation of solar water heating systems is high. Seminars, workshops and business meets are organized with different stakeholders to focus on accelerating solar water heater deployment in different sectors and potential cities in the country.

Solar Dryer and Space Heating

3.13 The MNRE has taken positive steps in the direction of applications of Solar Air Driers and Space Heating. The Ministry has been working in close association with various Ministries, Institutions and agencies to develop the application of Solar Air Driers and Space Heating in horticulture and animal husbandry sector. MNRE in cooperation with Deutsche Gesellschaftfuer Internationale Zusammenarbiet (GIZ), is implementing a project on "Solar Thermal Solution for Space Heating in Ladakh (SolLad)", in Ladakh Region. As part of this project, GIZ has been collaborating with local state agencies and various other stakeholders. On the basis of the experience, Kargil Renewable Energy Development Agency has come up with a proposal to install 1000 Nos. of Solar Space Heating systems in the region of Leh and Kargil.

Solar Pump Programme

3.14 Due to lack of grid-connected electricity in many parts of the country, diesel pump sets are being used in large numbers for the purpose of irrigation. Solar photovoltaic water pumping systems can easily meet the irrigation requirements of land holdings for small and marginal farmers. Solar Pumping Programme was first started by MNRE in the year

1992. From 1992 to 2014, about 14,000 solar pumps were installed in the country. This number was minuscule, if we compare with the pumps in agricultural sector.

3.15 The Ministry submitted that during 2014-15, the Government allocated Rs. 400 crore for installation of one lakh solar pumps for irrigation and drinking water in the country. Till date, about 1.27 lakh solar pumps have been installed under the solar pump programme.

3.16 The Ministry provides 30% capital Subsidy through State Nodal Agencies for irrigation and drinking water and 40% capital Subsidy through NABARD with mandatory loan. A table showing the benchmark Cost for Solar Pumps is given below:

Type	Category	Benchmark Cost
Solar Pumps (Rs/Hp)	Upto 3 HP(DC)	120000
	>3 HP - 5 HP (DC)	95000
	>5 HP – 10 HP (DC)	95000
	Upto 3 HP(AC)	100000
	>3 HP - 5 HP (AC)	85000
	>5 HP – 10 HP (AC)	85000

3.17 When asked about the progress made so far in the Solar Pump Programme, the Ministry stated as under:

> "About 1.43 lakh pumps have been sanctioned and 1.27 lakh solar pumps installed under the programme till 31.05.2017. State-wise status of Solar Pumps sanctioned to various states for irrigation, drinking water and bank scheme is given below".

Status of Solar Pumps for Irrigation & Drinking Water Sanctioned and Achievement as on 31.05.17

S. No.	State	Total Sanctioned	Installed as on 31.5.2017
1	Andhra Pradesh	19641	15221
2	Arunachal Pradesh	22	22
3	Assam	45	45
4	Bihar	1882	1882
5	Chhattisgarh	17580	18068
6	Goa	15	15
7	Gujarat	8147	8048
8	Haryana	3593	543
9	Himachal Pradesh	6	6
10	Jammu & Kashmir	39	39
11	Jharkhand	3561	3206
12	Karnataka	6200	3631
13	Kerala	818	818
14	Madhya Pradesh	3813	3813
15	Maharashtra	4488	2028

16	Manipur	40	40
17	Meghalaya	19	19
18	Mizoram	37	37
19	Nagaland	28	3
20	Orissa	9759	7598
21	Punjab	1857	1857
22	Rajasthan	41377	41377
23	Tamil Nadu	4459	4459
24	Tripura	151	151
25	Uttar Pradesh	11088	10582
26	Uttarakhand	26	26
27	West Bengal	653	653
28	Andaman & Nicobar	5	5
29	Chandigarh	12	12
30	Delhi	90	90
31	Puducherry	21	21
32	Telangana	424	424
Total		139896	124739
NABARD*		2833	2833
Grand Total		**142729**	**127572**
* Final numbers are awaited from NABARD's end			

3.18 On a query regarding the target for the year 2017-18, the Ministry replied:

"A target of 67,000 pumps will be taken for 2017-18 under Off-grid solar pumps. Out of that, 50,000 solar pump sets will be sanctioned in the first phase. State-wise allocation of 50,000 pumps is placed below. The remaining 17,000 will be sanctioned based on the progress made under the pumps sanctioned in the first phase and also on notification and compliance of the new RPOs by respective States".

State-wise Allocation of Solar Pumps for 2017-18

S No	State	Year of sanction	Sanctioned quantity (no.)	Completed So far (no.)	Fresh demand (no.)	Allocation (no.)
1	Andhra Pradesh	2015-16	10000	3517	20000	6000
2	Bihar				3300	2000
3	Chhattisgarh	2016-17	10000	6126	20000	5000
4	Gujarat	2015-16	2500	2204*	10000	5000
		2016-17	4000	4000		
5	Haryana	2015-16	3050			0
6	Jharkhand				2000	1000
7	Karnataka	2016-17	3000	277		0
8	Madhya Pradesh				19000	9000
9	Maharashtra	2016-17	2460	-	5800	2000
10	Odisha	2016-17	1000	180	1500	1000
11	Rajasthan	2015-16	7500	6216*	10000	5000
12	Tamilnadu				2000	1000

13	Telnagana				10000	2000
15	Uttar Pradesh	2015-16	6000	5500	22100	10000
16	West Bengal				1500	1000
Total					**127200**	**50000**

3.19 The Committee noted that the Ministry has advised stoppage of subsidy scheme routed through NABARD for Solar Pumps. When asked to explain, the Secretary deposed:

''मैं आपकी अनुमति से दो चीजें समिट करना चाहूंगा। एक यह है कि नाबार्ड स्कीम की प्रौग्रैस बहुत अच्छी नहीं रही है। हमने वर्ष 2014-15 में 120 करोड़ रुपये नाबार्ड के थ्रू दिये थे। उसमें जो फंड यूटिलाइजेशन था, जैसे मेरे साथी ने बताया कि सिर्फ 77.79 करोड़ रुपये ही हुआ है/ and they have been able to install only 3,817 number of pumps. इसका फेल होने का कारण यह है कि हम पम्प को जो कोलैट्रल सिक्योरिटी देते हैं, उसमें बैंक से लोन देने में काफी प्रॉब्लम्स है। अब हम नाबार्ड की जगह इरेडा के थ्रू यह स्कीम इम्प्लीमैंट करना चाहते हैं। इरेडा चूंकि हमारी अपनी संस्था है, उससे फार्मर्स को बड़ा लाभ होगा। वे सोलर पम्प की कोलैट्रल सिक्योरिटी ले पायेंगे। हम एक नयी गति से इस स्कीम का कार्यान्वयन कर पायेंगे। नाबार्ड की जगह अब इरेडा के माध्यम से देने का सुझाव है लेकिन सबसिडी 40 परसेंट ही रहेगी और उसे हम कन्टीन्यू करेंगे। अब इरेडा हमारी अपनी संस्था है, इसलिए बैंक में जो प्रॉब्लम्स आती हैं, उन सबको हम अवाइड कर सकेंगे।''

"In NABARD Scheme, there were bottlenecks and that is how we are trying to remove it. There are very few farmers who can bring in upfront capital and most of the farmers need a loan. That is why we have brought in IREDA now. I am sure, with these modifications, more and more farmers would be coming forward. In the years to come, we will not only install one lakh pumps but more than that".

3.20 The Ministry submitted the status of NABARD Projects as under:

- Fund released since 2014-15 : 120 Crore
- Fund utilized (as on 31.05.2017) : 77.79 Crore
- No. of pumps installed (as on 31.05.2017) : 3817
- Achievement of top ten banks are:

Name of the Bank	Units Installed	CFA (Rs. in Crore)
Ratnakar Bank Ltd.	443	9.70
Karur Vysya Bank	383	8.11
Rajasthan Marudhara GB	234	4.25
Rajasthan SLDB	140	2.91
Indian Bank	125	2.75
PNB	123	2.61
Kotak Mahindra	116	2.70
Pallavan GB	106	2.27
Vijaya Bank	104	2.23
Syndicate Bank	95	2.08

3.21 The Ministry has proposed some changes to the Solar Pump Scheme according to which standalone solar pumps will be promoted in the States with the following conditions:

i. Solar pumps will be installed with an objective to replace existing diesel pump set.
ii. Pumps will be installed in off-grid areas where there is no source of power for irrigation

iii. Solar off-grid pumps will be promoted in the locations which are at least 300 meters away from the grid.

iv. Preference will be given to solar pumps with micro irrigation systems such as sprinklers, drip irrigation, etc. 50% of sanctioned capacity shall be reserved for 3HP.

v. The scheme will be mainly focused on small and marginal farmers with the following pattern of subsidy:

- < 1 hp - 30% subsidy
- between 1 hp and 3 hp - 25% subsidy
- between 3 hp and 5 hp - 20% subsidy

vi. Minimum 22.5% of the sanctioned quantity will be reserved jointly for SC/ ST beneficiaries.

vii. Up to 10% of the sanctioned capacity may be utilised for drinking water pumps as per the demand.

3.22 The Ministry submitted that it has also proposed to bring a new scheme for grid connected solar pumps where the farmers can install extra solar panels connected to the grid (say, 3 hp pumps with 10 kW) to feed the surplus power to the grid @ Rs. 3.50 per kWh, when pump is not in use. A target of 1,40,000 pump for individual farmers is proposed for the period up to 2019-20. Further, 13000 tube-wells run by state government departments are proposed to be solarized by 2019-20. During 2017-18, 23000 solar pumps under this category are proposed to be promoted with following features:

- The programme will be implemented in areas where the agriculture feeder is preferably separated.
- Discoms /SNA /State Government Department will be the implementing agencies for the programme.
- The pumps will be installed under net metering. Farmers are allowed to install solar panels up to 10 kWp. The farmer will use the generated energy to meet the irrigation needs and excess available energy will be sold to Discom.
- In case of state government operated tube wells, the system capacity under this scheme will be limited to 1 kWp per hp of tube well with a ceiling of 100 kWp. Only those tube wells where the consumption is net metered (bills not paid on fixed charges) will be covered under the scheme.
- Under the scheme, distribution companies have to purchase excess power @ Rs. 3.50/ kWh from the farmer through net metering. In case of state government operated tube wells, the rate will be as per the mutually agreed rate between utility and the user department.
- Centralized procurement of the panels/inverters/BOS may be done by the agencies like SECI, NTPC, EESL etc., if required.
- No private intermediary will be involved in implementation of the programme.

- CFA for additional capacity of solar panels installed over and above the pump capacity will be as per norms of CFA finalized for Grid-connected Rooftop Programme (30% of the benchmark cost). In case of State Government operated tube wells, CFA will be restricted to 15% of benchmark cost for solarization of tube wells.
- DISCOMs will energize the feeder from 7.00 a.m. to 7.00 p.m. to feed the power into grid.

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

3.23 The Ministry of New and Renewable Energy has been implementing a National Programme on Solar Thermal aimed to reduce fossil fuels consumption and providing a clean, non-polluting solution to meet the heat requirement in industrial, institutional and commercial sectors. Industry has significantly improved its energy efficiency in recent decades. But industry's total energy use continues to grow and majority of its energy demand is for the process heating. The major share of the heat is needed in commercial and industrial companies for production, processes and heating.

3.24 It has been submitted that Concentrated Solar Technologies (CSTs) track the sun's incoming radiation with mirror fields, which concentrate the energy towards absorbers, which then transfer it thermally to the working medium. The heated fluid or steam may reach high temperatures and may be used for various processes requiring heat. CSTs can produce a range of temperatures, up to 300°C, which can be used in a variety of industrial and commercial heat applications. The industries showing good potential for implementation of solar concentrators 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 tinkering to the existing setup which can help in reduce conventional fuels which in turn will help in reducing GHG emissions. Some of the emerging concentrated solar technologies are as follows–

a) Scheffler Dish
b) Fresnel Reflector based dish
c) Paraboloid dishes
d) Parabolic troughs
e) Linear Fresnel
f) Non-Imaging Concentrator

3.25 About the Achievement with respect to Concentrated Solar Technologies (CST), the Ministry stated as under:

> "During the financial year 2016-17, a number of activities were undertaken by the Ministry and around 14 CST systems with 5200 sq. m collector/ reflector area were completed making a total of 203 systems with 51330 sq. m area installed so far in the country and 63 CST projects with 27970 sq. m collector/reflector area are under installation for process heating, air conditioning and steam cooking requirements in industrial, institutional and commercial establishment.

CHAPTER IV

PROGRESS OF NATIONAL SOLAR MISSION

Phase-I of NSM (2010-13)

4.1 Given below is a table showing summary of targets and achievements during Phase-I of JNNSM (2010-13):

Application Segment	Target for Phase I (2010-13)	Achievements till March, 2013
Grid solar power (large plants, roof top & distribution grid plants)	1,100 MW	1686.44 MW
Off-grid solar applications	200 MW	252.5 MW (Sanctioned) 117 MW (Installed)
Solar Thermal Collectors (SWHs, solar cooking, solar cooling, Industrial process heat applications, etc.)	7 million sq. meters	7.01 million sq. meters

Phase-II of NSM (2013-17)

4.2 The Ministry submitted that the Phase-I of NSM (2010-13) generated a huge interest in the solar sector wherein Grid connected and off-grid projects were commissioned throughout the country. Achievements of Phase-I exceeded the targets set for the period. The targets and achievements of Phase II of NSM is given below:

Summary of targets and achievements during Phase-II of JNNSM (2013-17)

Application Segment	Target for Phase II (2013-17)	Achievements till March, 2017
Grid solar power (large plants, roof top & distribution grid plants)	15,900 MW*	10,602.83 MW
Off-grid solar applications	600 MW	713 MW (Sanctioned) 345.5 MW (Installed)
Solar Thermal Collectors (SWHs, solar cooking, solar cooling, Industrial process heat applications, etc.)	8 million sq. meters	5 million sq. meters

** Target has been revised after enhancement of capacity.*

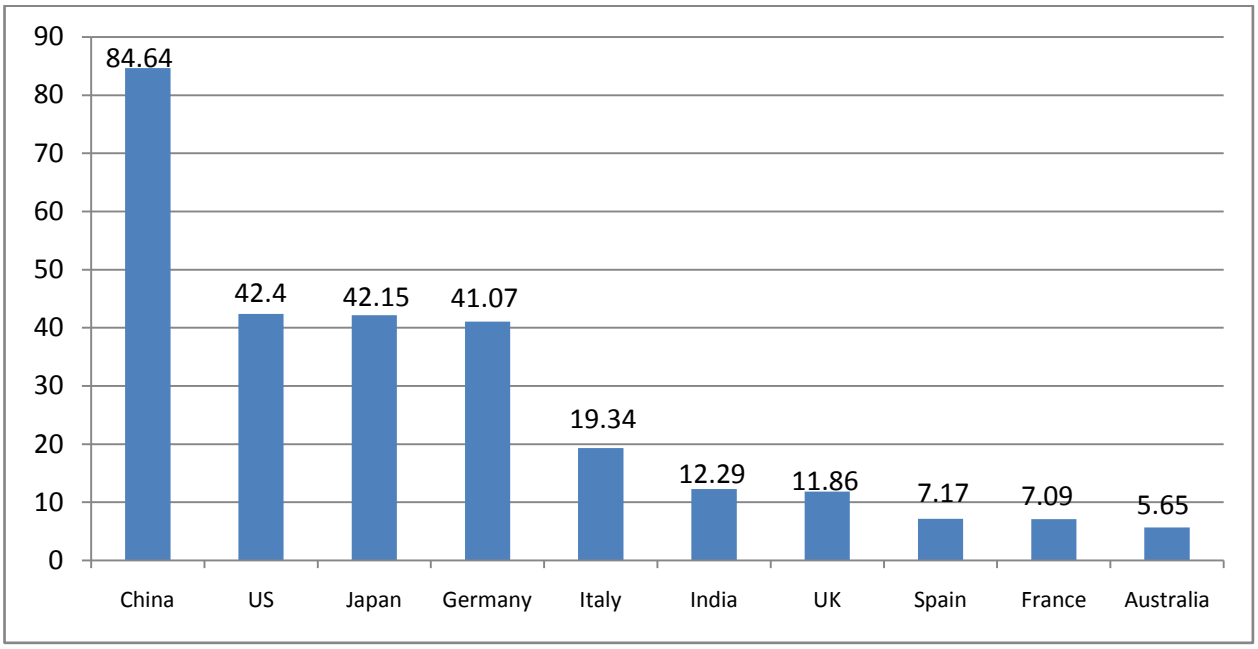
4.3 The Ministry also submitted that as on date Solar projects of 12504.27 MW capacity have been commissioned in the country. The state-wise details are given in the table below:

State-wise Commissioning Status of Grid-Connected Solar Projects

Sl. No.	State/UT	Capacity installed (MW)
1	Andaman & Nicobar	6.56
2	Andhra Pradesh	1948.10
3	Arunachal Pradesh	0.27

Sl. No.	State/UT	Capacity installed (MW)
4	Assam	11.78
5	Bihar	111.52
6	Chandigarh	17.32
7	Chhattisgarh	128.86
8	Dadra & Nagar Haveli	2.97
9	Daman & Diu	10.46
10	Delhi	40.27
11	Goa	0.71
12	Gujarat	1249.37
13	Haryana	81.40
14	Himachal Pradesh	0.73
15	Jammu & Kashmir	1.36
16	Jharkhand	23.27
17	Karnataka	1082.48
18	Kerala	74.20
19	Lakshadweep	0.75
20	Madhya Pradesh	857.04
21	Maharashtra	452.37
22	Manipur	0.03
23	Meghalaya	0.01
24	Mizoram	0.10
25	Nagaland	0.50
26	Odisha	79.42
27	Puducherry	0.08
28	Punjab	793.95
29	Rajasthan	1850.43
30	Sikkim	0.00
31	Tamil Nadu	1697.32
32	Telangana	1320.92
33	Tripura	5.09
34	Uttar Pradesh	336.73
35	Uttarakhand	233.49
36	West Bengal	26.14
37	Other/MoR/PSU	58.31
TOTAL		**12504.27**

4.4 Given below is installed Solar PV Scenario in Major Countries (in GW), as furnished by the Ministry:



4.5 The details of progress of year-wise commissioning of Grid-Connected Solar Projects are given in the Table below:

Year-wise progress of Commissioning of Grid-Connected Solar Projects

Sl. No.	Year	Capacity added (MW)	Cumulative Capacity (MW)
1	Up to 2010	--	11
2	2010-11	25	36
3	2011-12	994	1030
4	1012-13	656	1686
5	2013-14	945.9	2631.9
6	2014-15	1112.07	3743.97
7	2015-16	3018.883	6762.853
8	2016-17	5525.98	12288.83
9	2017-18 (upto 30/04/17)	215.67	12504.27

4.6 In response to a query regarding expenditure under NSM, the Ministry furnished the following:

Year	Funds (in Crore)
2010-11	350
2011-12	652
2012-13	599
2013-14	692
2014-15	1158
2015-16	3146
2016-17	2590
Total	**9,187**

4.7 On being queried about the plan for current year 2017-18, the Ministry stated as under:

"In order to achieve the target for current year, we have issued tenders of around 20,418 MW in the previous financial years. These tenders are at different stages. Out of the tenders of 20,418 MW, projects for around 17756 MW have already been awarded/financial bids opened and remaining projects are under process by various organizations. Projects of around 9575 MW are there for which PPAs have been signed. These projects are expected to be commissioned i n current year. We have to push for more projects to sign PPAs and try for early commissioning before March 2018. The organization-wise status is given below":

Tendering Status of Solar Projects under Central Schemes & State Scheme

(in MW)

Sl. No.	**Organizatio n**	**Scheme**	**Tender issued**	**Financial bid opened/ RA**	**LOI issued**	**PPA signed**	**Commis sioned**	**PPA signed but not commissioned**
1	SECI	VGF Scheme	5410	3415	3265	3265	80	3185
2	Other CPSUs		1071.76	1005	699.5	699.5	74.5	625
3	Canal Bank/Top		100	100	90	90	16	74
4	NTPC Ltd	Bundling scheme	3000	2750	2750	2750	1040	1710
5	NTPC Ltd	Own/EPC	1785	1510	760	760	510	250
6	State Entity	State scheme	9051	8976	7726	6538	2807	3731
	Total		**20417.8**	**17756**	**15290.5**	**14102.5**	**4527.5**	**9575**

- Tender issued but financial bid not opened/RA not done**:** 2661.76 MW
- Financial Bid opened/RA done but LOI not issued: 2465.5o MW
- LOI issued but PPA not signed: 1188 MW
- PPA signed but not commissioned: 9575 MW

4.8 The Ministry submitted that on account of bidding done through various schemes by the States, the solar tariff has been declining. In the bidding held in February, 2017 for solar projects to be set up in Rewa Solar Park, Madhya Pradesh; the levelized tariff has come down to Rs. 3.30 per kWh. The solar tariff declined to Rs. 3.15 per unit in the reverse auction done by NTPC at Kadapa Solar Park in Andhra Pradesh in April, 2017. The solar tariff further declined to Rs. 2.44 per unit in the recent reverse auction done by SECI at Bhadla Phase-III Solar Park in Rajasthan in May, 2017. The trends of solar tariff are given in the Table below:

Sl. No	Schemes	Year	Capacity on Offer (MW)	Highest Bid (Rs./KWh)	Lowest (Rs./KWh)	Weighted Avg. Price (Rs./KWh)
1	NSM Batch 1	Dec'10	150	12.76	10.95	12.16
2	NSM Batch2	Dec'11	350	9.39	7.49	8.79
3	Orissa Phase 1	Mar'12	25	8.98	7.0	8.36
4	Orissa Phase 2	Dec'12	25	9.50	7.28	8.73
5	Karnataka	Apr'12	60	8.5	7.94	8.34
6	Madhya Pradesh	Jun'12	125	12.45	7.9	8.05
7	Tamil Nadu	Mar'13	150	14.5	5.97	6.48*
8	Rajasthan	Mar'13	75	8.25	6.45	6.45 (L1)
9	Andhra Pradesh	Apr'13	226	15.99	6.49	6.49 (L1)
10	Punjab Phase 1	June'13	270	8.75	7.2	8.41
11	Uttar Pradesh Phase 1	Aug'13	130	9.33	8.01	8.9
12	Karnataka Phase 2	Aug'13	130	8.05	5.5	6.87
13	Madhya Pradesh Phase 2	Jan'14	100	6.97	6.47	6.86
14	Andhra Pradesh Phase 2	Oct'14	500	5.99** (7.03 Level.)	5.25** (6.17 Level.)	5.75** (6.75 Level.)
15	Karnataka	Nov'14	500	7.12	6.71	6.94
16	Telangana	Nov'14	500	6.9	6.46	6.72
17	Punjab (Capacity 5-24 MW)	Feb'15	100	7.45	6.88	7.17
18	Punjab (Capacity 25-100 MW)	Feb'15	100	7.56	6.88	7.16
19	NTPC Anantapur	May'15	250	-	-	6.16*** (L1)
20	Uttar Pradesh Phase 2	June'15	215	8.6	7.02	8.04
21	Madhya Pradesh	June'15	300	5.641	5.051	5.36
22	Telangana Group 1****	August'15	500	5.8727	5.4991	5.73
23	Telangana Group 2****	August'15	1500	5.8877	5.1729	5.62
24	Punjab	Sept'15	500	5.98	5.09	5.65
25	Uttarakhand	Oct' 2015	170	5.99	5.57	5.766
26	AP-500 MW Bundling scheme	Nov'2015	500	4.63	4.63	4.63
27	AP-350 MW Bundling scheme	Dec'2015	350	4.63	4.63	4.63
28	AP-150 MW Bundling scheme (DCR)	Dec'2015	150	5.13	5.12	5.123
29	Haryana (State scheme)	Dec'2015	150	5.00	5.00	5.00
30	Rajasthan-420 MW Bundling	Jan'2016	420	4.36	4.34	4.351
31	UP-100 MW Bundling	Jan'2016	100	4.78	4.78	4.78
32	Rajasthan-100 MW Bundling (DCR)	March'16	100	5.07	5.06	5.068
33	Telangan-50 MW Bundling (DCR)	March'16	50	5.19	5.19	5.19
34	Jharkhand-200	March'16	102	5.59	5.20	5.464
35	Jharkhand-1000	March'16	999	5.48	5.08	5.356
36	Telangan-350 MW Bundling	May'16	350	4.67	4.66	4.667
37	Karnataka-500 MW Bundling	May'16	500	4.80	4.78	4.79
38	KA-100 MW bundling(DCR)	Sept-16	100	4.86	4.84	4.85
39	MP-750 MW(State scheme)	Feb-17	750	2.979	2.970	2.9743# (3.30 Level tariff)

Sl. No	Schemes	Year	Capacity on Offer (MW)	Highest Bid (Rs./KWh)	Lowest (Rs./KWh)	Weighted Avg. Price (Rs./KWh)
40	AP-250 MW(Bundling)	April-17	250	3.15	3.15	3.15
41	Rajasthan Bhadla-IV 250 MW (VGF)	May-17	250	2.63	2.62	2.625
42	Rajasthan Bhadla-III 500 MW (VGF)	May-17	500	2.45	2.44	2.445
	*5% escalation for 10 years ** 3% escalation for 10 years. Separate L1 for 9 districts *** EPC Bids with Domestic content requirement. Capital subsidy of Rs. 1 Cr/MW ****Results for the lowest bid for 500 and 1500 MW respectively. # escalation of 5 paisa from 2nd year to 15th year					

4.9 In response to a query about Global trends regarding solar tariff, the Ministry furnished the following table:

"Global trend in solar tariff through bidding during period 2016-17 is as given below (based on information available in various reports)":

S. No	Country	Period	Tariff (US cent/kWh)
1	Abu Dhabi	May-2016	2.99
2	Dubai	May-2016	1.99
3	Chile	August-2016	2.91
4	Abu Dhabi	Sept-2016	2.42
5	Mexico	Oct-2016	2.70

4.10 On being asked about the project cost per megawatt for making the unit cost of Rs. 2.44 viable, the Ministry stated as under:

"Considering the declining cost of modules and CERC norm for bench mark cost, the project cost works out to around Rs 3.75 CR per MW. In a project cost, the major contribution is from Module, which is around 50-60 %. The parameter considered by the successful bidder for arriving at Rs 2.44 per unit is not available. However, the major factor which contributes to arrive at tariff is given below:

i. Project cost
ii. Debt equity ratio
iii. Financing with cheaper lending rate
iv. Return on equity
v. O&M cost
vi. Project IRR
vii. Guaranteed off take
viii. Guaranteed payment"

4.11 When further asked about the life of plant and return on investment in this regard, keeping in view the land and connectivity cost, the Ministry replied:

"As per Central Electricity Regulation Commission (CERC) norms, the life of project is 25 years and Return on equity (ROE) is 14 %. However, for arriving at lower tariff, the bidder may have considered a lower ROE. The projects take into account the land and connectivity costs while bidding."

4.12 The Committee noted that the tariffs sloped downwards by 26% in just three months and asked about the reasons that caused this sudden drop. The Ministry in its reply stated that:

"There are so many reasons for prices to come down. PPAS are signed after bid is completed and tariff is arrived at. Tender documents do mention different requirement of projects. The reasons for plummeting of the cost of solar power prices are as under:

(i) Conducive policies for encouraging solar sector;
(ii) Improved project structuring and technology;
(iii) Better learning curve;
(iv) Decline in cost of solar cells/modules and Cost of financing".

4.13 The Committee noted that in a rush to build market share in this sector, some players have become very aggressive in competitive auction process and are bidding very low tariff. There is a fear that some of these projects could become unviable because developers may find it difficult to raise funds and contain high project costs. Viability of solar power projects is a cause for concern. When asked to explain the situation along with remedial measures, the Ministry stated as under:

"At present, no such situation is foreseen. Rather lowering of tariff is a welcome situation. Necessary safeguards, regarding performance of projects are taken in bidding process and PPA signing. The successful bidders also take the viability of the project into the account while bidding. To ensure the performance of the contract, Bank Guarantees are taken from the concerned Solar Project Developers".

4.14 The Committee also noted that in the 500 MW Bhadla Phase-III Solar Park auction, Acme Solar lodged the winning bid of Rs. 2.44. This is the same company which previously won 250 MW in the Rewa auction at a tariff of Rs. 3.30. The Committee asked that how it would affect the viability of those Solar Projects which have been awarded earlier at a higher rate and if the developers were engaged in averaging of tariff. The Ministry replied that:

"The prices have been discovered through competitive biddings held in transparent manner. The prices are governed by market forces and the developers bid the projects keeping in viability thereof. The terms of allotment of Solar Park facilities in REWA Solar Park and Bhadla Phase-3 Solar Park are entirely different.

Further, the solar radiation level also varies between the above mentioned Solar Parks. Further, the completion period for development of Solar Park infrastructure and also the timelines for solar project implementation are different in the above mentioned Solar Park. Therefore, the above mentioned factors may have resulted in tariff offered by the some bidders during the E-reverse auction carried out for each Solar Park separately at different point of time".

"The biddings are held in open and transparent manner and it also depends upon market forces. In order to win a bid, developers may be playing with their margin of profit as well. As all this information remains with project developers, no definite reason can be correctly attributed".

4.15 On being asked about the companies involved in solar sector reporting losses, the Ministry stated that no specific case has been received in this regard.

4.16 When queried about major challenges to meet target of 100 GW by 2022, the Ministry stated as below:

"Major Challenges to meet target of 100 GW by 2022

1. Procurement of Land for Solar Installation,
2. Slow implementation of Solar Roof-top policy by DISCOMs,
3. Non-Compliance of Solar RPO by state utilities,
4. Delay in signing of PPA after finalization of tenders,
5. Transmission Infrastructure and Grid Stability,
6. Mandating Must-Run Status for all Solar Projects,
7. Payment Delays by DISCOMs."

4.17 When asked about the challenges in Procurement of Land for Solar Installation, the Ministry furnished that Land has not been a major problem so far and under Solar park scheme of 20,000 MW, 71,000 acres of land has been acquired against 1,00,000 acres requirement.

4.18 When queried about the possible reasons for non-compliance of Solar RPO by state utilities, the Ministry replied that:

"There were two major reasons why DISCOMS were not readily accepting renewable energy power – (i) its high cost and (ii) its infirm nature. So far the cost is concerned, renewable's tariff through transparent bidding process have come down (solar Rs. 2.44/unit, wind Rs. 3.46/unit). Solar and wind have reached to grid parity. Regarding infirm nature of RE, CERC has issued a DSM mechanism for scheduling and forecasting of renewable generation for inter-state transmission of renewable energy. SERCs are in process of bringing such regulations for intra-state transmission. These efforts will address the infirm nature of renewable energy as all the RE generation will have to be scheduled with penalty clauses".

4.19 On being further queried about the possible steps that should be taken to ensure compliance of Solar RPO, the Ministry stated as under:

"In January 2016, the revised Tariff Policy was issued where in strong provisions have been made for promotion of renewable energy. Subsequently, the Ministry of Power has issued guidelines for long term year-wise growth trajectory for RPO compliance up to 2018-19 as given below.

Long term trajectory	2016-17	2017-18	2018-19
Non-Solar	8.75%	9.50%	10.25%
Solar	2.75%	4.75%	6.75%
Total	11.50%	14.25%	17.00%

SERCs have been requested to notify their state specific requirements. In a meeting of Forum of regulators (FOR) held in February 2017, FOR was requested to take up with State Electricity Regulatory Commissions (SERCs) for ensuring the RPO compliance. Ministry has awarded a study to the Energy and Research Institute (TERI) for assessing the renewable energy addition for RPO compliance. Four works were to be held with stake-holders to discuss the issues. Three have been held and fourth is planned on 28.06.2017. As a part of study, a web based portal is being created for online monitoring of RPO compliance".

4.20 When the Committee desired to know about any alternative mechanism available to RPO/REC, the Ministry submitted that, at present, there is no alternative mechanism to RPO/REC.

4.21 When asked about the possible reasons behind delays in signing of PPA after finalization of tenders, possible fallouts of this situation and steps taken to expedite the signing of PPAs, the Ministry furnished that:

"The various reason are lack of direction from parent Ministry, lengthy internal approval process, involvement of multiple Ministries in the same buildings, lack of prior experience of Govt. Departments etc.

The possible fallouts are: delay in project implementation, changes in scheme norms, change in cost/incentives, demotivation among and backing out of developers, revenue loss for entity where grid power is costly.

To support Ministries/ Departments, CPSUs have been empanelled for undertaking project management consultancy (PMC) and for ensuring cost efficiencies through collation of RTS projects. MNRE has also prepared model EPC agreement/PPA which have been duly vetted by Ministry of Finance and Ministry of Law and Justice".

4.22 On being asked about the initiatives taken for expansion and up gradation of transmission network, the Ministry replied as under:

"Green Energy Corridor is under implementation with an aim to create evacuation and transmission infrastructure for renewable power. It is divided into two parts:

i) Inter-State Transmission System – being implemented by Power Grid Corporation of India Limited – consists of about 3200 ckm transmission lines and six Substations of approx. 18000 MVA. The scheduled commissioning of the project is May 2019. The total project cost is Rs. 11369 crores.

ii) Intra-State Transmission System – Total project cost is Rs. 10,141 crores - being implemented by 8 States (Tamil Nadu, Rajasthan, Karnataka, Andhra Pradesh, Maharashtra, Gujarat, Himachal Pradesh and Madhya Pradesh) under funding mechanism: 20% State Equity, 40% NCEF Grant (total 4056.67 crores) and 40% KfW loan (500 million EUR). The NCEF grant was approved by the Cabinet Committee of Economic Affairs in December 2014 (for Tamil Nadu) and July 2015 (for other States). The project includes about 9400 ckm transmission lines and about 48 Substations of approx. 19000 MVA to be completed by March 2020."

4.23 When asked about building separate transmission lines to evacuate green energy, the Ministry stated that Inter-State as well as intra-State transmission system for evacuation and transmission of renewable power is being created under Green Energy Corridor project.

Evaluation of National Solar Mission (NSM)

4.24 The Ministry furnished that it has engaged M/s. CRISIL to carry out the evaluation of National Solar Mission (NSM) and CRISIL has undertaken the work in the field and is in the process of submitting its final evaluation report. It was also submitted that Preliminary draft findings of the evaluation study are under examination in consultation with the relevant stakeholders.

4.25 The Ministry also stated that the draft findings suggest that aligning state-wise Renewable Purchase Obligations (RPOs) with the RPO trajectory as notified by the Ministry of Power in July 2016 would be necessary for achieving 100 GW solar power capacity by the 2022. It may be mentioned that so far only four states namely Andhra Pradesh, Chhattisgarh, Madhya Pradesh and Rajasthan have issued draft regulations for aligning RPO trajectory as per the notifications from the Ministry of Power. Another major finding of the evaluation relates to measures during backing down of solar power due to grid instability or unavailability of transmission line, and the suggestion is to develop suitable risk mitigation measures as part of the Power Purchase Agreement (PPA).

4.26 When asked to provide a summary of the draft findings of the evaluation study undertaken by CRISIL, the Ministry stated that:

"CRISIL report has been prepared after interacting with various stakeholders. Major recommendations/findings/suggestions of the report are summarized below:

i. Policy related

- Reconsider the need for continuation of VGF policy framework in subsequent phases
- Continue bundling scheme in subsequent phases
- Reconsider capital subsidy scheme for off grid systems
- Policy framework for utilization of stranded off grid systems
- Guaranteed off-take scheme/Export promotion scheme for promotion of solar manufacturing
- Align state-wise RPO targets in line with 100 GW solar target
- State-level bidding should be spread on a district wise/sub-station wise

ii. Infrastructure related

- Upgrade grid infrastructure
- Implementation of forecasting and scheduling protocol

iii. Bid/tender document related (grid and off grid)

- Remove cap on excess generation
- All new mini grid systems should have capability for grid synchronization and remote generation monitoring systems.
- Measures during backing down of solar power due to grid instability or unavailability of transmission line

iv. Capacity-building related:

- Consumer awareness is important for the growth of rooftop solar generation. As such, focused programmes for consumer awareness are necessary.
- Capacity-building of execution/metering staff in utilities on implementation of solar rooftop net/gross metering is required.
- Better coordination between SNAs and urban local bodies is needed. A sustained campaign targeting resident welfare associations, industry associations, etc. is recommended".

CHAPTER V

SOLAR MANUFACTURING IN INDIA

Domestic manufacturing in solar

5.1 Currently, India has installed solar PV manufacturing capacity of round 3 GW for solar PV Cells and around 7 GW for solar PV modules, however, the actual production is 1 GW and 3 GW respectively. In India, solar PV power plants installed in the year 2016-17 were about 5.5 GW and the target for 2017-18 is around 10 GW. Thus, from above, it is visible, that the installed manufacturing capacity of solar PV cells and modules is not capable of catering the annual demand of country.

5.2 Internationally China and China controlled Taiwan + SEA is holding 85% of total global capacity for solar cell and module manufacturing. China is also leading in Polysilicone and Wafer manufacturing. The per Watt cost of conversion from wafer to cell in India is around 16-18 US Cents whereas it is less than one third in China with 6 US Cents. The cost of conversion from cell to module is also high in India as compared to China.

Government's efforts to support domestic manufacturing in solar

5.3 To promote solar manufacturing in India, MNRE had been following the policy of Domestic Content Requirement (DCR) under its various Schemes for solar projects with support through Viability Gap Funding (VGF) or bundling of thermal power. But now this policy itself has been challenged in WTO. The details are as given below;

Programme	Domestic Content Provision	Remark
1. Phase-I		
a) Solar Grid connected power projects (capacity 150 MW) – Batch-I	Crystalline silicon technology - to use modules manufactured in India Thin film and CPV technology – allowed to be imported	70 MW capacity commissioned under DCR category.
b) Solar Grid connected power projects (capacity 350 MW) – Batch-II	Crystalline silicon technology - to use cells and modules manufactured in India Thin film and CPV technology – allowed to be imported.	70 MW capacity commissioned under DCR category
2. Phase-II		
a) Solar Grid connected power projects – Batch-I (375 MW with DCR content out of total allocated capacity of 750 MW)	Cells and Modules to be of indigenous origin of 375 MW. Cells and Modules in open category of 375 MW.	355 MW capacity commissioned under DCR category.
b) Batch-II, Tranch-I (Bundling scheme)	MNRE shall intimate the capacity to NTPC before announcement of State Specific Bid. Under DCR, the solar cells and modules used in the solar PV power plants must both be made in India.	PPA for 400 MW under DCR has been signed and projects are under construction stage. Out of this 60 MW commissioned.

c) Batch-III (2000 MW VGF scheme)	250 MW is kept for DCR category. Cells and Modules to be of indigenous origin	PPA for 100 MW under DCR has been signed and projects are under construction stage. 100 MW in AP was cancelled after WTO ruling.
d) Batch-IV(5000 MW VGF scheme)	Cells and Modules to be of indigenous origin. As per scheme, out of total capacity of 5000 MW, MNRE may allocate some capacity under DCR depending on availability and price. With the approval of Hon'ble Minister, 15 % is kept for DCR.	PPA for 25 MW under DCR has been signed and projects are under construction stage. 350 MW in different States was cancelled after WTO ruling.
e) 1000 MW CPSU scheme	a) 1 Cr/MW for Cells & modules b) 50 Lakhs/MW for Modules	All capacities have been allocated to different CPSUs. (NTPC-680, CIL-200, NHPC-50)
f) 300 MW Defense Scheme	Cells and Modules to be of indigenous origin.	Total capacities of 367.5 MW have been allocated to different Defense Organizations (BEL-150, Department of Defense -150).
g) Grid connected Rooftop	Only Module to be of indigenous origin under MNRE scheme	2347 MW sanctioned, out of which 201 MW commissioned. Another 461 MW has been commissioned by different stake holder without subsidy

5.4 Government of India provides incentives for solar manufacturing under Modified Special Incentive Package Scheme (M-SIPS) of Ministry of Electronics and Information Technology (MeitY). M-SIPS provide a capital subsidy to promote large scale manufacturing in the Electronic System Design and Manufacturing (ESDM) sector which includes Solar Photovoltaic units across the value chain. The scheme provides subsidy for capital expenditure - 20% for investments in Special Economic Zones (SEZs) and 25% in non-SEZs.

5.5 Ministry of New & Renewable Energy (MNRE) furnished that it has been working on developing proposals for two-pronged strategy to support domestic solar manufacturing in India:

(i) Supporting existing solar PV manufacturers to enable them to compete against the foreign suppliers

- MNRE is analyzing the cost differential between domestic solar PV manufacturers and foreign solar PV manufacturers, at each stage of solar PV production chain and the reasons for such cost differential.
- Appropriate ways and means are being looked at, to bridge this cost gap to make domestic solar PV manufacturers globally competitive.

(ii) Support to domestic manufactures by creating captive markets

- MNRE has initiated a 2nd phase of CPSU scheme of 7500 MW, which provides for installation of entire capacity of solar projects based on domestically manufactured solar PV cells and modules. The scheme is under process of approval.

- Similarly, MNRE has the Grid-connected Rooftop Solar Scheme under which domestic solar PV modules are required to be installed for projects under CFA/ Incentive.

(iii) Incentivizing setting up of fully vertically integrated, state-of-the-art solar PV manufacturing facility in India

- MNRE is working at encouraging development of world-class, fully vertically integrated, state-of-the-art solar PV manufacturing facility in India.
- It seeks to address the issues of technology obsolescence and fragmented, small-scale of operation that are the major challenges currently being faced by the Domestic Solar PV Manufacturing Industry. The vision is to build a world class manufacturing industry that is not only globally competitive, but is also an important component of overall Energy Security of the country.
- The Ministry is considering getting a study done on the critical elements involved in the entire solar production chain, the optimum scale of operation and the overall cost structure of such a production facility. Such a study will help in better formulation and focusing of overall Government policy in this regard.

5.6 When asked to explain the case that solar cell manufacturing companies in the US, China, Taiwan, Malaysia and EU has been dumping their cells in Indian Markets earning profits at the expense of indigenous cell manufacturers, the Ministry replied as under:

> "As per WTO norms, the international companies have to be given equal opportunities in supply of solar cells/modules. Indigenous suppliers, at present, are not competitive therefore more solar modules are being procured from foreign suppliers".

5.7 It has been submitted that the per Watt cost of conversion from cell to module is competitive in India as compared to wafer to cell as shown below:

S. No.	Process	Conversion cost (US Cents/watt)	
		China	India
1.	Silica to Poly Silicon	8	-
2.	Poly Silicon to Wafer	8	-
3.	Wafer to Cell	6	16-18
4.	Cell to Module	12	13-14

5.8 It has been learnt that the installed solar equipments are substandard and lack reliability. There are also complaints regarding maintenance of these equipments. When the Committee desired to know what the Government has done to ensure quality and reliability of installed solar equipments, the Ministry stated as under:

> "In the guidelines of all MNRE supported schemes, emphasis is given to quality of solar cells/modules to be deployed. Various Standards are specified in our

scheme guidelines to be followed. Moreover, Minimum generation is specified in bid documents, which takes care of quality assurance. So far, Ministry has not received any specific complaints about it.

Ministry is bringing out a "Lab Policy for Testing, Standardization and Certification for Renewable Energy Sector" for quality control of the renewable energy systems/components. The said policy aims at to bring out clarity about testing, standardization and certification process and making the same mandatory for all renewable energy technologies/systems/devices to ensure quality and reliability of performance of products. It contains plan for implementation for strengthening/expanding test labs for efficient and reliable delivery of testing services and also field inspection for quality control. The policy is an endeavour to ensure reliability and consistency in manufacturing of renewable energy systems/devices.

Notification for Quality Control of SPV Systems/Components

MNRE in 2016 initiated interaction with test labs, BIS and other related stakeholders for ensuring quality control of SPV Systems/components. Accordingly, the MNRE prepared draft Technical Regulation for SPV Systems/Components under BIS Act for quality control. The draft Technical Regulation prepared by MNRE in consultation with BIS approved by Hon'ble Minister was sent to Ministry of Law and Justice for vetting. The final draft Quality Control order in April, 2017 has been sent to Department of Commerce for further action for seeking comments of WTO TBT Committee from members for final notification. As per the procedure, 60 days' time is given for comments, once the draft is uploaded to WTO website. Thereafter, the quality control order will be notified".

CHAPTER VI

R & D AND HUMAN RESOURCE DEVELOPMENT

RESEARCH AND DEVELOPMENT

6.1 According to the MNRE, their Research & Development activities aims at resource assessment, technology development, demonstration and commercialization for promoting the large scale use of new and renewable energy across the country. The Ministry support Research, Design, Development and Demonstration (RDD&D) to develop new and renewable energy technologies, processes, materials, components, sub-systems, products & services, standards and resource assessment so as to indigenously manufacture renewable energy devices and systems.

6.2 The Ministry further stated that the underlying purpose of RDD&D efforts is to make industry competitive and renewable energy generation supply self-sustainable/profitable and thereby contribute to increased share in total energy mix in the country. The Ministry support RD&D to various R&D/academic institutions, industries, NGO's etc. for technology development and demonstration in the field of solar, wind, biogas, biofuel, hydrogen and fuel cells, geothermal, etc. An award scheme has been introduced to encourage young Scientists for innovation. The RD&D efforts are continued with emphasis on efficiency improvement and cost reduction.

6.3 The Ministry furnished the following with respect to facilitating research, design and development for technological advancements in Solar Energy Sector:

> "The MNRE has supported Centers for Excellence technology demonstration, apart from R&D projects supported to R&D institutions/industries for giving thrust to R&D in solar energy area. The Centers for Excellence have provision for collaboration with other institutions and industries for technology development and also for conducting training for promoting R&D and also for operation and maintenance of solar energy systems/components. Thrust areas with action plan for RD&D with emphasis on collaboration was prepared or implementation."

6.4 On a query regarding innovations made/underway in the field of storage of Solar Power, the Ministry replied as under:

> "For solar stand-alone off-Grid applications**,** the batteries used for this purpose are lead-acid batteries and are reasonably priced. The other battery technologies such as lithium ion, flow batteries, sodium sulphur, Zinc batteries are three to four times expensive than lead acid batteries and therefore yet not been adopted by the system

integrators in their systems. Efforts to reduce the cost of batteries are being made through R&D projects.

- Ministry sanctioned an R&D project with storage batteries consisting of 2.5 MW solar and wind hybrid with 1 MWh battery storage at Kaza, Himachal Pradesh implemented by SECI, New Delhi

- Development and demonstration of 1 MW capacity solar thermal power R&D project with 16-hour thermal storage at Mount Abu, with co-funding from German Ministry and Indian industry. The project is first of its kind to provide thermal storage of 16 hours and will be based on fully indigenously developed solar dish technology. The project has been commissioned and showed some good initial results. This project provides enormous opportunity in terms of product development and energy storage.

- Ministry has also sanctioned various R&D projects like Lithium ion Battery to SRM University, Storage Systems (Super capacitors) to IIEST, Kolkata and Li-ion battery modeling for large scale storage option and Demonstration of laboratory scale iron flow battery technology by 'National Centre for Photovoltaic Research and Education (NCPRE) Phase-II' IIT Bombay."

6.5 Regarding the technological up gradation undergoing with regard to solar PV and Solar Thermal, the Ministry stated:

> "In Solar PV, R&D efforts are directed to improving the efficiency of solar cells, developing invertors, power electronic systems storage systems. R&D efforts for developing higher efficiency solar cells of 20% are underway. In solar thermal, the efforts are directed towards technology development and demonstration for utilizing solar energy for industrial process heat, and power generation and other application."

6.6 Detailing the Research and Development (R&D) activities being undertaken at the Solar Energy Corporation of India (SECI) for intensive harnessing of Solar Energy potential in the country, the Ministry informed:

> "SECI is implementing a R&D project entitled "Development of Solar PV and wind hybrid power plant with large scale battery storage at Kaza, Himachal Pradesh and setting up facility for calibration of solar radiation measuring sensors and its analysis/modeling based on ground surface measurement."

6.7 On being queried about the details regarding R&D expenditure vis-à-vis total expenditure of MNRE and its comparison with other developing/developed countries, the Ministry stated that:

> "MNRE spent Rs. 534.3 crores on RD&D out of total expenditure of Rs. 11250 crores on Renewable Energy during the 12th Five Year Plan Period. R&D expenditure in 2012-13 was Rs. 108.90 crores out of the total Renewable Energy expenditure of

Rs. 1107 crores. During the year 2016-17 expenditure on R&D in renewable energy was Rs. 100 crores.

In the global context, R&D expenditure on renewable energy technology was $9.1 billion in 2015 against total Renewable Energy investment of $286 billion as per UNEP document "Global Trends in Renewable Energy Investment-2016" published by Bloomberg. China's R&D expenditure was comparable with Europe's, each investing $2.8 billion. US investment on R&D in 2015 was $1.5 billion. In India, MNRE's expenditure on R&D in 2015-16 was $15.92 million, around 22% lower than of 2014-15. Solar continues to dominate renewable energy R&D, with spending rising to $4.5 billion and equal to that in all the other sectors combined globally. In Indian context, solar R&D expenditure accounts for 63% of total R&D expenditure in new and renewable energy in the 12th Plan Period."

HUMAN RESOURCE DEVELOPMENT

6.8 The Ministry has launched the Suryamitra Training programme on 28th May, 2015 with a target of training 50,000 persons as Solar PV Technicians in the various states by 2019. These trained Solar PV Technicians are known as Suryamitras. The trained persons are to be skilled for acting as installation, commissioning and after sales services (Operation &Maintenance) providers with entrepreneurship skills in the field of renewable energy with special reference to solar energy. The National Institute of Solar Energy (NISE), a specialized institute in Solar Energy of Ministry of New and Renewable Energy (MNRE) is coordinating this programme through various institutes/SNAs in different states. Presently '156' institutes in different states in India are providing Suryamitra training to ITI/Diploma passed students. So far, 11,013 Suryamitras have been trained under this programme in the country.

The year wise targets and achievements are as follows:

Sr. No.	Year	No. of persons to be trained	No. of persons trained
1	2015-16	2,000	2713
2	2016-17	7,000	8,300
3	2017-18	12,000	-
4	2018-19	14,000	-
5	2019-20	15,000	-
Total		**50,000**	**11,013**

6.9 When asked how the Government ensured quality of training provided by private institutions in various states, the Ministry in its reply stated that:

"Assessment of the candidates and training of assessor is being done by Skill Councils for Green jobs (SCGJ) and trainees are being certified by them to maintain

the quality of the programme implemented by various institutions/SNA's in different States."

6.10 On a query regarding the status of funds sanctioned/released and spent for this programme, the Ministry gave the following reply:

"The Ministry has sanctioned/released an amount of total Rs. 41.91 crores to National Institute of Solar Energy (NISE) for implementation of Surya Mitra programme and NISE has spent Rs. 35.4 crores as on 31.03.2017."

Part –II

Observations/Recommendations of the Committee

1. The Committee note that the Government has embarked upon an ambitious mission of renewable energy laying great emphasis on the natural resources like solar, wind, hydro etc. A target of 175 GW has been set to be achieved by 2022. Solar is the thrust area of the mission. As far as wind is concerned, it is already performing satisfactorily and steps have been taken to provide the desire fillip to this sector. Among the various renewable energies, wind has taken a lead and it is presumed that the target set for this sector will be achieved. However, the performance in other sectors of the renewable energy such as solar, Small Hydro, Biomass, Biogas, Bagasse, etc. is not so encouraging. The success of the mission solely and squarely hinges on the success of solar energy programmes. Any unfulfilling result of our efforts on this count will have a cascading effect. If we are determined for the success of the renewable energy mission, then there can be no letup in our consistent efforts, close monitoring and keen interest in attainment of the Solar Energy targets. Sectors like Small Hydro, Biomass, Bagasse, etc. are local in nature and can be achieved with somewhat lesser efforts as there is not so significant target under these heads of renewable energy. The Committee, therefore, recommend that keeping in view the importance of the mission and its potential to transform the lives of the rural India, wholehearted and concerted effort should be made taking into account fiscal and financial targets, their time bound achievements with appropriate mechanism to review the shortfall, if any, in the successful implementation of the programme.

<u>Grid connected Solar Power</u>:

2. The Committee note that the total investment for commissioning of 100 GW Solar Power has been estimated to Rs. 5 Lakh Crore and most of the investment is done by private entities. The Government has been playing a facilitative role in land acquisition, loan at affordable rates, 100% FDI in RE sector through automatic route, etc. The Committee also note that the Ministry has not set any financial targets in this regard and all has been left to the private sector. The Committee are of the view that the Ministry should not act like a bystander as arrangement for such a huge investment cannot be left to the private sector alone. The Committee, therefore, recommend that the Ministry should play a more proactive role with respect to

financial investment like providing access to loans at more favourable rate of interests, introducing Green Bonds through SECI, approaching international donors, arranging finances from Green Climate fund etc., so as to achieve the ambitious target of 100 GW of Solar Energy by 2022.

3. The Committee note that the potential of Solar Energy in cantonment and Military Stations and in Ordnance Factory Boards (OFB) are approximately 5000 MW and 950 MW respectively. There is a target to install a capacity of 300 MW in various Establishments of Ministry of Defense i.e. Establishments of Army, Navy, Air Force, Ordnance Factory Board, Defense Laboratories and Defense PSUs etc. The Cabinet has approved the Scheme in its meeting held on 10th December, 2014. The Ministry has issued Administrative Approval for the same on 7th January, 2015. The Committee are informed that to keep the provisions of scheme WTO compliant, the capacity under EPC mode of the scheme will use made in India solar cells and modules in the solar PV power plants and the projects under developer mode will be free to procure solar cells/modules under open category (indigenous or imported). The Committee also note that, as on date, 357.5 MW has been allocated under this scheme but only 7 MW has been commissioned so far. The Committee are not satisfied with this performance. Keeping in view that more than two years have passed since issuance of Administrative approval, such dismal performance is not justified. The Committee, therefore, strongly recommend that:

(i) Time bound achievement of targets should be ensured.

(ii) In view of the estimated potential of about 6000 MW and large tracts of land and vacant roof-tops available with various establishments of the Ministry of Defense, the Ministry should set a target for setting up 5000 MW of Grid connected Solar PV Power Projects by the Defense Establishments.

(iii) The full capacity of 5000 MW should be tendered through EPC Mode so that only Made In India Solar Cells and Modules may be used.

4. The Committee are informed that the scheme for development of Solar Parks and Ultra Mega Solar Power Projects 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. It is also submitted that the solar parks will provide suitable developed land with all clearances, transmission

system, water access, road connectivity, communication network, etc. This scheme will facilitate and speed up installation of grid connected solar power projects for electricity generation on a large scale. The Committee note that, so far, 34 Solar Parks of aggregate capacity of 20,000 MW have been approved in 21 States. However, the Committee find that, till date, the Ministry has identified land at various places for 33 Solar Parks and land for one is yet to be finalized. So, it means that much of the infrastructure in these Solar Parks will be developed parallel to the construction of Solar Project inside these Parks which is not going to help project developers. The Committee also note that, as of now, Solar Projects of only 1516 MW capacity, out of 20,000 MW capacity, have been commissioned inside Solar Parks. The Committee, therefore, recommend that all necessary actions should be taken to expedite the development of Solar Parks. The Ministry should conduct regular review meetings with the State Governments and Solar Park Developers to ensure the time bound development of Solar Parks, so that the Solar Project Developers may get the benefit of the established infrastructure.

5. The Committee note that the Ministry provides Central Financial Assistance (CFA) up to Rs. 25 lakh per solar park for preparation of Detailed Project Report (DPR) and up to Rs. 20.00 lakh per MW or 30% of the project cost, including Grid-connectivity cost, whichever is lower on achieving the milestones prescribed in the scheme. The approved grant is released by Solar Energy Corporation of India Ltd. (SECI) as per milestones. The Committee also note that the total fund required to provide CFA is estimated as Rs. 4050 crore. The Committee find that, during the last three years (2014-15 to 2016-17), the SECI should have disbursed Rs. 1650 crore as CFA. But, CFA actually released during the said period is only Rs. 906.12 crore i.e. about 45% short of the target. The Committee, therefore, recommend that the reasons for low disbursement of funds should be identified and remedial measures should be taken in this regard.

6. The Committee have been informed that SECI has implemented Viability Gap Funding (VGF) Schemes of 750 MW, 2000 MW and 5000 MW each for setting up large scale ground-mounted solar PV projects. Under this scheme, developers would be paid tariff of Rs. 4.43 per kWh or the discounted tariff discovered through e-reverse auctioning, for 25 years by entering into a PPA with SECI. Power from these projects

would be sold to various DISCOMs/Bulk consumers/state utilities by SECI at Rs. 4.50 per kWh or discounted tariff discovered (including trading margin of 7 paisa per unit). The Committee find that the results of this scheme are not so encouraging. Under first batch of VGF Scheme of 750 MW, only 680 MW could be commissioned. Under the second batch of 2000 MW, only PPAs have been signed for 2295 MW and commissioning status is not known. Under the third batch of 5000 MW, 2500 MW should have been commissioned till 2016-17, but SECI has only signed PPAs for 970 MW till date. The Committee are of the view that VGF Scheme has outlived its utility. The Scheme had relevance when the quoted Solar tariff was above Rs. 4.43 per Kwh. Now, in view of the dwindling Solar tariff, the Committee do not find any rationale behind continuation of this Scheme. Moreover, the Committee are not able to understand the sanctioning of VGF to CPSUs like ONGC, Coal India Ltd., GAIL (India) Ltd., NTPC, BHEL, NHPC Ltd., etc. The Committee, therefore, recommend that the Ministry should reconsider the Viability Gap Funding Scheme in this sector.

7. The Committee are informed that there is a scheme for setting up of 1000 MW Grid connected Solar PV Power Projects by 15 CPSUs/Government Organizations by 2018. The Committee note that the Ministry has allocated 1037.26 MW capacity out of which 669 MW has been commissioned till date. Performance of the CPSUs like Coal India Ltd., NHPC Ltd., ONGC, GAIL (India) Ltd., THDC India Ltd., NVVN Ltd. etc. is disappointing. The Committee are concerned to note that even the Government Organizations are not able to achieve their targets. The Committee, therefore, recommend that the Ministry should take corrective steps so that 1037.26 MW capacity under this scheme gets commissioned in time.

8. The Committee note that there is a scheme for installation of 15000 MW Grid connected Solar PV Power Plants through NTPC Ltd. Under tranche I (2014-15 to 2016-17) of this scheme, 3000 MW of Solar Power is to be bundled with unallocated thermal power in the ratio of 2:1 for which the required 1500 MW unallocated thermal power has been made available by the Ministry of Power and NTPC Ltd./NVVN will 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 seven paisa per kWh. The Committee find that only 1090 MW has been commissioned under this scheme till 31.03.2017 i.e. 64%

short of the target. The Committee also find that the bundling of Solar Power with Thermal Power is to incentivize the Solar Power. However, in view of the dwindling Solar Tariff, the Committee feel that the Thermal Power is getting incentivized which is not the objective of the Bundling Scheme. The Committee, therefore, recommend that the Ministry should revisit the Bundling Scheme as this scheme has stopped yielding the desired results now.

9. The Committee note that out of the 100 GW Solar Power, 40 GW is to be achieved from grid connected Solar Roof-tops in residential, social, institutional and government sectors in the country. The Ministry has submitted that the capital subsidy of 30% is available for residential, institutional (hospitals, educational institutions, etc.) and social sectors. For the Government Institutions/ Public Sector Undertakings (PSUs), achievement-linked incentives/awards are being provided. There is no subsidy for commercial and industrial establishments in the private sector as they are eligible for other benefits such as accelerated depreciation, custom duty concessions, excise duty exemptions and tax holiday etc. The Committee also note that the Ministry has a budget of Rs. 5000 crore for Grid connected Solar Roof-top systems to be installed upto 2019-20. This will provide financial support /central financial assistance for installation of about 4200 MW Solar Rooftops in the country (2100 MW with Subsidy and 2100 MW without subsidy). Till now, the Ministry has sanctioned projects of cumulative capacity of 2032 MWp under the programme to various State Nodal Agencies (SNAs) and Public Sector Undertakings/Authorities (SECI, CEL, REIL, Railways, AAI, etc.). About 661 MW of RTS capacities have been installed including subsidized and non-subsidized projects as on 30.04.2017. The Committee are highly disappointed with the performance of the Ministry in this sector. The Committee find that Roof-top Systems are not remunerative for consumers due to high maintenance cost. The Committee feel that the Roof-top Solar target of 40 GW by 2022 is unrealistic and it is highly unlikely that this target will be achieved. The Committee are of the view that the Ministry should give this scheme a serious relook, otherwise, it will derail the target achievement of the National Solar Mission. The Committee, therefore, recommend that:

(i) The target of 40 GW through Roof-top Solar Projects should be reconsidered.

(ii) Public Awareness Programme should be conducted regularly to popularize the Grid connected Solar Roof-top Projects.

(iii) The Ministry should undertake regular review meetings with the implementing agencies.

(iv) The process of subsidy disbursement should be made simpler.

(v) Single Window Clearance System should be adopted for approvals like connectivity, net-metering, electricity inspection, limitation in sanctioned load, etc.

(vi) The Ministry should pursue all the States/UTs to make Roof-top Solar compulsory on new buildings by making changes in building byelaws.

(vii) Steps should be taken to encourage research and innovation in Solar Roof-top Systems so as to make them attractive and remunerative.

10. The Committee note that the Electricity Regulatory Commissions of all the 36 States/UTs have notified regulations/tariff orders for net metering/feed-in-tariff mechanism. But DISCOMs are reluctant to operationalize the Net-Metering Regulations as it may reduce their income from high-paying customers. The Committee also note that from the consumers point of view, availability of Net-Meters, time taken for giving Net-Metering connections by DISCOMs, inspection by Chief Electrical Inspector (CEI), etc. are few of the concerns. The Committee are of the view that to give boost to Roof-top Solar Systems, operationalization of Net-Metering is of utmost importance. It reduces AT&C losses and need for large tracts of land. It even helps DISCOMs to avoid buying expensive peak power. The Committee, therefore, recommend that:

(i) The concept of Cross-Subsidy should be reconsidered so that Net-Metering for all users will make more financial sense.

(ii) Clear installation guidelines should be formulated by the Central and State Regulatory Authorities.

(iii) There should be proper training of DISCOM's staff on implementation of Net-Metering.

11. The Committee note that the issues cited by the DISCOMs against Net-Metering like revenue erosion, tariff increase for non-RTS consumers and backing down of conventional power etc. are of sustainable nature and these problems will certainly

erode economic capacity of the DISCOMs and precisely for this reason, one or the other ruse will be cited to delay the process of net metering. Any delay in the process will impair the pace of the solar mission. We cannot be ignorant of the fact that Solar Roof-top systems will eliminate the techno-commercial losses and thus will provide a model for imitation on a larger scale. If we are to usher in new concepts, some inherent problems may arise, but the wisdom lies in finding their solutions. The Committee, therefore, recommend that some alternative concepts like micro cooperative grid in a standalone manner be explored wherein a group of consumers/households can be pooled in for availing the solar rooftop benefits among themselves. It should also be examined whether there can be a mini/micro open excess window for this cooperative grid arrangement in rural/semi-urban areas.

<u>Off-Grid Solar Applications</u>:

12. The Committee note that under Atal Jyoti Yojana, there is a target of installation of 2,97,440 Street Lights in 169 constituencies in Uttar Pradesh, Bihar, Jharkhand, Odisha and Assam by 2018. However, only 9401 street lights have been installed so far. Out of which, 9179 Street Lights have been installed in Uttar Pradesh only. The main constraining factor is availability of batteries which are needed to be imported. The Committee are apprehensive about the installation of remaining 2,88,039 Street Lights by March, 2018. The Committee, therefore, recommend that:

(i) The Ministry should speed up the installation process in consultation with the Energy Efficiency Services limited (EESL) and all the five State Governments concerned.

(ii) The Ministry should also ensure proper functioning and maintenance of the installed Street Lights with the help of Panchayats/Urban Local Bodies (ULBs).

13. The Committee note that the Ministry has been able to install 1.27 lakh Solar Pumps till 31.05.2017. The Committee find that the objective of the Solar Pump Scheme is to replace existing diesel pumps and the scheme is mainly focused on small and marginal farmers. The Ministry provides upto 30% capital subsidy through State Nodal Agencies for irrigation and drinking water and 40% capital subsidy through NABARD with mandatory loan. However, it has been submitted that

the Ministry has advised stoppage of subsidy scheme routed through NABARD and the same will now be handled by IREDA. The Committee hope that with this switchover, more farmers will be benefitted. The Committee, therefore, recommend that:

(i) As the scheme is mainly focused on small and marginal farmers who may not be able to bring upfront capital, the procedure for availing loans should be made easier and simpler.

(ii) The procedure for disbursement of capital subsidy should also be made faster and inclusive.

(iii) The Ministry should ensure quality, sustainability and maintenance of installed Solar Pumps.

(iv) The Ministry should analyze reasons for the scheme being unsuccessful with NABARD and it should be ensured that the same are not repeated in the new arrangement.

<u>Progress of National Solar Mission</u>:

14. The Committee note that the Ministry has a target of installation of 600 MW of Off-Grid Solar Applications during Phase II of NSM (2013-17), out of which 345.50 MW has been installed. The Committee are disappointed with the performance of the Ministry in this sector. The Committee feel that Off-Grid Solar Applications can play a significant role in giving electricity access to remote locations where extension of centralized grid is uneconomical. However, Off-Grid Applications too face some obstacles including high capital cost, complicated procedure of subsidy disbursal, difficulty in local operation and maintenance. The Committee, therefore, recommend that:

(i) Innovative schemes should be devised to drive down cost and increase return on investment.

(ii) Procedure of disbursement of subsidies should be made simpler and faster.

(iii) Public-Private Partnership with rural entrepreneurs should be encouraged.

(iv) Large multi-national companies should be persuaded to dedicate part of their Corporate Social Responsibility (CSR) fund to Off-Grid Solar Projects.

15. The Committee note that the per unit price of Solar Power in India has dropped from Rs. 10.95 in December, 2010 to Rs. 2.44 in May, 2017. Solar Power has become cheaper than coal-based thermal Power Plant. The Ministry submitted that the project cost per MW, to make the unit cost of Rs. 2.44 viable, works out to be Rs. 3.75 crore per MW. However, the parameter considered by the successful bidder for arriving at Rs. 2.44 per unit is not available with the Ministry. The Committee are informed that as per Central Electricity Regulation Commission (CERC) norms, the life of a Solar project is 25 years and Return on equity (ROE) is 14%. However, for arriving at lower tariff, the bidder may have considered a lower ROE. The Committee note that in a rush to build market share in this sector, some players have become very aggressive in competitive auction and are bidding very low tariff. The Committee are apprehensive about the quality of material used. The Committee are of the view that some of these projects would become unviable because the developers may find it difficult to raise funds and contain high project costs and such a low Solar Tariff would also affect the viability of those Solar Projects which have been awarded earlier at a higher rate. The Committee are concerned about the viability of such solar power projects. The Committee, therefore, recommend that:

i) High Anti-Dumping Duty or Duty based on efficiency of the material imported should be imposed so as to discourage import of poor quality material.

ii) The Ministry should ensure that some outlying bids do not disturb the market dynamics.

16. The Committee note that DISCOMs are not able to comply with their RPO target because of the high cost and infirm nature of the Renewable Energy. But, it has been submitted that the tariff for renewables has come down, Solar and Wind have reached grid parity and steps have been taken to address the infirm nature of Renewable Energy. The Committee also note that the Ministry of Power has issued guidelines for year-wise growth trajectory for RPO compliance upto 2018-19 and a web portal is being created for online monitoring of RPO compliance. However, the Committee find that the States are not willing to comply with their Renewable Purchase Obligations and they continue to default on their RPO targets which *prima-facie* points to a systemic flaw in the working of the concept of Renewable Energy

Obligations. Keeping in view the importance of Renewable Energy and the utmost need to increase the share of Renewable Energy in India's Energy mix, the Committee recommend that:

(i) The Ministry should work towards aligning State-wise Renewable Purchase Obligations (RPOs) with the RPO trajectory as notified by the Ministry of Power.

(ii) For ensuring stricter compliance, the Ministry should come up with some Penal Provisions for non-complying States so that such States may fall in line and make every effort to fulfill their Renewable Energy Obligations.

(iii) Reasons should also be analyzed as to why this scheme has not been successful in getting proper response from the States.

17. The Committee have been informed that one of the challenges to meet the target of 100 GW by 2022 is delay in signing of PPA after finalization of tenders which is a consequence of lack of directions from parent Ministry, lengthy internal approval process, involvement of multiple Ministries, lack of prior experience of the Government Departments etc., and the possible fallouts of this situation are delay in project implementation, changes in scheme norms, change in cost/incentives, backing out of developers, revenue loss for entity etc. The Committee have taken a serious view of this situation as with this delay in signing of PPAs, the sanctity of the whole Mission will be affected and the Ministry will not be able to achieve its target within the stipulated time. The Committee, therefore, recommend that:

i) The Ministry should devise a single window system wherein lengthy internal approval process and involvement of multiple Ministries can be avoided.

ii) The Ministry should come up with model PPAs with the help of specialized agencies.

<u>Solar Manufacturing in India</u>:

18. The Committee note that India has installed solar PV manufacturing capacity of round 3 GW for solar PV Cells and around 7 GW for solar PV modules, however, the actual production is 1 GW and 3 GW respectively. Also, solar PV power installed in the year 2016-17 was about 5.5 GW and the target for 2017-18 is around 10 GW. The

Ministry has submitted that the installed manufacturing capacity of solar PV cells and modules is not capable of catering the annual demand of the country and China and China controlled Taiwan + SEA hold 85% of total global capacity for solar cell and module manufacturing. The Committee find that despite its low labour cost, Indian Manufacturers are not able to compete with Chinese Firms. The Committee also note that the Government of India provides incentives for solar manufacturing under Modified Special Incentive Package Scheme (M-SIPS) of the Ministry of Electronics and Information Technology (MeitY). M-SIPS provide a capital subsidy to promote large scale manufacturing in the Electronic System Design and Manufacturing (ESDM) sector which also includes Solar Photovoltaic units. The Committee are concerned about the lack of domestic Solar Manufacturing Capacity. The Committee are of the view that it is a necessity for India to support Domestic Solar Manufacturing as over-reliance on a single country puts Indian Solar Sector at a risk of disruption in supply chain. The Committee, therefore, recommend that:

(i) The Ministry should urgently formulate a dedicated programme to establish India as a Solar Manufacturing Hub so as to provide policy support to the complete value chain.

(ii) There should be excise duty exemption and Zero import duty on raw materials.

(iii) The Ministry should work to provide Viability Gap Funding (VGF) and low interest rate loans to domestic manufacturers.

(iv) There should be provision for establishment of manufacturing units inside the Solar Parks so that Manufacturers may benefit from the Infrastructure & ecosystem of the Solar Parks.

(v) The Ministry should focus on quality and reliability of the Solar Cells/Modules.

<u>R & D and Human Resource Development</u>:

19. The Committee note that the Ministry has spent Rs. 534.30 crores on Research and Development out of the total expenditure of Rs. 11250 crores on Renewable Energy during the 12th Five Year Plan Period. During the year 2016-17 expenditure on R&D in renewable energy was Rs. 100 crores. The Ministry submitted that in the field of Solar PV, R&D efforts are directed to improving the efficiency of solar cells, developing invertors and power electronic systems storage systems. According to

the MNRE, its Research & Development activities aims at resource assessment, technology development, demonstration and commercialization for promoting the large scale use of new and renewable energy across the country. The Committee are of the view that the large scale utilization of solar energy can only be sustained if it is backed by indigenous R&D, innovation and manufacturing capability. The Committee, therefore, recommend that:

(i) The Ministry should adopt a coordinated approach for successful collaboration among the technological and R&D institutions and the industries to achieve the goal of indigenous renewable energy technology development and innovation.

(ii) The Ministry should also ensure constant monitoring of all the R&D projects with a view to evaluating their functioning in a cost effective and result-oriented manner.

(iii) The Ministry should provide financial support to start-ups, entrepreneurs and innovators for R&D of new solar related technologies and for creating new and unique business models which have a potential of increasing the deployment of solar related technologies.

20. The Committee note that the Ministry has launched the Suryamitra Training programme with a target of training 50,000 persons as Solar PV Technicians in the various States by 2019, to be skilled for acting as installation, commissioning and after sales services (Operation &Maintenance) providers with entrepreneurship skills in the field of renewable energy with special reference to solar energy. The Committee also note that so far, 11,013 Suryamitras have been trained under this programme in the country. The Ministry has submitted that it has sanctioned/ released an amount of Rs. 41.91 crores to National Institute of Solar Energy (NISE) for implementation of Suryamitra programme and NISE has spent Rs. 35.4 crores as on 31.03.2017. The Committee are of the view that the large-scale installation of Solar Energy will require a technically qualified manpower of high standard. The Committee, therefore, recommend that:

(i) Specialized courses in Solar Energy should be introduced in Research Institutes and other Institutes of higher studies, like IITs, IISc, etc. with financial assistance from the Government.

(ii) The Ministry should provide scholarship for research in the field of Solar Energy.

NEW DELHI
July 28, 2017
Shravana 06, 1939 (Saka)

DR. VIRENDRA KUMAR,
Chairperson,
Standing Committee on Energy

Annexure - I

STANDING COMMITTEE ON ENERGY

MINUTES OF THE SIXTEENTH SITTING OF THE STANDING COMMITTEE ON ENERGY (2016-17) HELD ON 19th MAY, 2017, IN COMMITTEE ROOM 'C', PARLIAMENT HOUSE ANNEXE, NEW DELHI

The Committee met from 1100 hrs to 1245 hrs

PRESENT

LOK SABHA

Dr. Virendra Kumar - Chairperson

2. Shri M. Chandrakasi
3. Shri Ashwini Kumar Chaubey
4. Shri Deepender Singh Hooda
5. Shri Bhagat Singh Koshyari
6. Dr. Arun Kumar
7. Shri Jagdambika Pal
8. Shri Ravindra Kumar Pandey
9. Shri M.B. Rajesh
10. Shri Conrad Kongkal Sangma
11. Shri Devendra Singh alias Bhole Singh
12. Shri Bhanu Pratap Singh Verma

RAJYA SABHA

13. Shri Oscar Fernandes
14. Shri S. Muthukaruppan
15. Shri Javed Ali Khan
16. Dr. Anil Kumar Sahani
17. Smt. Viplove Thakur

SECRETARIAT

1. Shri S.C. Chaudhary - Joint Secretary
2. Shri N.K.Pandey - Director

WITNESSES

MINISTRY OF NEW AND RENEWABLE ENERGY

1.	Shri Rajeev Kapoor	Secretary
2.	Shri Anjani Nandan Sharan	Joint Secretary
3.	Shri Bhanu Pratap Yadav	Joint Secretary
4.	Dr. Ashwini Kumar	MD (SECI)
5.	Shri K.S. Popli	CMD (IREDA)
6.	Dr. A.K. Tripathi	DG (NISE)
7.	Ms. Sutapa Majumdar	Economic Advisor
8.	Shri Dilip Nigam	Scientist - G
9.	Shri P.C. Maithani	Scientist - G
10.	Shri B.L. Ram	Scientist - G
11.	Shri B.S. Negi	Scientist - G

2. At the outset, the Chairperson welcomed the Members of the Committee and the representatives of the Ministry of New and Renewable Energy to the sitting and informed that the sitting had been called to discuss the 'National Solar Mission - An Appraisal'. Also, the Hon'ble Chairperson apprised them of the agenda and focus area for the discussion and the provisions of Directions 55(1) and 58 of the Directions by the Speaker.

3. During the discussion, the Joint Secretary, MNRE, made a power-point presentation on the subject "National Solar Mission - An Appraisal" which, *inter-alia,* covered Road Map for achieving 100 GW target, Year wise and Cumulative Targets, Support Mechanism for Solar Power in India, Schemes launched under NSM, Schemes for Off-Grid Applications, Progress of National Solar Mission, Expenditure under NSM, Growth of Solar Capacity in India, Plan for Current Year 2017-18, Factors leading to reduction in Solar Tariff, Suryamitra Programme, Major Challenges to meet the target of 100 GW by 2022, etc.

4. The Committee, *inter-alia,* deliberated upon the following points with the representatives of the Ministry of New and Renewable Energy:

(i) Mission mode implementation of Solar Energy Projects especially Solar Roof Top Projects in order to achieve 100 GW of Renewable Energy by 2022.

(ii) Need to pursue Discoms for speedy implementation of Solar Roof-top Policy and Net Metering.

(iii) Need to revisit Viability Gap Funding (VGF) Scheme in view of dwindling Solar Prices.

(iv) Need for a Policy to recycle Solar batteries.

(v) Need to strengthen Transmission Infrastructure and Grid Stability.

(vi) Need to ensure viability of Solar Projects.

(vii) Need to provide support to indigenous Solar Manufacturers so as to create favourable conditions for developing solar manufacturing capability in the country.

(viii) Need for strengthening the provisions relating to Renewable Generation Obligation and Renewable Purchase Obligation.

(ix) Need to ensure durability and quality of material being used in Solar Projects.

(x) Need to support R&D and capacity building activities in Solar Sector.

(xi) Clarity in policies and regulations.

5. Thereafter, the Members sought clarifications on various issues relating to the subject and the representatives of the Ministry responded to the same. The Chairperson directed the representatives of Ministry of New and Renewable Energy to furnish written replies to those queries which could not be readily responded to by them within a week.

6. The verbatim proceedings of the sitting of the Committee were kept on record.

The Committee then adjourned.

Annexure - II

STANDING COMMITTEE ON ENERGY

MINUTES OF THE NINETEENTH SITTING OF THE STANDING COMMITTEE ON ENERGY (2016-17) HELD ON 30th JUNE, 2017, IN CHAIRPERSON'S CHAMBER, ROOM NO. 111, PARLIAMENT HOUSE ANNEXE EXTENSION, NEW DELHI

The Committee met from 1000 hrs. to 1100 hrs.

PRESENT

LOK SABHA

Dr. Virendra Kumar - Chairperson

2. Shri Om Birla
3. Shri M. Chandrakasi
4. Shri Ashwini Kumar Chaubey
5. Shri Harish Dwivedi
6. Shri R.P. Marutharajaa
7. Dr. Pritam Gopinath Munde
8. Shri Jagdambika Pal
9. Shri Ravindra Kumar Pandey
10. Shri M.B. Rajesh
11. Shri Vinayak Bhaurao Raut
12. Shri Gutha Sukender Reddy
13. Shri Devendra Singh alias Bhole Singh
14. Shri Malyadri Sriram
15. Shri Bhanu Pratap Singh Verma

RAJYA SABHA

16. Shri T.K.S. Elangovan
17. Shri Oscar Fernandes
18. Shri La Ganesan
19. Dr. Prabhakar Kore
20. Shri Shamsher Singh Manhas
21. Shri Javed Ali Khan
22. Dr. Anil Kumar Sahani

SECRETARIAT

1. Shri A.K. Singh Additional Secretary

WITNESSES

MINISTRY OF NEW AND RENEWABLE ENERGY

1.	Shri Anand Kumar	Secretary
2.	Shri Jatindra Nath Swain	Joint Secretary
3.	Dr. Ashwini Kumar	MD (SECI)
4.	Ms. Sutapa Majumdar	Economic Advisor
5.	Shri Dilip Nigam	Sci. - G
6.	Shri B.L. Ram	Sci. - G

2. At the outset, the Chairperson welcomed the Members of the Committee and the representatives of the Ministry of New and Renewable Energy to the sitting and informed that the sitting had been called to discuss the subject 'National Solar Mission - An Appraisal'. Also, the Hon'ble Chairperson apprised them of the agenda and focus area for the discussion and the provisions of Directions 55(1) and 58 of the Directions by the Speaker.

3. During the discussion, the Secretary, MNRE, made a presentation on the subject "National Solar Mission - An Appraisal" which, *inter-alia,* covered Road Map for achieving 100 GW target, Year wise and Cumulative Targets, Support Mechanism for Solar Power in India, Schemes launched under NSM, Approved Solar Parks in India, Schemes for Off-Grid Applications, Cumulative SPV Off-Grid Systems, Progress of National Solar Mission, Expenditure under NSM, Growth of Solar Capacity in India, Installed Solar PV Scenario of Major Countries, Commissioning Status of Solar Power Projects, Plan for Current Year 2017-18, Year-wise lowest Solar Tariff, Factors leading to reduction in Solar Tariff, Solar PV : Getting more Affordable, Suryamitra Programme, Major Challenges to meet the target of 100 GW by 2022, etc.

4. The Committee, *inter-alia,* deliberated upon the following points with the representatives of the Ministry of New and Renewable Energy:

(i) Speedy implementation of Solar Energy Projects especially Solar Roof Top Projects in order to achieve 100 GW of Renewable Energy by 2022.

(ii) Need to provide support to indigenous Solar Manufacturers so as to create favourable conditions for developing solar manufacturing capability in the country.

(iii) Need to support R&D and capacity building activities in Renewable Energy Sector.

(iv) Need to allocate more funds for research activities.

(v) Need to collaborate with IITs and other institutes of Higher Studies for research in Renewable Energy Sector.

(vi) Need to ensure viability of Solar Projects.

(vii) Need to ensure durability and quality of material being used in Solar Projects.

(viii) Need to strengthen Transmission Infrastructure and Grid Stability.

(ix) Clarity in policies and regulations.

5. Thereafter, the Members sought clarifications on various issues relating to the subject and the representatives of the Ministry responded to the same. The Chairperson directed the representatives of Ministry of New and Renewable Energy to furnish written replies to those queries which could not be readily responded to by them within a week.

The Committee then adjourned.

Annexure - III

STANDING COMMITTEE ON ENERGY

MINUTES OF THE TWENTIETH SITTING OF THE STANDING COMMITTEE ON ENERGY (2016-17) HELD ON 7th JULY, 2017 IN COMMITTEE ROOM E, PARLIAMENT HOUSE ANNEXE, NEW DELHI

The Committee met from 1100 hrs. to 1225 hrs.

PRESENT

LOK SABHA

Dr. Virendra Kumar - Chairperson

2. Shri Sultan Ahmed
3. Shri Om Birla
4. Shri Ashwini Kumar Chaubey
5. Shri Harish Dwivedi
6. Kunwar Sarvesh Kumar
7. Dr. Arun Kumar
8. Shri R.P. Marutharajaa
9. Shri Jagdambika Pal
10. Shri Ravindra Kumar Pandey
11. Shri M.B. Rajesh
12. Shri Devendra Singh alias Bhole Singh
13. Shri Bhanu Pratap Singh Verma

RAJYA SABHA

14. Shri Oscar Fernandes
15. Shri La Ganesan
16. Shri S. Muthukaruppan
17. Shri Javed Ali Khan
18. Dr. Anil Kumar Sahani

SECRETARIAT

1. Shri N.K. Pandey Director

WITNESSES

1.	Shri Anand Kumar	Secretary, MNRE
2.	Shri Jatindra Nath Swain	Joint Secretary, MNRE
3.	Shri Bhanu Pratap Yadav	Joint Secretary, MNRE
4.	Dr. Ashwini Kumar	MD (SECI)
5.	Shri K. Suresh Kumar	GM (NABARD)
6.	Shri Suchindra Mishra	JS, Dept. of Financial Services (DFS)
7.	Ms. Sutapa Majumdar	Economic Advisor, MNRE
8.	Shri Dilip Nigam	Sci. - G, MNRE
9.	Dr. G. Prasad	Director, MNRE

2. At the outset, the Chairperson welcomed the Members of the Committee and the representatives of the Ministry of New and Renewable Energy, SECI, NABARD and DFS to the sitting and informed that the sitting had been called to discuss the subject 'National Solar Mission - With special reference to Agricultural Solar Water Pumps'. The Hon'ble Chairperson also apprised them of the agenda and focus area for the discussion and the provisions of Directions 55(1) and 58 of the Directions by the Speaker.

3. During the discussion, the Joint Secretary, MNRE, made a power-point presentation on the subject "National Solar Mission - With special reference to Agricultural Solar Water Pumps" which, *inter-alia,* covered Off-Grid Solar Power Programme, Progress of National Solar Mission (NSM), System-wise Cumulative. Achievements, State-wise Achievements, Solar Pumping Programme, Salient features & Progress, Benchmark Costs, Status of NABARD Projects, Targets, Proposed Scheme for Grid-connected Pumps, etc.

4. The Committee, *inter-alia,* deliberated upon the following points with the representatives of the Ministry of New and Renewable Energy:

(i) Progress made in the Solar Pumping System Programme since its launch.

(ii) Status of funds sanctioned/released and spent for this programme.

(iii) Details of subsidies offered by the Government for the Solar Pumping Systems Programme.

(iv) Reasons behind stoppage of subsidy scheme routed through NABARD.

(v) Need to ensure durability, quality and maintenance of Solar Pumps.

(vi) Whether Solar Pumps have been found to be remunerative as compared to diesel and electric pumps.

(vii) Details regarding the proposed scheme under which farmers can install extra Solar Panels to feed the surplus power to the grid through Net - Metering.

(viii) Need to encourage farmers to come forward and accept this scheme so that all the diesel pump sets may be replaced within a reasonable time frame.

(ix) Need to identify bottlenecks in the implementation of the Scheme and rectify the same by taking into account experience of farmers.

(x) Feasibility of using MPLAD Fund for Solar Pumping Systems Programme.

(xi) Need to explore other countries besides China for import of Renewable Energy Hardwares.

(xii) Need to give boost to Solar Charkha with the help of the State Governments.

(xiii) Need to support R&D and capacity building activities in Renewable Energy Sector.

(xiv) Clarity in policies and regulations.

5. Thereafter, the Members sought clarifications on various issues relating to the subject and the representatives of the Ministry responded to the same. The Chairperson directed the representatives of Ministry of New and Renewable Energy to furnish written replies to those queries which could not be readily responded to, within a week.

6. The verbatim proceedings of the sitting of the Committee were kept on record.

The Committee then adjourned.

Annexure - IV

STANDING COMMITTEE ON ENERGY

MINUTES OF THE TWENTY FIRST SITTING OF THE STANDING COMMITTEE ON ENERGY (2016-17) HELD ON 28TH JULY, 2017 IN COMMITTEE ROOM 'B', PARLIAMENT HOUSE ANNEXE, NEW DELHI

The Committee met from 1030 hrs. to 1100 hrs.

PRESENT

LOK SABHA

Dr. Virendra Kumar - Chairperson

2. Shri Om Birla
3. Shri Bhagat Singh Koshyari
4. Shri R.P. Marutharajaa
5. Shri Jagdambika Pal
6. Shri Vinayak Bhaurao Raut
7. Shri Conrad Kongkal Sangma
8. Shri Malayadri Sriram
9. Shri Bhanu Pratap Singh Verma

RAJYA SABHA

10. Shri Oscar Fernandes
11. Shri La Ganesan
12. Shri S. Muthukaruppan
13. Dr. Prabhakar Kore
14. Shri Shamsher Singh Manhas
15. Shri Javed Ali Khan
16. Smt. Viplove Thakur

SECRETARIAT

1.	Shri S.C. Chaudhary	Joint Secretary
2.	Shri N.K. Pandey	Director

2. At the outset, the Chairperson welcomed the Members and apprised them about the agenda of the sitting. The Committee then took up for consideration the draft Report on the subject 'National Solar Mission - An Appraisal'.

3. After discussing the contents of the Report in detail, the Committee adopted the aforementioned draft Report without any modification. The Committee also authorized the Chairperson to finalize the Report and present the same to both the Houses of Parliament in the current Session.

The Committee then adjourned.