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**No. 283/133/2017-GRID SOLAR**  
Grid Solar Power Division / ग्रिड सौर ऊर्जा प्रभाग

Ministry of New & Renewable Energy (MNRE) has prepared a concept note on Solar PV Manufacturing Scheme to build up manufacturing capacity of solar PV modules, cells, wafers/ingots and polysilicon in India. The same is placed at Annexure-I.

MNRE seeks views of stakeholders on the said concept note.

The Feedback/Views/Comments on the said concept note may please be sent to Shri Rahul Rawat, Scientist-B, MNRE, at (Email: rahul.mnre@gov.in), latest by 31<sup>st</sup> December, 2017.

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To

1. Director (Technical) - NIC, MNRE, for hosting on MNRE website and also for arranging for hosting on the website mygov.in

## Concept Note on Solar PV Manufacturing Scheme

### A Scheme to build up manufacturing capacity of solar PV modules, cells, wafers/ ingots and polysilicon in India

#### **1) Objectives of the Scheme:**

- a) To create end to end solar PV manufacturing capacity in India by way of building up manufacturing capacity of solar PV modules, cells, wafers/ ingots and polysilicon in India.
- b) To strengthen Make in India campaign, so as to reduce the dependency on foreign manufactures.
- c) To make domestic manufactures competitive with international manufactures.
- d) To ensure manufacture of quality solar PV equipment in the country.
- e) To insulate the domestic solar power industry from the vicissitudes of international market.
- f) To use this policy to create skilled jobs, and in domestic technology self-sufficiency.
- g) To convert India from a net importer country to a net exporter country and becoming a global player in solar manufacturing.

#### **2) Background:**

##### **i. Solar Power Mission in the Country**

National Solar Mission (NSM) was launched on 11<sup>th</sup> January, 2010 with the following targets:

- (i) Deployment of 20,000 MW of grid connected solar power by 2022 to be achieved in 3 phases (first phase upto 2012-13, second phase from 2013 to 2017 and the third phase from 2017 to 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.

Further, Government in June 2015 revised the target of Grid Connected Solar Power Projects from 20,000 MW to 1, 00,000 MW to be achieved by

the year 2021-22. Target of 100 GW is to be achieved through 60 GW ground mounted solar projects and 40 GW rooftop solar systems.

Thus, India is one of the biggest and fastest growing markets in the world, with plans of installing additional 90 GW of solar power capacity in the next five years.

ii. Existing solar manufacturing capacity in the country

The present solar manufacturing capacities in India are as given below (as given by Manufacturers of solar cells and modules):

S.No.	Particulars	Present Status of Cell Capacity (as on 31-07-2017)	
		Installed (In GW)	Actual Capacity Utilisation due to stiff competition from imports (in GW)
1	Polysilicon	-	-
2	Ingot/Wafer	-	-
3	Solar Cells	3.1	1.5
4	Solar Modules	8.8	2.0-3.0

Thus, it is seen that the installed capacity is limited to that of cells and modules, and other stages of the manufacturing chain have not yet started in the country. Even this capacity is not being fully exploited because of obsolete technology as the existing capacity is mainly under the conventional technology of multi-crystalline Al-BSF (Aluminium-Back Surface Field) solar cells, which have efficiency limitations. Very few players have ventured into the superior PERC (Passivated Emitter Rear Cell) technology.

iii. Dependence on Import

In light of the ambitious targets set under the National Solar Mission, and the limited manufacturing capacity available, the country is heavily dependent on imports. The present maximum solar cell manufacturing capacity per year is only around 3 GW against an average requirement of 20 GW i.e. 15 %. Balance capacities have to be procured from international market. Energy Security demands that at least 60-70% of the manufacturing capacity should be located within the country.

iv. Reasons for poor domestic manufacturing capacity

Some of the reasons for poor status of manufacturing in the country are as follows:

- (i) The country does not have a manufacturing base for Poly-silicon, Ingots/wafers, the upstream stages of solar PV manufacturing chain, which is a very energy intensive process.
- (ii) Lack of integrated set up, economies of scale & modern technology resulting in higher cost of production.
- (iii) Price of solar equipment produced in the country is not competitive as compared to that of foreign manufacturers, especially Chinese manufacturers.
- (iv) The domestic manufactures have to borrow at higher interest rates, compared to foreign manufacturers, pushing up their cost of production.
- (v) Since the assured market available to domestic manufacturers is limited, they are not able to set up larger plants, making them lose on economies of scales.
- (vi) Present assured schemes under Domestic Content requirement (DCR) schemes are not enough to be able to meet existing manufacturing capacity.
- (vii) Due to bleak future prospects, the manufactures are not motivated towards setting up of higher manufacturing capacity
- (viii) As per industry's views, some of the reasons for poor manufacturing capacity are high cost of land/ electricity, low capacity utilization, high cost of financing, and lack of skilled workforce.

### **3) Present Support System:**

The present support given by the Government for incentivizing greater domestic manufacturing capacity are as follows:

#### **i. Financial support for setting up of solar manufacturing plant:**

Modified Special Incentive Package Scheme (M-SIPS), administered by Ministry of Electronics and Information Technology (MEITY), 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, and units all across the manufacturing value chain are covered under the scheme.

However, the scheme is applicable for all electronics manufacturing and is not limited to solar, with no separate allocation for solar manufacturing.

#### **ii. Support to promote DCR:**

MNRE had initiated various schemes to promote Domestic Content Requirement (DCR). The details are as given below:

<b>Programme</b>	<b>Domestic Content Provision</b>
<b>1. Phase-I</b>	
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
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.
<b>2. Phase-II</b>	
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.
b) Batch-II, Tranche-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.
c) Batch-III (2000 MW VGF scheme)	250 MW is kept for DCR category. Cells and Modules to be of indigenous origin.
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.
e) 1000 MW CPSU scheme	i) 1 Cr/MW for Cells & modules ii) 50 Lacs/MW for Modules
f) 300 MW Defence Scheme	Cells and Modules to be of indigenous origin.
g) Grid connected Rooftop	Only Module needs to be of indigenous origin under MNRE scheme

**iii. Present Status of DCR:**

As on date around 1436 MW has been commissioned under DCR under various schemes of MNRE and around 1000 MW are under construction stage.

In view of WTO ruling, the provision of DCR has been stopped in future tenders which are not for Government/ PSU manufacture. Domestic manufacturers are solely dependent upon proposed CPSU scheme and Defence scheme, which has a target of only 300 MW.

**iv. Impact of WTO decision on supporting DCR in solar manufacturing:**

- a) Due to recent ruling by WTO on DCR, 5 solar projects of capacities of 450 MW were cancelled under VGF scheme.
- b) Around 400 MW solar projects under DCR under VGF scheme which were scheduled for tendering, could not take off.
- c) Future DCR solar projects can be set up only by Govt. organisations and not by private developers.
- d) Domestic solar manufacturers are discouraged in taking any initiatives for any expansion in existing capacity due to low market sentiments.

**4) Proposed support to Solar domestic manufacturing:**

It is proposed to support manufacturers of solar cells and modules to expand and upgrade the existing facilities or to set up new manufacturing facilities to enable the domestically produced solar product to be competitive with international solar products. The objective is to eventually have the entire spectrum of manufacturing – from poly-silicon to modules. The policy proposes a direct financial support of more than Rs 11000 crores and a large indirect support by way of concessions.

The different components of support proposed are as follows:

**A. Revival of DCR through expansion of CPSU scheme**

In the light of successful implementation of the 1000 MW CPSU scheme, it has been proposed to have an additional CPSU scheme of 12000 MW. This would have an assured DCR component, allowing the domestic manufacturers an assured market, enabling them to be secure while they scale up the capacities.

**B. Ensuring Quality Specifications for solar cells and Modules and drive for improving quality of solar cells**

To ensure that cheap low quality imports do not crowd out domestic manufacturers, the Government has brought out a new quality order for solar cells and molecules, and is setting up an infrastructure for quality testing. This will also ensure that the domestic manufacturers focus on quality from the beginning itself, ensuring that their products are competitive in the global market.

Further, to encourage continuous improvement in quality, the DCR content requirement would be reviewed every year to earmark part of the DCR for higher quality requirements also. That is, Government, through a notification every year may earmark a certain component of DCR, say 10%, of the DCR, for cells which are of higher quality than the minimum quality prescribed. The percentage to be earmarked, and the level of quality to be prescribed would be increased every year so as to ensure that overall quality of the products increase over time.

**C. Restructuring DCR content so as to encourage greater backward integration of the manufacturing process**

It is seen that the existing manufacturing capacity is focussing more on the modules, and to some extent on the solar cells. The earlier stages of manufacturing are totally absent. It is proposed to encourage gradual shift in the production capacity to the entire chain of manufacturing by earmarking certain components of DCR to earlier stages. This earmarking would be gradually increased over time so as to gradually encourage manufacturers to go for backward integration. For this purpose, following steps would be taken:

- a) In rooftop DCR scheme, as per the present guidelines, it is enough to manufacture modules by importing cells to satisfy DCR norms. To encourage cell manufacturing, we may provide that in the year 2018-19, 40% of the module under DCR should be manufactured from domestically manufactured cells. This percentage may be increased by 20% every year, so that by the year 2022, the entire DCR component of rooftop should have cell and module both manufactured domestically.
- b) Further, to encourage setting up of earlier stages of the manufacturing process, it would be additionally mandated that from the year 2019-20, minimum 20% of the DCR Modules should be made from domestically manufactured wafers. This earmarking of

DCR content to include domestically manufactured Wafers will be applicable to Tenders under MNRE's Schemes, issued from the year 2019-20. Further, the percentage requirement of DCR based on domestically manufactured wafers will be increased in blocks of 20% every year thereon.

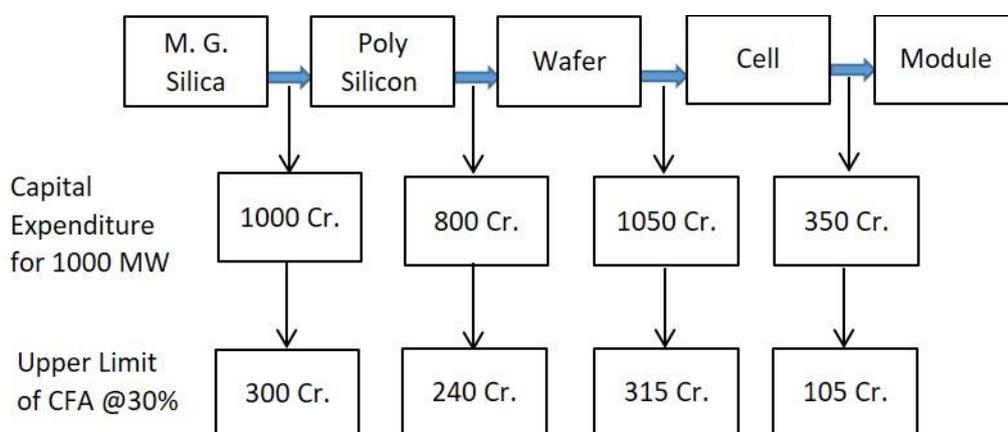
- c) Poly-silicon is the most capital & energy intensive supply chain, and the domestic capacity may take some time to come up. Hence, while it is proposed to have a similar earmarking of DCR to cover domestically manufactured Polysilicon also, this would be made effective from the year 2020-21, with the DCR content having an earmarked component of 20% from that year. This earmarked component for poly-silicon would be increased in blocks of 20% every year thereon.
- d) The above categorisation is independent of the categorisation referred to in Section B relating to categorisation for improving quality.

#### **D. Capital subsidy for new capacities/ upgradation of capacity**

The solar module industry, from silica to module, is a very capital intensive industry. For the exact capital costs of various stages of manufacture, DIPP's Report on "Attracting Investments for Large Scale Solar Projects with Manufacturing under Make in India" of Feb. 2016 formulated under DIPP's letter dated 25.02.2016 to Cabinet Secretary was referred. Since considerable time has passed since the said Report was made, discussions were also held with industry stakeholders and a report by Indian Chamber of Commerce was also referred. The exact capital costs of various stages of manufacture, as given in the study report dated 7<sup>th</sup> September 2017 of Indian Chamber of Commerce, in association with ICF Consulting India Pvt Ltd and Shakti Sustainable Energy Foundation are given below:

<b>Stage</b>	<b>Description</b>	<b>Capital expenditure for 1 GW (\$ million)</b>	<b>Capital expenditure for 1 GW (Rs crores @ conversion rate of Rs 65 per \$, rounded off to nearest 50)</b>
I	M.G.Silica to Poly-silicon	157.9	1000
II	Poly-silicon to wafer	125.9	800
III	Wafer to Cell	165.3	1050
IV	Cell to Module	53.4	350

It is proposed that Central Financial Assistance (CFA) in form of Capital Subsidy of 30% should be given for setting up/ upgradation of domestic manufacturing capacity in the country. This capital subsidy should be for following stages of production, subject to upper limits as indicated below:



It is proposed that at the initial stage, the policy will target creation of manufacturing capacity of 10 GW over a period of 5 years, with focus both on integrated silica to modules package and also for intermediate standalone packages or combinations thereof. Thus it will have the following components:

- Component D1: 2 GW from Polysilicon to Modules
- Component D2: 3 GW from Wafer to Modules
- Component D3: 1 GW from Polysilicon to Wafer
- Component D4: 1 GW from Cell to Module
- Component D5: 1 GW from Wafer to Cell
- Component D6: 1 GW from Polysilicon to wafer
- Component D7: 1 GW from Silica to Polysilicon

#### **E. Interest subvention to upgrade/expand existing manufacturing capacity.**

It is proposed that in cases where domestic manufacturing capacity is being set up without taking recourse to capital subsidy, an interest subvention of 3% shall be provided to manufacturers setting up new capacity, for loans taken through nationalized banks. This interest subvention will be available for manufacture of poly-silicon, wafer and cells. The total amount of interest subvention should in any case not exceed 30% of the capital cost and the limits of subsidy for each stage prescribed under Component D.

The scheme would be operated by IREDA, with the total capital available for interest subvention in the year to be indicated at the beginning of the year, when IREDA would call for EOIs from potential manufacturers on the interest

subvention required by them in the year and the subvention rate of interest expected by them, subject to a limit of 3%. The bidders giving the lowest subvention rate would be selected. If any capacity for any year is left after this exercise, IREDA may continue this exercise till the limit is exhausted. Any balance limit in a year can be carried over to the next year.

**F. Direct Support to select PSUs**

Historically, it is seen that it is the PSUs who have acted as leaders in capital intensive industry, and it is only later the private sector starts participating when the eco system is ready. Thus, so as to create such an eco-system and for demonstration effect, 4 PSUs (say CEL, BEL, RIEL, BHEL, NTPC, etc) will be supported to setup 1 GW each poly-silicon to module manufacturing facility. The PSUs would be selected based on the basis of minimum support required from the Government by them, subject to a maximum of 30% of the capital cost.

**G. Fiscal Incentives in the form of Exemption from Customs Duty on Import of Capital Goods**

It is proposed that capital goods required for setting up solar manufacturing facility, shall be exempt from customs duty.

**H. Support towards use of renewable power**

The solar manufacturing process is a very energy intensive process, with the following as the indicative energy cost for each stage of production (as per report of Indian Chamber of Commerce, in association with ICF Consulting India Pvt. Ltd. and Shakti Sustainable Energy Foundation):

<b>Description</b>	<b>Energy Cost (\$ mn/ GW)</b>
Silica to Poly-silicon	36.0
Poly-silicon to Ingot	9.6
Ingot to Wafer	7.1
Wafer to Cell	3.9
Cell to Module	0.9
<b>Total</b>	<b>57.1</b>

If we take one unit of power as 0.1 US \$, the total power requirement would be 571 million units. For supplying this power, we would need a dedicated 80 MW thermal power plant functioning at 80% PLF.

To offset this high power cost, it is proposed that the solar manufacturing unit would be allowed to set up a solar power plant of twice the required capacity. It would also be allowed to bank the surplus production in the day into the grid and draw down the same power in the night.

The above policy will also apply to floating solar power plants in which the intending manufacturer can set up floating solar power plants at designated reservoirs in accordance with the above condition.

Any manufacturing plant availing of this facility would not be eligible for any other incentive such as capital subsidy or interest subvention.

#### **I. Support from State Governments:**

Those states would be the preferred destination for setting up manufacturing units under the subsidy/ interest subvention schemes, which:

- Commit to Supply Power for manufacturing at APPC + 5% rates.
- Provide Land, preferably at, or near Ports, at preferential rates.

#### **J. Technology Up-gradation Fund (TUF) to be created applicable for solar sector.**

Solar cell manufacturing is an area which requires constant R&D and up-gradation of technology. Our existing manufacturing units are not able to bring any technology up-gradation as they are already kind of stressed companies on account of inadequate order chain.

Ministry of Textiles has a scheme for providing capital subsidy (% of Capex with a ceiling) for up-gradation of technology to be used in their sector. On same ground, MNRE will also bring out a scheme for technology up-gradation of the existing units. The support will be in form of capital subsidy or interest subvention, on the same principles as given for new capacity being suggested above under Components D and E, subject to the financial limits given therein. Separate guidelines would be issued for the same, including what would constitute Technology Upgradation, Authority to certify Technology Upgradation, method of creating and maintaining the Fund, etc.