Summary report of the roundtable discussion on promoting Solar Rooftop PV and solar PV manufacturing organized by Prayas Energy Group & Pune International Centre in Pune on 6th February 2013.

Background:

India is on the cusp of a solar energy revolution. The Jawaharlal Nehru National Solar Mission (JNNSM) was instrumental in kick-starting the large scale development of solar power in the country that has resulted in an installed capacity of 1446 MW in the country (as on Feb 28, 2013). There has been a dramatic reduction in cost of solar PV modules leading to very competitive solar tariffs of roughly Rs 7/kWh in 2012 at the end of Phase-I bidding for large-scale solar projects of the JNNSM. The Phase - II of JNNSM promises to be more ambitious both for large scale solar PV farms as well as rooftop solar PV deployment. This presents an opportunity to learn from the phase-I experience and improve both in terms of policy formulation and effective and streamlined implementation of the same.

Rooftop Solar PV: While the main thrust of JNNSM initiative has been on large-scale gird-connected solar PV power plants, a revolution in solar electricity in India will happen when it touches millions of individual users by Rooftop PV (RTPV) electricity generation. RTPV is not only becoming economically competitive but it also offers substantial benefits in terms of reducing T&D losses, providing peaking supply of power, improving tail-end voltages, increasing energy security, no land requirements and creating local jobs. However rooftop deployment has not yet taken off in India due to a lack of an enabling environment. A national policy of 'net-metering' to encourage in-situ generation primarily for self consumption, coupled with the provisions of grid inter-connection and energy banking facilities from the local utility, is highly desirable in the country. Net-metering approach to promoting rooftop deployment is already very successful in many progressive countries and it is certainly a better approach to subsiding projects through capital subsidies. Recent estimates indicate the potential of RTPV to be between 20-100 GW. The opportunity and likely gains for the country are quite substantial.

Domestic PV manufacturing in India: As per the JNNSM phase – II draft guidelines, India already has a base of 1932 MW and 848 MW of module and cell manufacturing capacity respectively. However with regard to the poly-silicon ingot and wafer production (the steps before cell and module manufacturing), the Indian capacity is a meagre 15 MW. With a view to promote Indian PV industry the JNNSM phase–I guidelines required that all installations from the batch-1 would need their modules to be made in India and for batch – II, even the cells were to be procured from India. However this did not really achieve the stated objective, since the country did not have enough thin film manufacturing capacity, it was left out of the ambit of the domestic content requirement leading to large scale import of thin film modules. The phase-II guidelines also propose to have some form of DCR with a view to promote Indian PV manufacturing. In addition anti-dumping investigations are also underway at the DG (Anti-dumping & Allied Duties, MoC). This is certainly a vexed issue with no easy answers. On the one hand is the possibility of low cost solar power (with cheaper imported modules/cells with additional access to low cost debt) and on the other is slightly higher solar costs but with incentives and protection of the domestic module and cell manufacturing industry. While the JNNSM has a laudable objective of promoting the solar manufacturing industry within the country, one needs to objectively study whether a DCR requirement would be an adequate response in the current global dynamics of the solar PV sector which is of over-supply. The existing solar manufacturing set-ups in the country have a number of inherent disadvantages which make

their operations far more sub-optimal than new industry set-ups and hence difficult to compete on price. These include continued reliance of imported poly-silicon ingots and wafers, domestic small-scale non-integrated set-ups not being able to compete with large-scale integrated set-ups abroad.

It is in this context that Prayas Energy Group (PEG) and Pune International Centre (PIC) jointly organized a round table discussion on 'Promoting Rooftop Solar Electricity Generation and Domestic PV Manufacturing' on 6th February 2013 at the MCCIA towers in Pune to enhance the understanding of the challenges and discuss issues of large-scale adoption of Rooftop PV and domestic PV manufacturing. The discussion was divided in two parts - the first session was devoted to discussing the emerging sector of Rooftop Solar PV (RTPV) electricity while the post-lunch session was entirely focused on issues surrounding domestic photovoltaic (PV) manufacturing in India. The objective of this roundtable was to take stock of this dynamic and fast paced sector and to provide a platform for sharing emerging issues and consolidate suggestions on the way forward. The roundtable was attended by over 65 professionals from different States, representing different stakeholders including, academia, developers, consultants, utilities, financial institutions and NGOs.

Session 1: Rooftop Solar PV; Chairman: Shri Ajit Nimbalkar, former Chief Secretary of the Govt Of Maharashtra

The roundtable began with **Mr Amitav Mallik, Founder Member, PIC** extending a warm welcome to all participants and speakers. He began by giving a brief introduction to the important and interesting topic at hand, namely solar PV. He noted the growing importance of solar energy in particular and that it would have a significant bearing on the future energy system. Given the expected grid parity in the near future and considering the advantages of distributed solar, the market for rooftop solar could grow significantly under the right enabling circumstances making it a game changer. While the Ph-1 of the JNNSM concentrate on MW scale projects, Ph-2 should keenly promote distributed solar, especially RTPV. A net metering approach would be possible, but the issues and challenges need to be squarely dealt with. The era of cheap energy is over and an age of consequences is upon us wherein energy efficiency and renewable energy is imperative. Hence the purpose of the roundtable is to collectively debate and discuss this important topic and come up with innovative solutions and actionable recommendations.

Mr. Ajit Nimbalkar, Session Chair: He began by noting that the country's energy needs are increasing leaps and bounds due to various reasons. While presently these are met through conventional sources, renewables can play a serious supplementary and synergetic role. As costs come down, renewables, particularly solar will potentially become a mainstay future energy source. It can also overcome various socio-environmental and economic limitations of conventional sources. Mr Nimbalkar hoped that grid parity will come sooner than later with the backdrop of sharply reducing prices. With regard to RTPV, one needs to go about rather systematically. He noted that a few agencies will play an important role in RTPV. The utility interface is important since they will have to absorb this power. However given their various competing and immediate considerations, solar may not be their priority and hence they may not play a big role. The Regulator who will decide the price at which solar may be procured also has a role in promoting RTPV. However the biggest and the most important role is that of the state government. They are responsible for long term policy formulation; with the right incentives and policy directives to the utilities and regulators, solar can be effectively promoted. Support from GoI in the form of subsides and

other incentives would also go a long way. Civil Society Organisations and NGOs should play a role in creating awareness in the community, further interact with and press the State govts for better implementation of policies to overcome practical difficulties. Mr Nimbalkar concluded by Conf is only first step, send recommendations to Govt and follow up.

Shri Gireesh Pradhan, former Secretary, Ministry of New and Renewable Energy (MNRE) delivered the keynote address. He noted that the image of renewables has changed significantly in the last two-three years and now is no longer seen as an insignificant part of the power sector. He explained the progress of renewable energy (non large-hydro) in the country which forms a significant and growing part of India's energy mix now standing at 27 GW (12%) in terms of installed power generation capacity and 6-6.5% in terms of actual generation. The growing importance of renewables is also seen from the 12th five year plan budgetary outlay of 19,000 crores as opposed to 4,000 crores in the 11th plan. Given the high electricity shortages and low per capita consumption in India, the need to supply power is dire indeed. Hence the outlook to RE is quite different in India, it is not for power capacity replacement as it is in the West, but more as a means to provide access and energy security. Earlier solar power was peripheral mainly due to its high costs, however things have changed a lot with the launch of National Action Plan on Climate Change (NAPCC). Of the 8 missions under the NAPCC, the National Solar Mission has been the most successful in its impact. The reverse bidding has been successful in reducing tariffs and the long term targets are helpful towards greater accountability.

Six major states already have a solar policy. The focus of electrification should now equally be on off-grid solar along with grid-connected projects. Off-grid allows providing access in areas needed without T&D losses. Solar radiation is widely available and decentralized solar applications should be promoted based on their local relevance. Rooftop PV may not be priority in all states, like in case of Bihar – solar pumps may be more relevant at this point in time. Rooftop Solar PV (RTPV) should be considered by states that are more urbanized. While RTPV is a promising and emerging sector, one needs to be systematic and cautious while moving forward. The role of the Utility would be crucial in promoting RTPV and hence at this early stage the entire process should be kept as simple as possible. A clustering and aggregator approach should be experimented with to reduce transaction costs and reduce interface with utilities. Initially larger rooftops in commercial areas should be the focus areas. One could also one look at charging existing inverters through solar panels as an option. For large RTPV projects/programs (with aggregated capacity) it is better to discover tariffs through bidding rather than the Feed in Tariff route. etc. With regard to net metering, Mr Pradhan suggested that it would be better to have 2 separate meters to avoid complexity. Pilot projects should be encouraged to understand ground practicalities and way forward. The Ministry already has initiated a pilot program for 10 MW in 6 cities in the competitive bidding route.

With regard to solar manufacturing, Mr Pradhan noted that for Ph-1, the JNNSM had a domestic content requirement for c-Si but not for thin film (since there was only one thin film manufacturer in the country) which resulted in most projects opting for thin film with cheap credit available along side. Off-grid solar already has a domestic content requirement for panels. It remains to be seen how far domestic content issue can be taken in Ph-2. Options for support could include cheaper credit to Indian manufacturers, tax waivers, trying to convince companies to invest in India. In general, domestic content rules would be difficult going forward if not for the purpose of direct Govt procurement. Finally Solar needs to be looked

at as a strategic source and hence ideally manufacturing in all its stages should have presence in India, but given its energy intensive nature it may not be very attractive in India.

Following the keynote address, there were four presentations:

Dr. S. P. Gon Chaudhari, former Director, WBREDA, began by noting that there are three types of RTPV systems in India. a) Stand alone, b) stand alone cum grid interactive (India specific arrangement due to the erratic power supply situation) and c) fully grid connected. While the first model does not need any regulatory and Distribution Company (DISCOM) permissions, the last two types of arrangements need such approvals. Unorganized and unplanned growth of Indian cities has implications on site selection since shadows can make an existing generating rooftop unit unviable, hence site selection should be done carefully. RTPV is also ideally suited to meet air conditioning loads. Secondly, only high efficiency cells should be used in RTPV to save on space requirements. In his opinion, RTPV will shortly become a mass program. Mr Gon Chaudhari then shared with the audience the experience of RTPV in West Bengal which was the first state to pilot such a program in the net metering route (in standalone cum grid interactive configuration) in 2007. One of the first projects was a 7.5 kW system on a college campus with net metering and a formal PPA with the local Utility. Getting the DISCOM on board to promote RTPV is a significant challenge. Given that thousands of consumers would have opted for RTPV, making the program difficult to manage, WB thought it better to start with institutional systems and Govt building. In WB, utilities provide a net metering connection to institutions, government housing and government offices for 2-100 kW systems. Consumer tariffs are much lower than solar costs and hence net metering can pick up only when solar PV achieves grid parity. Presently solar costs are higher than consumer tariffs in WB, hence negotiations are on requesting for a higher price when power is exported to the grid.

Dr.Tobias Engelmeier, Founder and MD of the consultancy, Bridge to India, explained various rooftop solar business models and their associated benefits and risks, not only to individual consumers but also to the country as a whole. For India, RTPV can take some stress of distribution grid, reduce diesel subsidy burden, improve local air quality (diesel replacement) and increase energy independence. RTPV has a very important role in future. The aim should be to try and make business models with some fundamental logic for the investor and with minimal Govt support so as to work in the long run. The key challenge is to make them bankable. Reduction of legal, regulatory and financial risk is crucial to increased adoption of RTPV. The focus should be on supplying quality power and not just on selling or putting up of rooftop systems. Predictable power price over long run acts as a hedge against rising power tariffs. In some places in India, one can already lower the cost of electricity through adding solar and replacing grid power, not just diesel based power. Contrary to expectations, green power does have some added value with consumers, sometimes in the form of marketing value. With regards to business models, they are mainly of two types, an Operating expense (Opex model -selling electricity) or a Capital expenditure (Capex model - selling the system). Both have their advantages and disadvantages. Capex involves a one time payment with a possible O&M contract. The drawback is that the consumer may not be able or willing to do it since it is not the core business. While the Opex model overcomes the liquidity challenge for the consumer, someone has to take the risk/bet of payments over the next 20-25 years for the upfront cost of the project. Hence there are some contractual enforcement and legal risks associated with the Opex model. One way of bringing down risks (and hence the costs of those risks) is to have a portfolio of projects to

average out the risks and get better financing. Another could be to have an alternative electricity sale option as a backup. Reducing all these risks, including the power price risk increases predictability and lowers finance risk and increases bankability and thus leads to scale. RTPV is very successful in Germany because the risk is so low on the regulatory or the payments side that banks are lending upto 100% of debt.

Mr. Ashwin Gambhir, Senior Research Associate, PEG presented the findings of a recent Prayas publication on RTPV. Solar has been in the discussion off late mainly because of solar PV prices coming down drastically and consumer electricity tariffs going up. Additionally RTPV has significant benefits like supply of peaking power, lesser system congestion, better tail end voltages, lower T&D losses etc. High-end consumers in many cities are already paying tariffs close to solar power generation costs. Additionally there are various challenges in determining appropriate Feed in Tariffs (FiTs) along with the associated governance and M&V challenges, meter tampering etc. Utilities can also get relatively cheaper solar power (compared to RTPV) through MW scale projects for their RPO compliance due to economies of scale. Hence instead of the FiT route net metering is an ideal solution for RTPV promotion as viability is determined by underlying energy charges and electricity usage. Net metering should incentivize self-consumption, and only the excess consumption should be pumped into the grid. The two things expected from the Utility are – energy banking and inter-connection at the LT level. This helps in getting rid of battery, reducing costs and environmental concerns. Additionally RTPV projects should not be allowed to avail the RECs since RECs were introduced to address the unequal geographical distribution of resources which is not the case for solar PV. Moreover it creates windfall profits for developers/investors. For Indian conditions net metering makes more sense taking the future into consideration wherein grid parity is expected in most of consumer segments.

The Indian approach towards solar differs from the West. For the West it is mainly about capacity replacement, while in India it is much more an issue for access. Hence solar should be compared not just with the average cost of power but with the marginal cost of power, thus freeing the cheaper power for low end consumers. Therefore many states have come out with policies promoting RTPV, West Bengal and Karnataka with a net metering policy, Gujarat opted for the FiT route, TN has announced a policy with GBI support but operational details are not yet finalised and finally Kerala is promoting battery based (with capital subsidy) off-grid rooftop plants. The Solar Energy Corporation of India has also come out with a program of supporting RTPV in various Indian cities through a process of competitive bidding.

Instead of capital subsidies the RTPV net metering policy should focus on removal of procedural hurdles and other barriers, in order to facilitate the quick adoption and deployment of RTPV systems. The Forum of Regulators (FORs) should recommend a set of standard guidelines for banking, metering, interconnection and other agreements. MNRE should come out with a national net metering policy and CEA should urgently notify the grid interconnection standards. Appropriate incentives to boost the initial momentum can include creating avenues for low-cost financing and encouraging innovative business models. Net-metering is ideally suited for India, as it is socially equitable, economically viable and environmentally sustainable. Hence State level policy support will be very important to overcome initial implementation hurdles. Starting with high-end electricity users who can well-afford the initial incremental high cost, innovative approaches must be evolved to make RTPV attractive and affordable to

all users. The city of Pune can undertake a pilot net metering program in coordination with the distribution utility, the state nodal agency and the municipal corporation (dubbed the "Green Pune" model). As per our rough calculations Pune has a significant potential and can yield in substantial energy savings, thus taking steps towards new green Pune model.

Finally **Mr. Chinmay Kulkarni from Janwani** shared with the audience his views on the possibilities of a community approach to rooftop solar. Mr Kulkarni noted that net metering could create some perverse incentives. Instead, clean power generation can be maximized by issuing RECs to RTPV participants coupled with the enforcement of RPOs. The main question under consideration is, "how can RTPV be made affordable and effective for everyone?" Solar undoubtedly has its benefits i.e. lesser emissions, reduced battery usage, improved energy ROI etc. However while the advantages of net metering are well documented we need to focus on the challenges moving forward. The main problems include governance and M&V challenges at each connection point. Net metering also creates distorted incentives like it favours only high end consumers and excludes consumers who want to install solar but don't have consumption high enough for solar to make economic sense. The other misaligned incentives include lapse of rollover credits after the year, system sizing according to self-consumption might lead to less usage of available space and capital. Taking all these factors into consideration a community solar approach can be best suited to address all the concerns of various stakeholders. In a community solar project, ownership and benefits are shared according to the capital invested in the project. There is a single meter, the system is sized properly and negotiating with the utility is less of a problem. It also ensures equity, good economic returns and most importantly public participation. To make this work it is necessary to ensure a market for energy generated, and the REC route is most suited for it. If RPOs are enforced, the project developer is guaranteed returns on his investment. Community RTPV has several advantages and is the best suited for Indian conditions (economically and for efficiency and equity reasons as well) and hence should be explored systematically.

Following the formal presentations, the chairman of the roundtable, Shri Ajit Nimbalkar put forward his thoughts on the way forward for RTPV. Mr Prashant Girbane, Director, PIC briefly summarized the discussions till then, thus concluding the first session. This was followed by an in depth discussion by all participants and speakers which highlighted various perspectives on the issues and challenges at hand. The idea of a Green Pune Model for RTPV was strongly supported. All in all, one could safely say that the mood on RTPV is very upbeat and the sector is sure to grow very strongly in the coming years.

Session 1: Discussion Summary

- RTPV has significant consumers benefit due to higher supply security and price stability in the face of rising power prices.
- The experience from the innovative RTPV policy experiments at the state level will assist the ongoing evolution of an effective RTPV strategy for the country. Regular dialogues of this kind should be continued to advise the policy makers.
- It is important to co-opt the distribution utility in the process and to approach rooftop solar programs in a cautious and systematic manner to ensure long term viability. Given the unhealthy fiscal condition of utilities, it would be wise not to places additional burden on their finances. It would also be beneficial to

minimize the number of interfaces to the utility that could potentially lead to conflicts. For instance, in West Bengal, a utility was reluctant to participate in an RTPV system due to the large number of consumers it would have to deal with. A compromise was arrived at and the program was extended only to institutions, government housing complexes and government offices.

- A key challenge to the success of RTPV is making it financially viable while minimizing dependence on local government and utilities. Solar PV costs are roughly 1 lakh per kilowatt before subsidy making the projects more viable than ever before. Even so, availability of credit and insurance is important.
- In order to maximize clean power generation and since there are no incremental generation costs (such as fuel costs), RTPV generation should be considered as “must run”. This will also incentivize greater RTPV adoption.
- There is an additional risk to RTPV generation due to the impact of changing urban landscape on continued availability of quality insolation. This risk can be minimized by using software tools available to undertake a proper study of the surrounding area and determine the best location. Shadows can become a serious issue with RTPV installations.
- Incentives for RTPV should be more efficiency and performance focused rather than upfront concessions like capital subsides.
- Quality control for PV systems and availability of trained technicians will be crucial to the success of RTPV. A large pool of technicians needs to be trained to support installation, commissioning and operation of rooftop solar PV systems. National Centre for Photovoltaic Research and Education (NCPRE) at IIT Mumbai and International Centre for Application of Solar Energy Technologies (ICASET) at IIT Jodhpur offer good training programs. Likewise, Industrial Training Institutes (ITIs) in Rajasthan have been offering courses. This needs to expand further. More awareness must be raised amongst the architect and developer community to tackle most issues at the design stage itself.
- Crystalline silicon modules are preferred to thin film modules due to better efficiency in RTPV applications with scarce roof resources. Building Integrated Photovoltaic (BIPV) systems may not be suitable for India.
- System testing of modules should be mandated in order to improve confidence of investors. MNRE could define standards along the lines of the Global Approval Program for Photovoltaics (PV GAP) while Standardization Testing and Quality Certification (STQC) Directorate under the Department of Electronics and Information Technology could provide the certification. Availability of standardized kits is also likely to help deployment. There is urgent need for harmonized standards in RTPV.
- While there was some skepticism expressed with respect to extent of availability of rooftops given their complementary uses, there was broad acknowledgement that rooftops are extremely under-utilized with respect to their solar electricity generation potential. Also the use of rooftop should be in a more holistic manner. Since conversion of solar energy to heat is more efficient this demand must be appropriately catered too with solar heaters as opposed to the in-efficient way of doing it by solar electricity.
- Grid stability is a challenge as well as an opportunity with RTPV. While the infirm nature of renewable energy is often cited as a challenge, recent studies have shown that the grid can absorb up to 20% infirm power in markets like the US. In addition, solar power is not as infirm as wind and it helps improve tail-end grid stabilization through voltage and reactive power support. Ensuring proper technical handshake and use of good quality inverters are critical to prevent grid interconnection issues. At the LT level voltages can vary from 180 to 240 V and inverters should be capable of handling these grid conditions. Solar power can

be made firmer by considering more reliable storage technologies like water storage and not batteries. The cost of interconnection for RTPV is very less and present day quality inverters do a very good job at it.

- For lesser cost and simplicity of regulation, two meters should be used, one for incoming and the other outgoing electricity, instead of one bi-directional meter. It gives insights into solar generation and demand side management. Whatever the metering solution, however, electricity generated should first be used locally such that only surplus goes to the grid.
- A "Green Pune" rooftop model was proposed at the roundtable. RTPV will reduce the peaking load demand of the city and ensure more reliable electricity supply to the city of Pune along the lines of the current Pune model based on backup diesel generation. A pilot net metering RTPV program could be undertaken in coordination with MSEDCL (distribution utility), MEDA (state nodal agency) and PMC (Municipal Corporation). There was enthusiastic support for the idea and it was suggested that similar discussions be held going forward to review progress and discuss policy and implementation issues.
- RTPV system costs are less than 1 lakh/kW without subsidies. The Finance and banking sector is critical to the success of RTPV, consumer financing should be made available for RTPV. The banking sector needs more sensitization on this issue.
- An energy banking facility with the utility will help overcome the issue of wasting RTPV electricity on weekends or holidays when there is not enough immediate local load demand.
- As renewables make up an increasing share of the electricity generation mix, RTPV will also have a role to play. Large scale private sector investments will drive this sector. An issue not discussed in detail, is the contribution of coal and other fossil fuel imports to fiscal deficit. RTPV can help in this regard in a small way.
- There is a need for a new thinking by way of shifting from centralized to decentralized generation of which RTPV is an excellent example and should be strongly encouraged.

Session 2: Domestic PV Manufacturing, Chair: Mr Pradeep Bhargava, Founder Member, PIC and chairman, CII Western Region.

The chairperson for the second session, **Mr Pradeep Bhargava** began by noting that given the fiscal issues faced by the government, any manufacturing policy should depend as little as possible on financial assistance from the government. It is key to understand the competing interests at stake here. On one hand is the need for cheap electricity; especially for sectors such as agriculture (which could be possible with cheaper imported solar modules) while on the other hand there is a need to incentivize solar manufacturing in the country. Policy directives will depend on which of these interested need to be safeguarded in the long run. The government has a lot of important issues to cater to and hence we should aim for minimum support from the government and dispassionately address how long can we subsidize / incentivize the solar power in the larger interest of the country.

After the opening remarks by the chairperson, the keynote speech was delivered by **Mr. K Subramanya**, ex-CEO of Tata BP Solar. Mr Subramanya began by noting that several issues are faced by the solar manufacturing sector in India due the high capital intensive nature of the sector along with the lack of an enabling environment as well as strong processes and technical know-how needed to compete internationally. He pointed out the various strategies such as premium on FiTs, domestic content

requirements etc used by other countries (including Canada, Japan, Turkey, France, Italy) to foster local solar industry development. This international experience shows how these measures brought unexpected results and regulations failed with regards to the achievement of initial envisaged objectives i.e. not being able to make the industry competitive to foreign markets and dependent on support for survival. Some of these policies may have violated international trade agreements and resulted in higher solar costs being passed on to consumers. As a result of this some players get unfair advantage, some technologies get unnecessarily preferred over others, poor technology gets chosen, transparency is compromised etc. Before deciding on policy matters related to solar manufacturing, the country needs to examine its strengths and weaknesses and in that light decide which products to source locally, what should be the metric to measure local content, set up processes to collaborate effectively and share risks and innovate together and develop local capability over time. It would be prudent to learn from the experiences in manufacturing from other markets and industries. The Indian solar industry needs improved manufacturing and human capital, good M&V practices, trained professionals and acceptable system costs. Solar is a great job creation resource but minimum value addition happens along its value chain. So we must focus on our strengths and competiveness and after a good understanding of the value chain, can decide on a realistic premium for the local production. Solar is a long term sector and fly by the night developers and manufacturing units should not be encouraged. This will ultimately damage the industry in the long run. While frugal innovation for which India is famous is certainly possible, it should not be taken to atrocious levels by compromising quality of workmanship and seeking products from distressed companies. We need solar manufacturing backed by R&D to take on global competition. The India solar industry also needs to effectively communicate with the Ministry on various issues.

China produces 70% of the global PV requirement and consumes only 33%. This has been possible only due to the favourable ecosystem that supports and promotes China's aim to be a global leader in solar manufacturing. This includes low cost finance at 4-5%, heavy support for reverse engineering, export subsidy, entrepreneurship speed, scale (all companies put together in India are possibly smaller than some single companies in China), use of IPOs to raise money, good technical innovation, patent filing incentives, raw material availability in a small radius and finally the determination, urgency and pride to be the best. The JNNSM is a very important mission announced by the Prime Minister but it is not taken with utmost seriousness by many bankers. India still has to import silicon as there is no critical mass of producers in the country and the cost of electricity (which forms a large input for solar manufacturing) for industry is very high in India.

Most of our technology is outdated, and we heavily reliant on imports. States could come out with their own solar manufacturing policy. They can have a fund to modernize the current solar set ups and not just to subsidize industry. Medium and Small scale industry is key to the country's growth and can contribute effectively through the solar sector.

Domestic content requirement made sense when the solar panel costs formed a major portion of the cost of solar power. However with the drastic reduction in panel prices, that is no longer the case. It would be prudent to focus more on the BOS systems which would increasingly form a larger part of the total costs of the solar power.

Discussion:

Neither China nor Germany have had unqualified success with solar PV manufacturing. Many German companies have closed down and many Chinese companies are losing money significantly. Is that a model that India wants to follow? It is important to step back and ask why India needs domestic content requirement in solar PV. Is it in anticipation of future with hitherto unknown applications? India is a key market for the future and there is a dire need for local knowledge and an approach towards innovation. The Indian approach thus far has been slow and steady, more oriented towards service with a balance of imports and local industry.

Many states have come out with their own solar procurement policies, none of them having the DCR. Increasingly state promoted deployment will become the mainstay of solar power development in the country. In the long run, the price of solar power would drive the industry and nothing else. We have already seen case of Indian solar PV manufacturers who are setting up solar power plants based on imported modules. Costs are the ultimate driver. In the future, Indian manufacturers would have to compete with the global industry to survive and hence the issue of a sunset clause for DCR also needs to be studied. Therefore only a DCR may be an inadequate response for incentivizing setting up of PV manufacturing in India. A far more long term and integrated view (keeping in mind global sectoral dynamics) needs to be evolved and serious industry players backed by latest technology and R&D with a focus on innovation needs to be incentivised through facilitating setting up of an eco-system of solar industries. Such a strategy needs to be evolved in synergy with industrial and manufacturing policies. As a first step, MNRE should come out with a status report on the SIPS incentive which was on offer earlier for setting up of large solar manufacturing bases and reasons as to why it was not utilized. New incentives which would allow setting up of large scale integrated PV plants in India need to be put in place to enable domestic manufacturing sector to compete with international competitors.

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