

## **Recommendations for National Solar Mission (NSM)**

**Prayas Energy Group**

5<sup>th</sup> November 2009

We welcome the NSM's intentions to promote solar energy in India. We feel (1) that NSM has to be seen against the backdrop of overriding national goals of equity and development and (2) it should echo India's international stand in climate negotiations – namely that the rich should pay for mitigation and technology development.

Considering the large public subsidy that India is willing to provide for solar (Rs 90,000 crores over two decades, equal to 0.1% of GDP per year today) in spite of the fact that India has little 'responsibility' as well as 'capability' for GHG mitigation and the fact that some of the Annex-I countries are not even proposing to pay 0.05% of GDP towards their responsibility towards international mitigation and adaptation; it is essential that India has clear in-country objectives that are met by the NSM. We believe the Government of India should ensure that:

- Needs of poor are met on priority,
- Access to technology and Indian technology development should get a boost,
- Least cost options for solar capacity are pursued.

These principles lead to our recommendations, the details of which are enclosed in this note. The summary points are the following.

1. Larger push for Solar Home Lighting systems for the poor houses in remote villages
2. Tariff-based competitive bidding for utility-scale solar plants
3. Reducing risks for project developers (Solar parks should adopt UMPP principles)
4. Phase I should pilot key solar technologies
5. Large Scale Development of Solar Thermal Power Generation in Phase II
6. Pilot rooftop PV program before large-scale implementation
7. Multiple schemes and policies need to be coordinated
8. Who pays for the NSM? Differentiated instead of uniform cess
9. Public consultation process for transparency and detailing the NSM

We hope that you would be able to consider our suggestions. We would be happy to have opportunity for more interaction on the National Solar Mission.

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## ***Prayas comments on draft National Solar Mission – For limited circulation***

### **1. Larger push for Solar Home Lighting systems for the poor houses in remote villages**

Today, 40 percent of India's population is without access to electricity. This constitutes approximately 78 million households. Providing photovoltaic based home lighting systems should be an absolute first priority for a nation where more than a third of its population lives in the dark! While India is willing to give public subsidies worth thousands of crore rupees for development of solar, and yet tolerates a large portion of its poor population buying high cost kerosene for basic service like lighting, it would be a case of bad policy and planning.

The NSM aims to provide 20 million solar home lighting systems to the poor by 2020 – but only a limited number in initial years. Even after the Rajiv Gandhi Grameen Vidyutikaran Yojana, which targets electrifying only identified BPL households, probably over 30 million households may not have access to electricity in 2012. The NSM should increase its target for home lighting systems in initial years, and make it its priority. NSM should give increased subsidy for this in a manner that does not remove incentive for good system performance.

The MNRE incentive and subsidy program, since its inception has disbursed only 0.73 million solar lanterns and 0.45 million solar home lighting systems<sup>1</sup>. To reach out to 20 million households in say five years, we need to increase the pace 30 times and hence will need a radically different approach. Since this is an unprecedented initiative, a committee should be appointed to develop appropriate program guidelines and oversight mechanism. The details of this program should be formulated through a participative process. Some of our recommendations for an effective and robust program are as follows.

- Low interest loans (~2%) by offering interest subsidy to lower the burden of initial capital costs.
- Additional government subsidy should be linked to loan repayment by user. This will reduce the monthly payment by user while maintaining accountability of manufacturers that systems remain in operation.
- Rigorous testing program for vendor and system approval to ensure that only high performance products are given subsidies.
- Mandate O&M contract and a multi-year system warranty as a condition for getting subsidy.
- Provide initial funds to financial institutions, NGOs, SHGs, manufacturers for extensive public outreach and advertisement in select population.
- Promote only LED based solar home lighting systems since good quality LEDs are more efficient and robust than CFLs, last longer and substantially reduce size and cost of home lighting systems (due to smaller battery and smaller PV panel).

Nearly seven percent of Indian population is nomadic – this is equivalent to the population of whole of Germany. This population cannot use home lighting systems. They need low cost, lightweight, and sturdy solar lamps. The NSM needs to address this special need.

### **2. Tariff-based competitive bidding for utility-scale solar plants**

Since the solar power generation costs are continuously dropping, it is difficult to predict these. Different solar technologies are in different stages of development (in the solar thermal as well as in solar photovoltaic arenas). As these technologies develop and start mass production, the costs will keep decreasing. However, due to the variability in the technologies, their development stages and their suitability and operation in Indian conditions, it is difficult to predict their costs.

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<sup>1</sup> <http://www.mnre.gov.in/>

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Assuming a low cost (and hence giving low subsidy) would not attract industry but assuming high cost (and giving a high subsidy) will result in equally serious problems. Capacity addition will be low and investors will rush resulting in using extraneous considerations for short listing them, leading to possibility of favoritism, resistance and large delays. We have seen all of this in the Enron and the IPP era.

Indications are that the cost of solar power generation assumed in NSM is more than the likely market cost, especially for solar thermal.<sup>2 3</sup> Consequently, the NSM may be offering a high GBI.

The NSM should adopt tariff-based competitive bidding even for the pilot plants. A competitive bidding process not only ensures the lowest cost but would also avoid delays seen in some other schemes. We believe, MNRE's utility solar scheme received 40 times more proposals (~2000 MW) than its limit of 50 MW. Case of Gujrat is similar, where it received many more proposals than its capacity ceiling. In both cases there seem to be considerable delays in execution.

The GoI should facilitate competitive bidding through a shell company after declaring a ceiling tariff as well as installed capacity. The tariff could have two components – one fixed between the shell company and the utilities (backed by state regulators say at Rs 5 or 6/kWh), and second being the GBI provided by the government. The GoI should fix a ceiling GBI (say Rs 10/kWh). The GBI will then be the variable component based on tariff bid by the project developers and will be fixed for every individual Power Purchase Agreement (PPA).

### **3. Reducing risks for project developers (Solar Park should adopt UMPP principles)**

Reducing the project risks related to land and water, government clearances, allocation of transmission capacity, and streamlining the project development process helps lower the tariff bids. Some of these are described in the NSM (“Solar Parks”). This will also signal government’s seriousness and fair play to the investors.

Phase I should be used to map solar resources in detail, arrange for access to land and water, procure clearances from appropriate agencies and begin installation of transmission lines connecting the high solar resource areas to the main grid. In addition, normative water and land use standards should be declared to prevent excessive land acquisition by project developers and ensure minimum water usage. These measures during Phase I would also lead to lower tariffs, effective bidding, and rapid project development in Phase II.

### **4. Phase I should pilot key solar technologies**

During Phase I, the NSM draft proposes to set up three pilot plants (totaling 300 MW) operating on solar thermal technology. We support the promotion and piloting of different promising solar technologies for utility scale power generation in India. This will enable the evaluation of each of these technologies in Indian conditions. Technologies should be selected not only on present cost competitiveness, but also with an eye on technology soundness and long term cost reduction potential.

Bids should be invited in each technology types e.g. linear parabolic troughs, compact linear Fresnel lens, solar power tower, concentrating dish array, Stirling dish, thermal storage, dry condensing plants as well as tracking PV/Concentrating PV. Fixed non-tracking solar photovoltaic technologies are widely deployed worldwide and do not need to be piloted. The bidding process in each technology type will lead to project selections for a fixed predetermined capacity (of say 50 MW each).

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<sup>2</sup> DLR, CIEMAT. (2008). “Final report on technical data, costs and lifecycle inventories of solar thermal power plants.” New Energy Externalities Developments for Sustainability.

<sup>3</sup> California Energy Commission, 2007. “Comparative Costs of California Central Station Electricity Generation Technologies”

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A potential lower GBI, due to competitive bidding, would enable more pilot plants to be set up for the same level of subsidy. This would help more solar technologies to be tested and increase access to larger number of technologies for Indian companies. The lessons learnt in Phase I, will help improve bidding and overall design of Phase II – where we have much larger stakes.

### **5. Large Scale Development of Solar Thermal Power Generation in Phase II**

The NSM should consider a more aggressive approach exclusively focused on utility-scale solar thermal technology on the lines of the Ultra-Mega-Power-Plant (UMPP) concept, starting in Phase II. Concentrating solar power in conjunction with thermal storage has the potential to scale up, and provide for base and peak (dispatchable) power. The development and deployment of solar thermal technology in India can leverage the existing domestic expertise in steam power generation.

Major reduction in cost and acquiring international funding is key to large scale deployment. The UMPP (for coal power) resulted in much lower tariffs than expected. Similarly, combination of competitive bidding, reduced risk for project developers, achieving economies of scale, and leveraging large-scale indigenous manufacturing should be attempted in Phase II. It is important to emphasize here that Indian manufacturing should gain from these projects, and indigenous manufacturing should be ensured by putting clauses in project contracts to enforce the same, as done by some countries.<sup>4</sup> The roadmap for large-scale development of solar thermal technology could be used to seek international finance under the NAMA outlined in Kyoto protocol – which India expects to come without offsets.

Since, MNRE has limited experience in utility scale power plants, the development of utility scale solar power generation should be handled by a government entity with the appropriate and relevant experience for large-scale power generation.

### **6. Pilot rooftop PV program before large-scale implementation**

The NSM proposes a high GBI for rooftop PV with net metering and time-of-the-day feed-in tariff for the excess power fed into the grid. However, the objective to promote rooftop PV in India should be clearly outlined.

The argument that rooftop PV systems on commercial buildings would avoid the use of diesel generators does not hold, since such systems will need battery storage, which will increase their capital costs. Hence, a much higher capital subsidy/feed-in tariff would be needed to make them financially more attractive than diesel gensets. This higher subsidy cannot be justified since it will end up subsidizing high electricity consumers.

The rooftop PV program does not need to be designed to create demand for solar PV, since such demand will be generated through utility scale power plants, as well as the international market.

Energy from decentralized rooftop PV systems costs much higher than utility scale solar. Since each rooftop system is a separate project, labor, transaction and implementation costs are seen to be high. In addition, rooftop systems will not be installed in the most optimum solar insolation sites. The economics for rooftop solar worsens if there is a high frequency of grid outages (which is the case in many places in India), which necessitates the need for battery storage.

The NSM suggests a high fixed GBI for rooftop PV. However, electricity tariffs are different in different states. Hence, a different GBI would be required for every state, to incentivize the system installation without providing excessive profits to project owners.

The NSM also suggests mandated solar rooftop or on-site PV applications on all government and PSU buildings and establishments. Mandatory deployment will not provide any incentive for

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<sup>4</sup> China is an emerging leader in the wind manufacturing industry following its mandate for indigenous manufacturing for at least 70% wind components in all turbines.

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efficient solar power generation, and could lead to wastage of capital cost grants for such installations. The rooftop space on government and PSU buildings could be made available for private solar installations.

Spain provided excessive tariffs during the first two years of its rooftop PV program, and when the tariffs were revised, there was a bust in the Spanish solar market. California, which started its net metering program in 1995 is presently re-examining costs of net metering to ratepayers and the state.<sup>5</sup> Hence, the mechanism to promote rooftop PV needs to be devised carefully. If excessive subsidies are provided, there is unnecessary profit making and may result in loss of public support (Spain). On the other hand, if subsidies offered are not adequate, the program never takes off.

We do recognize the benefits of rooftop PV systems, which are quick to deploy and reduce the need for long transmission lines. But we believe that the time is not right for large-scale rooftop PV deployment in India. However, a pilot program could be set up in a high insolation and high tariff location. Commercial consumers with Time of Day metering and high tariffs will have an incentive to install rooftop PV systems even with a low feed-in tariff. These systems should have two meters with feed-in tariff. The regular meter should measure the grid electricity consumption and an additional meter on the rooftop PV system should measure the solar electricity fed into the grid. This measuring system would facilitate monitoring of the solar system performance and total electricity consumption of the facility. The size of these systems should be limited to producing the same amount of electricity that is consumed on an annual net basis.

### **7. Multiple schemes and policies – Need to consolidate**

Presently, there are several different schemes and policies being pursued by various government entities to promote solar energy. (1) The MNRE has the GBI scheme for grid connected solar power plants, solar home lighting systems and lanterns, urban solar rooftop systems program for saving diesel, solar water heaters program, industrial solar heating program, solar cities program, stand alone small scale PV power plants etc. (2) The Department of Information Technology is providing support for setting up PV manufacturing units through 20-25 percent capital support under its Special Incentive Package Scheme (SIPS). (3) States like Gujarat have come up with their own solar power policy to promote utility scale solar power plants. (4) The Central Electricity Regulatory Commission (CERC) has come out with fresh guidelines for all renewables including solar PV and thermal power.<sup>6</sup> Several state regulatory commissions have already announced solar specific tariff.

The new CERC guidelines for solar power effectively suggest a 25-year levelized tariff of Rs 13.53/kWh and Rs 18.09/kWh for Solar Thermal and PV respectively. This is much higher than the tariff of Rs 13/kWh for solar thermal and Rs 15/kWh for solar PV assumed under the MNRE scheme – which got an overwhelming response. CERC has also been asked to look at the possibility of a national uniform Renewable Purchase Obligation, with a solar specific RPO along with a Renewable Energy Certificate (REC) mechanism. So far, 15 State Electricity Regulatory Commissions (SERC) have declared solar PV tariffs with 12 of them declaring solar thermal tariffs as well. Many of these tariffs were declared in conjunction with the MNRE GBI scheme, which is limited to only 10 MW (solar thermal and PV combined) per state. Those tariffs declared beyond the MNRE scheme vary widely from state to state.

There is also a need to find the combined effect of various incentive and subsidy mechanisms on the final price of the solar electricity (Rs/kWh)/solar system (Rs/kW) and then decide solar tariffs for states. Incentives include CDM, capital subsidy for PV manufacturing from Department of IT, interest rate subsidies, exemption from excise, customs and VAT, income tax holiday, GBI,

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<sup>5</sup> <http://www.greentechmedia.com/articles/read/cal-lawmakers-propose-smaller-increase-for-net-metering/>

<sup>6</sup> [http://cercind.gov.in/Regulations/CERC\\_RE-Tariff-Regualtions\\_17\\_sept\\_09.pdf](http://cercind.gov.in/Regulations/CERC_RE-Tariff-Regualtions_17_sept_09.pdf)

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accelerated depreciation etc. Presently there is no way to ensure that such benefits offered to the project developers are passed on to the consumer. For example, the 20-25% capital subsidy under the SIPS scheme for PV manufacturing does not have any export restrictions.

There seems to be a competition among institutions to offer subsidy for solar promotion. Multiple solar programs and policies are promoted by various actors acting independently, which has resulted in a loss of direction in the national vision for solar energy, lack of cohesion between different Central Ministries, State governments and Central and State Regulators. Hence there is an urgent need to re-look at the entire spectrum of solar energy policies and programs, and their executive actors in the light of the National Solar Mission. It is essential to realign and consolidate these policies and programs to avoid any overlap and bring about coherence to develop a unified solar vision and strategy for India.

### **8. Who pays for the National Solar Mission? Differentiated instead of uniform cess**

Any funding mechanism for the National Solar Mission should make sure that the burden of mitigating GHG emissions and promoting solar in India is borne by the rich, and not uniformly distributed.

The uniform cess on fossil fuels as proposed in the draft NSM (or such other schemes) will affect all people in India. Although a cess is a good idea, uniform cess will increase price of electricity, transportation and subsequently, commodities. However, the rich and high energy consumers in India (similar to the Annex-I countries) should pay for GHG mitigation. For this note we equate these to industry, commercial consumers and people using petrol, who should pay the cess.

Table 1: An alternate proposal for cess to generate same revenue

<b>Fuel</b>	<b>Annual Consumption</b>	<b>Proposed Cess</b>	<b>Annual revenue (Rs Cr)</b>
Petrol	10327 KT	INR 1.03/liter	INR 1280
Commercial/ Industrial electricity consumers	250,086 MU	INR 0.10/kWh	INR 2400
Captive and commercial coal consumption	Needs an estimate	Rs 150 / Ton	Needs an estimate (assumed nil)
<b>Total</b>			<b>INR 3680</b>

Second alternative would be to fix cess at a fixed \$ / T CO<sub>2</sub> (restricted to rich). A \$ 10 /T would generate Rs 10,000 Cr. This alternative will help India seek similar treatment by Annex-I countries.

### **9. Public consultation process for transparency and detailing of NSM**

Public subsidy proposed under NSM is very large, hence, it ought to be decided through a completely transparent process. At least after the 14<sup>th</sup> Nov 2009, a detailed public consultation process should be started, using the document that would be made public by the government. This would help identify actions to ease implementation and potential pitfalls.

Prayas would be happy to help the government in this process.