Ministry of New & Renewable Energy
"Comments on Jawaharlal Nehru National Solar Mission Phase II – Policy Document"

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1. **Cost of Procurement of Renewable Energy for Distribution Utilities**: Given the precarious financial status of electric distribution utilities, it is important to ensure that cost of procurement of RES is minimized. As cost of such procurement is ultimately passed on to consumers, higher level of RPO's can't be easily implemented unless these are available at decreasing costs in the future. Further, there is also a need to use budgeted public resource efficiently and chooce policy instruments that encourage competitive, efficient technology development and reduction in cost of development of RES.

2. **Competition in Renewable Energy Development (JNNSM – Phase II):** Rapid development in the international market and growing competition has led to sharp reduction in cost of deployment of solar energy. JNNSM Phase I and bidding for solar capacity in many states were able to attract investors at reducing costs. This has given rise to the belief that solar energy may achieve grid parity earlier than previously projected. This was achieved as there was clear objective to encourage competition in the sector. We should build on the experience from JNNSM Phase-I to usher in greater competition in the sector through JNNSM Phase II as well.

3. **Capital Subsidy Vs VGF Vs GBI:** Capital subsidy and Viability Gap Funding (VGF) suffer from information asymmetry as far as capital cost is concerned. and it is expected that capital costs of a technology would be padded up to garner higher support. This would also lead to various interests pushing one technology or the other and seek greater support for a particular technology. Since the consumers would ultimately bear this cost,

it is desirable that the national objectives to harness solar energy are achieved at the least cost to the consumers as well to the country. Use of economically inefficient approaches like capital subsidy is criticized for being economically efficient in meeting the intended objectives. Similarly, a VGF approach that defines a percentage subsidy is bound to be misused by padding up the capital cost. This would also make Indian manufacturing more non-competitive in the international market. Further, VGF would incentivize only capex giving incentive to deploy inefficient or unproven technology that may not contribute much in terms of electricity. Generation based incentive (GBI) promotes electricity generation and hence provides incentive to reduce capex while ensuring sustained performance of the plant during its operation phase. Given the choice between the three, GBI are more efficient in providing policy support to RES. VGF should be used only for supporting nascent technology and that too by defining a lump sum amount of support (Rs. X lakh per MW of deliverable output). Further, such support should only be made available through reverse bidding for the VGF for the identified technology.

4. **Long-term visibility of Generation Based Incentives (GBI):** GBI should have long term visibility of at least 10 -12 years and have pre-defined sunset clause that should define a declining rate of GBI each year. This would also ensure that greater RE capacity development can be leveraged through GBI incentives with similar or smaller level of budgetary resources in future. This would also ensure that industry would remain competitive and would encourage innovation to improve efficiency and reduce cost. The National Clean Energy Fund (NCEF) can be used to fund GBI.

5. **Additional GBI for Scheduled Peak Power to Energy Storage:** Solar energy is available on off peak hours and hence only provides energy support rather than capacity support as this cannot be scheduled. Investment in relatively cost effective energy storage technology like solar thermal energy storage and solar-pumped storage hybrid technology need special support to support availability of greater peaking power. This can be achieved by providing additional GBI for peak power for scheduled energy.

6. **Role of REC:** The market for Renewable Energy Certificates (RECs) can play a vital role in enhancing participation by a large number of buyers especially in states with less

endowment of solar energy in economical term. RECs can also enhance participation beyond the distribution utilities and other entities obligated by the respective SERCs. There is also a significant potential for voluntary market. Introduction of REC multipliers based on technology would offer go a long way in enhancing economic efficiency in these markets.

7. **Encouraging Domestic Manufacturing through Interest Subsidy:** Past few years witnessed increasing import of solar projects and proved non-competitiveness of the local manufacturing amidst the claim for dumping of solar PV projects from certain countries. This has raised clamour for anti-dumping duty. While this may offer some support in the short-run, it more important to improve competitiveness of the Indian manufacturers. This can be achieved by providing interest rate subsidy from National Clean Energy Fund (NCEF) for investment for domestic manufacturing of key materials (silicon ingots, cells), components and power conditioning equipments. Further, projects that use domestic content above (say) a 30% domestic content threshold (for main project cost excluding project development and land cost) to qualify for interest rate subsidy support from NCEF. Higher rate of interest rate subsidy may be offered for higher domestic content proportion beyond the 30% threshold. For e.g. a 50% domestic content may quality for 4% interest subsidy Vs a 2% interest subsidy for 30% domestic content. Similarly a 100% domestic content may attract higher interest subsidy. It is important to define domestic content in terms of the proportion of “value addition” in the country. Further, sufficient monitoring should be in place to ensure that transparent transfer pricing is adopted for trade amongst related entities located in India with their counterparts abroad. This would avoid misuse by merely assembling the modules in the country and taking shelter under low invoicing for imported content. A twin approach to incentivise investment in domestic manufacturing and use of domestic content, may show long-term results only if there is long-term visibility of continuation of such policies for a period of at least 8-10 years. Further, such incentives should only be available for creation of green-field manufacturing capability using state-of-the-art manufacturing facility rather than import of second hand machinery that would produce inefficient silicon wafers/ modules.

8. **Commercial Banks/FIs to channelise interest subsidy:** Interest rate subsidy should be provided by IREDA through commercial banks and FIs instead of NABARD, which has limited expertise in speedy evaluation of such projects and often seem to result in delay in payment of subsidies. Since commercial banks/FIs have better reach and expertise for project appraisal (ad now including solar projects). Further, sufficient interest margin should be made available to such commercial banks/FIs so as to incentive them to take appropriate interest in solar projects.

9. **Abolish MNRE 'approved' channel partners:** The MNRE's approach to 'approve' manufacturers / channel partners essentially imposes barriers to entry in the renewable energy sector. This has also defeated transparent transfer of subsidy for end-users of various renewable energy technologies. Studies at IIT Kanpur have also revealed that subsidized Solar Home Systems are not available to end users who are often misguided about availability of subsidy which has only been restricted to 'approved' manufacturers. No capital cost based subsidy should be provided. Rather interest rate subvention should be provided through micro-finance institutions to support purchase of solar appliances from any manufacturer. One of the most important reasons for poor off-take of various domestic oriented technologies is the lack of availability at local hardware stores. This is attributed to the following reasons: (i) A Restricted list of "approved manufactures" limits its production, supply, innovation and motorization; and (ii) Limiting subsidy to "approved" appliances. Since only the "approved" appliances are eligible for subsidy, the local hardware stores do not find it attractive to sell unsubsidized ones. It is important to note that significant penetration of solar water heaters in Kathmandu and other parts of Nepal can be attributed to (among other factors) due to their easy availability at a local hardware store. Even though these are not subsidized, the private ingenuity ensures that potential consumers understand its efficiency and that the product is well marketed, better implemented and locally serviced.

10. **From 'Approved' Manufacturers/Channel Partners to Rating based System:** As a replacement to the list of approved channel partners/manufacturers, a rating based

approach should be adopted. Similar to the BEE Star rating system, a rating scheme for rating the efficiency of the solar / renewable appliance be introduced. Given the successful experience with BEE Star Labelling programme, it may be prudent to implement this scheme through BEE through an inter-ministerial/inter-departmental arrangement. Duplication of institutional setups should be avoided to save costs and reduce institutional rigidities in implementing such a scheme effectively.

11. **Avoiding Leakage of Public Resources and Effective Implementation of Star Rating Scheme:** To ensure that efficient technology is manufactured/purchased and deployed across the country based on a transparent system of rating, a Bar code based system be developed. Under this system, each RE/solar device / module / power conditioning unit PCU be given a unique bar code that would provide information about the type of equipment/device, level of star rating, manufacturing plan location etc. This data be maintained and archived with a independent central nodal agency which should be independent of the rating agency. A end-user/buyer should then be able to send the bar code of the purchased system through SMS/IVR/website and cross-check authenticity of the rating. This would also ensure that there is no duplication of bar code and that spurious bar codes are not generated.

12. **Commoditising Solar/Renewable Energy:** The potential consumers in the present context prefer a single point contact that can ensure subsidy / financing, installation, AMC, etc. A consumer should expect a SHS or a SWH system to be available just like a Geyser or TV. It is important to “commoditize” renewable energy appliances to ensure that consumer find it convenient to buy. We should encourage e-shopping platforms to also offer rated solar based appliances as a single package as described above. Before that, it is crucial that the mechanism for “approving” supplier or channel partners be abolished and replant with an effective rating system. Barriers to entry to this market should be removed urgently. The historical approach to ‘approve’ such manufacturers/channel partners choke entry in the solar energy sector making it less competitive. It is ironic to note that solar PV systems are not found for sale at most leading electric/ electronic stores due to this historical approach.

13. **Designing and Targeting Solar Cookers for 'Dhabas'/Restaurants:** Solar cookers are not ideally suited for domestic cooking both due to inconvenience and long cooking time. Sustainability of use at mid-day meal locations[1] would be very limited due to similar reasons and may result in waste of public funds unless sufficient steps are taken to ensure sustainable use of such technologies through appropriate training in a targeted manner. Unless the efficiency and economics of solar cookers is established to those who would adopt it for commercial reasons, it would remain a program at the mercy of scarce public funds. I would suggest that solar cookers be designed and targeted for dhabas with appropriate subsidy. Given that Dhabas and restaurants are expected to use commercial LPG, increasing the popularity of solar cookers with such users with 'commercial' interest would be in the best interest of deployment of solar cookers in the country.

14. **Abolish benchmarking of capital cost for Off-grid Systems:** Due to the informational asymmetry with respect to the cost of a technology, it is not efficient to specify a benchmarked capital cost for a technology for various support schemes. Instead a lump sum support (Rs per MW of delivered output) be made available instead of percentage based scheme currently in place for off-grid systems. This would give incentive for cost reduction. It seems to be an open secret that solar plants/devices are available at cheaper cost in the market than the artificially high 'benchmarked' capital cost which seem to promise certain percentage subsidy.

15. **Performance Monitoring of Projects Developed under JMMSM Phase I & II:** A searchable public database on the daily and monthly performance of the solar projects developed under JNNSM and other schemes be made available at a website to be maintained on behalf of MNRE by IREDA or an appropriate agency. Disclosure of such information in soft online format be made a mandatory condition for participation in JNNSM and other such schemes. This database would provide to be very valuable for evaluating the benefit of the solar development schemes and help provide sufficient ground calibrated data for future project developers as well as researchers. The database should include information on technology, capacity, manufacturer, project developer,

[1] In fact, this may often be blamed for non-availability of mid-day meal in time and across all seasons, and further antagonize its users.

name of scheme, year of commissioning, local radiation profile, electricity generation profile, geographical location of the project and other operational parameters. A unique code be allotted for each project site. A comprehensive system should be developed in consultation/ cooperation with the implementing agency for the scheme of Renewable Energy Certificates (RECs) in the country. The later also compiles limited data for only REC based projects.

16. **Rethinking the Target Based Approach:** The historical approach to assign numerical targets for implementing various RE/solar scheme needs to be replaced with incentive based approach. Incentives should be designed so that these may help achieve the level of target expected. Numerical targets often end of waste of public money where different departments are often in a rush to 'achieve' targets by furnishing impressive achievements without keeping in mind sustainability of such schemes. For e.g. solar street lighting systems implemented in most parts of the country do not sustain beyond the life of the battery and are often found to be defunct in less than years time. The sustainability of the street lighting or SHS or agricultural pumping system is often disregarded in race to achieve numerical targets for 'implementation'. Targets should be set only with respect to operational years that result in replacement of existing/potential use grid electricity/fossil fuel. While implementing these projects a bar code based SMS/online/IVR system should be implemented to monitor operational status of the system. This can be entrusted to the end-users. Even if certain targets needs to be set, there is no justification of how these targets have been arrived at. A bottom-up approach is necessary to set and justify these targets.

17. **Mobile Solar Agricultural Pumping systems:** Farmers need water and attach higher value to it than electricity which is often compared with the value of grid-electricity, which is very cheap or free in most states. Mobile diesel pumpsets are often rented by farmers to provide water to their fields. If sturdy mobile agricultural pumping systems can be developed and deployed, these can provide more valuable water to the farmers. With improvement of rural roads, this may be implemented on pilot basis in few locations with poor reliability of electricity supply. Given the increasing cost of diesel,

PV based systems can be an attractive alternative. Public sharing of information on performance of such a system would help learning and development of the technology.

18. **Solar Technology for Telecom Towers:** Given the high cost of diesel used by telecom towers, these projects are economically justify for implementation by a telecom tower operator. Large subsidy supports are perhaps not required for such private initiatives. There is often little space around these towers to deploy solar PV. However, these can be implemented vertically alongside tall telecom towers which are often erected in rural areas. Further, some pilot projects should also deploy larger PV capacity and help electrify household around the tower. Only such projects, which allocate at least half of the capacity to meet household load, should be eligible for capital subsidy.

19. **Solar Mini-grids to be subsumed by Distribution Grid in Future:** A large part of rural as well as urban area faces poor access and reliability of grid electricity. RE/solar energy based mini-grids have been implemented through public as well as private efforts. It is important to note that as household incomes grow and consumers' aspirations grow, the household load would increase and such consumers would also expect 24-hour supply. As grid extension and grid reliability improves, such mini-grid projects should be subsumed by the local electricity distribution utility. Hence, implementation of such projects should have an upfront agreement with local utility to define conditions of grid integration. Any capital investment required for such integration later should be met by the local distribution utility.

20. **Informal Markets for Electricity in Urban/semi urban areas:** In spite of grid access in urban areas, there are pockets of poor access in vegetable and other informal markets, where users are either cannot get grid access or largely mobile. Such vegetable markets often finds use of battery based lamps, LPG mantle lamps, or DG based mini-grips. JNNSM Phase II should identify such need and encourage participation of existing entrepreneurs to adopt a clean technology like solar PV based mini-grids/charging system. These should also have provision to be subsumed by the local utility in future. A analysis based on field study and economic analysis of such options at four locations in Kanpur reveals favourable economics for solar technology. With increase in diesel cost

and grid power, and reduction in cost of solar technology, these projects should be attractive with some public policy support. In fact these projects offer good replicability based on business models. (A relevant paper and a proposal on the same is attached). GBI should be available to such off-grid projects as well. GBI for such projects should be designed so that the economics of such projects is justified even when such off-grid/mini-grid consumers pay tariffs as per applicable retail tariff in the state. This tariff parity would also ensure that consumers do not leave the mini-grid/off-grid system prematurely as soon as grid excess is available. GBI should be available to the investor for a pre-defined period even when grid-integration is achieved and the investor would then sell electricity to the local grid at the consumer tariff.

21. **Capital Subsidy to Government Supported Educational Institutions:** Centrally Sponsored (like IITs, IIMs, IISERs) and State Government supported public educational institutions should be eligible for 90% capital subsidy for implementation of off-grid/grid-interactive solar plants. This would not only enhance grid support but also provide much needed demonstration effect and help education and research on solar energy at such institutions. Based on performance of such a scheme, these can later be extended to private institutions as well.

22. **Building code to harness solar energy:** Building code should mandate efficient use of solar lighting/ energy for all new commercial/residential buildings. Given the explosion in the real estate sector (and which would continue for some time), it is desirable that such a code be designed implemented at the very earliest beginning with all commercial/office constructions.

23. **Operational Sustainability of off-grid, rooftops projects (especially those with public investment:** Numerous public agencies often invest public funds in off-grid, SHS, rooftops, solar street lighting projects etc. Studies at IIT Kanpur have revealed that poor design, absence of participation of local/users in project design and implementation, and absence of enforceable long-term service/maintenance contracts often results in failure of such projects as soon as enthusiasm of the people associated with it fails or one of the

major components (like batteries) fail much earlier than their promised life, whichever is earlier. We have visited various sites with remote village electrification (Betul, MP; Ladakh), solar street lights (UP), grid support systems (UP & MP) and often found that once the projects have been implemented (i.e. target achieved), their operational sustainability seems to be of limited relevance. While precious public funds are locked in and get wasted, a useful asset remains unutilised and may become defunct over time. (I am attaching one my relevant paper on the same).

24. **Visibility and enforceability of RPO:** Investors response to the JNNSM is based on the fact that the scheme defined procurement of a defined quantity of output. In most states renewable purchase obligations (RPOs) have few years of visibility and that too fall short of the target in most states. Absence of an enforceable mechanism (like buyout price; see attached paper) often makes investors less confident on investing in the sector. Further SERCs need to define at least 8-10 years of RPO trajectory to provide clear market potential to investors as well as manufacturers.

25. **Re-engineering the market for Renewable Energy Certificates (RECs):** The market for RECs is an effective way of implementing various policy support instruments in an economically efficient way. (I am attaching two of my relevant papers on the same). Currently solar RPOs are defined separately and there is a separate market for RECs. Implementation of a multiplier scheme, wherein solar as well non-solar RECs can be traded in a single market, would enhance liquidity in the market thus making it more efficient. The current level of floor price of RECs is also high (see the attached papers for arguments) resulting in most trades clearing around the floor price.

26. **Integrating the Feed-in-tariff as well as REC market:** In the present Indian context, an investor have the option of two alternate revenue streams, one based on the applicable feed-in-tariff (FiT) and the other based on RECs. It is possible to make REC a compliance as well as market mechanism by integrating the two schemes. The proposal is to issue RECs to all power procured under FiT mechanism as well. obligated entities (distribution utilities, captive plants & open access consumers) would then submit the accumulated RECs from the FiT as well as REC market as a proof towards meeting their

respective renewable purchase obligation (RPOs). The While this would not influence the FiT based revenue stream to investors, it would allow the obligated entities (distribution utilities, captive plants & open access consumers) to trade on RECs thus enhancing liquidity and efficiency in the market. For further explanation of this and other suggestions, please see the attached papers.

27. **Focus on capacity building / training / school curriculum:** Large scale penetration of the solar energy harnessing technologies needs trained local manpower who is able to implement as well as maintain the system locally. This would need a widespread program to train local electricians and ensure inclusion of solar as well as other RE technologies in the curriculum of schools, ITI, diploma and engineering colleges. Implementation of any off-grid projects should include training of local manpower as well.

28. **Development of Solar Energy in Ladakh Region:** Ladakh region offers perhaps one of the best locations to harness solar energy. Based on experience of a 100 kW plant in Dubruk region of Ladakh, we find that the region offers following advantage.

(i) Higher solar radiation.

(ii) It is a cold desert, and hence has more than 320-330 sunny days.

(iii) Cold climate assures that the PV modules give higher output (as PV efficiency decreases with increase in temperature in hot desert areas).

(iv) The region does not witness many sand storms like the one in desert area of Rajasthan, Gujarat etc. This ensures that the panels continue to provide higher output due to less dust collection and also avoids regular panel cleaning. Even if required, the water is generally available near most locations unlike hot desert areas.

Large scale deployment of solar technology in this region needs transmission links for evacuation of this power. The existing proposed efforts towards the same need to be implemented in a time bound manner to attract investors. The National Transmission Plan should accommodate larger capacity radial link for the region.