

## Policy Brief on Solar Off-Grid

### Introduction

As per 2011 Census, 75 million rural households in India live without access to electricity. To ensure universal access, among other things off grid or decentralized renewable energy (DRE) systems have provided better access and also improved the quality of life of people. Among off grid technologies, solar has seen better adoption for variety of reasons including the announcement of National Solar Mission in 2010.

In the past few years, solar market has seen tremendous growth with various DRE solar models of delivery experimented across the country starting from lanterns to solar home systems (SHS) to micro grids. However, the models and associated enterprises have not been able to scale up and universal access to electricity remains a challenge for the said 75 million households.

### Current Status

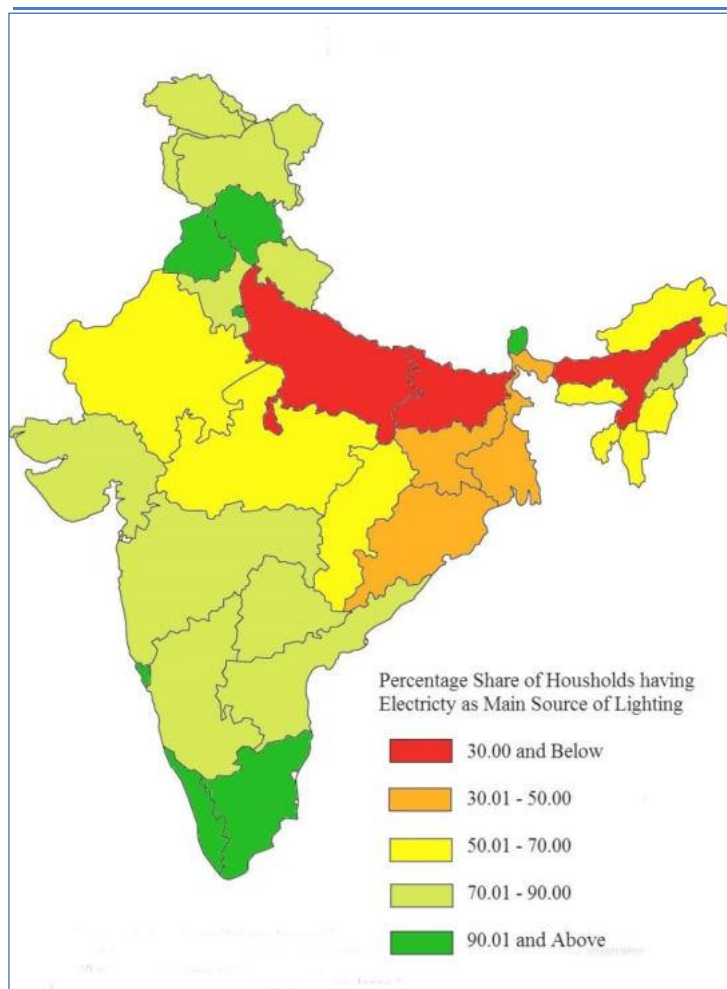


Figure 1: Households having Electricity as Main Source of Lighting

Fig.1 depicts the current status of electrification in rural households across various states in India<sup>1</sup>. The situation is worse in states like Assam, Bihar, Jharkhand, Odisha, Uttar Pradesh and West Bengal.

Though various initiatives have been launched to ensure 24x7 electricity, it might not be financially viable or geographically feasible to have grid connectivity at all places given the terrain and status of state distribution utilities.

Off grid solar technologies such as lantern, SHLS, micro grids etc. have been installed at various places but perceived high cost and lack of policy instruments have been limiting factor in its scalability.

Although no comprehensive statistics exist, a conservative count show that there are approximately 4 million lanterns and 2 million SHS installed till 2013. Similarly micro grids are estimated to be serving at least 125,000 households in India, divided mostly between large, government-sponsored projects in the states of Chhattisgarh and West

Bengal and private ventures centered on Uttar Pradesh and Bihar<sup>2</sup>.

<sup>1</sup> Census of India 2011

<sup>2</sup> [http://e360.yale.edu/feature/indian\\_microgrids\\_aim\\_to\\_bring\\_millions\\_out\\_of\\_darkness/2729/](http://e360.yale.edu/feature/indian_microgrids_aim_to_bring_millions_out_of_darkness/2729/)

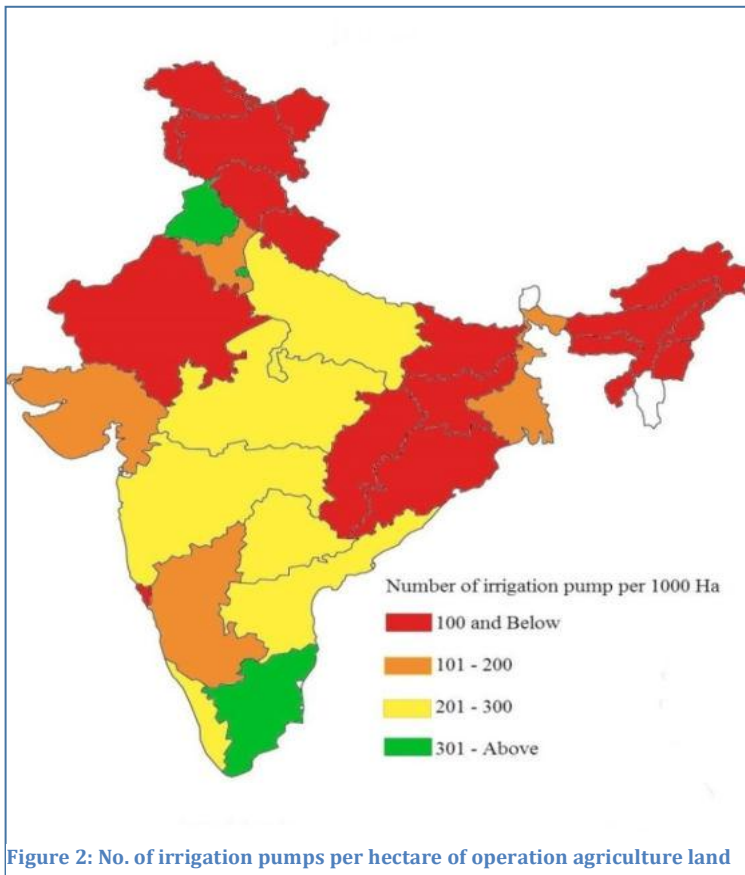


Figure 2: No. of irrigation pumps per hectare of operation agriculture land

Agriculture constitutes more than 20% of total power demand that consumes 85 Million Tons of coal annually due to dependence on irrigation pumps. Fig 2 shows the no. of irrigation pumps per 1000 hectare of operational agricultural land<sup>34</sup>.

Solar pumps have the potential to meet the electricity demands of the agriculture sector and reduce the dependency on grid while ensuring efficient utilization of water and energy.

As per climatic (hot with little rainfall), geographic (shallow water table) and socio-economic conditions, solar pumps make a lot of economic sense for states like Bihar, Jharkhand, Odisha, West Bengal, Jharkhand etc. Also, studies have shown direct correlation of irrigation and agriculture with poverty reduction.

## Target 2021

DRE solar technologies are sustainable solutions to mitigate the externalities of grid connected systems especially in terms of overall sustainability. It can provide electricity to millions along with creating jobs, improving health and education etc.

Table 1: Market potential of Portable Solar Light, SHS and Micro Grid

		Investment Required (in Cr)
Rural Households without electricity in 2021*	76 million	
Assumption, 40% household shift to solar	30 million	
Portable Solar Lights (50%)	15 million	
SHS (25%)	7.5 million	
Micro grid (25%)	7.5 million	
Assumption, 100 household cluster is connected to 2 kW micro grid	75000	
Portable Solar lights (average size 2W)	30 MW	1500 (Rs1000/piece)
SHS (average size 100W)	750 MW	22500 (Rs300/W)
Micro grid (average size 2kW)	150 MW	7500 (Rs500/W)
<b>Total</b>	<b>930 MW</b>	<b>31500</b>

\* Calculation taking into account household growth rate since 1971

<sup>3</sup> <http://www.mowr.gov.in>

<sup>4</sup> <http://agcensus.nic.in/>

India today has around 19 million grid connected pump-sets and 7 million diesel pump-sets. However, erratic grid supply and high cost of diesel pumping continue to remain problem areas for the farmers<sup>5</sup>. Poor irrigation leads to significant yield losses. Hence, solar pumps not only provide answers to these problems but also are an income-generating asset as it helps farmers in growing additional crops.

In 2014, MNRE issued a notification for installation of 100,000 solar pumps and consequently increase the number to 10, 00,000 by 2021<sup>6</sup>.

**Table 2: Potential of Solar Pumps**

		<b>Investment required (in Cr)</b>
Average size of Solar Pumps	3HP; 2.2 kW	
Total solar pumps by 2021	10,00,000	
<b>Total</b>	<b>2200 MW</b>	<b>88000 (4 Lakh/pump)</b>

## Recommendations

Given that the case for decentralized solar in India is strong, following are the recommendations to facilitate faster adoption and make the numbers mentioned above achievable

- Awareness Generation – knowledge is still low among population about solar being an option and the fact that it could be cheaper than kerosene and diesel. Statistics to support this sector, country wide campaign and marketing would facilitate the shift towards DRE products and services
- Financing: Ease access to low cost finance for customers and entrepreneurs and put in place incentives that are effective, including phasing out of capital subsidies gradually
  - Risk Guarantees – to extend loans for both end users and entrepreneurs
  - Interest Subsidy - similar to the Differential Rate of Interest Scheme (DRI), with modifications in criteria
  - Priority Sector – specific allocation (5%) for decentralized and strictly monitored by RBI/ MNRE
  - MUDRA – specific category for DRE entrepreneurs
  - Training Bankers at all levels to extend financing to the category
- Standards - for technologies that shall function as benchmarks thus providing guarantee on product, assurance on energy output and better after sales service. The central standards framed should have enough flexibility for states depending on specific requirement
- Efficiency –Incentives for promotion of energy efficient components and ancillaries for bringing down life cycle costs
- Entrepreneurship and Skill Development - either by leveraging existing schemes or developing entrepreneurship funds and incubation centers
- Mission Mode – Target setting (through banks, State Nodal agencies and others involved in implementation), Monitoring and incentives / penalties for achievement or lack of it.
- Co-ordination – between ministries of MNRE, Finance, Power, Agriculture, Rural Development, Health, Education, Forests and Environment
- Subsidy could be more directed towards LWE and predominantly Tribal Districts and NE Region
- Decentralized Energy Enterprises play a role in complementing grid availability in a number of areas. ‘Power for All’ plans at the state level must take note of DRE interventions in areas

<sup>5</sup> <http://shaktifoundation.in/wp-content/uploads/2014/02/feasibility-analysis-for-solar-High-Res-1.pdf>

<sup>6</sup> <http://mnre.gov.in/file-manager/UserFiles/Scheme-for-Solar-Pumping-Programme-for-Irrigation-and-Drinking-Water-under-Offgrid-and-Decentralised-Solar-applications.pdf>

where the grid is unreliable. CLEAN's members can support in providing clearer picture on this for the agencies involved in creating 'Power for All' / similar grid extension plans

Few technology specific recommendations:

### *Portable Solar Lights*

- As majority of the households opt for portable solar lights as an intermediate option, MNRE should come up with quality and testing standards. BIS should be brought on board for initiating discussion on the standards and MNRE could decentralize and bring down the cost of testing for SMEs
- Contingent on high portable lights that meet testing standards, direct cash transfer of kerosene subsidy can be linked

### *SHS*

- Release of backlog subsidy so that the confidence of Bankers for solar lending is reinforced.
- Though cost of SHS is perceived to be high post subsidy withdrawal from Centre, ensuring availability of (low cost) finance - at lower interest rates and collateral free - would be beneficial in scaling up

### *Solar Pumps*

- Extensive awareness programs for farmers, financial institutions and other stakeholders about solar being a competitive option and its benefits vis-a-vis diesel powered pumps
- Efficient distribution and graduated removal of subsidy, while strengthening bankers' confidence in lending for various pump systems and sizes
- For solar water pumping to be promoted on a large-scale, a 'single window' approach is must. All different ministries need to have a unified approach to cover the different aspects of bringing the solar water pumping to the farmer

### *Micro Grid*

- To encourage grid compatibility, either the policy on viable gap funding or price of asset in case of grid expansion need to be clear
- To begin with, instead of grid compatibility as a parameter, new criteria could be created by CLEAN and vetted by MNRE/MoP for micro grids on quality of services that should be provided/ no. of hours/ type of appliances/ warranties and servicing compliances
- The grid expansion predictability will go a long way for the entrepreneurs to accordingly design their business model