

CSE's roundtable
on
Improving Energy Access: Evolving role of Mini-grids

Solarization of pumps to improve water and
electricity access

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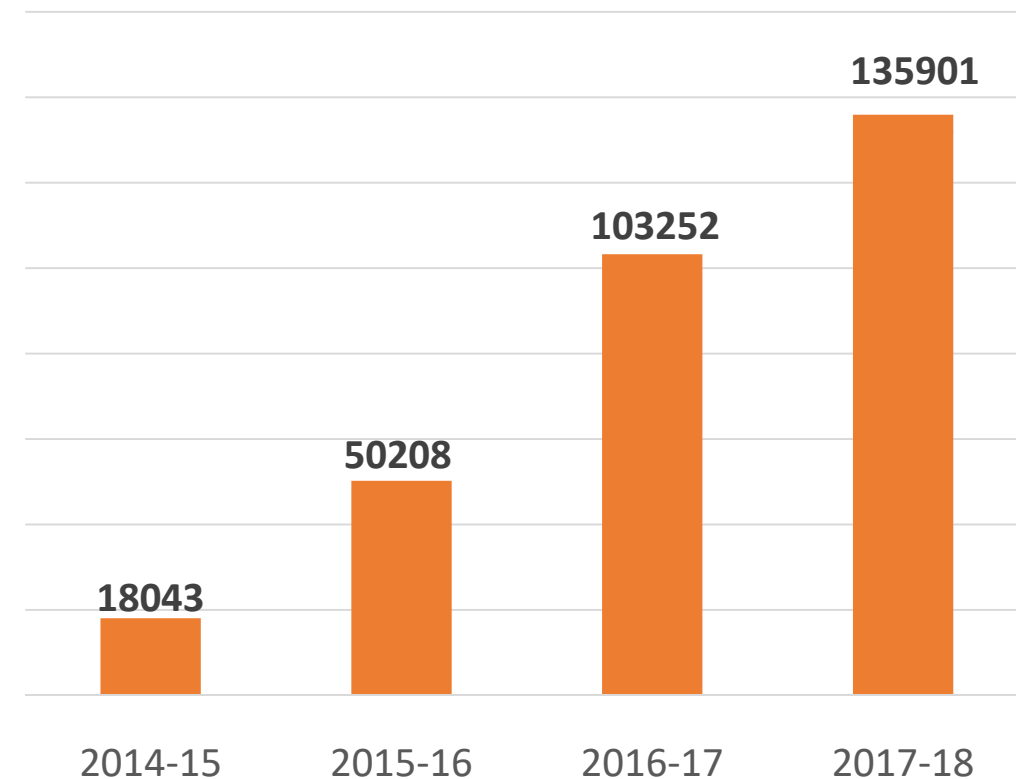
International Water Management Institute (IWMI)

29th May 2018

Growth of Solar Pumps

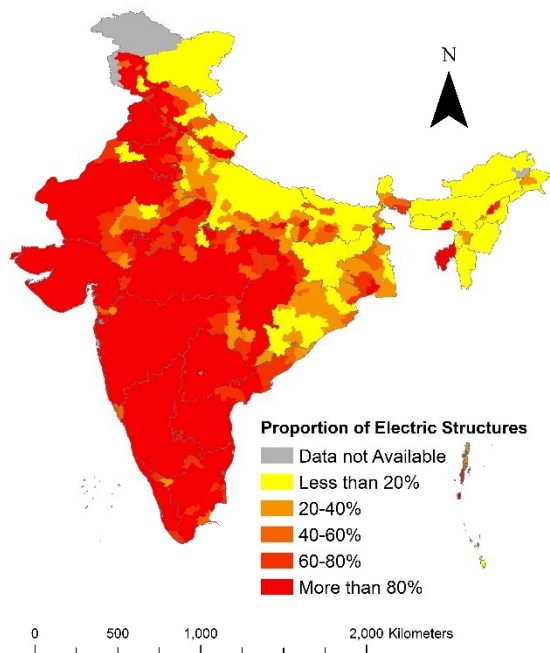
Threat and Opportunity

Cumulative Solar Pumps Installed till Dec 2017

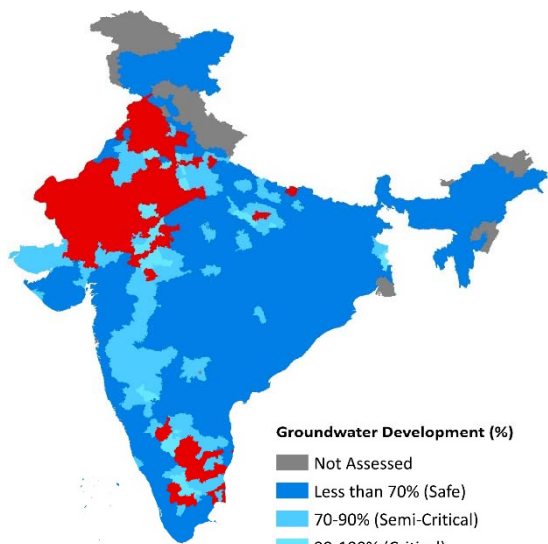


- Solar Pumps are growing at a CAGR of 65 percent
- Dropping cost, increased affordability with 75-90 percent capital subsidies by center and state
- Farmers value irrigation control- Surface water to Groundwater Irrigation, solar pumps give them ultimate control
- They can irrigate in day time, whenever they need to, not when there is water in canal or when there is no electricity
- But since there is no marginal cost to pumping, farmers will have no incentive to economize on energy-water use. Is it a curse or a blessing?

Energy Divide [2013-14]

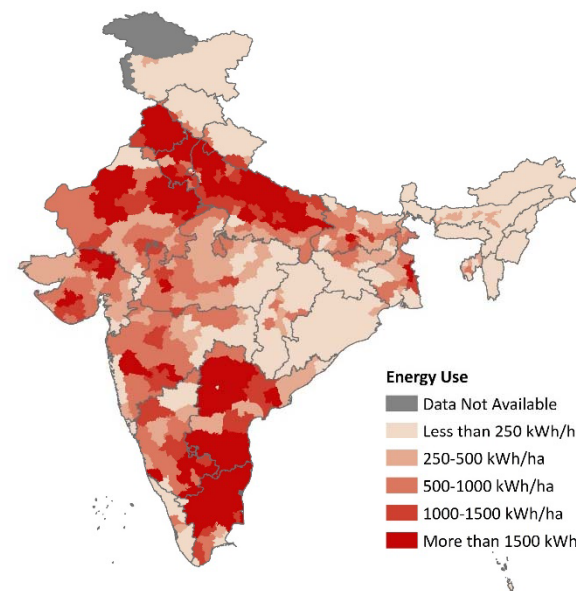


Energy Divide Map



Groundwater Map

Energy Use in Minor Irrigation [2013-14]
(kWh- equivalent per ha of Net Sown Area)

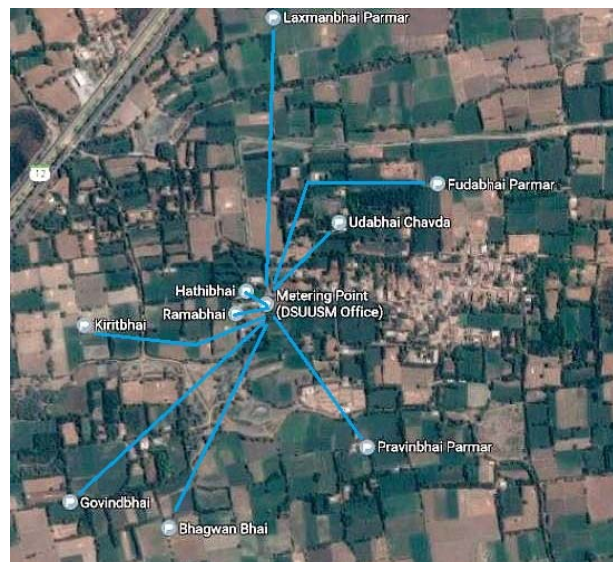


Energy Consumption

Water Scarce and Electricity Abundant Regions



- Solarize electric pumps and net-meter them
- Allow farmers to generate their own power, sell excess power to grid at a remunerative tariff
- Institutionalize by making feeder level solar cooperatives
- Power utilities to give long term power purchase guarantee at this tariff
- The tariff can govern groundwater demand and terms of trade in local irrigation service markets
- Tariff to represent the “Right” scarcity value of energy and water



India's First Solar Cooperative was set up in Dhundi Village in Early 2016

- Already SKY and KUSUM Schemes have been announced
- Discussions on institutional models for Feeder Level Solar Cooperatives

Water Abundant Energy Scarce Eastern India



Chakhaji, Samastipur, Bihar
220 cultivators, 115 acres, 2600 plots

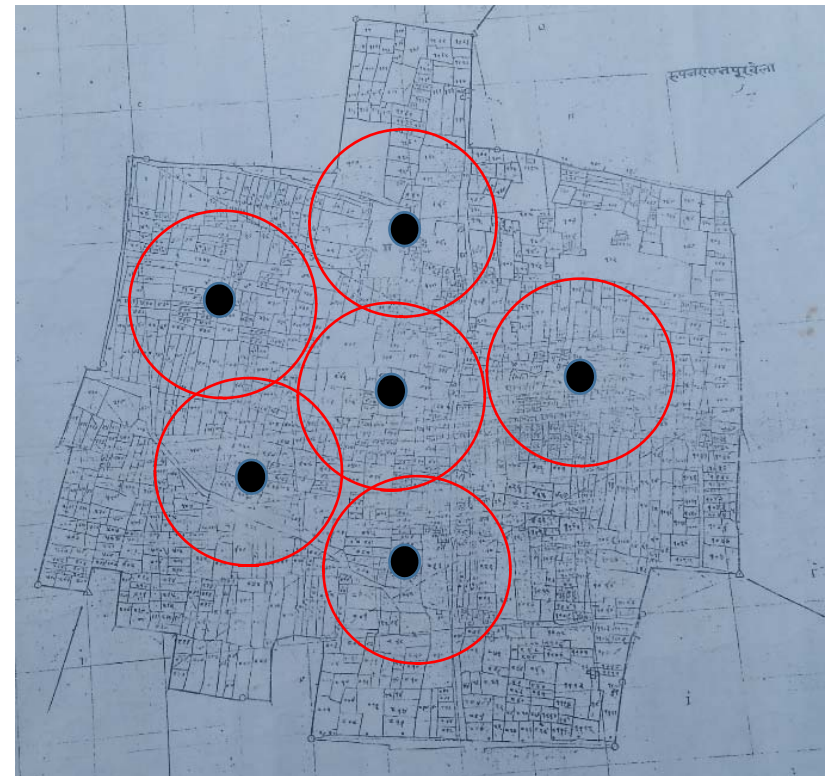
- The eastern regions, the well density is high but there is scarcity of affordable energy
- High land fragmentation, scarcity of land and expensive diesel irrigation has resulted in low productivity agriculture
- Yield and cropping intensity, both are low compared neighboring West Bengal
- The need is to catalyze competitive irrigation service markets.
- Irrigation Service Markets thrived in western India owing to flat rates and cheaper electricity and available surplus with farmers.
- Due to low margins on diesel irrigation sale and well-owner centric markets, ISMs were present in eastern India, but they never thrived
- Solar Power Irrigation service providers could catalyze the much needed ISMs to energize Bihar's Agriculture – Chakhaji Pilot

Diesel ISM



5 HP Surface Diesel Pump
 Flexible Pipes
 Rs 40/Katha or Rs 120/hr
 Does not work in pre-monsoon season
 Av. # of buyers/seller 41
 Hours for own irrigation/seller 180
 Hours of irrigation sold/seller 699

Solar ISM



- 5 HP Submersible Solar Pump
- 1000 ft buried pipelines, split in different directions
- Rs 20/katha or Rs 90-100/hr
- Works in pre-monsoon season
- Av. # of buyers/seller 81
- Hours for own irrigation/seller 207
- Hours of irrigation sold/seller 2064

Existing Solar Pump Policy Vs ISP Model

2-3 kWp Solar Pumps at 90 percent subsidy

Individual Pumps, largely not usable in pre-monsoon

Higher subsidy, limits number of beneficiaries

Underground pipeline is not included because the objective is individual use

Access and affordability is improved only for limited solar pump owners

- 5 HP - 5 kWp Pumps at 40 percent subsidy with loan component.
- Usable through out the season
- Subsidy is transferred to the water buyers in terms of availability of cheaper and reliable irrigation
- Water distribution system- underground pipeline ensures less losses due to leakage and creates an environment of water selling business
- Access and affordability trickles down to water buyers
- Eventually connect the solar pumps to a local microgrid or a set-up an entire feeder

In a country where majority of the farmers are water buyers, incentivizing well/pump owners to sell water can increase access and creating competition amongst sellers will create affordability



Stage 1

- Build a cluster of ISPs – Competitive ISM
- Affordable and accessible water for irrigation/drinking



Stage 2

- Develop a cluster of villages with flourishing ISMs
 - Faster knowledge transfer amongst villagers
 - Local capacity building will happen because of the increased and concentrated demand of maintenance



Stage 3

- Use solar pumps to sell back surplus electricity via dedicated feeders (if domestic electricity supply infrastructure is developed) or;
 - Solar Pumps to energise microgrids



Thank you

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