Silver Bullet
Are Solar Pumps a Panacea for Irrigation, Farmer Distress and Discom Losses?
Solar Energy in India – Expanding role

- INDC commitment to increase share of non-fossil-fuel sources in generation to 40% by 2030.
- 175 GW RE target, including 100 GW solar.
- Unprecedented capacity addition and tariff decline
Solar for Agriculture

- Promoted since 1990s, initially under MNRE schemes and later also under state govt schemes.
- Subsidy of 60 to 100 per cent provided to farmers.
- Crippled implementation, not a single scheme could achieve targets.
- Only recently picked up.
Why solar pump?

**Farmer’s perspective**
- Assured irrigation
- Reduced fuel cost
- Poor state of electricity
- Reliable day time power

**Government/Discom’s perspective**
- To meet increasing agricultural irrigation/energy demand
- Reducing subsidies
- Distributed RE
- Source of additional income to farmers
## PM KUSUM

<table>
<thead>
<tr>
<th>Components</th>
<th>Details</th>
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| Component B: Off-grid solar pumps | • 17.50 lakh off-grid solar pumps to be installed, of individual capacity of up to 7.5 HP  
• Centre and state to share 30 per cent of pump cost each; farmer to provide the remaining 40 per cent (Can access bank loan for up to 30 per cent of the cost)  
• Tendering to be carried out by designated central public sector units(CPSUs) |
## PM KUSUM

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| Component A: Decentralized ground-mounted grid-connected solar plants | • 10,000 MW of solar capacity to be set up as 500 kW to 2 MW plants  
• To be developed and owed by farmers, co-operatives, panchayats, or farmer producer organizations for sale of power to discoms at a feed-in-tariff determined by state electricity regulator  
• Discoms to be provided performance-based incentives of Rs 0.40 per unit for five years  
• 1,000 MW to be taken up on pilot basis first |
## PM KUSUM

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| Component C: Solarization of grid-connected electric pumps                | • Solarization of 10 lakh grid-connected electric pumps of up to 7.5 HP each.  
• Allowed solar PV capacity up to two times the pump capacity in kW terms, to enable sale of excess power to discoms.  
• PBI of Rs 0.60 per unit for discoms to purchase of surplus power  
• Both net-metering and one-way transfer of power allowed  
• Centre and state to share 30 per cent of pump cost each; farmer to provide the remaining 40 per cent (Can access bank loan for up to 30 per cent of the cost) |
Comparative Economics

5 HP pump, 800 hrs/year, 25 years of operation.
CSE Survey – Buldhana

Findings

• Inability to invest in new electric pumps [upto 1 lakh for new connection]
• High cost of irrigation (diesel – Rs. 9,800/acre/year, electric – Rs. 3,800/acre/year)
• Load-shedding, fluctuations, night time power and 6-7 hours supply
• Depleting water tables and reduced hours for irrigation

Implications and learning

• Very low utilization making off-grid solar pump uneconomical
• On-grid and solarized feeder better solutions
  – Feeder supply can be controlled
  – On-grid can help generate additional income
CSE Survey – Pilibhit

Findings

• Inadequate solar pump capacity
• Inefficient beneficiary targeting
• Pumps used for domestic needs
• Weak service market

Implications and learnings

• Solar pumps have little/no impact on agricultural power consumption – given parallel electric connections
• Higher subsidy for smaller pumps – bad policy design
• Poor farmers unable to pay even low upfront cost
• Lack of service market compromising performance of the pumps.
CSE Survey – Vizianagaram

Findings

• Off-grid pumps replacing electric pumps - under utilization of capacity
• APEPDCL (one of best performing discoms) unable to pay small FiT to a very small number of farmers

Implications and learnings

• Free pumps with low FiT, bad policy design – no not incentivize farmers to restrict groundwater extraction
• Discom’s role critical
• Transition from electric to off-grid pumps should be discouraged
Key Fundamental Challenges
Groundwater concerns are unaddressed
## Other Key Fundamental Challenges

<table>
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<tr>
<th>Challenge</th>
<th>Description</th>
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| Inefficient Discoms                          | • ill prepared, benefit not in the design  
• Not enough incentive to bring millions of prosumers on-board  
• Hard to implement metering (one-way or two-way) |
| Unaddressed farmer distress                   | • Free electricity - not a solution  
• Surplus generation has limits (FiT has limits)  
• Will benefit small minority of large farmers (will further add to income divide) |
| Unaddressed subsidy burden                    | • No restriction on hours of supply, tariff increase  
• New subsidy comes in picture |
| Weak beneficiary targeting                    | • Small and marginal farmers left out  
• No targets to be inclusive  
• Income divide may increase under new schemes |
Key Fundamental Challenges
KUSUM Scheme gaps

• Continued focus on off-grid pump
• Missing financing mechanisms
• Missing measures to ensure efficient discom participation
## Discussion

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<tr>
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<th>Off-grid pumps</th>
<th>On-grid pumps</th>
<th>Solarized feeders</th>
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<tbody>
<tr>
<td><strong>Irrigation</strong></td>
<td>Access to day time reliable electricity to farmers</td>
<td></td>
<td></td>
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<tr>
<td><strong>Additional income</strong></td>
<td>Income increases due to assured irrigation, and reduction fuel/energy cost</td>
<td>Additional income due to sale of surplus power; benefit depends on FiT</td>
<td>No income change</td>
</tr>
<tr>
<td><strong>Economics</strong></td>
<td>Least economic with breakeven of 20-25 years; cheaper only than diesel pumps</td>
<td>Net benefit increases significantly due to higher utilization</td>
<td>Most economic option</td>
</tr>
<tr>
<td><strong>Agriculture subsidy</strong></td>
<td>Subsidy burden remains unchanged</td>
<td>Subsidy burden reduces, however unclear impact in case of net metered pumps</td>
<td>Subsidy burden reduces due to decrease in cost supply</td>
</tr>
<tr>
<td><strong>Groundwater</strong></td>
<td>Overuse may increase as there is no monitoring of use, and no incentive to restrict extraction</td>
<td>Extraction can be controlled if the FiT is sufficiently high</td>
<td>Extraction continues unless hours of supply limited or tariff increased</td>
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Centre for Science and Environment
Recommendations

• Solarization of feeders most economical, but needs to be accompanied by agricultural tariff increase and limits on hours of power supply.
• On-grid pumps are an alternative for water-scarce regions with high farmer distress but adequate FiTs and one-way power flow (as opposed to net meter) is necessary.
• Off-grid pumps should be considered only in exceptional cases, in un-electrified regions with relatively high water-table, and utilization should be increased through sale of electricity or water.
• Explicit and strict measures of monitoring and control to manage groundwater extraction necessary. Funds should be extended only to states willing to take strong measures.
• Clear targets must be set for small and marginal farmers.
• Providing access to financing is a crucial determinant in this.
• Efficient discom operations should be ensured by regulatory mandated for regular reporting on installations, operations, evacuation, billing and payment to farmers.