Solar Powered Irrigation Pumps: Opportunities and Challenges for India

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Presentation Outline

- Understanding Solar Powered Irrigation Pump (SPIP) as a technology

- Market Status for Solar Powered Irrigation Pumps in India

- Opportunities and Challenges
Understanding Solar Powered Irrigation Pump: as a technology
Components of a Solar Pump

- Solar Panel
- Inverter (if AC)
- Controller
- Pump (AC/ DC; Surface / Submersible)
- Mounting structure (Fixed/ Tracking)
Components of a Solar Pump

Photons

PV Array → DC Current

Inverter

AC Current → Controller

Frequency adjustment

Water Output

Water pump

*The illustrative is for AC pumps
Types of Solar pumps

Solar pumps

Surface pumps
- AC pumps
- DC pumps

Submersible pumps
- AC pumps
- DC pumps
Mounting Structure

Tracking

Fixed
Benchmark cost for “Off-grid and decentralized solar PV applications Programme”

<table>
<thead>
<tr>
<th>S.No.</th>
<th>SPV system</th>
<th>Capacity</th>
<th>Benchmark costs (INR per HP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC pumps</td>
<td>Up to 3 HP</td>
<td>120000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;3 HP- 5 HP</td>
<td>95000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;5 HP- 10 HP</td>
<td>95000</td>
</tr>
<tr>
<td>2</td>
<td>AC pumps</td>
<td>Up to 3 HP</td>
<td>100000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;3 HP- 5 HP</td>
<td>85000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;5 HP- 10 HP</td>
<td>85000</td>
</tr>
</tbody>
</table>
Break up of cost for the different components
Market Status for Solar Powered Irrigation Pumps (SPIP) in India
Status of installation of solar pumps till date

<table>
<thead>
<tr>
<th>Year</th>
<th>Implemented by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upto 2011</td>
<td>7315</td>
</tr>
<tr>
<td>2011-12</td>
<td>2</td>
</tr>
<tr>
<td>2012-13</td>
<td>1509</td>
</tr>
<tr>
<td>2013-14</td>
<td>2800</td>
</tr>
<tr>
<td>2014-15</td>
<td>7875</td>
</tr>
<tr>
<td>2015-16</td>
<td>31472</td>
</tr>
<tr>
<td>Cumulative</td>
<td>109000</td>
</tr>
</tbody>
</table>
Status of solar pumps sanctioned during 2014-15*

Source: MNRE
Market Status for Solar powered irrigation pumps in India

- Primarily driven by Government programmes (B2G)
- Capital subsidy by Central up to (30%) and State (variable) Government
- Target oriented approach for installations
- Involvement of different departments of the state government
- Regulated market with empanelled players
- Limited involvement of Banks
Market Opportunities and Challenges
Market Opportunities

- Regulated market
- Untapped potential users
- Innovative service delivery models

- Empanelled players are eligible for participation in government tenders
- 46% of the net sown area is irrigated
- Asset sharing model/ portable pumps/ innovative finance mechanisms
Innovative service delivery models
Market Challenges

- Awareness
- Affordability
- Availability

Among farmers and bankers
High-up front cost / limited involvement of Financial Institutions
Technology / Financing options / Secondary market
Opportunities for strengthening the ecosystem

- Facilitate a shift from “technology deployment” to “technology adoption”

- Unpacking of the ‘energy-food-water nexus’ with focus on improved water conservation.

- Innovations in business models with water as a ‘service’
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### Site selection matrix with weightages

#### Demographic
- **No. of cultivators**
- Weightage: 5

#### Economic
- **Crop revenue per hectare**
- Weightage: 5
- **No. of tractors per hectare**
- Weightage: 5
- **Area under medium & large landholdings**
- Weightage: 3
- **Average size of landholdings**
- Weightage: 3
- **Per-capita income**
- Weightage: 2
- **No. of cultivators per hectare**
- Weightage: 2

#### Cropping Pattern
- **Area under horticulture crops**
- Weightage: 10
- **Total area irrigated**
- Weightage: 3
- **Cropping intensity**
- Weightage: 2

#### Favorable Ecosystem
- **Depth of water table**
- Weightage: 7
- **Solar radiation**
- Weightage: 3

#### Banking
- **Institutional credit per hectare of landholding**
- Weightage: 10
- **No. of bank branches**
- Weightage: 10

#### Technology
- **Use of agri-implements**
- Weightage: 10
- **Land under micro-irrigation**
- Weightage: 5