INDIA’S RURAL ELECTRIFICATION
Rural electrification in India: Several wins

**Installed capacity has almost doubled over 7 years and is projected to grow further**

<table>
<thead>
<tr>
<th>Year</th>
<th>Installed Capacity (GW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>177</td>
</tr>
<tr>
<td>2012</td>
<td>202</td>
</tr>
<tr>
<td>2013</td>
<td>223</td>
</tr>
<tr>
<td>2014</td>
<td>245</td>
</tr>
<tr>
<td>2015</td>
<td>272</td>
</tr>
<tr>
<td>2016</td>
<td>302</td>
</tr>
<tr>
<td>2017</td>
<td>327</td>
</tr>
<tr>
<td>2018</td>
<td>350</td>
</tr>
<tr>
<td>2022</td>
<td>523</td>
</tr>
</tbody>
</table>

Source: Central Electricity Authority, India

**Grid distribution network has also expanded**

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent of villages across India</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>59%</td>
</tr>
<tr>
<td>2005</td>
<td>67%</td>
</tr>
<tr>
<td>2010</td>
<td>76%</td>
</tr>
<tr>
<td>2015</td>
<td>88%</td>
</tr>
<tr>
<td>2018</td>
<td>100%</td>
</tr>
</tbody>
</table>

Household (HH) Electrification: 76%, 88%, 99%
Supply Hours - Rural: 4-6 hours, 8-10 hours, 14-18 hours

Source: World Bank, 2018; Energy Access Outlook, 2017
Per capita electricity consumption is low, but is projected to grow.

Electricity consumption in India growing at 6% - 7%

Annual kWh per capita

<table>
<thead>
<tr>
<th>Country</th>
<th>Annual kWh per capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>India (2014-15)</td>
<td>1,010</td>
</tr>
<tr>
<td>Brazil</td>
<td>2,578</td>
</tr>
<tr>
<td>World average</td>
<td>3,144</td>
</tr>
<tr>
<td>China</td>
<td>3,297</td>
</tr>
<tr>
<td>South Africa</td>
<td>4,229</td>
</tr>
<tr>
<td>Germany</td>
<td>7,035</td>
</tr>
<tr>
<td>Japan</td>
<td>7,819</td>
</tr>
<tr>
<td>UAE</td>
<td>11,263</td>
</tr>
<tr>
<td>USA</td>
<td>12,984</td>
</tr>
<tr>
<td>Canada</td>
<td>15,545</td>
</tr>
</tbody>
</table>

Source: World Bank, 2014
However, Public Utilities are struggling to serve rural customers viably

YoY losses, driven by gap between average cost of supply (ACS) and average revenue realized (ARR)

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2015</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&amp;D Losses³</td>
<td>28%</td>
<td>23%</td>
<td>21%</td>
</tr>
<tr>
<td>Accumulated Losses (USD billion)⁴</td>
<td>20.1 Bn</td>
<td>51.5 Bn</td>
<td>62.4 Bn</td>
</tr>
</tbody>
</table>

The rural segment has been unprofitable**

<table>
<thead>
<tr>
<th>Parameters⁵</th>
<th>Overall</th>
<th>Rural</th>
<th>Urban/Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tariff/Unit</td>
<td>6.60</td>
<td>2.90</td>
<td>9.30</td>
</tr>
<tr>
<td>Cost/Unit</td>
<td>7.70</td>
<td>8.30</td>
<td>7.50</td>
</tr>
<tr>
<td>Surplus/(Gap)/ Unit</td>
<td>(1.10)</td>
<td>(5.40)</td>
<td>1.80</td>
</tr>
</tbody>
</table>

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* Estimates fir FY 2017 and 2018 as per data available in ARR filing by DISCOMS to regulator
** Using West UP (PVVN) tariff petition; excluding all categories which are not broken into rural and urban such as institutions, HV customers, etc; Rural customers domestic at Rs 1.27 and enterprise at 3.37
Source: Report on performance of state utilities Jun-16
And rural customers continue using multiple sources for lighting and electricity.

![Graph showing primary sources of electricity](image)

- **GRID**: 71%
- **Mini Grid**: 1.5%
- **Other sources**: 27%

Others include: Solar Home System, Solar lanterns, Diesel gensets, Rechargeable batteries, Kerosene lamps, Torch, candles and Emergency lights.

Source: SPI-ISEP, John Hopkins Research study covering 12000+ customers in India, Feb 2019
Customer dissatisfaction from the grid services is high

Dissatisfaction is driven by:

- Poor redress services
- Power cuts: 1 in 2 households with grid-electricity face power cut of at least eight hours per day
- Poor Metering/Billing: There is a high share of unmetered connections and billing is highly irregular

41% Unsatisfied Customers

Source: SPI-ISEP, John Hopkins Research study covering 12000+ customers in India, Feb 2019
And myths about serving rural segment remain

- Rural electricity DEMAND IS LOW
- Rural customers CAN’T AFFORD ELECTRICITY
- Rural customers DON’T PAY
- HIGH RATE OF THEFT
SPI’s LEARNING
SPI’s Learning 1: Service and Reliable electricity drive Customer Satisfaction

Comparison of Customer Satisfaction (%) Satisfied) between 2 grid serviced geographies

What drives customer satisfaction?

- Supply Hours
- Evening Supply Hours
- Metered Connection
- On-time billing
- Complaint redress
- Stable voltage

Source: SPI-ISEP, John Hopkins Research study covering 12000+ customers in India, Feb 2019
SPI’s Learning 2: Rural customers pay for reliable service

Trend-line data of 1-year collection efficiency of 19000+ number of customers across 150+ Smart Power Mini-grids in India

Trend-line of collection efficiency in grid areas with improved service

Source: SPI Analysis of portfolio mini grids, January 2019
SPI’s Learning 3:
Customer service drives the perception of affordability

Comparison of Affordability Perception (% Agree) between Mini-grid and Grid serviced geographies

<table>
<thead>
<tr>
<th></th>
<th>Mini Grid</th>
<th>Typical Grid Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affordability</td>
<td>59</td>
<td>31</td>
</tr>
</tbody>
</table>

Comparison of Affordability Perception (% Agree) between Grid serviced geographies

<table>
<thead>
<tr>
<th></th>
<th>Grid with Distribution Franchisee</th>
<th>Typical Grid Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affordability</td>
<td>53</td>
<td>32</td>
</tr>
</tbody>
</table>

What drives affordability perception?

- Reliability
- Evening Supply Hours
- On-time billing
- Complaint redress
- Stable voltage

Source: SPI-iSEP, John Hopkins Research study covering 12000+ customers in India, Feb 2019
SPI’s Learning 4:
Even among the low-income segment, electricity consumption increases with increased hours of supply

Comparison of Electricity consumption among the low-income households between 2 grid serviced geographies (kWh/month)

<table>
<thead>
<tr>
<th>Hours of Supply</th>
<th>Low income</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 hours</td>
<td>49</td>
<td>33</td>
</tr>
<tr>
<td>13 hours</td>
<td>31</td>
<td>20</td>
</tr>
</tbody>
</table>

Source: SPI-ISEP, John Hopkins Research study covering 12000+ customers in India, Feb 2019
SPI’s Learning 5:
Rural microenterprises are an important segment and can’t be ignored

Despite the physical availability of grid-electricity almost half of rural enterprises in surveyed states of India relied on non-grid sources like diesel generators, solar systems, batteries etc.

Other sources include: Solar Home System, Solar lanterns, Diesel gensets, Rechargeable batteries, Kerosene lamps, Torch, candles and Emergency lights

Source: SPI-ISEP, John Hopkins Research study covering 12000+ customers in India, Feb 2019
ABOUT SPI’S WORK
SPI has enabled the world’s largest portfolio of mini grids supplying homes and businesses. We have demonstrated that the poor will pay for power to improve their lives. Average collection rates are 97%. Annual increase of energy consumption is 15%. Homes ending use of kerosene and diesel is 25%. Increase in monthly revenues for small businesses is 12-15%. Source: SPI Analysis of portfolio mini grids, January 2019.
SPI is piloting a Model Distribution Zone (MDZ) in partnership with a DisCom

**Target Outcomes**

- Universal electrification (including SMEs)
- Ensure adequate reliable electricity (SAIFI & SAIDI)
- Network Infrastructure enhancement
- Mini-grid integration
- Superior customer service
- Financially viable for Govt and Pvt.

**MDZ Framework**

- **Govt. Utility**
  - Operate as per Governance Charter agreed among stakeholders
  - Capex commitment for T&D infrastructure upgrade
  - Prompt approvals for on-ground implementation
  - Share upside with the supporting Pvt Operator

- **Private Operator**
  - Develop best practices for utility operations
  - Implement performance improvement initiatives
  - Track progress and resolve any bottlenecks

- **Govt. SPI Pvt. O&M**
  - Baselining (Technical, Commercial)
  - Customer engagement & Demand enhancement
  - Training / Awareness
  - Underwrite 80% of Pvt Operator Overheads – 2yr

**MDZ Project Management Unit**

- Site Selection Using SPI's Proprietary tool
- Cluster of 400 – 600 Villages
- Supply Hours < 15 Hrs / day
- Rural Mix Over 60%
- Mini-grids for hamlets/remote villages
- T&D Loss Over 35%

**Smart Power India**

- Baselining (Technical, Commercial)
- Customer engagement & Demand enhancement
- Training / Awareness
- Underwrite 80% of Pvt Operator Overheads – 2yr

- Mini-grids for hamlets/remote villages
- T&D Loss Over 35%
- Supply Hours < 15 Hrs / day

**Rural Mix Over 60%**

- Stylistic elements are used for visual clarity and emphasis.

Cluster of 400 – 600 Villages

- **Cluster of 400 – 600 Villages**

- **Supply Hours < 15 Hrs / day**

- **Cluster of 400 – 600 Villages**

- **Rural Mix Over 60%**

- **Mini-grids for hamlets/remote villages**

- **T&D Loss Over 35%**

- **Stylistic elements are used for visual clarity and emphasis.**