Off-grid Distributed Generation Based Distribution Franchisee (ODGBDF Model)

Paradigm Shift in Rural Electrification
Overview of Rural household electrification in India

- Despite 95% village electrification through grid extension, over 30% households still depend on kerosene for lighting.

- There exists great disparity in household level electrification in States like Bihar (10.4%), Uttar Pradesh (23.8%), Assam (28.4%), and Jharkhand (32.3%), and Odisha (35.6%) lagging way behind states like HP (96.6%), Punjab (95.5%) and Andhra Pradesh (89.7%)
Mission “Electricity for ALL by 2012” still distant unfulfilled dream
Of 6 lakh villages, only 14,000 be electrified.
>40% rural & >10% urban HHs still do not have access to electricity
Several of these HHs are in un electrified villages, padas, bastis
Even electrified villages are witnessing shortages in supply (<6hr)
More 74 million HHs still depending kerosene as primary source for lighting
With 240W connected load technical off-grid power potential is ~ 20GW/40BU
Expensive to undertake extension of network, CoS of Rs. 20+/unit
Difficult to maintain quality of supply for long network, voltage drops
Need local generation to stabilise the grids
Abundant RE resources are locally available
Micro/ mini grids if structured properly, would be viable solutions
Challenges faced by Rural Micro Grid Developers

Often begin to supply only residential segment~ a few KW system. High unit costs

Need to convince the customers/villages on one’s own. Takes time and high cost of effort

‘High risks’, ‘low scale’, uncertainties of ‘revenue model’, and lack of ‘credible track record’ -- bankers unwilling to lend, despite priority lending status

Threat that discom will begin supply and outcompete the micro grid

RGGY and MNRE subsidies are not easily accessible by private Developer’s
Rationale for Development of New Policy Initiatives

- Large number of communities in hamlets/ bastis/ padas are yet to be electrified
- Many places grid has reached but supply is severely constrained
- Liquid fuels (kerosene & diesel) are being widely used for basic applications such as lighting
- Significant untapped local renewable energy potential exists
- RE though cheaper than kerosene, expensive than grid supply
- Existing policies/programs inadequate for large scale deployment of off-grid generation projects
Two distinct but interconnected problems

- Rural electrification consists of two distinct but interconnected problems
  - i.e. Generation & Distribution
  - Different business models exist for generation & network

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Off-Grid</th>
<th>Grid Connected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Without Grid</td>
<td>After Grid</td>
</tr>
<tr>
<td>Generation</td>
<td>Must</td>
<td>Remains Idle</td>
</tr>
<tr>
<td>Hours of Supply</td>
<td>Limited based on technology</td>
<td>Depends on grid supply</td>
</tr>
<tr>
<td>Certainty of supply</td>
<td>Fixed duration / fixed time</td>
<td>Depends on grid supply</td>
</tr>
<tr>
<td>Distribution Network</td>
<td>Property of franchisee</td>
<td>Duplicate Network</td>
</tr>
<tr>
<td>O&amp;M of Distribution Network</td>
<td>Franchisee</td>
<td>Two separate operators</td>
</tr>
<tr>
<td>MBC</td>
<td>Franchisee</td>
<td>Duplicate efforts</td>
</tr>
<tr>
<td>Major Risk</td>
<td>Grid Interconnection</td>
<td>Idle Infrastructure</td>
</tr>
</tbody>
</table>

Proposed Business Model must address these problems

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Key Considerations for developing new Business Models

- Business model must work in off-grid & grid connected set up
- Consumer should not pay more than
  - Electricity tariff in adjoining areas (not more than DISCOM tariff)
  - Existing expenditure on lighting load
- Compliant with EA 2003, existing policies
- Create structure for flow of subsidy
- As far as possible, internalization of costs of Rural Electrification
- Should make use of existing institutional structure
- Avoid conflict between programmes of various ministries
- Should promote private sector involvement

In view of these requirements and the analysis carried out, potential models have been proposed
ODGBDF Model
(Off-grid Distribution Generation Based Distribution Franchisee)

- Project Developer (PD) will not only generate electricity but also undertake metering, billing, and collection (MBC) on behalf of DISCOM within the cluster.
- Thus the developer will act both as generator and distributor franchisee.
- So PD and DISCOM would need to draw up two agreements:
  - PPA for lifetime of proposed RE-based DDG power plant
  - Franchisee agreement for MBC on behalf of the DISCOM.
- DISCOM will pay agreed-upon FIT to PD. As per current practice, DISCOM will distribute electricity to rural consumers and PD will undertake MBC under franchisee agreement.
Institutional & Contractual Structure of ODGBDF Model implementation
Major Advantages of ODGBDF Model

- Would enable large scale deployment of off-grid projects which no other model can do
- Model could be used for off-grid as well as on-grid supply augmentation
- Maximum certainty of revenue to the developer
- Benefits of economies of scale
- Economic benefit to the consumers
- Accounting and Optimum utilisation of the government subsidy, if offered
- FIT guidelines at national level would bring in uniformity.
- Proper integration of off-grid projects with grid as and when is feasible
- Internalisation of costs of rural electrification
- Distribution Licensee can meet twin objective of electrification and RPO
- Possible to customise model according to local requirements
Bihar Feed In Tariff for Off-Grid Generators
Voltage-wise Cost of Supply

The cost of supply at each voltage level has 4 elements which are added to arrive at per unit cost of supply as tabulated below:

<table>
<thead>
<tr>
<th>Voltage Level (kV)</th>
<th>220</th>
<th>132</th>
<th>33</th>
<th>11</th>
<th>0.4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of power purchase (Cents/Unit)</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
</tr>
<tr>
<td>Cost of Loss (Cents/Unit)</td>
<td>0.29</td>
<td>0.62</td>
<td>0.64</td>
<td>1.02</td>
<td>5.36</td>
<td>3.67</td>
</tr>
<tr>
<td>Wire cost (Cents/Unit)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.33</td>
<td>2.07</td>
<td>3.55</td>
<td>2.44</td>
</tr>
<tr>
<td>Retail Supply Cost (Cents/Unit)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.0016</td>
<td>0.002713</td>
<td>1.15</td>
<td>0.70</td>
</tr>
<tr>
<td><strong>Cost of supply (Cents/Unit)</strong></td>
<td><strong>7.08</strong></td>
<td><strong>7.42</strong></td>
<td><strong>8.15</strong></td>
<td><strong>10.69</strong></td>
<td><strong>16.86</strong></td>
<td><strong>13.63</strong></td>
</tr>
</tbody>
</table>
Urban-Rural Cost of Supply

<table>
<thead>
<tr>
<th>Cost of Supply</th>
<th>Urban</th>
<th>Rural</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of power purchase (Cents/Unit)</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
</tr>
<tr>
<td>Cost of Loss (Cents/Unit)</td>
<td>4.35</td>
<td>7.95</td>
<td>5.36</td>
</tr>
<tr>
<td>Wire cost (Cents/Unit)</td>
<td>1.99</td>
<td>7.6</td>
<td>3.54</td>
</tr>
<tr>
<td>Retail Supply Cost (Cents/Unit)</td>
<td>0.92</td>
<td>1.75</td>
<td>1.15</td>
</tr>
<tr>
<td><strong>Cost of supply (Cents/Unit)</strong></td>
<td><strong>14.06</strong></td>
<td><strong>24.11</strong></td>
<td><strong>16.86</strong></td>
</tr>
</tbody>
</table>

Clearly, cost of supply to LT rural consumer is much higher than grid tariff charged. This necessarily implies that, grid extension to serve rural consumers would further increase the distribution costs of Discom.

This, to some extent, supports hypothesis that, proposed higher FITs to be paid to off-grid RE based DDGs for rural electrification might not be really too high and even subsidy as such as real cost of supplying power to rural consumer even through grid extension may even be higher than FIT in some cases.
Feed-in Tariffs for Off-Grid Generators

As per the PPA to be signed between the two parties, the Feed-In tariff is to be pa

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Up to 25 kW</th>
<th>25-50 kW</th>
<th>50-75 kW</th>
<th>75-100 kW</th>
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</thead>
<tbody>
<tr>
<td>Biomass</td>
<td>30.7</td>
<td>26.91</td>
<td>23.79</td>
<td>20.95</td>
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<tr>
<td>Solar</td>
<td>38.28</td>
<td>35.96</td>
<td>31.90</td>
<td>30.88</td>
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<tr>
<td>Micro Hydel</td>
<td>15.11</td>
<td>12.75</td>
<td>10.56</td>
<td>8.55</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Levelised COG/ FiT (Cents/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Without Subsidy</td>
</tr>
<tr>
<td>Biomass</td>
<td>20.92</td>
</tr>
<tr>
<td>Solar</td>
<td>30.88</td>
</tr>
<tr>
<td>Hydro</td>
<td>8.55</td>
</tr>
<tr>
<td>Total COG</td>
<td>20.92</td>
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</tbody>
</table>
Way Forward

- Develop state specific draft regulations for ODGBDF in potential states (ongoing)
- Develop Feed-in-Tariff (FiTs) for Small-Scale Off-Grid RE power plants (ongoing)
- Develop and implement few pilot projects based on proposed business model
  - To put in place requisite policy and regulation framework
  - To show case proof of concept of viability
  - To get insight and learning for launching large-scale deployment programme
- Assessment of entrepreneur ability to undertake electrification
- Assessment of the financial institutions to fund projects under ODGBDF Model
- Explore possible synergy with SPEED programme or new 1000 village program
Thank You

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