Future of Utilities: Challenges and Solutions for the Indian Electricity Sector

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Emerging Challenges for Electric Utilities in India – Regulatory and Policy

• Open Access with gradual reduction in OA Surcharge
• Rooftop Solar – lucrative for cross-subsidising consumers
• RPO Compliance – Feed-in Tariff & REC Market
• Excess PPAs with some state utilities
• Carriage and Content Separation – Retail Competition
• Impact of EVs
All India Generation Capacity (GW) (As on 31 Aug 2018)
Emergence of Competition and Impact on Electric Utilities
Indian Power Sector Reform Timeline

- 1991- Opening up of Power Sector for IPPs (Private Power Policy & Mega Power Policy)
- 1995-97 - Unbundling, regulatory reforms beginning with Orissa, Haryana & AP + +
- 1998 – Electricity Reform Act; setting up of CERC & SERCs
- 2001 - Electricity Bill Introduced
- 2002 -Privatisation of DVB (Delhi)
- 2005 – National Electricity Policy and Amendments
- 2006 – National Tariff Policy and Amendments
- 2014 – Electricity (Amendment) Bill
- 2018 – Proposed Amendment to Electricity Act
Market Reforms – Quest for a Competitive Order

Evolving Market Reforms

Allocated Capacities with MoD

Negotiated PPAs

ABT

Tariff Based Bidding

Trading with Negotiated Contracts

PX - DAM

Ancillary Services - RRAS

Real Time Market (Proposed)

Derivatives?
Re-emphasising Role of the Market
Demand & Gen. Curve for LT Realistic Growth Scenario – Uttar Pradesh

So: Study by IIT Kanpur
From a Darker Past to a ‘Bright’ Future
The Past of Indian Utilities......
Access and Availability

Per Capita Consumption of Electricity in India

Note: As on 31st March, except 1947 and 1950 which are expressed as on 31st Dec; *Provisional
The Past of Indian Utilities...... Operational Performance
The Past of Indian Utilities...... Financial Performance

![Graph showing All India T & D Loss (%) from 1947 to 2014*]

Source: CEA (June, 2010, 2012, 2014, Dec 2016), Note: *Provisional
Financial Turnaround or turning around....
Financial Concerns in the Power Sector

Average revenue realization < average cost of production and supply.

• Accumulated losses: Rs. 3.8 trillion (As on March 2015).

• Outstanding debt: Rs. 4.3 trillion (As on March 2015).
## UP Discoms in distress

- **Rs. 138.02 billion**
  - Revenue deficit during 2013-14

- **Rs. 707.38 billion**
  - Accumulated losses at the end of September 2015.

- **Rs. 532.11 billion**
  - Outstanding debt level at the end of September 2015.
UDAY Scheme

• UDAY- Ujwal Discom Assurance Yojana.
• Launched in November 2015 by Ministry of Power to revive financially stressed Discoms.

Four initiatives of UDAY scheme:

- Improving operational efficiencies of Discoms.
- Reduction of cost of power.
- Reduction in interest cost of Discoms.
- Enforcing financial discipline on Discoms through alignment with state finances.
UP’s UDAY Scheme - salient features

States shall take over 75% of DISCOM debt as on September 30, 2015 over two years:
- 50% in 2015-16.
- 25% in 2016-17.

GoI will not include this debt in calculating fiscal deficit of states.

States shall take over the future losses of DISCOM in a graded manner:

- 2016-17: 5%
- 2017-18: 10%
- 2018-19: 25%
- 2019-20: 50%
- 2020-21:
UP Discoms vis-à-vis UDAY

As per MoU for UP, Discoms of UP shall fulfill RPO obligation 3 years after the DISCOMs reach break even, i.e. the financial year 2019-20.

Target distribution loss trajectory of MVVNL:
UDAY Vs Political Will – Required Tariff increase in Uttar Pradesh (MVVNL)

Projected Loss with Distribution losses as per UDAY scheme, without state takeover of losses

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<tbody>
<tr>
<td>8% tariff increase</td>
<td>-1868</td>
<td>-2297</td>
<td>-2354</td>
<td>-2598</td>
<td>-2832</td>
<td>-2939</td>
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<tr>
<td>10% tariff increase</td>
<td>-1770</td>
<td>-2070</td>
<td>-1956</td>
<td>-1989</td>
<td>-1935</td>
<td>-1662</td>
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<tr>
<td>12.1% tariff increase</td>
<td>-1668</td>
<td>-1827</td>
<td>-1523</td>
<td>-1313</td>
<td>-919</td>
<td>-191</td>
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<tr>
<td>12.36% tariff increase</td>
<td>-1655</td>
<td>-1797</td>
<td>-1468</td>
<td>-1227</td>
<td>-788</td>
<td>0</td>
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Calculations by Utkarsh
UDAY Vs Political Will – Required Tariff increase in Uttar Pradesh

Profit/ loss prediction - Annual tariff increase: 12.36% at different levels of distribution losses, without state takeover of losses:

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<tr>
<td>Distribution loss as per UDAY</td>
<td>-1655</td>
<td>-1797</td>
<td>-1468</td>
<td>-1227</td>
<td>-788</td>
<td>0</td>
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<tr>
<td>Distribution loss @20%</td>
<td>-1578</td>
<td>-1516</td>
<td>-1319</td>
<td>-1320</td>
<td>-1277</td>
<td>-1145</td>
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<tr>
<td>Distribution loss @17%</td>
<td>-1357</td>
<td>-1268</td>
<td>-1042</td>
<td>-996</td>
<td>-898</td>
<td>-699</td>
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Calculations by Utkarsh
UP (MVVNL) – Loss Trajectory with Rooftop PV Growth

Total losses including losses due to solar rooftop PV systems

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<tbody>
<tr>
<td>Distribution loss</td>
<td>19.16% (UDAY)</td>
<td>16.09% (UDAY)</td>
<td>11.8% (UDAY)</td>
<td>20%</td>
<td>19%</td>
<td>18%</td>
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<tr>
<td>Simulation Set (Type A)</td>
<td>-1310.66</td>
<td>-947.83</td>
<td>-202.11</td>
<td>-1404.53</td>
<td>-1303.27</td>
<td>-976.79</td>
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<tr>
<td>Simulation Set (Type B)</td>
<td>-1316.69</td>
<td>-962.85</td>
<td>-228.45</td>
<td>-1410.63</td>
<td>-1318.72</td>
<td>-1004.39</td>
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<tr>
<td>Simulation Set (Type C)</td>
<td>-1322.73</td>
<td>-977.87</td>
<td>-254.80</td>
<td>-1416.73</td>
<td>-1334.16</td>
<td>-1031.99</td>
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<td>Simulation Set (Type D)</td>
<td>-1334.80</td>
<td>-1007.92</td>
<td>-307.49</td>
<td>-1428.92</td>
<td>-1365.05</td>
<td>-1087.20</td>
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Calculations by Utkarsh
Distribution Utilities –
Resisting Open Access, but harnessing market for procurement
Open Access Energy Trade – Andhra Pradesh – Utility Vs Non-Utility (MWh)

So: Analysis by EAL, IIT Kanpur
Open Access Energy Trade – Maharashtra – Utility Vs Non-Utility (MWh)

So: Analysis by EAL, IIT Kanpur
Open Access Energy Trade – Uttar Pradesh - Utility Vs Non-Utility (MWh)

So: Analysis by EAL, IIT Kanpur
Are mini-grids a Challenge or part of the solution?
Mini-grids - Existing Business Model
Mini-grids as grid interactive RE plant
Distribution Ancillary Service Model?
Mini-grids as Distribution Franchisee or ‘Peer-to-Peer’ Market?
Are EV’s Disruptive?
Electricity Demand for EV Charging – Case of Delhi
Is RE Disruptive – seems to be
Emerging Duck Curve with growing RE

For Peak RE Generation Days

* Solar, wind, Small hydro and bio-mass has maximum generation load
Are Regulators and Policymakers Demanding?
Recent Developments

• Amendments to the Tariff Policy
• Real Time Market
• (Fast Response Ancillary Services?)
• Proposed Amendments to the Electricity Act 2003
Proposed Amendments to Electricity Act 2003 (2018)

• Separation of Carriage and Content: Distribution and supply are defined explicitly and to be segregated [1]. ➔ Retail Competition

• Renewable Generation Obligation and Renewable Energy Service Company introduced, along with the existing Renewable Purchase Obligation[1].

• Distribution/supply licensees to be obligated to supply 24×7 power [42]

• Mandatory metering of electricity consumption, and Direct Benefit Transfer (DBT) [45];

• Regulatory Scrutiny/control over Power Purchase [42, 49]
# Proposed Amendments to Electricity Act 2003 - Impact on Utilities

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<thead>
<tr>
<th>Proposed Amendments</th>
<th>Impact</th>
<th>How to Address</th>
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<tr>
<td>Separation of Carriage and Content: Distribution and supply are defined explicitly and to be segregated [1].</td>
<td>'Legacy' Network losses? - Cherry Picking of Consumers</td>
<td>Metering of all supplies, DTs/Feeders for energy accounting - Freedom to offer 'menu of tariffs'</td>
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<td>Renewable Generation Obligation (RGO)</td>
<td>RGO already present in some form (e.g. RE bundling by NTPC)</td>
<td>Presence of RGO and RPO may have operational challenges - Strengthen REC Market for compliance</td>
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<tr>
<td>Distribution/supply licensees to be obligated to supply 24×7 power [42]</td>
<td>How to ensure this with C &amp; C separation? - Who would be penalised for 'network' issues rather than supply issue?</td>
<td>Strengthening and automation of distribution system with effective monitoring - Should provide for Reliability based (curtailable) tariff</td>
</tr>
<tr>
<td>Mandatory metering of electricity consumption, and Direct Benefit Transfer (DBT) [45];</td>
<td>Improved estimation of distribution loss</td>
<td>Need to be further strengthened by mandating electricity supply only based on metered consumption</td>
</tr>
<tr>
<td>Closure Regulatory Scrutiny/control over Power Purchase [42, 49]</td>
<td>Return of intrusive regulatory regime</td>
<td>Better SoP Compliance mechanism with incentive/disincentives</td>
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Full Retail Competition – Story of developed world

**Context of retail competition**
- Private Utilities
- Commercially operated
- Strong metering infrastructure
- Consumers aware supported with vibrant consumer organisations
- Consumer end generation (PV) and storage yet to emerge

**New realities**
- Significant inroads by Solar PV and Storage
- Growth of Electric Vehicles
- Distributed Microgrids
Full Retail Competition – The Emerging India Story

Access of electricity to all yet to be achieved
Large consumption remains unmetered
High Distribution losses (theft)
Lopsided tariffs – leading to cherry picking
Subsidy and Cross-subsidy
Success of telecom
Thank You

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