Linking Electric Vehicles to Renewable Energy

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Agenda

• BRPL – Brief Profile
• EVs at BSES Rajdhani
• Utility’s role in RE and EV integration
• Summary
BSES Rajdhani Power Ltd. – A Profile

Distribution Area | 750 sq. Km
No. of customers | 2.55 Mln.
Customer Density | 3400 /sq Km
Max Demand met (Till Date) | 3211 MW
Annual Billed energy FY19 | 12,194 MU
AT&C Loss FY19 | 8.06 %

Consumer Mix

About 86% residential contributing to ~70% consumption

RE ~ 29% of portfolio (1300MW+) by ’21-22

Peak Demand Met

BRPL Peak demand growth ~ 6% CAGR; BRPL’s share is ~43% in energy terms

> 43% reduction since Year ‘02

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Annual Billed energy FY19 12,194 MU
AT&C Loss FY19 8.06 %

BRPL Peak demand growth ~ 6% CAGR; BRPL’s share is ~43% in energy terms

> 43% reduction since Year ‘02
Steep Loss reduction post- privatization

<table>
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<tr>
<th>FY02</th>
<th>FY19*</th>
<th>Reduction</th>
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<tr>
<td>51.5%</td>
<td>8.06%</td>
<td>~44%</td>
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BRPL Loss Trajectory

~44% reduction in losses post takeover against 20% rise in a decade up-to privatization
Power Portfolio & Network Landscape (1/2)

• Large seasonal and diurnal variation in demand and hence loading of assets

• High RE share including robust growth in Roof Top Solar

Daily variation of Load – Seasonal and Diurnal Impact

Daily variation in load

- Summer (Jul) ~1160 MW
- Winter (Jan) ~1200 MW
- Fall/Spring (Oct/ Apr) ~600 MW
Asset is loaded at ~20% rated capacity for 80% time of year

- Space constraints for network upgrading
- Overall lower utilization of assets
- Rooftop Solar can help reduce day peak loading of assets
Impact of RTS and ISTS Solar on Demand

Ramp rate of ~300 MW per Hour needed – Impact on DT loading and Conventional sources
EV charging during High RE share slots

- EV TOU tariff could align with high RE (Wind + Solar) slots for EV charging
- Overnight EV charging to promote Wind power absorption
- Similarly day charging (barring peak hours) to promote Solar power absorption
- EV charging coupled / synchronized with Rooftop solar to promote RTS penetration in Grid

Valley filling using EV load; Maximize utilization of RE
1468 Installations completed, 47.47 MWp; Another 18.30 MWp in Progress
- Y1: 90 Nos, 3.1 MWp, Y2: 155 Nos, 3.8 MWp, Y3: 353 Nos, 14.4 MWp, Y4: 734 Nos, 23.0 MWp
- Capacity of Solar 47.47 MWp against sanctioned load of 155.1 MW (~31%)
BRPL’s Rooftop Journey till YTM Jun19

**RTS installations capacity crossed 50 MWp in Aug ‘19**

No. of net-meter installations in FY18-19 is higher than cumulative no. of installations in last 3 FYs

Waste-to-Energy, Hybrid Solar, Wind Plants in Pipeline
EVs at BSES Rajdhani

- Member of EV100
- Phased transition of corporate fleet
- Roll-out of Public EV CI in collaboration with Land owning agencies
- EODB for EV charging connection support
- Participating in Freight pilot in Delhi
- Facilitating legal charging and battery swapping infra for 3W / e-Rickshaws
- App based booking and EV charging
- Managed charging of EVs – Integration with Distribution systems control
EVs at BSES Rajdhani
Process for EV charging
(1/2)
Managed Charging - Drivers

• Key Drivers for Managed Charging:
**Forms of Managed Charging**

**Passive** managed charging relies on customer behavior to affect charging patterns.

**Active** managed charging relies on communication (i.e., “dispatch”) signals originating from a utility or aggregator to be sent to a vehicle or charger to control charging in a predetermined specific way.

<table>
<thead>
<tr>
<th>Passive</th>
<th>Active</th>
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<tr>
<td>EV time-varying rates, including time-of-use rates and hourly dynamic rates</td>
<td>Direct load control via the charging device</td>
</tr>
<tr>
<td>Communication to customer to voluntarily reduce charging load (e.g., behavioral demand response event)</td>
<td>Direct load control via automaker telematics</td>
</tr>
<tr>
<td>Incentive programs rewarding off-peak charging</td>
<td>Direct load control via a smart circuit breaker or panel</td>
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*Source: Smart Electric Power Alliance, 2019.*
Role of Utility

• Provide EV education and awareness to their consumers

• Participate in the managed charging communication standards development process

• Engage vendors to share utility needs and learnings from other comparable DER efforts

• Provide a test bed or pilot effort for new solutions

• Develop solutions to integrate EV charging into demand response systems

• Continue to evolve rate structures matched with active load management strategies

• Encourage greater deployment of managed charging-capable infrastructure among customers

Source: Smart Electric Power Alliance, 2019
Proposed EV TOD tariff - Delhi

<table>
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<tr>
<th>S.No</th>
<th>Period</th>
<th>Applicable Off Peak Rebate during identified off peak time slots</th>
<th>Applicable Peak Surcharge during identified peak time slots</th>
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<tbody>
<tr>
<td>1</td>
<td>May – September (Other categories of consumers)</td>
<td>05:00 – 09:00 (30%)</td>
<td>00:00 – 02:00 (40%)</td>
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<td></td>
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<td>14:00 – 18:00</td>
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<td>18:00 – 24:00</td>
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<tr>
<td>2</td>
<td>April – November &amp; February - March (For EV charging)</td>
<td>02:00 – 10:00 (45%) 18:00 – 22:00</td>
<td>22:00 – 24:00 (46%)</td>
</tr>
<tr>
<td>3</td>
<td>December – January (EV Charging)</td>
<td>00:00 – 05:00 (32%) 18:00 – 24:00</td>
<td>05:00 – 10:00 (44%)</td>
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TOD Tariff for EVs along with Active Managed Charging expected to promote stable distribution, RE integration and cost economics for EVs
Summary

• Distributed Public EV charging Infrastructure across city (near to Electric sub-stations) to enable optimal network requirements, optimal costs and space use
• Active and Passive managed charging to play key role in grid integration of EV and RE
• EV specific rate plans to induce better network utilization and optimal costing of backend infrastructure
• Integration of EV charging with DERMS shall be key
• Discoms in partnerships with land owning agencies can be new “fuel provider” for electrified mobility
Thank You

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