



# Linking Electric Vehicles to Renewable Energy

Abhishek Ranjan

AVP & Head – Renewable & DSM Initiatives  
BSES Rajdhani Power Ltd, New Delhi , India

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**BSES**  
BSES Rajdhani Power Limited

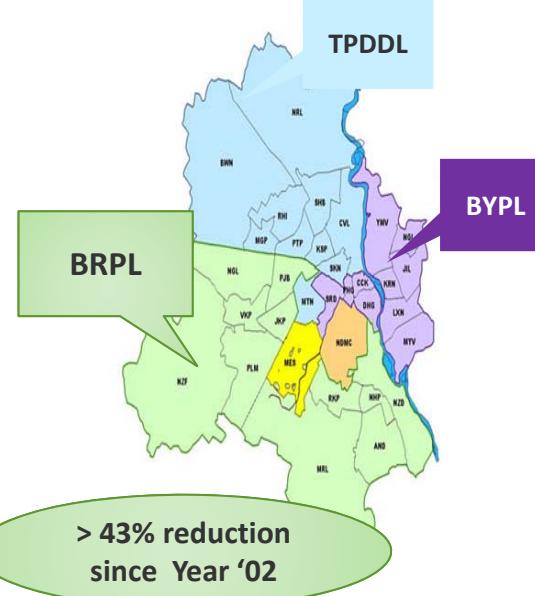
*BSES is a JV of Reliance Infrastructure (51%) and Govt. of Delhi (49%)*

# Agenda

- BRPL – Brief Profile
- EVs at BSES Rajdhani
- Utility's role in RE and EV integration
- Summary

# BSES Rajdhani Power Ltd. – A Profile

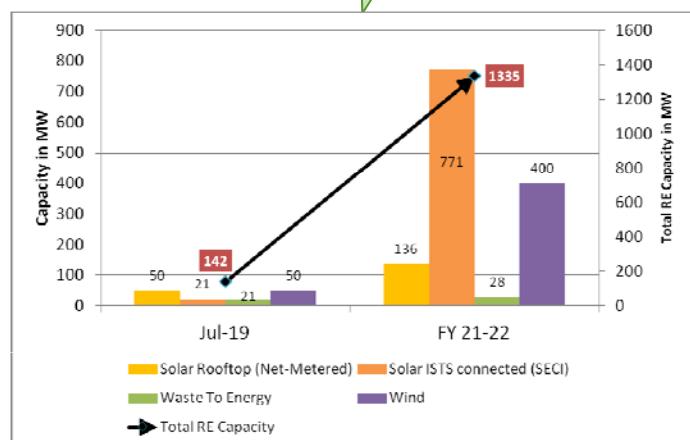
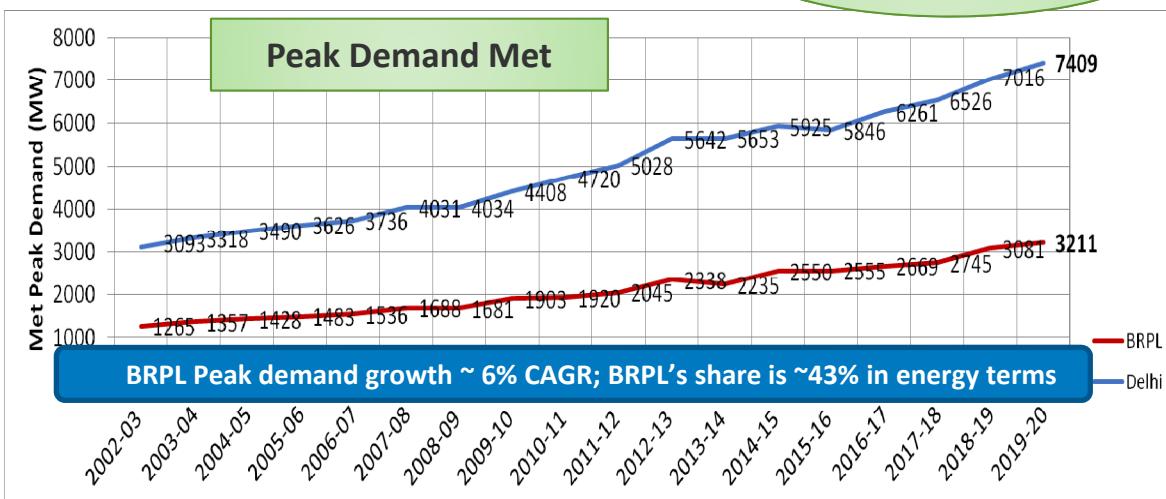
Distribution Area	750 sq. Km
No. of customers	2.55 Mln.
Customer Density	3400 /sq Km
Max Demand met (Till Date)	3211 MW
Annual Billed energy FY19	12,194 MU
AT&C Loss FY19	8.06 %



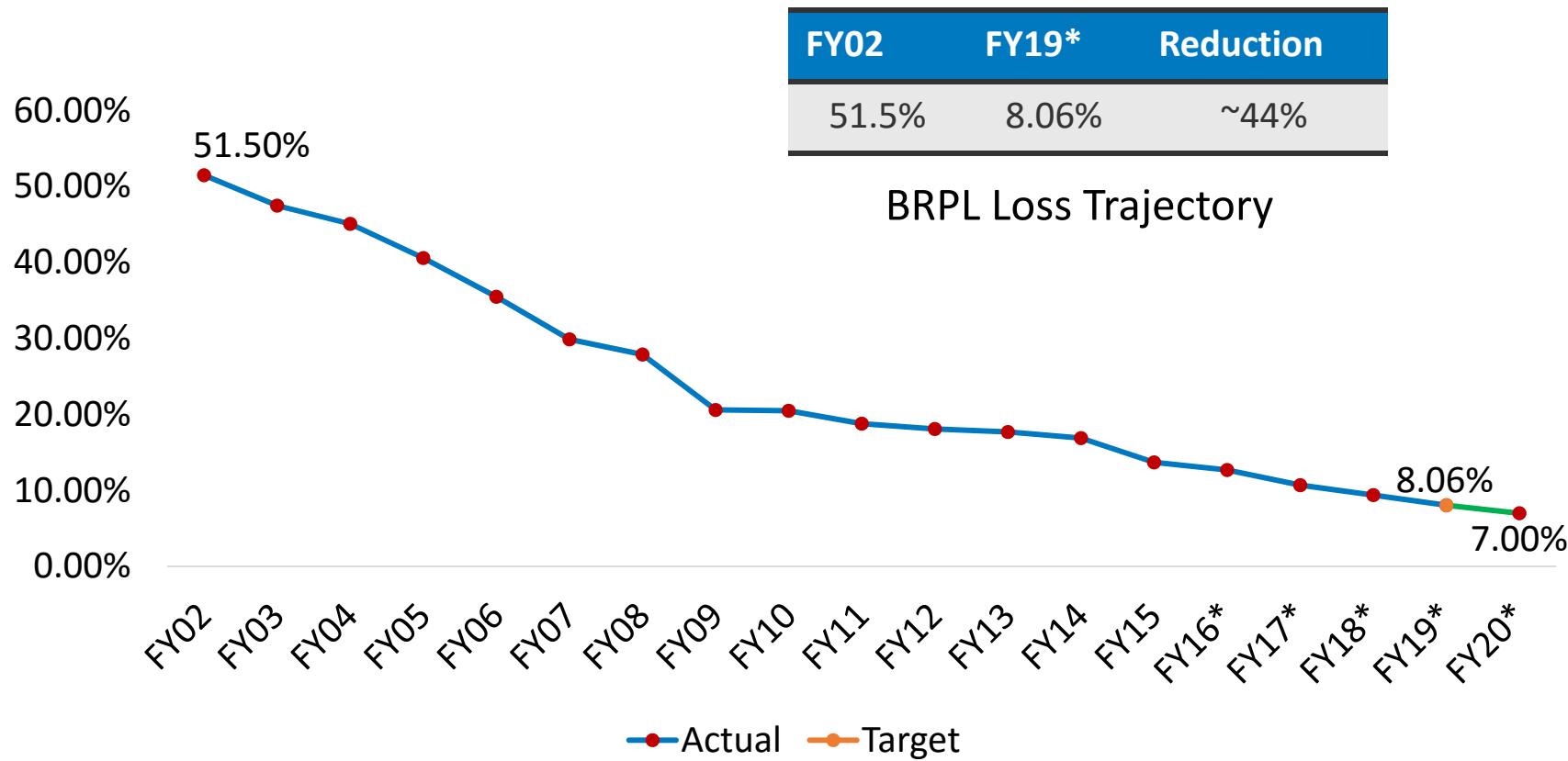
## Consumer Mix

About 86% residential contributing to ~70% consumption

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



# Steep Loss reduction post- privatization

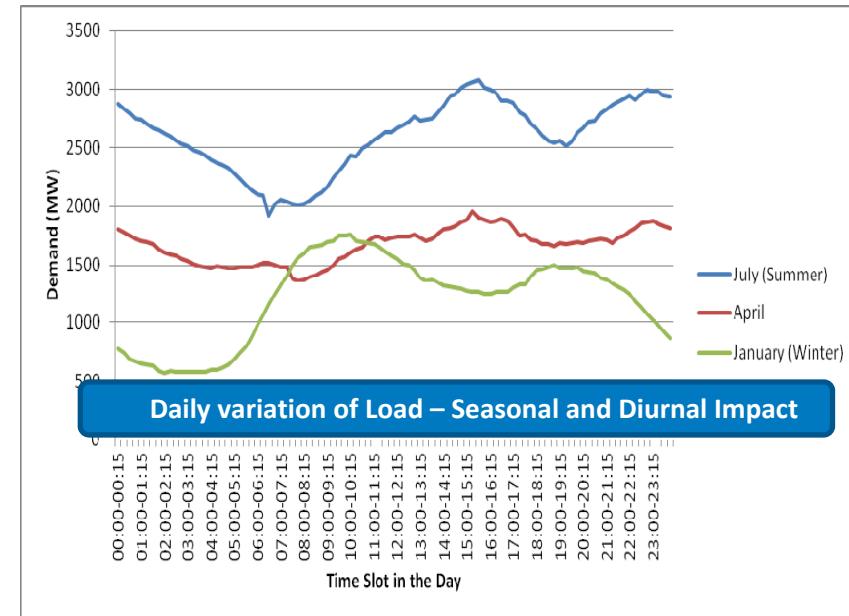
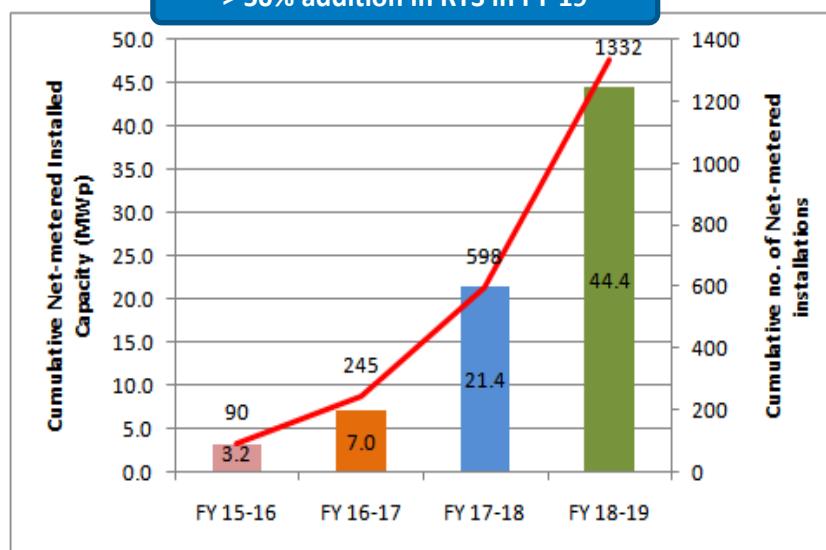


*~44% reduction in losses post takeover against 20% rise in a decade up-to privatization*

# 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

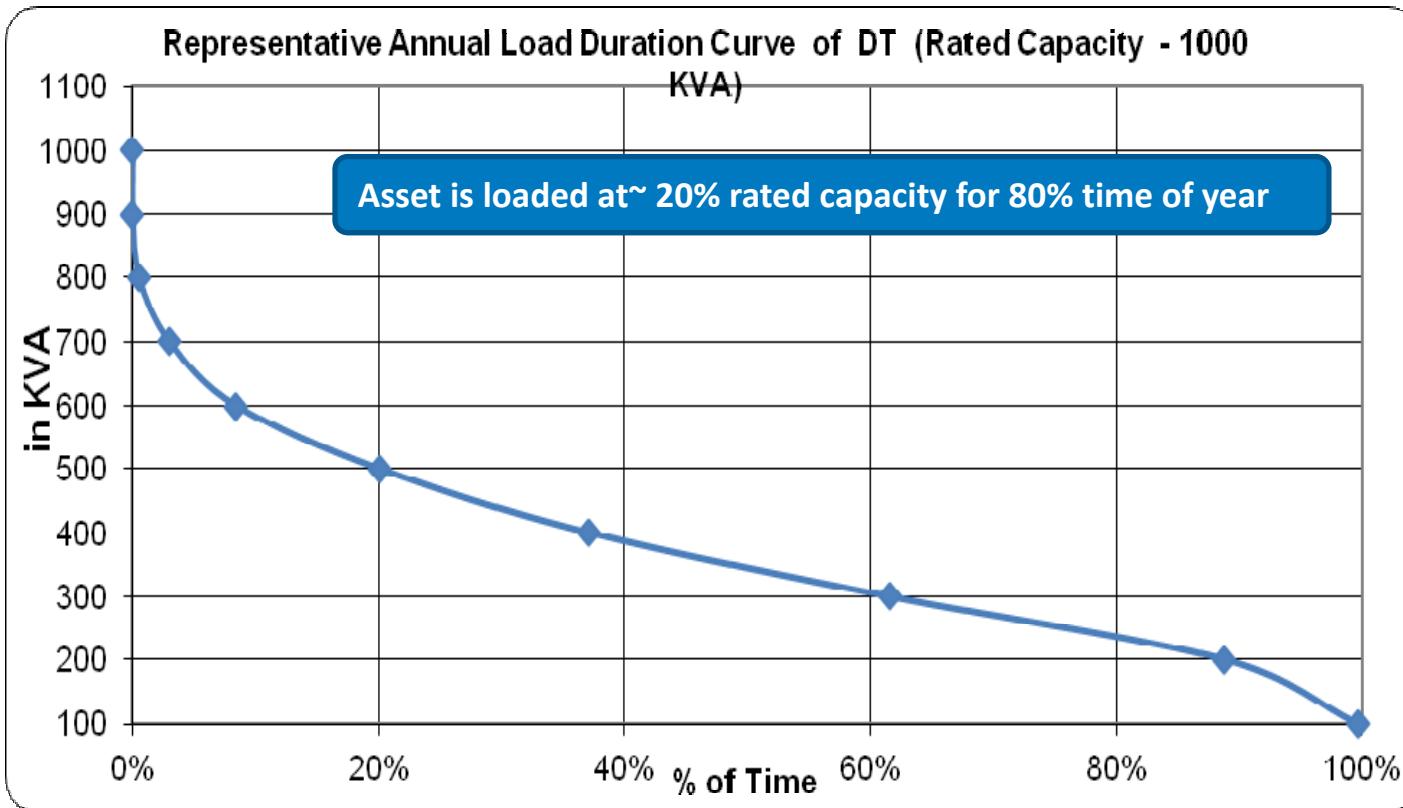
> 50% addition in RTS in FY'19



## Daily variation in load

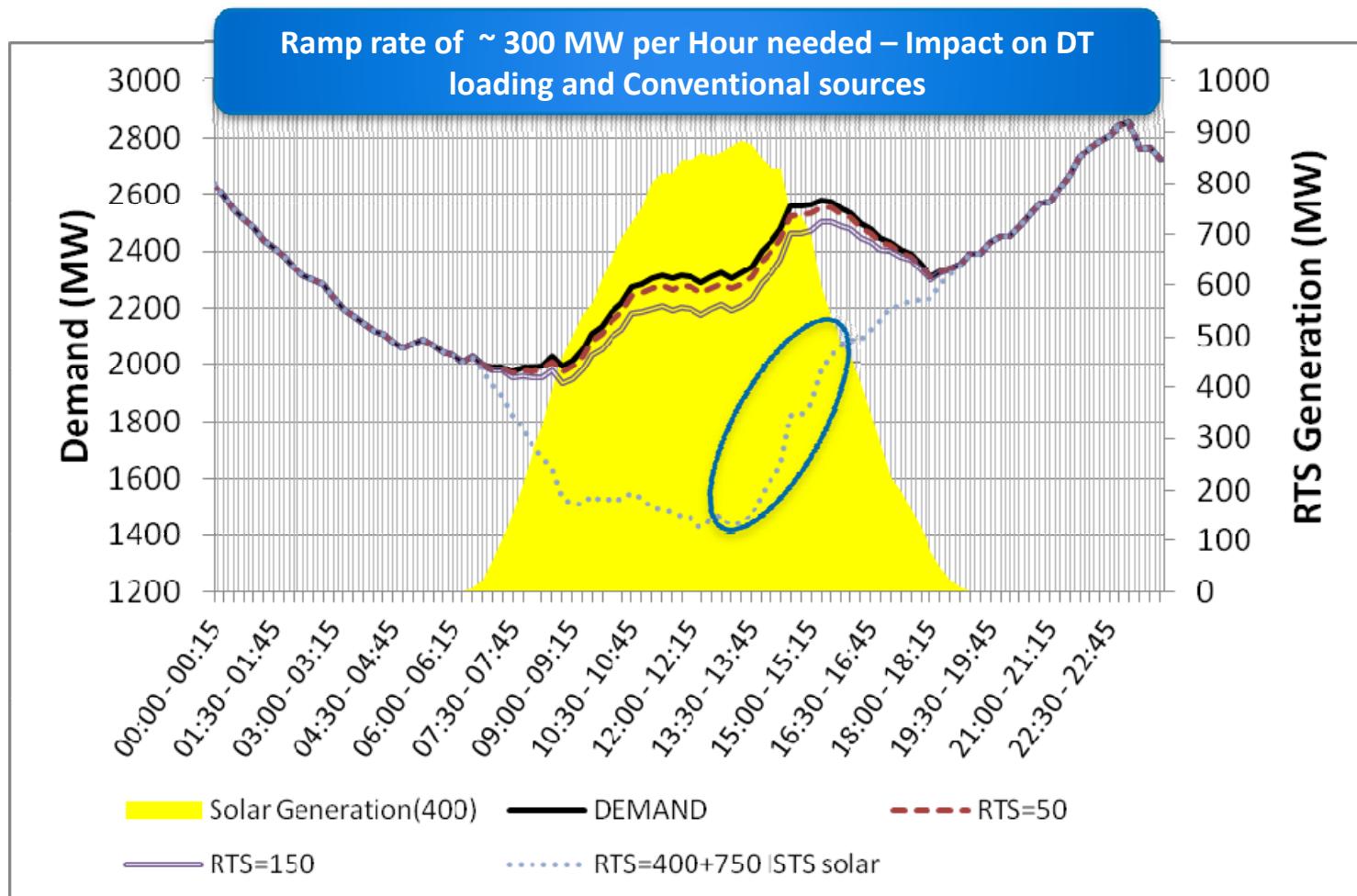
Summer (Jul)	~1160 MW
Winter (Jan)	~1200 MW
Fall/Spring (Oct/ Apr)	~600 MW

## Power Portfolio & Network Landscape (2/2)



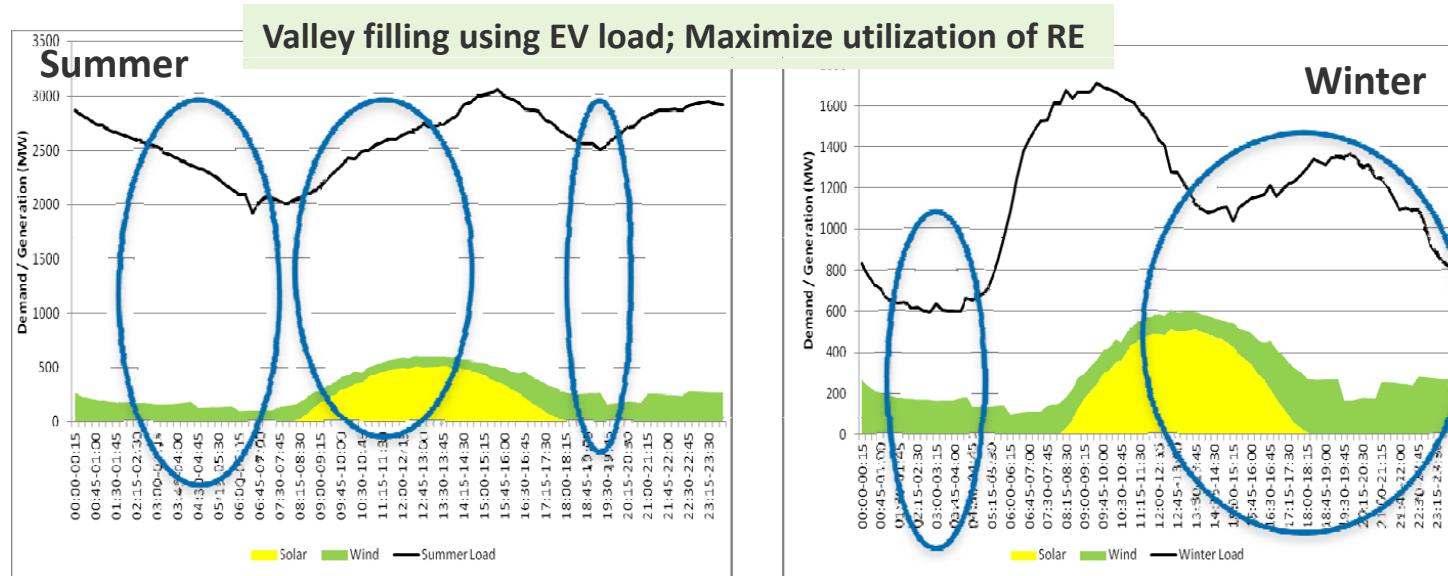
- Space constraints for network upgradation
- Overall lower utilization of assets
- Rooftop Solar can help reduce day peak loading of assets

# Impact of RTS and ISTS Solar on Demand



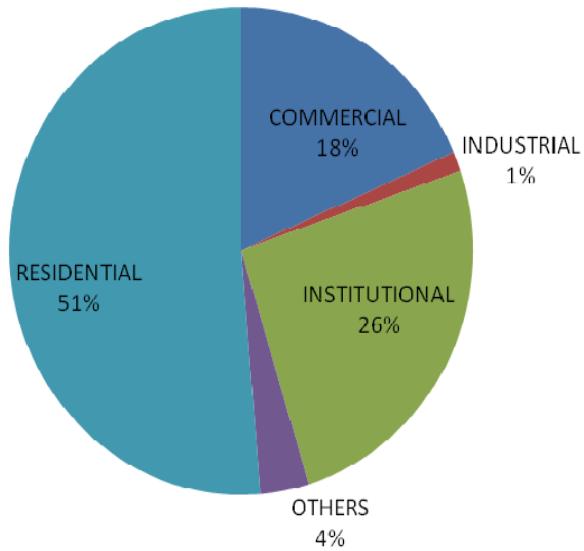
# EV charging during High RE share slots

- 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

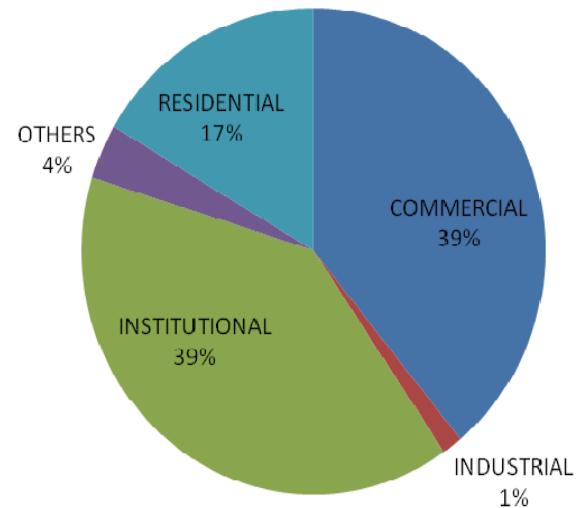


# BRPL's Rooftop Journey till YTM Jun19

No. of net-metered installations



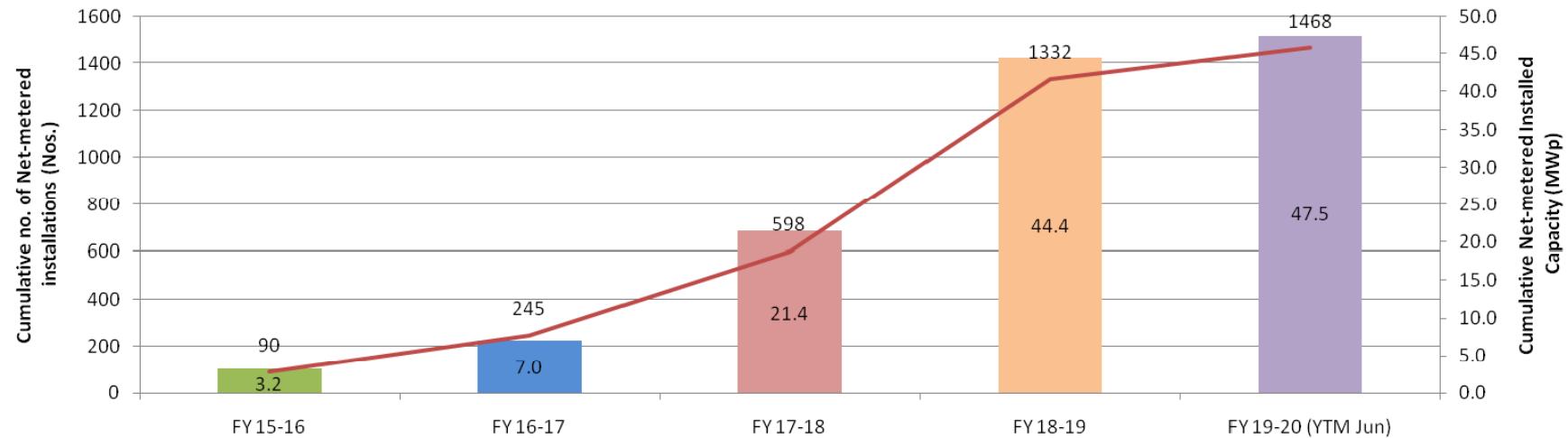
Installed solar capacity



- 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 MW
- 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

**THE °CLIMATE GROUP**

# EVs at BSES Rajdhani



# Process for EV charging

## (1/2)

**Step- 1**  
User Registration / Login  
New USER – KYC Process

**Step- 5**  
Booking Confirmation

**Step- 7**  
Complete Charging & Unlocking

**Step- 2**  
Finding Charging station near you

**Step- 6**  
Initiate Charging / Session Authentication (RFID/SMS / Mobile App) / Highlight Gum Locking

Initiate Charging

**Step- 8**  
Billing & Invoicing

Transaction Details

Vehicle Number	DL3CBR6157
Booking ID	4604
Booking Mode	QR CODE
Station Name	V-Charge-DC0001
Charger Code	VC MH MUM DC-0001
Connector Type	BEVC-DC001
Booking Date	2019-03-25
Booking Start Time	08:41 PM
Cancelled On	2019-03-25 08:15 PM
Charging Amount (₹)	56.25
Tax(₹)	0.00
Total Amount Payable (₹)	0.00
Payment Status	Paid

Charging Log

Status	Completed
Charging Time	20:90
Power Consumed	20:90
Star Meter Reading	20:03
Stop Meter Reading	20:90
Total Amount	4823
Battery Percentage	100%

**Step- 3**  
Booking  
Advance Booking

**Warning in case connector is not connected to EV**  
DC Charging Warning  
(In case connector is not connected with EV)

EV Charging

Initializing Charging

BSES Nehru Place

Connector not connected.  
Kindly connect the connector with vehicle and retry.

AC Charging (Alert notification to ensure connector is connected to EV)

Warning?

Kindly ensure that charger is connected to your vehicle before you initiate charging.

Transactions

UPCOMING	CANCELLED
BSES Nehru Place	
Booking ID:	1026
Booked On:	14-11-2018
Booking Date:	14-11-2018
Charging Time:	28 minutes
Transaction Amount:	₹ 39.88
Payment Status:	Pending

**Step- 4**  
Payments

Credit Card / Debit Card

Wallet

BHIM / UPI

Charging Log

Status	Completed
Charging Time	20:90
Power Consumed	20:90
Star Meter Reading	20:03
Stop Meter Reading	20:90
Total Amount	4823
Battery Percentage	100%

# Process for EV charging ...(2/2)

## Exceptions

### 1. NO Show by EV consumer

Feb 4, 3:45PM  
Booking Reminder! Dear customer, you have an upcoming booking with ID: 1540 for vehicle charging scheduled at 04-02-2019 03:45 PM.

Feb 4, 4:08PM  
Dear Customer, Your booking with booking ID: 1540 dated: 04-02-2019 03:45 PM has been cancelled. Amount of INR 1 has been refunded to your wallet.

Notifications  
3 notifications  
Booking Cancel  
Dear Customer, Your booking with booking ID: 4843 dated: 05/04/2019 05:30 PM has been cancelled. Amount of INR 1 will be refunded to your account within 2-3 working days.

Transaction  
04/04/2019 03:45PM  
Transaction successfully done

Transaction  
04/04/2019 03:45PM  
Transaction failed

### 2. Cancellation by EV user

NEW CANCELLED COMPLETED

**BSES Nehru Place**  
(Charger Code : BSES-NPDC02)

Booking ID: 4854  
Booked On: 05-04-2019  
Booking Date: 05-04-2019  
Start Time : 02:30 PM End Time: 02:45 PM  
Payment Status: Pending

INITIATE CHARGING CANCEL

Confirm Cancellation  
Are you sure you want to cancel this booking?  
CANCEL OR

Charging Details  
NEW CANCELLED COMPLETED

**BSES Nehru Place**  
Booking ID: 4854  
Booking On: 05-04-2019  
Booking Date: 05-04-2019  
Transaction Amount: ₹0.00  
Payment Status: N/A

**BSES Nehru Place**  
Booking ID: 4853  
Booking On: 05-04-2019  
Booking Date: 05-04-2019  
Transaction Amount: ₹0.00  
Payment Status: N/A

**BSES Nehru Place**  
Booking ID: 4843  
Booking On: 05-04-2019  
Booking Date: 05-04-2019  
Transaction Amount: ₹0.00  
Payment Status: N/A

Payment Refund / credit back payment

### 3. Over payment / Under Payment from EV User

Transaction Details

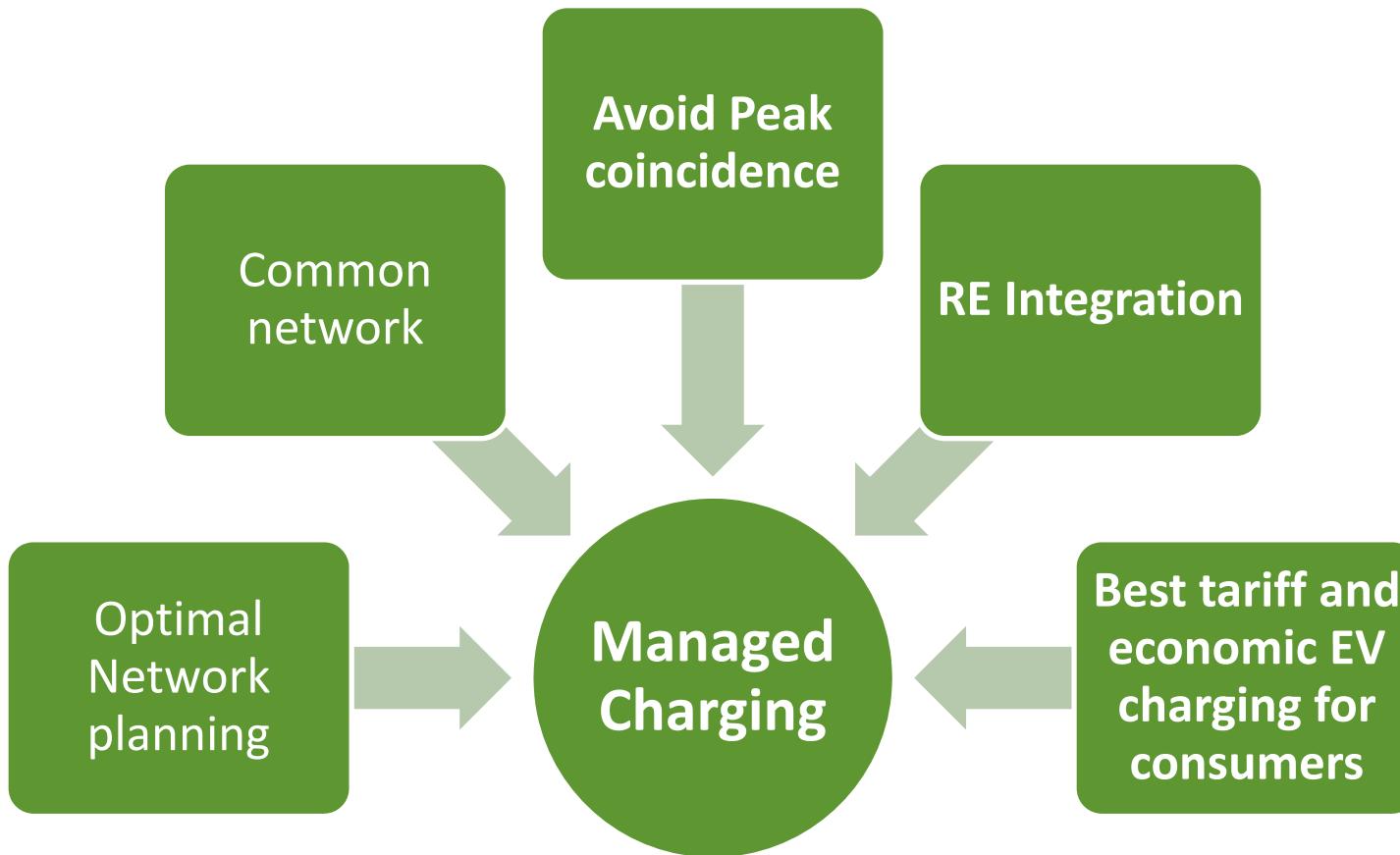
Vehicle Number	UP08KD8989
Charging Station	TRFSLT1
Connector Type	TYPE - 1 (AC)
Date For Booking	05-04-2019
Actual In Time	02:33:18 PM
Actual Out Time	02:33:56 PM
Charging Amount (₹)	250.00
Total Amount Paid Before Charging (₹)	44.90
Applied Promo Value (₹)	0.00
Tax Amount (₹)	49.13
Total Amount Payable (₹)	254.23
Enter Promo Code <input type="text"/> APPLY	
PAY	

EV Charging made Simpler

DESCRIPTION OF CHARGING PROCESS

# Managed Charging - Drivers

- Key Drivers for Managed Charging:



# Forms of Managed Charging

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

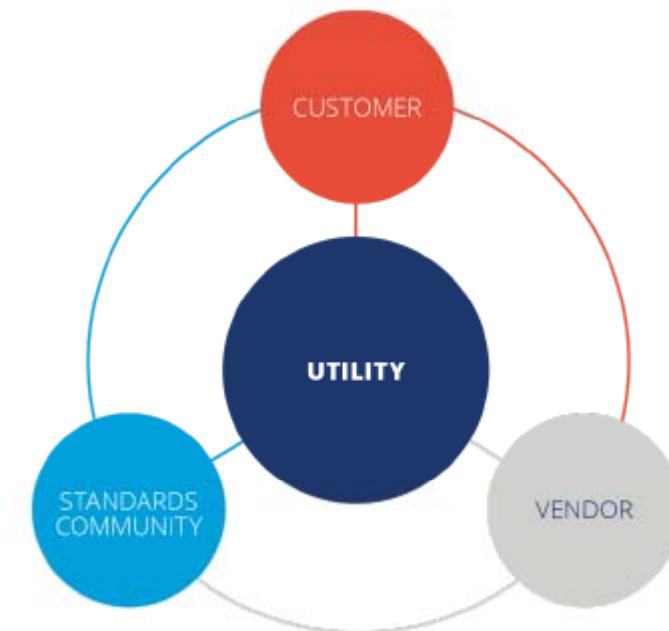
**Active** managed charging relies on communication (i.e., “dispatch”) signals originating from a utility or aggregator to be sent to a vehicle or charger to control charging in a predetermined specific way.

Passive	Active
EV time-varying rates, including time-of-use rates and hourly dynamic rates	Direct load control via the charging device
Communication to customer to voluntarily reduce charging load (e.g., behavioral demand response event)	Direct load control via automaker telematics
Incentive programs rewarding off-peak charging	Direct load control via a smart circuit breaker or panel

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

S.No	Period	Applicable Off Peak Rebate during identified off peak time slots	Applicable Peak Surcharge during identified peak time slots
1	May – September (Other categories of consumers)	05:00 – 09:00 (30%)	00:00 – 02:00 (40%) 14:00 – 18:00 18:00 – 24:00
2	April – November & February - March (For EV charging)	02:00 – 10:00 (45%) 18:00 – 22:00	22:00 – 24:00 (46%)
3	December – January (EV Charging)	00:00 – 05:00 (32%) 18:00 – 24:00	05:00 – 10:00 (44%)

**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

