Rooftop Solar

Discom Perspective

By:

BSES Rajdhani Power Ltd.

10th Jan 2017

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Presentation Flow

- **Renewable Energy in Delhi**
- **BRPL Experience in Solar**
- **Unique Opportunity of Rooftop Solar**
- **Discom Perspective**
- **Support Required**

Renewable Energy in Delhi

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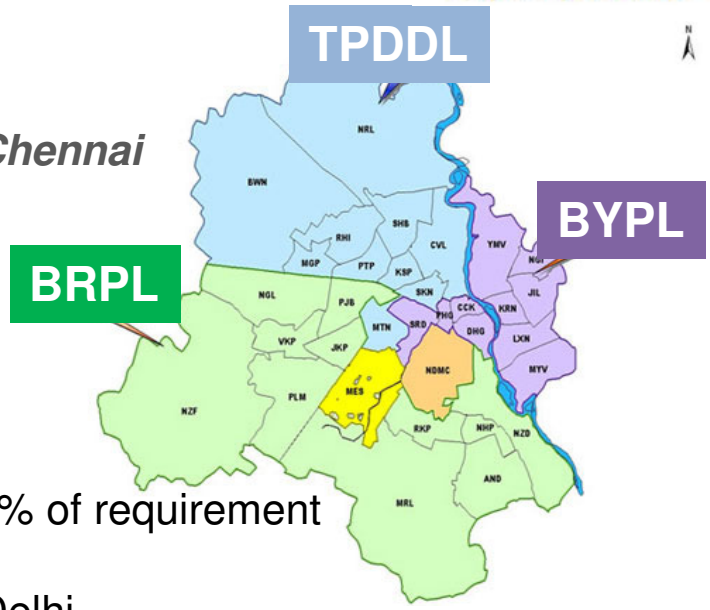

- **Power Demand:** Touched 6260 MW.
  - *65% more than Mumbai, 3 x of Kolkata, 4 x of Chennai*
  - Doubled in past decade
  - Increasing by over 6% each year
- **Total power requirement** to touch 33 BUs in 2017.
- **Limited Generation in** Delhi Grid dependent for over 80% of requirement
- **Solar and Waste to Energy** are the two RE sources in Delhi
- **Estimated Solar potential: ~2000 to 2500 MW**
- **Net Metering Regulations notified by DERC in Dec 2014**
- **Delhi Solar Policy** notified in Aug 2016, target of 1503MW by 2022 & 1995MW by 2025
- **Solar panel costs** down by over 80% since 2008. (Source: New Climate Economy Report)

Delhi, with high per capita consumption & income along with horizontal growth offers a unique opportunity to be the Rooftop Solar Capital

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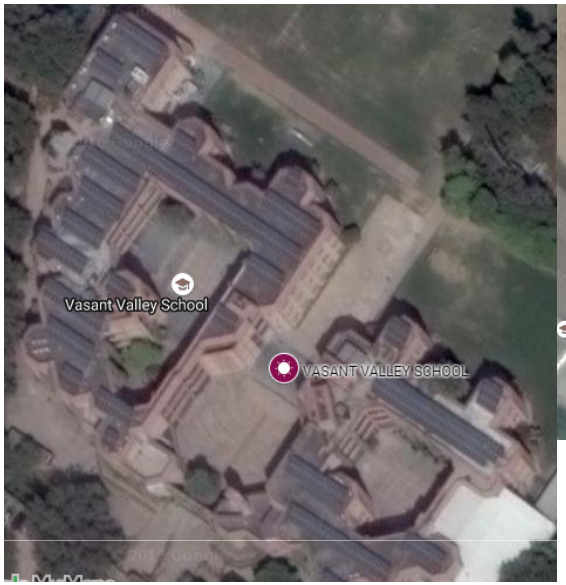
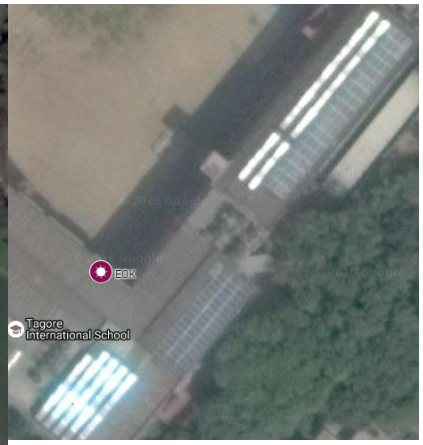
BRPL Experience in Solar

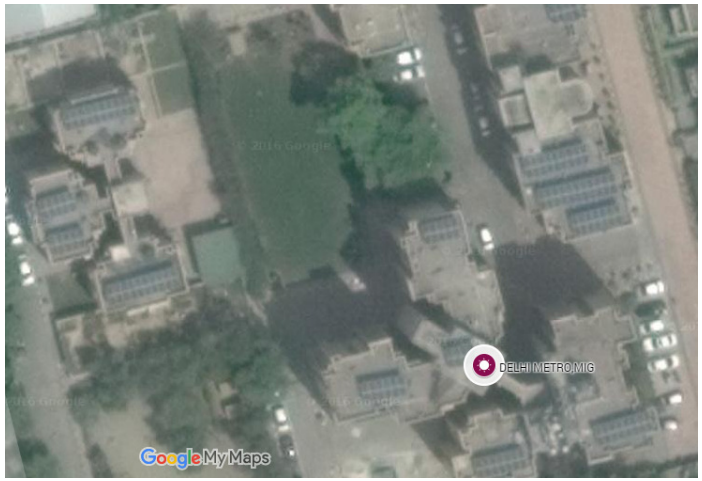
Institute



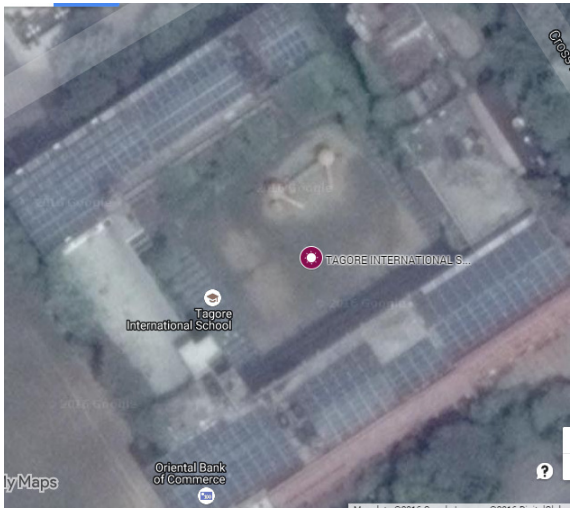


Schools

Stadium



Residential Complex



Commercial Complex

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Courtesy: Google Maps

BRPL scorecard in Solar Roof Top

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Connections Energized	• **200Installations** • **Y1: 90, Y2: 110**
Installed Capacity	• **5670 kWp (~6 MW)** • Another 4 MW in pipeline
Consumer Category Mix	• Overall Mix: Domestic: 85%, Comml: 13% • **Solar Installations:** • Residential : 47% of nos & 12% of Capacity • C&I: 27% of nos & 29% of Capacity • Govt & Inst: 24% of nos & 54% of Capacity
Capacity range	• **1 kWp to 1 MWp**

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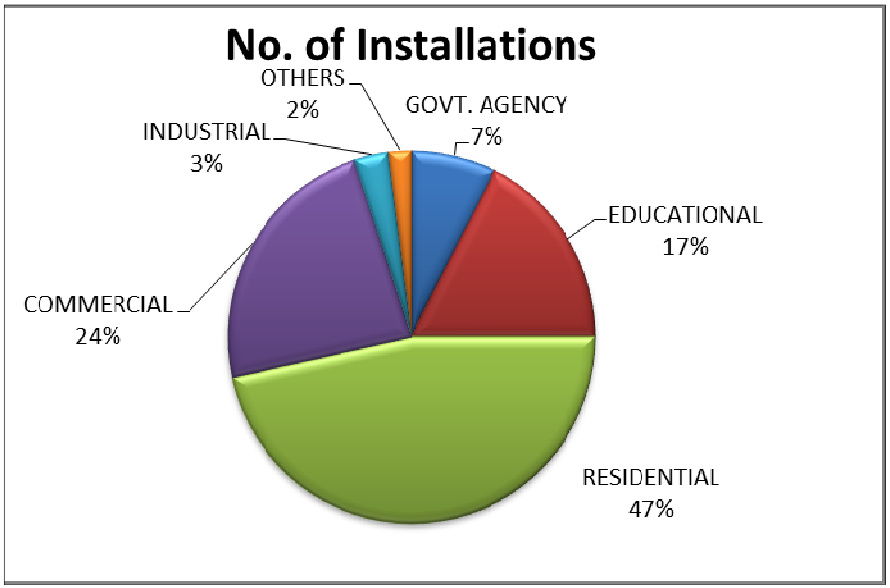
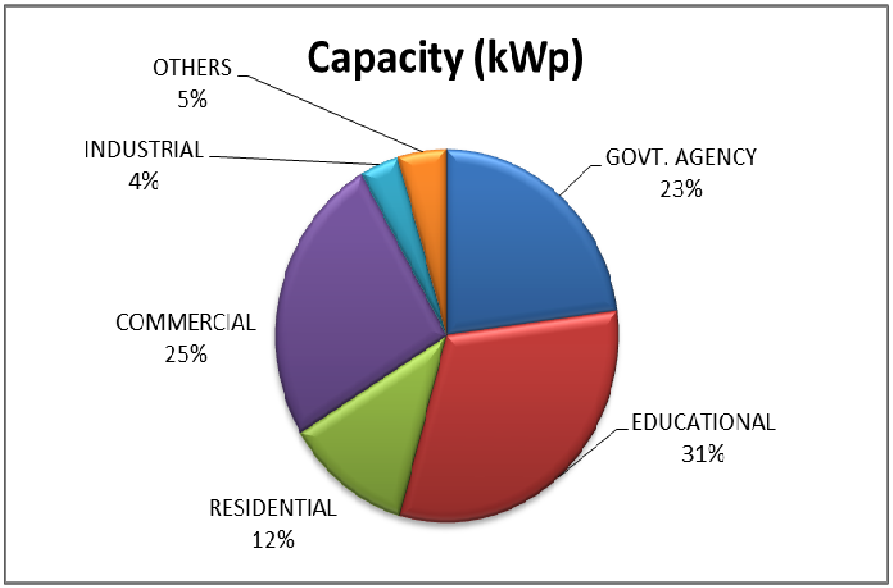
Highest Number of Installations mainly through Facilitation

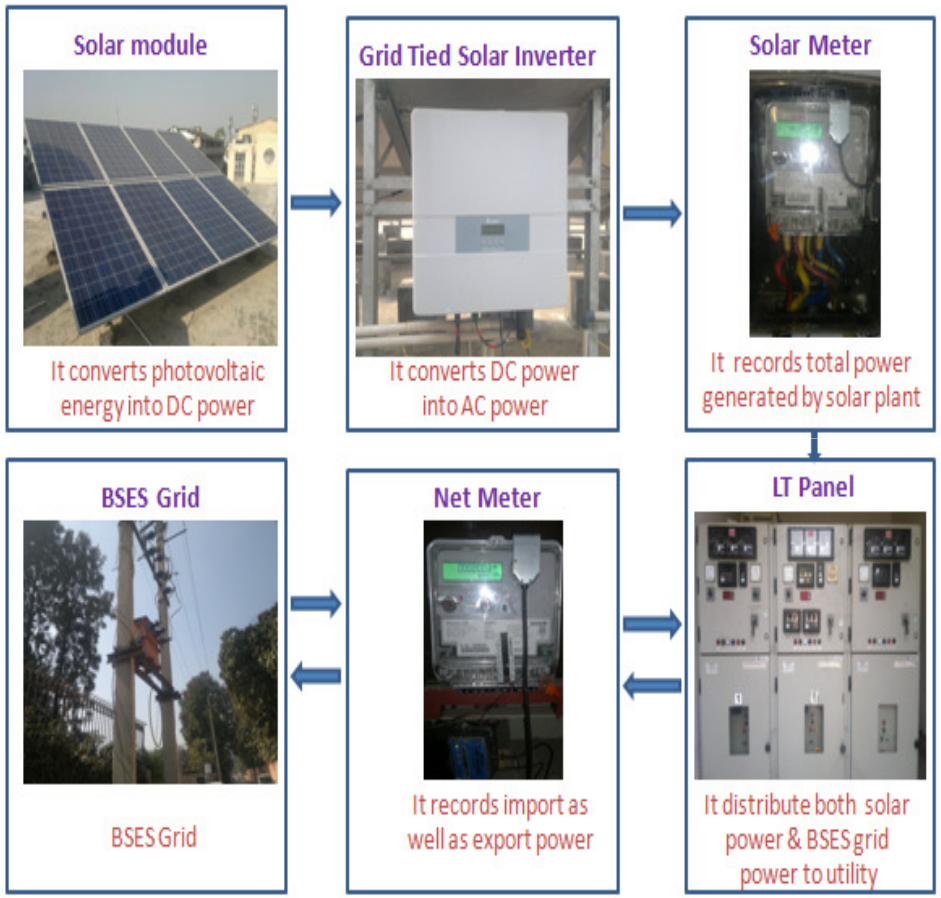
BRPL's Rooftop Journey till date





- 200 Installations, 5.67 MWp
  - Y1: 90 nos, 3.2 MWp, Y2 9 Months: 110 nos, 2.47 MWp
- Capacity of Solar 6.67 MWp against sanctioned load of 36.3 MW **(18%)**
- Interest from all segments
- Higher Participation from Residential (nos) & Institutions (Capacity)

BRPL – Playing the Facilitator



1st stage - Application

- ***Consumer**: Receipt of Application Form*
- ***Discom:** Technical feasibility*
- ***Discom :** Application Approval/ Rejection on the basis of technical feasibility*

2nd stage – Registration

- ***Consumer**: Receipt of Registration form*
- ***Discom :** Technical evaluation*
- ***Discom** : Site visit of solar plant*
- ***Discom :** Registration form Approval/ Rejection*
- ***Discom and Consumer** : Net metering connection agreement*

3rd stage - Net meter installation

- ***Consumer:** Solar plant installation & Intimation*
- ***Discom** : Auto debit necessary charges through electricity bill*
- ***Discom :** Net meter installation*

BRPL – Playing the Facilitator

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Net Metering

Net metering is a special metering and billing agreement between power utilities and their consumers, which facilitates connection of renewable energy-generating systems to the discoms' network. It allows consumers to export surplus power to the grid and helps reduce their electricity bills.

DERC has issued new regulations on the subject. Termed "Renewable Energy on Net Metering Regulation 2014", these regulations are applicable to consumers of the respective discoms. Detailed guidelines are available on DERC website: http://www.derc.gov.in

Details of the nodal officer for net metering

Discom	Name of Nodal officer	Contact No
BRPL	Sachin Vats Karishma Sharma	01139999439 01139999956
BYPL	Sandhaya Srivastava Srajan Mangal	01139997141 01139999955

Net meting application form & DT transformation capacity details

Discom	Forms	Download
BRPL	Net Metering Application Form	
BRPL	Net Metering Registration Form	
BRPL	DT Transformation Capacity	

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http://www.bsesdelhi.com/HTML/NetMetering.html

Direct Benefits of Roof Top Solar

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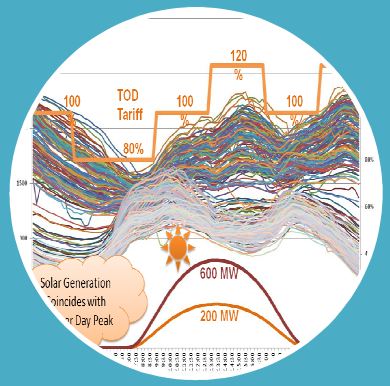

Day Peak shaving

Helps in reducing Afternoon Peak Load & giving relief to Network

RPO & Other Benefits

Rooftop Solar to meet RPO

Reduce Technical losses, Improve Voltage regulation

Happy Customer

Lower Bill to Consumer

Need to handle Technical Challenges associated with Reversal in Power Flow & the Variability of Solar Power

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Key Stakeholders

Government

Regulators

Utilities

Developers

Who's the one behind?

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Consumer

Unique Opportunity of Rooftop Solar

Discom

- Changes the nature of business – every aspect will be touched
- Different level of Consumer Engagement
- Readies for newer Technologies, challenges/opportunities – EVs, Smart Grid, Home Automation, other Value Added Services

Consumer

- Direct involvement in Nationally Determined Contribution
- Higher Mindshare about Electricity
- Better adoption of Energy Efficiency, Demand Response and other New Technologies

Service Providers

- Large scale Entrepreneurial & Employment Opportunity
- Drive Innovation in Technology, Business Models and the Energy Transformation

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India can Leapfrog to Reliable, Empowered & Clean Energy

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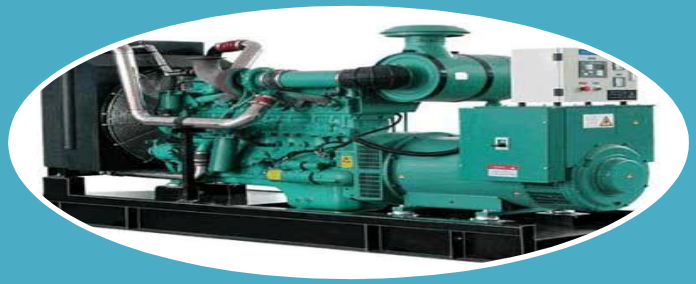
DG Sets vs Solar Rooftop



- Polluting
- Expensive : ~ Rs. 20/- per unit
- Addresses the Reliability gap in Grid supply

- Clean Energy
- Tariff Parity: ~ Rs. 5 to 6/- per unit
- Needs Grid connectivity to provide Reliable supply

Solar Rooftop is not a direct substitute for DG Set or Grid supply

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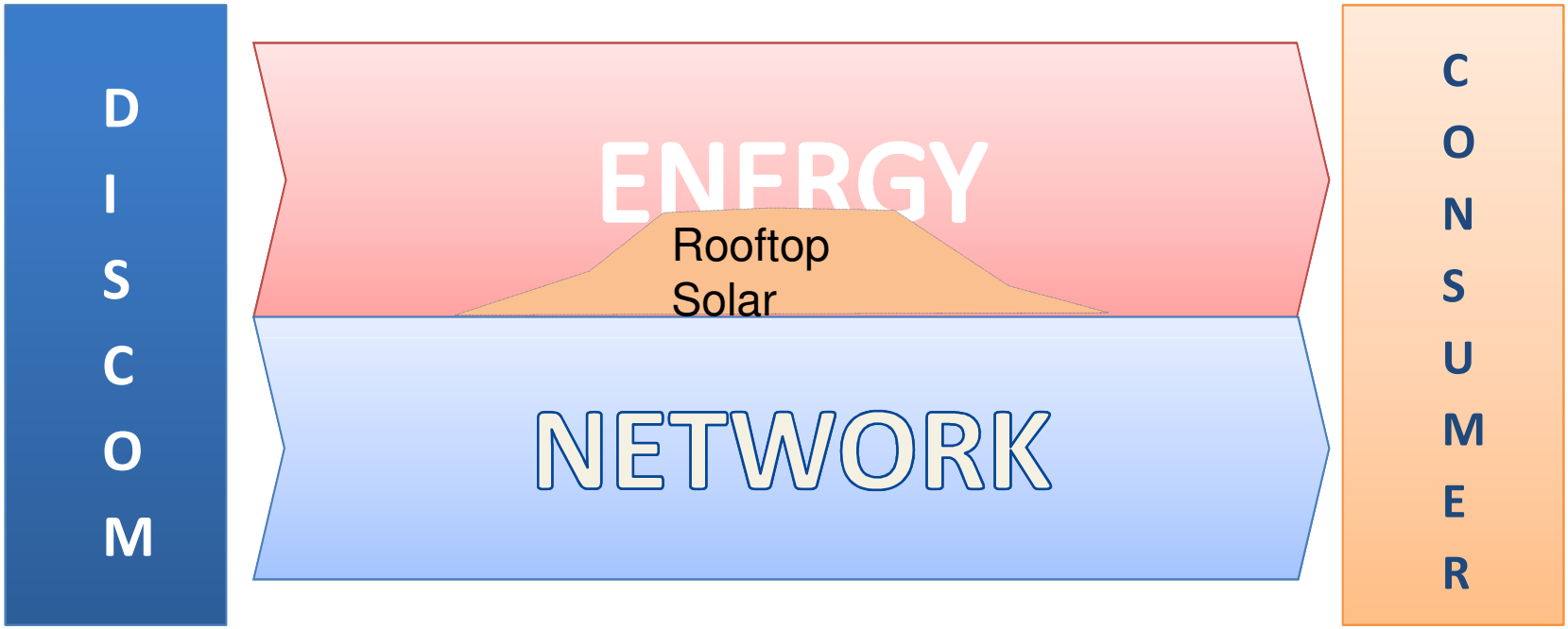
Discom Perspective

Discom's Role: Supply Electricity in a Cost Effective, Reliable manner with Quality



Net Metering

- **Very useful for initial adoption**
- **can lead to cost-shift, reduction in recovery of network costs**
- **Risk of behind the meter installations without Discom NoC**
- **Disparity between Fixed Costs vs Fixed Charges**

Discom Perspective - Rooftop Solar Operation

- Key Considerations
  - RTS capacity can be added real quick
  - Helps defer distribution network upgrades
  - Helps reducing losses and improves voltage
  - Solar PV has limited load following capability, hence need utility source for a reliable & quality power supply
- However
  - Distribution Networks not designed to include Generation, only for one way power flow
  - Islanding poses Safety Hazard to personnel and over voltages to others in the island
  - Can disturb Protection, Voltage Regulation and insert other Power Quality problems such as flicker, harmonics, DC Injection etc
  - Reversal of power flow can bring in complex challenges thus limiting penetration at DT level

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Support Required

- Involvement of Discoms
  - Technical Specifications and Interconnection Standards
  - Build in Incentives for Discoms
- Discom Capabilities to be Developed
  - Project Development
  - Trained & Skilled Manpower for Installation and Maintenance
  - Network Analysis and Load Flow Modeling & Testing Facilities
  - Integration and Operation of various Distributed Energy Resources while ensuring stable and reliable network (DSO)
    - Newer Technologies
    - Communication Networks
    - Data Analysis

Support Required

1. Capacity building of Stakeholders

- Regulators
- **Grid Operators**
- **Discoms** as key enablers for Rooftop Solar
- **Consumers** at the heart of the sustainable energy transition

2. Technical Impact Studies for Grid Readiness

- State specific studies

3. Commercial Impact

- Additional cost of balancing and reserves
- Impact of lower PLF, fixed Cost of partially stranded capacity
- Financial Support to Discoms

4. Regulatory Enablement

- Techno Commercial mechanisms
- Mechanisms to drive Innovation and Efficiencies across value chain
- Retail Tariff structures, incentives, penalties

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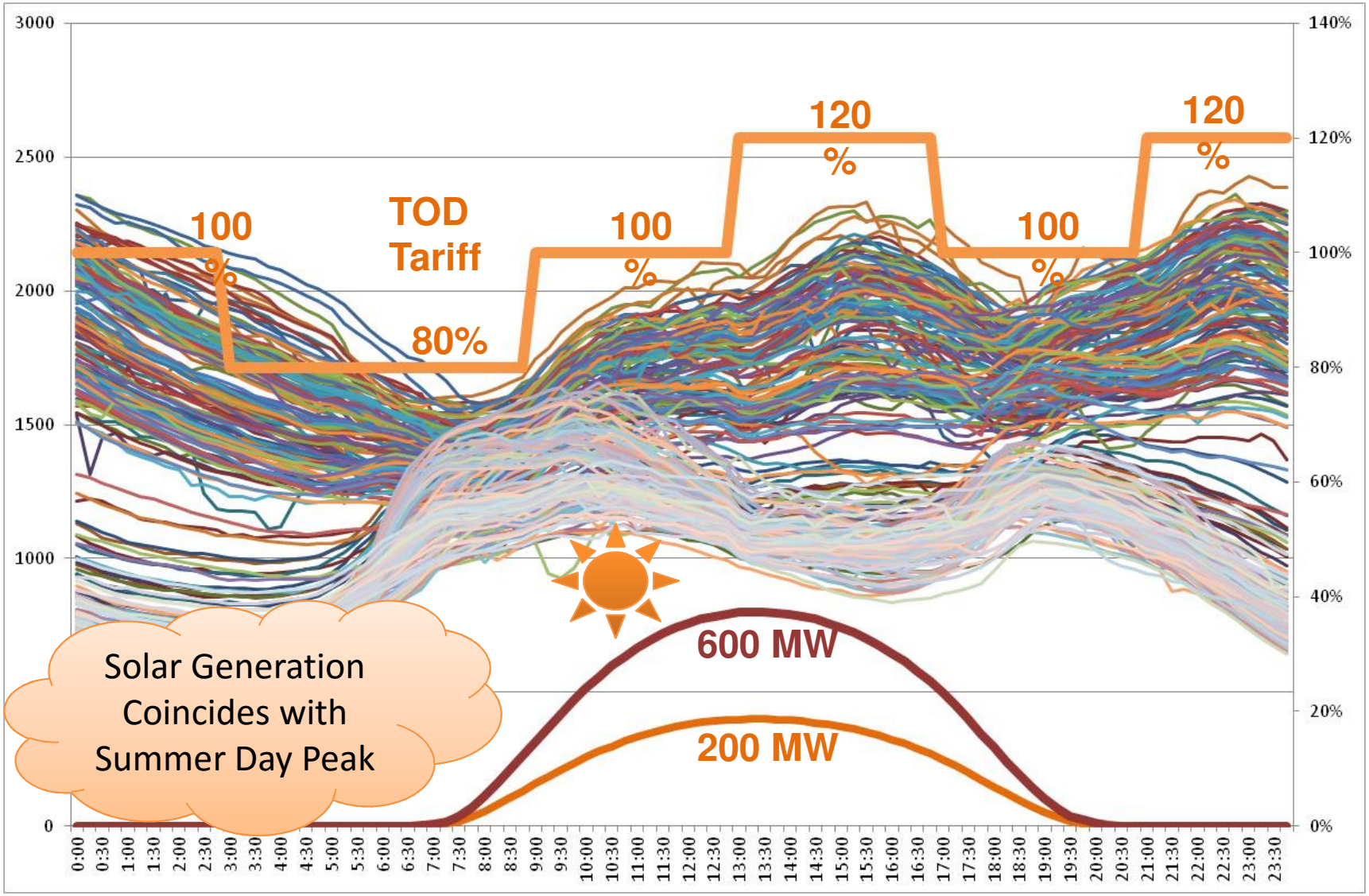
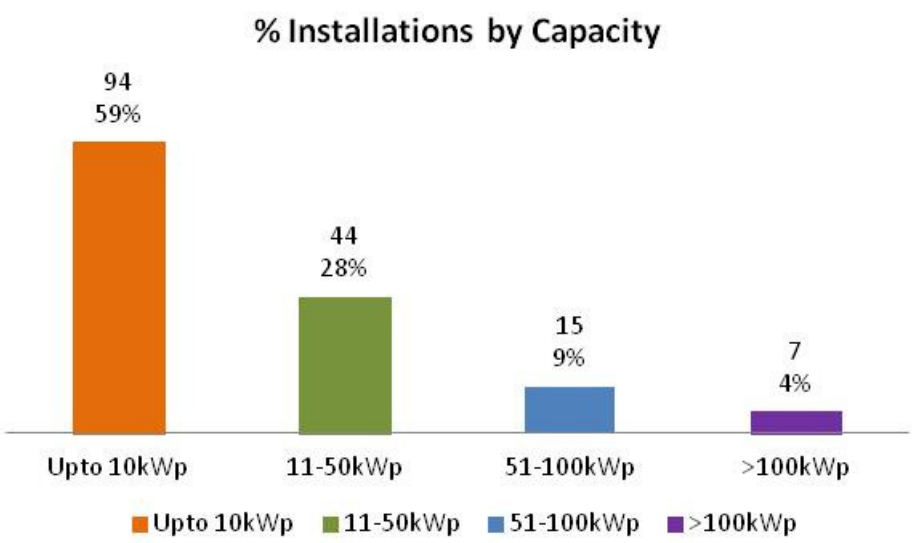
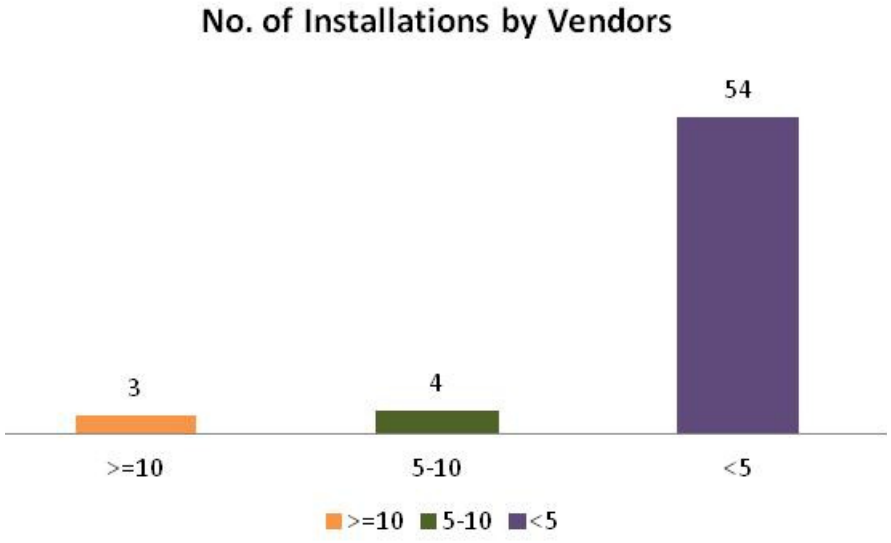
BRPL Demand Curve and Solar Generation



BRPL's Rooftop Journey till date





- Large Quantum of small size installations
- Large number of Vendors
- Very few focused Vendors
- Market still in early stages