



DSM and Demand Flexibility Initiatives



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BSES Rajdhani Power Ltd, New Delhi , India

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

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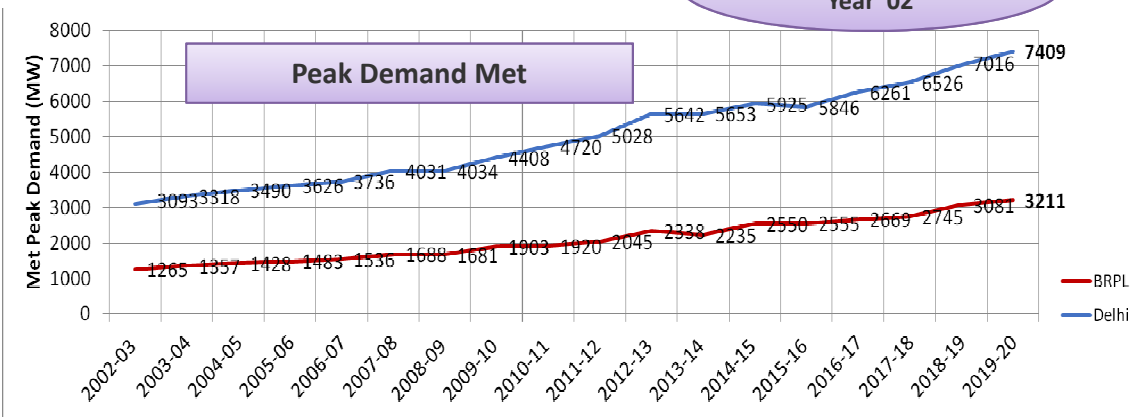
- **About Us - BRPL**
- **DSM : Value additions to DISCOMs**
- **Various Demand Side Management initiatives undertaken**
 - **Consumer Awareness**
 - **Energy Wise Energy Rise (EWER)**
 - **Behavioural Energy Efficiency Program**
 - **Automated Demand Response**
 - **Time of Day Tariff (TOD)**
 - **Energy Efficient Appliance program**
 - **Challenges and Suggestive Measures**

BRPL at a glance

Distribution Area	750 sq. Km
No. of customers	3.0 Mln.
Customer Density	4000 /sq Km
Max Demand met (Till Date)	3457 MW
Annual Billed energy FY23	13,149 MU
T&D Loss FY23	7.14%

Consumer Mix

About 86% residential contributing to ~70% consumption



DSM :Utility prospective

Delhi Peak Demand June'22



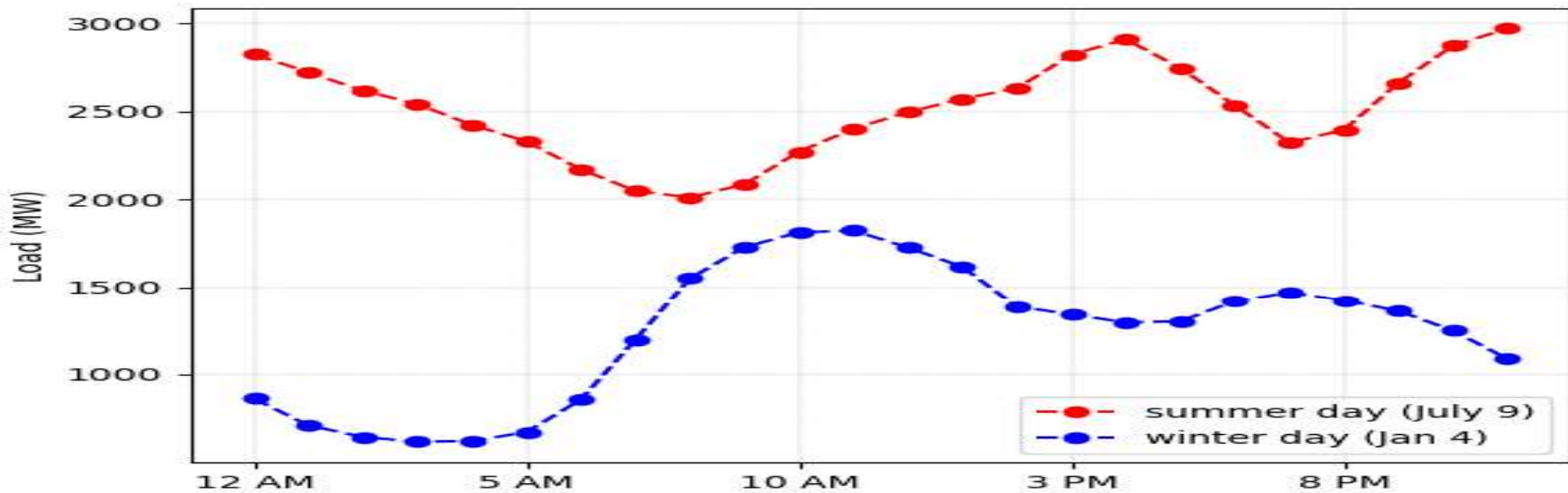
BRPL peak demand touched 3457 MW on July 07, 2022 at 23:26:29 hrs

Power Demand: Touched 7601MW on 28th June 2022

- 65% more than Mumbai, 3 x of Kolkata, 4 x of Chennai
- Doubled in past decade ; Increasing by over 5-6% each year

Typical Summer and Winter Daily Load Curves

The variation in daily demand of BRPL is very high. Geographic location of Delhi also leads to a higher seasonal variation in demand as shown in the figure below;

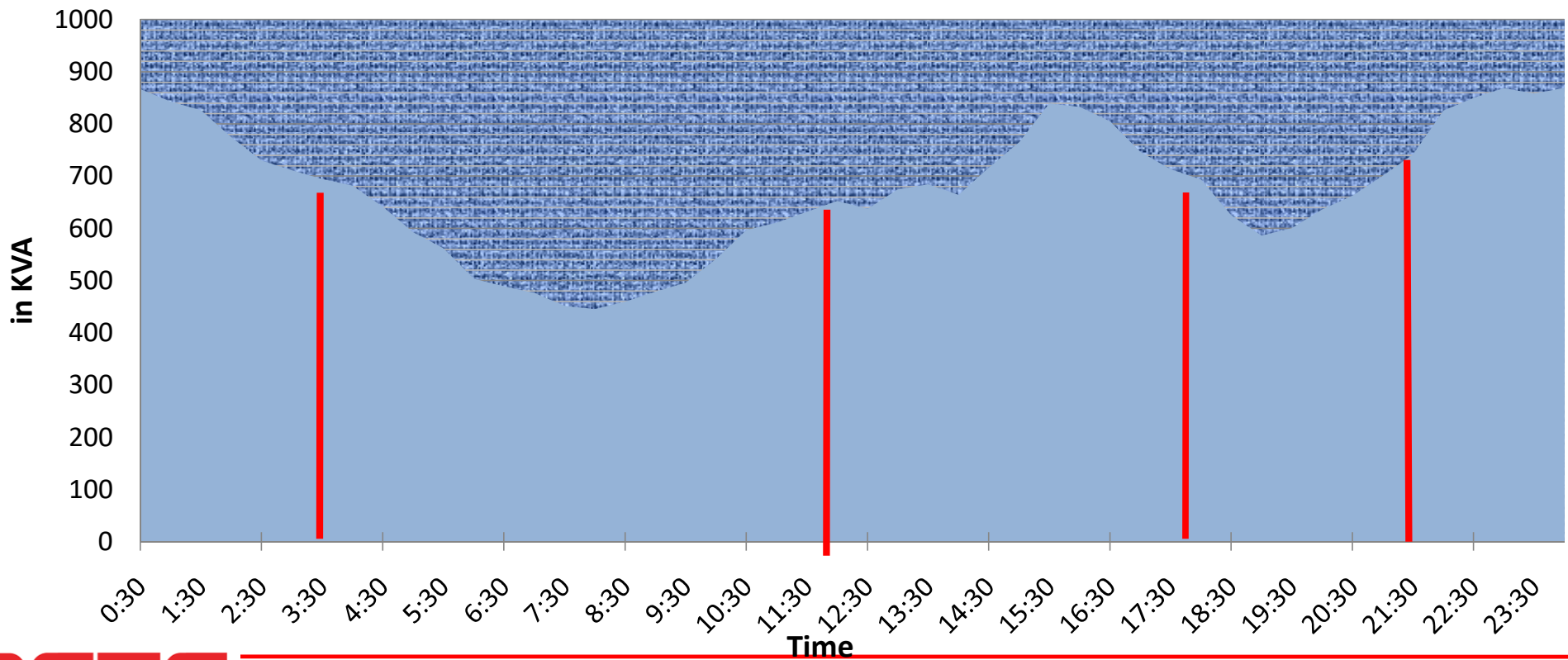


Daily Demand Variation is more than 1000 MW in summer and more than 1200 MW in winter.

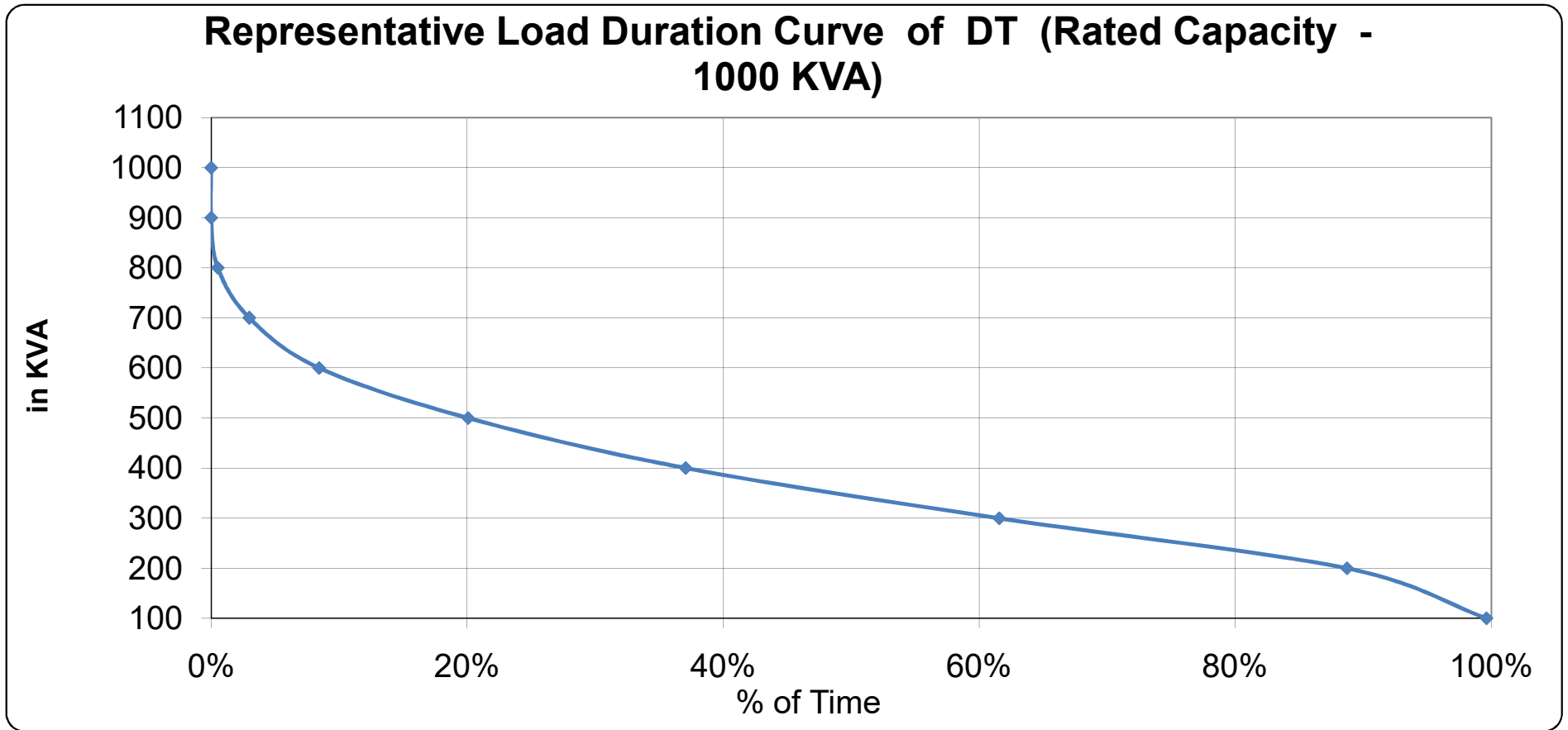
A flat demand curve is more beneficial to the operation of DISCOMs as it leads to lower overall costs of generation and helps defer grid investment costs. Substantial overloading and under loading of Distribution Transformers results in higher technical distribution losses, resulting in higher O&M costs.

Network / Capacity Augmentation

Residential DT (Rated Capacity - 1000 KVA)

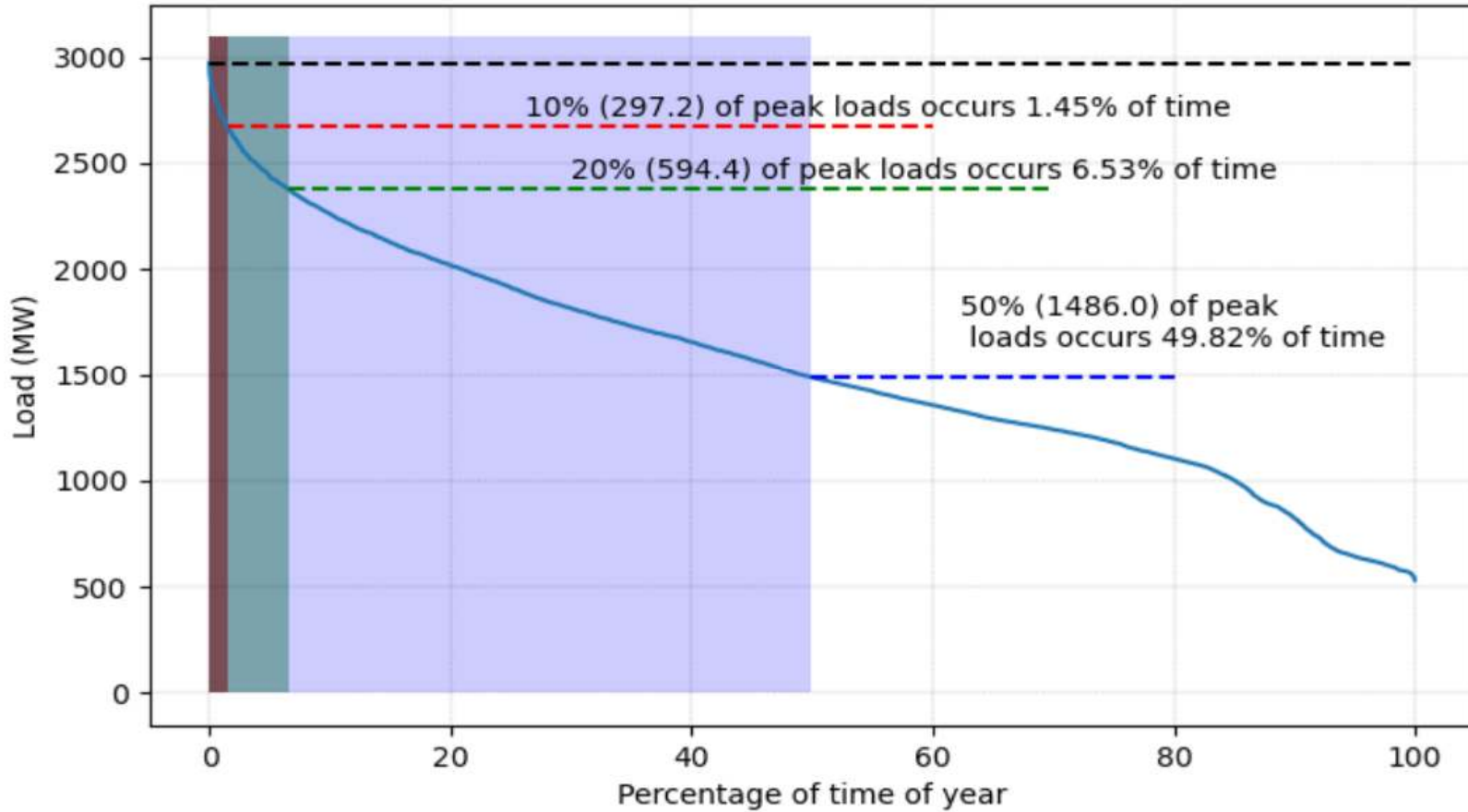


Network / Capacity Augmentation



Load Duration Curve

Load duration curve



DSM potential for BRPL as per Load Research Study

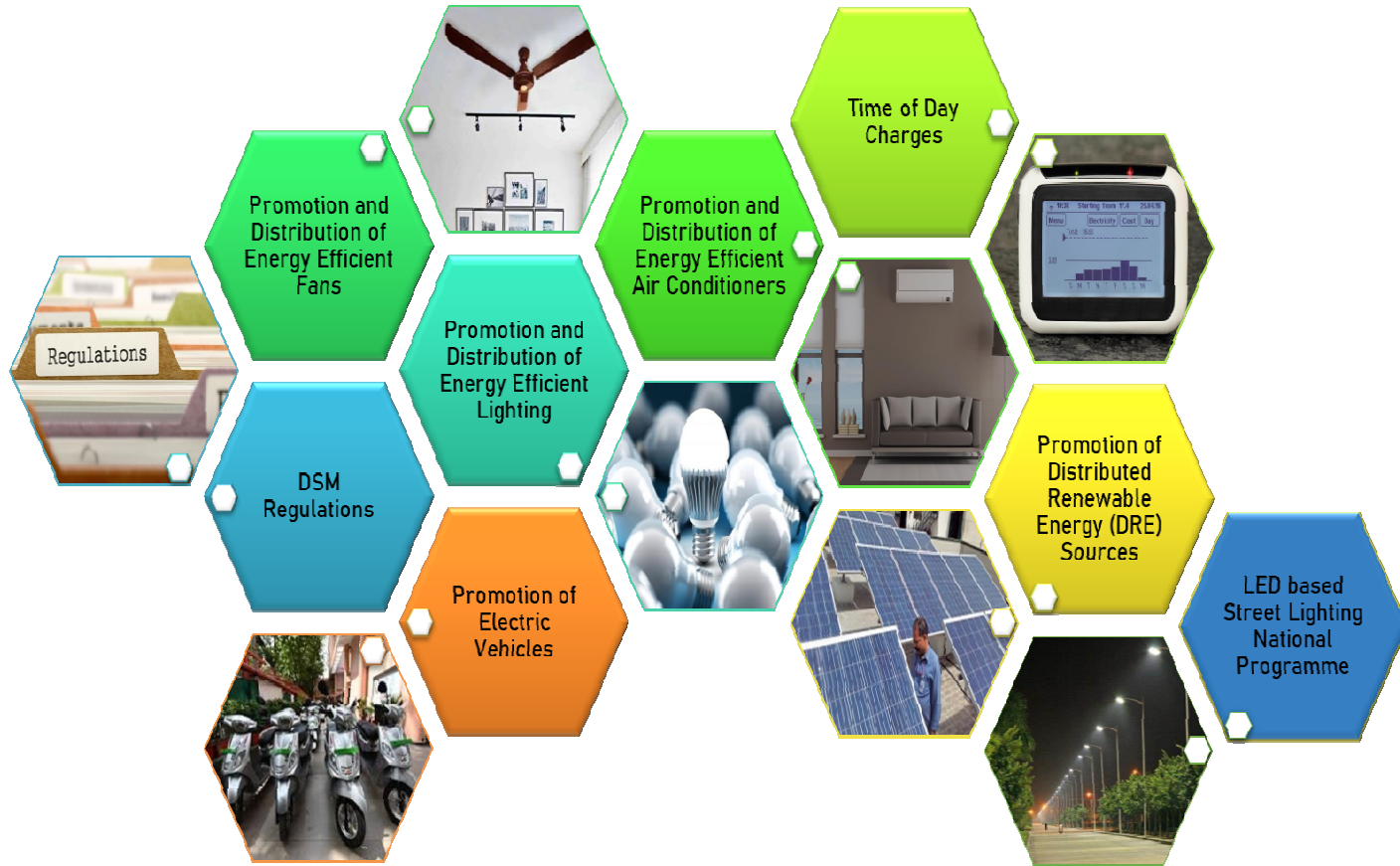
Category	Demand Reduction (MW)	Energy Savings (MUs)	Energy Savings Potential (%)
Domestic	428	504	6 to 7
Commercial	191	199	6 to 6.5
Industrial	7.1	21.8	4 to 5
Agricultural	2.7	1.7	7-8
Total	628.8	726.5	5-6

DSM- Approach

Customer Engagement Pyramid



DSM Initiatives in BRPL



Energy Saving Tips for AC

Cool AC Tip

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BSES Rajdhani Power Limited



**Every degree Celsius increase in
AC temperature = ~ 6% electricity savings**

#Save Energy. Save Environment. Save Money

Energy Saving by Reducing Temperature Set points

Energy Saving Tips for AC

Air conditioning system contributes 30 to 50 % of your electricity consumption / bill. You can save 6% of AC Energy Consumption by just increasing the set point by 1°C.

From	To	Annual saving Up to (Rs)	Annual saving Up to (%)
18 degree Celsius	24 degree Celsius	4228	33
	25 degree Celsius	4933	38
	26 degree Celsius	5638	43

6% reduction of electricity consumption by increasing 1°C temperature Set point

Energy Wise Energy Rise Program

Energy Wise Energy Rise (EWER) Program

- ❑ Recognising the need for awareness and education of energy efficiency in this growing energy crisis, BSES Rajdhani introduced the programme Energy Wise Energy Rise (EWER) in collaboration with The Energy and Resources Institute(TERI).
- ❑ The programme's is a unique community level awareness campaign and its primary focus is educating and sensitising children, teachers and the neighbourhoods about the importance of energy conservation and its efficient and responsible use
- ❑ The program duration is 3 years and each year a new set of 100 government middle schools and 30,000 students and school teachers are engaged.
- ❑ 90,000 students from 300 government schools alongwith teachers and their household communities have benefitted from participating in this programme.



Behavioral Energy Efficiency (BEE) program- Home Energy Report



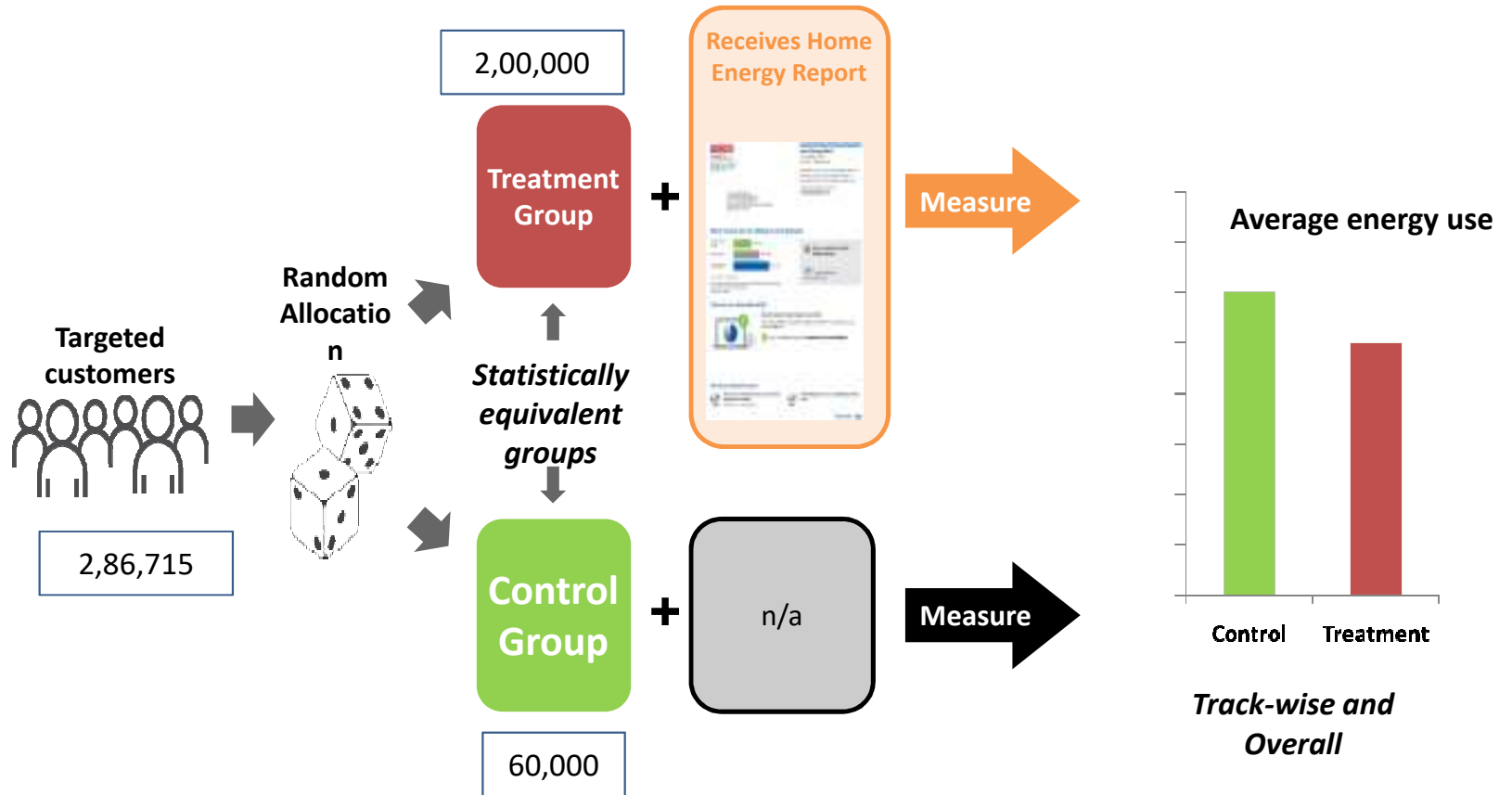
- **Report by Niti Aayog released on 03rd August, 2021 on “Turning Around The Power Distribution Sector” which talks about the essence of Behavioural Energy Efficiency in achieving demand flexibility.**
- **The Report clearly mentions about the Pilot Project on Behavioural Energy Efficiency which is first of its kind in the country.**

Behavioural Energy Efficiency (BEE) Program

- BEE-HER is an unique programme which has benefits not only like increased energy awareness but also higher customer engagement and increased programme adoption
- BEE pilot project
 - ❑ BEE pilot project from Oct'18 for 2 Lakh consumers in South and West Delhi using Oracle Utilities' O'power customer engagement software under the guidance of the Hon'ble Commission for a period of 15 months customers with funding support from USTDA.
 - ❑ The total energy savings by the consumers with average monthly consumption of above 200 Units as a percentage of the total energy consumption of the said consumers is given in below table

Type of Consumers	Medium & High User Category		Medium User Category		High User Category	
	Total savings (in MU)	Energy savings achieved as a percentage of total consumption	Total savings (in MU)	Energy savings achieved as a percentage of total consumption	Total savings (in MU)	Energy savings achieved as a percentage of total consumption
Total Savings	3.08	0.32%	1.5	0.32%	1.57	0.31%

Measurement Approach

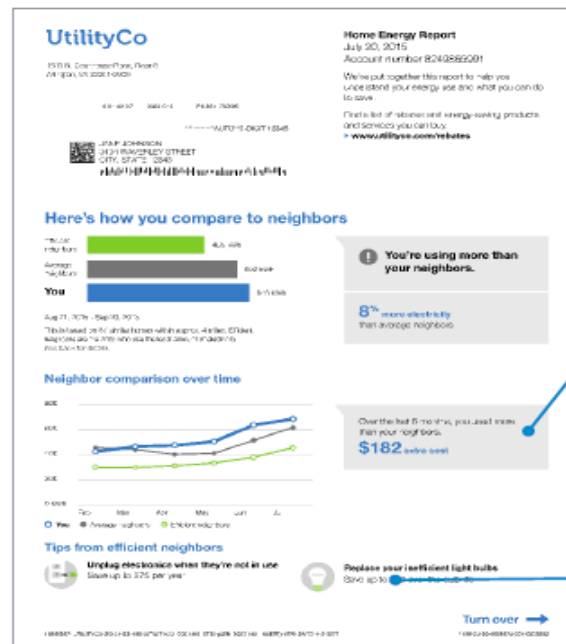


Behavioral Energy Efficiency (BEE) program - Pilot

HER Design: Fast Path to Insight and Action

Reads like a story

Bold, graphic headers help tell a consistent and approachable narrative about the customer's energy use.



Instant insights

Highlights the two most important insights using proven behavioral science levers — normative comparison and loss aversion.

Leads customers to action

Two quick and easy tips from neighbors leverage a third behavioral science driver — social proof.

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Behavioral Energy Efficiency (BEE) program - Pilot



SURAM CHALDHARY
FLAT NO. Q-704 PLDT
NO-15 SEC-5
HEMACHAL CHAUHADHAR COLS, DWARKA
WALKING SEQUENCE: S05235656RQAD
NEW DELHI 110075

Home Energy Report
17 August, 2018
CA No. : 103425617

Well, how your home is using energy with these personalised reports and exclusive online tools. Learn more about your use at www.bsesdelhi.com

Here's how you're doing in comparison



19 Jul 2018 - 17 Aug, 2018
This is based on 85 homes like yours. Energy-efficient homes are the 20% who use the least amount of electricity. See back for details.

Great
Good
Using more than average

60% more electricity than energy-efficient homes.

How are you using electricity?



See what uses the most energy in your home
Take a quick online Home Energy Analysis to understand more about how you consume electricity.
Log in to take the survey now at bseedelhi.com/group/brpl/hea

Tips from efficient homes



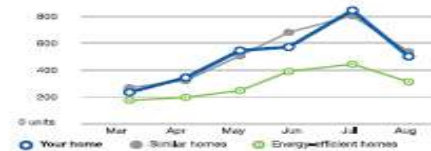
Keep your refrigerator door closed as much as possible
Save up to ₹ 450 per year



Use computer power-saving modes
Save up to ₹ 155 per year

Turn over →

Electricity comparison over time



In the last 6 months, you used more than energy-efficient homes in your locality.
₹ 5,915 extra cost

Save on your next bill



Use focused lighting (table lamps) at your workplaces

When you are studying or working at your desk, you need light only at your workstation, not the entire room. Using focused lighting will allow you to reduce the amount of energy used for lighting while providing sufficient lighting for your work.

Choose from various available focused lighting products in the market which will enable you to light your workplace sufficiently well. You can get the help of a knowledgeable sales representative for determining the right lighting fixture for the kind of task you need to perform.

Save up to ₹ 700 per year

Frequently Asked Questions

What is a unit?
A unit is a measure of electricity use. A 100-watt lightbulb uses 1 unit in 10 hours.

How is my comparison calculated?
We use similar areas, dwelling type, and relevant records for identification of similar homes from our database, typically within a few kilometers of your home within the BRPL license area.

How do I access the online tool to find more information or update my home's data?
Visit <http://bseedelhi.com/web/brpl/home> and log in using your account username and password in the My Account menu, or create an account by clicking on the New User Sign Up link displayed below the Login button.

Can I opt out of this program?
Yes. You can contact us by email at brpl.homeenergy@bsesdelhi.com, or call us at 19123 / 011-399 99 707 to opt out of the program.

The energy in collection is based on consumption units. They are an indication and may vary from household to household depending on usage, age of appliances and other factors. BRPL does not guarantee the amount of money or energy saved while implementing the recommended actions.

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BRPL made video to promote the program in Hindi and English
<https://www.youtube.com/watch?v=x6xVbLdL6yU>;
<https://www.youtube.com/watch?v=hsFv1MdZLis>

**Load shaping initiatives –
Automated Demand Response Program**

Automated Demand Response (ADR) program

Auto Demand Response (ADR) means customers changing their electricity usage (typically reducing use or shifting use to other times in the day) in response to economic incentives, price signals, or other conditions.

- ❑ Effective Auto demand response programs provide various economic and environmental benefits **on a self-sustainable basis.**
 - ✓ Avoiding the purchase of high-priced energy and network augmentation cost
 - ✓ Providing greater reliability to the grid, which helps prevent blackouts
 - ✓ Avoiding the consumption of fossil fuels which can damage the environment
 - ✓ Help in RE integration and help deal with high load ramp rate due to Duck Curve phenomenon
- ❑ Participating Consumer gets incentive for the load reduction during the DR event
- ❑ **Hon'ble Commission had given in-principle approval for implementation of Automated Demand Response Scheme in BRPL licensee area without any Capex liability.**
- ❑ To conduct a proof of concept for Automated Demand Response using ADR solution, BRPL in collaboration with IIMA and Sustain Impact conducted POC for ADR program for residential as well as C&I consumers to understand the technical and business feasibility of ADR for different categories of consumers .

Requirement of Hardware and Software for ADR Program

- ❑ Put forth regulatory recommendations with the intent to seek approval for commercial implementation from summer of 2021.
- **Hardware Support for ADR Program**
 - IOT based smart plug is one of the best solutions for hardware support due to following reasons:
 - ❖ Easily communicable, programmable, remotely controllable and affordable to the consumers.
 - ❖ Consumers as well as utility can monitor the energy consumption the energy consumption pattern at any moment of time.
 - ❖ The Device should be communicable through Wi-Fi/GSM network.
 - ❖ The device can be integrated with web-based application so that it can be controlled /monitored through mobile application as well as web based designed program.
 - ❖ ADR intervention can be communicated and confirmation can be obtained through the application



Smart Plugs



IR Blasters

Automated Demand Response (ADR) Pilot Project

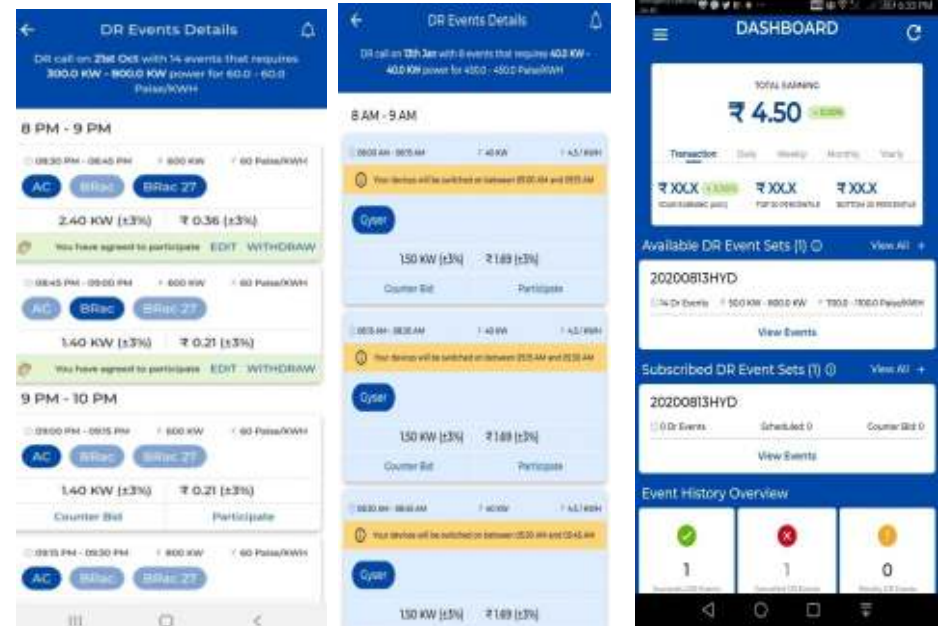
Software support for ADR Program

- ❑ A customizable web-based platform is developed for on-boarding the consumers, through which DISCOM can publish the events, send notifications to the participating consumers about the events.
- ❑ Mobile based app is designed for the participating consumers through which participating consumers can give their approval to the events published by the DISCOM so that the connected appliances are operated as per the scheduled events.



Comprehensive
Automated
Trusted & Secure
Customizable

DSO Publishing DR Events using the GridSync Web app



Dashboard screen of GridSync mobile app

Automated Demand Response (ADR) Pilot Project

- The program was conducted in two phases
 - ❑ In Phase – I, peak shaving is demonstrated by controlling AC ON/OFF using 16A Smart Plug in summer. Peak Shaving is also demonstrated with 5 participants by increasing the AC set point during ADR event through IR Blasters.
 - ❑ In Phase – II, Load Shifting is demonstrated by shifting the water heating loads (Geysers) from morning hours to early morning hours during winter through smart plug.
 - ❑ Commercial and Industrial consumers are participating only in peak shaving events.
- Total 22 consumers including domestic consumers and commercial and industrial consumers are on boarded in the ADR POC.
- Total savings achieved under ADR POC is 652 KWh and peak load avoided is 1005 KW.

62% of the surveyed residential respondents have agreed to participate in Demand Response Programs.

Considering average 1KW relief will be offered by residential consumers, ADR has potential about **408MW**

The conceptual video of the program - <https://youtu.be/v6EOmrQ4q8k>

Time Of Use Tariff

TIME OF DAY (TOD) TARIFF

- ❑ TOD tariff is an important to flatten the load curve and to avoid high peaking power purchases cost.
- ❑ Rebate is offered on consumption during off-peak hours.
- ❑ ToD tariff is be applicable on all consumers (other than Domestic) whose sanctioned load/MDI (whichever is higher) is 10kW/11kVA and above.
 - Optional for all other three phase (3 ϕ) connections including Domestic connections. If the consumer who has opted for ToD, the charges for up-gradation of meters, if any, shall be borne by respective consumers.
- ❑ The Commission has decided to retain the Rebate during the Off Peak hours and Peak hours Surcharge at 20%.
- ❑ Optional ToD Consumers will have the option to move back to non-ToD regime only once within one Financial Year.

TIME OF DAY (TOD) TARIFF

MONTHS	PEAK HOURS (HRS)	SURCHARGE ON ENERGY CHARGES	OFF-PEAK HOURS (HRS)	REBATE ON ENERGY CHARGES
May -September	1400– 1700 & 2200 – 0100	20%	0400 – 1000	20%

TOU tariff design for Residential Consumers

- BRPL, in collaboration with NREL (National Renewable Energy Laboratory) and GTG-RISE, examined the potential of DSM in BRPL's service territory, developing detailed information on consumer classes and willingness to participate in DSM.
- The study addresses the DSM design problem and presented the findings in the form of two major research components:
 - ❑ A tool development for evaluating DSM as a resource in utilities' planning processes, and
 - ❑ a survey component to understand possible consumer participation in designing an effective DSM program.
- NREL developed the EFFORT tool for assessing and optimizing TOU rate structures. The study shows that BRPL could benefit from rolling out TOU tariffs to their domestic consumers which could deliver a reduction in system peak demand.
 - ❑ The tool examined a range of consumer responses and helped find the most effective hours and price ratios to get the best response from consumers given their price responsiveness.
 - ❑ The summary of optimization results for summer and winter seasons by targeting top 5% of peak load hours to reduce is shown in below table

Metric	Summer (Apr.–Oct.)	Winter (Nov. –Mar.)
<i>Peak Reduction</i>	2%	3.8%
<i>On-peak to off-peak price ratio excluding fixed costs</i>	1.28	1.36
<i>Savings</i>	1.24%	2.5%
<i>On-peak hours</i>	15:00–17:00 and 22:00–01:00	9:00–12:00

Alexa Skill Development

BSES Rajdhani Power Skill on Alexa

- BRPL partnered with Amazon to launch BSES Rajdhani Skill on Alexa Platform.
- The skill offers following features for BRPL consumers –
 - ❖ Latest electricity bill
 - ❖ Bill due date
 - ❖ Previous 5 bills
 - ❖ Nearest Cash Counters
 - ❖ E-bill registration
- BRPL customers will be able to ask Alexa for their latest Electricity bill, know payment locations, due date and many more features.

"Alexa, ask BSES for my latest electricity bill."

Special offers on Alexa devices
for BSES customers

BSES
BSES Rajdhani Power Limited

amazon alexa

BSES Rajdhani Power Skill on Alexa

- BRPL has also tied up with Amazon to offer Alexa devices at discounted price for BRPL consumers.
 - The offer is open for all BRPL customers and the coupon is valid till 31st March 2024
 - Consumer validation is done based on the CA Number. and there is no limit on number of appliances per CA number.
 - Till now 53 Alexa devices were offered to BRPL consumers.
 - BRPL promoted the BSES Rajdhani Skill along with Alexa devices through on bill advertisement and through DSKs and divisional offices.
 - Under the promotional offer, following devices are offered to BRPL consumers .discounted prices.

S. No	Device	MRP	Offered Price for BRPL Consumers
1	Echo Dot 3rd Gen	4499	2319
2	Echo Dot 4th Gen	4499	3329
3	Echo Show 5	8999	4947
4	Echo Show 8	13999	8862

BSES BSES Rajdhani Power Limited **amazon alexa**

Special offers on Alexa devices for BSES Rajdhani customers

Echo Dot 4th Gen
₹4,499 ₹3,349

Echo Show 8
₹13,499 ₹8,749

*Terms and Conditions Apply

Energy Efficient Appliance Program

Energy Efficient Appliance Program

BRPL DSM Initiatives

S. No	Name of the Program	Summary	Estimated Savings
1	BRPL AC Replacement Scheme	<ul style="list-style-type: none"> Total number of AC installed during the period May 2018 – Sep 2021 - 8732 	<ul style="list-style-type: none"> Estimated Savings at consumer end – 6.81 MU Estimated peak load reduction – 7.56 MW
2	BRPL Super Energy Efficient (BLDC) Fan Scheme	<ul style="list-style-type: none"> Scheme closed on 31st March 2022. Total number of energy efficient fans installed - 7858 	<ul style="list-style-type: none"> Estimated Savings at consumer end – 1.02 MU Estimated peak load reduction – 0.28 MW
3	Distribution of Energy Efficient LED Bulbs and LED Tube lights	<ul style="list-style-type: none"> LED Bulbs – 4241704 LED Tubelights - 56119 	<ul style="list-style-type: none"> Estimated Savings at consumer end – 421.45 MU Estimated peak load reduction – 162.44 MW
4	Replacement the conventional street Light with LED Light under Street Light National Program (SLNP)	<ul style="list-style-type: none"> Total Numbers: 3.6 Lakh 	<ul style="list-style-type: none"> Estimated Savings– 80.6 MU Estimated peak load reduction – 89.3 MW

Challenges

Challenges and Suggestive Measures.

- ❑ Policy intervention for **firm annual allocation of DSM budget** under regulatory mechanism through Government/ Forum of Regulators.
- ❑ Policy intervention for **setting the target of utility Led DSM Program** through Government/ Forum of Regulators.
- ❑ Develop guideline / framework for **appliance level saving calculation** for monitoring and verification under utility led DSM Program.
- ❑ Develop a framework for the open ADR protocol for integrating the any smart devices to the utility platform.
- ❑ High Cost of energy efficient appliance



Thank you

Creating Innovative Solutions for a Sustainable Future