ROLE OF INFORMATION AND MARKET BASED INSTRUMENT IN ENERGY SAVING: CONSUMER BEHAVIOR IN RESIDENTIAL SECTOR

24th Sept., 2020
Importance of residential sector
Importance of Energy efficiency program in Residential sector
Objective of the study
Broad overview of the study
Findings of the study
Conclusion
Residential sector consumes approx. 24% of the total electricity consumption in India.

In last five years residential demand has grown by 7% (CAGR).

Future demand is expected to increase:
- rapid electrification
- improvement in livelihood
- introduction and increasing penetration of appliances

Lighting and cooling requirements constitute 75 per cent of the total residential demand.
Room air conditioner (AC) demand is growing rapidly at a rate of 20% on average per year over the last ten years.

- AC demand is increasing rapidly
  - Increasing floor space and urbanization
  - Affordability of AC
  - Hotter climate and longer summer
  - Existing AC penetration is relatively low

Electricity demand from ACs will increase to 239 TWh/yr by 2030.

- Constraints for rapid increase of power demand
  - India’s commitment to reduce emission intensity
  - Provide reliable power supply for all households
Control of rapid increase: Energy efficient measures

- Set up Bureau of Energy efficiency (BEE)
- Outreach and awareness activities
- Providing incentives for manufacturing and adopting energy efficient appliances (Bachhat Lamp Yojana, Super-Efficient Equipment Programme)
- Standards and Labeling (S&L) Scheme
- Energy savings of 136.8 billion units by 2030 from greater penetration of energy efficient appliances
OBJECTIVES

- Understand current usage of energy efficient appliances by residential consumers
- Create awareness about use of energy efficient appliances and help consumers understand its benefits
- Understand the impact of continuous usage tracking and social comparison on energy usage
- Understand the impact of information and market based instrument on adoption of energy efficient appliances
- Measure potential of energy saving and realisation
- Provide platform for consumers to search and buy efficient products from certified vendors
PROJECT BRIEF (1)

- Primary survey of 600 households
  - Across seven residential societies (in BYPL service area)
  - Questionnaire based door-to-door survey
  - Random sampling without replacement
  - Household characteristics and household member details
  - Appliance penetration and Technical details
  - Appliance usage pattern
  - Electricity consumption
  - Awareness/status of Energy Efficiency
  - Willingness for energy efficient appliances

- Regular RWA interaction
  - Awareness camp in Societies
  - Regular interaction with RWAs in collaboration with BYPL
Survey data analysis
- Relationship of consumption pattern and household/appliance characteristics
  - Number of AC frequently used
  - Star rating of AC
  - Number of adult household members
  - Duration of AC usage
- Willingness of households to replace existing appliance with energy efficient one

Development of “SustHome” app

Estimation of energy saving potential from AC replacement

Post intervention survey
- Measure realization of energy saving potential
PRE-INTERVENTION SURVEY ANALYSIS

Awareness among HH

- % of HH
- star rating, BYPL Scheme, Carbon footprint, ToD tariff
- 2BHK, 3BHK, 4BHK

% of HH with Recent Replacement

- % of HH
- AC, Refrigerator, Fan
- 2BHK, 3BHK, 4BHK

% of HH want to replace

- % of HH
- AC, Refrigerator, Fan
- 2BHK, 3BHK, 4BHK

Replacement due to efficiency Issue
<table>
<thead>
<tr>
<th>Electricity Bill</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mdi</td>
<td>199.2*</td>
<td>180.8</td>
<td>152</td>
<td>141.6</td>
<td>178.7</td>
<td>217.2**</td>
<td>179.4</td>
<td>208.0*</td>
</tr>
<tr>
<td>No. of adult member</td>
<td>908.4***</td>
<td>857.8***</td>
<td></td>
<td>815.4***</td>
<td>371.5**</td>
<td>842.6***</td>
<td>841.0***</td>
<td></td>
</tr>
<tr>
<td>no. of child member</td>
<td>-309.8</td>
<td></td>
<td>-104.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>awareness about star rating</td>
<td>-1861.6</td>
<td>-1867.7</td>
<td>160.6</td>
<td>-916.3</td>
<td>-460.8</td>
<td>-333.6</td>
<td>-1817.3</td>
<td>-468.6</td>
</tr>
<tr>
<td>no. of Acs</td>
<td>1020.9**</td>
<td>1032.5**</td>
<td>1142.5**</td>
<td>1100.7**</td>
<td>380.6</td>
<td>1156.7***</td>
<td>979.6**</td>
<td>612.3</td>
</tr>
<tr>
<td>tod</td>
<td>-302.9</td>
<td>-279.5</td>
<td>-112.3</td>
<td>-167.8</td>
<td>-284</td>
<td>-298.7</td>
<td>-329.2</td>
<td></td>
</tr>
<tr>
<td>usage of AC1</td>
<td>327.4*</td>
<td>335.6*</td>
<td>303</td>
<td>331.5</td>
<td>49.31</td>
<td>259.4**</td>
<td>302.6</td>
<td></td>
</tr>
<tr>
<td>average usage of all Acs</td>
<td>-723.0*</td>
<td>-726.3*</td>
<td>-585.2</td>
<td>-664</td>
<td>-215.3</td>
<td>-671.1*</td>
<td>-192.9</td>
<td></td>
</tr>
<tr>
<td>Household characteritics</td>
<td>-356.4</td>
<td>-373.4</td>
<td>-210.4</td>
<td>-320</td>
<td>-200.3</td>
<td>-1349.8**</td>
<td>-180.4</td>
<td></td>
</tr>
<tr>
<td>no. of total members</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>381.5**</td>
</tr>
<tr>
<td>N</td>
<td>139</td>
<td>139</td>
<td>139</td>
<td>139</td>
<td>139</td>
<td>489</td>
<td>139</td>
<td>139</td>
</tr>
<tr>
<td>R-sq</td>
<td>0.757</td>
<td>0.754</td>
<td>0.718</td>
<td>0.732</td>
<td>0.744</td>
<td>0.65</td>
<td>0.752</td>
<td>0.746</td>
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<tr>
<td>adj.</td>
<td>0.74</td>
<td>0.739</td>
<td>0.701</td>
<td>0.716</td>
<td>0.731</td>
<td>0.645</td>
<td>0.739</td>
<td>0.732</td>
</tr>
</tbody>
</table>

- No. of adult members, no. of ACs and usage of frequently used ACs are important determinants of monthly electricity consumption
- Efficient utilisation of energy efficient ACs can significantly reduce demand
ESTIMATED ENERGY SAVING POTENTIAL

Change of 3 star AC to 5 star AC has following saving potential savings

<table>
<thead>
<tr>
<th>Appliance</th>
<th>Power Savings (in unit)</th>
<th>Monetary savings in INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 Ton Window AC</td>
<td>770 Units per annum</td>
<td>5575 INR per annum</td>
</tr>
<tr>
<td>1.5 Ton Split AC</td>
<td>890 Units per annum</td>
<td>6444 INR per annum</td>
</tr>
</tbody>
</table>

- Power savings and monetary savings is based on approx. 8 hr. per day for 6 months of consumption and INR 7.24 per unit cost
- The approx. payback period will range from 2.4 years to 2.9 (approx. 3 years), further depending on the model and brand of the product as well as on the usage pattern.
- More frequent usage (more number of hours in a day and/or longer period in a year) leads to shorter payback period.
KEY FEATURES OF THE MOBILE APP (SUSTHOME)

- Energy Consumption Tracking
- Social Comparison and Benchmarking
- Energy Savings Recommendations/Tips
- Marketplace for Energy Efficient Products
SUSTHOME SNAPSHOT (1)

Your Consumption Trends

<table>
<thead>
<tr>
<th>Vs Last Month</th>
<th>Vs Last Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>APR 2019</td>
<td>MAR 2019</td>
</tr>
<tr>
<td>183 units</td>
<td>165 units</td>
</tr>
</tbody>
</table>

Your consumption for this month is 10% higher than last month

1. Before purchasing new appliances. | 2. Power y
**SUSTHOME SNAPSHOT (2)**

### House Profile

**Basic**

**House Profile**

- **MDI**
  - 7
- **Sanctioned Load**
  - 10
- **Total carpet area of the house in sq ft**
  - 1500
- **No. of adults**
  - 2
- **No. of children**
  - 1
- **No. of bedrooms**
  - 3
- **No of drawing/dining rooms**
  - 1

### Advanced

**Appliances**

**Your Consumption Trends**

- **Last 3 months**
  - Jan 2019 - Mar 2019
  - Your consumption
    - 785 units
  - Consumption of similar homes within society
    - 446.67 units
- Similar homes within your society consume 75% less than you
  - 75%
- Consumption of similar homes within nearby societies
  - 446.67 units
- Similar homes within nearby societies consume 75% less than you
  - 75%
SUSTHOME SNAPSHOT (3)

Product Marketplace

Have you taken advantage of BSES' AC Replacement Schemes?

- Air Conditioner: Coming Soon
- Refrigerator: Coming Soon
- LED Lights: Coming Soon
- Fan: Coming Soon
- Geyser: Coming Soon
- Electric Vehicle: Coming Soon

Contact
BPL (South & West Delhi) 19123 / 39999727
BPL (East & Central Delhi) 19122 / 29994008

Air Conditioner

5 star inverter based AC

Calculate

Annual Units Saved*: 0.0 Units
Replacement Cost: Rs. 0

Payback Period
Browse energy efficient ACs

View Query Cart
FAQ

All Categories
All

How is my green rating calculated?

How do you define which home is similar to me?

What are the benefits of maintaining a good green rating score?

How can a different society home be similar to mine?

How are you calculating savings for ACs?

How are you calculating savings for water pump?

Contact Us

For any product / offer related query, please write to us at:
bypl.dsm@relianceada.com

For any app related technical query, please write to us at:
info@susthome.in

For providing feedback, please use the dialogue box below:

Feedback

Submit feedback

This app is brought to you by
POST INTERVENTION ANALYSIS

- Data provided by BYPL and SustHome app
- Data of consumers who replaced AC under BYPL AC replacement scheme
- Data on average monthly energy consumption in AC usage season
  - 2017, 2018 and 2019
- Data for treatment and control area
  - Mayur Vihar area as treatment sample where information and market based instrument were introduced
  - SE zone and entire BYPL service area as control sample
- BYPL AC replacement scheme was launched in 2017-18 while information and market based instrument was introduced in early 2019
POST INTERVENTION ANALYSIS

Effect of BYPL scheme and information and market based instrument on energy consumption

<table>
<thead>
<tr>
<th>% of Consumers</th>
<th>Mayur Vihar</th>
<th>SE Zone</th>
<th>Entire BYPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-18</td>
<td>33.3</td>
<td>45.9</td>
<td>52.0</td>
</tr>
<tr>
<td>2018-19</td>
<td>33.0</td>
<td>36.5</td>
<td>37.1</td>
</tr>
<tr>
<td>Increase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decrease</td>
<td>66.7</td>
<td>54.1</td>
<td>48.0</td>
</tr>
<tr>
<td></td>
<td>67.0</td>
<td>63.5</td>
<td>62.9</td>
</tr>
<tr>
<td>&lt;20</td>
<td>70.0</td>
<td>89.1</td>
<td>76.1</td>
</tr>
<tr>
<td></td>
<td>59.5</td>
<td>56.5</td>
<td>56.5</td>
</tr>
<tr>
<td>20-50</td>
<td>20.0</td>
<td>8.7</td>
<td>19.7</td>
</tr>
<tr>
<td></td>
<td>33.8</td>
<td>36.8</td>
<td>36.6</td>
</tr>
<tr>
<td>&gt;50</td>
<td>10.0</td>
<td>2.2</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td>6.8</td>
<td>6.7</td>
<td>6.9</td>
</tr>
</tbody>
</table>

- Consumers replaced AC under BYPL scheme (2017-18)
  - 2/3rd experienced reduction and 1/3rd experienced increase in consumption in MV area
  - 54% in SE zone and 48% in entire BYPL service area experienced reduction in consumption
- Consumers under instrument and BYPL scheme (2018-19)
  - 2/3rd experienced reduction and 1/3rd experienced increase in consumption in MV area
  - 64% in SE zone and 63% in entire BYPL service area experienced reduction in consumption
POST INTERVENTION ANALYSIS

Share of Consumers with change in energy consumption

<table>
<thead>
<tr>
<th></th>
<th>Mayur Vihar</th>
<th>SE Zone</th>
<th>Entire BYPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease-Decrease</td>
<td>53.8</td>
<td>29.6</td>
<td>21.8</td>
</tr>
<tr>
<td>Increase-Decrease</td>
<td>15.4</td>
<td>32.1</td>
<td>33.1</td>
</tr>
<tr>
<td>Increase-Increase</td>
<td>15.4</td>
<td>12.3</td>
<td>19.0</td>
</tr>
<tr>
<td>Decrease-Increase</td>
<td>15.4</td>
<td>25.9</td>
<td>26.1</td>
</tr>
</tbody>
</table>

- Consumers replaced AC in 2017-18 and part of instrument in 2018-19
  - 54% consumers has reduction in consumption in consecutive periods in MV
    - 30% in SE zone and 22% in entire BYPL service area
    - 15% has increase in consumption in first period and reduction in next period in MV
      - 32% in SE zone and 22% in entire BYPL service area
POST INTERVENTION ANALYSIS

Average monthly energy saving (%)

<table>
<thead>
<tr>
<th></th>
<th>Mayur Vihar</th>
<th>SE Zone</th>
<th>Entire BYPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-18</td>
<td>24.7</td>
<td>13.7</td>
<td>15.9</td>
</tr>
<tr>
<td>2018-19</td>
<td>19.9</td>
<td>21.0</td>
<td>20.8</td>
</tr>
<tr>
<td>2017-19 Decrease</td>
<td>30.6</td>
<td>18.3</td>
<td>17.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Mayur Vihar</th>
<th>SE Zone</th>
<th>Entire BYPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-18</td>
<td>34.6</td>
<td>16.6</td>
<td>17.5</td>
</tr>
<tr>
<td>2018-19</td>
<td>10.9</td>
<td>15.7</td>
<td>24.2</td>
</tr>
</tbody>
</table>

- 25% and 20% average monthly saving in consumption in MV area in 2017-18 and 2018-19
- In MV area, 31% energy saving per month for the consumers who replaced AC in 2017-18 and part of instrument in 2018-19 and reduction in consumption in 2019 vis-à-vis 2017
- Consumers with energy saving in consecutive period
  - 35% monthly energy saving in 2017-18 in MV
  - 11% monthly saving in 2018-19 in MV
POST INTERVENTION ANALYSIS

- Relatively larger proportion of consumers experienced energy saving (in 2018 compared to 2017 as well as in 2019 compared to 2018) in Mayur Vihar service area compared to SE zone or entire BYPL service area.

- Proportion of consumers with energy saving in consecutive periods (both in 2018 compared to 2017 and 2019 compared to 2018) is highest for Mayur Vihar area where information and market based instrument were introduced.

- Extent of energy saving (as measured by % of per month energy consumption) is relatively higher in Mayur Vihar service area compared to SE zone or entire BYPL service area.

- Information and market based instruments in terms of awareness campaign and information/data provided by *SustHome* app plays an important role in changing consumer behavior towards adoption of energy efficient AC.
CONCLUSION

• Huge potential of energy saving through adoption of energy efficient appliances
  • Help both consumers and distributors
• Number of challenges
  • Lack of awareness about energy efficient appliances
  • Saving potential
  • Proper usage
  • Availability
  • Initial investment
  • Vis-à-vis saving potential
  • financial issue
• Information and market based instrument can play important role
Thank You

Saswata Chaudhury

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