Electricity Supply Monitoring Initiative (ESMI)

Shweta Kulkarni
Prayas (Energy Group)
Prayas (Energy Group)

- Not-for-profit organization founded in 1994
- Analysis based policy advocacy for promoting public interest.
- Focus on governance aspects & policy innovation
- Extensive engagement with civil society groups, peoples’ movements, consumers groups and media.
Electricity Supply Monitoring Initiative (ESMI)

Need for Evidence based feedback about electricity supply quality ...
Wide disparity in supply quality across regions, Lack of independent, transparent mechanism to monitor the supply quality, need for increasing accountability and holding electric utilities accountable for their performance.

Electricity Supply Monitoring Initiative (ESMI)...
Electricity Supply Monitoring Initiative is an innovative approach of using advanced technology to address above gap.
ESMI objective is to provide evidence based feedback of actual supply quality in public domain . Facilitate effective action by utilities, regulators and policy makers alike to improve supply quality.

ESMI Journey...
Began work on the idea in 2007... 2012 pitched idea at Google social impact challenge....2014 launch of ESMI website in public domain ...2016 ,350+ devices
How does ESMI Work?

Advanced Electricity Supply Monitors (ESM) deployed at consumer premises in urban and rural areas, which record minute by minute voltage and entire data is made available at watchyourpower.org.
ESMI expanse

ESMI India 50+ districts - 400+ locations
~9 million location hours of data

ESMI international 5 countries - 100+ locations
Website overview
Location report: watchyourpower.org

The website allows all users to select an ESMI location, view and download reports showing quality of supply during the selected time period.

The pie chart displays supply quality (Low voltage, Normal Voltage, High Voltage and No supply) for the selected period.

The interruptions profile table details the duration and number of interruptions.

The bar chart shows the daily supply quality during evening hours (5 PM - 11 PM).

The final line graph shows the minute by minute voltage profile for the selected duration.
State supply summary Dashboards

Daily average hours of supply in Maharashtra

Select state
Maharashtra

State
Location type

Supply hours

2015 2016 2017 2018

Supply hours

2015 2016 2017 2018

Supply hours

Other Municipal Area

Supply hours

Rural

Supply hours

No data available
No supply
High voltage
Low voltage
Normal voltage

Mega city
Other Municipal Area
Rural

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Monthly summary reports

Power supply monitoring data gathered through ESMI is used to prepare regular monthly analysis reports. The reports present a summary of the state of electricity supply.
Snapshots of analysis using ESMI Data
Variation in hours of supply across states

Megacities population greater than 2 million
Other municipal areas /Semi urban towns
Rural akin to villages

Daily supply hours

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# Interruption frequency in megacities

## Intermittence at megacity locations

**Average number per month**

<table>
<thead>
<tr>
<th>Town</th>
<th>Short interruptions (15 min-1 hour)</th>
<th>Long interruptions (&gt;1 hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2016</td>
<td>2017</td>
</tr>
<tr>
<td>Mumbai</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Kolkata</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chandigarh</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Nagpur</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Delhi</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Pune</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Jaipur</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Chennai</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Hyderabad</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Lucknow</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Bengaluru</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Kanpur</td>
<td>18</td>
<td>16</td>
</tr>
</tbody>
</table>
Occurrence of outages in time of day

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Megacity</strong></td>
<td>12am to 6am</td>
<td>6 am to 12 pm</td>
<td>12 pm to 6 pm</td>
<td>6 pm to 12 am</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other Municipal Area</strong></td>
<td>12am to 6am</td>
<td>6 am to 12 pm</td>
<td>12 pm to 6 pm</td>
<td>6 pm to 12 am</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rural</strong></td>
<td>12am to 6am</td>
<td>6 am to 12 pm</td>
<td>12 pm to 6 pm</td>
<td>6 pm to 12 am</td>
</tr>
<tr>
<td></td>
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</tr>
</tbody>
</table>
Trends in number Interruptions

Short Interruptions

Long Interruptions

Prayas (Energy Group)
Average hours of high/low voltage supply per day

Low voltage

<table>
<thead>
<tr>
<th>Year</th>
<th>Megacity</th>
<th>Other Municipal Area</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

High voltage

<table>
<thead>
<tr>
<th>Year</th>
<th>Megacity</th>
<th>Other Municipal Area</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2018</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Agricultural supply Quality

Agricultural location Gondur-Dhule

December 2016

January 2017

February 2017
Regression Analysis

Poisson regression values

Number of supply interruptions in a month (Short < 1 hour and Long > 1 hour)

<table>
<thead>
<tr>
<th>Location</th>
<th>Short Interruptions</th>
<th>Long Interruptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)/Delhi</td>
<td>7.4</td>
<td>1.0</td>
</tr>
<tr>
<td>Other Municipal Area</td>
<td>2.4</td>
<td>2.8</td>
</tr>
<tr>
<td>Rural</td>
<td>3.9</td>
<td>7.1</td>
</tr>
</tbody>
</table>
Time series trend analysis: Long duration Interruption
Time series trend analysis: Short duration Interruption

- Maharashtra Megacity
- Maharashtra Other Municipal Area
- Maharashtra Rural

- Karnataka Megacity
- Karnataka Other Municipal Area
- Karnataka Rural
Using ESMI Data...

The initiative has been extensively covered by media through various newspaper articles and social media blogs.

ESMI Data has also been used as a lever in Political campaigns.

Electricity Regulatory Commissions (ERCs) have decided to use more of an Electricity Supply Monitoring System (ESMS) to check the performance of distribution utilities. The said systems record voltage every minute at an installed location, sending the data to a central server. This is on the heels of the Delhi government’s recent proposal to the Delhi Electricity Regulatory Commission (DERC) to penalise distribution companies for any load shedding and poor quality. It had also asked DERC to compensate consumers for outages, by asking power utilities to deduct a penalty amount from ...

Contrary to government’s claims, small towns, rural areas still suffer from power outages

Unsmart city 2015: During rains, MSEDCL flooded with power cut complaints

As Pune enters 2016, riding hopes of donning a new avatar, Newsline takes stock of areas in the city that remained more or less ‘unsmart’ in 2015.
Using ESMI Data ...

ESMI has found mention in several reports national and international with a diverse set of audiences.
Monitoring and Analysis of Residential Electricity Consumption: eMARC

- A better way to manage the rising demand for electricity cost-effectively is to understand the current consumption patterns for it.
- This household level data on consumption is currently unavailable.
- Built on ESMI (Electricity supply monitoring Initiative)
  emarc.watchyourpower.org
- eMARC records the actual load and consumption patterns of households across various socio-economic/geographic/climatic strata
- Records the actual load and consumption patterns of selected appliances
- Generates publicly available datasets
- Current expanse in 125 households across Semi-Urban and Rural, Maharashtra and Uttar Pradesh
Thank you!

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Prayas prohibits and does not tolerate sexual harassment in the workplace or during any organization-related activity. All employees, volunteers, trustees, interns, or anyone visiting the workplace including children, has a legal right to report such acts to the Internal Committee, Child Protection Committee, or any suitable authority.

Prayas has a child protection policy to ensure safety and welfare of children which will prohibit any harm, abuse and misuse of children.