OPINION PIECE

When the lights went off: Insights on lighting loads and need for ground level data in residential sector

Background about the event:

As an act of showing solidarity to fight COVID-19 during the ongoing nationwide lockdown, the Honourable Prime Minister of India had requested for switching off electrical lights at home on the 5th April at 9 pm for 9 minutes.

Plans to handle the event:

The National Load Despatch Centre (NLDC) of POWER SYSTEM OPERATION CORPORATION LIMITED (POSOCO) published a preliminary report on the PAN India Lights switch off event on 5th April, 2020. A detailed advisory was sent by POSOCO to all the State Load Despatch Centres (SLDC) to manage the demand variation. The unprecedented demand variation was successfully handled by the NLDC, SLDC and local utilities.

Projection:

POSOCO estimated the lighting demand drop to be between 12,000 and 14,000 MW. This was based on the evening peak ramp up data of 29th March 2020, the previous Sunday and some theoretical estimates. Roughly this was the expected drop in demand during this event, assuming that only electrical lights at home were switched off, with other appliances left on.

What happened during the event:

However the actual reduction in all India demand recorded was 31,098 MW during the event (between 20:45 hours and 21:09 hours), as reported by POSOCO. The expected reduction in the demand was about 10% of the total electricity demand (ref: demand recorded at 8:45 pm) but the actual reduction in demand came to be at about 25%. Demand started reducing from 8:45 PM and reached the lowest of 85799 MW at 09:10 PM.

The large gap between estimated and actual drop in demand:

What could have contributed to the high drop in load, much more than estimated, is open for speculation. It is possible that other appliances were also switched off. It is also possible that common area lighting was not considered.

From annexure I (Page 7) on the POSOCO report , we observe that the connected active household lighting demand has been considered at 100 watts per urban household and 50 watts per rural household across India. This reflects the urban rural gap in electricity demand.

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If we observe the actual demand drop reported across the region (annexure – 2 on the POSOCO report, Page 17), further diversity is evident.

Time	Demand (MW)					
	North Region	**West Region**	**South Region**	**East Region**	**North East Region**	**All India**
20:45	31,791	32,474	35,012	15,815	1,796	11,6887
21:10	22,061	24,010	29,034	9,679	1,015	85,799
Reduction in demand	**31%**	**26%**	**17%**	**39%**	**43%**	**27%**

A paper (http://www.iitk.ac.in/npsc/Papers/NPSC2016/1570293957.pdf) based on POSOCO's study highlights the inherent diversity in India and the need for capturing these for better planning.

These findings strongly bring out the need for ground level reliable data on household electricity usage in India, disaggregated based on climatic regions and social demographics minimally.

How can we bridge this data gap?

With smart meters just catching up, India largely relies on surveys and top down projections to estimate electricity demand, particularly in the residential sector. The residential sector contributes to about a quarter of India's electricity consumption and is growing.

In the last few years, there have been efforts by some utilities and civil society organizations in India to engage actively with household consumers through Home Electricity Reports (HER) providing conservation tips while also crowd-sourcing data on electricity usage.

One such program is VidyutRakshaka which engages with more than 5000 electricity consumers in Bangalore urban district. The program uses electrical appliance details along with consumption data to build models, benchmark consumers and provide customized HER. The data thus sourced provides valuable insights into various aspects of electricity usage in urban households. Studies like VidyutRakshaka are able to determine total appliance load and peak hour usage behaviour thus giving evidence for demand projections.

As per our data estimates, the lighting demand contribution per urban household is about 12% of the total connected load. This does not include common area lighting, in places like apartment complexes and gated communities. Through another pilot study done with 10 apartment complexes in Bangalore, about 8% contribution is estimated from lighting to the total connected load in common areas.

Programs like VidyutRakshaka and other Home energy report initiatives are small but successful efforts that show how to source reliable data from the ground while actually empowering consumers (by influencing and recommending actions based on data analysis). The data when aggregated (anonymized and aggregated, within categories like cities, house size, etc) yields residential electricity consumption benchmarks. It is this kind of information that would be helpful not just in being better prepared for exigency like this solidarity event but also for policy planning.

Conclusion:

Data is not just knowledge but power! With data analytics and machine learning, direct measurement is not the only choice for sourcing data, as programs like VidyutRakshaka and Home Energy Report programs have shown.

This unusual social experiment has highlighted the need for local, low footprint initiatives to supply robust ground level data for better planning and policy.

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