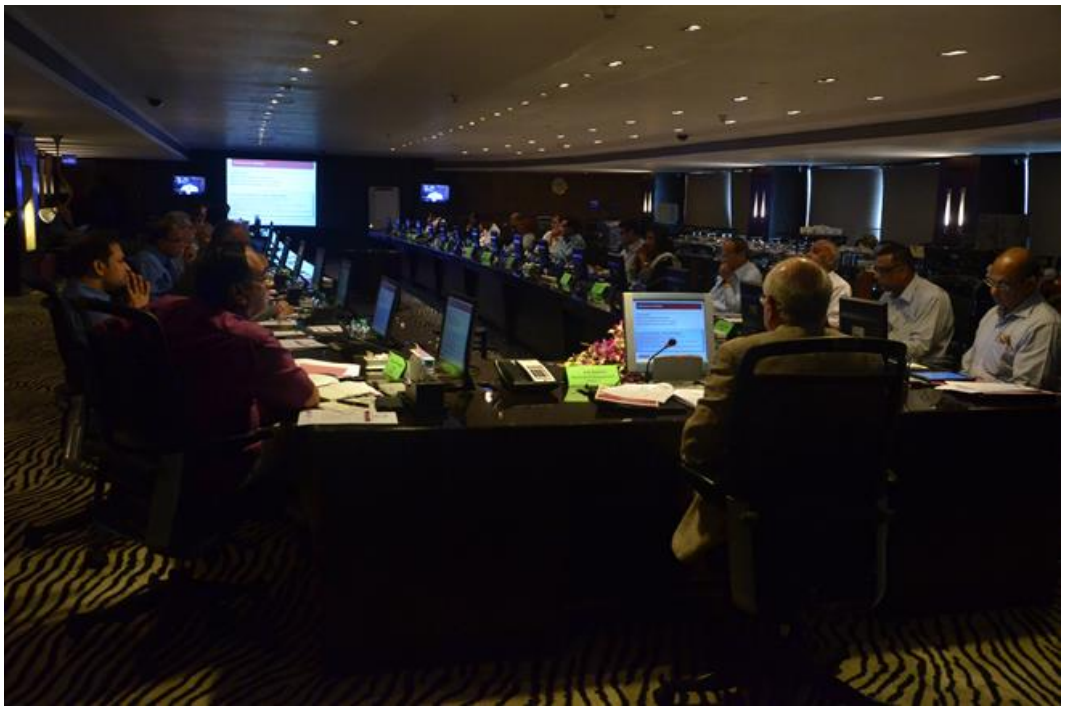
Proceedings
Ninth Meeting Utility CEO Forum on Demand Side Management

17 September 2015



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SHAKTI SUSTAINABLE ENERGY FOUNDATION

EESL

1. Introduction and participant profile

In the context of Utility driven Demand Side Management (DSM), 'Load Research' can be regarded as the starting point to get insights into the patterns of electricity usage of end users, either in total or by individual end uses. The information derived from load research help Utilities identify potential demand side measures and quantify their resource potential[1].

Considering the importance of Load Research in DSM planning, the 'Utility CEO Forum on DSM' deliberated on the topic: 'Capitalizing on the Insights from Load Research Studies' in their ninth meeting, held on 1st September 2015, in Mumbai. Anil Razdan, Former Secretary, Ministry of Power, chaired the meeting which was attended by experts and officials from the electricity regulatory commissions, electricity distribution licensees (utility) and other stakeholders across the country.

Participant profile in the 9th meeting of Utility CEO Forum on DSM

Honorary Chairperson	Anil Razdan, IAS (retired), Former Secretary, Ministry of Power
Electricity Regulatory Commissions	1. Gireesh B. Pradhan, Chairperson & Chief Executive, Central Electricity Regulatory Commission 2. Jagjit Singh, Chairman, Haryana Electricity Regulatory Commission 3. Umesh Narayan Panjiar, Chairman, Bihar Electricity Regulatory Commission 4. Kiran M. Shringarpure, Member, Gujarat Electricity Regulatory Commission 5. Somanjan Ponda, Deputy Director (Engg.), The West Bengal Electricity Regulatory Commission 6. Virender Kumar Sarangal, Superintending Engineer (Electric), Jammu & Kashmir State Electricity Regulatory Commission
Utilities	1. Selva Kumari J, IAS, Managing Director, Kanpur Electricity Supply Company Limited 2. Ashok Sethi, Chief of Corporate Operations Management, Tata Power Company Limited 3. Kaushik Sanyal, Tata Power Delhi Distribution Limited 4. S.D. Khadilkar, Tata Power Delhi Distribution Limited 5. Pramod Deo, Reliance Infrastructure Limited 6. R.R.Mehta, Chief Executive Officer, Reliance Energy 7. R.K.Awasthi, Chhattisgarh State Power Distribution Company Limited 8. Sarbeswar Bhuyan, North Eastern Electricity Supply Company of Odisha Limited 9. Hemant V Shah, Deputy Engineer (DSM), Madhya Gujarat Vij Co. Limited 10. Parag S Naik, Deputy Chief Engineer (DSM Cell), Brihan Mumbai Electric Supply & Transport Undertaking 11. Dineshchandra R. Saboo, Chief Engineer, Maharashtra State Electricity Distribution Co. Limited 12. Ravi Malik, Deputy General Manager, BSES Rajdhani Power Limited
Others	1. Ajay Mathur, Director General, Bureau of Energy Efficiency 2. Padu.S. Padmanabhan, Independent Expert 3. Mahesh Patankar, Managing Director, MP Ensystems Advisory Private Limited 4. Sonia Shukla, MP Ensystems Advisory Private Limited 5. Parag Kulkarni, MP Ensystems Advisory Private Limited

[1] a saving in consumption (kWh) and/or demand (kW/KVA) available as a result of the programmatic implementation of DSM measure, to be expressed in the following important dimensions:

- Quantum – as to how much is available (kWh and/or kW)
- Time – as to when is it available (at what time of day, on what days, in what season)

6. Anshumali Bhushan, Director, Business Development & Strategic Consulting, Genesis Futuristic Technologies Limited
7. Sudeysh Rao, Managing Director, LEO Electronics

Secretariat

1. Saurabh Kumar, Managing Director, Energy Efficiency Services Limited
2. Neelima Jain, National Program Manager (DELP), Energy Efficiency Services Limited
3. Prabhat Kumar, Program Manager (DSM), Energy Efficiency Services Limited
4. Dipak Kokate, Project Manager (DSM), Energy Efficiency Services Limited
5. Chinmaya Acharya, Chief of Programs, Shakti Sustainable Energy Foundation
6. Deepak Gupta, Senior Program Manager, Power, Shakti Sustainable Energy Foundation
7. Amit Kumar, Partner, PwC India
8. Kulbhushan Kumar, Associate Director, PwC India
9. Shuboday Ganta, Manager, PwC India
10. Samved Patil, Manager, PwC India
11. Rajesh Verma, Consultant, PwC India

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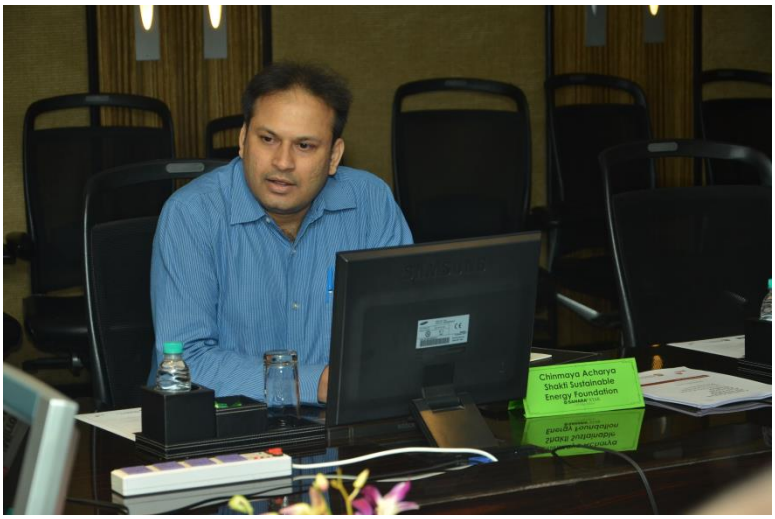
2. Inaugural session

2.1. Welcome Note

Chinmaya Acharya, of Shakti Sustainable Energy Foundation (Shakti), welcomed the participants and presented a brief overview of the agenda. He added that the meeting was focused to discuss the insights from load research studies and way forward for Utilities to effectively plan for large scale DSM programs. He concluded his welcome note by encouraging the dignitaries to voice their views openly during the course of presentations.



Chinmaya Acharya, Shakti Sustainable Energy Foundation

2.2. Setting the Context

Anil Razdan, Honorary Chairperson, gave his introductory remarks by stressing on the significance of load research in view of the need to equip utilities with the knowledge of load shapes and individual end use consumptions (both at the facility and appliance level). He underscored that load research studies are indispensable tools to manage intermittent sources of energy, assess true cost of serving specific load shapes, forecast minimum base load and peak load all of which are the greatest challenges of the country's electricity system. He however concluded that the current Forum meeting aims to discuss the significance and benefits of load research for developing effective demand side management programs.

Anil Razdan, Honorary Chairperson

3. Presentations and discussions

3.1. Theme presentation: Insights from Load Research Studies conducted under the BEE DSM Program

Presentation by Kulbhushan Kumar, PwC India

Kulbhushan started by underlining the regulatory framework for conducting load research in the context of DSM. He mentioned that the DSM regulations requires utilities to conduct load research in the process of developing a concrete DSM action plan and stipulating DSM targets. He added that under the national 'Bureau of Energy Efficiency (BEE) DSM Capacity Building Program' 33 utilities across 20 states are being provided with technical and financial assistance for undertaking a systematic DSM planning in accordance with the DSM regulations. He presented the list of load research studies conducted under the BEE DSM capacity building program (***see Appendix 1A***). He further explained that all the load research studies have broadly adopted a similar methodology by analyzing hourly load shapes on select 11 KV feeders (or below feeders or Distribution Transformers) and conducting facility level consumer surveys for sample consumers.

Kulbhushan Kumar, PwC India

Subsequently, Kulbhushan shared some of the insights from the review of eight load research studies completed under the BEE DSM program. He stressed that managing morning /afternoon peak is the major concern for utilities, as they are higher than the evening peak in many utilities. He highlighted that the domestic consumers are the major contributors to peak load for utilities that serve predominantly in urban areas. AC and Refrigerator are the top end use contributors to the peak load in summer. Geyser and Lights are the top contributors to the peak load in winter. Among Utilities that serve predominantly in the rural areas, Industry and Agriculture are the major contributors to peak load. Pumps and motors are the top end use contributors to peak load in both summer and winter.

He also shared some insights on the appliance ownership, penetration of BEE Star rated products and energy efficient technologies among household consumers. He mentioned that the penetration of BEE Star rated ceiling fans, pump sets and electric geysers is less than 5% of domestic consumers who own these products. He further mentioned that almost 24% to 40% of consumers are still using incandescent bulbs.

Kulbhushan concluded his presentation by emphasizing the need and actions to sustain the benefits of load research. He mentioned that the information gathered through load research studies have limited shelf life for a meaningful application by Utilities (ie, max. 2 to 3 years). He emphasized that the insights from load research studies need to be updated continuously in order to keep pace with the rapidly changing consumer choices, technologies and DSM market dynamics.

Highlights of discussion and debate on theme presentation

The Honorary Chairperson added that the load research studies should be carried out at the interface of 11 kV feeders and last mile connection feeders (415 V or 240 V feeders) to enhance the granularity of information captured. He stressed that the analysis of peak load occurrences and contributors should dive deeper into various sub classes of consumers within domestic, commercial and industrial categories. For example, in the domestic sector, he added that load research study should provide distinctive answers for peak load contributors in multi storied apartments, independent villas, residential colonies etc. He also sought clarification regarding the residential water pumps as peak load contributors in winter.

Gireesh B Pradhan of CERC added that the use of basement water tanks in multi storied apartments and subsequent pumping to overhead tanks may justify the water pumps as peak load contributors.

Ajay Mathur from the Bureau of Energy Efficiency agreed with the Chairperson's suggestion and emphasized that the load research can equip Utilities with the knowledge of effective demand side measures to respond to the variability in the power generation.

Umesh Narayan Panjiar from the Bihar Electricity Regulatory Commission highlighted that the load research studies help utilities to undertake better load forecasting and thereby enable optimum utilization of resources by matching the power demand with various sources of generation and transmission capacities.

Padu S Padmanabhan, an eminent expert, also concurred that the applications of load research go beyond DSM. He cited that many utilities in USA conducted load research in the 1970s in response to regulatory mandates that required tariff setting to be based on econometric and statistical design. He added that load research originally began to improve allocation of costs among different rate classes and then slowly expanded to other critical functions such as DSM. He further added that managing intermittence from renewables in another key function of load research. With regard to discussions pertaining to water pump as a peak load contributor, he mentioned that a Delhi utility had identified water pumping in parks as peak load contributor. He emphasized that load research studies should aim to identify such non trivial factors in close consultation with utility engineers to comprehensively identify peak load contributors.

3.2. Demand Side Management BRPL Plan

Presentation by Ravi Malik, BSES Rajdhani Power Limited (BRPL)

Ravi outlined the DSM planning process defined in the DERC DSM Regulations. He emphasized that the load research was the first step in this planning process.

He further presented the methodology and key findings of load research study undertaken by BRPL. The sampling for consumer surveys included two levels - first level considered the consumer tariff class (domestic, commercial, industry etc.), and the second level further segregated each of these groups into various sub groups. For example, in the domestic sector, six different sample sub groups (viz. apartments, JJ colonies, upmarket areas, rural areas, semi-rural, DDA and others) were identified.

He argued that the peak demand growth (73.7%) in Delhi has been substantially higher than the energy growth (36.7%) between 2004 and 2012. In the domestic category, most of the sub groups contributed to the highest share of load during 20:00 - 00:00 hours in summer and during 8:00 – 11:00 hours in winter. He argued that in summer, the overall BRPL peak occurs during 13:00 – 16:00 hours. This is primarily because of high contributions from commercial and industrial establishments. In winter, the overall BRPL peak occurs during 8:00 – 11:00 hours. This is primarily because of high contributions from domestic and industrial establishments. He added that winter peak contributors are geysers, television, refrigerators, lighting and water pumps and summer peak contributors are ACs, refrigerators, fans, air coolers and lighting. He also added that

the lack of awareness is an important barrier for not using star rated products and electricity bill reduction is the major driver for using them.

Ravi Malik, BRPL

Ravi also mentioned the key findings from the load duration curve of BRPL. BRPL experienced load above 2200 MW for 115 hours in 2014, primarily in July. He added that the top 110 MW load occurs in two time slots (viz. 15:00 – 16:00 and 23:00 – 00:00) and therefore DSM programs must coincide with these time slots to manage peak load.

Ravi concluded the presentation by adding that the DSM action plan for 2015-16 includes promotion of LED lamps, energy efficient fans, ACs, demand response and solar rooftop power generation. He added that by implementing these DSM measures, BRPL can reduce 50 MW and 73 MW load that coincides with peaks occurring at 15:00-16:00 and 23:00-24:00 slots respectively.

3.3. Tata Power Delhi Distribution Limited - DSM & Energy Efficiency Initiatives

Presentation by Kaushik Sanyal, Tata Power Delhi Distribution Limited(TPDDL)

Kaushik started by presenting the seasonal variations in hourly load shapes for industrial, commercial and domestic consumer categories in TPDDL's license areas. He then moved on to discuss the key features of different DSM programs initiated by TPDDL. One such initiative is the program on replacement of conventional / old air conditioners (AC) with BEE 5 Star rated / inverter ACs for the residential sector. The program is approved by the Delhi Electricity Regulatory Commission (DERC) and targets replacing 20,000 ACs wherein TPDDL is offering upfront rebates between INR 4,800 – 7,400 per AC, thus reducing the price by nearly 50% of MRP[2] or almost 20 to 25% of market operating price, Kaushik claimed. The electricity savings and avoided peak capacity expected from this program are 11.61 million units (MU) and 12.9 MW respectively.

Kaushik Sanyal, TPDDL

Domestic Efficient Lighting Program (DELP) is another DSM initiative of TPDDL, which involves distribution of upto four 7 watt LED self ballasted lamps to each domestic consumer at a nominal rate of INR 93 per lamp. The program, launched in July 2015 with the support of EESL, aims to distribute around 3 million lamps over a period of four to five months.

[2] Maximum Retail Price

In order to advance DSM in the industry segment, Kaushik mentioned that TPDDL envisions to offer ESCO services in its license area. In this regard, TPDDL has been empanelled by BEE as Grade A channel partner,

Further, Kaushik drew audience's attention to TPDDL's initiatives in Automated Demand Response (ADR) with the help of smart meters. He claimed that TPDDL reach out to around 200 consumers including both commercial and industrial(11 kV and above) as on September'15. He pointed out that these consumers are able to offer a voluntary load curtailment aka demand response of 13-28% of their total load.He also highlighted that in view of the applicable differentiated tariff rates during peak and off-peak hours, the consumers could considerably benefit from shifting their load from peak to off-peak or normal.

Kaushik also mentioned about three pilot projects of home automation solution undertaken by TPDDL to enable load shifting by consumers. He added that this would help shift the morning or evening pump load to off-peak slots. TPDDL along with Home / Building Automation Solution provider is targeting for enhanced uptake of this solution in the coming years. He empahiszed that TPDDL will benefit from reduced peak demand with no additional investment, additional power available to cater to the load growth and revenue generation from value added services. The consumers will benefit from reduction of capacity and energy costs through real time energy use information, improved productivity and ease of building operation.

Finally, Kaushik presented TPDDL's DSM action plan for the period FY15 to FY18. The plan included energy efficient fans and refrigerator programs for domestic consumers, apart from the ongoing initiatives. He highlighted that DSM action plan aims to achieve 46 MU of annual energy savings by 2017-18.

Highlights of Discussions

Following the presentation, Padu S Padmanabhan sought clarification on how TPDDL categorized critical and non-critical loads in the evaluation of demand response potential for the ADR initiative, especially during peak hours. In response, Kaushik explained that the energy audit studies have revealed that most industries experience critical load during majority of the time. He pointed out that limited share of non-critical load makes it economically less attractive to curtail the load in absence of sufficient incentive.

3.4. Update on National Energy Efficiency Programs

Presentation by Neelima Jain, Energy Efficiency Services Limited

Neelima began her presentation with the snapshot of progress made by EESL with regard to two major national energy efficiency initiatives: DELP, which entails large scale distribution of LED self ballasted lamps at discounted prices, and the national street lighting program, which entails retrofitting of conventional street lighting fixtures (Eg: HPSV, MH, T12) with LED fixtures. She mentioned that DELP is currently running in 25 towns and the street light program is ongoing in 89 municipalities across the country. Both the programs will be rolled out across 100 smart cities proposed in the country. DELP aims to achieve 150 million figure of installed LED lamps by FY16 and 770 million in next three years. EESL has already distributed nearly 12 million LED lamps across five States and has registered a per day off-take of around 0.12 million lamps.

Neelima Jain, EESL

She added that EESL is targeting to increase the per day offtake to 0.7 million lamps.

In the street lighting segment, she mentioned that EESL has already installed 0.26 million LED street lights under the national street lighting program, against a target of 1.5 million. She further added that the target for LED street lights has been raised to 33 million in next three years.

Going forward, Neelima highlighted that taking cue of the success of the current business model of aggregating and e-procuring efficient appliances, which has led to substantial upfront cost reduction, EESL will be undertaking pilot scale projects wherein almost 1.1 million inefficient old fans would be replaced with BEE certified 5 Star rated fans in Andhra Pradesh and Maharashtra.

Neelima concluded the presentation by sharing the National DELP Dashboard (http://www.delp.in/) that tracks real time achievement of LED lamp distribution under the DELP initiative. The portal also allows users to track the location of LED lamp distribution points in their cities.

3.5. Capitalizing from Load Research Studies and Way Forward

Presentation by Shuboday Ganta, PwC India

Shuboday started by outlining the way forward for Utilities to complete the DSM planning process that began with load research. The way forward for DSM planning entails cost effectiveness evaluation; economic potential assessment; setting goals and targets; and finally formulating program designs for identified DSM interventions.

Shuboday Ganta** (second from left), **PwC India

Shuboday then touched upon the salient aspects of the most commonly adopted DSM program designs in India and abroad. He mentioned that the 'Standard Product' design offers capital rebate to offset the differential cost involved in the purchase of efficient electric appliance. He added that this design has been employed in the recently launched TPDDL's initiative to replace old ACs with BEE 5 Star rated products. He argued that this program design mitigates the high upfront cost for consumer and therefore is highly cost effective for participating consumers. However, the realization of energy savings is critical for utility's cost effectiveness in such programs.

Shuboday mentioned 'Standard Offer' is another prominent program design wherein utilities purchase energy savings and/or demand reductions at a predetermined rate per kWh or per kW. He drew an analogy of this design with typical power purchase agreements for conventional and renewable sources of energy and compared the Standard offer rates with feed-in tariffs for renewables. He cited the DELP programs in Puducherry and Andhra Pradesh as examples of this program design. He also argued that this design treats energy savings from DSM programs as virtual power supply and fosters competition between DSM and conventional resources. The actual realization of energy savings is critical for utility's cost effectiveness in this program design as well.

Shuboday mentioned 'On-bill Financing' as the third DSM program design wherein the Utility offers capital rebate to offset the differential cost involved in the purchase of efficient electric appliance and subsequently recovers the upfront rebate from the customer's monthly bill. He cited the DELP programs in Delhi and

Rajasthan as examples of this program design. He argued that the On bill design mitigates the high upfront cost barrier faced in many low income consumer classes and simultaneously ensures complete cost recovery through bills. This program design is highly cost effective for Utility. However, programs targeting high investment appliances may limit consumer participation and stringent regulations along with enforcement is required for securing the on bill loans.

Shuboday concluded his presentation by emphasizing that there is no single best program design option for DSM. The Utilities should evaluate pros and cons of different program designs for various end use appliances and adopt the best form of incentive and its delivery mechanism to mitigate the most important local barriers for achieving the DSM objectives.

Highlights of Discussions

The Honorary Chairperson tabled a suggestion that the program design shouldbe such that it allows the consumers to choose the manufacturer or supplier of the energy efficient appliance, instead of Utilities or Energy Service Companies determining them. He argued that this is important to enhance transparency in DSM investments and is especially critical in the wake of utilities coming under increased public scrutiny.

3.6. Launch of Standard Offer Program Handbook

This session witnessed the launch of 'Standard Offer Program Handbook' developed by the Shakti Sustainable Energy Foundation along with MP Ensystems. The handbook is a 'How to Guide' for designing and implementing standard offer programs in India.

From left to right**: Saurabh Kumar (EESL), Umesh Narayan Panjiar (BERC), Ajay Mathur (BEE), Anil Razdan, Gireesh B Pradhan (CERC), Chinmaya Acharya and Jagjit Singh (HERC)**

3.7. Interventions of Software for Efficient Energy Distribution

Presentation by Anshumali Bhushan, Genesis Futuristic Technologies Ltd.

Anshumali began by explaining the key product offerings of the company to address three major problems at the distribution side of the power sector: energy loss, high outage and poor maintenance. One of the solutions, he mentioned, was 'EnerCount' (software) which can be used for energy accounting at distribution

transformer(DT) level. He argued that this solution would help measure transmission & distribution losses in unprecedented ways. Energy accounting at DT level at daily frequency would give Utilities very actionable inputs for loss reduction.

He also presented a solution called Outage Management System (OMS) for managing unpredictable outages. He argued that unlike the existing SCADA systems at most Utilities, OMS solution will take outage management down to LT (low tension) level, enabling highly effective customer interaction in real time.

This apart, he mentioned Smart Ops, another solution to remotely capture operation parameters of distribution transformers and substations. He argued that this solution is capable of shifting from unscheduled breakdown to predictive maintenance using condition based monitoring, which will improve performance and reduce manpower cost for Utilities..

Anshumali Bhushan, Genesis Futuristic Technologies Ltd

Concluding remarks by Honorary Chairperson

The Honorary Chairperson thanked the participants for sharing their valuable experience and knowledge during the course of the meeting. He further tabled a recommendation that sought to enhance the participation of equipment manufacturers and technology suppliers in the Forum discussions. He argued that the DSM investments cannot be driven by market forces unless their commercial aspect is adequately dealt with and this warrants engagement of those actors in order to get a holistic view of the issues derailing the large scale implementation of DSM solutions.

Appendix 1 A - List of Load Research Studies initiated under the BEE DSM program

State	Name of the Utility	Agency Name	State	Name of the Utility	Agency Name
Andhra Pradesh	Southern Power Distribution Company of A.P. Limited	Darashaw & Company Pvt Ltd	Kerala	Kerala State Electricity Board Ltd.	Enfragy
Assam	Assam Power Distribution Company Limited	Enfragy Solutions India Pvt Ltd.	Madhya Pradesh	Madhya Pradesh Madhya Kshetra Vidyut Vitran Co. Ltd	Darashaw
Bihar	North Bihar Power Distribution Company Limited	REC PDCL	Maharashtra	Maharashtra State Electricity Distribution Co. Ltd.	Idam Infrastructure and Advisory Pvt Ltd.
Bihar	South Bihar Power Distribution Company Limited	REC PDCL	Meghalaya	Meghalaya Power Distribution Corporation Ltd.	Darashaw
Delhi	BSES Rajdhani Power Ltd.	EESL	Mizoram	Power & Electricity Department, Government of Mizoram	Darashaw
Delhi	BSES Yamuna Power Ltd.	PwC	Odisha	Western Electricity Supply Company of Odisha Limited	PwC
Delhi	Tata Power Delhi Distribution Limited	PwC	Puduchery	Electricity Deptt., Puducherry	PwC
Goa	Electricity Department, Government of Goa	TERI	Punjab	Punjab State Power Corp. Limited	TERI
Gujarat	Dakshin Gujarat Vij Company Limited	TERI	Rajasthan	Jaipur Vidyut Vitran Nigam Limited	ABPS Infrastructure Advisory Pvt Limited
Gujarat	Paschim Gujarat Vij	TERI	Rajasthan	Ajmer Vidyut Vitran	PwC

	Company Limited			Nigam Ltd.	
Gujarat	Uttar Gujarat Vij Company Limited	TERI	Rajasthan	Jodhpur Vidyut vitran Nigam Ltd.	Enfragy
Gujarat	Madhya Gujarat Vij Company Limited	TERI	Tamilnadu	Tamil Nadu Generation and Distribution Corporation Limited	MITCON
Haryana	Dakshin Haryana Bijli Vitran Nigam Limited	Darashaw	Tripura	Tripura State Electricity Corporation Limited	Enfragy
Haryana	Uttar Haryana Bijli Vitran Nigam Limited	TERI	Uttar Pradesh	Purvanchal Vidyut Vitram Nigam Limited	PwC
Himachal Pradesh	Himachal Pradesh State Electricity Board Ltd.	MITCON Consultancy Services Limited	Uttarakhand	Uttarakhand Power Corporation Ltd	Idam
Karnataka	Chamundeshwari Electricity Supply Corporation Limited	MITCON			
Karnataka	Gulbarga Electricity Supply Company Ltd	MITCON			
Karnataka	Bangalore Electricity Supply Company Limited	PwC			