
Proceedings of the eleventh meeting

Utility CEO Forum on Demand Side Management

August 2016



Introduction and participant profile

The eleventh meeting of the 'Utility CEO Forum on Demand Side Management' was conducted on 5th of August 2016 in New Delhi, to discuss and debate 'Smart Grid enabled Demand Side Management Solutions'. Mr. Anil Razdan, Former Secretary with the Ministry of Power, Govt. of India, chaired the meeting that was attended by officials from electricity distribution licensees (herein after referred as 'utility'), electricity regulatory commissions, central and state governments, nodal agencies and other experts from across the country.

Participant profile

Honorary Chairperson	Anil Razdan, IAS (retired), Former Secretary, Ministry of Power
Key Dignitaries	<ol style="list-style-type: none"> 1. P. Ravi Kumar, Additional Chief Secretary (Energy), Government of Karnataka 2. Gireesh B. Pradhan, Chairperson CERC
Electricity regulatory commissions	<ol style="list-style-type: none"> 3. D.S. Bains, Chairperson, PSERC 4. Raghunath Prasad Singh, Chairperson, APSERC 5. Shakti Kumar Negi, Chairperson, BERC 6. K.M. Shringarpure, Member, GERC 7. Amitava Biswas, Member, WBERC 8. S.K. Agrawal, Member, UPERC
Electric Utilities	<ol style="list-style-type: none"> 9. Ajay Kumar Singh, Managing Director, PuVVNL 10. Pramod Deo, Addl. Vice President, Reliance Infra 11. Sharat Ch. Mahalik, AGM (ABT &MRT Cell), NESCO 12. Kaushik Sanyal, Head of Group (Business Services), TPDDL 13. Amita Sharma, TPDDL 14. Jayant Kumar Dubey, Executive Engineer, NBPDC 15. Purushottam Prasad, Executive Engineer, SBPDCL 16. Himanshu Sheokand, Executive Engineer, UHBVNL 17. Bharathi K.S., Executive Engineer, GESCOM 18. Ilyas Ahmed, Executive Engineer, GESCOM
Others	<ol style="list-style-type: none"> 1. Sanjiva Mandilwar, Chief Engineer, CEA 2. Reji Kumar Pillai, President & CEO, ISGF 3. Rupendra Bhatnagar, General Secretary, ISGF 4. Prabhu N. Singh, Director, NSGM 5. Hemant Thukral, ISGF 6. Sachin Shukla, ISGF 7. Rakesh Tirath, Tata Consultancy Services 8. Prabhakar Tandon, Head-Business Development, Secure Meters 9. Madhura Srivastava, Secure Meters 10. Tushar Sud, Deloitte India 11. Rajneesh Sharma, Deloitte India 12. Suryanarayana Doolla, Professor, IIT Mumbai

Secretariat

1. Krishan Dhawan, Chief Executive Officer, Shakti Sustainable Energy Foundation (SSEF)
 2. Deepak Gupta, Senior Program Manager, Power, SSEF
 3. Vrinda Sarda, Program Associate, SSEF
 4. Prabhat Kumar, EESL
 5. Amit Kumar, Partner, PwC India
 6. Kulbhushan Kumar, Director. PwC India
 7. Shuboday Ganta, Manager, PwC India
 8. Samved Patil, Manager, PwC India
 9. Nikhil Vijayvergiya, Sr. Consultant. PwC India
 10. Shyamasis Das, Sr. Consultant PwC India
 11. Rajesh Verma, Consultant, PwC India
 12. Ankit Kalanki , Consultant, PwC India
 13. Thadi Rahul , Consultant, PwC India
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Inaugural session

Welcome Note

Mr. Krishan Dhawan, Chief Executive Officer, Shakti Sustainable Energy Foundation (SSEF), welcomed the participants with an introductory note. On the DSM front, he mentioned that SSEF has been actively supporting the utilities to create an effective implementation eco system for DSM measures in the states of Karnataka, Maharashtra, Haryana, Uttar Pradesh, Jharkhand etc. He highlighted that SSEF is also actively working with stakeholders to promote newer forms of clean and smart energy solutions and their integration with the grid. He briefly highlighted the Forum's journey since its launch in 2013 and emphasized its role in promoting utility driven DSM through focused thematic discussions tailored for advancing solutions driven dialogue among power sector stakeholders. He appreciated the participation from a diverse set of stakeholders (viz. electricity distribution utilities, electricity regulatory commissions, state governments, nodal agencies, industry, academia and experts) in the Forum meetings that has tremendously helped to advance the DSM agenda through knowledge exchange and experience sharing. He concluded the welcome note by detailing the agenda for the rest of the meeting.



From left to right: P. Ravi Kumar (Additional Chief Secretary, GoK); Gireesh Pradhan (Chairperson, CERC); Anil Razdan, Honorary Chairperson & Krishan Dhawan (CEO, SSEF)

Setting the Context

Mr. Anil Razdan, Honorary Chairperson emphasized on the need for advancing clean energy solutions in the context of rapid climate change and environmental degradation. He underlined that penetration of electric vehicles is one of the important solutions in this regard that not only displaces fossil fuel consumption for transportation but also promotes DSM by effectively filling the valleys and flattening the load curve. He further drew everybody's attention on the role of smart grid solutions in not only advancing DSM but also enabling several other applications for Indian utilities that promote loss reduction, improve efficiency, reliability, economics, and sustainability of the production, distribution and end use consumption of electricity. There were

also words of caution when he spoke about transitioning to a new smart grid that would require safer and more reliable security systems, people with sufficient domain knowledge and familiarity to perform required duties, and regulations to protect the integrity of the grid, facilitate standardization and cost effectiveness of utility investments.

Special Address- Smart Grid Initiatives in India

Gireesh Pradhan, Chairperson, CERC acknowledged Mr. Razdan's statements and appreciated the Forum's efforts in bringing together a diverse set of stakeholders to discuss and debate smart grid enabled DSM solutions. He acknowledged that the discussions of the forum, since its launch in 2013, on the various facets of a vast subject such as DSM has borne fruit. He stressed that the characteristics of smart grid should be defined primarily in the context of Indian scenario. Absence of reliable data has been the biggest hurdle for DSM program implementation and a smart grid would be crucial in collecting such data. A perfect symbiosis of DSM and smart grid is a game changing strategy for utility operations in India and aspects like cyber security, firewall and other strategies must be looked into with greater attention to detail. He concluded by arguing that smart grid development is poised to incur a lot of time and effort on the choice of both hardware and software solutions, and therefore the initial development and design stage of the project is crucial to mitigate critical problems, especially on the interoperability front.

Presentations and discussions

Indian Smart Grid History: Challenges and Opportunities ahead

Presentation by Prabhu N. Singh, Director, NSGM

Prabhu Singh began by echoing the sentiment expressed by Anil Razdan and Gireesh Pradhan that there is a need for inclusive development of smart grid solutions by embracing the existing standards by the respective authorities. He then introduced the National Smart Grid Mission as a dedicated institution established in 2015 under the aegis of the Ministry of Power, to plan and monitor implementation of policies and programs related to Smart Grid activities in India. He mentioned that the NSGM is vested with its own resources, authority, functional & financial autonomy to achieve its goals. The total outlay for NSGM activities for 12th Plan is INR 980 crores with a budgetary support of INR 338 crores. He highlighted that the smart grid journey in India began when the MoP realized the growing importance of smart grid technologies in the Indian power sector and took early steps in 2010 by constituting the India Smart Grid Task Force (ISGTF) and the India Smart Grid Forum (ISGF). He then mentioned some of the key milestones in the journey which included the smart grid vision and roadmap ratified in 2013, smart meter standards published by the Bureau of Indian Standards in 2015, model smart grid regulations published by the Forum of Regulators, smart grid test bed developed by Central Power Research Institute, smart grid knowledge center being developed by POWERGRID, and functional specification of AMI published by CEA most recently. He also mentioned the status of 11 smart grid pilots sanctioned earlier by the MoP, GoI to test various Smart Grid technologies. He emphasized that one of the key mandates of NSGM in the current scenario is to develop smart grids in the 100 smart cities planned under the National Smart Cities Mission.



Prabhu N. Singh, Director, NSGM

smart grid projects for many Indian utilities in the current scenario. He also mentioned that three full scale smart grid projects worth INR 258 Crores are sanctioned under NSGM in this regard.

Discussions

P. Ravi Kumar from Govt. of Karnataka enquired about the availability of standardized smart meter functionalities and specifications. Mr. Prabhu clarified that the CEA has most recently published the functional

He underscored that insufficient readiness, frequent change in the top management of utilities, high costs, lack of smart meter standards and functionalities, were some of the major causes for the slow progress of the 11 smart grid pilots. In the current scenario, he argued that testing facilities for smart meters, indigenous manufacturing, seamless communication infrastructure, business case, financial health and readiness of utilities are some of the critical success bottlenecks for successful implementation of smart grid projects.

He concluded by arguing that high T&D losses provides excellent business case for

requirements of smart meters and rest of AMI along with detailed technical specifications for single and three phase whole current smart meters.

Theme Presentation: Smart Grid enabled DSM Solutions

Presentation by Shuboday Ganta, Manager, PwC



Shuboday Ganta, Manager, PwC

Shuboday initiated the discussion by emphasising the characteristics of smart grid that are relevant to Indian market conditions. He highlighted that enhanced customer engagement is one of the principal characteristics of smart grid that is crucial for enabling DSM. Active customer participation is one of the critical success factors envisaged for successful uptake of utility driven DSM programs. He then went on to explain the basic conceptual model of smart grid to understand what exactly contributes to the smartness. He underscored that the communication and information processing layers are important contributors of smartness in a typical smart grid solution.

The presentation hereafter was centred around the important smart grid technologies and their DSM applications. Advanced metering infrastructure (AMI) comprising of smart meters, communications network, data reception / management systems and associated software was discussed as the principal smart grid technology for enabling demand response, an important DSM application that has tremendous potential for peak load management. Shuboday underscored that there are several other important applications of AMI (viz. theft detection, remote disconnection of service, automated meter reading, improved billing and collection efficiencies) that are crucial business case contributors for Indian utilities in the current scenario.

On the policy front, Shuboday highlighted that UDAY and the recently notified National Tariff Policy Amendments both emphasise fast track roll out of smart meters for all customers with monthly consumption of 200 kWh and above. This has created a market for 35 million smart meters with an investment potential of INR 11,280 crores. He then argued that the precarious financial condition of DISCOMs is the principal barrier for financing the huge capital investment required for the rollout of millions of smart meters. Given this and limitations in human resource capacity / skill gap within the utilities, 'AMI as a Service' concept can be very effective for smart meter roll out. The concept allows utilities to engage energy service companies, AMI technology suppliers, financial institutions and other third party service providers to outsource the entire AMI solution as a turn-key service for monthly/quarterly/semi-annual/annual compensation. Apart from this, Shuboday underscored that lack of smart grid regulations and limitations in last mile connectivity are also major obstacles in the road ahead for massive roll out of AMI solutions. The governments and utilities must leverage the economies of scale in rolling out smart meters. They should aggregate demand at a national / regional scale and undertake bulk procurement of smart meters through a designated agency to bring down the cost of AMI solutions significantly and establish sound business case for such investments. He also mentioned that if one considers the upfront cost of smart meters as INR 3,223 through demand aggregation and bulk procurement, the indicative impact on consumer bill considering 12 month EMI period can be approx. INR 288 per month per consumer. This is approx. 29% and 12% of monthly electricity expenditure for consumers with 200 kWh and 500 kWh monthly consumption respectively (@ INR 5 per kWh). The rest of AMI solution (one time hardware, software, installation, testing, and integration costs) can have an impact of approx. INR 38 per month per

consumer for 12 month EMI period. For greater tenure, the impact can be as low as 5%. Shuboday also underscored that data privacy and security would emerge as a major concern at higher penetration of smart meters because breach would not only endanger the consumer but also hamper the operational integrity of the grid.

Apart from AMI, Shuboday also discussed the role of IOT (Internet of Things) enabled devices, beyond the customers meter, as the last crucial link in the smart grid value chain for enabling DSM.

Shuboday concluded the theme presentation with a discussion of important synergies of promoting smart grid enabled DSM solutions with other ongoing national programs such as Smart Cities Mission, Digital India, National Electric Mobility Mission, and National Solar Mission.

The Communication challenge of AMI roll out

Presentation by Mr. Reji Kumar Pillai, President and CEO, India Smart Grid Forum

Reji focused his discussion mostly on last mile communication technologies for AMI, their architecture and challenges for seamless data reception from millions of smart meters expected to be rolled out. He began by listing the various communication technologies available in both wireless and wired communication modes and important characteristics for smart grid applications. He emphasized that selection of communication technology for smart grid applications must depend on the nature of application. For the mission critical applications such as SCADA, Distribution Automation and Wide Area Monitoring Systems, reliability, latency and security will be the key. Whereas for non-mission critical applications such as AMR, AMI cost will be crucial. He highlighted that for last mile communication in AMI, GPRS, RF mesh, PLC and WiFi are the popular communication technology options available today.



Reji Kumar Pillai, President and CEO, India Smart Grid Forum

Reji also shared ISGF's vision of communication architecture for next generation AMI. He stated that the RF mesh networks can be replaced with broadband internet / WiFi based architecture for last mile communication. One of the biggest advantage of internet based network is that it eliminates the need for intermediate components such as DCUs/gateways, which are otherwise required in the RF mesh networks. Once smart meters are connected on the internet, the meter data can be aggregated on a server anywhere – in utility's control room or on the cloud. The total cost of ownership for internet based network is lower as compared to other technologies. Wi-

Fi is mature, standardized and has a long technology life cycle. DISCOMs don't need to invest, maintain and manage the communication network. Moreover, it is easy to implement for multiple applications such as electricity, gas and water metering, home automation etc. using a common communication medium. The technology is capable of handling very large number of connections as compared to DCUs. He highlighted that under the GOI's Digital India initiative, at least 75-80% of India would have access to broadband network by 2020.

Going forward, he drew the forum's attention to the scale and complexity of challenges arising from the government's vision of 20 million solar PV rooftops (equivalent to approx. 40 GW generation capacity) injecting power into the grid. He emphasized that this poses new set of problems and challenges for grid operators, especially at the low voltage level and is a tremendous business opportunity for technology companies. He concluded his presentation by mentioning that ISGF along with National Information Infrastructure Protection Centre (NIIPC) are working together to develop cyber security infrastructure policies for AMI applications. A cyber security manual has been prepared and submitted to the Ministry of Power, which is expected to review and recommend it as mandatory requirement for all AMI solutions. In this regard, he also requested the regulators to treat cyber security related infrastructure costs as inherent costs of AMI solutions and allow the same for cost recovery.

Discussions

Mr. Razdan argued that smart meters could be made mandatory for all new electricity connections to accelerate AMI adoption. Mr. Gireesh Pradhan of CERC argued that despite the existence of CEA specifications / standards that apply to all states across the country, many states feel the need to further customize those standards to meet local conditions. He also argued that centralized procurement has been very successful in bringing down costs by citing the example of LED bulbs under UJALA initiative.

Mr. D.S. Bains enquired about the potential of prepaid meters to improve collection efficiency and revenue realization. Razdan responded by stating that there is tremendous potential for prepaid meters, especially in the states with abysmally low collection efficiencies. Mr. Kaushik Sanyal added to the discussion saying that prepaid metering was undertaken by TPDDL since 2010 and results were encouraging. All government establishments were metered with prepaid coupons by virtue of government policy in Delhi. This also resulted in reduction of energy consumption in many of the prepaid connections. Mr. Reji added to the discussion by highlighting that the CEA specifications of smart meters allow both prepaid and postpaid functionalities.

Mr. S.K. Agarwal from UPERC argued that the uptake of prepaid metering was not satisfactory in the state of U.P. primarily because of high upfront cost of prepaid meters. To mitigate the high upfront cost, UPERC allowed utilities to recover the cost of prepaid meters through on-bill EMI for 24 months without charging any interest component to the consumer. The regulator also allowed the DISCOMs to book the interest expenses in the Annual Revenue Requirement. These incentives have accelerated the penetration of prepaid meters. Similar to Delhi, all government connections in U.P were notified to opt for prepaid connection. However, one of the major problems currently faced by DISCOMs and regulators with prepaid connections is lack of energy accounting from such connections. DISCOMs are unable to integrate energy bills of prepaid connections with the central energy accounting mechanisms.

The representatives from meter supplying companies argued that this is akin to chicken and egg story. The high cost of prepaid meters is mainly because of low volumes. The upfront costs can be brought down significantly with high volume procurement, greater uptake and resulting economies of scale.

Mr. Rupendra Bhatnagar argued by citing the experience of procurement for RAPDRP implementation in various states. He mentioned that the cost of identical solutions procured by state agencies were different from state to state although they complied to the limit of central stipulate budget. He argued that such arbitrage can be avoided with central procurement.

Mr. Razdan responded to this by emphasizing that while the states should be given the prerogative for procurement, the technical standards should be set by a central agency and the state procurement should ensure that the cost does not shoot up significantly beyond the industry benchmark considering the economies of scale.

Case Study on Automated Demand Response Project in Delhi

Presentation by Mr. Kaushik Sanyal, Head of Group (Business Services), TPDDL



Kaushik Sanval, Tata Power Delhi Distribution Limited

highlighted that despite auditing 550 high tension industrial and commercial consumers, only 162 permitted for installing the ADR solution. The lack of incentives was the primary reason for this poor conversion rate.

Kaushik also highlighted that power intensive industries (such as flour mill, plastic, cold storage etc.) were primarily targeted under the project. Results of on-site audits reflected that the critical and non-critical loads could not be segregated in many of these industrial setups, due to which load curtailment during DR event was not possible. He stated that the potential savings from voluntary load curtailment during DR event ranged from 13% to 28% of the connected load.

He emphasized that ADR solution alone cannot achieve the DSM goals but it has to be complemented with incentives and supported by smart and energy efficient technologies to enhance the capacity of consumers to provide load curtailment by separating critical loads from noncritical ones. He concluded the presentation by arguing that there is tremendous potential with the LT consumers to scale up ADR solution and in order to capture this potential, the participating consumers would have to be incentivized appropriately.

Case Study on Smart meter and AMI roll out

Presentation by Mr. Rupendra Bhatnagar, General Secretary, ISGF

Rupendra shared ISGF's experience with promoting the AMI eco system in India. He started his presentation by introducing the entire technology spectrum supporting end-to-end AMI processes for the utilities. He mentioned about the advancements in metering standards, communication network architecture and technologies. He also illustrated the various business case drivers for utilities for implementation of AMI solutions and emphasized that AT&C loss reduction resulting from theft/tampering detection, remote disconnection applications remains the biggest business case driver for AMI rollout in India. With the support of AMI, utilities can accelerate the rate of reduction of AT&C losses which otherwise might take much longer time to achieve the targeted levels.

Rupendra also shared the learnings from international experience in adopting AMI solutions and stakeholder perspectives in those countries. He highlighted that several utilities from all over the world share a situation similar to India, where reduction of AT&C losses is the major driver for AMI implementation. He also cited examples of European countries who conducted detailed cost benefit analysis that has shown savings from energy efficiency and DSM alone can justify the business case for AMI. He also presented the expected AMI penetration in different regions of the world. By 2020, AMI is expected to achieve 50-55% penetration across the world.



Rupendra Bhatnagar, Indian Smart Grid Forum

He also reiterated that ADR alone cannot achieve the desired load curtailment goals and there is a need for time of use tariff incentives to make them attractive for consumers. He emphasized that suitable changes in the law and policy framework, demand forecasting, and customer outreach efforts can play a crucial role in ensuring successful implementation of ADR solutions.

Rupendra mentioned that ISGF has been doing relevant research and several white papers have been published to help policy makers and utilities take informed decisions on the design and implementation of AMI solutions. These papers talk about meter standards & specifications, communication technologies, manufacturing

capability, customer prioritization and business models for AMI implementation. He argued that AMI roll out strategy for India needs to consider feeders having majority of customers with high monthly consumption (>1000 units, >500 units, >200 units in that order of priority) and feeders/pockets with high AT&C losses (>25%). Manufacturers/suppliers of meters and different communication devices can be empanelled based on the best evaluated prices. DISCOMs can appoint AMI Implementation Agency (ideally a System Integrator or a large engineering company) through a transparent procurement process. Once the communications technology is selected, the DISCOM can choose any of the meter suppliers empanelled. 10% of the meters can be procured from Micro, Small and Medium Enterprises (MSME) sector to promote innovation and start-up ecosystem in the country. He emphasized that demand aggregation of smart meters can prove to be very crucial to bring down the costs. From technology point of view, he suggested that by and large RF mesh with the added advantage of existing technology such as GPRS works for India.

He concluded the presentation by illustrating the various benefits of AMI solutions that needs to be considered in the evaluation of cost benefit analysis for establishing the business case for both DISCOMs and consumers.

Discussions

Mr. Razdan enquired about the strategy adopted by other countries for AMI roll-out. Mr. Rupendra responded that most of the developed countries have rolled out smart meters initially for consumers falling in the high consumption category. He mentioned that the European strategy evaluated the load profile of the consumer before rolling out smart meters. He further argued that for Indian conditions, feeder wise profiling of consumers should be more appropriate, irrespective of the load being served by the feeder. Mr. Razdan argued that Indian economy is unlike those of the European nations where the trend of per capita energy consumption is seeing a downfall, as they are moving away from manufacturing. Hence, the roll-out strategy for India must be brainstormed by considering the relevant learnings from the global experience.

Mr. Razdan also emphasized over the need to build human resource capacity of the electricity distribution sector, and recruit man-power with required skill sets. Mr. Rupendra acknowledged the need for skilled manpower among utilities and added that TPDDL and ISGF are jointly offering a smart grid certification course for the development of skilled professionals in the smart grid domain. Mr. Deepak mentioned that SSEF is also supporting ISGF for the development of a foundation course on smart grids. Mr. Razdan suggested to include distance learning option in order to ensure greater participation.

IOT based Energy Management Initiative @ TCS

Presentation by Mr. Rakesh Tirath, Business Head - India (North), Tata Consultancy Services

Rakesh began by citing that about three years ago, the CFO of his organization convened a meeting to bring down the enormous energy costs incurred by the organization (approx. 600-650 crores per annum) using a systematic enterprise level approach. He mentioned that a focused task force was created and this project came about as part of the digital re-imagination initiative. He mentioned that creating an energy conscious enterprise was an important goal under this initiative apart from the other common goals of bringing down the sizeable energy bill and reducing carbon footprint. He emphasized that people contribution was crucial beyond a certain point that is enabled by technology and process improvement. He mentioned that an integrated system was developed to continuously monitor energy guzzling applications / assets through a cloud based architecture supported by strong analytics to benchmark performance and measure savings / benefits. He also mentioned that the system



had to be made vendor agnostic so that a wide variety of meters, energy assets with varied vintages, could be bought onto a common platform to pull the data and produce meaningful reports. Also given that TCS India has 114 buildings across the country and 3.5 lakh employees the solution needed to be scalable. 60,000 devices and equipment data points are placed from which real time energy performance characteristics is being captured. Further the captured data is being efficiently processed/ analyzed to enable automated control and actions aimed at optimizing energy usage. For this purpose, TCS has set up the Energy Command Centre in Kochi. He

Rakesh Tirath. Business Head. TCS India (North) highlighted that initially, this command center managed in house energy assets, but given its potential for scalability, the solution is now made as a full grown offering to the market place.

He mentioned that one of the major challenges faced in the early stages of data collection was that the asset types had no standard interface or protocol. In order to overcome this, a gateway had to be built to shield the vagaries of multiple environments and capture data through programmable IOT gateway. This was the heart of entire solution and if there is a building management system preexisting, the data was being pulled to process information using extensive analytics.

Remote monitoring & diagnostics, optimization & controls, resources optimization, streaming data & dashboard, energy, equipment analysis & demand prediction are some of the key functionalities enabled by this solution.

He mentioned that at the energy command center in Kochi, the system benchmarked energy performance of various assets with respect to its own performance over time, also benchmarked assets of different companies, and energy consumption of different buildings.

He concluded with an assessment of benefits achieved from this enterprise level solution. Reduced operation costs, improved productivity and reliability are some of the major benefits realized. He mentioned that they were able to eliminate energy wastage based on loading and occupancy levels through automated control solutions at various assets such as UPS, air handling units, and chillers. He also mentioned that because they were able to

make informed decisions well in advance, the reliability of energy assets was significantly improved. He mentioned that 27 million units of energy was saved per year and the payback was less than 2 years.

Solar rooftop from DISCOM perspective

Presentation by Deloitte India

Deepak Gupta from SSEF introduced the speakers and stated that the objective of this study was to understand the DISCOM's perspective in promoting solar PV rooftop solutions. He mentioned that the study aims to identify solutions that make solar rooftop more comfortable to the DISCOMs and other stakeholders in the journey ahead.



Tushar Sud, Deloitte India

Tushar from Deloitte started the presentation by giving a brief outline of the study. He mentioned that the study aims to map the key benefits and impact of rooftop solar projects for DISCOMS and also identifies the critical changes to the existing models to balance the interests of utilities, regulators, prosumers and consumers.

Tushar began by shedding some light on the international experience of solar rooftops. He highlighted there are broadly two types of implementation models adopted world over (Gross Metering and Net Metering). In Gross Metering mechanism, the consumer feeds all the power generated into the

grid without consuming any of it, while in Net Metering mechanism the consumer utilizes the electricity generated for self-consumption and only the excess power generated is fed into the grid.

Tushar also mentioned about the metering models adopted globally. While California and Japan adopted net metering, Germany adopted gross metering. He mentioned that tax rebates, feed in tariffs, Generation Based Incentives etc. have been the key incentives offered for solar rooftops worldwide. From the asset ownership perspective, he mentioned that there are two broad categories of business models: CAPEX and RESCO model. In the CAPEX model, the system is owned by the rooftop owner and the responsibility of O&M also lies with the rooftop owner only. In the case of RESCO model, the system is owned and maintained by the developer only. The rooftop owner may consume the electricity generated and the excess electricity can be fed into the grid. He further mentioned that with the increasing role of utilities in the solar rooftop business, various other innovative business models are also emerging. One of the popular emerging models is the "Utility owned" model, in which the electric utility company rents the homeowner's roof for a predefined monthly fee, in order to install and operate a solar PV system. In this model, the entire energy output is controlled by the utility and the homeowner continues to purchase energy normally, but the monthly rent payment is deducted from the utility bill. The utilities can manage the power demand by aligning the solar generation with other sources of power generation.

Tushar also briefly mentioned about the recent developments on how the various impacts of solar rooftops on Utilities is being managed. He mentioned that in some jurisdictions in USA, many utilities perceived under recovery of fixed costs from increased penetration of solar rooftops and therefore proposed to impose special charges on consumer bills / tariffs to bridge such under recovery. He also mentioned that there is some inclination towards gross metering mechanism. Few utilities have asked regulators to change the time of use rates in the wake of solar proliferation to truly reflect the actual peak and off-peak hours after considering solar rooftop generation.

Tushar further presented an analysis to understand the impact of rooftop solar if targets as per MNRE are achieved for FY 2022. He mentioned that the analysis quantified the impact and benefits covering the following aspects:

- Revenue loss to utility on account of consumer adopting rooftop solar
- Cross subsidy loss/Benefit to utility on account of consumer adopting rooftop solar
- Impact on grid charges collection by utility
- Deemed RPO benefits to utility
- Banking charges loss to utility
- Environmental benefits from rooftop solar generation : Various tangible impacts as reduction in water, land and CO₂

Tushar mentioned that this analysis was conducted for 17 state utilities across eight states considering various scenarios that are characterized by the nature of impact and tariff profile of consumers who switches to solar rooftop.

In the first such scenario, he presented the overall impact on Utility's revenue considering environmental benefits, deemed RPO benefits, grid & banking charges loss when the highest tariff paying consumers switches to rooftop solar. He highlighted that the analysis shows Utilities with low energy charge have lower negative impact, whereas utilities having high T&D losses will gain from rooftop solar.

In the second such scenario, he presented the impact on cross subsidy considering environmental benefits, deemed RPO benefits, grid & banking charges loss when the highest tariff paying consumers switches to rooftop solar. He highlighted that the analysis shows Utilities with low level of cross subsidy levels will have lower impact. Consumer categories having energy charge lower than CoS & adopting rooftop solar will benefit utilities.

Tushar also presented the recommendations from regulatory, operational, commercial and implementation perspective to ease the impact on Utilities and create a more balanced environment to accelerate solar rooftops. Rationalization of consumption slabs, mandating net metered consumers to be considered under ToD framework, allowing surplus rooftop solar power injection during peak time, introducing incentives for promoting peak time solar power injection, de-coupling import and export tariff under net metering in order to protect utility's interest are some of the recommendations on the regulatory front. From operational perspective, advanced smart inverters can be used for controlling the power injected by rooftop systems into the grid. Such advanced inverters can also be used to reactive power voltage regulation for improvement of tail end voltage profiles.

Tushar concluded by adding that initiatives towards capacity building of the utilities, incentives to utilities for meeting yearly rooftop solar targets are some of the crucial steps that can be taken to promote solar rooftops in the country.

Discussions

Amita from TPDDL enquired as to how environmental and land benefits were monetized and whether any avoided peak energy was taken into consideration. Tushar responded that environmental benefits were monetized considering GHG emission reduction and CERC benchmark cost for land was considered to monetize avoided investments on land. He also clarified that avoided peak energy was not considered in the analysis.

S.K. Agarwal from UPERC emphasized that there will be no reduction in the revenue from fixed charges from solar rooftops. This is because the consumers adopting solar rooftops will have to rely on grid electricity for meeting the energy requirements during night times, when the solar rooftop will not be active. He also added that revenue loss computations for Utilities should compute the difference between marginal cost of power (procured to meet the demand during high solar irradiance) and the feed-in-tariff for solar rooftops.

Razdan argued that complexity of the solar rooftop challenge will be enormous when the 40 GW penetration will be achieved. Grid operators will face unprecedented challenges to maintain grid frequency and most practically they will resort to pulling the plug of conventional generators.

P. Ravi Kumar from Govt. of Karnataka seconded Razdan's opinion and emphasized that it is important to study the technical impact for effective grid management rather than the financial impact of solar rooftops.

Conclusion

Anil Razdan appreciated the valuable insights from the speakers and participants on various topics discussed during the course of the meeting. He emphasized that the forum would like to carry this forward. He also requested the participants to share specific suggestions or any other useful information that can be used by the participants to initiate dialogue on smart grid implementation in their respective states. Citing the importance of grid management in the age of growing renewables share of power generation, he mentioned that the capacity for effective grid management still relies heavily on the availability of balancing power with the states.

Vrinda Sarda from SSEF mentioned about the DSM India portal (<http://dsm-india.org/>) and its key features to disseminate DSM related information and knowledge. She added that SSEF and IIT Bombay together have been managing the DSM-India portal, which provides information about important key DSM events/workshops, Forum updates, best practices and e-learning DSM tutorials for interested stakeholders.

Krishan Dhawan from SSEF expressed his gratitude to all the participants, especially from state utilities and regulators, for attending the forum meeting. He further welcomed their inputs, suggestions for further meetings to be held. He also requested the stakeholders to share the ideas and thoughts in form of discussion papers which can be utilized to stimulate for the future forum meetings.

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