



India Smart Grid Forum

SMART GRID FOUNDATION COURSE FOR ASEAN DELEGATION

DATE: 01 – 05, OCTOBER 2018

NEW DELHI, INDIA

AGENDA

DAY 1: 01 OCTOBER 2018 – CLASSROOM SESSION

09:30–10:00 TEA/ COFFEE AND DISTRIBUTION OF TRAINING KITS

10:00-11:00 INAUGURATION

Senior Officers from Ministry of Power, Ministry of External Affairs, Central Electricity Regulatory Commission, Central Electricity Authority etc.

11:00 - 11:15 TEA/ COFFEE

11:15 – 13:30 SESSION 1: INTRODUCTION TO SMART GRIDS

11:15-12:00 - Topic 1: 21st Century Grids

Speaker: Reji Kumar Pillai, President, ISGF

The 21st century electric grid is witnessing several disruptive changes. After 100 years of centralized power generation and creation of massive electric grids, the shift is now towards de-centralized generation. In the recent past we have witnessed that increasing share of new generation resources are being added at the low voltage or distribution end of the grid. The traditional boundaries between generation, transmission and distribution are fast disappearing and the grid is evolving into an integrated grid. Distributed energy resources and electric vehicles are making the grid much more complex than before.

12:00-12:45 - Topic 2: Power Systems: Planning, Operational, and Business Challenges in Smart Grid Implementation

Speakers:

Pankaj Batra, Former Chairman, Central Electricity Authority (CEA); Chair of ISGF Working Group on Policy, Regulations and Business Models

Ravi Seethapathy, Chair of ISGF Working Group on Renewables & Microgrids;

Ambassador of Global Smart Grid Federation (GSGF) for Americas

Power System Planning in the era of Distributed Energy Resources (DER) and “Behind-the-Meter (BTM)” Resources that are important components for grid management, pose new challenges to utilities and smart technologies have become essential for stable operation of the grid. Although Smart Grids developments started in the early years of this century and several forward-looking utilities in few developed countries have implemented a host of smart systems, utilities in most parts of the world are still trying to justify the business case for investment in smart grids. While efficiency improvements, loss reductions and access to quality power can be justified in developing countries where 24x7 supply is still far-fetched, the utilities in developed countries are now looking at transition to low carbon economy through main-streaming renewables and e-mobility as primary drivers for smart grid investments.



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12:45-13:30 - Topic 3: Smart Grid – Drivers and Global Roadmaps
Speaker: Rahul Tongia, Fellow, Brookings India

The key drivers for smart grids may vary from country to country and utility to utility. While in the developing countries the focus may still be on Energy Access, Grid Expansion, Reliability and Quality of Supply, Peak Load Management etc, the key drivers in developed countries are Aging Infrastructure and Workforce, RE Integration, Prosumer Enablement, Electric Mobility, Asset Optimization, Customer Retention, transition to low carbon economy etc. The Smart Grid Roadmap for each utility may vary based on the current state of the utility, their business priorities, Government programs and customer's expectations.

13:30-14:15 LUNCH

14:15 – 15:15 SESSION 2: SMART GRID MATURITY MODEL (SGMM) AND SKILLING FOR THE 21ST CENTURY

14:15-14:45 - Topic 1: Smart Grid Maturity Model (SGMM)
Speaker: Reji Kumar Pillai, President, ISGF

The SGMM is a management tool originally developed by a team of progressive electric utilities and is now being maintained by the Software Engineering Institute (SEI) at Carnegie Mellon University (CMU), USA. The model provides a framework for assessing the current state of smart grid deployment and capability within an electric utility. The model covers the entire gamut of utility operations from strategy, management and organization structure to grid operations, work and asset management, technology, customer, environmental and value chain integration (8 domains); and clearly measurable characteristics have been defined for 5 levels of maturity in each of these 8 domains.

14:45-15:15 - Topic 2: Skilling for the 21st Century
Speaker: Chandan Chowdhury, Dean-Infrastructure, Indian School of Business (ISB)

In the last quarter century, new technologies such as internet, mobile telephony and related services have radically changed the way we live and work. The next 25 years will witness much more profound changes that would destroy several existing businesses and transform our life in ways that are still un-imaginable. To survive in this era of fast paced changes the workforce needs to be re-skilled. This session will give glimpses of the new technologies on the horizon and their impacts to businesses.

15:15-15:30 TEA/COFFEE



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15:30 – 17:30 SESSION 3: COMMUNICATIONS AND SMART METERING

15:30 -16:30 - Topic 1: Smart Grid Communications, Standards & Interoperability

Speaker: Ajoy Rajani, Senior Executive Vice President, Reliance Infrastructure, Mumbai

Smart Grid applications require Machine to Machine (M2M) communication and a host of technologies are available to achieve M2M communications. However, adopting the appropriate communication technology is the key to successful smart grid implementation. Interoperability between equipment and systems is the primary consideration in selecting the communication technology and architecture.

16:30-17:30 - Topic 2: Smart Metering and Advanced Analytics

Speaker: Sanjay Banga, CEO, Tata Power Delhi Distribution Ltd (TPDDL)

Advanced Metering Infrastructure (AMI) or Smart Metering is one of the basic building blocks of Smart Grids. AMI extends the grid observability or visibility of power flows on the low voltage network all the way to individual customers which helps fine grain the distribution network operations. The AMI data (48-96 meter reads per day) is a goldmine of information which offers valuable insights on power consumption, demand estimation, customer behavior etc. Choosing the right business model and key components of AMI is critical to the success of an AMI project.



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DAY 2: 02 OCTOBER 2018 – CLASSROOM SESSION

09:15–09:30 TEA/ COFFEE

09:30 – 11:00 SESSION 4: T&D AUTOMATION

09:30-10:15 - Topic 1: SCADA/EMS, Wide Area Monitoring

Speaker: Subir Sen, Executive Director, Power Grid Corporation of India

Traditionally Extra High Voltage (EHV) network deployed Supervisory Control and Data Acquisition (SCADA) and Energy Management System (EMS) which help monitor and control the power flows in real-time. Wide Area Monitoring (WAM) systems deploy Phasor Measurement Units (PMU) for fast and accurate measurements from grid equipment spread across a large geographical area. While SCADA data is collected in 1-5 seconds, PMU data is captured in milliseconds. Wide Area Monitoring applications have strict latency requirements in the range of 100 milliseconds to 5 seconds. A fast communication infrastructure is needed for handling the huge amounts of data from PMUs. Smart Grid applications are designed to exploit these high throughput real-time measurements.

10:15-11:00- Topic 2: GIS - Mapping, Distribution Automation and Substation Automation, Self-Healing Grid

Speaker: Suhas Dhapre, ISGF Member, Ex-Tata Power Company, Mumbai

GIS map of a utility depicting the electrical infrastructure and customers can be integrated with other automation and IT applications in the utility which will help asset optimization, outage detection and faster restoration. GIS maps need to be updated on a regular basis. Whenever a new asset is added or removed or a new customer is given connection or an existing customer is removed, that information must be captured in the GIS map so that it remains up to date. The GIS maps of electric utilities would ideally include all the roads and buildings in a town/locality. It can be a valuable asset for other infrastructural service providers in the town for planning and management of services like water distribution, gas distribution, transport planning and management etc. With falling cost of automation equipment and last mile connectivity, Distribution Utilities have also adopted SCADA, Distribution Automation and Substation Automation to build self-healing grids.

11:00 - 11:30 TEA/ COFFEE



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11:30 – 12:30 SESSION 5: DIGITAL ARCHITECTURE & CYBER SECURITY FOR SMART GRIDS

Speaker: Farooq Kazi, Chair of ISGF Working Group on Digital Architecture and Cyber Security

Digital Architecture for integration of Grid Operations with DER and Enterprise IT systems plays a vital role in the modern utility embarking on digitalization. The critical infrastructure of a nation and other sectors depends directly and indirectly on the power sector. Cyber-physical security is protection of the assets (both hardware and software) from natural and manmade disasters and intended and unintended activities. Since physical assets are associated with the cyber space of a utility, cyber-physical security completely defines the security paradigm of a utility. This dependency of the physical assets on the cyber assets (and vice versa), has prompted the utilities to inject resiliency and robustness into their grids.

12:30-13:30 SESSION 6: GRID PLANNING AND CHARGING INFRASTRUCTURE FOR ELECTRIC VEHICLES

Speakers:

Reji Kumar Pillai, President, ISGF

Ravi Seethapathy, Chair of ISGF Working Group on Renewables & Microgrids;

Ambassador of Global Smart Grid Federation (GSGF) for Americas

Electric Vehicles (EVs) and services represent new economic pathways to increase energy security (avoid oil imports), reduce carbon emissions (ensure sustainability) and improve air quality (better human health). Globally various initiatives have been undertaken to improve the global EV adoption rates, of which availability and access to charging infrastructure is a key determinant. Understanding the electric mobility systems and their interface standards represents an opportunity to provide cost-effective and secure interoperability with a diverse set of technologies and business models. Impact of EVs on low voltage grid can be severe owing to formation of pockets of EV concentration. Hence deployment of EV charging infrastructure require meticulous planning. Choosing the right business models along with an effective operational strategy will help the utilities to maintain grid reliability and avoid any adverse impact on the electricity grid and also leverage EVs for Ancillary Services.

13:30-14:30 LUNCH



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14:30 – 15:30 SESSION 7: ENERGY STORAGE AND OTHER EMERGING TECHNOLOGIES

Speaker: Rahul Walawalkar, President & MD, IESA

A host of energy storage technologies are fast approaching commercialization and already MW-scale lithium ion and Sodium Sulphur (NaS) batteries are commercially deployed for certain grid applications. The dynamics of battery market both globally and in India is changing rapidly, with the increase in demand for advanced battery technologies to ensure higher storage capacity at low cost. Lithium Ion battery cost has already decreased by 80% in the last 6 years making it more affordable and scalable for using as energy storage systems. Besides batteries, other energy storage technologies such as fly wheels, compressed air energy storage, super capacitor, pumped storage etc are also being deployed commercially.

15:30-16:00 TEA/COFFEE

16:00 – 16:45 SESSION 8: SMART INFRASTRUCTURE: SMART BUILDINGS, SMART CAMPUSES, SMART MICROGRIDS AND SMART CITIES

Speaker: Reji Kumar Pillai, President, ISGF

In the near future, Smart Appliances in Smart Buildings could interact with power markets and contract electricity from the cheapest sources through smart contracts executed on blockchain. Smart Buildings and Campuses with solar panels, battery storage and electric vehicles will be able to arbitrage real-time pricing in the power markets-island from the grid when required or sell electricity from local generation and storage to the power market at higher price on the grid and buy electricity and store when the price on the grid is low - era of grid interactive buildings and smart microgrids.

16:45 – 17:45 SESSION 9: VER & DER – INTEGRATION CHALLENGES, DERMS AND OTHER FLEXIBILITY SOLUTIONS

Speaker: Rahul Walawalkar, President & MD, IESA

All around the world we are witnessing variable renewable energy (VRE) resources penetrating the power systems at fast rate. Management of VRE resources requires flexibility in both generation and demand. Distributed Energy Management Systems (DERMS) is the emerging solution that offers power systems flexibility for integration of VER and DER. With rural electrification being a major focus area for the government, DER will play an important role in ensuring last mile connectivity and considerable attention need to be paid in its development and subsequent integration to the central grid. However, successful implementation of DERs will require integration of storage devices and demand flexibility through customer participation.



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DAY 3: 03 OCTOBER 2018 – CLASSROOM SESSION

09:15–09:30 TEA/ COFFEE

09:30 - 10:30 SESSION 10: ENTERPRISE IT SYSTEMS

Speaker: Satya Gupta, Advisor-IT, Tata Power Delhi Distribution Ltd (TPDDL)

Enterprise IT Systems include: IT Network – LAN/WAN, DC/DR; Mail-Messaging Systems; Management Information Systems with Dashboards; Enterprise Resource Planning (ERP); Portal/Website – Intranet and Customer Portal. With ERP, information that is fragmented in different systems can seamlessly flow throughout the organization so that it can be shared by business processes in grid operations, engineering, procurement, finance, accounting, human resources, and other areas of the utility. Inter-operability of different systems and their seamless integration is a challenge all IT departments struggle to resolve.

10:30 - 11:30 SESSION 11: SOCIAL MEDIA FOR UTILITIES; BLOCKCHAIN FOR UTILITIES

Speaker: Reena Suri, General Manger, ISGF

Customer engagement continues to be one of the top concerns for utilities worldwide. As consumers nowadays flock to social networking platforms such as Twitter, Facebook, YouTube and LinkedIn to connect with each other, these platforms have become a ground for business as well as personal networking. Therefore, utilities need to incorporate social media as part of their broader customer engagement programs. Many utilities have ventured into this space to discuss energy conservation and efficiency, branding and promotion, and outage information. Social media is gaining acceptance as a viable means of delivering vital communications, customer service issues and promotional offers.

Blockchain, a distributed ledger technology built on a shared network infrastructure and public key encryption, is emerging as a popular solution in power sector. There are about 30 different blockchain use cases in the power industry which are being piloted in many geographies.

11:30–12:00 TEA/ COFFEE



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12:00 – 13:00 SESSION 12: MODAL SMART GRID REGULATIONS AND TIME OF USE (TOU) TARIFF

Speaker: VL Sonavane, Former Member, Maharashtra Electricity Regulatory Commission (MERC)

The regulatory system in India is similar to the United States – FERC and PUCs in each state. In India we have a CERC at central level and SERCs in all the states. Forum of Regulators (FOR) comprising of the Chairmen of all these regulatory commissions is constituted as a statutory body. In 2015, FOR approved the Model Smart Grid Regulations which has been notified in several other states. Time-of-Use (TOU) pricing is the system of electricity prices depending on real time grid conditions (supply-demand balance) at the time of use - high electricity tariff at peak demand period and lower tariff at off-peak period. ToU encourages the customer to shift their electricity usage from peak demand period to low demand period. ToU rate design require detailed planning and its implementation requires smart metering.

13:00-14:00 LUNCH

14:00-15:30 SESSION 13: CASE STUDY: POWER SYSTEM TRANSFORMATION IN DELHI (2003-2018)

Speaker: B.P.Singh, Member, Delhi Electricity Regulatory Commission

In 2002, when the electricity distribution business in Delhi was privatized, the transmission and distribution losses in Delhi were hovering around 60%. The private distribution companies have brought down these losses close to 10% in last 15 years which has no parallels in the world. This humungous task was achieved through meticulous planning, technology deployment and enabling regulations.

15:30-16:00 TEA/COFFEE

16:00-17:00 OPEN HOUSE: PARTICIPANTS, PRESENTATIONS/FEEDBACK, Q&A

Panellist:

- 1. Reji Kumar Pillai, President, ISGF*
- 2. Rahul Tongia, Fellow, Brookings India*

Moderated by: Reena Suri, General Manager, ISGF

17:00 ~ onwards FREE EVENING



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DAY 4: 04 OCTOBER 2018 – SITE VISIT

09:15–09:30 PICK UP FROM HOTEL LE MERIDIAN

10:30 – 12:30 SITE 1: TATA POWER SMART GRID LAB

As a stepping stone towards implementing smart grid practices for power distribution utilities, Tata Power Delhi Distribution (TPDDL) has set up a state of the art ‘Smart Grid Lab’ for demonstration of various foundational and advanced operational technologies, information technologies and benefits derived by convergence of information and operational technologies. The visitors can view the features of routers, collectors, head end system (HES) and meter data management system (MDMS), as well as the actual data obtained from the pilots in service in the field. Also featured is the automatic demand response (ADR) controllers and systems which have been implemented on a pilot basis in the TPDDL distribution area, enhancing the distributed generation and quick load management. Also, on display is the logger and analytics on distributed solar plants which will become an essential tool in forecasting and managing distributed solar resources.

The lab is also showcasing a new technology for the grid edge devices which integrates all the grid boundary technologies. It includes the building-level automatic demand side management of both lighting and air-conditioning load, integration of solar and storage, and forming of micro grid to isolate the building.

12:30-14:00 LUNCH

14:30 – 17:30 SITE 2: TATA POWER SCADA CENTRE

The SCADA control centre is located at the CENNET (Centre of Network) Building, Pitampura, which is the centralized location to control TPDD's operations of the electricity distribution of North and North-West areas in New Delhi, the capital of India. The entry to the control centre is prohibited. A special state-of-the-art visitor's gallery is an important part of the SCADA control room, Tata Power Delhi Distribution (Tata Power-DDL) has commissioned a 66/11 kV AIS grid substation at Deeper, Delhi. It is an unmanned substation and will be remotely operated from Tata Power- DDL's state-of- the-art SCADA Centre.

OR

14:30 – 17:30 VISIT TO RE – INVEST (<https://re-invest.in>)

The RE-Invest series of Investors' Meet & Expo hosted by the Ministry of New and Renewable Energy (MNRE), Government of India, showcases India's renewable energy potential and the Government's efforts to scale up capacity to meet the national energy requirement in a socially, economically and ecologically sustainable manner. The 2nd Global RE-Invest India-ISA Partnership Renewable Energy Investors Meet & Expo is set to be held from 3-5 October, 2018 at the India Expo Mart, Greater Noida, India



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DAY 5: 05 OCTOBER 2018 – SITE VISIT AND NETWORKING DINNER

09:15–09:30 PICK UP FROM HOTEL LE MERIDIAN

10:30 – 12:30 SITE 1: NORTHERN REGIONAL LOAD DISPATCH CENTRE (NRLDC)

Indian Power system is operated as one large synchronous grid-345 GW generation capacity covering over 3 Million sq. km is one of the largest grids in the world. There is a National Load Dispatch Centre (NLDC) in Delhi and 5 Regional Load Dispatch Centre (RLDC) in North, South, West, East and North East regions as well as State Load Dispatch Centres (SLDCs) in all 29 states. These Control Centres are equipped with State of the Art SCADA and WAMS and Communications Systems. NRLDC is located in Delhi.

12:30-14:00 LUNCH

14:30 – 15:30 SITE 2: NATIONAL INSTITUTE OF SOLAR ENERGY (NISE)

National Institute of Solar Energy (NISE), an autonomous institution of Ministry of New and Renewable (MNRE), is the apex National R&D institution in the field Solar Energy. It has 200 acre campus and availability of land is one of the strength of the Institute which facilitate setting up of large sized outdoor projects and provides scope of expansion in future. NISE is maintaining a NABL accredited Solar Photovoltaic module testing laboratory, lighting system test laboratory, battery testing facility and a water pumping system test rig and outdoor test facilities. The centre has fully developed testing facility for small and large size solar thermal systems and Solar Resource Assessment. It has a 1 MW solar thermal R&D power project that was implemented in collaboration with IIT, Bombay. Head quarter of International Solar Alliance (ISA) is also located at NISE campus.

15:30 -16:00 TEA/ COFFEE

19:30 - 22:30 DINNER AND CULTURAL PROGRAM; PRESENTATION OF CERTIFICATES