Manual for Training Program on
CYBER SECURITY FOR
POWER SYSTEMS
ONLINE PROGRAM
21 May - 05 June 2020
Importance of reliable and uninterrupted power supply is underscored during this COVID-19 lockdown when society is heavily depending on work from home and online collaboration platforms. Nothing works without electricity and no meaningful task could be accomplished without reliable communication networks which again require electricity to function! A cyber-attack on the power grid could result in complete disruption of all activities in the society and it can cause electrical blackouts and pose threat to national security. It is a growing concern and a key success factor for reliable power generation and distribution as security has become a crucial factor for wide deployment of IT and automation and technologies in the power systems. According to an IT Governance Report, there were more than 1.7 billion data breaches and cyber-attacks in January 2019 alone. A cyber-attack can have far-reaching implications including financial losses, theft of intellectual property, and loss of customer confidence and trust. Cyber crime affects society in a number of different ways, both online and offline. The industry and utility managers have raised concerns about the dearth of trained cyber security professionals and there is a critical knowledge gap among the workforce about the need and availability of cyber security resources, assets and solutions. The course has been designed to create a talent pool in utilities and industry to design and implement state of the art Cyber Security Solutions and maintain them securely. With the mandate to build capacity in electric utilities, India Smart Grid Forum (ISGF) regularly organises training programs on select topics of importance. ISGF, in association with the National Critical Information Infrastructure Protection Centre (NCIIPC) and Veermata Jijabai Technological Institute (VJTI), Mumbai has conducted six editions of the training programs on Cyber Security for Power Systems in the past 5 years.

With this background, ISGF in Collaboration with NCIIPC and VJTI is pleased to announce an Online Training Program on Cyber Security for Power Systems from 21 May -05 June 2020.

Training Program Framework

A. REGISTRATION AND PAYMENT
B. TRAINING DELIVERY MODELS
C. COURSE MODULES
D. TRAINING PROGRAM & COURSE MATERIALS
E. QUERY SOLVING
F. EXAMINATION AND CERTIFICATION
G. DETAILED SYLLABUS AND SCHEDULE
H. TUTORS PROFILE
India Smart Grid Forum

ONLINE - LIVE TRAINING

Trainees registered and paid on ISGF website will attend the live training program through WebEx

OFFLINE - RECORDED VIDEO TRAINING

Trainees registered and paid on ISGF website, will be given the PPTs and other relevant reading materials and the access to the recorded training program videos

A. REGISTRATION & PAYMENT

All Online /Offline Trainees will register following this link

https://indiasmartgrid.org/onlinetrainingprogram/

FEE Structure

<table>
<thead>
<tr>
<th>Mode of Training</th>
<th>INR</th>
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</thead>
<tbody>
<tr>
<td>Online (Live) Training</td>
<td>4000 + GST</td>
</tr>
<tr>
<td>Offline (Recorded Video) Training</td>
<td>3000 + GST</td>
</tr>
</tbody>
</table>

All Types of Debit Card / Credit Card and Netbanking will be accepted for registration at ISGF Training Portal

Bank details of ISGF for NEFT / Fund Transfer of ISGF as below

Account Name: India Smart Grid Forum
Address: CBIP Building Malcha Marg New Delhi – 110021
Account Number: 0003110005017
Bank Name: HDFC Bank Ltd
RTGS/NEFT/IFSC Code: HDFC0000003
Bank Address: 209-214 Kailash Building, 26 K G Marg, New Delhi – 110001

B. TRAINING DELIVERY MODELS

<table>
<thead>
<tr>
<th>ONLINE - LIVE TRAINING</th>
<th>OFFLINE - RECORDED VIDEO TRAINING</th>
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</thead>
<tbody>
<tr>
<td>• Trainees registered and paid on ISGF website will attend the live training program through WebEx</td>
<td>• Trainees registered and paid on ISGF website, will be given the PPTs and other relevant reading materials and the access to the recorded training program videos</td>
</tr>
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</table>

C. COURSE MODULES

- Introduction to Cyber Security for Power System and Cyber Security for Critical Infrastructure and Role of NCIIPC & Understanding Threats and Attacks on Smart Grids
- Basic Concepts of Cyber Security and Digital Grid & Cyber Security and Information Security (Indian and International Case Studies)
- Smart Grid Communications and Network Security
- State of the Art Cyber Security Solutions
- Building Cyber Attack Resilience for Smart Grid Power Systems, Cyber Security Standards, Audit and Assessment for Smart Utilities
- Indian Manual on Cyber Security for Power Systems
## D. TRAINING PROGRAM & COURSE MATERIALS

<table>
<thead>
<tr>
<th>ONLINE - LIVE TRAINING</th>
<th>OFFLINE - RECORDED VIDEO TRAINING</th>
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<tbody>
<tr>
<td>• A day before each module PPTs and other relevant reading materials will be emailed to all registered participants</td>
<td>• PPTs of each module and other relevant materials will be emailed to all registered participants</td>
</tr>
<tr>
<td>• Recording of each module will be available online till one month after the training program is completed</td>
<td>• Recording of each module will be available till mentioned last date of material availability of the training program</td>
</tr>
<tr>
<td>• If a trainee misses any live sessions owing to other commitments, he/she can watch the recording online and send the queries to the trainer using Google sheet given by ISGF and schedule an interactive Audio/Video session with the trainer per mutual convenience</td>
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## E. QUERY SOLVING

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<tr>
<th>ONLINE - LIVE TRAINING</th>
<th>OFFLINE - RECORDED VIDEO TRAINING</th>
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<tbody>
<tr>
<td>• Q&amp;A for 30 minutes scheduled in each 2 hours sessions</td>
<td>• Queries can be posted in a Google form so that it is easy for tutor to answer all queries in one sheet and same can be emailed to all attendees</td>
</tr>
<tr>
<td>• Post session, queries can be posted in a Google form so that it is easy for tutor to answer all queries in one sheet and same can be emailed to all attendees</td>
<td>• All Q&amp;A will be available online on ISGF website under Q&amp;A Section of training for trainees to view</td>
</tr>
<tr>
<td>• Recorded sessions including all Q&amp;A will be available online on ISGF website under Q&amp;A Section of training for trainees to view</td>
<td>• There will be a LinkedIn/WhatsApp Group where Q&amp;A will be posted by ISGF</td>
</tr>
<tr>
<td>• There will be a LinkedIn/WhatsApp Group of each batch of the trainees where Q&amp;A will be posted by ISGF</td>
<td>• Group of trainees can schedule interactive (audio/video) session with tutors as per mutual convenience to clear their doubts</td>
</tr>
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## F. EXAMINATION AND CERTIFICATION

- Online Examination will be conducted at the end of the program
- Successful trainees undergoing Online Mode* will be issued Certificate of Merit and Offline trainees will be issued Certificate of Participation

*ISGF is in consultation with IEEE and some universities for academic credit for ISGF Training Courses
## DAY 1: 21 May 2020 (Thursday)

<table>
<thead>
<tr>
<th>Time</th>
<th>Topics and Tutors</th>
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</thead>
<tbody>
<tr>
<td>17:00~19:15</td>
<td><strong>Welcome and Introduction: Reji Kumar Pillai</strong></td>
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<tr>
<td></td>
<td><strong>Module-1:</strong></td>
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<tr>
<td></td>
<td>a. <strong>Introduction to Cyber Security for Power Systems:</strong> Faruk Kazi (45 min)</td>
</tr>
<tr>
<td></td>
<td>b. **Cyber Security for Critical Infrastructure and Role of NCIIPC &amp; Understanding</td>
</tr>
<tr>
<td></td>
<td><strong>Threats and Attacks on Power Systems:</strong> R K Singh (45 Min)</td>
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<td></td>
<td>Q &amp; A (30 min)</td>
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<td>DAY 5: 27 May 2020 (Wednesday)</td>
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</tbody>
</table>
| **Time** | Topics and Tutors  
| 18:30~20:30 | Module 5: Cyber Security Solutions – Latest Trends and Practices  
|  | Tutors:  
|  | a. Andrew Ginter  
|  | Q & A (30 min)  
| DAY 6: 29 May 2020 (Friday) |  
| **Time** | Topics and Tutors  
| 17:00~19:00 | Module 6: Indian Manual on Cyber Security for Power Systems  
|  | Tutors  
|  | a. Reji Kumar Pillai (45 min)  
|  | b. N Murugesan (45 min)  
|  | Q & A (30 min)  
| DAY 7: 01 June 2020 (Monday) |  
| **Time** | Topics and Tutors  
| 17:00~19:00 | Module 7: Business Continuity and Resiliency Planning  
|  | Tutors  
|  | a. Anurag Kuthiala (45 min)  
|  | b. Abhijeet Raj Shrivastava (45 min)  
|  | Q & A (30 min)  
| DAY 8: 03 June 2020 (Wednesday) |  
| **Time** | Topics and Tutors  
| 17:00~19:00 | Module 8: Building Cyber Attack Resilience for Smart Grids & Cyber Security Standards, Audit and Assessment for Smart Grids  
|  | Tutors:  
|  | a. Ganesh Kr Sahu (30 min)  
|  | b. Faruk Kazi (30 min)  
|  | c. N. Murugesan (30 min)  
|  | Q & A (30 min)  
| DAY 9: 05 June 2020 (Friday) |  
| **Time** | Topics and Tutors  
| 17:00~19:00 | Module 9: Examination and Valedictory Session  
|  | Tutors  
|  | a. Reji Kumar Pillai  
|  | Q & A (30 min)  

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India Smart Grid Forum
Ajoy Rajani has been a technology disrupter in the IoT and Smart Grid space for the past 18 years – he pioneered Automatic Meter Reading and Smart Meters in India and enjoys introducing disruptive products into established markets. He has been helping companies and planners use IOT technologies to help solve today’s biggest challenges in energy management, public safety, intelligent traffic and transportation to name a few. Given his intimate and long involvement in the industry he plays a significant role in helping companies invest and explore partnerships & markets in India & abroad.

Some of his notable achievements are:

• He devised the unique architecture for CDMA telemetry for which he was awarded the Global 3G industry award. This paved the way for IOT using CDMA.
• His individual efforts at Reliance Communications led to the reduction in the cost of handsets and other devices by over 100% of the then established prices.

He provided leadership for all technology initiatives as Group Head, Digital Initiatives & Automation for Adani Electricity Mumbai. He formulated the digital roadmap for the groups energy vertical and the adoption of technologies for an intelligent organisation, including adoption of Smart Grids, Electric Vehicles, and Artificial Intelligence. At Reliance ADAG, Ajoy Rajani was the Group Head of Technology & Innovation, he also led the Smart Grid & IOT initiatives with oversight over major initiatives including Smart meters, Auto Demand Response, Consumer Engagement, Wireless Network for Smart City Applications etc. He Delivered new focus on innovation across Artificial Intelligence (AI), Big Data, Block Chain, Virtual and Mixed Reality. Presently, he is on the board of several entities in India and abroad including the India Smart Grid Forum (New Delhi, India), advisor to the board of Smart Energy Water (Irvine, California) and was formerly on the board of CDMA Development Group. (San Diego, California)

Andrew Ginter is the VP Industrial Security at Waterfall Security Solutions, leading a team of experts who work with the most secure industrial sites on the planet. Andrew is the co-chair of the ISA SP-99 Working Group 1 and is a frequent contributor to cybersecurity standards, regulations and post-secondary curricula. He is the author of two books, SCADA Security – What’s broken and how to fix it and Secure Operations Technology, and is a co-author of the Industrial Internet Consortium Security Framework. Andrew has 20 years’ experience leading the development commercial products for industrial control systems, IT/OT middleware and industrial cybersecurity, and he holds a dozen industrial cybersecurity patents. Andrew was awarded BS AMAT and MS CS degrees from the University of Calgary.
Anurag is an IBM leader with more than 21 years in the ICT Industry. He is the Executive Solutions Leader for Europe/AP/Japan/GCG for IBM Resiliency Orchestration& Cyber incident Recovery. He is leading a team of technical SMEs which works with customers, business partners and IBM sellers/solutioners to showcase the value of IBM Resiliency Orchestration& Cyber Incident Recovery.

Before joining IBM, Anurag has extensive experience in service delivery and Presales/Systems Engineering across various data center technologies like Backup, High Availability, Disaster Recovery, enterprise storage sub-systems etc. He has been part of organizations like Veritas, EMC, Tata Infotech Ltd etc.

Anurag holds a Bachelors degree in Instrumentation & Control Engineering from National Institute of Technology, Jalandhar.

With a career spanning more than 22 years with the TATAs and other renowned IT companies, Mr Dharmendra Kumar has been an architect of technology-based reforms and benchmark implementation for leading Indian utility- Tata Power Delhi Distribution Company.

Mr Kumar’s passion for optimum use of technology for achieving business excellence has been exemplary during his illustrious career and there are several prst to his credit. At Tata Power-DDL, he spearheaded implementation of IT infrastructure including Data Centre, Wide Area Network of Fibers and Radio Frequency along with the usage of latest technology to support all applications with respect to commercial and consumer interactions as well as operational technologies. His vision of ICT implementation transformed Tata Power-DDL’s work force into a vibrant, agile and consumer centric workforce. He enhanced the adoption of IT systems from merely 2 PCs (before privatization) to 3000 PCs and from two servers to more than 250 servers. He further brought IT infrastructure to next level of excellence by implementing hot Secondary Data Centre at Tata Power-DDL. This initiative has resulted in 24x7 availability of information and systems across organization. It brought a sea change in Power distribution business and as a result, Tata Power-DDL’s ICT implementation is being considered as a bench mark in the power distribution sector.

In recent past he spearheaded implementation of initiatives e.g. AMI, FFA, OT Security etc. at Tata Power-DDL. He is currently heading the Application Development, SAP & Mobility groups and is also the Chief Information Security OfPcer of the organization responsible for entire gambit of IT & OT including Cyber Security.
Faruk Kazi received his Ph.D. degree from Systems & Control Engineering of Indian Institute of Technology (IIT) Bombay, in 2009. He is currently a Professor and Dean of Research & Development at VJTI, Mumbai, India. He works in the domain of cyber-physical systems and critical infrastructure security. His research interests include SCADA security, Industrial Control System (ICS) and Operational Technology (OT) security. He is working as Chair of WG-3 (Digital Architecture and Cyber Security) of India Smart Grid Forum (ISGF), PPP initiative of Ministry of Power, Government of India. He also works as a consultant with Tata Consulting Engineers (TCE) for Smart Grid projects.

He was invited as a visiting research scholar at Swiss Federal Institute of Technology, EPFL, Switzerland and Tufts University, Boston, USA. He has delivered invited talks and presented his research work at MIT USA, SUPELEC, CNRS, Paris (France), Budapest (Hungary), Florence (Italy) and Japan. He has published more than 90 research papers in various international journals & conferences. He has received project funding from ISRO, BARC, DRDO and DST for his various research projects. He has also secured project funding and in-kind support from industries like Siemens, Emerson, L &T (Electrical & Automation), L & T Infotech and CISCO for test-bed on security of cyber-physical systems.

Ganesh Kumar Sahu had received his M. Tech. in Computer Technology from IIT Delhi & B.Tech in ECE from BPUT. His present areas of interest include Cyber Security and CII Protection. Presently he is serving as JDD, National Critical Information Infrastructure Protection Centre, New Delhi.

N.Murugesan holds MSc (Engg) and MBA. He has more than 38 years of experience in the area of Smart Metering, Smart Grid, Advanced Metering Infrastructure (AMI), Power Systems, Transmission & Distribution system, SCADA, Substation & Distribution Automation, Switchgear testing & Certification (Low & High voltage equipment) as per National & International standards. Managed one of the largest Power Engineering Research Institute in the world as Director General. He added many infrastructures to carry out Research and for certification of electrical
equipment from Low Voltage to EHV Class equipment to meet International and National standards. Managed various laboratories located 7 cities across India (Bangalore, Hyderabad, Nagpur, Bhopal, Noida, Kolkata, Guwahati). Organised more than 400 workshop/ Training / Conferences in the area of Power Engineering. Supervised various of Consulting works covering Generation, Transmission and Distribution and managed various Research & Development projects in the above areas. He established Communication Protocol conformance laboratories for the first time in Asia in 2003 and 2008 for Energy Meter and Substation Automation as per IEC 62056 and 61850 respectively. Established other laboratories as per IEC 60870 series, Modbus etc. Certified largest number of products as per above IEC and helped to produce in India. Played an active role in drafting specification under RAPDRP. He was the Chairman to bring Smart Meter standard -BIS 16444 and CBIP Manual for Energy Meter.

Dr. RK Singh received his M. Tech. degree from IIT, Bombay and awarded Ph. D. degree on Ultra-wide Band Microstrip Antenna Design. He has vast experience as installation and maintenance engineer on different types of Communication, Networking Systems and Power Plants. He has published multiple research papers in International Journals and Conferences. His areas of interest include Cyber Security and Communication System Design. Presently he is serving as Director, National Critical Information Infrastructure Protection Centre, New Delhi.

Reji is the President of India Smart Grid Forum (www.indiasmartgrid.org) since its inception in 2011 and is also the Chairman of Global Smart Grid Federation since November 2016. He is an internationally renowned expert with over three decades of experience in the electricity sector in diverse functions covering the entire value chain and across continents. He is spearheading a mission to leverage technology to transform the electric grid in India and light every home at affordable cost through sustainable developmental models. Reji played the pivotal role in formulation of the Smart Grid Vision and Roadmap for India (August 2013) and the launch of a National Smart Grid Mission (March 2015) by Government of India, issue of Model Smart Grid Regulations (June 2015) by Forum of Regulators; and issue of National Standards for Smart Meters (IS: 16444 -2015 and IS 15959 Part 2) and Electric Vehicle Charging Infrastructure (IS: 17017-2018) by Bureau of Indian Standards. He is presently advocating for a “Right to Electricity Act” that will ensure lifeline supply of electricity to all citizens in the country. His current areas of research include: WiFi as Last Mile Connectivity Solution for Smart Metering, Smart Grids as Anchor Infrastructure for Smart Cities, Development of Smart City Maturity Model and Electric Vehicle Maturity Model, Grid Interactive Buildings and Campuses, Blockchain for Utilities; Future of Transportation; Policies and Business Models for Electric Vehicle Rollouts; and Interconnection of Regional Grids in ASEAN, SAARC and GCC countries.
Reena Suri joined India Smart Grid Forum (ISGF), a PPP initiative of Govt of India, in 2013 and is currently the Executive Director of ISGF. She brings over 20 years of experience in the Energy Sector. She is responsible for the research projects, advisory services, business development, training and capacity building programs, customer outreach activities, members relations and finances of ISGF. Reena has contributed to the various advisory services, whitepapers and research reports of ISGF on key Smart Grid domains such as: Smart Grid Roadmaps for Indian, SAARC and ASEAN Utilities; Electric Vehicles and Charging Infrastructure; Blockchain for Electric Utilities; Energy Storage; Smart Metering Infrastructure; Customer Engagement etc.

Reena is the founder-editor of the Smart Grid Bulletin published by ISGF since January 2014 which has online circulation of over 75,000 senior professionals in 120+ countries. As an outreach specialist, she has been involved in development of the Customer Outreach programs for the utilities implementing the Smart Grid projects in India. Reena is also responsible for designing and delivering training and capacity building programs on various domains of Smart Grids for policy makers, regulators and utility officials. She is instrumental in making the India Smart Grid Knowledge Portal (www.indiasmartgrid.org), one of the most popular portals on smart grids globally.

Reena has worked with ISGF Board to conceive, design, develop and the successful delivery of ISGF’s Annual Event, India Smart Utility Week (ISUW, www.isuw.in) since 2015. She is the Principal Show Director of ISUW which in a short span has grown to be the signature event on Smart Grids and Smart Cities around the world.

Prior to joining ISGF, Reena has worked with various International organisations such as Tetra Tech, Nexant Inc., PA Consulting and Academy for Educational Development (AED). She has worked on energy related projects funded by United States Agency for International Development such as Distribution Reform, Upgrades and Management (DRUM) Project, South Asia Regional Energy Initiative for Energy (SARI/E) and Small Grants Program. Under the DRUM Project, Reena worked with electricity distribution companies in India to help them upgrade their infrastructure to match international benchmarks. Reena has also helped in developing several modules on Smart Grid and been instrumental in conducting Train the Trainer workshops. She was involved in conducting a series of Smart Grid Maturity Model (SGMM) workshops for utilities in India. These workshops enabled her to study the position of Indian utilities on SGMM landscape and their aspirations for future. Reena assisted BESCOM in design of their IT Strategy and Roadmap and Pilot Architecture Design for a Smart Grid Pilot.
Vijayan SR, Asst. Vice President, ABB Power Products and Systems India Limited, is the HUB Digitalization Lead including Cyber Security for Grid Automation in Power Grids division.

He is a graduate in Electronics and Communication engineering, with an MBA in Information Technology and Marketing Management and has over 24 years of experience. He has also completed certificate programs on Digital Marketing and Business Analytics. He joined ABB in 2000 and over the last 19 years has held various roles in Engineering, Product Management and Technology functions in Network Control SCADA/DMS/EMS, Substation Automation, Smart Grid and Cyber Security solutions. He has extensive experience as a Solution Architect and System Designer.

He is active across various international and national industry forums through participation in seminars and technical papers. He is also the Vice Chair of the ISGF Working Group (WG)-1 for Grid Modernization and Smart Cities and was Convener - Technical Committee of the IEEMA Smart Grid Division. Prior to joining ABB, Vijayan was working in the process automation industry with Larsen and Toubro for 5 years.

Abhijeet Raj Shrivastava had received his M. Tech. in Information Technology & B.Tech in IT. His present areas of interest include Cyber Security, CII Protection of Transport Sector Organisation and SCADA Security. Has over 11 years of experience in the field of Information security. Presently he is serving as JDD / Sectoral Coordinator in National Critical Information Infrastructure Protection Centre, New Delhi.