

Very Early Bird: Save up to £800 on Delegate places and £2,000 on Exhibitor spaces by booking before Friday 24th June 2022!

Leveraging virtualisation and centralisation to drive the large-scale deployment of IEC 61850 across the smart grid

5-Day Conference, Exhibition & Networking Forum | Monday 17th to Friday 21st October 2022 | Cardiff, UK



Programme Highlights Include:

Specification - working effectively with suppliers to develop robust technical specifications and drive industrial scale employment

Virtualisation - ensuring accuracy and reliability of IEC 61850 processes in the migration toward virtualised digital substations

Automatic Testing - ensuring the accuracy and reliability of automatic testing procedures to maximise time and cost efficiency

DER Integration - leveraging IEC 61850 to integrate a complex system of DER players into the grid

Workforce Development - optimising the training and development of the workforce to ensure full organisational adoption of IEC 61850

Digital Twin - defining the attributes of Digital Twins and assessing how best to leverage the technology for digital substations

Event Highlights Include:

Case-Study Programme - hear the experiences of 20+ utilities from across the globe who are implementing IEC 61850 in TSO and DSO organisations

Technology Innovation Panels - follow the latest IEC 61850 innovations of system suppliers and tool manufacturers

Communication Panel - discover insights into IEC 61850 communication channels across the digital substation ecosystem from telecommunication providers

Roundtable Debates - participate in intimate discussions and benefit from the insights of the whole IEC 61850 community

Solution Zone - technology scout through a focused display of 20+ IEC 61850 enabled product and service providers

Facilitated Networking - join the networking evening reception and meet with IEC 61850 leads from across the global utility sector in a relaxed and informal setting

40+ Speakers Including:



Christoph Brunner
President of **it4power** & Convener - **TC57 WG10**



Alex Apostolov
Editor-in-Chief **PacWorld**



David MacDonald
System Monitoring Lead Engineer **Iberdrola**



Jennifer MacKenzie
Lead Design Engineer **SP Energy Networks**



Martin Greenwood
Technologist Secondary Systems **TenneT**



Birkir Heimisson
Specialist in Digital and Smart Grid Development **Landsnet**



Florian Soyey
Expert Secondary Systems **Elia**



Salim Bouramman
Expert OT Cyber Resilience and Cyber Range **E.ON**



Sander Jansen
Product Owner Virtual Substations **Alliander**



Bendic Ritt
Project Manager **Stromnetz Hamburg**



Réne Troost
Grid Strategist **Stedin**



Frans Campfens
Principal Consultant Energy Consulting **Qirion**



Michael Eves
Senior Innovation Manager **SP Energy Networks**



Dennis Murphy
Lead OT Security Engineer **National Grid USA**



Rafael San Juan Moya
Digital Platforms and Innovation Team **Iberdrola**



Farzad Khalilpour
Lead of Fully Digital Substation Automation System **Southern California Edison**



Renaud Renaud-Drouin
Automation Engineer **Hydro Quebec**



Pablo Humeres Flores
Head of Digital Supervision and Automation **CGT Eletrosul**



Chi-Shiang Cho
Research & Development Taiwan Power Research Institute **Taiwan Power Company**



Tuan Vu
Senior Digital Asset Strategies Engineer **Powerlink Queensland**

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9th Annual Conference, Exhibition & Networking Forum

Dear Colleague,

Welcome to the 9th annual **IEC 61850 Week 2022**. We are delighted to bring you this year's edition in the safe, secure and collaborative in-person environment of the Parkgate Hotel, in Cardiff UK.

Whilst the pandemic has exacerbated the need for digital transformation, remote access and cybersecurity, meeting virtually has slowed down the pace of standardisation development, community information sharing, and long-term partnership development. Now is the time for the IEC 61850 community to return to in-person, where discussions can go deeper, interactions can be more extensive, and relationship building can be more intensive.

The programme research for this year's event revealed that the IEC 61850 community is ready to embrace the next phase of IEC 61850 deployments, in terms of laying the organisational foundations, embracing next generation virtualised and centralised architectures, adopting automated engineering and testing procedures, and applying innovative solutions such as digital twin to support cybersecure remote testing and maintenance.

All of this and much more will be addressed in the course of this year's week-long programme. With 20+ utility case-studies, 3 technology innovation panels, a series of intimate roundtable discussions, a solution zone displaying state-of-the-art IEC 61850-enabled products and services, as well as a networking evening reception open to all participants, this year's event promises the perfect balance of intelligence gathering, technology scouting, and partnership forming, in a highly productive, focused and enjoyable setting.

Monday 17th October – System Specification Workshop

The week begins with a hands-on practical workshop providing utilities and suppliers with a thorough understanding of the IEC 61850 specification process, to help improve your collaboration, streamline the end-to-end specification process, reduce duplication of effort, and ensure absolute clarity of utility objectives whilst leveraging supplier expertise.

Tuesday 18th to Thursday 20th October – Implementation Case-Study Conference & Exhibition

Going beyond pilot projects, this year's 3-day implementation conference provides an intensive programme of utility case-studies from around the world. Focused on the implementation of advanced IEC 61850 architectures based on virtualisation and centralisation, we explore how you can leverage more features and functionalities, optimise the design, specification, installation, engineering, testing, operation and maintenance processes, and migrate your cybersecurity to business as usual. Technology and operational issues will be discussed in the context of organisational goals, workforce development strategies, and the drive to reduce TOTEX in the years ahead.

Friday 21st October – Digital Twin Briefing

The week wraps up with a deep dive into the potential of Digital Twin as an extension of IEC 61850 simulation testing. This briefing provides a thorough explanation of the Digital Twin concept, explores results from the application of the technology in the power grid environment, and provides an opportunity to gain hands on experience with Digital Twin tools.

We look forward to welcoming you onsite to the event in October.

Kind regards,



Mandana White
CEO | **Smart Grid Forums**

PS: Very Early Bird Discount – Save £800 per delegate by booking before Friday 24th June 2022!

PSS: Group Booking Discount – Save 10% on 3+ delegates booked from the same organisation at the same time. Contact us to arrange!

Pre-Conference Workshop

IEC 61850 System Specification

Monday 17th October 2022

Workshop Format:

As more and more utilities embrace digital substations, the pressure is on to develop advanced in-house specification skills and processes that will enable utilities to procure at the speed of the digital age, with the accuracy and cost-efficiency that remains the hallmark of the power grid.

This full-day workshop on System Specification, designed to assist utilities in developing the advanced Specification skills they need to ensure they remain in the driving seat of the end-to-end IEC 61850 implementation process

Workshop Agenda:

10:00	Welcome address and introduction to the Workshop
10:30	Session 1: Introduction to System Specification for IEC 61850 from the Utility Perspective <ul style="list-style-type: none">· Determining the level of detail required to ensure accuracy of end-user requirements· Quantifying the benefits of detailed end-user specification in terms of project time and cost savings· Setting expectations for how suppliers will respond and what they will deliver as part of the tender
11:30	Session 2: Introduction to System Specification for IEC 61850 from a Standards Perspective <ul style="list-style-type: none">· Understanding the history of specification in IEC 61850· Examining how the specification process has evolved over time· Reviewing the implications of the latest updates with part 6-100
12:30	Lunch
13:30	Session 3: Understanding the Engineering Process with Enhanced Specification <ul style="list-style-type: none">· Comparing the variations in engineering process specified in IEC 61850-6· Pinpointing what should be specified for engineering process
14:30	Session 4: Working with Data Models <ul style="list-style-type: none">· Examining the variations in Data Models· Determining how to specify the Data Model
15:00	Afternoon Refreshments
15:30	Session 5: System and Communication Architecture <ul style="list-style-type: none">· Evaluating variations supported by the Standard· Understanding the criteria that should be specified for architecture and how this can be done
16:30	Session 6: Practical Demonstration and Lessons Learnt <ul style="list-style-type: none">· Specification demonstration using the Helinks STS including verification of the specification by simulation· Feedback from various projects including OSMOSE
17:00	Close of Workshop

Workshop Leader:



Christoph Brunner
President of **it4power**
Convener of **TC57 WG10**

Christoph Brunner graduated as an electrical engineer at the Swiss Federal Institute of Technology in 1983. He is a Utility Industry professional with over 25 years of industry experience with both knowledge across several areas within the Utility Industry and of technologies from the Automation Industry. He is president of it4power in Switzerland, a consulting company to the power industry. He has worked as a project manager at ABB Switzerland Ltd in the business area Power Technology Products in Zurich / Switzerland where he was responsible for the process close communication architecture of the substation automation system. He is convener of the working group (WG) 10 of the IEC TC57 and member of WG 17, 18 and 19 of IEC TC57. He is IEEE Fellow, member of IEEE-PES and IEEE-SA. He is active in several working groups of the IEEE-PSRC (Power Engineering Society – Relay Committee) and member of the PSRC main committee and the subcommittee H. He is international advisor to the board of the UCA international users group.

Conference Day One: Tuesday 18th October

08:00 **Registration and Refreshments**

08:20 **Opening address from the Chair**

08:30 **Standards Update:** Reviewing the latest standardisation activity in TC57 and understanding how it is paving the way for more robust multi-vendor multi-edition IEC 61850 system deployments within TSO and DSO substation environments and beyond

- Identifying the IEC 61850 standardisation priorities and how these will enhance existing and planned substation implementations
- Evaluating the progress being made with new extensions for the substation, inter-substation, and to the control room
- Determining the latest standardisation to support the DER environment
- Updating on progress with verifying SCL files to improve quality
- Creating a roadmap for the deployment of future editions of the standard

Christoph Brunner, President - **It4power**, Convenor - **TC57 1G10**

09:15 **Organisational:** Optimising the workforce to maximise operational efficiency and drive the large-scale deployment of IEC 61850 at greater speed

- Writing a standard IEC 61850 based approach to meet existing requirements in Germany and the Netherlands to streamline operations and gain time and cost advantages
- Driving a standard IEC 61850 solution to improve specification of equipment and vendor solutions
- Investing in training to build in-house knowledge to expert level to improve and develop IEC 61850 projects
- Assuring confidence in conceptual models by investing in test equipment, laboratory testing, and feasibility studies before implementing a new standard model in substations
- Benefiting from a flexible model that can improve commonality between projects and drive a dynamic, fast-paced, and cost-effective implementation of IEC 61850 across two nations

Martin Greenwood, Technologist, Secondary Systems – **TenneT**

10:00 **Morning refreshments, networking and exhibition**

10:30 **System Interoperability Panel:** Evaluating how system suppliers are adapting their IEC 61850 integration approaches to ease multi-vendor multi-edition system interoperability

During this session 3-4 system suppliers will discuss their current IEC 61850 integration strategies, report on the feedback they have received from their utility customers and discuss how they will incorporate these into the next edition of their products. They will elaborate on the work they are currently doing within the IEC working groups to ensure they raise the plug-and-playability of future products. The formal presentations will be followed by Q&A and panel discussion.

12:00 **Lunch, networking and exhibition**

13:30 **Virtualisation Standardisation:** Reviewing the latest research findings on the standardisation of virtualisation for substations

- Simplifying substation processes onto a singular virtual platform to transform substations into intelligent hubs
- Researching protection, automation, and control functions with virtual systems by utilising IED data to assess their reliability in a virtual environment, such as PTP, Sampled Values, GOOSE, Redundancy Solutions
- Rigorously testing new concepts with widespread industry participation to encourage the standardisation of virtual applications
- Assessing how to build cybersecurity architectures and mitigating the risks of a virtual environment
- Examining the change management that needs to be adopted by utilities and vendors to welcome virtualisation and manage expectations
- Driving virtualisation from concept into the field to transform substations, integrate legacy systems, enable remote maintenance, simplify lifecycle management and to ensure reliability while driving down timelines and cost

Herb Falk, Managing Director – **Outside the Box Consulting Services**

14:15 **Virtualisation:** Ensuring accuracy and reliability of IEC 61850 processes in the migration toward virtualised digital substations

- Demonstrating the benefits of a virtualised substation environment with a centralised protection box to enhance the speed of construction and operations as well as improving the safety of testing procedures
- Showcasing how transferring data in a digital virtualised environment enables flexible communications with Process Bus
- Examining how implementing different layers of redundancy and maintenance can aid software updates and prevent systems going down

- Determining if a virtualised system can meet performance and operational requirements by testing its reliability and ensuring the workforce is trained in the new technology
- Assessing the difficulties of time synchronisation and ensuring real time data for the guaranteed performance of protection relays
- Integrating OT and IT departments to meet cybersecurity requirements and enhance virtualised operations and maintenance
- Understanding how a virtual centralised control room will minimise the cost of construction and enhance the flexibility of operations and maintenance in a remote environment

Farzad Khalilpour, Lead of Fully Digital Substation Automation Systems – **Southern California Edison**

15:00 **Afternoon refreshments, networking and exhibition**

15:30 **Cloud:** Leveraging configuration tools in a cloud-based environment to facilitate the effective build (substation/DER) configurations.

- Demonstrating the advantages of configuration tools for general substation configuration in a centrally managed system
- Determining how best to utilise such tools with (virtual) merging units
- Assessing how configuration tools could work in a cloud based substation environment and determining how best to define and manage cloud functions
- Making IEC 61850 configurations compatible with open-source software to virtualise all protection function IEDs
- Enabling a user-friendly software that allows IEC 61850 to be a readable 'plug-in' architecture
- Overcoming workforce shortages by investing time in training and IEC 61850 community collaboration to fast-track change
- Creating a mature software that streamlines IEC 61850 configurations on a virtual cloud platform to integrate DER/substations assets and to meet energy transition goals

Sander Jansen, Product Owner Virtual Substations – **Alliander**

16:15 **Centralisation:** Striking the balance between functionality and cost-efficiency in the migration toward centralised architectures

- Clarifying the advantages of adopting centralised functions and investing in Process Bus to enhance functionality and reduce ongoing costs
- Overcoming the challenges posed by rapid replacement in the instalment and refurbishment of secondary devices by prioritising cost and time efficiency
- Examining how to manage increased data flow when integrating new network schemes and to ensure their reliability in emergency situations
- Overcoming the challenges associated with training the workforce to adopt and effectively manage new technology
- Determining how merging unit functionality can be simplified and improved by manufacturers to justify the cost of implementing Process Bus within medium and low Voltage substations
- Demonstrating the benefits of implementing a centralised protection scheme through maintenance efficiencies gained, remote accessibility, and centralised communication

Bendic Ritt, Project Manager – **Stromnetz Hamburg**

17:00 **Roundtable Discussions:** During this session the audience breaks out into several smaller working groups, each focused on a specific theme that arose during the day's presentations. Each working group will comprise of representatives of the entire IEC 61850 community to ensure a well-rounded and holistic discussion.

18:00 **Roundtable Feedback:** During this session each working group leader will provide a 5-min summary back to the wider group, highlighting the issues raised, the solutions discussed, and the recommendations made to take the matter to the next level.

18:30 **Networking Evening Reception:** Time to relax after an intensive day of presentations and discussions! All participants are invited to join this networking reception where you will have the opportunity to enjoy the company of colleagues from across the European IEC 61850 community, in a relaxed and informal setting



20:30 **Close of Conference Day One**

Conference Day Two: Wednesday 19th October

08:00	Registration and Refreshments	
08:20	Opening address from the Chair	
08:30	<p>Multi-Vendor: Leveraging new tools and workarounds to address multi-vendor interoperability gaps, and to ensure the seamless operation and maintenance of advanced IEC 61850 systems</p> <ul style="list-style-type: none"> • Demonstrating the flexibility of the multi-vendor approach and its effectiveness in speeding up large-scale implementation of IEC 61850 in brownfield and greenfield projects • Creating clear design specification documentation to piece together multi-vendor equipment and facilitate the sustainable and practical roll out of IEC 61850 • Proactively managing different details of implementation to find solutions to delays and bugs caused by a multi-vendor approach • Working with vendors to find concrete solutions in areas lacking maturity and functionality, such as metering revenue and power quality measuring devices • Utilising the full benefits of IEC 61850 by keeping up with the pace of documentation change to fast-track operational team training and design finalisation • Realising the potential of the multi-vendor approach in keeping up with future technology, enabling end-user flexibility and facilitating important learning curves <p>Birkir Heimisson, Specialist in Digital and Smart-Grid Development – Landsnet</p>	<ul style="list-style-type: none"> • Assessing the cybersecurity risk of routable communications • Showcasing the benefits of R-GOOSE in optimising substation reliability through accelerated operations and accurate monitoring of the grid
		15:00
		15:45
		16:15
09:15	<p>Top-Down Engineering: Clarifying the benefits and driving new processes and culture change to achieve organisational adoption of top-down engineering</p> <ul style="list-style-type: none"> • Driving conversation to mature the IEC 61850 market to enhance top-down engineering projects by: <ul style="list-style-type: none"> - Pushing efficient specification and configuration tools - Propelling the optimisation of the interface between user and IED supplier • Discussing documentation of digital substations • Achieving engineering efficiency with the IEC 61850 standard by introducing <ul style="list-style-type: none"> - Large-scale template libraries - Concept traceability and automation of updates - Optimized version and file management systems • Enhancing the top-down engineering process to keep up with the future expansion of IEC 61850 substation projects <p>Florian Soyez, Expert Secondary Systems – Elia</p>	<p>Version Management: Overcoming the complexity of managing multiple editions of IEC 61850 within brown field substations to optimise replacement and lifecycle regimes</p> <ul style="list-style-type: none"> • Determining how to organise an efficient asset management system to maintain lifecycle leaps in different versions of the IEC 61850 standard to guarantee up to date operations • Creating a role-based access system that enables the cybersecure management of personnel access to files and documentation • Adopting an effective communication system architecture that organises data flow for better management and to guarantee availability • Assessing how to protect against outages in automatic systems to ensure the safety of workplace personnel • Demonstrating how a reliable version management system can fast-track IEC 61850 implementation in brownfield and greenfield substation projects
		15:45
		16:15
10:00	Morning refreshments, networking and exhibition	
10:30	<p>Testing Tools Panel: Reviewing the latest features, functionalities and cybersecurity effectiveness of 3rd party testing tools in supporting multi-vendor multi-edition station bus and process bus installations</p> <p>During this session 3-4 3rd party tool suppliers will discuss how they have been developing their products to support true multi-vendor multi-edition testing within a variety of grid scenarios. The formal presentations will be followed by Q&A and panel discussion.</p>	<p>Afternoon refreshments, networking and exhibition</p> <p>Sampled Values: Overcoming timing and synchronisation complexities to maximise the benefits of sampled values for next generation process bus digital substations</p> <ul style="list-style-type: none"> • Understanding the evolution of the application of sampled values and the impact of its load on the grid • Quantifying the risk that timing and synchronisation continues to pose to the effective use of sampled values in process bus driven digital substations • Determining how multi-vendor systems are compounding the challenges around timing and synchronisation for sampled values • Evaluating the challenges posed by automatic configuration and testing of sampled values • Overcoming the challenges associated with merging units in terms of: <ul style="list-style-type: none"> - Responses to differences in PTP signals - Responses to jumps and time - Quality of information transmission • Building in device flexibility to offset timing and synchronisation issues • Determining how the IEC 61850 standard needs to evolve to support more effective timing and synchronisation for sampled values <p>Jennifer Mackenzie, Lead Design Engineer – Scottish Power</p>
		17:00
12:00	Lunch, networking and exhibition	
13:30	<p>Automatic Testing: Ensuring the accuracy and reliability of automatic testing procedures to maximise time and cost efficiency</p> <ul style="list-style-type: none"> • Understanding the technical and organisational drivers for adopting automatic testing in IEC 61850 systems • Clarifying the automatic testing functionality inherent in IEC 61850 and how it can be enhanced through state-of-the-art tools and techniques • Examining the automatic testing methodology adopted for GOOSE Messaging and MMS • Determining the optimal way to facilitate automatic testing in a remote access environment • Rolling out automatic testing across multiple functions and system domains to maximise return on investment • Demonstrating the value of automatic testing through the operational efficiencies gained, testing accuracy, and substation roll-out timelines reduced <p>Renaud Renaud-Drouin, Automation Engineer – Hydro Quebec</p>	<p>Remote Access: Ensuring the accuracy, reliability and cybersecurity of remote access procedures for the cost-effective maintenance of next generation digital substations</p> <ul style="list-style-type: none"> • Demonstrating the benefits of integrity checks in tracking device and version changes to enable remote access operations and save time on testing • Creating detailed specifications of command line configuration tools to engineer an interoperable remote access database that manages data and sends automated commands • Enabling efficient remote and automatic firmware upgrades that are time stamped with constantly verified data • Developing a remote and cybersecure communication system with accurate fault information and event logs to maximise operations • Investing in detailed specifications to enable remote access maintenance and testing to reduce on-site maintenance, drive down cost and build confidence in machine-led processes <p>David MacDonald, System Monitoring Lead Engineer – Iberdrola</p>
		17:45
14:15	<p>GOOSE Messaging: Evaluating the potential of R-GOOSE as a highly targeted, efficient and secure messaging feature for next generation digital substations</p> <ul style="list-style-type: none"> • Evaluating R-GOOSE technology as published by the IEC 61850-90-5 Working Group 10 report and its possible applications • Demonstrating the benefits of wide area network channels and flexible communications • Managing communication traffic and maximising the effectiveness of R-GOOSE through intensive testing 	<p>Close of Conference Day Two</p>

Testimonials

"As usual, high-quality presentations and relevant topics."
Anders Johnsson, Power System Specialist - **Vattenfall Eldistribution AB**

"Great opportunity to find out what different solutions are being applied to the same problems."
David MacDonald, Protection and Control Standardisation Manager - **Iberdrola**

"Great conference for keeping updated on the IEC 61850 standard and the experience of utilities in their projects from engineering, deployment, testing and maintenance."
Jun Verzosa, Senior Principal Consultant - **Doble Engineering**

Conference Day Three: Thursday 20th October

08:00	Registration and Refreshments		
08:20	Opening address from the Chair		
08:30	<p>Driving Collaboration: Establishing a framework for effective collaboration when leveraging IEC 61850 to integrate a complex ecosystem of DER players into the grid</p> <ul style="list-style-type: none"> • Determining the pros and cons of utilising IEC 61850 to support the integration of large volumes of DER into the grid • Developing a robust framework to support the timely and efficient input of all DER players into the technical solutions • Collaborating on the optimal data model, system specification, engineering process, interfaces • Ensuring effective cybersecurity of network interfaces • Measuring the impact of this approach on project timelines and cost efficiency <p>René Troost, Grid Strategies – Stedin</p>		<ul style="list-style-type: none"> • Adapting relationships with vendors to update procurement processes to fit operational requirements • Navigating rapidly evolving project engineering and construction timelines to meet the needs of interdisciplinary stakeholders and the business as a whole <p>Building expert in-house telecommunication knowledge to lessen reliance on third parties and drive costs down</p> <ul style="list-style-type: none"> • Negotiating the requirements of IT personnel, software vendors and power grid operators to ensure that security requirements and lifecycle maintenance align with reliability obligations • Architecting the substation network to enable segmentation of data flows to ensure communication patterns are compartmentalised • Quantifying the cybersecurity risk of routable based data and providing controls to limit the risk to an acceptable level • Overcoming the challenges of standardising processes within a multinational utility that stemmed from mergers and acquisitions of legacy utilities to streamline designs and organise large quantities of data <p>Dennis Murphy, Lead OT Security Engineer – National Grid USA</p>
09:15	<p>Renewables: Applying IEC 61850 to renewables to support the seamless transfer of communication across the end-to-end energy system as more DER assets integrate into the grid</p> <ul style="list-style-type: none"> • Demonstrating the value of IEC 61850 features in meeting the rapid growth of DER integration required for the energy transition • Utilising the features of IEC 61850-8-2 to monitor and control privately owned DER assets through XMPP • Determining how to convert legacy protocols used in DER assets to enable the transition to IEC 61850 in a time and cost-efficient manner • Establishing verification procedures through IEC 61850-8-2 XMPP Gateway or cloud system to ensure efficient information transmission and the secure management of real time data in WAN • Examining how advancements in DER transmissions and communications could enable remote access in the future • Assessing how IEC 61850 needs to become more flexible to integrate DER and enable the achievement of 20% renewable energy in Taiwan's power structure by 2025 <p>Chi-Shiang Cho, Research & Development, Taiwan Power Research Institute – Taiwan Power Company</p>	15:00	Afternoon refreshments, networking and exhibition
10:00	Morning refreshments, networking and exhibition	15:30	<p>Cybersecurity: Ensuring the ongoing cyber-physical security of IEC 61850 enabled digital substations through a proactive defence-in-depth approach</p> <ul style="list-style-type: none"> • Evaluating the latest trends in the threat landscape for digital substations and the new attack vectors being exploited • Understanding the implications of specific IT/OT vulnerabilities such as IEDs, communication within and from substation to SCADA systems, and from SCADA systems to other substations • Evaluating the potential of state-of-the-art solutions such as OT intrusion detection and substations encryption • Adopting a proactive offensive defence-in-depth approach to cyber securing digital substations through effective Board engagement and advanced staff training • Implementing CyberRange-e to drive a proactive security mindset across the organisation • Working with the national cybersecurity centre and EE-ISAC to ensure effective incident response, recovery, and resilience <p>Salim Bouramman, Expert OT Cyber Resilience and Cyber Range – E.ON</p>
10:30	<p>Communication Equipment Panel – Updating on advancements in the development of high reliability and security communication technology to support high speed data transfer</p> <p>During this session 3-4 communication equipment suppliers present how they are developing their technology to increase the redundancy, reliability and security of future power grid communication networks. The formal presentations will be followed by Q&A and panel discussion.</p>	16:15	<p>Time Synchronisation: Leveraging advances in time synchronisation solutions to support real-time communication across IEC 61850 enabled assets</p> <ul style="list-style-type: none"> • Driving workforce engagement in Time Synchronisation protocols to optimise the implementation of IEC 61850 across the digital substation • Evaluating PTP mechanisms and assessing its technical possibilities • Assessing how best to monitor and test the performance of Time Synchronisation by evaluating the tool market and determining how it needs to mature • Training the workforce to implement ethernet based solutions and verify real time data with confidence • Optimising the design and specification process to implement a Time Synchronisation system that enables informed decision making and early action for protection systems • Lessons learnt from setbacks in recent projects to strengthen future Time Synchronisation applications <p>Pablo Humeres Flores, Head of Digital Supervision and Automation – CGT ELETROSUL</p>
12:00	Lunch, networking and exhibition	17:00	<p>Workforce Development: Creating culture change through effective knowledge transfer, training and development, and re-enforcement of IEC 61850 best practice to ensure full organisational adoption</p> <ul style="list-style-type: none"> • Clarifying the advantages of a clear and concise IEC 61850 implementation strategy to satisfy all stakeholders and drive digital substation projects forward with momentum • Demonstrating the importance of acting swiftly to develop your workforce to manage increased data flow and ensure efficient asset management, operations, and planning • Assessing how best to articulate risk, cost, and performance indicators to all key stakeholders to facilitate effective conversations and address workplace grievances • Determining how to have a centralised vision when implementing IEC 61850 projects to streamline training and evolve the skills of your workforce • Understanding the importance of transparency, navigating failures, and setting realistic timelines to ensure the long-term benefits of IEC 61850 are recognised <p>Tuan Vu, Senior Digital Asset Strategies Engineer – Powerlink Queensland</p>
13:30	<p>Inter-Substation Communication: Designing, specifying, and deploying reliable wide area networks to support the use of IEC 61850 inter-substation</p> <ul style="list-style-type: none"> • Evaluating how Inter-Substation Communication applications can optimise the operations of digital substations • Determining why applications of Inter-Substation Communication are worth pursuing, such as: <ul style="list-style-type: none"> - Accelerated Protection Schemes: to quickly identify faults and maintain the reliability of the DER grid - System Integrity Protection Schemes: to monitor the state of the grid over wide area distances and wide area Protection, Automation and Control systems • Assessing the technology published by the IEC 61850-90-5 Working Group 10 report, such as, R-GOOSE, Sampled Values, and Wide Area Synchronisation • Ensuring R-GOOSE is specified effectively to meet requirements and to reap the benefits of utilising wide area network channels over the building of dedicated communication channels • Understanding how to test Inter-Substation Communications through simulation testing at different sites • Overcoming the cybersecurity challenge of undetermined communication paths that exist outside of the substation by following IEC 61850-90-5 requirements for encryption and authentication • Realising the benefits of Inter-Substation Communication in: <ul style="list-style-type: none"> - Accelerating fault clearing - Monitoring wide area Protection, Automation and Control systems to achieve a real time assessment of the state of the grid and in conducting system alterations - Implementing a more deterministic and flexible communication channel <p>Alex Apostolov, Editor-in-Chief – PacWorld</p>	17:45	Close of Conference Day Three
14:15	<p>Control Centre Communication: Harmonising IEC 61850 to support robust, reliable and secure data transfer from the substation to the control centre</p> <ul style="list-style-type: none"> • Leveraging IEC 61850 and data centralisation methods to integrate legacy systems and drive the digitalisation of the substation to foster trust in the system, collect large volumes of data and enable the secure and reliable transfer of data to SCADA/control centre 		

Post-Conference Briefing: Friday 21st October

Digital Twin Applications

08:00 **Registration and Refreshments**

08:20 **Welcome address from the Chair**

08:30 **Digital Twin Standardisation:** Defining the attributes, updating on standardisation progress, and reviewing successful applications of Digital Twin across a range of sectors

09:15 **DER Digital Ecosystem:** Using a Digital Mesh ecosystem for local energy management with real time data from a Digital Twin simulation

- Clarifying how the Digital Mesh concept drives an ecosystem of multi-commodities to connect customers to the grid and facilitate the energy transition
 - Applying a Digital Mesh concept to local energy management to control multiple energy sources and optimise renewable energy resources
 - Utilising IEC 61850 beyond the substation to improve the reliability of renewable energy loads on the grid
 - Demonstrating the use of Digital Twin technology to simulate and control the local energy system through real time data of the ecosystem
 - Assessing how to standardise a combination of communication protocols in a large ecosystem of actors
 - Looking to the future development of autonomous substation control and directing IEC 61850 communication beyond the substation to decentralised assets under Digital Mesh technology
- Frans Campfens**, Principal Consultant Energy Consulting – **Qirion**

10:00 **Morning refreshments and networking**

10:30 **Interoperability:** Driving a Digital Twin methodology that connects disparate data systems on a reliable and cybersecure platform to optimise digital substation operations and maximise IEC 61850 capabilities

- Examining how the SIF Project will enable:
 - Applicable methodology for the power grid drawn from a distribution Digital Twin use case
 - Connection of disparate systems through a standardised and digitised holistic data connector
- Securing a complex data platform to match the Government's security strategy by implementing AI innovation technology to embed cybersecurity for intrusion detection and data verification
- Assessing how Digital Twin technology can draw information from substation assets to allow planning and analysis of the network
- Anticipating the next 12 months and evaluating how a Digital Twin substation will maximise the benefits of IEC 61850 communication

Michael Eves, Senior Innovation Manager – **Scottish Power Energy Networks**

11:15 **Cybersecurity:** Digital Twins for IEC 61850 vulnerability assessment, impact analysis and mitigation

- Designing an ecosystem to digitally simulate cyberattacks on the power grid to improve the response of power system operators and security personnel
- Creating infrastructures that utilise Digital Twin technology to simulate system operations and create prototypes to secure the grid, such as:
 - A control room of the future
 - Digital substation/RTDS power system via SCADA
- Developing cyber-range to exploit the vulnerabilities of IEC 61850 and using Digital Twin to conduct impact analysis, narrow the search space, mitigate risk, and avoid blackout
- Assessing the system dynamics and purpose of Digital Twin technologies

- Proving the value of adopting software-based solutions such as Digital Twin, Machine Learning & AI to improve the system response to congestion, allow flexibility in operations and foster informed decision making
 - Showcasing the future capabilities of Digital Twin technologies and the potential for further research
- Alex Stefanov**, Assistant Professor – **TU Delft**

12:00 **Lunch and networking**

13:30 **Maintenance:** Applying Network Digital Twin to support engineering maintenance and smart fault detection

- Driving an accurate virtual replica of the physical network to achieve operational excellence and efficiency
 - Creating a 3D models repository of existing equipment and new infrastructures to utilise digital twin technology throughout entire life cycles
 - Using a network data lake to pool digital twin technology with a continuous flow of data from network devices, IoT and smart sensors in the network and in substations
 - Performing predictive maintenance and anomaly detection to ensure safety of work personnel and alert to faults in primary and secondary substations
 - Building a network twin that will shape the future of all grid operations and ensure the achievement of sustainable development goals across the smart grid
- Antonio Trematerra**, Head of Industrialization Grid Domain – **Enel**

14:15 **Workforce Development:** Using SCADA and IoT data to create a functional 3D Digital Twin and utilise VR technology to train the workforce

- Utilising SCADA and IoT data to create a 3D functional Digital Twin to ensure safe training procedures that avoid accidents and ensure on-site reliability
 - Recreating a virtual substation entirely and truly to enable a VR immersive experience for operational personnel to train with a proximity to reality and develop reflex memory of activity
 - Driving the mapping of Digital Twins from the substation construction stage until completion to ensure a full 3D model that enhances the immersive experience
 - Creating detailed specifications to ensure that the platform and hardware assets match your operational needs
 - Assessing how best to overcome cybersecurity risks
 - Improving operations through a virtualised Digital Twin that can cross reference system data to diagnose and identify faults
 - Training in a remote location that allows for extensive and detailed sessions that can be repeated and specialised to suit operational needs
- Rafael San Juan Moya**, Digital Platforms and Innovation Team – **Iberdrola**

15:00 **Afternoon refreshments and networking**

16:00 **Roundtable Discussions:** During this session the audience breaks out into several smaller working groups, each focused on a specific theme that arose during the day's presentations. Each working group will comprise of representatives of the entire IEC 61850 community to ensure a well-rounded and holistic discussion.

16:30 **Roundtable Feedback:** During this session each working group leader will provide a 5-min summary back to the wider group, highlighting the issues raised, the solutions discussed, and the recommendations made to take the matter to the next level.

17:00 **Close of Briefing**

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Strukton Power is a system integrator with extensive knowledge and experience with Design & Construct contracts for high voltage substations. The market segments Strukton is focused on are power generation, transmission & distribution and high voltage projects for the infrastructural and industrial segments. Strukton has also extensive knowledge about the renovation of substations. Currently Strukton is retrofitting 110kV and 150kV substations for TenneT, the Transmission Network Operator in the Netherlands. The project scope consists of the use of modular skid designs for both AIS and GIS and the application of vendor independent IEC for these retrofit projects.

Elvexys specialises in network digitalisation for TSO and DSO and brings vast experience with communication gateways to develop complete and reliable solutions for utilities in the process of substation retrofit. The company proposes audits and tailor-made assessments for the technical implementation of utilities' communication and control-command systems. Elvexys then provides tools allowing implementation of test-based engineering to guarantee the success of its clients' projects all whilst ensuring the overall control and vision of IEDs lifecycle. Elvexys differentiates itself from major suppliers of primary hardware by offering vendor-independent solutions and providing extensive expertise in data management.

For the 9th annual IEC 61850 Week of the Smart Grid Forums, Strukton and Elvexys will present their common projects, the first substations retrofitted for TenneT as part of Bay Replacement Program. This will be a unique opportunity to share their discoveries on how the IEC 61850 standard can help to accelerate the substations retrofit and thus reducing the costs.

Find out more at: www.elvexys.com and www.strukton.com

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OMICRON is the leading supplier of testing and supervision solutions for power utility communication systems utilizing the IEC 61850 standard. OMICRON's products support the whole lifecycle of IEC 61850 Digital Substations from design verification, evaluation, factory testing, commissioning, to operation and maintenance. The applications in protection, automation & control of electrical power systems in connection with IEC 61850 GOOSE, Sampled Values, and Client/Server (MMS) communication are covered by a diverse portfolio of tools. The products range from pure software tools to protection and automation test sets and distributed test, measurement, recording, and supervision systems. OMICRON's intrusion detection system has a special focus on IEC 61850 and serves an important role for the Cybersecurity of Digital Substations. With OMICRON subsidiaries and service centers on every continent, the OMICRON team serves customers world-wide.

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Rhebo develops and markets OT and IIoT cybersecurity for the energy sector, critical infrastructure and manufacturing companies. The company provides cross-locational cybersecurity, intrusion detection and visibility in industrial automated networks (ICS) from the initial cyber risk analysis to cybersecurity operation through OT monitoring with threat & intrusion detection. Since 2021, Rhebo is part of the Landis+Gyr AG, a leading global provider of integrated energy management solutions for the energy industry with around 5,000 employees in over 30 countries worldwide. Rhebo is a partner of the Alliance for Cyber Security of the Federal Office for Information Security (BSI) as well as the Teletrust - IT Security Association Germany. The company was awarded the »IT Security Made in Germany« and »Cybersecurity Made In Europe« labels for its strict data protection and data security policies.

Find out more at: www.rhebo.com



Hitachi Energy serves customers in the utility, industry and infrastructure sectors with innovative solutions and services across the value chain. Together with customers and partners, we pioneer technologies and enable the digital transformation required to accelerate the energy transition towards a carbon-neutral future. We are advancing the world's energy system to become more sustainable, flexible and secure whilst balancing social, environmental and economic value. Hitachi Energy has a proven track record and unparalleled installed base in more than 140 countries. Headquartered in Switzerland, we employ around 38,000 people in 90 countries and generate business volumes of approximately \$10 billion USD.

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Find out more at: www.helinks.com

Exhibitors:



Westermo provides a full range of data communication products for demanding applications in the energy industry. Within critical infrastructure applications, the loss of data communication at any point is unacceptable. Due to this, every Westermo product is designed to operate reliably for many years in even the harshest environmental conditions. Designed to support engineers installing and maintaining networks of increasing complexity, the Westermo "Made Easy" concept offers software solutions that are extremely easy to use. With this concept, mission-critical industrial systems can be configured and maintained in a robust, reliable, and cyber-secure manner for years to come. Whether it is in a power plant, renewables applications or inside the most demanding substations, Westermo has the most robust industrial data communication solutions for any energy application.

Find out more at: www.westermo.co.uk



Megger is an international group which is the largest test equipment manufacturer in the world which makes test equipment for all parts in the electrical network. Test equipment for the protection circuit – relay protection, circuit breaker and instrument transformers – has been a core part of the business for many decades. Megger is present in the IEC 61850 world since 2009, when Megger introduced in the market innovative products and concepts like separation of the PC from the IEC 61850 station bus, comparison between network data and SCL data (SCL description and actual network traffic, patented concept), conversion of GOOSE messages in contact signals and binary input into GOOSE messages (the so called today Breaker IED, BIED, that is going to be standardized by TC 95 in the next years). The test equipment with built in IEC 61850 capability that are safe (cybersecure) for direct connection to the IEC 61850 network as they do not require the use of any computer to operate. These products are FREJA and SMRT and they are used for GOOSE and Sampled Values. Megger is actively working on developing new products and concepts for testing the smart grid like on-line monitoring the operation of the electric power system and for automatic detection of errors and predictive maintenance. The latest addition, the SMRT digital twin for relay protection test set, opens a new era of substation verification, enables the concept of virtual commissioning and it will drive increased quality and reduced costs of the delivered protection systems. Megger is actively member of many standardisation committees (IEC, IEEE and Cigré).

Find out more at: www.uk.megger.com



For over 20 years, the RTDS Simulator has been the industry's de facto tool for the closed-loop testing of protection and control systems. Today, RTDS Technologies continues to lead the way with innovative developments, ensuring real time simulation's applicability for the grid modernization practices that are so critical for utilities, protection and control manufacturers, and research institutions around the world. NovaCor™, our newest generation of simulation hardware, is bringing digital grid, distribution automation and grid-edge connectivity to life in real time.

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Global Smart Energy Federation (GSEF) established in 2010 and formerly known as Global Smart Grid Federation (GSGF), is a global stakeholder organization of national smart grid associations, forward-looking utilities, and think tanks from around the globe working in the domains of energy transition and clean transportation. By linking the major public-private stakeholders and initiatives of participating countries, the federation shares practices, identifies barriers and solutions, fosters innovation, and addresses key technology standards and policy issues. The activities of GSEF help our member organizations and their member utilities in their energy transition and grid modernization initiatives that enhance access to affordable clean energy and increase the security, flexibility and resiliency of the power system while reducing the emissions. GSEF has 16 member countries including India, Indonesia, Mexico, Malaysia, Thailand, Mozambique, South Africa, Botswana, Saint Lucia, USA, Japan, France, South Korea. European Distribution System Operators (E.DSO), an organization promoted by European Commission; and several think-thanks of global repute in also a member of GSEF.

Find out more at: www.globalsmartenergy.org



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