9th INTERNATIONAL CONFERENCE on RENEWABLE ENERGY RESEARCH and APPLICATIONS (ICRERA 2020)

Glasgow, UK 27-30 September 2020

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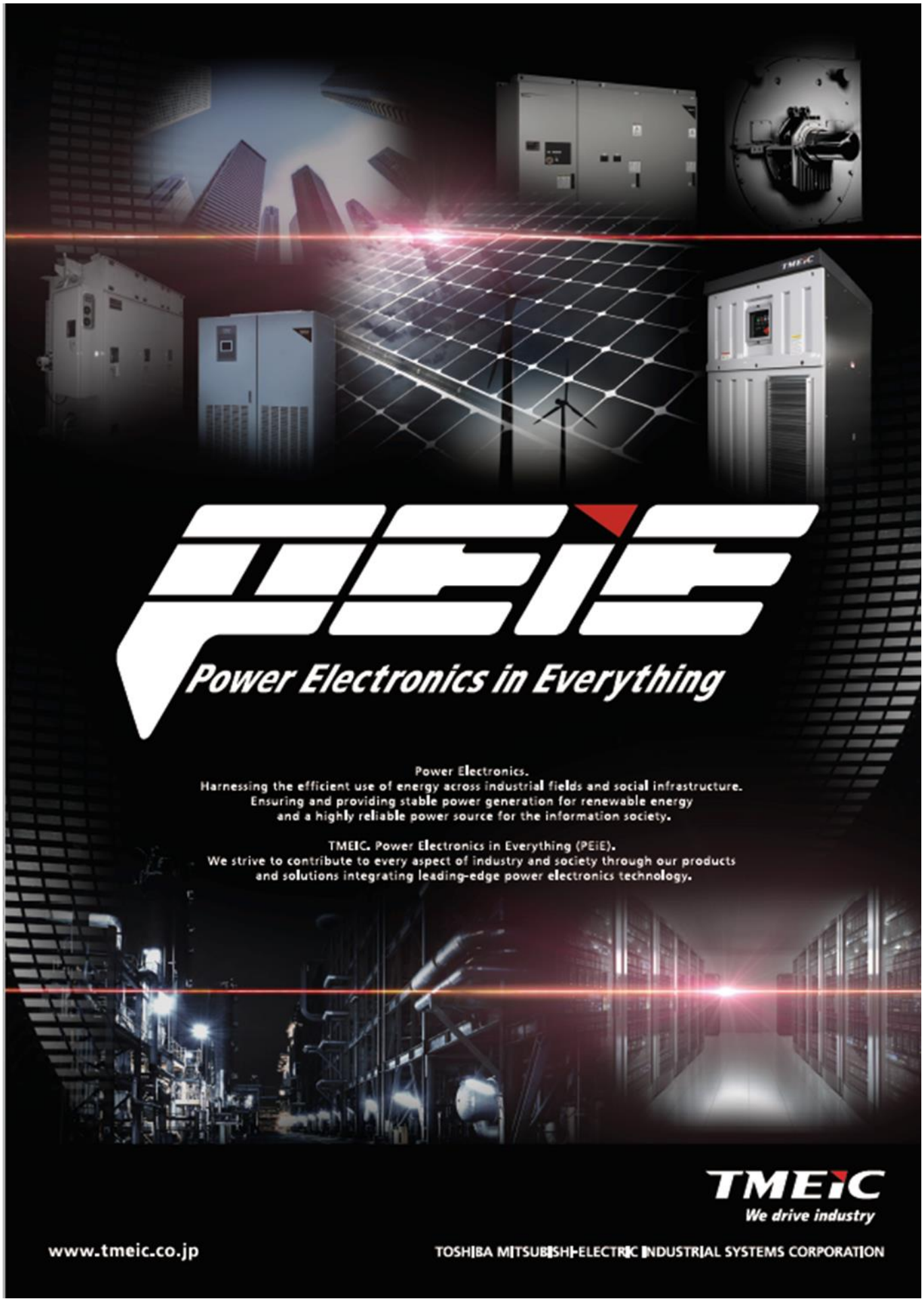

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TOPICS

Topics within the scope of the conference include the following areas, but not limited to:

- Renewable (Green) Energy Systems and Sources (RESSs) as Wind Power, Hydropower, Solar Energy, Biomass, Biofuel, Geothermal Energy, Wave Energy, Tidal energy, Hydrogen & Fuel Cells, Energy Storage
- New Trends and Technologies for RESSs
- Policies and Strategies for RESSs
- Energy Transformation from Renewable Energy System (RES) to Grid
- Novel Energy Conversion Studies for RESs
- Power Devices and Driving Circuits for RESs
- Control Techniques for RESs
- Grid Interactive Systems Used in Hybrid RESs
- Performance Analysis of RESs
- Hybrid RESSs
- Decision Support Systems for RESSs
- Renewable Energy Research and Applications for Industries
- RESSs for Electrical Vehicles and Components
- Artificial Intelligence and Machine Learning Studies for RESs and Applications
- Computational Methods for RESSs
- Energy Savings for Vehicular Technology, Power Electronics, Electric Machinery and Control, etc.
- New Approaches in Lightings
- Public Awareness and Education for Renewable Energy and Systems
- Reliability and Maintenance in RESSs
- Smart grids and RESSs
- Safety and Security of RESSs
- Renewable Energy Systems in Smart Cities
- Future Challenges and Directions for RESSs
- IoT for RESSs
- Energy Management, VPP(Virtual Power Plant) and ERAB (Energy Resource Aggregation Businesses) for RESSs
- Model based Design and Digital Twin for RESSs

LANGUAGE

The working language of the ICRERA conference is English

WELCOME to ICRERA 2020

Dear Colleagues,

The purpose of the International Conference on Renewable Energy Research and Applications (ICRERA) 2020 is to bring together researchers, engineers, manufacturers, practitioners and customers from all over the world to share and discuss advances and developments in renewable energy research and applications.

After the success of the first eighth editions of ICRERA in Nagasaki (2012), Madrid (2013), Milwaukee (2014), Palermo (2015), Birmingham (2016), San Diego (2017), Paris (2018), and Brasov (2019), the nineth edition will be in Glasgow, UK, and will continue focusing on several key topics and technologies related to renewable (green) energy systems and sources.

It is our happiness to share with you that 84 selected papers out of 178 papers at ICRERA2019 have been proposed for possible publications in IEEE Transactions on Industrial Applications (15 papers), International Journal of Renewable Energy Research (21 Papers), International Journal of Smart Grid (20) and International Journal of Engineering Science and Applications (28). We hope to select similar rate of papers for the ICRERA 2020.

Up to 2019, all papers presented ICRERA have been cited in IEEE Xplore, SCOPUS and Web of Science (Clarivate Analytics).

According to WEB of Science (Clarivate Analytics);

h-index = 14

Average citation per item = 1.97

Impact Factor = 4.16

ICRERA aims to present important results to the international renewable energy community in the form of research, development, applications, design, and technology. It is therefore intended to assist researchers, scientists, manufacturers, companies, communities, agencies, associations and societies to keep abreast on new developments in their specialties and to unite in finding alternative energy solutions to current issues such as the greenhouse effect, sustainable and clean energy issues.

Dr. Khaled Ahmed
General Chair, ICRERA 2020

Professor Ilhami COLAK
Co-Chair, ICRERA 2020

Professor Fujio KUROKAWA
Co-Chair, ICRERA 2020

KEYNOTE SPEAKERS

Keynote 1: Mr. Akira KAWAGUCHI, TMEIC, Japan
Date : September 28, 2020 09.40-10.40 AM

Biography:

Professional Experience:

• Oct. 2003 - Present Toshiba Mitsubishi-Electric Industrial Systems Corporation

• Jun. 2018 Executive Officer Vice President of Power Electronics Systems Division

• Apr. 2018 Vice President of Power Electronics Systems Division

• Apr. 2016 Deputy Vice President and Technology Executive of Renewable Energy & New Technology Division

• Apr. 2014 Technology Executive of Renewable Energy & New Technology Division

• Apr. 2013 Senior Manager of Photovoltaic System Center Power Electronics Systems Division

• Oct. 2010 Senior Manager of Power Electronics Department Power

PEiE, Power Electronics in Everything, Provides Solutions to Global Difficulties

Summary: The world is now facing tremendous difficulties including the extreme weathers and COVID-19. In addition to these, Japan sometimes suffers from earthquakes because of its geological position. The other global concern is the electrification. In near future, the electricity will be the first carrier in the final energy demand in the world where the oil is the first at present. Considering these two factors, this speech introduces potential of Power Electronics technology to provide solutions against the global difficulties from viewpoint of electric power supply. The key words of solutions are the continuity and the resilience.

The first topic is from the experiences on severe damages to electric power networks, these years. Extreme weathers, namely, large typhoons, never experienced in the past, frequently hit Japan. In 2019, two large typhoons passed near Tokyo. The one broken down many transmission towers for overhead lines and resulted in long outages. The other brought floods and damaged PV power plants. In 2018, the great earthquake developed the black out on whole of Hokkaido island. In this topic, against the power outage, two types of solutions are considered. The first solution is for continuity, to continue the supply even in the extreme weathers. The second solution is for resilience, to restore quickly from the outage.

As the first type of solutions, the speech discusses if the cables can be used in place of the overhead lines because the underground cable transmission will not be affected by strong winds of typhoons. In the discussion, it is noted that the cables have limits for power transmission if they transmit AC power at high voltage and for long distance. Then, as the solution based on power electronics technology, the HVDC converters are introduced. The next solution is the hybrid system of power electronics and the emergency generator. Even if a factory has an emergency generator, the factory shuts down the process at the instant of power outage since the generator needs several seconds to start up. The power electronics named MPC, Multiple Power Compensator, instantaneously disconnects the factory from the faulted AC power network and at the same time it feeds all the power to whole of the factory. Then, the MPC can compensate the power while the emergency generator starts up and the hybrid system can feed the power to whole of the factory at any instant. The third example is the hybrid system of the PV generation and the energy storage system. Usually, the hybrid system is connected to the AC power network and outputs the generated power as required. The system can be designed to function as an independent power supply during the outage. The system supports the business continuity, for example, the office activities of the factories.

The HVDC converters of the voltage source type also can be used in the second type of solutions. Since the voltage source type HVDC converters can energize the transmission lines by their ability to generate AC voltage, it can be the start point of the restoration of the AC power network once blacked out. In Hokkaido, the MMC, Multilevel Modular Converter, for HVDC were verified their ability in the actual power network, unfortunately, after the great earthquake. As the next example of solution, the modular type PV inverters are introduced. They can be useful for fast restoration of the PV power plants damaged by floods because of its features designed in, namely, fast replacement and transportation flexibility.

The second topic addresses the contributions of power electronics technologies for fight against COVID-19 in aspect of continuous power supply. The web conferences, including this ICREA 2020, the remote work from home and other digital activities are all based on the ICT, Information and Communication Technology. In other words, the ICT is the digital armor for fight against COVID-19. Here, it should be reminded that all ICT facilities are fed by electric power. An example of contributions is UPS, Uninterruptible Power System. Many UPSs feed stable and continuous power to the servers in the data centers. Without UPS, even very short time voltage sag may shut down the ICT facilities. The other example is MPC, which supports the factories for manufacturing ICT devices, CPUs, memories, liquid crystal displays and so on for PCs and for smart phones. The manufacturing processes of the ICT devices are very sensitive to disturbances in the AC power network. The MPC assures the power to whole of the process to continue its operation and supports the ICT device supply chain.

The speech is summarized with the words, power electronics in everything, PEiE and conclude that PEiE can provide solutions against the global difficulties by supplying reliable electric power with key words, the continuity and the resilience.

Keynote 2: Carl Barker, GE Renewable Energy, UK
Date : September 28, 2020 10.50-11.50 AM

Biography: Carl Barker holds a B.Eng from Staffordshire Polytechnic and a M.Sc. from Bath University in the UK. He joined GE's Grid Solutions in Stafford, UK in 1989, initially working on the design and development of individual HVDC and SVC projects then becoming System Design Manager, responsible for all technical aspects of HVDC projects. Carl is, at present, a Consulting Engineer within the business providing technical direction and guidance across several disciplines.

Carl is a Chartered Engineer in the UK, a member of the IET (UK), a Senior Member of the IEEE, a distinguished Member of CIGRE, a visiting lecturer at Birmingham University and an honorary visiting professor at Cardiff University..

The Connection of Offshore Wind Using the Latest Developments in Offshore to Onshore HVDC Technology

Summary: In an effort to meet the European target for CO2 reduction, large offshore wind farms have been constructed with others under construction or planned. For far offshore the accepted method of transmitting the power from the wind farm to the onshore electrical power grid is through High Voltage Direct Current (HVDC) transmission.

In this talk we will look at the application of GE's latest offshore HVDC to onshore connection. Currently this equipment is being used to connect the Sofia 1400 MW wind farm to the UK grid via 227 km of HVDC cable. The talk will review a typical overall scheme circuit and then investigate the various main circuit components; transformers, VSC valves, reactors, Dynamic Braking System (DBS) and will also look at the auxiliary equipment associated with such a scheme. Harmonic instability, due to the multiplicity of power electronic converters associated with an offshore wind farm and its connection to a HVDC VSC converter, is one of the challenges to be addressed in this type of offshore scheme. Examples of harmonic damping will be discussed in this talk.

Finally, future interconnections may make better utilization of the installed infrastructure by combining the connection of remote offshore wind farms with connections between onshore AC networks, requiring multi-terminal operation and DC grid protection strategies. The implications of these developments will be discussed.

Keynote 3: Professor Gungor BAL, Gazi University, Turkey
Date : September 29, 2020 09.40-10.40 AM

Biography: Güngör BAL was born in 1959 in Turkey. He received his diploma in Electrical Engineering from Gazi University, Turkey in 1983. Then he did his MSc in Electrical Engineering in the field of A Reactive power compensator for industrial loads at Gazi University in 1988. After that he received his PhD at Stratclyde University in Scotland on Performance Analysis of Field-Orientation Controlled Induction Motor with Parameter Adaptation in 1993. He became an assistant professor, an associate professor and a full professor at Gazi University in 1994, 1998 and 2004 respectively.

He has published more than 80 papers in different subjects including electrical machines, drive systems, machine learning, reactive power compensation, machines, drives, power electronics, power line communication, induction heating, renewable energy sources and augmented reality. More than 115 of his papers have been cited in several database. They have received more than 740 citations. He supervised 17 MSc students and 12 PhD students. He is member of IEEE. He was the Editor-in-Chief of Journal of Polytechnic. He is currently working in the Department of Electrical and Electronics Engineering of Faculty of Technology at Gazi University Ankara/Turkey.

Augmented Reality Applications on Renewable Energy Sources

Summary: Augmented reality (AR) uses digital information, whether it be images, audio, video, and touch or haptic sensations and overlaying them over in a real-time environment. AR allows the user to see the real world, with virtual objects superimposed upon or composited with the real world. There are three characteristics that define augmented reality: (i) combines real and virtual information (ii) is interactive in real time (iii) operates and is used in a 3D environment. AR has recently become a worldwide research topic. AR has the potential to impact almost every industry, from education to maintenance, medicine to business, entertainment to law enforcement. This presentation will focus on applications of augmented reality on electrical end electronics engineering, particularly on renewable energy sources.

Keynote 4: Ricardo Da Silva, ScottishPower Renewables, UK
Date : September 29, 2020 10.50-11.50 AM

Biography:

MBA Global Energy Industry.

Strathclyde University Universidad Potifical Comillas – Cohort 4

MSc Renewable Energy and Environment Universidad Politécnica de Madrid

Spanish: Native, English: High, Portuguese: Low

Grid & Regulation Analyst ScottishPower Renewables October 2016 – Current Time

• **Scope of the role**

Responsible for commercial analysis and contractual negotiation of all ScottishPower Renewables' wind farm portfolio, onshore and offshore in UK and Ireland, covering projects in development, construction and operation.

• **Main responsibilities:**

Liaise directly with National Grid and Eirgrid at senior management level and across various operational functions

Responsible for proposing, negotiating and agreeing regulatory frameworks with NGESO and Eirgrid for implementation of additional ancillary service options over and above obligatory services Ensuring compliance with grid related policies and procedures Assist in SPR's contribution to industry code and framework changes and proposals.

Previous experience:

Electricity Market RealTime Operator at Gas Natural Fenosa – February 2011-October 2016

Perform real-time trading operation in the control room managing conventional generation plans, such as Combined Cycle Gas Turbine, Coal Thermal and Hydropower, managing a portfolio of over 8.4GW of installed power.

Electrical Engineer at Jacobs Engineering

January 2007-March 2011 Design and develop of low and medium voltage electrical systems on the industrial, commercial and residential sector.

Experience in Iberdrola

No previous roles in Iberdrola

Flexibility Strategy from Predictable Variable Resources

Summary: Wind, along with converter based technologies, is meant to play an active role on network stability in a carbon free future. New enhancements and technologies are rising fast to cope with the decarbonisation challenges and provide the necessary services to ensure the system operates safe and secure. SPR is committed to a flexibility strategy to demonstrate the value of offshore and onshore wind to deliver benefits to the system and the consumer.

Keynote 5: Prof. Dr. Andrea Tonello, University of Klagenfurt, Austria
Date : September 29 2020 12.00-13.00 AM

Biography: Andrea Tonello is professor of embedded communication systems at the University of Klagenfurt, Austria. He has been associate professor at the University of Udine, Italy, technical manager at Bell Labs-Lucent Technologies, USA, and managing director of Bell Labs Italy where he was responsible for research activities on cellular technology. He received the PhD from the University of Padova, Italy (2002). Dr. Tonello was the recipient of several awards including: the Lucent Bell Labs Recognition of Excellence Award (1999), the RAENG (UK) Distinguished Visiting Fellowship (2010), the IEEE Vehicular Technology Society (VTS) Distinguished Lecturer Award (2011-15), the IEEE Communications Socitey (ComSoc) Distinguished Lecturer Award (2018-19), the IEEE ComSoc TC-PLC Interdisciplinary and Research Award (2019), the IEEE ComSoc TC-PLC Outstanding Service Award (2019), and the Chair of Excellence from UC3M (2019-20). He also received 9 best paper awards. He was the chair of the IEEE ComSoc Technical Committee on PLC, and he was/is associate editor of IEEE TVT, IEEE TCOM, IEEE ACCESS, IET Smart Grid, Elsevier Journal of Energy and Artificial Intelligence. He is the chair of the IEEE ComSoc Technical Committee on Smart Grid Communications. He has been appointed director for Industry Outreach in IEEE ComSoc.

Website: www.andreatonello.com

Connectivity and Diagnostics in Smart Energy Grids Enabled by Communication Systems

Summary: The introduction of renewables and the goal of increasing efficiency and reliability is revolutionizing the energy grids. Energy grids must become intelligent and be able to manage energy flows and flexibly adapt to changes in production and demand. This paradigm has fostered the creation of new business models on top of technology advances. The physical infrastructure must embed sensing, communication and processing capabilities. New challenges and opportunities are brought to telecommunication technology. This talk will address the requirements posed by smart grids. It will cover the approaches for massive connectivity offered by new wireless and power line communication technologies: 4G-5G cellular machine type communications, long range and low power wireless access, as well as narrow band and broadband PLC for IoT. Advances in power line communications are presented such as PLC wireless hybridization and machine learning tools for the design of PLC systems. In addition, we will discuss the recently proposed approaches that exploit PLC devices to enable grid diagnostics for protection/maintenance by processing high frequency signals.

Keynote 6: Benjamin Marshall, SSE National HVDC Centre, HVDC Technology Manager, UK
Date : September 30, 2020 10.50-11.50 AM

Biography: As the HVDC Technical Manager, Ben oversees the team of Simulation Engineers undertaking detailed HVDC simulation studies in real-time using vendor-supplied replica hardware, to understand multi-infeed, multi-terminal and multi-vendor HVDC operation and interactions, for real schemes in GB; interpreting the results to gain insights to improve the design and operation of HVDC schemes.

Ben previously has had a 23 year long and varied career within National Grid with a broad range of experience, particularly with respect to the analysis of the operation and design of the AC and DC transmission systems. He has experience in both offline and realtime EMT simulation and in modelling of convertors across battery, solar wind and HVDC systems, He has developed deep technical skills relating to dynamic stability of power systems and the performance specification of HVDC convertors. Within the ESO, Ben advised on the specification, validation and modelling of new HVDC connections, supporting the compliance connection planning and requirements and provided technical leadership on AC and DC control systems, System Operability, Smart Grids and power system simulation; leading complex power system studies.

Implementing the transition to a non-synchronous dominated low carbon electricity system

Summary: Both in GB and internationally, we are beginning the journey towards a zero carbon future. Inherent to that future is a transition towards increasingly more convertor based generation sources, which have different characteristics to the synchronous generation which have since the beginning of AC transmission systems defined its dynamic and operational paradigm. These differences are both a source of risk and opportunity as convertor-based resources address the challenges of supporting an increasing range of areas of transmission system support and services. To mitigate the risk and realise the opportunities of this transition new techniques for analysis and tools for simulation are required to plug the "information gap" between vendor expertise in control and protection and TSO expertise in the planning, design and operation of transmission networks. In the keynote speech I will describe the challenge facing us and our current activities within the National HVDC centre which are contributing to national and international insights on the journey to net zero.

Keynote 7: Professor Necmi ALTIN, Gazi University, Turkey
Date : September 30, 2020 12.00-13.00 AM

Biography: NECMI ALTIN was born in 1978 in Turkey. He received his diploma in Electrical Education from Gazi University, Turkey in 2000. Then he did his MSc in Electrical Education in the field of 18 Pulse Rectifier Design at Gazi University in 2003. He got his PhD at Gazi University on Design and Implementation of Fuzzy Neural Controlled Grid Interactive Inverter in 2009. He became an assistant professor, an associate professor and a full professor in 2010, 2014 and 2020, respectively.

He has published more than 100 papers in different subjects including power electronics, application of power electronics in renewable energy systems, high power factor rectifiers, grid interactive inverters, smart grids, solid state transformers and control systems. He was a recipient of the Best Paper Award at the 8th International Conference on Renewable Energy Research and Applications. He is member of IEEE and IES. He is currently serving as the associate editor of the IEEE Transactions on Industry Applications for Renewable and Sustainable Energy Conversion Systems Committee. He had been a Visiting Scholar at University of Wisconsin-Milwaukee, USA for two years.

An LLC Resonant Converter for HF-Link Grid Interactive Inverter for MV Applications

Summary: The voltage source inverters (VSIs) are commonly used in grid-connected inverter applications. The transformers have been one of essential component of the grid connected VSI inverters to fulfill the voltage matching and isolation requirements. In initial studies, line frequency transformers (LFTs) are used at the output of the gridconnected VSIs for this aim. However, these transformers increase the cost, weight and size of the system and decrease the efficiency. Therefore, especially in low power applications such as micro-inverters or AC-module inverters, high frequency transformers (HFTs) embedded in DC-DC converter are used instead of the LFTs. This topology also called high-frequency-link inverter. Whereas this topology with a HFT provides same advantages with the LFT, it decreases size and weight, and improves the overall efficiency of the system. In micro-inverters, several converter topologies and soft switching methods have been proposed for the DC-DC converter stage to improve the efficiency.

Isolated unidirectional or isolated bidirectional DC-DC converters have been commonly used and investigated for this inverter topology. Conventional Phase-Shift Full-Bridge (PSFB) converter and Dual Active Bridge (DAB) converters are two popular topologies applied in these applications. These topologies provide same advantages such as providing galvanic isolation and zero-voltage-switching (ZVS) without any additional component. Besides, they have some limitations and drawbacks such as narrow ZVS range or higher circulating currents.

Recently, MV penetration of PV systems have become more common with the increasing power levels of the PV systems. Different multilevel and modular multilevel inverter topologies have been investigated to overcome the semiconductor switch voltage and current limitations. However higher number of the switches has negative effects on the reliability and efficiency of the system. In addition, requirement of additional capacitors inductors and/or balancing circuits, and complicated control schemes make the system more complex.

In these direct MV connection applications, replacing the LFT with HFT which isembedded into power electronic converters introduces many advantages such as significantly reduced size and volume, improved efficiency and extended control functions.

This talk focus on a high-frequency-link PV inverter topology to provide direct connection to the MV grid. Here, different from the past studies, the isolated DC-DC converter is controlled to generate rectified sine wave voltage and current at the DC bus. The grid side inverter circuit operates at line frequency and only inverts the regulated DC voltage and current to AC. Thus, high frequency switching requirement at the grid side and related switching losses are removed. This makes the proposed system suitable for MV grid connected applications. All the current control and regulation actions performed through the DC-DC converter stage. An LLC resonant converter is designed for this DC-DC converter stage. A hybrid modulation scheme employing both frequency modulation and phase-shift modulation methods is applied to control the current and to generate rectified sine waveform at the DC bus. Besides, an optimization study will be introduced to determine the phase-shift – switching frequency pair for any operation point.

Industrial Talk 1: Mr. Yukihisa IIJIMA, Senior Manager, Power Electronics Systems Department, TMEIC, Japan
Date : September 27, 2020 13.10-14.10 PM

Biography:

Professional Experience:

Oct. 2003 to present, Toshiba Mitsubishi-Electric Industrial Systems Corporation, Power Electronics Systems Division

Apr. 2019 General Manager of Fuchu Works & Senior Manager of Power Electronics Systems Department

Apr. 2018 Senior Manager of Power Electronics Department Systems

Oct. 2015 Manager of Development Section in Energy and Environment Power Electronics Systems Department

Apr. 1993 to 2003 Sept., Toshiba Corporation

Mainly engaged in development of the control systems for power converters applied in the electrical power networks and development of inverters applied for battery energy storage systems.

More Renewables, More Stable Power and More Energy Efficiency for Sustainable Future

Summary: The talk introduces high-capacity high-efficiency power electronics solutions contributing to realize the sustainable future. As the business and technical background of solutions, profile of TMEIC is briefly introduced with the concept of PEiE, Power Electronics in Everything.

The talk analyzes the expected share of renewables in global generation capacity and continues to the first topic, the inverters for PV solar generation. In the topic, the power electronics technology for high power efficiency is introduced. Further for high energy availability, the universal inverter is reported to be developed based on a new concept of the modular inverter design.

The second topic introduces the energy storage systems with its sophisticated control. The energy storage systems are expected to enhance stable power transmission from the renewables. The talk covers the inverters for battery energy storage systems and the system control technologies.

The third topic changes the talking point to digitalization. The digitalization is now supporting the remote works from home and web conferences and so on for fight against the COVID-19. In the topic, it is reminded that the digitalization relies on electricity and requires highly reliable power supply systems. As the power supply systems, the talk introduces the uninterrupted power systems for digital facilities and the multiple power compensator for factories manufacturing ICT devices. It is also proposed to apply MPCs for business continuity during the prolonged power outage caused by the extreme weathers.

The fourth topic returns the talking point to the sustainable future but in different aspect, the efficient use of energy. The topic analyzes that more than half of the electricity in the world is consumed by motor applications. For that situation, TMEIC proposes to improv the efficiency further in industries by high voltage motors and its drive inverters.

In the summary, it is noted that the PEiE concept, based on ever-developing power electronics technology, can provide various solutions for the sustainable future.

Industrial Talk 2: Mr. Akihiro Goroumaru, Senior Manager, Business development division, ENNET Corporation, Japan.
Date : September 27, 2020 14.20-15.20 PM

Biography:
Professional Experience:
Oct. 2011 to present, ENNET Corporation
Apr. 2004 to Oct.2011, NTT FACILITIES, INC.

Mainly engaged in business development in electricity retail company utilizing data and controllable equipment to create additional value to commercial customer and generation asset.

Ennet eye® Energy-saving service utilizing AI

Summary: The talk introduces energy saving service Enneteye which utilizes smart meter data and AI to help small and medium enterprises to reduce energy consumption. While energy conservation is being greatly promoted in large-scale facilities such as factories, it is a social issue that energy conservation cannot be promoted by improving operations because there is not enough human resource and investment capital in small and medium-sized enterprises. Enneteye is developed to support these SMEs reduce energy with no capital investment and with efficiency.

Industrial Talk 3: Sanjeeth Sewchurran, Dr.
Date : September 27, 2020 16.40-17.40 PM

Biography: Sanjeeth holds a BSc, MSc and a PhD degree in Electrical Engineering from the University of KwaZuluNatal. He is a member of the South African Institute of Electrical Engineering (SAIEE) and a registered Professional Engineer with the Engineering Council of South Africa (ECSA). He is a Chief Engineer at the eThekwini Municipality in South Africa and has extensive experience in the electrical industry and renewable energy sector. He is a member of the NRS 097 "Grid Integration of Small Scale Embedded Generation" workgroup, the CIGRE "Distributed Energy Resources" workgroup, the Renewable Energy Technical Evaluation Committee, C40 Clean Energy Networks and the Chairman of the eThekwini Electricity Future Technology and Diversification Workgroup.

The drivers, opportunities and challenges of small scale renewable energy projects within Municipalities in South Africa

Summary: Under-frequency load shedding, rising electricity tariffs, environmental concerns, Carbon Taxes, ageing power stations and delays in constructing new power stations has led consumers and municipalities alike to explore various renewable energy generation options to reduce their own electricity needs, whilst assisting the sector.

This talk discusses the drivers of small scale embedded generation projects, identifies the opportunities for renewable energy resources within municipalities and discusses the challenges of small scale renewable energy projects within municipalities in South Africa.

TUTORIALS

Tutorial 1: Enabling Technologies for the Silicon Superjunction MOSFET in Renewable Energy Systems: Recent Developments
Date : September 27, 2020- 09.40-11.50 AM

Organizer: Dr Neville McNeill, University of Strathclyde,
Dr Andrew Hopkins, University of Bristol,

Biography: Neville McNeill has a PhD in power electronics, is a Chartered Engineer, and has worked in the electric vehicle and renewable energy industries. He was at the University of Bristol, UK, for 12 years until 2016 where he was latterly Senior Lecturer in Power Electronics. Since 2016 he has been Senior Research Fellow in Power Electronics at the University of Strathclyde, UK. His main research interest is in high-efficiency multi-kilowatt power electronic conversion for electric vehicle, aerospace and renewable energy applications..

Biography: Andrew Hopkins received the MEng and PhD degrees in Electrical and Electronic Engineering from the University of Bristol, UK, in 2013 and 2018 respectively. His research was on the topic of ancillary techniques for enabling high efficiency power electronics with superjunction MOSFETs. Following his PhD he became a Research Associate before progressing to Senior Research Associate in 2019 in the Electrical Energy Management Group at the University of Bristol, UK. His research interests include high-efficiency power conversion and integrated motor drives for automotive applications

Enabling Technologies for the Silicon Superjunction MOSFET in Renewable Energy Systems: Recent Developments

Summary: Power converters are used in many renewable energy applications including grid-tie inverters and power management systems in electric vehicles. Obtaining high efficiencies is often a key design driver for these power conversion systems as it consequently results in the reduction of lifetime energy consumption and cooling requirements.

Instead of the traditional IGBT, the silicon superjunction (SJ) MOSFET can be applied to raise efficiencies as it exhibits a low specific on-state resistance and rapid switching speed capability. Further, SJ MOSFETs are a well-established technology and benefit from robust gate oxide reliability and avalanche characteristics, offering an attractive alternative to the use of wide-bandgap devices. However, two major challenges must be tackled when applying SJ MOSFETs in the voltage source converter (VSC), which is the fundamental building block in many power converter circuits used in renewable energy systems:

• The SJ MOSFET's intrinsic diode passes a very large reverse recovery charge.

• Its extremely non-linear output capacitance is problematic. Whilst the non-linearity is well-suited to singleended converters, it becomes highly adverse when attempting to use the SJ MOSFET in VSCs.

These factors, if not addressed, will lead to very high switching losses and EMI levels when in a VSC. Following discussion of the motivation for using SJ MOSFETs and their associated issues, recently developed solutions for these challenges, and ongoing research will be presented in this tutorial.

1. The key terminal characteristics of the SJ MOSFET will be outlined. The merits and demerits of silicon SJ MOSFETs when compared to their wide-bandgap counterparts and the traditional silicon IGBT will be reviewed.

2. The challenges of using SJ devices in the VSC will be elucidated.

3. The possibility of using SJ devices in converter families other than the VSC, namely the current source converter (CSC) and impedance source converter (ZSC), will be reviewed. The limitations

of the CSC and ZSC, and the consequent prevalence of the VSC in practical renewable energy systems, will be addressed.

4. The presenters will then attempt to classify techniques for facilitating the use of SJ MOSFETs in VSCs into the following broad, and sometimes overlapping, categories:

- resonant circuits
- auxiliary networks
- switching-aid circuits
- intelligent commutation schemes
- advanced driver control circuits

5. Recent developments of techniques within these categories will be discussed. Examples of practical hardware solutions will be presented.

6. Ongoing research in the field will be highlighted, and areas identified for future research will be discussed.

Tutorial 2: Electric vehicles and psychology
Date : September 27, 2020- 12.00-13.00 AM

Organizers: : Fabio Viola, Ph.D.

Biography: Fabio Viola obtained his driving license at sixteen for motorcycles and at eighteen for cars. He later graduated in electrical engineering and his Ph.D while maintaining his interest in road vehicles. After the first years of research on the study of the phenomenon of the electromagnetic field (pioneering study on the 48 V systems of electric vehicles), on the study on the sizing of grounding and lightning strikes, and high voltage, he lands on research on electric vehicles and inverters powering them. Since 2019 he has also been vice-coordinator of the first Italian engineering course for electric mobility. Now he says he is working, but he really enjoys fantasizing about the future of electric mobility.

Electric vehicles and psychology

Summary: The high diffusion of electric vehicles is evidenced by every sector magazine or by the catalog of all the manufacturers that always insert new models. But what are the user's most hidden reactions to the new world of vehicles? Is the user ready for the fifth level of automation (fully automatic driving and absence of the driving position)?

The purpose of this tutorial is to present and discuss the psychological aspects that influence the adoption of electric vehicles by users and beyond. Topics such as the egg and chicken paradox (electric vehicles and charging stations, who was born first) but also performance anxiety (range anxiety) will be addressed. Contradictions and irony will characterize this tutorial.

Tutorial 3: Basics of Energy Efficiency Indicators, A Deep Dive into Residential Sector
Date : September 27, 2020- 15.30-16.30 PM

Organizers: Bilal DÜZGÜN, Energy Efficiency and Environment Directorate, Turkish Ministry of Energy and Natural Resources,

Biography: Bilal Düzgün born in Kocaeli, completed his undergraduate education in 2011 at İstanbul Technical University, Department of Electrical Engineering. He continues his academic career as Ph.D. candidate in Electrical-Electronics Engineering at Gazi University Technology Faculty. Bilal has experience in designing, monitoring and implementation of energy efficiency policy and programs, data analysis and generating indicators related to energy efficiency. Bilal has involved and managed several international projects on energy efficiency in industry, appliances, power generation and heating & cooling systems. He is currently working for Turkish Ministry of Energy and Natural Resources as the Head of Planning and Supervision Department under Energy Efficiency and Environment Directorate.

Basics of Energy Efficiency Indicators, A Deep Dive into Residential Sector

Summary: Energy efficiency occupies a central place in energy policies as economic growth, environmental issues, energy demand and supply security rise to become top agenda items in national policies. Several indicators are used not only to better understand the progress in energy efficiency but also to determine the effectiveness of implemented policy and strategies. With this tutorial, the basics of indicators and energy efficiency will be introduced. The data collection process on energy efficiency including official sources, surveys and measurements will be presented together with the most commonly used energy efficiency indicators through the examples from the residential sector. Energy consumption breakdown by end-use consumption will be examined and the most frequently used indicators will be explained.

CONFERENCE PROGRAM SUMMARY

Program Summary of ICRERA 2020, September 27-30, 2020, Glasgow, UK

	Sunday, 27 September 2020	Monday, 28 September 2020					Tuesday 29 September 2020					Wednesday, 30 September 2020				
9:10-9:40		Opening Ceremony (30 Min) Yoshinobu Higashi, Former Japan Ambassador to Romania Hidehiko Kikuchi, Corporate Senior Executive, Vice President, TMEIC, Japan Yuji Kawagoe, President and CEO, ENNET Corporation, Japan Dr. Khaled Ahmed, Strathclyde University, UK Fujio Kurokawa, Nagasaki Inst. of Applied Science, Japan Ilhami Colak, Nisantasi University, Turkey													
9:40-10:40	Tutorial-I (130 Min) Neville McNeill, PhD Senior Research Fellow in Power Electronics at the University of Strathclyde, UK Andrew Hopkins, PhD Senior Research Associate in the Electrical Energy Management Group at the University of Bristol, UK	9:40-10:40	Keynote Speech-I (60 Min) Mr. Akira KAWAGUCHI TMEIC, Japan				9:40-10:40	Keynote Speech-III(60 Min) Professor Gungor BAL Gazi University, Turkey							
10:40-10:50		10:40-10:50	Break				10:40-10:50	Break								
10:50-11:50		10:50-11:50	Keynote Speech-II (60 Min) Mr. Carl Barker GE Renewable Energy, UK				10:50-11:50	Keynote Speech-IV (60 Min) Mr. Ricardo Da Silva Scottish Power Renewables, UK				10:50-11:50	Keynote Speech-VI(60 Min) Mr. Benjamin Marshall SSE National HVDC Centre, HVDC Technology Manager, UK			
11:50-12:00	Break	11:50-12:00					11:50-12:00	Break				11:50-12:00	Break			
12:00-13:00	Tutorial-II (60 Min) Fabio Viola, PhD Vice-coordinator of the first Italian engineering course for electric mobility, University of Palermo, Italy	12:00-13:00	Break				12:00-13:00	Keynote Speech-V (60 Min) Prof. Dr. Andrea Tonello University of Klagenfurt, Austria				12:00-13:00	Keynote Speech-VII (60 Min) Professor Necmi ALTIN Gazi University, Turkey			
13:00-13:10	Break	13:00-13:10					13:00-13:10	Break				13:00-13:10	Break			
13:10-14:10	Industrial Talk- I (60 Min) Mr. Yukihisa IIJIMA Senior Manager, Power Electronics Systems Department, TMEIC, Japan	13:10-14:50	VP1 VP2 VP3 VP4 VP5	Virtual Session-1 5 PAPERS (5*20=100 Min)	Virtual Session-2 5 PAPERS (5*20=100 Min)	Virtual Session-3 5 PAPERS (5*20=100 Min)	13:10-14:50	VP11 VP12 VP13 VP14 VP15	Virtual Session-7 5 PAPERS (5*20=100 Min)	Virtual Session-8 5 PAPERS (5*20=100 Min)	Virtual Session-9 5 PAPERS (5*20=100 Min)	13:10-14:50	VP21 VP22 VP23 VP24 VP25	Virtual Session-13 5 PAPERS (5*20=100 Min)	Virtual Session-14 5 PAPERS (5*20=100 Min)	Virtual Session-15 5 PAPERS (5*20=100 Min)
14:10-14:20	Break															
14:20-15:20	Industrial Talk- II (60 Min) Mr. Akihiro Goroumaru, Senior Manager, Business Development Division, ENNET Corporation, Japan	14:50-15:00	Break				14:50-15:00	Break				14:50-15:00	Break			
15:20-15:30	Break	15:00-16:40	VP6 VP7 VP8 VP9 VP10	Virtual Session-4 5 PAPERS (5*20=100 Min)	Virtual Session-5 5 PAPERS (5*20=100 Min)	Virtual Session-6 5 PAPERS (5*20=100 Min)	15:00-16:40	VP16 VP17 VP18 VP19 VP20	Virtual Session-10 5 PAPERS (5*20=100 Min)	Virtual Session-11 5 PAPERS (5*20=100 Min)	Virtual Session-12 5 PAPERS (5*20=100 Min)	15:00-16:40	VP26 VP27 VP28 VP29 VP30	Virtual Session-16 6 PAPERS (6*20=120 Min)	Virtual Session-17 6 PAPERS (6*20=120 Min)	
15:30-16:30	Tutorial-III (60 Min) Bilal DÜZGÜN Energy Efficiency and Environment Directorate, Turkish Ministry of Energy and Natural Resources, Turkey															
16:30-16:40	Break															
16:40-17:40	Industrial Talk- III (60 Min) Sanjeeth Sewchurran, PhD Chief Engineer at the eThekwini Municipality in South Africa												Closing Ceremony			

CONFERENCE PROGRAM SCHEDULE 27 SEPT 2020

Date: 27 SEPT 2020	
9:40-11:50	Tutorial-I Neville McNeill, PhD Senior Research Fellow in Power Electronics at the University of Strathclyde, UK Andrew Hopkins, PhD Senior Research Associate in the Electrical Energy Management Group at the University of Bristol, UK Chairs:Onder Eyecioglu; Alo Allik
11:50-12:00	BREAK
12:00-13:00	Tutorial-II Fabio Viola, PhD Vice-coordinator of the first Italian engineering course for electric mobility, University of Palermo, Italy Chairs:Massimo Caruso; Korhan Kayisli
13:00-13:10	BREAK
13:10-14:10	Industrial Talk- I (60) Mr. Yukihisa IIJIMA Senior Manager, Power Electronics Systems Department, TMEIC, Japan Chairs:Murat Beken, Fabio Viola
14:10-14:20	BREAK
14:20-15:20	Industrial Talk- II (60 Min) Mr. Akihiro Goroumaru, Senior Manager, Business Development Division, ENNET Corporation, Japan Chairs:Neville McNeill, Mehmet Yesilbudak
15:20-15:30	BREAK
15:30-16:30	Tutorial-III Bilal DÜZGÜN Energy Efficiency and Environment Directorate, Turkish Ministry of Energy and Natural Resources, Turkey Chairs:Erdal Irmak; Naci Genc
16:30-16:40	BREAK
16:40-17:40	Industrial Talk- III Sanjeeth Sewchurran, PhD Chief Engineer at the eThekwini Municipality in South Africa Chairs:Mehmet Yesilbudak; Necmi Altin

CONFERENCE PROGRAM SCHEDULE 28 SEPT 2020

Date: 28 SEPT 2020	
9:10-9:40	Yoshinobu Higashi, Former Japan Ambassador to Romania Hidehiko Kikuchi, Corporate Senior Executive, Vice President, TMEIC, Japan Yuji Kawagoe, President and CEO, ENNET Corporation, Japan Dr. Khaled Ahmed, Strathclyde University, UK Fujio Kurokawa, Nagasaki Inst. of Applied Science, Japan Ilhami Colak, Nisantasi University, Turkey **Chairs:Seref Sagiroglu; Nobumasa Matsui**
9:40-10:40	**Keynote Speech-I (60 Min)** **Mr. Akira KAWAGUCHI** **TMEIC, Japan** **Chairs: Brayima Dakyo; Rosario Miceli**
10:40-10:50	**BREAK**
10:50-11:50	**Keynote Speech-II (60 Min)** **Mr. Carl Barker** **GE Renewable Energy, UK** **Chairs:Khaled Ahmed; Inno Davidson**
11:50-12:00	
12:00-13:00	**BREAK**
13:00-13:10	

CONFERENCE PROGRAM SCHEDULE 28 SEPT 2020

VIRTUAL PARALLEL PRESENTATIONS			
Date: 28 SEPT 2020			
	PARALLEL SESSION A	PARALLEL SESSION B	PARALLEL SESSION C
	VIRTUAL SESSION 1 CHAIRS:Mohamed Emad Farrag; John Outram	VIRTUAL SESSION 2 CHAIRS:Rui Li; Arber Haxhiu; Jin Yang	VIRTUAL SESSION 3 HAIRS:Koki Kato; Rodrigo Soto
13:10-13:30	**ID:123 Changing Power Transformer Meteorology to Increase Responsibility of Electric Vehicle Fast Charge Profile** Tohid Harighi (Gazi university)*; Ramazan Bayindir (Gazi University); Uğur gökmen (Gazi Üniversitesi); Leili Eslam Jamalgolzari (Gazi University); ATAOLLAH KHANLARI (Gazi University)	**ID:77 IoT Based Water Quality Monitoring System for Rural Areas** Ali Hadi abdulwahid (Dr)	**ID:19 Analysis of the Impacts of V2G Chargers on LV Grid Harmonics** Jingli Guo (University of Glasgow)*; Jin Yang (University of Glasgow); Preye Ivry (Nortech Management Limited); Clara Serrano (Aston University)
13:30-13:50	**ID:124 Energy Management for EV Charging Based on Solar Energy in an Industrial Microgrid** MURAT AKIL (Başkent University)*; Emrah Dokur (Bilecik S.E. University); Ramazan Bayindir (Gazi University)	**ID:12 Optimal Control of a Standalone Wind-Solar-Battery Power System with a Quasi-Z-Source Inverter** Ivan Grgić (Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, Split); Mateo Bašić (Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, Split)*; Dinko Vukadinović (Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, Split); Matija Bubalo (Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, Split)	**ID:20 Control of Incoming Drain Currents Drawn by Super-Junction MOSFETs in Voltage Source Bridge-Legs** Zhengyang Feng (University of Strathclyde)*; Neville McNeill (University of Strathclyde); Barry Williams (Unknown); Zhengyang Feng (University of Strathclyde)
13:50-14:10	**ID:8 Investigation of thermal behavior of large lithium-ion prismatic cell in natural air convection** Rekabra Youssef (Vrije Universiteit van Brussel)*	**ID:13 Pre-Feasibility Analysis of Electric Vehicle Public Charging Infrastructure in Ontario, Canada** Marika Lamanuzzi (Politecnico di Milano); Jacopo Di Antonio (Politecnico di Milano); Michela Longo (Politecnico di Milano)*; Dario Zaninelli (Politecnico di Milano); Wahiba Yaici (Natural Resources Canada/Canmet ENERGY)	**ID:21 Optimal-and-Robust Control Strategy Decoupling Torque and Magnetic-Flux for IM by IRM-ILQ Design Method** Hiroshi Takami (Shibaura Institute of Technology)*; Tsubasa Waida (Shibaura Institute of Technology); Teppei Masunaga (Shibaura Institute of Technology); Masahiro Watabe (Shibaura Institute of Technology); Masashi Nakamura (Toshiba Mitsubishi-Electric Industrial Systems Corporation); Toshiaki Oka (Toshiba Mitsubishi-Electric Industrial Systems Corporation)
14:10-14:30	**ID:9 Feasibility of a multistage solar still in Southern Africa** Mfanafuthi M Mkhize (Cape Peninsula University of Technology)*; Velaphi Msomi (Cape Peninsula University of Technology)	**ID:17 Development of an improved computer model for organic photovoltaic cells** Han Huang (Swansea University)*; Thomas Coote (Swansea University); Noel Bristow (Bangor University); Tudur Wyn David (Bangor University); Jeffrey Kettle (School of Electronic Engineering, Bangor University, Bangor, Gwynedd, Wales); Grazia Todeschini (Swansea University)	**ID:22 Sensorless Field Weakening Strategy With Overmodulation for High-Speed SPMSM Drives** Runze Jing (Harbin Institute of Technology, Harbin)*; Guoqiang Zhang (Harbin Institute of Technology, Harbin); Guangdong Bi (Harbin Institute of Technology, Harbin); Gaolin Wang (Harbin Institute of Technology, Harbin); Xu Dianguo (Harbin Institute of Technology, Harbin)
14:30-14:50	**ID:10 AC Distribution System with Small Photovoltaic Cells for the Windows of Buildings** Zheng Zhang (Tokyo Denki Univ)*	**ID:18 Development of an Intelligent Control Platform for Vehicle-to-Grid Systems** Jingli Guo (University of Glasgow)*; Jin Yang (University of Glasgow); Preye Ivry (Nortech Management Limited)	**ID:24 Comparison of Different Battery Balancing Methods for use with Second Life Batteries** Jingxi Yang (Loughborough University); Dani Strickland (Loughborough University)*; Mina Abedi-Varnosfaderani (Loughborough University)
14:50-15:00	BREAK	BREAK	BREAK
	VIRTUAL SESSION 4 CHAIRS:Neville McNeill; Murat Akıl	VIRTUAL SESSION 5 CHAIRS:Ahmad Elkhateb; Toyosi Oye	VIRTUAL SESSION 6 CHAIRS:Dimitrios Vozikis; Guoqiang Zhang
15:00-15:20	**ID:25 Frequency estimation using curve fitting** Matthew Strickland (Warwick University); Dani Strickland (Loughborough University)*; Simon J Royston (University of Sheffield); Artis Riepinieks (PNNL)	**ID:36 Instrumentation and Visualization of a Small Scale Downdraft Gasifier** Miguel Rosa (Universidade de Avero, Departamento de Electrónica, Telecomunicações e Informática); Valter Silva (University of Aveiro, Escola Superior de Tecnolgia e Gestão de Águeda)*; Alexandre Mota (Universidade de Avero, Departamento de Electrónica, Telecomunicações e Informática); Miguel Mendonça (University of Aveiro, Escola Superior de Tecnolgia e Gestão de Águeda)	**ID:44 Voltage ▪ Frequency Control Switching Method Using V ▪ f Plane of PV Inverter** Koki Kato (Aichi Institute of Technology)*; Yuji IWANE (Aichi Institute of Technology); Tadahiro Goda (Aichi Institute of Technology); Kazuto YUKITA (Aichi Institute of Technology); Toshiro Matsumura (Aichi Institute of Technology); Toshiya Nanahara (Aichi Institute of Technology); Yasuyuki Goto (Aichi Institute of Technology)
15:20-15:40	**ID:26 Wave Energy Potential with a Magnetic Thread Power Take-Off** Radnya Mukhedkar (University of Canterbury)*; Josh Schipper (University of Canterbury); John Outram (Bathwick Electrical Design Limited)	**ID:37 Modified Variable DC Approach Applicable to Fuel Cells and DOL Batteries in Shipboard Power Systems** Arber Haxhiu (Aalto university)*; Jorma Kyyrä (Aalto University); Ricky Chan (ABB); Sami Kanerva (ABB)	**ID:45 Methods for Increasing Shares of Self-Consumption in Small PV Solar Energy Applications** Andres Annuk (Estonian University of Life Sciences)*; Janar Kalder (Estonian University of Life Sciences); Toivo Kabanen (Estonian University of Life Sciences); Risto Ilves (Estonian University of Life Sciences); Maido Marss (Department of Solar Business, Eesti Gaas AS); Birgitta Martinkauppi (School of Technology and Innovations, Energy Technology University of Vaasa); Peep Miidla (Estonian Center of Industrial Mathematics)
15:40-16:00	**ID:31 Verification of an Active Anti-Islanding Technique Using C-HIL Real Time Simulation** Mohammad Bani Shamseh (TMEIC)*; Alperen Colak (TMEIC); Ruben Inzunza (TMEIC); Tatsuaki Amboh (TMEIC)	**ID:38 Analyses of MPPT algorithms in real test conditions** Thiago Fialho Guimarães (Polytechnic Institute of Bragança)*; Vicente Leite (Polytechnic Institute of Bragança)	**ID:46 On the Influence of trip strips on Rotor Blade Measurements** Rodrigo Soto (Technische Universität Berlin)*; Sirko Bartholomay (Technische Universität Berlin); Marinos Manolesos (Swansea University); Christian Navid Nayeri (Technische Universität Berlin); Christian Oliver Paschereit (ISTA, TU Berlin)
16:00-16:20	**ID:34 A Low Power Photovoltaic Water Pumping System based on a DC-DC Step-up Converter and Standard Frequency Converters** Alice Fey (Polytechnic Institute of Bragança)*	**ID:39 Design of a Smart and Intelligent Energy Efficient Controller for a Bathroom System** Toyosi Oye (Edinburgh Napier University); Toyosi Oye (Edinburgh Napier University)*	**ID:47 Low Frequency Domino Wireless Power Transfer: A Simulation Study and Analysis** Altynay Smagulova (National Laboratory Astana)*; Mehdi Bagheri (National Laboratory Astana)
16:20-16:40	**ID:35 Influence of the Mission Profile on the lifetime modelling of the Wind Turbine Power Converter – A review** Cameron Simpson (University of Strathclyde)*; Maurizio Collu (University of Strathclyde); Agusti Egea Alvarez (University of Strathclyde)	**ID:40 Feasibility Development of Optimized Smart Indoor Control for Renewable Air-Conditioning** Tosin Oye (Edinburgh Napier University)*	**ID:48 Control Hardware-in-the-Loop Simulation on Fast Frequency Response by Energy Storage System Equipped with Advanced Frequency Detection Algorithm** Yasuaki Mitsugi (Toshiba Mitsubishi-Electric Industrial Systems Corporation)*

CONFERENCE PROGRAM SCHEDULE 29 SEPT 2020

Date: 29 SEPT 2020	
09:00-10:00	**Keynote Speech-III(60 Min)** **Professor Gungor BAL** **Gazi University, Turkey** **Chairs:Dani Strickland; Wahiba Yaici**
10:00-10:10	**BREAK**
10:10-11:10	**Keynote Speech-IV (60 Min)** **Mr. Ricardo Da Silva** **Scottish Power Renewables, UK** **Chairs:Andres Annuk; Alo Allik**
11:10-11:20	**BREAK**
11:20-12:20	**Keynote Speech-V(60 Min)** **Prof. Dr. Andrea Tonello** **University of Klagenfurt, Austria** **Chairs:V. Fernao Pires; Fabio Viola;**
12:20-13:00	**BREAK**

CONFERENCE PROGRAM SCHEDULE 29 SEPT 2020

VIRTUAL PARALLEL PRESENTATIONS			
Date: 29 SEPT 2020			
	PARALLEL SESSION A	PARALLEL SESSION B	PARALLEL SESSION C
	VIRTUAL SESSION 7 CHAIRS:Mariacristina Roscia; Jizhe Wang	VIRTUAL SESSION 8 CHAIRS:Ahmed Aboushady; Yasuaki Mitsugi	VIRTUAL SESSION 9 CHAIRS: Grain Philip Ased; Yudai Furukawa
13:10-13:30	**ID:49 A New Dynamic WPT Driven Capacitor Scooter System** Ryota Miyao (Osaka Institute of Technology)*; Hideki Omori (Osaka Institute of Technology); Toshimitsu Morizane (Osaka Institute of Technology); Hidehito Matayoshi (Osaka Institute of Technology)	**ID:64 Control of grid-connected inverter output current: a practical review** Victor H Avila (Federal University of Technology - Paraná)*; Vicente Leite (Polytechnic Institute of Bragança)	**ID:72 A Current Controlled Virtual Synchronous Machine Adapted for Operation under Unbalanced Conditions** Eros Avdiaj (Politecnico di Milano); Jon Are Suul (SINTEF Energy Research & Norwegian University of Science and Technology)*; Salvatore D'Arco (SINTEF Energy Research); edit Luigi Piegari (Politecnico di Milano)
13:30-13:50	**ID:50 Optimization of Electric Transmission Line Routing for a Renewable Energy Based Micro-Grid System using Geographic Information System (GIS) Spatial Analysis** Rovick P. Tarife (Waseda University)*; Yosuke NAKANISHI (Waseda University)	**ID:65 Bidirectional DC-DC Resonant Converter Design for Electric Vehicle Charging Stations Integration to MVDC Grids** Ibrahim Alhurayyis (Queen's University Belfast)*; Ahmad Elkhateb (Queens University Belfast); D John Morrow (Queen's University Belfast)	**ID:73 Optimization of Single-Axis Discrete Solar Tracking** Joan Francisco Alvarado Molina (EAFIT)*; Esteban Betancur (EAFIT); Alejandro Velásquez (EAFIT)
13:50-14:10	**ID:51 Performance Evaluation of Four Grid-Forming Control Techniques with Soft Black-Start Capabilities** Abdulrahman S. Alassi (Iberdrola)*; Dr K Ahmed (Strathclyde); Agusti Egea Alvarez (University of Strathclyde); Omar Ellabban (Iberdrola)	**ID:68 Smart Meter Data Analytics for Occupancy Detection of Buildings with Renewable Energy Generation** Alo Allik (Estonian University of Life Sciences)*; Siim Muiste (Estonian University of Life Sciences); Heino Pihlap (Estonian University of Life Sciences)	**ID:76 A concept schema of a portable IoT-sensor system for smartphones** J. Birgitta Martinkauppi (University of Vaasa)*
14:10-14:30	**ID:53 Control of Switching Frequency Twice the Output Frequency for a Matrix Converter in Induction Heating Application** Satsuki Shibuya (Nagoya Institute of Technology)*; Wataru Kitagawa (Nagoya Institute of Technology); Takaharu Takeshita (Nagoya Institute of Technology)	**ID:69 Monitoring, modeling and simulation of bifacial PV modules over normal and high albedos** Salim Bouchakour (Technical University of Catalonia, UPC)*; Daniel Valencia Caballero (TECNALIA, Donostia-San Sebastian, Spain); Alvaro Luna (Universitat Politecncia de Catalunya); Eduardo Roman Medina (TECNALIA, Donostia-San Sebastian, Spain); El Amin Kouadri Boudjelthia (Centre de Développement des Energies Renouvelables, CDER, 16340, Algiers, Algeria); Pedro Rodriguez (Loyola University Andalusia)	**ID:78 Social Acceptance of Renewable Energy Dedicated to Electric Production in Adrar Region** Harrouz Abdelkader (Department of Hydrocarbon and Renewable Energy, Laboratory (LEESI), University of Adrar, Algeria)*; Djamel Belatrache (Laboratoire de développement durable et d'informatique, Adrar); Ilhami Colak (Nisantasi University); Korhan KAYISLI (Nisantasi University)
14:30-14:50	**ID:54 Transmission Adequacy for Renewable Energy: A Transmission Expansion Model** Momoko Tatsuma (Waseda University)*	**ID:70 A day-ahead multi-approach machine learning technique for photovoltaic power forecasting** zied hajej (LGIPM)*; Aisha Sa'ad (lgipm); Aime Nyoungue (lgipm)	**ID:79 A Study on Effect of Dynamic Quantized Resolution on MPC Based DC-DC Converter with Combinatorial Optimization** koya taguchi (Nagasaki University)*; Hidenori Maruta (Nagasaki University)
14:50-15:00	BREAK	BREAK	BREAK
	VIRTUAL SESSION 10 CHAIRS:Abdulrahman S. Alassi; Ryota Miyao	VIRTUAL SESSION 11 CHAIRS:Victor H Avila; Siim Muiste	VIRTUAL SESSION 12 CHAIRS:J. Birgitta Martinkauppi; Akihiro Goroumaru
15:00-15:20	**ID:80 Stabilization Improvement of MPC based DC-DC Converter with Load Estimation** Naoto Umeno (Nagasaki University)*; Hidenori Maruta (Nagasaki University)	**ID:85 Adaptive PI Control Strategy Based on Fuzzy Logic for an Active Harmonic Compensator** Ahmed Bouhouta (Research Laboratory of Electrical Engineering & Automatic, LREA, University of Médéa); Samir Moulahoum (University of Medea)*; Nadir Kabache (Laboratory of Electrical Engineering and Automatic, University of Medea); Ilhami Colak (Nisantasi University)	**ID:90 Comparative Analysis of Three Low Voltage Fault Ride Through Techniques for Wind Energy Conversion Systems** James G Tait (University of Strathclyde)*; Dr K Ahmed (Strathclyde); Grain P Adam (University of Strathclyde)
15:20-15:40	**ID:81 Generating Open-Source Datasets for Power Distribution Network using OpenStreetMaps** MUHAMMAD ALI (University of New South Wales (UNSW))*; Carlos Macana (ZEPBEN); Krishneel Prakash (UNSW); Robi Islam (University of Sunshine Coast, Queensland, Australia); ILHAMI COLAK (Nisantasi University); Hemanshu Pota (UNSW)	**ID:86 Overview of Fault Ride-Through Requirements for Photovoltaic Grid Integration, Design, and Grid Code Compliance** Elutunji Buraimoh (Durban University of Technology)*; Innocent E Davidson (Durban University of Technology)	**ID:91 Characterization of Street motorcycles for Development of a Hybridization Kit** Laura M. Moreno-Durango (Eafit university)*; Gilberto Osorio-Gómez (Eafit university); Jorge Córdoba-Morales (EIA university)
15:40-16:00	**ID:82 Space Vector Modulation Control of a Grid-connected Wind Turbine with Quasi-Z-Source Inverter** Emanuel P. P. Soares-Ramos (Federal Center for Technological Education of Minas Gerais, Department of Electro-electronics); Laís de Oliveira-Assís (University of Cadiz); Raúl Sarrias-Mena (University of Cadiz); Pablo García-Triviño (University of Cadiz); Carlos Andrés García-Vázquez (University of Cadiz); Luis M. Fernández-Ramírez (University of Cadiz)*	**ID:87 Resynchronization of Islanded Virtual Synchronous Machines by Cascaded Phase and Frequency Controllers Acting on the Internal Power Reference** Francesco Giudicepietro (Politecnico di Milano); Salvatore D'Arco (SINTEF Energy Research); Jon Are Suul (SINTEF Energy Research & Norwegian University of Science and Technology)*; edit Luigi Piegari (Politecnico di Milano)	**ID:92 Criteria to locate lithium batteries within buildings. A study case.** Maria Alejandra Garzón Vargas (Universidad EAFIT)*; Alejandro Velásquez (EAFIT); Esteban Betancur (EAFIT)
16:00-16:20	**ID:83 Blockchain and Fuzzy Logic Application in EV's Charging** Mariacristina Roscia ("University of Bergamo, Italy")*	**ID:88 Photovoltaic MPPT Techniques Comparative Review** Muhammed Lawan (Robert Gordon University); Ahmed Aboushady (Glasgow Caledonian University)*; Dr K Ahmed (Strathclyde)	**ID:93 What is of interest that the buildings of the public electrical companies are also provided with solar energy? Case study "Empresa Eléctrica Centro Sur C.A." in Cuenca-Ecuador.** Daniel Icaza (Catholic University of Cuenca, Cuenca, Ecuador)*; Santiago Pulla (Catholic University of Cuenca, Cuenca, Ecuador)
16:20-16:40	**ID:84 Adaptive Gain-Regulating-based Control of Parallel-Connected Γ-Z-Source Power Converters in Hybrid Microgrids** Mahdi Zolfaghari (Amirkabir University of Technology); Venera Nurmanova (Electrical and Computer Engineering Department, Nazarbayev University)*; Mehdi Bagheri (Electrical and Computer Engineering Department, Nazarbayev University); Gevork B. Gharehpetian (Amirkabir University of Technology (AUT))	**ID:89 Comparison of Conventional and Improved Two-level Converter during ac Faults** Dimitrios Vozikis (University of Strathclyde); Fahad Alsokhiry (King Abdulaziz University); Ahmed Alabdulwahab (King Abdulaziz University); Grain P Adam (University of Strathclyde)*	**ID:94 Back-stepping Control of Off-Grid PV Inverter** Martino O Ajangnay (Juba University)*; Fahad Alsokhiry (King Abdulaziz University); Grain P Adam (University of Strathclyde); Ahmed Alabdulwahab (King Abdulaziz University)

CONFERENCE PROGRAM SCHEDULE 30 SEPT 2020

Date: 30 SEPT 2020	
10:50-11:50	Keynote Speech-VI(60 Min) Mr. Benjamin Marshall SSE National HVDC Centre, HVDC Technology Manager, UK Chairs:Mariacristina Roscia; Necmi Altin
11:50-12:00	BREAK
12:00-13:00	Keynote Speech-VII (60 Min) Professor Necmi ALTIN Gazi University, Turkey Chairs:Daniel Foito; Massimo Caruso
13:00-13:10	BREAK

CONFERENCE PROGRAM SCHEDULE 30 SEPT 2020

VIRTUAL PARALLEL PRESENTATIONS			
Date: 30 SEPT 2020			
	PARALLEL SESSION A	PARALLEL SESSION B	PARALLEL SESSION C
	VIRTUAL SESSION 13 CHAIRS:Naki Guler; Evan S. Jones	VIRTUAL SESSION 14 CHAIRS:Filippo Pellitteri; Nicola Campagna	VIRTUAL SESSION 15 CHAIRS:Claudio Nevoloso; Korhan Kayisli
13:10-13:30	**ID:95 Research Status and Development Trend of Concentrating Solar Power** **qimei chen (National Science Library, Chinese Academy of Sciences)*; yan wang (Institute of Electrical Engineering, Chinese Academy of Sciences)**	**ID:107 Evaluation of LLC Resonant Converter in Anode Power Supply for All-electric Satellites** Hiromasa Kondo (Japan Aerospace Exploration Agency)*; Fujio Kurokawa (Nagasaki Institute of Applied Science)	**ID:113 Full Torque Range Stator Loss Minimization of Post Fault Five-Phase Induction Wind Energy Generators** abdullah mohamed shawier (alexnadria university)*; ayman abdel-khalik (alexnadria university); Dr K Ahmed (Strathclyde); Ragi A Hamdy (Alexandria University)
13:30-13:50	**ID:98 Targets of Countries in Renewable Energy** Faten Faten Ayadi (ENIS); ILHAMI COLAK (Nisantasi University)*; ilhan Garip (Nisantasi Univ); Halil Ibrahim BULBUL (Gazi University)	**ID:108 Critical Conduction Mode Three-Phase Vienna Rectifier** Jizhe Wang (Nagasaki Institute of Applied Science)*; Shanghua Feng (Guangdong Giwee Group Co., Ltd.); Fujio Kurokawa (Nagasaki Institute of Applied Science)	**ID:115 Effect of Electric Vehicle Chargers on the Harmonic Levels of a UK LV Electricity Distribution Network under Steady-State Cable Faults** Graham P Gissing (Aston University)*; Nagi Fahmi (Aston University); Jin Yang (Aston University)
13:50-14:10	**ID:99 Sliding Mode Vector Control of Grid-Connected PV Multilevel Systems Based on Triple Three-Phase Two-Level Inverters** V. Fernao Pires (ESTSetubal/IPS)*; Daniel Foito (ESTSetubal - IPS); Armando Cordeiro (ISEL - IPL); José Silva (INESC-ID, IST, Universidade de Lisboa)	**ID:109 Reliable Power Flow Control in Parallel Transmission Lines Based on UPFC** Harrouz Abdelkader (Department of Hydrocarbon and Renewable Energy, Laboratory (LEESI), University of Adrar, Algeria)*; Boulal Etayeb (U. Adrar); saidi ahmed (tahri mohammed university); Ilhami Colak (Nisantasi University); Korhan KAYISLI (Nisantasi University)	**ID:116 Promotion of EV shift by smart charging service** Akihiro Goroumaru (Ennet Corporation); Yoshiki Endo (Ennet Corporation); Akihiro Goroumaru (Ennet Corporation)*; Naoyuki Takehiro (Ennet Corporation)
14:10-14:30	**ID:101 Degradation Diagnosis Estimating Internal Resistance for Digital Control DC-DC Converter** Yudai Furukawa (Fukuoka University)*; Kazuhiro Kajiwara (Nagasaki Institute of Applied Science); Fujio Kurokawa (Nagasaki Institute of Applied Science); Yoshiyasu Nakashima (FUJITSU Advanced Technology Limited); Nobumasa Matsui (Nagasaki Institute of Applied Science)	**ID:110 A Comprehensive Review of Islanding Detection Methods for Distribution Systems** Kianoush Naraghipour (strathclyde university)*; Dr K Ahmed (Strathclyde)	**ID:118 Transmission Adequacy for Renewable Energy: A Transmission Expansion Model** Momoko Tatsuma (Waseda University)*; Hiroshi Takamori (Waseda University); Kazuaki Iwamura (Waseda University); Yosuke NAKANISHI (Waseda University)
14:30-14:50	**ID:105 Time Series Clustering Analysis of Energy Consumption Data** Umit Cetinkaya (Gazi University)*; Ezgi Avci (Middle East Technical University); Ramazan Bayindir (Gazi University)	**ID:112 A New 0.8Voc Model Technique to Estimate the Peak Global Voltage for Medium Voltage Megawatt Photovoltaic System Integration** Isaac Owusu-Nyarko (University of Strathclyde)*; Dr K Ahmed (Strathclyde)	**ID:134 Optimization of the use and exploitation of the water resource of the catchments of the "Hydroelectric Power Plant Ing. Carlos Mora Carrión" located in the Canton of Zamora.** Daniel Icaza (Catholic University of Cuenca, Cuenca, Ecuador)*; Ricardo Villavicencio (Universidad Católica de Cuenca)
14:50-15:00	BREAK	BREAK	BREAK
	VIRTUAL SESSION 16 CHAIRS:V. Fernao Pires; Umit Cetinkaya	VIRTUAL SESSION 17 CHAIRS:Jizhe Wang; Kianoush Naraghipour	
15:00-15:20	**ID:120 On the Feasibility of Electrification for Large Mobile Cranes** Donovin Lewis (University of Kentucky); Damien Lawhorn (University of Kentucky)*; Dan M. Ionel (University of Kentucky)	**ID:125 Experimental Characterization Of a Double Receiver Dynamic Wireless Charging System** Nicola Campagna (University of Palermo)*	**ID: 14 Adaptive Controller Based on Neural Network Artificial to Improve Three-phase Inverter Connected to the Grid** Daouda Gueye (Alioune Diop University)*; Daouda Gueye (Université Alioune Diop de Bambey-Sénégal); Alphousseyni Ndiaye (Universite Alioune Diop de Bambey-Senegal); Amadou Diao (Université Cheikh Anta Diop de Dakar-Sénégal)
15:20-15:40	**ID:121 The Effect of High Efficiency Building Technologies and PV Generation on the Energy Profiles for Typical US Residences** Evan S. Jones (University of Kentucky)*; Rosemary E. Alden (University of Kentucky); Huangjie Gong (University of Kentucky); Andrew Frye (Tennessee Valley Authority); Donald Colliver (University of Kentucky); Dan M. Ionel (University of Kentucky)	**ID:126 Interior Permanent Magnet Synchronous Machine Drive Powered by Fuel Cell for Automotive Applications** Claudio Nevoloso (University of Palermo)*	**ID: 135 Design of a photovoltaic station for electromobility to be located in the Campus "Luis Cordero El Grande" of the Catholic University of Cuenca** Daniel Icaza (Catholic University of Cuenca, Cuenca, Ecuador)*; Rafael Riera (Universidad Católica de Cuenca)
15:40-16:00	**ID:122 Developing a Framework for Underground Cable Fault-Finding in Low Voltage Distribution Networks** Khalif Ali (Glasgow Caledonian University); Ahmed Aboushady (Glasgow Caledonian University)*; Salah Abdel Maksoud (Port Said University); Mohamed Farrag (Glasgow Caledonian University)	**ID:127 A comparison of different DC-DC converters for energy storage management in nearly-Zero Energy Buildings** Filippo Pellitteri (University of Palermo)*; maurizio Cellura (Università di Palermo); Francesco Guarino (Department of Engineering University of Palermo Palermo, Italy); Rosario Miceli (University of Palermo); Luigi Schirone (Sapienza, University of Rome)	**ID:67 Unified Power Quality Conditioner with Energy Storage based on Active Transformer** Jose David Vidal Leon (Polytechnic University of Catalonia)*; Jose Ignacio Candela (Universitat Politècnica de Catalunya); Pedro Rodriguez (Loyola University Andalusia)
16:00-16:20	**ID:111 LSTM Forecasts for Smart Home Electricity Usage** Rosemary E. Alden (University of Kentucky); Huangjie Gong (University of Kentucky)*; Cristinel Ababei (Nil); Dan M. Ionel (University of Kentucky)	**ID:131 Minas of Huascachaca wind project in Ecuador** Daniel Icaza (Catholic University of Cuenca, Cuenca, Ecuador)*; Santiago Pulla (Catholic University of Cuenca, Cuenca, Ecuador); Juan Portoviejo (Universidad Católica de Cuenca)	
16:20-16:40	**ID:130 Proportional Resonant and Proportional Integral Based Control Strategy for Single Phase Split Source Inverters** Naki GÜLER (Gazi University)*	**ID:133 Design of lighting systems using solar energy sources for rural outdoor use: Case study of the Guapán hot springs tourism project** Daniel Icaza (Catholic University of Cuenca, Cuenca, Ecuador)*; Vinicio Guallpa (Universidad Católica de Cuenca)	
16:40-17:00	**CLOSING CEREMONY**		

Presentation Instruction for ICRERA 2020 Presenters

Virtual presentation

Presentation time is 20 minutes including 5 minutes Question/Discussion.

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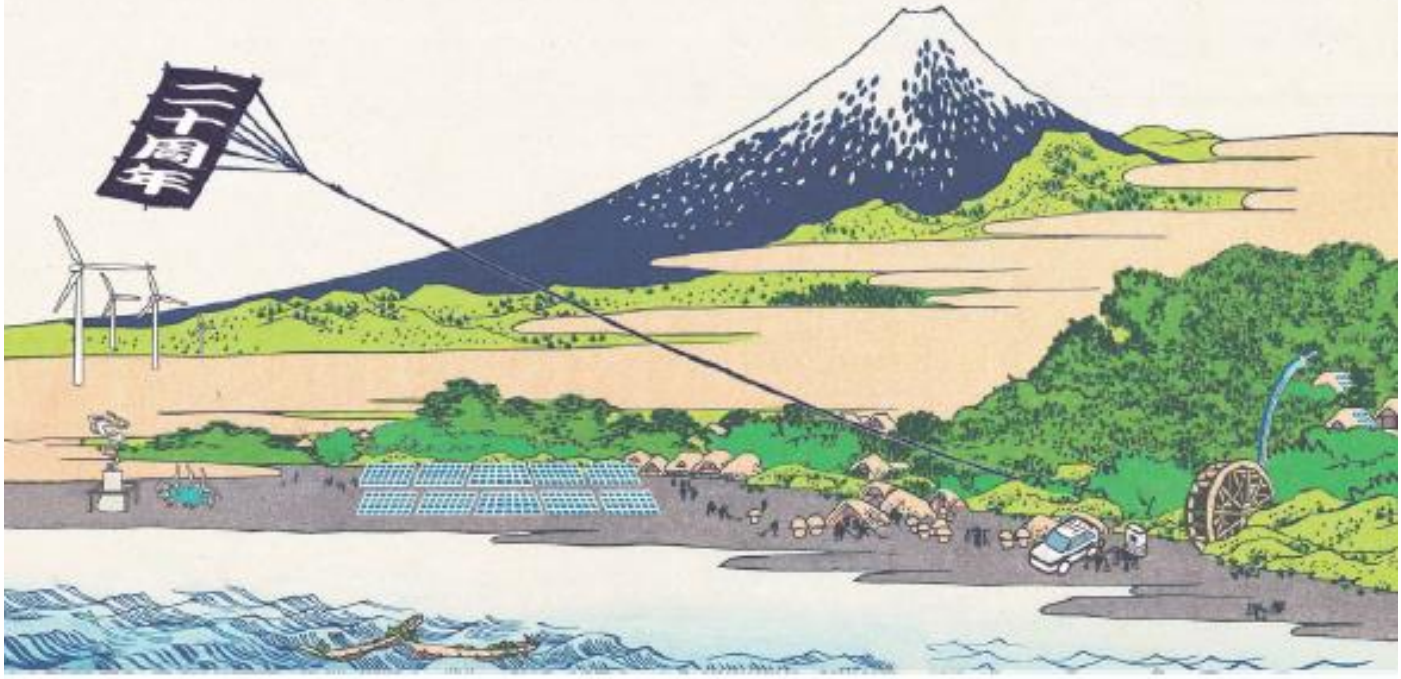

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