

Posters

Session 1 - Network components

Wednesday, 5 June 2019 from 9:00 to 18:00

Block 1: Asset management and condition assessment of Network Components – Cables, lines and associated components

- 37 **Cross-bonding for MV cable systems: advantages and impact on accessories design**
Ralf Meier, NKT (Germany) • Dario Quaggia, Prysmian Group (Italy) • Ladislaus Kehl, TE Connectivity (Germany)
- 43 **Field Study of Intermittent Faults in Low-Voltage Underground Cable Systems**
Armand van Deursen, Eindhoven University of Technology (Netherlands) • Peter Wouters, Eindhoven University of Technology (Netherlands) • Han Slootweg, Eindhoven University of Technology / Enexis Netbeheer (Netherlands) • Fred Steennis, DNV GL Energy & Eindhoven University of Technology (Netherlands)
- 52 **Automated visual inspection – comparing computer vision to machine learning**
Joao Gomes-Mota, Albatroz Engineering (Portugal)
- 54 **Dry Zone Formation Surrounding Underground Medium Voltage Cables During Load Cycling**
Ossama Gouda, Cairo University (Egypt)
- 97 **A Risk-Assessed Approach to Overhead Line Corridor Clearance Management**
Jason Noctor, ESB International (Ireland) • Patrick Porter, ESB International (Ireland) • Oisín Armstrong, ESB International (Ireland) • Alan Carroll, ESB International (Ireland)
- 99 **The Application of Advanced Data Analytics to Smart Meter Data**
Peter Kai Cheung Wong, Jemena (Australia) • Steven Spence, Jemena (Australia) • Jiangxia Zhong, Jemena (Australia)
- 263 **Lightning protection of unshielded overhead medium voltage power lines in South Africa**
Andreas Beutel, Eskom Holdings SOC Ltd (South Africa) • Bruce McLaren, Eskom Holdings SOC Ltd (South Africa) • Hendri Geldenhuys, Eskom Holdings SOC Ltd (South Africa) • Willem Dirkse Van Schalkwyk, Eskom Holdings SOC Ltd (South Africa) • John Van Coller, University of Witwatersrand (South Africa)
- 415 **Interpretation of Statistical Analysis on LV Asset Condition**
Maikel Klerx, Eindhoven University of Technology (Netherlands) • Johan Morren, Eindhoven University of Technology / Enexis Netbeheer (Netherlands) • Aad Prein, Stedin (Netherlands) • Denny Harmsen, Alliander (Netherlands) • Edwin Groot-Kabalt, Ksandr (Netherlands) • Han Slootweg, Eindhoven University of Technology / Enexis Netbeheer (Netherlands)
- 535 **Asset Management of HV Cables on an Electricity Distribution Network Using On-line Condition Monitoring**
Graham Earp, EA Technology (United Kingdom) • John Burns, NIE Networks (United Kingdom)
- 569 **The THOR Hammer Tester - a step change in the management of wooden utility poles**
Ralph Eyre-Walker, SP Energy Networks (United Kingdom) • Catherine Dow, SP Energy Networks (United Kingdom) • Russell Bryans, SP Energy Networks (United Kingdom) • Baraneedaran Sriskantharajah, Groundline Engineering (United Kingdom)

- 597 **Tracking the degradation of polyethylene insulation in medium voltage power cables**
 Quentin PELZER, EDF (France) • Lara PERRIN, LEPMI (France) • Adrien RESMOND, EDF (France) • Petru NOTINGHER, IES (France)
 • Xavier COLIN, PIMM (France) • Mouna BEN-HASSINE, EDF (France) • Houssam TANZEGHTI, ENEDIS (France) • Lionel FLANDIN,
 LEPMI (France)
- 662 **A disruptive method for vegetation management on Enedis' Medium**
 Michel CORDONNIER, Enedis (France) • Paolo GUZZINI, Delair (France)
- 694 **Material efficiency for circular economy: from assessments to optimizations**
 Thierry Cormenier, Schneider Electric (France) • Marcel Chevalier, Schneider Electric (France) • Karim Helal, Schneider Electric
 (France) • Matthieu Briens, Schneider Electric (France)
- 757 **Measuring PD propagation in complex MV distribution network configurations**
 Sonia Raquel Barrios Pereira, Ormazabal Corporate Technology (Spain) • Ian Gilbert, Ormazabal Corporate Technology A.I.E
 (Spain) • Iñaki Orue, Ormazabal Corporate Technology A.I.E (Spain) • Patrick Mulroy, Ormazabal Corporate Technology A.I.E
 (Spain) • Aritz Hurtado, Ormazabal Corporate Technology A.I.E (Spain)
- 774 **Utility pole deterioration modeling by machine learning with big data of distribution facility inspection result**
 Masaru Yamanaka, Kansai Electric Power Co.,Inc. (Japan) • Tatsuya Tokunaga, Kansai Electric Power Co.,Inc. (Japan) • Tatsushi
 Matsuki, Kansai Electric Power Co.,Inc. (Japan)
- 807 **A new approach for evaluating the condition of cable systems and estimation of remaining life time of MV**
 Tobias Neier, BAUR GmbH (Austria) • Manfred Bawart, BAUR GmbH (Austria) • Sung Min Kim, KEPCO Korean Electric Power
 Corporation (Korea, Republic of) • Jens Knauel, BAUR GmbH (Austria)
- 921 **Automated Identification technology of Trees Endangering to Distribution Facilities by using Mobile Mapping**
 Daiki Mori, CHUBU Electric Power Co.,Inc. (Japan) • Yasuhisa Watanabe, CHUBU Electric Power Co.,Inc. (Japan) • Itushi Ishihara,
 CHUBU Electric Power Co.,Inc. (Japan) • Masato Ohori, Hitachi Solutions, Ltd. (Japan)
- 940 **DISTRIBUTION SURGE ARRESTER MONITORING**
 Michel CORDONNIER, Enedis (France) • Christian GAZZOLA, DERVASIL (France) • Damien Jeanneau, Sicame (France) • Iulia IVAN,
 Enedis (France) • Denis SPORTIELLO , Enedis (France) • Alban-Marie LIMONET, Enedis (France)
- 943 **Standardization and contingency storage for submarine cable systems**
 Hans Lavoll Halvorson, SINTEF Energy Research (Norway) • Magnus Johansson, REN Sjøkabelberedskap AS (Norway) • Bjørn
 Haukanes, REN Sjøkabelberedskap AS (Norway)
- 1037 **Energy harvesting technology applicable to Distribution Line**
 Boo-hyun Shin, KEPCO(Korea Electric Power Corporation) (Korea, Republic of) • Jun-hyuk Lm, KEPCO(Korea Electric Power
 Corporation) (Korea, Republic of)
- 1114 **Pioneer earth systems remote monitoring for secondary distribution substations**
 Lúgia Fernandes, EDP Distribuição – Energia, S.A. (Portugal) • Ricardo Catalão, EDP Distribuição – Energia, S.A. (Portugal) • Luís
 Pires, EDP Distribuição – Energia, S.A. (Portugal) • João Pinto, EDP Distribuição – Energia, S.A. (Portugal) • Carolina Janeiro, EDP
 Distribuição – Energia, S.A. (Portugal) • Luís Rocha, EDP Labelec (Portugal) • Marcos Cordeiro, Eneida Wireless and Sensors, S.A.
 (Portugal)
- 1123 **Use of fault statistics for the management of aging medium voltage PILC cable systems**
 Jens Zoëga Hansen, Danish Energy (Denmark)
- 1128 **Condition Monitoring of Surge Protective Devices by Measuring the Magnetic Field of Discharge Currents in**
 Stefan Joerres, University of Kassel (Germany) • Albert Claudi, University of Kassel (Germany) • Gernot Finis, Phoenix Contact
 GmbH & Co.KG (Germany) • Martin Wetter, Phoenix Contact GmbH & Co.KG (Germany)
- 1146 **Characterization of the frequency-dependent transmission losses of the grid up to 500 kHz**
 Igor Fernández, University of the Basque Country (UPV/EHU) (Spain) • Itziar Angulo, University of the Basque Country
 (UPV/EHU) (Spain) • Amaia Arrinda, University of the Basque Country (UPV/EHU) (Spain) • David de la Vega, University of the
 Basque Country (UPV/EHU) (Spain) • Ibon Arechalde, Tecnalia (Spain) • Noelia Uribe-Perez, Tecnalia (Spain) • Txetxu Arzuaga,
 ZIV Automation (Spain)

- 1149 **Impact of fault localization on MV cables on adjacent telecommunication cables**
Blandine Hennuy, ENGIE-Laborelec (Belgium) • Jonathan Moens, Laborelec (Belgium) • Marcel Van Den Berg, Sibelga (Belgium) • Philippe Colin, Ores (Belgium) • Joost Van Slijcken, Fluvius (Belgium)
- 1189 **Research and Application of Distribution Network Equipment Remote Monitoring and Fault Diagnosis System**
Le Gu, Guangzhou Power Supply Co.,Ltd (China) • Haibo Su, Guangzhou Power Supply Co.,Ltd (China) • Yong Wang, Guangzhou Power Supply Co.,Ltd (China) • Jun Chen, Guangzhou Power Supply Co.,Ltd (China) • Huihong Huang, Guangzhou Power Supply Co.,Ltd (China) • Wenxiong Mo, Guangzhou Power Supply Co.,Ltd (China)
- 1369 **Propagation Characteristics of Partial discharge Signals in Medium Voltage Branched Cable Joints using HFCT**
Muhammad Shafiq, University of Vaasa (Finland) • Guillermo Robles, Carlos III University of Madrid (Spain) • Kimmo Kauhaniemi, University of Vaasa (Finland) • Brian Stewart, University of Strathclyde (United Kingdom) • Matti Lehtonen, Aalto University (Finland)
- 1390 **Features Selection for Partial Discharge and Interference Recognition of HV Cables based on Random Forest**
Ganjun Wang, Zhongshan Power Supply Bureau of the Guangdong Power Grid Corporation, China Southern Power Grid Co., Ltd. (China) • Jingshu Li, Huazhong University of Science and Technology (China) • Yufeng Hu, China Southern Power Grid Co., Ltd. (China) • Xiaosheng Peng, Huazhong University of Science and Technology (China) • Yijiang Wu, Zhongshan Power Supply Bureau of the Guangdong Power Grid Corporation, China Southern Power Grid Co., Ltd. (China) • Yuzhu Chen, Huazhong University of Science and Technology (China)
- 1492 **Frequency Response of a Real Cable Network and its Impact on Field PD Measurements**
Saliha Abdul Madhar, Haefely Test AG / TU Delft (Switzerland) • Petr Mraz, Haefely Test AG (Switzerland) • Sonia Raquel Barrios Pereira, Ormazabal Corporate Technology (Spain) • Nabil Akroud, Ormazabal Corporate Technology (Spain)
- 1497 **Practical method for global earthing system determination of the urban area**
Primož Hrobat, EIMV (Slovenia) • Jure Strmec, EIMV (Slovenia) • Vilijem Bonča, Elektro Gorenjska (Slovenia)
- 1718 **Ambient Temperature Influence on Cable Trifurcating Joint Failures**
ShengJi Tee, SP Energy Networks (United Kingdom) • Malcolm Bebbington, SP Energy Networks (United Kingdom) • David Neilson, SP Energy Networks (United Kingdom) • Russell Bryans, SP Energy Networks (United Kingdom) • Matthew Jones, SP Energy Networks (United Kingdom) • Jonathan Fox, SP Energy Networks (United Kingdom)
- 1739 **Optimizing network replacement with AI**
Odilon Faivre, Enedis (France) • Pierre Cochet, Enedis (France) • Jérémie Mérigeault, Enedis (France) • Sébastien Folleville, Enedis (France)
- 1747 **Investment Decision-Making Using Probabilistic Life Cycle Costing – Comparing Flooded Lead-Acid and Lithium**
Jan Henning Jürgensen, KTH Royal Institute of Technology (Sweden) • Åsa Majlund, KTH Royal Institute of Technology (Sweden) • Patrik Gustafsson, KTH Royal Institute of Technology (Sweden) • Eysteinn Eiríksson, KTH Royal Institute of Technology (Sweden) • Patrik Hilber, KTH Royal Institute of Technology (Sweden)
- 1749 **Integrating Circular Economy in Asset Management. A case study on circular asset development.**
co den Hartog, Liander N.V. (Netherlands) • Sanne Preso, Qirion N.V. (Netherlands) • Dominique Hermans, Alliander N.V. (Netherlands)
- 1768 **Deterioration Trend Analysis Utilizaing Environmental Data and Asset Management: the Case of Porcelain Cutout**
Daisuke Muramoto, The Kansai Electric Power Company (Japan) • Koichi Tanaka, The Kansai Electric Power Company (Japan) • Kazuhiro Murata, The Kansai Electric Power Company (Japan)
- 1866 **Condition assessment of medium voltage underground cables based on tangent delta and partial discharge**
Pertti Pakonen, Tampere University (Finland) • Juha Keränen, Helen Sähköverkko Oy (Finland) • Tuomo Heinonen, Dekra Industrial Oy (Finland) • Pekka Verho, Tampere University (Finland)
- 1890 **On-Site Testing of 66 kV Subsea Array Cables for Off-Shore Windfarms**
Uwe Kaltenborn, Highvolt Prüftechnik Dresden GmbH (Germany) • Peter Coors, Highvolt Prüftechnik Dresden GmbH (Germany) • Ralf Pietsch, Highvolt Prüftechnik Dresden GmbH (Germany) • Thomas Steiner, Highvolt Prüftechnik Dresden GmbH (Germany)

1980 **A Battery Testing Toolbox for Real-World Operating Conditions**

Jelle Smekens, Laborelec (Belgium) • Dominique Corbisier, Laborelec (Belgium) • Dries Lemmens, Laborelec (Belgium) • Rafael Jahn, Laborelec (Belgium) • Catherine Stuckens, Laborelec (Belgium) • Felix Hildenbrand, RWTH Aachen (Germany)

2133 **Autonomous monitoring system for the detection of disrupting power cables on distribution networks using**

Ignacio Leonardo Del Hoyo, UTFPR (Brazil) • José Francisco Bianchi Filho, Lactec (Brazil) • Gerson Alcantara Andrade, Copel (Brazil) • Guilherme Cordeiro Vogt, UFPR (Brazil) • Yan Victor Murmel, UTFPR (Brazil) • Sebastião Ribeiro Júnior, UFPR (Brazil) • Alan Naoto Tabata, Lactec (Brazil) • Gabriel dos Santos Haveroth, Lactec (Brazil)

2154 **Low voltage overhead distribution Neutral wire multi-Grounding by Poles (NGP)**

Mehrdad Tarafdar Hagh, University of Tabriz (Iran, Islamic Republic of) • Vahid Chakeri, University of Tabriz (Iran, Islamic Republic of)

2331 **Test recommendations for ground screen power cable connections (poster linked to the CIRED working group)**

Sverre Hvidsten, SINTEF Energy Research (Norway)

Block 2: Asset management and condition assessment of Network Components – Substations, switchgear and transformers

93 **Fingerprinting made easy by machine learning**

Sathiswar Jayaseelan, TUE (Netherlands) • Albert Pondes, Enexis (Netherlands) • Armand Deursen, van, TUE (Netherlands) • Han Sloodweg, Eindhoven University of Technology / Enexis Netbeheer (Netherlands)

110 **Residual Magnetic Flux of Transformer at Power System Accident**

Yukihiko Himata, Tokyo Denki University (Japan) • Takashi Nakajima, Tokyo Denki University (Japan) • Tadashi Koshizuka, Tokyo Denki University (Japan) • Shiro Maruyama, Toshiba Energy Systems & Solution Corporation (Japan) • Minoru Saito, Toshiba Energy Systems & Solution Corporation (Japan) • Hiroyuki Maejima, Toshiba Energy Systems & Solution Corporation (Japan)

227 **Identification of Copper or Aluminum for Winding Material of Dry Type Transformer**

W X MO, Power Test and Research Institute Guangzhou Power Supply Company (China) • H B WANG, Power Test and Research Institute Guangzhou Power Supply Company (China) • K YIN, Power Test and Research Institute Guangzhou Power Supply Company (China) • W CAO, wuhan university (China) • Y QIN, Power Test and Research Institute Guangzhou Power Supply Company (China) • J G WANG, wuhan university (China) • L GAN, Power Test and Research Institute Guangzhou Power Supply Company (China) • Y D FAN, wuhan university (China)

383 **Partial Discharge alert system in medium voltage switchgear**

Carlo Gemme, ABB (Italy) • Francesco Guastavino, University of Genova (Italy) • Kai Hencken, ABB (Switzerland) • Andrej Krivda, ABB (Switzerland) • Yannick maret, ABB (Switzerland) • Marco Testa, ABB spa (Italy) • Federico Gallesi, University of Genova (Italy)

384 **Installed base modernization and monitoring solution at Petrochemical Company**

Carlo Gemme, ABB (Italy) • Danie Mare, ABB (South Africa) • Junaid Sulaiman, petrochemical company (South Africa)

417 **Criteria to Prioritize the Replacement of HV Instrument Transformers in a Distribution Utility: a Practical**

José Luis Martínez, Edenor S.A. (Argentina)

541 **Smart Distribution Substation design for a sustainable and efficient DSO model**

Cristina Fundulea, Scottish Power Energy Networks (United Kingdom) • Maria Anzola, Scottish Power Energy Networks (United Kingdom) • David Macdonald, University of Strathclyde (United Kingdom)

573 **New generation of Smart low-voltage switchgear and controlgear assembly**

Javier Cormenzana, Ormazabal (Spain) • Roberto Martinez, Ormazabal (Spain) • Sergio Sebastián, Ormazabal (Spain) • Susana Carillo, Endesa (Spain) • Francisco Javier Leiva, Endesa (Spain)

658 **Asset management application. Instrument Transformers On Line Monitoring System**

Nuria Calvo, Artech (Spain) • Enrique Chávez, Artech (Mexico) • Rolando Gómez, Artech (Mexico)

- 676 **Research on Intelligent Diagnosis Method of Oil Temperature Defect in Distribution Transformer Based on**
 Fei Xiao, State Grid ShangHai Municipal Electric Power Company (China) • Guo-jian Yang, State Grid ShangHai Municipal Electric Power Company (China) • Wei Hu, Tellhow Software Co. Ltd. (China)
- 697 **Sweep Frequency Response Analysis test as tool for distribution transformers management**
 Hernan Mayora, IITREE - LAT (Argentina) • Raúl Emilio Alvarez, IITREE - LAT (Argentina) • Emilio Calo, IITREE - LAT (Argentina) • Leonardo Catalano, IITREE - LAT (Argentina) • Pablo Morcelle del Valle, IITREE - LAT (Argentina)
- 835 **Integrating Life Cycle Assessment in operational Asset Management decision making: A case study on asset**
 Willem Haanstra, University of Twente (Netherlands) • Rolf Gelpke, University of Twente (Netherlands) • co den Hartog, Liander N.V. (Netherlands) • Ihsan Karakoc, Liander Assetmanagement (Netherlands)
- 865 **End of life evaluation of power transformers**
 Jose Quintana, SP Energy Networks (United Kingdom) • David Walker, SP Energy Networks (United Kingdom) • Ian Hunter, Polaris Diagnostics (United Kingdom)
- 884 **Towards Smart Digital Circuit Breakers enabling advanced control and diagnostic features**
 Marco Testa, ABB spa (Italy) • Pierino Bertolotto, ABB spa (Italy) • Diego Pagnoncelli, ABB spa (Italy) • Marco Riva, ABB spa (Italy)
- 887 **Distribution transformer modelling and monitoring**
 jean françois tissier, ITRON (France) • j erome Cornet, ITRON (France) • Laurent Party, ITRON (France) • Pierre Jeanne, ITRON (France)
- 1009 **Lifecycle cost analysis of online dissolved gas analysis monitors**
 Simon Sutton, Doble Engineering Company (United Kingdom) • John Skog, Maintenance and Test Engineering LLC (USA)
- 1030 **Compact Solutions for Electrical Installations in Urban Infrastructure**
 Dhiraj Ingole, The Tata Power Co. Ltd (India) • Chintamani Chitnis, The Tata Power Co. Ltd (India) • Bhagyalakshmi Nair, The Tata Power Co. Ltd (India) • Sandeep Kundargi, The Tata Power Co. Ltd (India)
- 1129 **Ageing behaviour of medium-voltage substations**
 Petros Dalamaras, University of Wuppertal (Germany) • Markus Zdrallek, University of Wuppertal (Germany) • Ulrich Gro , Rheinische NETZGesellschaft mbH (Germany) • Martin Knapp, Rheinische NETZGesellschaft mbH (Germany) • Heike Schulze, Mitteldeutsche Netzgesellschaft Strom mbH (Germany) • Patrick Kl ockner, MVV Netze GmbH (Germany) • Axel Straube, SWS Netze Solingen GmbH (Germany) • Ralf Gawlitta, SWS Netze Solingen GmbH (Germany)
- 1187 **Forensic studies on 9teardown power transformers - Correlation between DPv paper and 2-FAL**
 Jo o Vasco Ferreira, EDP Distribui o (Portugal) • Cristina Carvalho, EDP Distribui o (Portugal) • Lu s Pinto S , EDP Distribui o (Portugal) • Anabela Peixoto, LABELEC (Portugal) • Rui Martins, LABELEC (Portugal)
- 1188 **MV/LV Transformer Substations Monitoring gives rapid response to faults (Case Studies-New Technologies)**
 Rafael Minguez, Viesgo Distribucion (Spain) • Igor Auzokoa, Ingeteam Power Technology (Spain) • Benito Barrenetxea, Ingeteam Power Technology (Spain) • Javier Celada, Ingeteam Power Technology (Spain) • Rafa Toledo, Ingeteam Power Technology (Spain) • Jose Antonio Saez, Viesgo Distribucion (Spain) • Marcos Alvarez, Viesgo Distribucion (Spain)
- 1312 **The performance of in-service shunt capacitor switching devices as investigated by CIGRE WG A3.38**
 Edgar Dullni, ABB AG (Germany) • Benjamin Baum, DNVGL (New Zealand) • Daniel Desmond, S&C Electric Comp. (USA) • Christian Heinrich, Siemens (Germany)
- 1333 **Investigations at operational aged switchgears with the age up to 50 years**
 Thomas Gr f, Hochschule f r Technik und Wirtschaft Berlin (Germany)
- 1479 **Distribution transformer integration in Eco-grid**
 Alexandre HAMMEN, Schneider Electric (France) • Gianluca RANALLETTA, Schneider Electric (France)
- 1521 **On-line PD monitoring of Medium Voltage assets: an innovative approach to improve asset management**
 Andrea Caprara, Techimp - Altanova group srl (Italy) • Giacomo Ciotti, Techimp - Altanova group srl (Italy)

- 1587 **Digital remote IOs to simplify Substation retrofits & upgrades:** **ENEDIS PCCN example**
Jean-Pierre MOLINIE, ENEDIS (France) • Jean MARMONIER, Schneider-Electric (France) • Julien CORNILLE, Schneider-Electric (France) • Bruno ANDRÉ, Schneider-Electric (France)
- 1593 **Quality and Reliability of Smart Grid Components**
Massimo Bartolucci, Enel (Italy) • Stefano Gottardelli, Enel (Italy) • Alfonso Sturchio, Enel (Italy) • Giuseppe Molina, Enel (Italy) • Fabio Zucchetti, Enel (Italy)
- 1613 **Smart Secondary Substation. A reality and a big opportunity for innovative solutions for predictive maintenance**
Iñaki Apellaniz, Ormazabal (Spain) • Joseba Arostegui, Ormazabal (Spain) • José Ramón Tejedo, Iberdrola (Spain) • Juan Antonio Sánchez, Ormazabal (Spain)
- 1735 **Thermal measurement on a HV/LV substation installed in a building - Study and thermal balance on ventilation**
Coyade Jean - Miichel, EDF R&D (France) • Basuyaux Laurent, EDF R&D (France)
- 1744 **Dynamic Thermoelectric Modelling of Oil-filled Transformers for Optimized Integration of Wind Power in**
Syed Hamza Hasan Kazmi, Orsted Offshore Wind A/S (Denmark) • Joachim Holbøll, Technical University of Denmark (DTU) (Denmark) • Thomas Herskind Olesen, Orsted Offshore Wind A/S (Denmark) • Troels Stybe Sørensen, Orsted Offshore Wind A/S (Denmark)
- 1821 **Monitoring of a large fleet of Substation Power transformers**
Mohammed ZOUITI, Enedis (France) • Annie KIRCHE, Enedis (France) • Antoine TROBOIS, Edf International networks (France) • Laurent KARSENTI, Edf International networks (France)
- 1865 **On-Site Testing of Distribution Transformers**
Uwe Kaltenborn, Highvolt Prüftechnik Dresden GmbH (Germany) • Andreas Thiede, Highvolt Prüftechnik Dresden GmbH (Germany)
- 1881 **Automated Testing of Distribution Transformers and Utilization of Test Information**
Raoul Harkenthal, HIGHVOLT Prüftechnik Dresden GmbH (Germany) • Uwe Kaltenborn, Highvolt Prüftechnik Dresden GmbH (Germany) • David Kremzow, HIGHVOLT Prüftechnik Dresden GmbH (Germany)
- 1924 **Smart Distribution Transformers: Non-Invasive Sensing to Enable Business Transformation**
Joana Faria, University of Coimbra (Portugal) • David Lima, University of Coimbra (Portugal) • Luís Oliveira, eneida.io (Portugal) • José Oliveira, Eneida.IO (Portugal) • Francisco Cardoso, University of Coimbra (Portugal)
- 1931 **Anomalies in On-Load Tap Changers: failure prevention through continuous monitoring and advanced data**
Marco Tozzi, Camlin Power Ltd (United Kingdom) • Steve Cox, Electricity North West (United Kingdom) • Lorenzo Chiesi, Camlin Technologies (Italy) • Anatoliy Mudryk, Camlin Power Ltd (United Kingdom)
- 2017 **Overview of Non Intrusive Methods for Switchgear Condition Assessment prepared by CIGRE/CIREDA A3.32**
Nenad Uzelac, G&W Electric Co. (USA) • Nicola Garibaldi, Qualitrol (Switzerland) • Christian Heinrich, Siemens (Germany) • Colin McCahey, ESP International (Ireland) • Per Westerlund, KTH Royal Institute of Technology (Sweden)
- 2089 **Mitigation of lock-in effect for compact substations with transformers meeting future EU efficiency regulations**
Radosław Szewczyk, DuPont (Poland) • Philippe Trifigny, Cahors (France) • Jean-Claude Duart, DuPont (Switzerland)
- 2260 **Field PD testing on solid dielectric MV switch**
Ana Milosevic, Electrical engineering Institute Nikola Tesla (Serbia) • Nenad Kartalovic, Electrical engineering Institute Nikola Tesla (Serbia) • Srdjan Milosavljevic, Electrical engineering Institute Nikola Tesla (Serbia) • Nenad Uzelac, G&W Electric Co. (USA) • R. J. Reg Gamblin, Manitoba Hydro (Canada) • Mark Niemczyk, Manitoba Hydro (Canada) • Udo Ranninger, Omicron Electronics (Austria)
- 2300 **Practical Study on Ventilation & Cooling of MV distribution substations and Providing Effective Ventilation**
Saeed Abachizadeh, Tabriz Power Distribution Company (Iran, Islamic Republic of) • Masoud Rahmani, Tabriz Power Distribution Company (Iran, Islamic Republic of) • Rahim Hamrah, Tabriz Power Distribution Company (Iran, Islamic Republic of)

2324 **Smart Solution and Application for MV class Switchgear**

Hyun-Wook Lee, LSIS Co. (Korea, Republic of) • Young-Woo Jeong, LSIS Co. (Korea, Republic of) • Seog-Won Lee, LSIS Co. (Korea, Republic of) • Kil-Young Ahn, LSIS Co. (Korea, Republic of) • Young-Geun Kim, LSIS Co., Ltd. (Korea, Republic of)

Block 3: Innovation in Network Components – Cables, lines and new types of components

36 **Modelling and Testing of Saturated Core Fault Current Limiter**

David Klaus, ASG Power Systems (United Kingdom) • Antonio Morandi, University of Bologna (Italy) • Antonio Pellicchia, ASG Superconductors (Italy) • Gianni Grasso, Columbus Superconductors (Jamaica)

98 **ACCURATE REVENUE METERING WITH LOW POWER CURRENT AND VOLTAGE SENSORS ACCORDING TO THE**

Rob Kopmeiners, Alliander (Netherlands) • Denny Harmsen, Alliander (Netherlands) • Jens Weichold, 3M (Germany) • Marcus Biström, Netcontrol (Finland) • Douglas Brown, Netcontrol (United Kingdom)

103 **Low-power Instrument Transformers Frequency Response and Accuracy Requirements for Harmonics**

Miroslav Hrabčik, ABB s.r.o. (Czech Republic) • Radek Javora, ABB s.r.o. (Czech Republic) • Vaclav Prokop, ABB s.r.o. (Czech Republic)

306 **Use of self administered energy meters - Accesibility of the population with low income resources to sustainable**

Miguel Pulice, Edenor (Argentina)

409 **Screen Connection for MV cables with laminatd Aluminium screen**

Kai-Uwe Bentkowski, Behr Bircher Cellpack BBC Radeberg GmbH (Germany) • Klaus-Dieter Haim, University of Applied Sciences Zittau/Görlitz (Germany)

513 **Design and Verification of DC 1000V Air Circuit Breaker for Broad range of Protection in LVDC Distribution**

Young Kook Kim, LSIS Co., Ltd. (Korea, Republic of) • Sangchul Lee, LSIS Co., Ltd. (Korea, Republic of) • Woojin Park, LSIS Co., Ltd. (Korea, Republic of) • Kil-Young Ahn, LSIS Co. (Korea, Republic of) • Young-Geun Kim, LSIS Co., Ltd. (Korea, Republic of)

645 **The development and application of a multi-terminal power electronics soft open point device**

Yi Lu, State Grid Zhejiang Electric Power Research Institute (China)

709 **A New Installation Technology of Mid-Voltage Cable Joint Using RTV Silicone Rubber Adhesive**

Xiaohui Zhu, State Grid Tianjin Electric Power Research Institute (China) • Zhengzheng Meng, State Grid Tianjin Electric Power Research Institute (China) • Huai Zou, State Grid Tianjin Electric Power Research Institute (China)

1033 **Lessons learnt from the eco-design process for an elbow connector for medium voltage networks**

Lucie Domingo, Nexans (France) • Stefaan Van den Broeck, Nexans (Belgium)

1233 **Presenting new equipment called “variable spring damper” to reduce the possibility of failure of distribution**

Foad Gol avar mohammadi, Power Distribution Company of Kurdistan (Iran, Islamic Republic of)

1282 **Underground distribution network monitoring so much easier**

Francisc Zavoda, IREQ(HQ) (Canada) • George Fofeldea, 3M Canada (Canada) • ERnie Rodrigez, 3M USA (USA)

1366 **A Study of the Optical Bending Sensor characteristic for Distribution Underground Cable Joint**

Hyoung-Jun Park, Electronics and Telecommunications of Research Institute (Korea, Republic of) • Ji Hyoung Ryu, Electronics and Telecommunications of Research Institute (Korea, Republic of) • Hyun-Jin Kim, Electronics and Telecommunications of Research Institute (Korea, Republic of) • Sung Chang Kim, Electronics and Telecommunications of Research Institute (Korea, Republic of) • Youngbeom Jung, KEPCO Research Institute (Korea, Republic of) • Byung-sung Lee, KEPCO Research Institute (Korea, Republic of) • Seok Hun Song, KEPCO (Korea, Republic of) • Dongmin Kim, KEPCO (Korea, Republic of)

1442 **Application of RTV coating on Insulators and their benefits**

Tushar Rahatal, Tata Power (India) • Jagdish Kamble, Tata Power (India) • Devendra Santani, Tata Power (India) • Parmanand Tendulkar, Tata Power (India) • Gajanan Kale, Tata Power (India) • Shriprakash Joshi, Tata Power (India)

- 1528 **TEMPORARY OR SEMI-PERMANENT SINGLE CORE POWER CABLES: A NEW WAY TO SAFE AND RELIABLE YET**
 Theo Bruijnse, Power Chain Solutions BV (Netherlands) • Jan Dikken, Power Chain Solutions BV (Netherlands)
- 1529 **Application of LVDC Distribution Switchboard System with New and Renewable Energy Source on the**
 YoungPyo Cho, KEPCO Research Institute (Korea, Republic of) • HongJoo Kim, KEPCO Research Institute (Korea, Republic of) • SeokWoong Kim, KEPCO Research Institute (Korea, Republic of) • JinTae Cho, KEPCO Research Institute (Korea, Republic of) • JuYoung Kim, KEPCO Research Institute (Korea, Republic of) • InYong Seo, KEPCO Research Institute (Korea, Republic of)
- 1549 **Conceptual Design of a 25.8 kV, 2.0 kA Resistive SFCL for Power System Interconnection**
 Min Jee Kim, LSIS Co., Ltd. (Korea, Republic of) • Ok-Bae Hyun, LSIS Co., Ltd. (Korea, Republic of) • Sang Hoon Lee, LSIS Co., Ltd. (Korea, Republic of) • Gyeong Ho Lee, LSIS Co., Ltd. (Korea, Republic of) • Chae Yoon Bae, LSIS Co., Ltd. (Korea, Republic of) • Young-Geun Kim, LSIS Co., Ltd. (Korea, Republic of) • Jong-Jin Lee, Korea Electric Power Corporation (Korea, Republic of) • Yong Hoon Jang, Korea Electric Power Corporation (Korea, Republic of)
- 1550 **Online Monitoring Leads to Improve the Reliability and Sustainability of Power Grids**
 Doina VORNICU, CEZ Romania (Romania) • Laurentia PREDESCU, CEZ Romania (Romania) • Alessandro Mingotti, University of Bologna (Italy) • Lorenzo Peretto, University of Bologna (Italy)
- 1555 **Development of High Speed DC Circuit Breaker using IGBT Drivers**
 HongJoo Kim, KEPCO Research Institute (Korea, Republic of) • YoungPyo Cho, KEPCO Research Institute (Korea, Republic of) • HyunMin Kim, KEPCO Research Institute (Korea, Republic of) • JinTae Cho, KEPCO Research Institute (Korea, Republic of) • JuYoung Kim, KEPCO Research Institute (Korea, Republic of) • InYong Seo, KEPCO Research Institute (Korea, Republic of)
- 1601 **Special tests on MV Joints**
 Massimo Bartolucci, Enel (Italy) • D'Orazio Luigi, Enel (Italy) • Alfonso Sturchio, Enel (Italy) • Maurizio Della Corte, Enel (Italy) • Humberto Forero Pedraza, Enel (Italy) • Federico Marmeggi, Enel (Italy) • Alessandro Erba, Enel (Italy) • Alfonso Rinaldini, Enel (Italy)
- 1606 **Comparative research between XLPE and P-laser MV-cable**
 Piet Soepboer, Enexis Netbeheer (Netherlands) • Tjeerd Broersma, Enexis Netbeheer (Netherlands) • Blandine Henny, ENGIE-Laborelec (Belgium) • Robin Simal, ENGIE-Laborelec (Belgium) • Jos van Rossum, Prysmian Netherlands (Netherlands) • Sander Lauwers, Prysmian Netherlands (Netherlands) • Robert Bartholomeus, Prysmian Netherlands (Netherlands)
- 1617 **The Operational Performance and Benefits of an MVDC Device Integrated within a 33kV Distribution Network**
 Jonathan Berry, Western Power Distribution (United Kingdom) • Yiango Mavrocostanti, Western Power Distribution (United Kingdom)
- 1642 **Smart Common utility duct system for Under Ground Power Cables.**
 ROBIN KUMAR GIRI, Tata Power Company Limited (India) • Dhiren Pandya, Tata Power Company Limited (India) • Muraleedharan T, Tata Power Company Limited (India) • Sanket Bendkhale, Tata Power Company Limited (India)
- 1689 **Experience on diagnosis of MV cable in wind farm**
 Dae-jin Park, LS Cable & Systems (Korea, Republic of) • Chung-hwan Lee, LS Cable & Systems (Korea, Republic of) • Hyeon-seok Lee, LS Cable & Systems (Korea, Republic of) • Jung-ji Kwon, LS Cable & Systems (Korea, Republic of) • Jin-wook Choi, LS Cable & Systems (Korea, Republic of) • Seok-hyun Nam, LS Cable & Systems (Korea, Republic of)
- 1696 **Comparison of different thermal models for optimized dimensioning of HV cable cluster grids as means of**
 Sebastian Wingender, E.DIS Netz GmbH (Germany) • Steffen Trinks, Technische Universität Berlin (Germany) • Gerd Wessolek, Technische Universität Berlin (Germany) • Stefan Dorendorf, E.DIS Netz GmbH (Germany)
- 1784 **Smart Metering 2G – Evolution of a Smart Metering experience**
 Alessandro Piti, e-distribuzione (Italy) • Antonio Cammarota, E-distribuzione Spa (Italy) • Gianni Ceneri, e-distribuzione (Italy) • Alessandra Boscagin, e-distribuzione (Italy) • Daniele Mardero, e-distribuzione (Italy) • Antonio Signorini, e-distribuzione (Italy)
- 1837 **Benchmarking Linear and Non-Linear Behaviour of Power Inductors for Switched Mode Power Supplies**
 Markus Makoschitz, AIT Austrian Institute of Technology GmbH (Austria) • Jon Berrotaran, AIT Austrian Institute of Technology GmbH (Austria) • Sumanta Biswas, AIT Austrian Institute of Technology GmbH (Austria)

1921 Numerical simulations of a new desing of pin insulators

Alessandro Dadam, Celesc Distribuição S.A. (Brazil) • Aline Salum, Lactec (Brazil) • Signie Santos, Lactec (Brazil) • Guilherme Silva, Lactec (Brazil) • Vitoldo Filho, Lactec (Brazil) • Edemir Kowalski, Lactec (Brazil) • Rodrigo Quadros, Lactec (Brazil) • Fábio Richart, Lactec (Brazil)

1944 Improve underground cabling projects by designing a special spacer

Saeed Abachizadeh, Tabriz Power Distribution Company (Iran, Islamic Republic of) • Ali Sabzikari, Tabriz electric power distribution company (Iran, Islamic Republic of) • Jafar farshbaf hamed, Tabriz electric power distribution company (Iran, Islamic Republic of)

2050 Fault current limiting circuit breaker in distribution systems

Magnus Backman, ABB Corporate Research (Sweden) • Thomas Eriksson, ABB Corporate Research (Sweden) • Tobias Hintzen, ABB AG (Germany) • John Moutafidis, UK Power Networks (United Kingdom)

2059 Research on the improved fault current limiter based on high coupled split reactor

Kaijian WU, State Key Laboratory of Advanced Electromagnetic Engineering and Technology (China) • Zhao YUAN, State Key Laboratory of Advanced Electromagnetic Engineering and Technology (China) • Lixue CHEN, State Key Laboratory of Advanced Electromagnetic Engineering and Technology (China) • Junjia HE, State Key Laboratory of Advanced Electromagnetic Engineering and Technology (China) • Yuan PAN, State Key Laboratory of Advanced Electromagnetic Engineering and Technology (China) • Jingjing YE, State Key Laboratory of Advanced Electromagnetic Engineering and Technology (China)

2167 Technical Recommendations for Implementation of Dynamic Cable Rating System – Cable Modelling

Ali Kazerooni, WSP (United Kingdom) • Cameron Scott, WSP (United Kingdom) • David Ruthven, SP Energy Networks (United Kingdom) • Watson Peat, SP Energy Networks (United Kingdom)

2171 Development and implementation of Smart Metering infrastructure: the Eletropaulo Experience

Lucas Romero Freitas, Enel (Brazil) • Daniel Perez Duarte, Sinapsis Inovação em Energia (Brazil) • Diogo Serra Baldissin, Sinapsis Inovação em Energia (Brazil) • Ana Rosa Matos da Silva, Enel (Brazil) • Clayton da Silva Luiz, Enel (Brazil) • Marcelo Pelegrini, Sinapsis Inovação em Energia (Brazil) • Renan Machado Sales, Sinapsis Inovação em Energia (Brazil) • Bruno Hideki Nakata, Sinapsis Inovação em Energia (Brazil)

2316 Aerial MV Covered Networks : worth a new look?

Robert Battle, Sicame (Australia) • Rajesh Khanna, Sicame (India) • Blaise Beauger, Sicame (France) • Damien Jeanneau, Sicame (France)

Block 4: Innovation in Network Components – Substations, switchgear and transformers

28 SF6 Alternative – What to learn from the high voltage experience

yannick KIEFFEL, GE Grid Solutions (France) • Arnaud Ficheux, GE Grid Solutions (France) • Robert Luescher, GE Grid Solutions (Switzerland) • Elodie Laruelle, GE Grid Solutions (France) • Louis Maksoud, GE Grid Solutions (France)

259 Integrated dual voltage sensors based reclosers improving power distribution in developing countries

Vijay Shah, ABB India Ltd. (India) • Vikas Jakate, ABB India Ltd. (India) • Gary Foubert, ABB SPA (Italy) • Luca Fornasari, ABB SPA (Italy)

340 Comparison of SF6-free load-break switching principles

Martin Schaak, SIEMENS AG (Germany) • Kristian Ermeler, SIEMENS AG (Germany) • Marvin Bendig, RWTH Aachen (Germany) • Thomas Krampert, RWTH Aachen (Germany)

376 Endurance Life Prediction of Gas-Insulated Circuit Breaker and Spring Operating Mechanism Components

JaeHo Jeong, LSIS (Korea, Republic of) • KwangJin Ko, LSIS (Korea, Republic of) • SungJun Tak, LSIS (Korea, Republic of) • HeeSub Ahn, LSIS (Korea, Republic of) • JongUng Choi, LSIS (Korea, Republic of) • Young-Geun Kim, LSIS Co., Ltd. (Korea, Republic of) • Min Jee Kim, LSIS Co., Ltd. (Korea, Republic of)

380 Arc phenomena and method of arc extinction in air circuit breaker

Woojin Park, LSIS Co., Ltd. (Korea, Republic of) • Young Kook Kim, LSIS Co., Ltd. (Korea, Republic of) • Sangchul Lee, LSIS Co., Ltd. (Korea, Republic of) • Kil-Young Ahn, LSIS Co. (Korea, Republic of) • Young-Geun Kim, LSIS Co., Ltd. (Korea, Republic of)

- 398 **Integration, Analysis and Optimization of Components in Secondary Substations for e-Mobility**
Carlos Nieto, ABB (Estonia) • Danel Türk, ABB (Estonia) • Tiit Simonlatser, ABB (Estonia)
- 511 **ASSESSING POSSIBLE ALTERNATIVES TO SF6 IN MV SWITCHGEAR**
José Manuel Inchausti, Ormazabal (Spain) • Jesús Izcara, Ormazabal (Spain) • Javier Larrieta, Ormazabal (Spain) • Sergio Sebastián, Ormazabal (Spain)
- 557 **Hardware dependability study of an automatic circuit recloser**
Jaroslav Snajdr, Schneider Electric (Germany) • Marc Ferrazzi, Schneider Electric (France) • Pavel Novak, Schneider Electric (Germany) • Laurence Amigues, Schneider Electric (France)
- 561 **Comparison of alternatives to SF6 regarding EHS and end of life**
Romain Maladen, Schneider Electric (France) • Christophe Prevé, Schneider Electric (France) • Daniel Piccoz, SASU Daniel PICCOZ (France)
- 596 **Fully motorised cubicle leads to more safe, reliable and easy to use AIS switchgear.**
Philippe BRUN, Schneider-electric (France) • Venzazio FERRARO, Schneider-electric (Italy) • Jean-Pierre MELEY, Schneider-electric (France)
- 617 **Reliable Arc Flash Damage Mitigating System In MV Switchgear**
Young-Woo Jeong, LSIS Co. (Korea, Republic of) • Hyun-Wook Lee, LSIS Co. (Korea, Republic of) • Seog-Won Lee, LSIS Co. (Korea, Republic of) • Kil-Young Ahn, LSIS Co. (Korea, Republic of) • Young-Geun Kim, LSIS Co., Ltd. (Korea, Republic of)
- 678 **High-Voltage Fuses - Next Generation with Improved Performance**
Dirk Wilhelm, SIBA GmbH (Germany) • Dr. Jens Weber, SIBA GmbH (Germany) • Johannes-Georg Gödeke, SIBA GmbH (Germany)
- 770 **Innovative SF6 free switch with shunt vacuum interruption technology**
Christophe Prevé, Schneider Electric (France) • Romain Maladen, Schneider Electric (France) • François TRICHON, Schneider-Electric (France) • Daniel Piccoz, SASU Daniel PICCOZ (France)
- 771 **Dielectric stress, design and validation of MV switchgear**
Christophe Prevé, Schneider Electric (France) • Romain Maladen, Schneider Electric (France) • Garret DAKIN, SCHNEIDER-ELECTRIC (United Kingdom) • Francois GENTILS, SCHNEIDER-ELECTRIC (France) • Daniel Piccoz, SASU Daniel PICCOZ (France)
- 874 **Decomposition and Electrical strength of C5-PFK/Air and C4-PFN/Air mixtures as possible SF6 substitute gases**
Guopei Wu, Guangzhou Power Supply Bureau Co., Ltd (China) • Wenxiong Mo, Guangzhou Power Supply Bureau (China) • Libo Lin, Guangzhou Power Supply Bureau Co., Ltd (China) • Qingdan Huang, Guangzhou Power Supply Bureau Co., Ltd (China) • Haoyong Song, Guangzhou Power Supply Bureau Co., Ltd (China) • Weiyan Liao, Guangzhou Power Supply Bureau Co., Ltd (China) • Chentao Li, Guangzhou Power Supply Bureau Co., Ltd (China)
- 883 **High Performance Smart MV apparatus for arc furnace applications**
Andrea Bianco, ABB spa (Italy) • Bill Brewer, NUCOR SMG P (USA) • Martin Štefanka, ABB (Czech Republic) • Marco Riva, ABB spa (Italy)
- 967 **Comparison and selection of accelerated corrosion test protocol for Gas Insulated Switchgear**
Keyur TANDEL, Schneider Electric (India) • Thierry Cormenier, Schneider Electric (France) • Juan CARLOS PEREZ QUESADA, Schneider Electric (Spain)
- 1031 **RMU with Eco-Efficient Gas Mixture: Evaluation after 3 years of Field Experience**
Martin Kristoffersen, ABB (Norway) • Maik Hyrenbach, ABB AG (Germany) • Denny Harmsen, Alliander (Netherlands) • Theo Van Rijn, Liander (Netherlands) • Robert Vosse, Qirion (Netherlands)
- 1035 **Magnetic Fluid Seal for Switchgear**
RAO Yi, Guangzhou Power Supply Company, China Southern Grid (China) • GAN Lin, Guangzhou Power Supply Company, China Southern Grid (China) • MA Jieran, Guangzhou Power Supply Company, China Southern Grid (China) • LUO Linhuan, Guangzhou Power Supply Company, China Southern Grid (China) • YAN Xiaohui, Guangzhou Power Supply Company, China Southern Grid (China) • HAO Fangzhou, Guangzhou Power Supply Company, China Southern Grid (China) • SHEN Chao, Guangzhou Power Supply Company, China Southern Grid (China)

- 1084 **Eco-efficient puffer-type load break switch for medium voltage applications**
Elham Attar, ABB AS (Norway) • Magne Saxegaard, ABB (Norway) • Maik Hyrenbach, ABB AG (Germany) • Pouria Homayonifar , ABB (Norway) • Tor Bratsberg, ABB (Norway) • Ole Granhaug, ABB (Norway) • Nina Støa-Aanensen, Sintef (Norway) • Erik Jonsson, Sintef (Norway)
- 1100 **Smart Switchgear for Extreme Installation Environments**
Blair Kerr, G&W Electric Co. (USA) • Janet Ache, G&W Electric Co. (USA) • Nenad Uzelac, G&W Electric Co. (USA) • Stephen Linn, G&W Electric Co. (USA)
- 1346 **Emission Reductions through use of Sustainable SF6 Alternatives**
John Owens, 3M (USA) • Ang Xiao, 3M (USA) • Jason Bonk, 3M (USA)
- 1552 **An Enel-ABB partnership to develop an eco-sustainable alternative to SF6 for MV switchgears, dimensionally**
Luciano Chenet, ABB SPA (Italy) • Maik Hyrenbach, ABB AG (Germany) • Elham Attar, ABB AS (Norway) • Ivano Gentilini, Enel Global Infrastructure & Networks s.r.l. (Italy) • Luca Giansante, e-distribuzione S.p.A. (Italy)
- 1625 **Performance of Synthetic Ester and Mineral Oil in an Experimental Study of Impregnation of Cellulose Insulation**
Inmaculada Fernández, University of Cantabria (Spain) • Jaime Sanz, University of Cantabria (Spain) • Carlos J. Renedo, University of Cantabria (Spain) • Felix Ortiz, University of Cantabria (Spain) • Ernesto Iván Diestre, Repsol Technology Center (Spain) • Ismael Vela, Repsol Technology Center (Spain)
- 1637 **Advanced Finite Element calculation of losses due to the harmonic content of current and design optimization of**
SERGIO BARRIO, ORMAZABAL CORPORATE TECHNOLOGY (Spain) • ALVARO ORTIZ, ORMAZABAL COTRADIS (Spain) • PABLO CIRUJANO, ORMAZABAL COTRADIS (Spain) • VICENTE AUCEJO, INDIELEC (Spain)
- 1646 **Start&Stop system for more efficient Smart Transformers at renewable power plants. Beyond the Ecodesign**
LUIS DEL RIO ETAYO, ORMAZABAL CORPORATE TECHNOLOGY (Spain) • BITTOR VILLAMERIEL, ORMAZABAL CORPORATE TECHNOLOGY (Spain) • IBON LARRACOECHA, ORMAZABAL CORPORATE TECHNOLOGY (Spain) • RAFAEL AGUNSO, ORMAZABAL CORPORATE TECHNOLOGY (Spain) • PABLO CIRUJANO, ORMAZABAL COTRADIS (Spain)
- 1654 **Using smart distribution transformers to reduce both industrial energy consumption and peak demand by means**
IBON LARRACOECHA, ORMAZABAL CORPORATE TECHNOLOGY (Spain) • ALENA ULASENKA, ORMAZABAL CORPORATE TECHNOLOGY (Spain) • LUIS DEL RIO ETAYO, ORMAZABAL CORPORATE TECHNOLOGY (Spain) • PABLO CIRUJANO, ORMAZABAL COTRADIS (Spain)
- 1714 **Pilot of an environmentally friendly SF6-free MV switchgear technology and assessment of sensor technologies**
Bastian Wölke, Westnetz GmbH (Germany) • Manjunath Ramesh, Nuventura GmbH (Germany) • Anna Carina Schneider, Westnetz GmbH (Germany) • David Jebamony, Nuventura GmbH (Germany)
- 1845 **Comparative Study on Turbulent Flow Structure under Air, CO2 and SF6 Gas Blasting Visualized by Band-Pass**
Yuki Inada, Saitama University (Japan) • Hiroyuki Nagai, The University of Tokyo (Japan) • Akiko Kumada, The University of Tokyo (Japan) • Kunihiko Hidaka, The University of Tokyo (Japan) • Yuki Demura, Kanazawa University (Japan) • Yu Tabata, Kanazawa University (Japan) • Yasunori Tanaka, Kanazawa University (Japan) • Tomoyuki Nakano, Central Research Institute of Electric Power Industry (Japan)
- 1862 **Adaptation of the Thermal Network Method (TNM) for use in low-voltage switchgear and controlgear assemblies**
Robert Adam, IEEH Technische Universität Dresden (Germany) • Julian Heger, IEEH Technische Universität Dresden (Germany)
- 1909 **Decomposition of SF6-free gas mixtures by energy impacts**
Achim KALTER , SIEMENS AG (Germany) • Karsten ESSER-RANK, SIEMENS AG (Germany) • Florian KESSLER, SIEMENS AG (Germany) • Henning MILNIKEL, SIEMENS AG (Germany) • Daniel PESCH , SIEMENS AG (Germany) • Roland POHLE, SIEMENS AG (Germany)
- 2053 **Fast recovery adaptable transformer for renewable generation**
Pablo Pacheco, ABB (Spain) • Miguel Cuesto, ABB (Spain) • Ignacio CAMPOS, IBERDROLA Renovables (Spain) • Oscar HERNÁNDEZ , IBERDROLA Renovables (Spain) • Jesús MARCOS, IBERDROLA Renovables (Spain)
- 2058 **Improving System Safety and Reliability with Solid Dielectric Switchgear**
Kennedy Darko, G&W Electric Co. (USA) • Alexander Beierlein, G&W Electric Co. (USA) • Stefan Micic, G&W Electric Co. (USA)

2078 A New Medium Voltage Circuit Breaker Type for the ANSI Market

Predrag Milovac, IEM (USA)

2108 Innovative insulation materials helping in cost reduction of modern transformers

Radoslaw Szewczyk, DuPont (Poland) • Richard Marek, DuPont (USA) • Giorgio Vercesi, DuPont (Switzerland) • Jean-Claude Duart, DuPont (Switzerland) • Robert Casey Ballard, DuPont (USA)

2116 Assessment and Development of Stability Enhancing Methods for Dynamically Changing Power Hardware-in-the-

Efren Guillo-Sansano, University of Strathclyde (United Kingdom) • Mazheruddin Hussain Syed, University of Strathclyde (United Kingdom) • Andrew Roscoe, Siemens Gamesa Renewable Energy (United Kingdom) • Graeme M. Burt, University of Strathclyde (United Kingdom)

2173 Technical requirements of Smart Transformer for Deployment in Grid Application

Ali Kazerooni, WSP (United Kingdom) • Giovanni De Carne, Kiel University (Germany) • Markus Andersen, Kiel University (Germany) • Marco Liserre, Kiel University (Germany) • Michael Eves, SP Energy networks (United Kingdom) • James Yu, SP Energy networks (United Kingdom)

Session 2 - Power quality and electromagnetic compatibility

Tuesday, 4 June 2019 from 9:00 to 18:00

Block 1: Electric and magnetic fields, grounding, transients and immunity of systems

- 35 **Temperature and voltage distortion analysis in LED lamps**
Elena Gutiérrez Ballesteros, University of Cordoba (Spain) • Aurora Gil de Castro, University of Cordoba (Spain) • Sarah Rönnerberg, Luleå University of Technology (Sweden) • Selcuk Sakar, Luleå University of Technology (Sweden)
- 156 **IMPACT OF INSTALLATION PHOTOVOLTAIC CELLS ON ELECTROMAGNETIC FIELDS AND ELECTRICAL PARAMETERS**
Mohammad Atia, North Delta Electricity Distribution Company (Egypt) • Kamelia Youssef, Ministry of Electricity and Renewable Energy (Egypt)
- 226 **Frequency Response Test and Key Parameter Estimation of Oil-immersed Capacitive Voltage Transformer**
Mingxing Zhu, Anhui University (China) • Yadong JIAO, Anhui University (China) • Wei Huang, Asian Power Quality Initiative (China) • Qing Zhong, South China University of Technology (China) • Jan Meyer, Technische Universitaet Dresden (Germany)
- 367 **40 MW Photovoltaic Power Plant's Earthing System Design – New Challenges for an Integrated Methodology**
Carlos Cardoso, EDP Labelec (Portugal) • Andreia Leiria, EDP Labelec (Portugal)
- 519 **Analysis of effects of harmonics generated by PCS on the protection devices of ungrounded distribution systems**
Su-Hyeong Jang, LSIS Co., Ltd. (Korea, Republic of) • Kyung-Won Park, LSIS Co., Ltd. (Korea, Republic of) • Young-Geun Kim, LSIS Co., Ltd. (Korea, Republic of)
- 550 **Measurement of Earth Fault Current and Earth Potential Rise on Live HV Systems**
Mark Davies, RINA Consulting (United Kingdom) • Robert Weller, RINA Consulting (United Kingdom) • Paul Jones, RINA Consulting (United Kingdom) • Stephen Tucker, UK Power Networks (United Kingdom) • Hao Guo, Power Networks Demonstration Centre (United Kingdom)
- 611 **Underground Power Cables Magnetic Field effects on Human Health**
Ahmad Anany, North Delta Electric Distribution Company (Egypt)
- 628 **Analyzing And Investigation of Lightning Overvoltage on Distribution Transformers Considering Case Study in**
hassan emami, ZANJAN electrical distribution company (Iran, Islamic Republic of) • Hossein Kaboli, ZANJAN electrical distribution company (Iran, Islamic Republic of) • Hossein Emami, ZANJAN electrical distribution company (Iran, Islamic Republic of)
- 699 **Influence of NSDD phenomenon on power quality after breaking of vacuum circuit-breaker**
Guangwei FAN, Xi'an High Voltage Apparatus Research Institute Co., Ltd. (China) • Gang LI, Xi'an High Voltage Apparatus Research Institute Co., Ltd. (China) • Haojun LIU, Xi'an High Voltage Apparatus Research Institute Co., Ltd. (China) • Shi HUANG, Xi'an High Voltage Apparatus Research Institute Co., Ltd. (China) • Zhaoyang ZHANG, Xi'an High Voltage Apparatus Research Institute Co., Ltd. (China)
- 763 **Immunity Assessment of Household Appliances in the Frequency Range from 2 to 150 kHz**
Victor Khokhlov, Technische Universitaet Dresden (Germany) • Jan Meyer, Technische Universitaet Dresden (Germany) • Peter Schegner, Technische Universitaet Dresden (Germany) • Daniel Agudelo-Martínez, Universidad Nacional de Colombia (Colombia) • Andrés Pavas, Universidad Nacional de Colombia (Colombia)
- 765 **Light intensity immunity performance of LED street lamps under power quality disturbances**
Selcuk Sakar, Luleå University of Technology (Sweden) • Sarah Rönnerberg, Luleå University of Technology (Sweden) • Math Bollen, Luleå University of Technology (Sweden)

- 822 **Global Earthing System Characterisation of an Actual UK Distribution Network**
Paul Jones, RINA Consulting (United Kingdom) • Mark Davies, RINA Consulting (United Kingdom) • Robert Weller, RINA Consulting (United Kingdom) • Stephen Tucker, UK Power Networks (United Kingdom)
- 843 **FAST CALCULATION OF DC-BIASED UHV TRANSFORMER**
Huan Wang, State Grid Shanghai Qingpu electric power supply company (China)
- 965 **Derating method for dry type power transformers based on current distortion parameters**
Bart Verhelst, Ghent University (Belgium) • Johan Rens, School for Electronic and Electrical Engineering, North-West University (NWU) (South Africa) • Jan Desmet, Ghent University – Research Group EELAB/Lemcko (Belgium)
- 1096 **Active and passive shield for aerial power lines**
aldo canova, Politecnico di Torino (Italy) • Luca Giaccone, Politecnico di Torino (Italy) • Vincenzo Cirimele, Politecnico di Torino (Italy)
- 1104 **Assessment of EMF-Exposure in Residences due to PLC-based Smart Metering**
Gernot Schmid, Seibersdorf Laboratories (Austria) • Andreas Abart, Netz Oberösterreich GmbH (Austria)
- 1168 **Understanding the harmonic performance of voltage transformers for distribution system power quality**
Vidyadhar Peesapati, The University of Manchester (United Kingdom) • Richard Gardner, The University of Manchester (United Kingdom) • James King, Nortech Management Ltd (United Kingdom) • Samuel Jupe, Nortech Management Ltd (United Kingdom) • Jonathan Berry, Western Power Distribution (United Kingdom)
- 1213 **Identifying ground faults on a TT grounded system with a 9 channel PQ analyser**
Andrew Sagl, Megger (USA)
- 1231 **Towards an integral EMC test of intelligent Ring Main Units**
Sjoerd Nauta, Alliander (Netherlands) • Ramiro Serra, TU Eindhoven (Netherlands) • Benjamin Baum, DNVGL (New Zealand) • Maarten van Riet, Alliander (Netherlands)
- 1320 **Magnetic shielding of power supply of electric glass oven**
aldo canova, Politecnico di Torino (Italy)
- 1383 **How the observed declining strength of Distribution Earthing Networks will impact the risk exposure of power**
Darren Woodhouse, Safearth Consulting (Australia) • Stephen Palmer, Safearth Consulting (Australia)
- 1415 **Earthing System Testing Methods - Historic Approaches & Recent Developments**
Stephen Palmer, Safearth Consulting (Australia) • Darren Woodhouse, Safearth Consulting (Australia)
- 1619 **EXPERIMENTAL INVESTIGATION OF FERRORESONANCE AND MITIGATION MEASURES IN 35 KV ISOLATED**
Maja Muftić Dedović, University of Sarajevo, Faculty of Electrical Engineering (Bosnia and Herzegovina) • Adnan Mujezinović, University of Sarajevo, Faculty of Electrical Engineering (Bosnia and Herzegovina) • Nedim Turković, EPC Elektroprivreda of Bosnia and Herzegovina (Bosnia and Herzegovina) • Nedis Dautbašić, University of Sarajevo, Faculty of Electrical Engineering (Bosnia and Herzegovina) • Irfan Turković, University of Sarajevo, Faculty of Electrical Engineering (Bosnia and Herzegovina) • Amir Tokić, University of Tuzla, Faculty of Electrical Engineering (Bosnia and Herzegovina) • Zijad Bajramović, University of Sarajevo, Faculty of Electrical Engineering (Bosnia and Herzegovina)
- 1624 **Assessment of Smart Meter Communication Over PLC PRIME in a Laboratory Simulating a Real Grid**
Pedro Arsenio, EDP Labelec (Portugal) • Marco Silva, EDP Labelec (Portugal) • Diogo Ribeiro, EDP Labelec (Portugal) • Roberto Barros, EDP Labelec (Portugal) • Pedro Nunes, EDP Distribuição (Portugal)
- 1671 **Occupational EMF-Exposure: A Simple Guide for Testing Compliance with Requirements of Directive 2013/35/EU**
Andreas Abart, Netz Oberösterreich GmbH (Austria) • Ernst Schmutzner, TU Graz (Austria) • Wolfgang Emmer, TU Graz (Austria) • Katrin Friedl, APG (Austria) • Rudolf Mörk Mörkenstein, IES (Austria)
- 1700 **Estimation of stray current impact on electrical earthing systems**
Aurel Garry, EDF R&D (France) • Sarah Nasr, EDF R&D (France)

- 1750 **Earthing design incorporating risk quantification – an expensive overhead or key decision-making tool?**
William (Bill) Carman, Bill Carman Consulting (Australia) • Stephen Palmer, Safearth Consulting (Australia)
- 2040 **IDENTIFICATION AND OPTIMIZATION OF THE SEQUENCE OF PARALLEL CONDUCTORS USING AN AUTOMATIC**
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- 2091 **Case study of the implementation of cross-bonding to underground long medium voltage cables in wind parks**
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- 2095 **Switching analysis of a transmission substation and its effect on the downstream sub-transmission substation: A**
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- 2119 **Simplified Magnetic Field Evaluation for Workers with Conductor Loops**
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- 2230 **New methodology for on-site measurement of Voltage Transformer magnitude and phase ratio as a function of**
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- 9 **Passive Mitigation Technique for the Harmonics Caused by LED Lamps**
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- 92 **Harmonic Analysis of Electrical Vehicle Fast-charging Station Considered Uncertainty of Load**
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- 105 **Investigating Increased Error of Measurement Meters in Smart Grids in Presence of high frequency harmonics**
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- 222 **Novel Circuit to Compensate the Effect of Source Open Circuit Fault in Distributed Generation System**
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- 237 **Characterization of Interactions between PV systems and energy efficient lighting (LED)**
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- 287 **A Robust D-FACTS Based Metaheuristic Control System for Battery Charging Scheme**
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- 370 **Overvoltage due to single-phase and three-phase connected PV and what to do about it**
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- 404 **Impact of PV on Harmonics in Low-Voltage Networks**
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- 562 **Influence of PV plant 1 MWp connected on MV overhead line on voltage quality in PCC – case study**
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- 599 **Optimal Control of DVR to enhance the power quality of PV/Wind/Fuel cell hybrid system feeding a new**
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- 667 **Description of the low frequency phenomena involved when connecting a 3 kW EV charger to the distribution**
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- 675 **Interharmonics and LED flicker: an assessment by CFD**
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- 738 **Power Quality Assessment of a Single Customer Micro Grid-Case Study**
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- 841 **PV Based Dynamic Voltage Restorer for Power Quality Enhancement in Distribution System**
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- 916 **Impact of Fast Charging Stations on Grid Quality**
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- 958 **Object Detection Based Power Quality Expert System for an Electric Vehicle Infrastructure**
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- 959 **Response of Rotor Over-Voltage in DFIG Based Wind Generator under Recurring Voltage Sags**
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- 960 **Light flicker Performance of Low power LED Units**
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- 963 **PowerQuality improvement in a rural grid by grid storage system**
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- 1022 **Harmonic analysis and mitigation in distribution grids with high penetration of power inverters**
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- 1032 **Strategies for Voltage Oscillation Mitigation in LV Distribution Networks with EV Smart Charging control**
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- 1074 **Impact of Fast Charging and Home Charging Infrastructure for Electric Vehicles on the Power Quality of the**
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- 1170 **An evaluation of V2G for distribution network harmonic suppression**
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- 1356 **A Practical Case of Harmonic current Issues Operating a Small Rooftop PV Plant**
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- 1409 **A Data-driven Harmonic Modeling Method for Electric Vehicle Charging Stations**
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- 1513 **An Analysis of Harmonic Disturbances in Distribution Systems Caused by Grid-Connected Inverters: Experimental**
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- 1527 **The Impact of LED Lighting Systems to the Power Quality and Recommendations for Installation Methods to**
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- 1554 **Charging problems in EV paradise**
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- 1561 **LED technology in Public Lighting – Analysis of the impact in power quality in the low voltage grid distribution**
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- 1572 **Power Hardware-in-the-Loop Testbed for High Frequency Interdependency Issues of Inverter-Based Generation**
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- 1802 **How Photovoltaic Inverter Firmware Could Affect PQ**
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- 1814 **Impact of Renewable Generation on the harmonic distortion in distribution networks: Key Findings of the**
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- 1859 **Design and Control Strategy of Thyristor Voltage Regulator for Distribution Line Voltage Regulation for Expansion**
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- 2097 **Artificial neural network based UPQC controller for power quality improvement in Micro-grids**
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- 2234 **E-mobility impact on supply in distribution grid**
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- 2321 **DESIGNING A MICROGRID TO IMPROVE CONTINUITY OF SERVICE AND FLEXIBILITY THE CASE OF POLITECNICO DI MILANO**
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- 74 **HARMONICS CANCELLATION IN THE RESIDENTIAL DISTRIBUTION NETWORKS**
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- 86 **Optimal Harmonic Passive Filters for Power Factor Correction, Harmonic Mitigation and Electricity Bill Reduction**
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- 155 **Railway Power Conditioner With Parallel Quasi-resonant Controller**
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- 416 **Modelling the propagation of harmonic voltages in large medium voltage distribution networks**
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- 426 **A Multiple Harmonic Source Localization Method based on Data Analysis**
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- 475 **Multi –harmonic source decoupling algorithm and treatment in the radial distribution network**
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- 483 **Application of adaptive EEMD method in voltage sag detection**
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- 485 **Comprehensive Evaluation of Voltage Sags Based on Grid and Device Sensitivity Analysis**
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- 582 **Analysis of Harmonic Distortion Levels on Alexandria Distribution Network**
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- 677 **Efficient open-source power quality analyser and smart meter**
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- 830 **Impact of Distributed Energy Resources on resonance conditions and harmonic amplification in distribution**
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- 930 **A power system model for resonance studies**
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- 937 **Stochastic Analysis of Transient Voltage Dip in Distribution System**
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- 1025 **Voltage variation in MV distribution networks and its impact on selection of MV/LV transformation ratio**
 Filip Broz, EGC-EnerGoConsult CB (Czech Republic) • Karel Prochazka, EGC-EnerGoConsult CB (Czech Republic) • Martin Kaspírek, E.ON Distribuce (Czech Republic) • Jan Jiricka, E.ON Distribuce, a.s. (Czech Republic)

- 1062 **Harmonic Emission Level Assessment Considering the Influence of Filters in Harmonic Source Side**
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- 1078 **SURVEY OF CURRENT GRADIENT AT PUBLIC LOW VOLTAGE CUSTOMER TERMINALS IN GERMANY**
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- 1191 **Determining the impedance-frequency characteristic of the network in capacitor placement studies by**
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- 1228 **Analysis and design of harmonic filter for commercial and official substations in Lorestan Province Electricity**
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- 1229 **Measurement and analysis of zero-sequence current levels during normal operation**
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- 1239 **Simulations in GNU Octave to Analyse the Behaviour of Rogowski Coil Integrators for Measurement of**
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- 1431 **Characteristics of Fifth and Seventh Harmonics in Japanese Electric Power Distribution System**
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- 1512 **A Network-Wide Evaluation of Single-Point Harmonic Contributions from Customer Installations: Comparison of**
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- 1535 **Incipient Fault Prediction in Power Quality Monitoring**
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- 1627 **Research on the Typical Problem of Shunt Capacitors Excessive Noise Caused by Harmonics Based on Field**
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- 1641 **Characterization and Laboratory Performance Testing of Interconnected Star Phase Balancer**
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- 1795 **EVALUATING TEMPORAL VARIATIONS OF HARMONIC IMPEDANCES FOR CONTINUOUS ASSESSMENT OF LOW-**
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- 1799 **An analytic investigation of the dc link trajectories in electric power train applications**
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- 1930 **Distribution System Reliability Modelling and Optimization of city Outskirts: Case Study of Polebaba Feeder**
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- 2049 **PQ prediction by way of parallel computing - benchmark and sensitivity analysis for classical ML approaches**
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- 2052 **Assessment of Distributed Harmonic Filters on Grid Voltage Quality**
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 (Korea, Republic of) • InYong Seo, KEPCO Research Institute (Korea, Republic of)
- 366 **Typical harmonic levels and spectra with low-voltage customers**
 Math Bollen, Luleå University of Technology (Sweden) • Aurora Gil de Castro, University of Cordoba (Spain) • Sarah Rönnerberg,
 Luleå University of Technology (Sweden)
- 521 **The experimental evaluation and monitoring for power quality status of inverter-driven air conditioners**
 Ling Luo, State Grid Shanghai Electric Power Research Institute (China) • Shuang Xiao, State Grid Shanghai Electric Power
 Research Institute (China) • Fan Cheng, State Grid Shanghai SMEPC (China)
- 538 **Empirical measurements of Power Quality in Danish LV systems**
 Henrik Hansen, Danish Energy (Denmark)
- 542 **Voltage dip assessment in context of voltage quality regulation**
 Miloslava Tesarova, University of West Bohemia (Czech Republic) • Martin Kaspirek, E.ON Distribuce (Czech Republic)
- 551 **Methods for the Evaluation of New Power Quality Parameters: a Review of Rapid Voltage Changes and**
 Stefano Lodetti, CIRCE - Universidad de Zaragoza (Spain) • Jorge Bruna Romero, CIRCE Foundation (Spain) • Julio J. Melero,
 CIRCE - Universidad de Zaragoza (Spain)
- 635 **Issues on the Application of Chinese Harmonic Standard GB/T 14549**
 Rui XIANG, Department of Electrical Engineering, Tsinghua University (China) • Yiwei ZHANG, Department of Electrical
 Engineering, Tsinghua University (China) • Yong MIN, Department of Electrical Engineering, Tsinghua University (China) • Fei
 XU, Department of Electrical Engineering, Tsinghua University (China) • Junfei HAN, Inner Mongolia Electric Power Research
 Institute (China) • Jun TAO, Inner Mongolia Electric Power Research Institute (China)
- 652 **Long-term power quality measurements in medium voltage networks**
 Sarah Rönnerberg, Luleå University of Technology (Sweden) • Elena Gutiérrez Ballesteros, University of Cordoba (Spain) • Aurora
 Gil de Castro, University of Cordoba (Spain) • Mailn Westman, Skellefteå Kraft Elnät (Sweden) • Magnus Brodin, Skellefteå Kraft
 Elnät (Sweden)

- 713 **Determination the Switching State of Compensatory Equipment Based on Monitor Data Analysis**
Ying Wang, College of Electrical Engineering and Information Technology, Sichuan University (China) • Ling-Feng Deng, Sichuan University (China) • Xianyong Xiao, College of Electrical Engineering and Information Technology, Sichuan University (China) • Chong Hu, Anhui Electric Power Research Institute (China) • Xin Wang, CEIEC Shenzhen Electric Technology Inc (China)
- 724 **Evaluation of Harmonic Impacts on Distribution Transformers in Mashhad Based on Smart Meter Data**
Amir Khazaee, Mashhad Electric Energy Distribution Co. (Iran, Islamic Republic of) • Hossein Delavaripour, Mashhad Electric Energy Distribution Co. (Iran, Islamic Republic of) • Mehran Ghasempour, Mashhad Electric Energy Distribution Co. (Iran, Islamic Republic of) • Hossein Hooshmandi Safa, Mashhad Electric Energy Distribution Co. (Iran, Islamic Republic of)
- 737 **Power Quality Assessment of Key Consumer Installation - Interruption statistics of Grid Disturbances**
GOUTHAM CHAKRAVARTHY YELMANCHLI, The Tata Power Company Limited (India) • Chintamani Chitnis, The Tata Power Co. Ltd (India) • NISHANT BHARGAVA, The Tata Power Company Limited (India) • Vishwas R Shrikhande, The Tata Power Company Limited (India)
- 739 **DECIPHERING POWER QUALITY CONCERNS OF CONSUMER – BEYOND THE METER**
GOUTHAM CHAKRAVARTHY YELMANCHLI, The Tata Power Company Limited (India) • Chintamani Chitnis, The Tata Power Co. Ltd (India)
- 744 **Advanced Utilization of Big Data for Real-time Monitoring and DataAnalytics in Sundom Smart Grid**
Petri Hovila, ABB Oy (Finland) • Aurelien Monot, ABB Corporate Research (Switzerland) • Hannu Laaksonen, University of Vaasa (Finland) • Matti Rita-Kasari, Jubic Oy (Finland)
- 902 **Review on Harmonic Impact Assessment Indices and Methods of Multiple Harmonic Sources**
Shuangting Xu, College of Electrical Engineering and Information Technology, Sichuan University (China) • Xianyong Xiao, College of Electrical Engineering and Information Technology, Sichuan University (China) • Xian Zheng, College of Electrical Engineering and Information Technology, Sichuan University (China) • Ying Wang, College of Electrical Engineering and Information Technology, Sichuan University (China)
- 1353 **Impact of IEC 61850 on Power Quality Monitoring andRecording**
Alexander Apostolov, OMICRON electronics (USA) • Frederic Dunet, OMICRON electronics (France) • Juan Parra, OMICRON electronics (Suriname)
- 1389 **Influence of Voltage Sag on Process Parameters and the Control Measures for a Process of Auxiliary Engine in**
Yan Jianhai, Nanjing Golden Cooperate DC Power Distribution Technology. Co.,Ltd. (China) • Chen Wenbo, Nanjing Golden Cooperate DC Power Distribution Technology. Co.,Ltd. (China) • Mei Zhonghua, Nanjing Golden Cooperate DC Power Distribution Technology. Co.,Ltd. (China) • WANG Xinxiang, Nanjing Golden Cooperate DC Power Distribution Technology. Co.,Ltd. (China) • Li Jiateng, School of Electrical Engineering, Beijing Jiaotong University (China) • Liu Siyi, School of Electrical and Information Engineering, Hunan University (China)
- 1393 **New challenges for the determination of emission limits for customer installations - Activities of CIGRE JWG**
Jan Meyer, Technische Universitaet Dresden (Germany) • Mark Halpin, Auburn University (USA)
- 1398 **Survey of network impedance in the frequency range 2-9 kHz in public low voltage networks in AT/CH/CZ/GE**
Robert Stiegler, Technische Universität Dresden (Germany) • Jan Meyer, Technische Universitaet Dresden (Germany) • Michael Höckel, Bern University of Applied Sciences (Switzerland) • Stefan Schori, Bern University of Applied Sciences (Switzerland) • Karl Scheida, Österreichs E-Wirtschaft (Austria) • Tomáš Hanžlík, EGC – EnerGoConsult CB s.r.o. (Czech Republic) • Jiří Drápela, Brno University of Technology (Czech Republic)
- 1407 **Suitability of test procedures in IEC 61000-3-2 for assessing harmonic emission of modern mass-market**
Jan Meyer, Technische Universitaet Dresden (Germany) • Ana-Maria Blanco, Technische Universitaet Dresden (Germany) • Roberto Langella, Università della Campania “Luigi Vanvitelli” (Italy) • Sasa Z. Djokic, The University of Edinburgh (United Kingdom)
- 1574 **Application aspects and measurement methods in the frequency range from 2 kHz to 150 kHz**
Michael Schwenke, Siemens AG (Germany) • Dimitrij Klingbeil, Siemens AG (Germany)
- 1608 **Large scale PQ, temperature and energy monitoring in secondary substations.**
JOSE MARIA ROMERO GORDON, ENDESA (Spain)

- 1796 **OPERATION EFFECT TO VOLTAGE SAG IMMUNITY LEVELS OF AC CONTACTORS AT PETROCHEMICAL PLANT IN**
KHALIS MOKHTAR, TNB Energy Services (Malaysia) • HAZRI DAHALAN MD RAZIP, Universiti Malaysia Pahang (Malaysia) •
EFFINIZAM ABDUL LATIP, TNB Energy Services (Malaysia)
- 1911 **THE NEED TO REDEFINE EMC STANDARDIZATION: POWER SPECTRAL DENSITY LIMITS OF NON-INTENTIONAL**
Noelia Uribe-Perez, Tecnalía (Spain) • Ibon Arechalde, Tecnalía (Spain) • Alberto Sendín Escalona, Iberdrola España (Spain) •
Ainara Fernandez, Iberdrola (Spain) • Juan Sebastián Gómez Guajardo, Iberdrola España (Spain)
- 2072 **Service Quality in the Brazilian Electricity Distribution Sector: Challenges, Regulatory Approaches and Results**
João Marcelo Cavalcante de Albuquerque, Brazilian Electricity Regulatory Agency – ANEEL (Brazil) • Renato Eduardo Farias de
Sousa, Brazilian Electricity Regulatory Agency – ANEEL (Brazil) • Hugo Lamin, Brazilian Electricity Regulatory Agency – ANEEL
(Brazil)
- 2145 **Forecast of steady-state voltage problems considering simulation and socio-environmental information**
Renan Machado Sales, Sinapsis Inovação em Energia (Brazil) • Ivo Ordonha Cyrillo, Sinapsis Inovação em Energia (Brazil) •
Marcelo Pelegrini, Sinapsis Inovação em Energia (Brazil) • Hector Luz, Sinapsis Inovação em Energia (Brazil) • Nelson Kagan,
ENERQ - USP (Brazil) • Elson Borges da Silva Filho, Eletrobras (Brazil) • Daniel Perez Duarte, Sinapsis Inovação em Energia (Brazil)
- 2265 **Proposal to improve the Brazilian regulation on the electric energy reliability**
Ednelson de Moraes, USP (Brazil) • Carlos Almeida, ENERQ - USP (Brazil)
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Session 3 - Operation, control and protection

Thursday, 6 June 2019 from 9:00 to 18:00

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- 49 **Reactive Power Provision by Means of Flexible Industry Consumers**
Tim Plößler, TU Darmstadt (Germany) • Anna Macke, TU Darmstadt (Germany) • Dominik Maihöfner, TU Darmstadt (Germany) • Jutta Hanson, Technische Universität Darmstadt (Germany)
- 136 **Phase Detection in PLC-based Advanced Metering Infrastructures**
Cédric LAVENU, EDF (France) • Thierry ALDEBERT, ENEDIS (France) • Mickaël CAQUEUX, Fameca Electronics (France) • David BRETAND, Fameca Electronics (France) • Alexandre CHAPOULIE, Fameca Electronics (France)
- 215 **Grid Operation 2025 - Digitalisation for Distribution System Operators**
Robert Schmaranz, KGN-Kärnten Netz GmbH (Austria) • Walter Schaffer, Salzburg Netz GmbH (Austria) • Ursula Tauschek, Österreichs Energie (Austria) • Roland Bergmayer, Energienetze Steiermark GmbH (Austria) • Gernot Bitzan, Energie Klagenfurt GmbH (Austria) • Leopold Fiedler, Netz Oberösterreich GmbH (Austria) • Klaus Schüller, TINETZ-Tiroler Netze GmbH (Austria) • Robert Stacher, Wiener Netze GmbH (Austria)
- 220 **Augmented Reality in Grid Operation - a new Approach to Support Manual Switching Operations**
Robert Schmaranz, KGN-Kärnten Netz GmbH (Austria) • Stefan Schöner, OMICRON electronics GmbH (Austria) • Mario Liesinger, KNG-Kärnten Netz GmbH (Austria) • Daniela Smith, OMICRON electronics GmbH (Austria)
- 236 **Study of Calculation of Currents Induced by Closing-loop Operations in Medium-voltage Distribution Grids**
Kaiyu ZHANG, Electric Power Research Institute, SMEPC, Shanghai (China) • Yuyao FENG, Electric Power Research Institute, SMEPC, Shanghai (China) • Yinghui YU, Electric Power Research Institute, SMEPC, Shanghai (China) • Yong CUI, Electric Power Research Institute, SMEPC, Shanghai (China) • Yun SU, Electric Power Research Institute, SMEPC, Shanghai (China)
- 343 **Cost Benefit Analysis (CBA) approach of Non-Conventional STATCOM Applications**
Mark Friese, TNEI Services (United Kingdom) • Stephanie Hay, TNEI Services (United Kingdom) • Emanuel Mugwanda, SP Energy Networks (United Kingdom) • Albert Santandreu, SP Energy Networks (United Kingdom) • David Neilson, SP Energy Networks (United Kingdom)
- 460 **Automation of DSO processes combining grid planning and operation: An efficient way to handle large numbers**
Philipp Erlinghagen, envelio GmbH (Germany) • Robin Ashrafuzzaman, envelio GmbH (Germany) • Felix Glinka, envelio GmbH (Germany) • Peter Mathis, DigiKoo GmbH (Germany) • Benjamin Jambor, Westnetz GmbH (Germany) • Steffen Woltering, Leitungspartner GmbH (Germany)
- 488 **Real-time Image Transmission and Operation Control for Power Transmission Line Patrol using Unmanned Aerial**
Liming Chen, China Southern Power Grid, Electric Power Research Institute (China) • Xuzhu Dong, China Southern Power Grid, Electric Power Research Institute (China) • Ying Sun, Guangzhou Power Supply Company Co. Ltd, China Southern Power Grid (China) • Zhipeng Su, Guangzhou Power Supply Company Co. Ltd, China Southern Power Grid (China)
- 537 **Impact of renewable and distributed generation on grid restoration strategies**
Elmira Torabi, TU Wien (Austria) • Wolfgang Gawlik, TU Wien, Institute of Energy Systems and Electrical Drives (Austria) • Robert Schmaranz, KGN-Kärnten Netz GmbH (Austria) • Ewald Traxler, Netz Oberösterreich GmbH (Austria) • Rainer Krebs, Siemens AG (Germany) • Philipp Hinkel, TU Kaiserslautern (Germany) • Wolfram H. Wellßow, University of Kaiserslautern (Germany) • Martin Ostermann, PSI Software AG (Germany)
- 547 **Driving reliability with machine learning and improving operation by digitalization of medium power**
Karsten Viereck, Maschinenfabrik Reinhausen GmbH (Germany) • Anatoli Saveliev, Maschinenfabrik Reinhausen GmbH (Germany)
- 584 **Implementation Of 3D Modeling For Simulation Laboratory Based On Unity And 3DMAX**
Chengying Jiang, SGCC (China) • Jinxia Jiang, SGCC (China)

- 590 **LV Grid Data Analysis demonstrated at DSO Arbon Energie**
Ingo Herbst, Siemens AG (Switzerland) • Slobodan Lukovic, USI Lugano (Switzerland) • Alberto Gasparin, USI Lugano (Switzerland) • Nicola Schulz, FHNW Brugg (Switzerland) • Jens Witzig, FHNW Brugg (Switzerland) • Silvan Kieber, Arbon Energie AG (Switzerland)
- 703 **Operation of distribution power systems with dynamic compensators to integrate intermittent energy sources.**
Marcelo Cassin, EPE Santa Fe (Argentina)
- 750 **Mobile-GIS evolving as a key tool for field Workforce Management**
SHRIRAM MODAK, TATA POWER (India) • SUNIL JOGLEKAR, TATA POWER (India) • RAKESH KADU, TATA POWER (India) • Daleep Singhal, TATA POWER (India) • Mahesh Yadav, TATA POWER (India)
- 751 **Distribution Network Maintenance Work Enhancement with Drones During Limited Mobile Network Access**
Joonas Sæe, Tampere University (Finland) • Jarkko Laaja, Tampere University (Finland) • Heikki Paananen, Elenia Oy (Finland) • Mikko Valkama, Tampere University (Finland)
- 764 **Levers optimization in short-term operational planning for real distribution systems**
Hugo Morais, EDF (France) • Clement Paris, EDF (France) • Olivier Carré, Enedis (France) • Madeleine Carlier, EDF R&D (France) • Benoît Bouzigon, Enedis (France)
- 775 **Measurement, modelling and real-time calculation of medium voltage cable temperatures**
Jan Van de Vyver, Fluvius cvba (Belgium) • Tine Vandoorn, Fluvius cvba (Belgium) • Piet Lauwers, Fluvius cvba (Belgium)
- 806 **Forecasting Method of LV Distribution's Load Curve By Means of Machine Learning Utilizing Smart Meter Data**
Yuki Kanazawa, Chubu Electric Power Company (Japan) • Hiroyuki Ishikawa, Chubu Electric Power Company (Japan) • Hirokazu Uenishi, Chubu Electric Power Company (Japan) • Hiroki Ichinomiya, Mitsubishi Research Institute (Japan)
- 823 **Optimization of photovoltaics active power curtailment in low voltage networks by using Artificial bee colony**
Tomislav Alinjak, HEP ODS d.o.o. (Croatia) • Ivica Pavic, Faculty of electrical engineering and computing, University of Zagreb (Croatia) • Marinko Stojkov, Mechanical engineering faculty in Slavonski Brod (Croatia) • Kruno Trupinic, HEP ODS d.o.o. (Croatia)
- 872 **TDX-Assist: Beyond state of art in TSO-DSO interoperability – The Portuguese demonstrator**
Tiago Simão, EDP Distribuição (Portugal) • Pedro Gama, EDP Distribuição (Portugal) • Miguel Louro, EDP Distribuição (Portugal) • Leonel Carvalho, INESC TEC (Portugal) • Gonçalo Glória, NESTER (Portugal) • Rui Pestana, REN (Portugal) • Francisco Reis, REN (Portugal) • João Silva, INESC TEC (Portugal)
- 894 **Research on the optimization of the district energy mix for smart city operation**
Dong-joo Kim, KEPCO Research Institute (Korea, Republic of) • Seong-chul Kwon, KEPCO Research Institute (Korea, Republic of) • Jung-sung Park, KEPCO Research Institute (Korea, Republic of) • Moon-sung Bae, KEPCO Research Institute (Korea, Republic of) • Jong-uk Lee, KEPCO Research Institute (Korea, Republic of)
- 896 **Research on Power Equipment Rainstorm Warning Combined with Weather Forecast Data Interpolation and**
YIPING CUI, Guangzhou Power Supply Co. Ltd. (China) • LE LUAN, Guangzhou Power Supply Co. Ltd. (China) • YUQUAN LIU, Guangzhou Power Supply Co. Ltd. (China) • WENXIONG MO, Guangzhou Power Supply Co. Ltd. (China) • Xin Li, Guangzhou Power Supply Co. Ltd. (China) • HONGBIN WANG, Guangzhou Power Supply Co. Ltd. (China)
- 925 **Predicting the impacts of the major disturbances for better resource management and situational awareness**
Santtu Vähäkuopus, Elenia Oy (Finland) • Heikki Paananen, Elenia Oy (Finland) • Lauri Anttila, Futurice Oy (Finland) • Tuomas Kupila, Taaleri Energia Operations Oy (Finland)
- 935 **Coordination of the transmission control center management and distribution control center management for**
Mario Zadro, HEP - ODS d.o.o (Croatia) • Dario Polančec, HEP - ODS d.o.o (Croatia)
- 1038 **Reliability Analysis of Interconnected Electrical Power and ICT Systems using Hybrid Object-oriented Modelling**
Yushi Chen, The University of Manchester (United Kingdom) • Jovica Milanovic, The University of Manchester (United Kingdom)

- 1076 **Comparative Study of Partial Discharge Localization based on UHF Detection Methods**
Hua Chai, University of New South Wales (Australia) • Shibo Lu, University of New South Wales (Australia) • B. T. Phung, University of New South Wales (Australia) • Steve Mitchell, Ampcontrol (Australia)
- 1080 **Defining a Digitalization Concept for Electricity Distribution Network Maintenance**
Turo Ihonen, Elenia Oy (Finland) • Pauliina Salovaara, Elenia Oy (Finland) • Henri Niemi, Elenia Oy (Finland)
- 1086 **Over-specification due to lack of knowledge**
Gerard Schoonenberg, Eaton (Netherlands) • Maarten van Riet, Alliander (Netherlands)
- 1207 **Augmented Reality Opportunities in EDP Distribuição**
Bernardo Almeida, EDP Distribuição (Portugal) • Ricardo Jorge Santos, EDP Distribuição (Portugal) • António Fonseca, EDP Distribuição (Portugal) • Constança Casquinho, Nova SBE (Portugal) • Filipe Guerreiro, Fujitsu (Portugal)
- 1209 **“Outage Forecast” – A Real Application of Machine Learning on Grid Operation Management Strategies**
Bernardo Almeida, EDP Distribuição (Portugal) • Gonçalo Faria, EDP Distribuição (Portugal) • Tiago Soares, EDP Distribuição (Portugal) • Ricardo Jorge Santos, EDP Distribuição (Portugal) • José Ferreira Pinto, EDP Distribuição (Portugal) • Tiago Santos, Smartwatt (Portugal) • Isabel Preto, Smartwatt (Portugal) • Cláudio Monteiro, FEUP (Portugal)
- 1214 **Forecasted chronological Power Flow for enabling timely dynamic tariff activation**
Ricardo Gonçalves, EDP Distribuição (Portugal) • Miguel Louro, EDP Distribuição (Portugal) • André Paulo, EDP Distribuição (Portugal) • Pedro Ferreira, EDP Inovação (Portugal) • Marco Pinheiro, EDP Inovação (Portugal) • Margarida Pedro, EDP Inovação (Portugal) • Luís Marcelino Ferreira, Ambertree (Portugal) • Pedro Carvalho, AmberTREE (Portugal)
- 1395 **Cluster Autonomous Optimization of Distribution Networks with High Penetration of Distributed PV Units**
Yuanyuan Chai, Tianjin University (China) • Li Guo, Tianjin University (China) • Chengshan Wang, Tianjin University (China) • Zongzheng Zhao, Tianjin University (China)
- 1452 **Best Practices for Reliability Improvement of LT network in Tata Power, Mumbai**
Pramod Jadhav, Tata Power (India) • Devendra Santani, Tata Power (India) • Parmanand Tendulkar, Tata Power (India) • Gajanan Kale, Tata Power (India) • Shriprakash Joshi, Tata Power (India)
- 1567 **Demonstration Results of Energy Storage System for Multi-Purpose Utilization in Distribution Network**
Won Wook JUNG, KEPCO (Korea, Republic of) • Jeong Hun KIM, KEPCO (Korea, Republic of) • Won NAMKOONG, KEPCO (Korea, Republic of) • Changhoon Shin, Korea Electric Power Corporation (KEPCO) (Korea, Republic of)
- 1602 **Storm-proof automatic fault isolation and restoration system for medium voltage networks**
Jukka Kuru, Trimble Solutions Corporation (Finland) • Teemu Väre, Trimble Solutions Corporation (Finland) • Sami Vehmasvaara, Elenia Oy (Finland) • Heikki Paananen, Elenia Oy (Finland)
- 1640 **Design and implementation of an optimal algorithm for urban medium voltage overhead lines preventive**
javavd mahjoob, Guilan power distribution Co (Iran, Islamic Republic of) • Aryan Salmanpour, Guilan power distribution Co (Iran, Islamic Republic of) • Sajjad Mohammadian, Daneshmand Co. (Iran, Islamic Republic of) • Esmaeel Khoshmaslak, Guilan power distribution Co (Iran, Islamic Republic of)
- 1657 **Partial Discharge Assessment with Ultrasound and TEV (Transient Earth Voltage) in Medium Voltage Substation**
Agik Promento Yahya, PT PLN (Persero) (Indonesia) • Azkia Azkia, PT PLN (Persero) (Indonesia) • Ricky Cahya Andrian, PT PLN (Persero) (Indonesia)
- 1773 **Multi-energy Microgrid Scheduling: A multi-vector demonstrator case study**
Natalia-Maria Zografou-Barredo, Newcastle University (United Kingdom) • Charalampos Patsios, Newcastle University (United Kingdom) • Sara Louise Walker, Newcastle University (United Kingdom) • Peter Davison, Newcastle University (United Kingdom)
- 1789 **Analysis of voltage patterns for topology identification and GIS correction**
Luc Richaud, Odit-e (Spain) • Rémi Pellerej, Odit-e (France) • Clémentine Benoit, Odit-e (France) • Enrique Ramos, Schneider- Electric (Spain)

- 1790 **Improving Distribution Network Maintenance Process with Self-Driven Maintenance Actions by Contractor**
Pauliina Salovaara, Elenia Oy (Finland) • Otso Karhu, Elenia Oy (Finland) • Turo Ihonen, Elenia Oy (Finland) • Harri Salomäki, Elenia Oy (Finland)
- 1871 **Reactive Power Flow over System Boundaries in the Distribution Grid**
Christoph Groiß, Salzburg Netz GmbH (Austria) • Paul Zehetbauer, AIT (Austria) • Roman Schwalbe, AIT (Austria) • Christian Schirmer, TU Wien (Austria)
- 1894 **Relevant experiences of online PD Monitoring of MV and HV cable systems**
Javier Ortego, DIAEL (Spain) • Gonzalo Donoso, Red Eléctrica de España (Spain) • Antonio González, Viesgo (Spain) • Jesús Llandres, Naturgy (Spain) • Pedro Álvarez, Aena (Spain) • Oscar López, Aena (Spain) • Fernando Garnacho, LCOE-FFII (Spain)
- 1906 **Approach for multi criteria optimization and performance monitoring of a Virtual Power Plant with urban**
Alexander Hobert, Institute of Power System Engineering, University of Wuppertal (Germany) • Heiko Schroeder, Institute of Power System Engineering, University of Wuppertal (Germany) • Björn Uhlemeyer, Institute of Power System Engineering, University of Wuppertal (Germany) • Marlon Koralewicz, Institute of Power System Engineering, University of Wuppertal (Germany) • Markus Zdrallek, University of Wuppertal (Germany) • Lena Seeger, Wuppertaler Stadtwerke GmbH (Germany) • Dirk Aschenbrenner, Wuppertaler Stadtwerke Netz GmbH (Germany) • Pascal Biesenbach, Aufbruch am Arrenberg e.V. (Germany)
- 1918 **The development of DNO flexibility services to fit within the existing UK market for ancillary services.**
Matthew Watson, Western Power Distribution (United Kingdom) • Gary Swandells, Smart Grid Consultancy (United Kingdom) • Roger Hey, Western Power Distribution (United Kingdom)
- 1919 **Experience of SmartGrid implementation in Ufa city power grid for optimization of the distributive electric**
Dmitriy Sharovarov, BESK JSC (Russian Federation) • Andrey Kucheryavenkov, Trinity Engineering LLC (Russian Federation) • Ekaterina Kartasheva, Trinity Engineering LLC (Russian Federation)
- 1957 **Dynamic Line Rating Operational Planning: Issues and Challenges**
Seyede Fatemeh Hajeforosh, Luleå University of Technology (Sweden) • Math Bollen, Luleå University of Technology (Sweden) • Lars Abrahamsson, Luleå University of Technology (Sweden)
- 1962 **Method to characterize variability of photovoltaics power output**
Laurène Parent, National Institute of Solar Energy (France) • Delphine Riu, Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab (France) • Tuan Quoc TRAN, National Institute of Solar Energy (France) • Thai-Phuong DO, National Institute of Solar Energy (France)
- 1998 **Fault Zone Classifier Performance Improvement of PMU-Enabled Distribution System Through Feature**
Anton Domini Sta. Cruz, University of the Philippines (Philippines) • Michael Angelo Pedrasa, University of the Philippines (Philippines) • Roel Dobbe, University of California, Berkeley (USA)
- 2022 **Managing local flexible generation and consumption units using aquota-based grid traffic light approach**
Katharina Volk, Netze BW GmbH (Germany) • Linda Rupp, Netze BW GmbH (Germany) • Christian Lakenbrink, Netze BW GmbH (Germany) • Kilian Geschermann, Netze BW GmbH (Germany)
- 2036 **Analysis of the potential uncertainty in accommodation of NETSO dispatched services in DSO controlled networks**
David Tuffery, Western Power Distribution (United Kingdom) • Oliver Spink, Western Power Distribution (United Kingdom) • Stephen Quinn, Western Power Distribution (United Kingdom) • Clive Goodman, Western Power Distribution (United Kingdom)
- 2060 **Architectures for optimised interaction between TSOs and DSOs: compliance with the present practice,**
Andrei Morch, SINTEF Energy Research (Norway) • Gianluigi Migliavacca, RSE SpA (Italy) • Ivana Kockar, University of Strathclyde (United Kingdom) • Han Xu, University of Strathclyde (United Kingdom) • Julia Merino, Tecnalia (Spain) • Helena Gerard, VITO (Belgium)
- 2061 **Evaluate and analysis the reason of distribution transformers burn near the compressed natural gas station in**
Reza Bazyar, Tabriz Electric Power Distribution Company (Iran, Islamic Republic of) • Majid Valizadeh, Ilam University (Iran, Islamic Republic of) • Mohammad Bagher Bannae Sharifian, Tabriz university (Iran, Islamic Republic of) • Mohammad Reza Javadi, Azar Region Communications Regulatory Authority (Iran, Islamic Republic of) • adel kazemi, Tabriz Electric Power Distribution Company (Iran, Islamic Republic of)

- 2068 **Phase Identification in smart metering pilot project Komorany**
 Vaclav Vycital, Brno University of Technology (Czech Republic) • Michal Ptacek, Brno University of Technology (Czech Republic)
 • Petr Toman, Brno University of Technology (Czech Republic) • David Topolanek, Brno University of Technology (Czech Republic) • Jiří Drápela, Brno University of Technology (Czech Republic) • Juan Zamphiropolos, E.ON Distribuce (Czech Republic)
- 2070 **A Camera-based Tracking System for Distribution Network Inspection Based on Unmanned Aerial Vehicles**
 Zhai Ruicong, Guangdong Power Grid Co.,Ltd (China) • Chen Hao, Guangdong Power Grid Co.,Ltd (China) • Zhang Feng, Guangdong Power Grid Co.,Ltd (China) • Xu Zhihai, Guangdong Power Grid Co.,Ltd (China) • Yang Chengcheng, Wuhan huzoho Technology Co., (China)
- 2085 **Improving crisis management in the case of blackout by ensuring operational capability of the authorities**
 Pekka Verho, Tampere University (Finland) • Annina Takala, Tampere University (Finland) • Ossi Heino, Police University College (Finland) • Joanna Kalalahti, Police University College (Finland) • Pirjo Jukarainen, Police University College (Finland) • Tuula Kekki, Finnish National Rescue Association (Finland)
- 2114 **USE CASE APPLYING MACHINE-LEARNING TECHNIQUES FOR IMPROVING OPERATION OF THE DISTRIBUTION**
 Jørn Foros, SINTEF Energy Research (Norway) • Maren Istad, SINTEF Energy Research (Norway) • Andrei Morch, SINTEF Energy Research (Norway) • Bjørn Magnus Mathisen, SINTEF Digital (Norway)
- 2165 **Investigation on operating behavior of selected DC-provided components of a substation at depth discharge**
 Hans-Juergen Wernegger, KNG-Kärnten Netz GmbH (Austria)
- 2313 **DESIGNING A LABORATORY SETUP TO EXPERIMENT WITH SMART METERING FOR SMART LOW VOLTAGE GRID**
 Ali Hamdan, Grenoble INP (France) • Florent CADOUX, Fondation Partenariale de Grenoble INP (France) • Christine Collet, Grenoble INP (France)

Block 2: Control

- 46 **Enhanced Feeder Reconfiguration in Primary Distribution Networks using Backtracking Search Technique**
 Abdullah Shaheen, SDEDCo, Ministry of Electricity (Egypt) • Ragab El sehiemy, Faculty of Engineering, Kafrelsheikh University (Egypt)
- 47 **Operation of extensive grid automation: Challenges on the example of voltage control**
 Christina Sufke, Westnetz GmbH (Germany) • Nele Schlenker, innogy SE (Germany) • Ralf Heilemann, Westnetz GmbH (Germany)
- 68 **Real-time decision support system applied to distribution utility dispatches**
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- 1083 **Self-healing distribution grid based on adaptive protection and IEC61850 decentralized architecture**
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- 1097 **The Need Case and Benefits of an Autonomously Controlled Active Distribution Network**
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- 1109 **IEC 61850 GOOSE MESSAGING APPLICATIONS IN DISTRIBUTION NETWORK PROTECTION AND AUTOMATION**
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- 1138 **Advanced Decentralized Protection, Control and Monitoring Strategies for Distribution Automation**
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- 1195 **EDGE Digital Substation – A disruptive automation field project**
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- 1222 **Soft-open points for medium voltage networks – A case study**
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- 1335 **Transition to smartgrids in developing countries, contributions from telco operator in telecontrol of electricity**
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- 1355 **Function and Operation Plan for Stable Off-Grid Microgrid**
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- 1362 **Operation and Optimization Technologies of Active Distribution Network with Multi-terminal Soft Open Points**
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- 1368 **Introduction to IEC 62361-102 CIM - 61850 Harmonization**
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- 1396 **Development of digital twin technology for operation and control in distribution system**
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- 1427 **IOT Enabled Monitoring System for Non-Automated Unmanned Substations for Reliability Improvement.**
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- 1510 **Enabling Autonomous Reconfiguration of Low Voltage Networks**
Maizura Mokhtar, Heriot-Watt University (United Kingdom) • Valentin Robu, Heriot-Watt University (United Kingdom) • Jim Whyte, NotSoAnalytic Ltd. (United Kingdom) • Ciaran Higgins, Derryherk Ltd. (United Kingdom) • David Flynn, Heriot-Watt University (United Kingdom) • Fiona Fulton, SP Energy Networks (United Kingdom) • Caroline Loughran, SP Energy Networks (United Kingdom)
- 1520 **Multi-Agent-Based Grid Automation: Field test experiences of the distributed grid state control**
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- 1551 **PRIVATE FAN (Field Area Network) FOR NEXT GENERATION SMART GRIDS**
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- 1586 **Avoid technical problems in LV networks: from data-driven monitoring to predictive control**
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- 1603 **A study of Model Predictive Control applied to the French Demo of InterFlex**
Dominik Mildt, EON Energy Research Center - RWTH Aachen (Germany) • Marco Cupelli, EON Energy Research Center - RWTH Aachen (Germany) • Antonello Monti, EON Energy Research Center - RWTH Aachen (Germany) • Julien Bruschi, Enedis (France) • Thibaut Wagner, Enedis (France) • Christian Dumbs, Enedis (France)
- 1730 **Anti-islanding protection in distributed generation with synchronous generators**
Ivan Goran Kulis, Koncar-KET (Croatia) • Miljenko Boras, Koncar-KET (Croatia)
- 1800 **Analysis of practical issues in the development of voltage control system for Low Voltage DC Distribution System**
Phi Hai Trinh, Kookmin University (Korea, Republic of) • Hector Cho, Kookmin University (Korea, Republic of) • Van Thinh Huynh, Kookmin University (Korea, Republic of) • Il-Yop Chung, Kookmin University (Korea, Republic of) • SeokWoong Kim, KEPCO Research Institute (Korea, Republic of) • JuYoung Kim, KEPCO Research Institute (Korea, Republic of)
- 1850 **Enhancing Operational Awareness of Distribution System Operators with a Semi-Autonomous Intelligent Grid**
Andreas Kubis, PSI Software AG (Germany) • Markus Boller, PSI Software AG (Germany) • Julian Kemper, PSI Nentec GmbH (Germany) • Roman Uhlig, PSI Nentec GmbH (Germany) • Martin Stiegler, PSI Nentec GmbH (Germany) • Marcus Stötzel, PSI Nentec GmbH (Germany)
- 1903 **Simulation of islanding in distribution networks**
Attila Kovács, Astron Informatics Ltd. (Hungary) • Róbert Gaál, Astron Informatics Ltd. (Hungary) • János Csátár, Budapest University of Technology and Economics (Hungary)
- 1908 **MPC based energy management optimization for a European microgrid implementation**
Gonca Gürses-Tran, EON Energy Research Center - RWTH Aachen (Germany) • Dominik Mildt, EON Energy Research Center - RWTH Aachen (Germany) • Michael Hirst, E.ON UK (United Kingdom) • Marco Cupelli, EON Energy Research Center - RWTH Aachen (Germany) • Antonello Monti, EON Energy Research Center - RWTH Aachen (Germany)

- 1912 **ANALYSIS AND TEST OF EFFECTIVE SYNCHRONIZATION OF MICROGRID WITH THE UPSTREAM NETWORK**
 Carlos Candido, EDP Distribuição (Portugal) • Joao Filipe Fernanders, EDP Distribuição (Portugal) • Joao Sa, EDP Distribuição (Portugal) • Neuza Gomes, EDP Distribuição (Portugal)
- 1917 **Impact evaluation of IEC 62351 cybersecurity on IEC 61850 communications performance**
 Mauro Giuseppe Todeschini, RSE Ricerca Sistema Energetico (Italy) • Giovanna Dondossola, RSE Ricerca Sistema Energetico (Italy) • Roberta Terruggia, RSE Ricerca Sistema Energetico (Italy)
- 1928 **Improved Supervision and Control of the LV Portuguese Network**
 Rita Pires, EDP Distribuição (Portugal) • Bernardo Almeida, EDP Distribuição (Portugal) • Miguel Louro, EDP Distribuição (Portugal) • Tiago Simões, EDP Distribuição (Portugal) • Pedro Nunes, EDP Distribuição (Portugal) • Mónica Vaz, CGI (Portugal) • Hugo Calado, CGI (Portugal) • Guilherme Pires, CGI (Portugal)
- 1952 **5G Network Slicing as an Enabler for Smart Distribution Grid Operations**
 H. V. Kalpanie Mendis, Norwegian University of Science and Technology (NTNU) (Norway) • Poul Einar Heegaard, Norwegian University of Science and Technology (NTNU) (Norway) • Katina Krlevska, Norwegian University of Science and Technology (NTNU) (Norway)
- 2122 **On The Cost-Effectiveness Of Multistage Deployment of Wide Area Monitoring Systems In Weak Networks under**
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- 2255 **Voltage-frequency Stability of a Low Inertia Electrical Grid using a Kuramoto Model**
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- 2293 **Microgrid Controller and Distributed Energy Resource Functionality Verification via Laboratory and Field**
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 Martin Horák, Západoslovenská distribučná, a.s. (Slovakia) • Tomáš Škumát, Západoslovenská distribučná, a.s. (Slovakia)
- 65 **New method for identification and localisation of an earthfault in compensated networks**
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- 66 **First results concerning localisation of earthfaults in compensated 20-kV-networks based on travelling waves**
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- 250 **Real Time Fault Level Monitoring**
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- 292 **Utilization of a mixture of CTs and current sensors in line differential protection applications**
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- 341 **5G networks enabling new smart grid protection solutions**
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- 402 **New method of arc suppression coil tuning using truly multifrequency current signal**
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 nader sherbilla, Beheira Co. for Electricity Distribution (Egypt)
- 490 **Practical Demonstration of High-impedance Fault Detection Technology in MV Distribution Network**
 Li Tianyou, Fujian Electricity Power Co. LTD. (China) • Huang Chaoyi, Quanzhou Electric Power Supply Company (China)
- 531 **Analytical calculation of the neutral point displacement voltage for high impedance earth faults in resonant**
 Ludwig Döring, Technische Universität Darmstadt (Germany) • Benjamin Braun, Technische Universität Darmstadt (TU DA) (Germany) • Klaus Böhme, Siemens AG (Germany) • Stefan Werben, Siemens AG (Germany) • Matthias Kereit, Siemens AG (Germany) • Jutta Hanson, Technische Universität Darmstadt (Germany)
- 661 **New solution for detecting single phase-to-ground faults in resonant-grounded systems**
 Gergely Pócsi, Protecta Co. Ltd. (Hungary) • Ferenc Radvánszki, Protecta Co. Ltd. (Hungary) • Dr. Ferenc Weingart, Protecta Co. Ltd. (Hungary) • György Csipke, Protecta Co. Ltd. (Hungary)
- 695 **IMPROVING PERSONAL SAFETY IN MV-NETWORKS THROUGH NOVEL EARTH-FAULT CURRENT BASED FEEDER**
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- 801 **Frequency & ROCOF protections: toward a better evaluation of their rapidity**
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- 833 **Loss of Neutral in Low Voltage Electrical Installation with connected DG units – Consequences and Solutions**
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- 837 **IEC 61850: Believe or don't believe in testing. That is the question!**
 Jorge Cardenas, GE Grid Automation (Spain) • Rannveig Løken, Statnett (Norway) • Javier Martin, Red Electrica de España (Spain) • Jose Mendez, GE Grid Automation (Canada) • Joaquin Rodriguez, GE Grid Automation (Spain) • Diego Arribas, Red Electrica de España (Spain) • Daniel Ruiz Ayala, Red Electrica de España (Spain)
- 851 **FAULT DETECTION IN LOW VOLTAGE NETWORKSWITH SMART METERS AND MACHINE LEARNING TECHNIQUES**
 TANIA VAZQUEZ, EDP España (Spain) • PABLO PEREZ, OVIEDO UNIVERSITY (Spain) • JORGE DIEZ, OVIEDO UNIVERSITY (Spain) • JESÚS FERNÁNDEZ, EDP España (Spain)
- 863 **Operation Analysis and Improvement Measures of Residual Current Protection of Low Voltage Distribution**
 Huang Chaoyi, Quanzhou Electric Power Supply Company (China) • Li Tianyou, Fujian Electricity Power Co. LTD. (China) • PAN Guomei, Electric Power Research Institute, SMEPC (China)

- 917 **Study on Accuracy of Distribution Fault Point Localization by Resonance Frequency Analysis**
Ryota Yamamoto, Tokyo Electric Power Company Power Grid, Inc. (Japan) • Kentaro Hirose, Tokyo Electric Power Company Holdings, Inc. (Japan) • Takaki Yasui, Tokyo Electric Power Company Holdings, Inc. (Japan)
- 945 **Using Smart Grid SurveillanceTM to detect and localize failures in the overhead medium voltage grid**
Stefan Burström, Exeri AB (Sweden) • Elisabeth Söderström Johansson, Exeri AB (Sweden)
- 1049 **Locating Single Phase-to-Earth Faults in Compensated and Isolated Distribution Networks Applying Travelling**
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- 1055 **Prognostic failure detection on overhead power distribution grid utilizing TDR measurement method**
Matsui Masakazu, Kansai Electric Power Co.,Inc. (Japan) • Daisuike Taketani, Kansai Electric Power Co.,Inc. (Japan) • Toshihiro Hayashi, Kansai Electric Power Co.,Inc. (Japan) • Tomohiko Morita, Kansai Electric Power Co.,Inc. (Japan) • Matsushima Tohlu, Kyoto University (Japan) • Takashi Hisakado, Kyoto University (Japan) • Wasa Osami, Kyoto University (Japan)
- 1075 **An Experimental Study of Low-Current DC Series Arc Faults for Condition Monitoring Purpose**
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- 1079 **Application of fuse autopsy methodology to estimate protected element type of failure**
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- 1081 **Return paths of earth faults current in medium voltage grids with underground shielded cables**
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- 1093 **Scales and Objectives for Under-frequency Load Shedding**
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- 1141 **Current based Distance Protection in Closed-Ring Grids with Distributed Generation**
Martin Biller, Friedrich-Alexander University Erlangen-Nuremberg (FAU) (Germany) • Johann Jaeger, Friedrich-Alexander University Erlangen-Nuremberg (FAU) (Germany)
- 1194 **Characterising Grid Connection Stability of Low Voltage PV Inverters through Real-time Hardware Testing**
Panagiotis Bountouris, Power Networks Demonstration Centre (United Kingdom) • Ibrahim Abdulhadi, Power Networks Demonstration Centre (United Kingdom) • Adam Dysko, University of Strathclyde (United Kingdom) • Federico Coffele, University of Strathclyde (United Kingdom)
- 1307 **Verification of protective measures for safety of DC charging stations for electric vehicles**
Daniel Herbst, Graz University of Technology (Austria) • Robert Schürhuber, Graz University of Technology (Austria) • Ernst Schmautzer, TU Graz (Austria) • Benjamin Jauk, Graz University of Technology (Austria) • Christian Auer, Kristl, Seibt & Co. GesmbH (Austria)
- 1341 **Exploring IED data management and IEC 61850 features to introduce a condition based maintenance approach in**
Luís Candeias, EDP Distribuição (Portugal) • Carlos Cura, EDP Distribuição (Portugal) • Helder Heitor, EDP Distribuição (Portugal) • Miguel Veríssimo, EDP Distribuição (Portugal) • Paulo Ribeiro, EDP Distribuição (Portugal)
- 1351 **Functional Testing of Distribution Systems with High Penetration of Distributed Energy Resources**
Alexander Apostolov, OMICRON electronics (USA) • Frederic Dunet, OMICRON electronics (France) • Juan Parra, OMICRON electronics (Suriname)
- 1386 **Touch voltages and earth fault currents in a rural large-scale underground cable network with connected**
Jyrki Reikko, Caruna Oy (Finland) • Antti Keskinen, Caruna Oy (Finland) • Rauno Ristimäki, Caruna Oy (Finland)

1391 Research and application of active protection technology in LVDC system

Zou Xueyi, Nanjing Golden Cooperate DC Power Distribution Technology. Co.,Ltd. (China) • Zhu Xuezhong, Nanjing University of Aeronautics & Astronautics (China) • Li Zhong, Nanjing Golden Cooperate DC Power Distribution Technology. Co.,Ltd. (China) • Tong Hao, Nanjing Golden Cooperate DC Power Distribution Technology. Co.,Ltd. (China) • Chen Wenbo, Nanjing Golden Cooperate DC Power Distribution Technology. Co.,Ltd. (China) • Yan Jianhai, Nanjing Golden Cooperate DC Power Distribution Technology. Co.,Ltd. (China)

1499 New faulted phase selector solution for dealing with the effects of Type-4 Wind Turbine on present protection

Eduardo Martinez Carrasco, Fundacion CIRCE (Spain) • Maria Teresa Villén Martínez, Fundacion CIRCE (Spain) • Samuel Borroy Vicente, Fundacion CIRCE (Spain) • David López Cortón, Red Eléctrica de España (Spain) • Marjan Popov, TU Delft (Netherlands) • Henri Grasset, Schneider Electric (France)

1537 Smart Grid Protection and Automation Enabled by IEC 61850 Communications Over 5G Networks

Ana Cristina Aleixo, EFACEC (Portugal) • José Cabaça, Altice Labs (Portugal) • Pedro Neves, Altice Labs (Portugal) • Rui Dias Jorge, EFACEC (Portugal) • Rogério Dias Paulo, EFACEC (Portugal) • Alberto Rodrigues, EFACEC (Portugal)

1570 Protection Coordination in DC Shipboard Power Systems: Challenges, Current Status and New Technologies

Seongil Kim, École Polytechnique Fédérale de Lausanne (EPFL) (Switzerland) • Soo-Nam Kim, Hyundai Electric & Energy Systems (Korea, Republic of) • Drazen Dujic, École Polytechnique Fédérale de Lausanne (EPFL) (Switzerland)

1583 Enel grid digitalization through multifunctional control and protection devices

Christian Noce, Enel Global Infrastructure and Networks Srl (Italy) • Antonio Cammarota, E-distribuzione Spa (Italy) • Luca Delli Carpini, E-distribuzione Spa (Italy) • Fabio Giammanco, Enel Global Infrastructure and Networks Srl (Italy) • Pietro Paulon, E-distribuzione Spa (Italy) • Gianluca Sapienza, E-distribuzione Spa (Italy)

1620 The Benefits and Design of a Dynamic Protection System for the Distribution Network

Daniel Hardman, GHD (United Kingdom) • Neil Murdoch, GHD (United Kingdom) • Jonathan Berry, Western Power Distribution (United Kingdom)

1761 Smart fault selection through smart protection devices using IEC61850

Luca Delli Carpini, E-distribuzione Spa (Italy) • Antonio Cammarota, E-distribuzione Spa (Italy) • Gianluca Sapienza, E-distribuzione Spa (Italy) • Pietro Paulon, E-distribuzione Spa (Italy)

1973 Real Time detection and localization of self extinguishing defects on a MV network

Nicolas Grégis, CEA TECH - LIST (France) • François Cochet, Nexans Suisse SA (Switzerland) • Jaume Benoit, CEA TECH - LIST (France) • Nicolas Ravot, CEA TECH - LIST (France) • Gabriel Gobat, Nexans Suisse SA (Switzerland) • Philippe Desbats, CEA TECH - LIST (France)

2002 Protection and Earthing Requirements of Low Voltage AC and DC Distribution Networks Interfaced by Smart

Abdullah Emhemed, Department of Electronic and Electrical Engineering, University of Strathclyde (United Kingdom) • Kyle Smith, Department of Electronic and Electrical Engineering, University of Strathclyde (United Kingdom) • Graeme M. Burt, University of Strathclyde (United Kingdom) • Paul Black, WSP (United Kingdom) • Ali Kazerooni, WSP (United Kingdom) • Anthony Donoghue, SP Energy Networks (United Kingdom) • Michael Eves, SP Energy networks (United Kingdom)

2004 Digital System Protection Design – A new Toolchain for Protection System Automation

Georg Janick Meyer, Friedrich-Alexander University Erlangen-Nuremberg (FAU) (Germany) • Martin Biller, Friedrich-Alexander University Erlangen-Nuremberg (FAU) (Germany) • Christian Romeis, Siemens AG (Germany) • Li Shang-Jaeger, Siemens AG (Germany) • Maximilian Dauer, Siemens AG (Germany) • Benjamin Braun, Technische Universität Darmstadt (TU DA) (Germany) • Nils Schäkel, Leibniz Universität Hannover (LUH) (Germany) • Johann Jaeger, Friedrich-Alexander University Erlangen-Nuremberg (FAU) (Germany)

2084 Improved Control System for Hybrid AC/DC microgrids considering Transient Short Circuit Faults

Meisam Sadeghi, Tabriz Electric Power Distribution Company (Iran, Islamic Republic of) • Mojtaba Khederzadeh, Shahid Beheshti University (Iran, Islamic Republic of) • Sheida Mohammadzadeh Jasour, Tabriz Electric Power Distribution Company (Iran, Islamic Republic of)

2110 SIEMENS Fault Collector Gateway Test On LE “Sandbox” – The First Open National Energy Sandbox In Europe

Paulius Butkus, Energijos skirstymo operatorius (Lithuania) • Felix Cadelcu, Siemens AG (Germany) • Andrius Stamkauskas, Siemens Osakeyhtioe (Lithuania) • Audrius Grainys, Vilnius Gediminas Technical University (Lithuania)

2142 Comparison of decentralised and centralised under-frequency loadshedding

Karel Maslo, CEPS, a.s. (Czech Republic) • Petr Toman, Brno University of Technology (Czech Republic) • Jan Koudelka, Brno University of Technology (Czech Republic)

2217 Reliable Rate of Change of Frequency (RoCoF) Measurements: Use Cases, Operational Parameters and Test

Gert Rietveld, VSL (Netherlands) • Paul Wright, NPL (United Kingdom) • Kevin Johnstone, Strathclyde University (United Kingdom) • Andrew Roscoe, Strathclyde University (USA)

2323 Improve your SAIDI with Advanced Fault Passage Indication

Jean-Yves Pochier, Schneider Electric (France) • Ludovic Lamberti, Schneider Electric (France) • Yves Chollot, Schneider Electric (France)

Session 4 - Distributed energy resources and efficient utilisation of electricity

Thursday, 6 June 2019 from 9:00 to 18:00

Block 1: Co-ordination, flexibility and services

- 199 **From Flexible Connections to Enabling Flexibility: The Evolution of Active Network Management at SP Energy**
Euan Norris, Iberdrola (United Kingdom) • Laura Kane, ScottishPower (United Kingdom) • Euan Davidson, ScottishPower (United Kingdom)
- 666 **Flexibility Hub – Multi service framework for coordination of decentralised flexibilities**
José Villar, INESC TEC (Portugal) • João Aguiar, INESC TEC (Portugal) • Fabio Retorta, INESC TEC (Portugal) • Bernardo Silva, INESC TEC (Portugal) • Nuno Fulgêncio, INESC TEC (Portugal) • Nuno Lopes Filipe, EDP CENT / Labeltec (Portugal) • Miguel Marques, EDP CNET (Portugal) • Miguel Louro, EDP Distribuição (Portugal)
- 684 **Coordinated Volt/Var Control for Smart Distribution Grids**
Roberta Biazi, Federal University of Santa Maria (Brazil) • Daniel Pinheiro Bernardon, Federal University of Santa Maria (Brazil) • Alzenira Da Rosa Abaide, Federal University of Santa Maria (Brazil) • Pedro Marcolin, Federal University of Santa Maria (Brazil) • Ana Paula Carboni de Mello, Federal University of Pampa (Brazil) • Rafael Gomes Bento, CPFL Power Utilit (Brazil)
- 870 **A Smart Contracting Framework for Aggregators of Demand-Side Response**
Sergio Elizondo, Heriot-Watt University (United Kingdom) • Stephen Wattam, Upside Energy Ltd (United Kingdom) • Valentin Robu, Heriot-Watt University (United Kingdom) • Rachel Jones, Upside Energy Ltd (United Kingdom) • Graham Oakes, Upside Energy Ltd (United Kingdom)
- 879 **Charges for Producers connected to Distribution Systems**
Sophia Politopoulou, HEDNO S.A. (Greece) • Antonis Spyropoulos, HEDNO S.A. (Greece) • Paul Wilczek, Eurelectric (Belgium) • Jan Bocora, Východoslovenská distribučná (Slovakia) • Jan Budke, German Association of Energy and Water Industries – BDEW (Germany) • Manuel Martinez, ENEL (Spain)
- 1044 **Assessing the Impact of Distributed Energy Resources' Incentive Designs on Network Expansion Using a Spatial**
Fabian Heymann, MITEI/ INESC TEC/ FEUP (Portugal) • Pablo Duenas, MITEI (USA) • Filipe Joel Soares, INESC TEC (Portugal) • Vladimiro Miranda, INESC TEC/ FEUP (Portugal)
- 1137 **A smart grid alternative to network reinforcement for HV/MV substations constraints : Active power curtailment**
Leticia De Alvaro Garcia, Enedis (France) • Xavier Debold, Enedis (France) • Mathieu Gondolo, Enedis (France)
- 1158 **Testing TSO-DSO Interaction Schemes for the Participation of Distribution Energy Resources in the Balancing**
Marco Rossi, RSE (Italy) • Giacomo Viganò, RSE (Italy) • Gianluigi Migliavacca, RSE SpA (Italy) • Yelena Vardanyan, Technical University of Denmark (Denmark) • Razgar Ebrahimi, Technical University of Denmark (Denmark) • Guillaume Leclercq, N-SIDE (Belgium) • Peter Sels, N-SIDE (Belgium) • Marco Pavesi, N-SIDE (Belgium)
- 1164 **Transformation of a microgrid in a distribution grid support asset**
Gregorio Fernández Aznar, CIRCE Foundation (Spain) • Miguel Ángel Oliván Monge, CIRCE Foundation (Spain) • José Sediles Ortiz, CIRCE Foundation (Spain) • Andreas Muñoz Zuara, CIRCE Foundation (Spain) • Jorge Bruna Romero, CIRCE Foundation (Spain) • Hans Bludszuweit, CIRCE Foundation (Spain) • Inmaculada Prieto Borrero, Endesa Distribución (Spain)
- 1186 **Adaptive Energy Resource Management System – scaling out microgrid based solutions in electrical power**
Luis Marques, EFACEC (Portugal) • Filipe Campos, Efacec (Portugal) • Marta Ribeiro, Efacec Energia (Portugal) • Alberto Bernardo, Efacec Energia (Portugal) • Ismael Miranda, Efacec (Storage) (Portugal)
- 1208 **The EU-SysFlex French industrial-scale demonstrator: coordinating distributed resources for multi-services**
Ye Wang, EDF (France) • Hugo Morais, EDF (France) • Bettina Lenz, ENERCON (Germany) • Victor Gomes, ENERCON (France) • Thomas Godlewski, EDF (France) • Heloise Baraffe, EDF R&D (France)

- 1215 Net Metering in Brazil: Setting the Scene for the Regulatory Framework Review**
 João Marcelo Cavalcante de Albuquerque, Brazilian Electricity Regulatory Agency – ANEEL (Brazil) • Daniel Vieira, Brazilian Electricity Regulatory Agency – ANEEL (Brazil) • Hugo Lamin, Brazilian Electricity Regulatory Agency – ANEEL (Brazil)
- 1295 Provision of flexibility services through energy communities**
 Massimiliano Garella, DTU (Denmark) • Tiago Sousa, DTU (Denmark) • Pierre Pinson, DTU (Denmark)
- 1394 Optimal Operation of a Community Integrated Energy System Considering Tie-line Smoothing**
 Hao Yu, Tianjin University (China) • Chaoxian Lv, Tianjin University (China) • Chengshan Wang, Tianjin University (China) • Peng Li, Tianjin University (China) • Guanyu Song, Tianjin University (China) • Shuquan Li, State Grid Customer Service Center (China)
- 1416 Blockchain-based self-consumption optimization in local energy communities**
 Regina Hemm, AIT Austrian Institute of Technology GmbH (Austria) • Mark Stefan, AIT Austrian Institute of Technology GmbH (Austria) • Friederich Kupzog, AIT Austrian Institute of Technology GmbH (Austria) • Michael Niederkofler, Energie Kompass GmbH (Austria) • Andreas Schneemann, Energie Kompass GmbH (Austria)
- 1502 Aggregation of thermostatically controlled loads for flexibility markets**
 Joseba Jimeno, Tecnalia (Spain) • Nerea Ruiz, Tecnalia (Spain) • Carlos Madina, Tecnalia (Spain)
- 1506 Assessing the energetic self-sufficiency of a residential district**
 James Garzon-Real, Bergische Universität Wuppertal (Germany) • Björn Uhlemeyer, Institute of Power System Engineering, University of Wuppertal (Germany) • Markus Zdrallek, University of Wuppertal (Germany) • Jörn Benthin, Gas und Wärme Institut Essen e.V. (Germany) • Nadine Lucke, Gas und Wärme Institut Essen e.V. (Germany) • Ben Wortmann, Gas und Wärme Institut Essen e.V. (Germany) • Carsten Stabenau, Westnetz GmbH (Germany) • Ulrich Dirkmann, innogy SE (Germany)
- 1632 Cost-Benefit Analysis of TSO-DSO coordination to operate flexibility markets**
 Carlos Madina, Tecnalia (Spain) • Sandra Riaño, Tecnalia (Spain) • Inés Gómez, Tecnalia (Spain) • Pirkko Kuusela, Technical Research Centre of Finland, Ltd. (Finland) • Hamid Aghaie, AIT (Austria) • Joseba Jimeno, Tecnalia (Spain) • Nerea Ruiz, Tecnalia (Spain) • Marco Rossi, RSE (Italy)
- 1652 Use of radio base stations to provide ancillary services to the DSO through local flexibility markets**
 Miguel Pardo, Endesa (Spain) • Miguel Duarte, Endesa (Spain) • Carlos Madina, Tecnalia (Spain) • Miguel Marroquin, Our New Energy (Spain) • Eric Estrade, Vodafone (Luxembourg)
- 1662 Coordination and data exchange between DSO and TSO as key factors for optimizing DER management in the**
 Christian D'Adamo, e-distribuzione SpA (Italy) • fabio cazzato, e-distribuzione SpA (Italy) • marco di clerico, e-distribuzione SpA (Italy) • simone ferrero, e-distribuzione SpA (Italy)
- 1688 Holistic coordination of smart technologies for efficient LV operation, increasing hosting capacity and reducing**
 ALENA ULASENKA, ORMAZABAL CORPORATE TECHNOLOGY (Spain) • LUIS DEL RIO ETAYO, ORMAZABAL CORPORATE TECHNOLOGY (Spain) • PABLO CIRUJANO, ORMAZABAL COTRADIS (Spain) • ALVARO ORTIZ, ORMAZABAL COTRADIS (Spain) • RON BRANDL, FRAUNHOFER IEE / DERlab e.V. (Germany) • Juan Montoya, Fraunhofer IEE (Germany)
- 1721 UK Power Networks Providing Power Services from Distributed Energy Resources to Transmission System**
 Ali R. Ahmadi, UK Power Networks (United Kingdom) • Inma Martinez, National Grid ESO (United Kingdom) • Biljana Stojkowska, National Grid ESO (United Kingdom) • Tim Manandhar, UK Power Networks (United Kingdom) • Sotiris Georgiopoulos, UK Power Networks (United Kingdom)
- 1732 Enhanced Transmission and Distribution System Coordination and Control Utilising Distribution Network**
 Ali R. Ahmadi, UK Power Networks (United Kingdom) • Michael Gordon, National Grid (United Kingdom) • Matthew White, UK Power Networks (United Kingdom) • Alan Minton, National Grid (United Kingdom) • Sotiris Georgiopoulos, UK Power Networks (United Kingdom) • Dionysios Stamatiadis, UK Power Networks (United Kingdom)
- 1806 INNOVATIVE ELECTRICITY NETWORK OPERATION PLANNING TOOL FOR TSOs AND DSOs**
 Ataollah Moghim Khavari, DERlab (Germany) • Melios Hadjikypris, UCY (Cyprus) • Giorgio Graditi, ENEA (Italy) • Marialaura Di Somma, ENEA (Italy) • Anna Wakszyńska, IEn (Poland) • Sawsan Henein, AIT (Austria)
- 1847 Valuation of harnessing flexibility from decentralized water electrolysis systems for the DSO**
 Karl Axel Sträng, Enedis (France) • Jean-Christophe Lanoix, Hincio (France) • Joel Neave, Hincio (France) • Frederic Barth, Hincio (France) • Bruno François, Centrale Lille (France)

- 1891 **A Transparent Market Design for Balancing and Voltage Control Products**
Irina Oleinikova, NTNU (Norway) • Luciano Martini, RSE (Italy) • Emilio Rodriguez, TECNALIA (Spain)
- 1900 **Stochastic bottom-up framework for load and flexibility for agent based controls of energy communities**
Arne Surmann, Fraunhofer Institute for Solar Energy Systems (Germany) • Stefan Chantrel, Fraunhofer Institute for Solar Energy Systems (Germany) • David Fischer, Fraunhofer Institute for Solar Energy Systems (Germany) • Robert Kohrs, Fraunhofer Institute for Solar Energy Systems (Germany) • Christof Wittwer, Fraunhofer Institute for Solar Energy Systems (Germany)
- 1936 **Project SENSIBLE's results from MV/LV coordinated island operation in a distribution grid**
Ricardo Jorge Santos, EDP Distribuição (Portugal) • André Neves, EDP Distribuição (Portugal) • António Araújo, EDP Distribuição (Portugal) • Pedro Castro, EDP NEW (Portugal) • Filipe Guerra, EDP NEW R&D (Portugal) • Clara Gouveia, INESC TEC (Portugal) • José Damásio, Siemens S.A. (Portugal)
- 1948 **The role of market facilitator: how DSO-owned Energy Storage Systems can support private resources in ancillary**
Daniele Clerici, Ricerca sul Sistema Energetico (Italy) • Marco Rossi, RSE (Italy) • Giacomo Viganò, RSE (Italy) • Diana Moneta, RSE (Italy)
- 1992 **Storage and Energy Management enabling Grid and Market Services: SENSIBLE's Portuguese real demonstration**
Filipe Guerra, EDP NEW R&D (Portugal) • Ricardo André, EDP NEW R&D (Portugal) • Ricardo Jorge Santos, EDP Distribuição (Portugal) • Alexis Bocquet, MINES-ParisTech, PERSEE (France) • Catherine Murphy-O'Connor, Indra (Portugal) • Clara Gouveia, INESC TEC (Portugal) • José Damásio, Siemens S.A. (Portugal) • Salvador Rodriguez, GPTech (Spain)
- 2037 **Regional Coordination Control of Active Distribution Network Based on Bidding Mechanism**
Qiang FAN, Shanghai Jiao Tong University (China) • Dong Liu, Shanghai Jiao Tong University (China) • Xiaochun XU, State Grid Huai'an Power Supply Company (China) • Xiaofei WU, State Grid Huai'an Power Supply Company (China)
- 2055 **Integration of distributed reactive power sources through Virtual Power Plant to provide voltage control to**
Danny Pudjianto, Imperial College London (United Kingdom) • Predrag Djapic, Imperial College London (United Kingdom) • Goran Strbac, Imperial College London (United Kingdom) • Biljana Stojkovska, National Grid ESO (United Kingdom) • Ali R. Ahmadi, UK Power Networks (United Kingdom) • Inma Martinez, National Grid ESO (United Kingdom)
- 2144 **Energy Procurement of Large Industrial Consumers: Real-time Pricing against Time-of-Use Pricing**
Habib Farham, East Azarbaijan Electric Power Distribution company (Iran, Islamic Republic of) • Leila Mohammadian, Islamic Azad University Shabestar Branch (Iran, Islamic Republic of) • Hasan Alipour, Islamic Azad University Shabestar Branch (Iran, Islamic Republic of) • Jaber Pouladi, Islamic Azad University Shabestar Branch (Iran, Islamic Republic of)
- 2320 **BESS located in Primary Substation for RES integration and ancillary services provision**
Maurizio Delfanti, Politecnico di Milano (Italy) • Filippo Bovera, Politecnico di Milano (Italy) • Davide Falabretti, Politecnico di Milano (Italy) • Marco Merlo, Politecnico di Milano (Italy) • Giuliano Rancilio, Politecnico di Milano (Italy)
- 2325 **A Collaborative Demand-Side Management Scenario for Liberalized Smart Grids**
Martin Hupez, University of Mons (Belgium) • Zacharie De Grève, University of Mons (Belgium) • François Vallée, University of Mons (Belgium)

Block 2: Planning for and understanding the impact of DER

- 184 **Filling missing values for AI-based (load) forecasts within the InterFlex micro grid demo in Simris, Sweden**
Roxana Pohlmann, RWTH Aachen (Germany) • Henning Wilms, RWTH Aachen (Germany) • Marco Cupelli, EON Energy Research Center - RWTH Aachen (Germany) • Inko Elgezua Fernandez, E.ON (Germany) • Antonello Monti, EON Energy Research Center - RWTH Aachen (Germany)
- 308 **Recommended Distributed Energy Resource Modeling Practices in North America**
Ryan Quint, North American Electric Reliability Corporation (USA) • Irina Green, California Independent System Operator (USA) • Deepak Ramasubramanian, Electric Power Research Institute (USA) • Pouyan Pourbeik, PEACE (USA) • Jens Boemer, Electric Power Research Institute (USA) • Anish Gaikwad, Electric Power Research Institute (USA) • Dmitry Kosterev, Bonneville Power Administration (USA) • Mohamed Osman, North American Electric Reliability Corporation (USA)

- 390 **Reasonability of “Fit and inform” for sources up to 50 kW within LV networks**
Josef Hrouda, EGC-EnerGoConsult CB (Czech Republic) • Frantisek Kysnar, EGC-EnerGoConsult CB (Czech Republic) • Zdenek Pavlovic, CEZ Distribuce, a.s. (Czech Republic) • Jan Petrasek, EGC-EnerGoConsult CB (Czech Republic) • Karel Prochazka, EGC-EnerGoConsult CB (Czech Republic)
- 413 **Disaggregating Grid Load into Consumption and Solar Generation**
Frank Kreuwel, Alliander N.V. (Netherlands) • Kasper van Lohuizen, Alliander N.V. & Wageningen University & Research (Netherlands) • Chiel van Heerwaarden, Wageningen University & Research (Netherlands)
- 421 **A novel scheme of under frequency load shedding for a microgrid integrated with renewable energy resources**
Ahmed Elzawawy, Benha University (Egypt) • Mahmoud Ali, Benha University (Egypt) • Said Mekhemer, Ain Shams university (Egypt) • Fahmy Bendary, Faculty of Engineering Shoubra, Benha University (Egypt) • Wagdy Mansour, Benha University (Egypt)
- 425 **Mitigation of Faults in Grid-Connected Single Machine Brushless Double-Fed Induction Generator**
Maged Nashed, Electronics Research Institute (Egypt) • Mona Eskander, Electronics Research Institute (Egypt) • Mahmoud Saleh, Electronics Research Institute (Egypt)
- 427 **Generalized Synthesis Load Model Considering Lithium-ion Battery**
Li Shiming, Guangdong Grid Company Power Dispatching Control Center (China) • Liu Wenzhe, Datang Xianyi Technology Co. Ltd (China) • Tan Zuoyun, Hunan University (China) • Lin Yueting, Guangdong Grid Company Power Dispatching Control Center (China)
- 524 **Experimental Study of the Isolated Operation of a Home DC Link System**
Teru Miyazaki, Waseda University (Japan) • Wataru Hirohashi, Waseda University (Japan) • Jun Yoshinaga, Waseda University (Japan) • Yasuhiro Hayashi, Waseda University (Japan) • Kosuke Kobayashi, Tokyo Gas Co., Ltd (Japan) • Tatsuya Tsukada, Tokyo Gas Co., Ltd (Japan)
- 549 **Flexibility Determination of Distributed Energy Resources, Storage Systems and Heating Units considering Load**
Martin Zimmerlin, Karlsruhe Institute of Technology (Germany) • Ovidiu Popa, Karlsruhe Institute of Technology (Germany) • Lukas Held, Karlsruhe Institute of Technology (Germany) • Felicitas Mueller, Karlsruhe Institute of Technology (Germany) • Michael Suriyah, Karlsruhe Institute of Technology (Germany) • Thomas Leibfried, Karlsruhe Institute of Technology (Germany)
- 598 **Voltage management in the presence of Distributed Energy Resources - Field implementation of a robust**
Keddy KAMGA, EDF R&D (France) • Olivier Carré, Enedis (France) • Benoît Bouzigon, Enedis (France)
- 624 **Study on Voltage Stability Limit of 6.6 kV Distribution System by Reverse Power Flow from a Group of**
Hideki Iwatsuki, Nagoya Institute of Technology (Japan) • Hiroyuki Ishikawa, Chubu Electric Power Company (Japan) • Ippei Matsuura, Polytechnic University (Japan) • Hirotaka Shimizu, Polytechnic University (Japan) • Toshiro Matsumura, Aichi Institute of Technology (Japan) • Kento Tatewaki, Nagoya University (Japan) • Yasunobu Yokomizu, Nagoya University (Japan)
- 671 **The influence of voltage-controlled transformers on PV-Park Inverters.**
Werner Hofer, Maschinenfabrik Reinhausen GmbH (Germany) • Markus Riepl, Maschinenfabrik Reinhausen GmbH (Germany)
- 702 **The Introduction of Voltage Stabilization System according to the Increased DERs in KOREA**
Hak-Yeol Park, KEPCO KDN (Korea, Republic of) • Deok-Chul Kim, KEPCO KDN (Korea, Republic of)
- 726 **Optimization of network planning based on hourly classification of consumed energy**
Amir Khazaei, Mashhad Electric Energy Distribution Co. (Iran, Islamic Republic of) • Hossein Delavaripour, Mashhad Electric Energy Distribution Co. (Iran, Islamic Republic of) • Hossein Hooshmandi Safa, Mashhad Electric Energy Distribution Co. (Iran, Islamic Republic of) • Mehran Ghasempour, Mashhad Electric Energy Distribution Co. (Iran, Islamic Republic of)
- 729 **CVR in PV-Rich Distribution Networks: A Customer Perspective**
Luis Gutierrez-Lagos, The University of Manchester (United Kingdom) • Luis F. Ochoa, The University of Melbourne (Australia)
- 982 **A risk-based framework to optimize distributed generation investment plans considering incentive reliability**
Mohammad Jooshaki, Sharif University of Technology (Iran, Islamic Republic of) • Hossein Farzin, Shahid Chamran University of Ahvaz (Iran, Islamic Republic of) • Ali Abbaspour, Sharif University of Technology (Iran, Islamic Republic of) • Mahmud Fotuhi-Firuzabad, Sharif University of Technology (Iran, Islamic Republic of) • Matti Lehtonen, Aalto University (Finland)

- 1020 Modelling of Stationary and Dynamic Demand Behavior considering Sectoral and Regional Characteristics**
Daniel Stenzel, Technical University of Munich (Germany) • Lorenz Viernstein, Technical University of Munich (Germany) • Dominic Hewes, Technical University of Munich (Germany) • Thomas Würfl, Technical University of Munich (Germany) • Rolf Witzmann, Technical University of Munich (Germany) • Sascha Altschäffl, TenneT TSO GmbH (Germany) • Jörg Michael Schmidt, TenneT TSO GmbH (Germany)
- 1058 Combining distributed synchronized high frequency measurements with a control system for smart low voltage**
Gerwin Hoogsteen, University of Twente (Netherlands) • Marco E. T. Gerards, University of Twente (Netherlands) • Johann L. Hurink, University of Twente (Netherlands) • Gerard J. M. Smit, University of Twente (Netherlands) • Omar Mansour, Smart State Technology (Netherlands) • Dennis Bijwaard Smart State Technology, Smart State Technology (Netherlands)
- 1134 Assessment of the Reliability of Power Balance and Flexibility Forecasts from Distribution Networks**
Lukas Kalisch, FGH e.V. (Germany) • Dirk Lehmann, FGH e.V. (Germany) • Hendrik Vennegeerts, FGH e.V. (Germany) • Albert Moser, FGH e.V. / RWTH Aachen (Germany)
- 1319 Conditions for increasing DER anti-islanding protection frequency range**
Miguel Veríssimo, EDP Distribuição (Portugal) • André Neves, EDP Distribuição (Portugal) • Miguel Louro, EDP Distribuição (Portugal) • Nuno Lopes Filipe, EDP CENT / Labelec (Portugal) • Andreia Leiria, EDP Labelec (Portugal) • Luís Marcelino Ferreira, Ambertree (Portugal) • Pedro Carvalho, AmberTREE (Portugal) • Fernando Carvalho, Ambertree (Portugal)
- 1330 Real case islanding detection on the Distribution network by using microPMU units**
Miguel Veríssimo, EDP Distribuição (Portugal) • Pedro Aleixo, EDP Distribuição (Portugal) • André Falcão, EDP Distribuição (Portugal) • André Neves, EDP Distribuição (Portugal) • Miguel Louro, EDP Distribuição (Portugal) • Celso Filipe Silva, EDP Distribuição (Portugal) • João Carvalho, EDP Distribuição (Portugal) • Fernando Pimenta, Infocontrol (Portugal)
- 1419 Development of Electricity Demand Estimation Modelin Distribution Network Based on Grid-Square Statistics**
Yasuyuki Kunii, Chubu Electric Power Co.,Inc. (Japan) • Junzou Takemura, Chubu Electric Power Co.,Inc. (Japan) • Tetsuya Matsuki, Nagoya University (Japan) • Masaki Imanaka, Nagoya University (Japan) • Muneaki Kurimoto, Nagoya University (Japan) • Shigeyuki Sugimoto, Nagoya University (Japan) • Takeyoshi Kato, Nagoya University (Japan)
- 1438 Visual Display of Variability and Adequacy Requirements for VRE-Dominated Electricity Systems**
Frank Wiersma, TenneT (Netherlands)
- 1531 Automated Detection of Electric Vehicles in Hourly Smart Meter Data**
Volker Hoffmann, SINTEF AS (Norway) • Bjørn Ingeberg Fesche, SINTEF AS & University of Oslo (Norway) • Karoline Ingebrigtsen, SINTEF Energy Research AS (Norway) • Ingrid Nyttun Christie, Eidsiva Nett AS (Norway) • Morten Punnerud, Eidsiva Energi AS (Norway)
- 1569 Recursive estimation of flexibilities in a radial distribution network**
Pacco Bailly, Mines ParisTech, PSL University, PERSEE (France) • Andrea Michiorri, Mines ParisTech, PSL University, PERSEE (France) • Georges Kariniotakis, Mines ParisTech, PSL University, PERSEE (France)
- 1588 Data Driven Approach to Decentralized Control: A Primary Frequency Control Study**
Mazheruddin Hussain Syed, University of Strathclyde (United Kingdom) • Efren Guillo-Sansano, University of Strathclyde (United Kingdom) • Eleftherios Kontis, Aristotle University of Thessaloniki (Greece) • Steven M Blair, University of Strathclyde (United Kingdom) • Yan Xu, Nanyang Technological University (Singapore) • Graeme M. Burt, University of Strathclyde (United Kingdom)
- 1669 Impact of the correct modeling of low voltage grid with high DG share on the medium voltage grid calculations**
Christian Schirmer, TU Wien (Austria) • Lukas Kloibhofer, TU Wien (Austria) • Christoph Groß, Salzburg Netz GmbH (Austria) • Albana Ilo, TU Wien (Austria)
- 1713 Mathematical modelling and evaluation of a control algorithm for speed control of DFIGs using model-based**
Rahim Ajabi-Farshbaf, Tabriz Electric Distribution Company (Iran, Islamic Republic of) • Mohammad Reza Azizian, Sahand University of Technology (Iran, Islamic Republic of) • Ataollah Mokhberdorran, Vestas Wind Systems A/S, Porto Area (Portugal)
- 1738 A Three-phase Four-wire State Estimator Algorithm for Low Voltage Network Management**
Ferréol BINOT, CentraleSupélec – GeePs (France) • Trung Dung LE, CentraleSupélec – GeePs (France) • Marc Petit, GeePs-CentraleSupélec (France)

- 1818 **Regionalized Aggregation of Distributed Energy Resources and Distribution Networks for Large-scale Dynamic**
Thomas Würfl, Technical University of Munich (Germany) • Dominic Hewes, Technical University of Munich (Germany) • Lorenz Viernstein, Technical University of Munich (Germany) • Daniel Stenzel, Technical University of Munich (Germany) • Rolf Witzmann, Technical University of Munich (Germany) • Sascha Altschäffl, TenneT TSO GmbH (Germany) • Jörg Michael Schmidt, TenneT TSO GmbH (Germany) • Jörg Jahn, TenneT TSO GmbH (Germany)
- 1861 **A comprehensive study for evaluation of the energy losses in distribution systems with high penetration of**
Chenjie Ma, Fraunhofer Institute for Energy Economics and Energy System Technology (IEE) (Germany) • Simon Ruben Drauz, Fraunhofer IEE (Germany) • Roman Bolgaryn, Fraunhofer IEE (Germany) • Jan-Hendrik Menke, University of Kassel (Germany) • Florian Schäfer, University of Kassel (Germany) • Johannes Dasenbrock, Fraunhofer IEE (Germany) • Martin Braun, Fraunhofer IEE (Germany)
- 1978 **Scalable Power System Communications Emulation with OPC UA**
Marius Stübs, University of Hamburg (Germany) • Paulius Dambrauskas, University of Strathclyde (United Kingdom) • Mazheruddin Hussain Syed, University of Strathclyde (United Kingdom) • Kevin Köster, University of Hamburg (Germany) • Hannes Federrath, University of Hamburg (Germany) • Graeme M. Burt, University of Strathclyde (United Kingdom) • Thomas Strasser, Austrian Institute Of Technology (Austria)
- 1983 **Dynamic Modelling Approach to Assess Control Strategies of Distributed Energy Resources**
Marek Kopicka, Brno University of Technology (Czech Republic) • Petr Toman, Brno University of Technology (Czech Republic) • Jiří Drápela, Brno University of Technology (Czech Republic) • Michal Ptacek, Brno University of Technology (Czech Republic) • Vojtech Novak, E.ON Distribuce (Czech Republic)
- 1994 **Coordinated operation of a grid scale energy storage system with tap changer for voltage control on primary**
Alejandro Nieto, UK Power Networks Services (United Kingdom) • Maria-Aliki Efstratiadi, UK Power Networks Services (United Kingdom) • Kieran Coughlan, UK Power Networks Services (United Kingdom) • Alastair Currie, UK Power Networks Services (United Kingdom)
- 2016 **Impact of forecast on control methods for customer-sited battery storage**
Andres Cortes, Electric Power Research Institute (EPRI) (USA) • Aditie Garg, Electric Power Research Institute (EPRI) (USA)
- 2062 **Computational Diagnostics of Photovoltaic Smoothing Potential for Composite Orientations**
NIDA RIAZ, Tampere University (Finland) • Sami Repo, Tampere University of Technology (Finland)
- 2210 **Sizing of a battery energy storage system to minimize underfrequency load shedding in island power systems**
Lukas Sigrist, Universidad Pontificia Comillas (Spain) • Luis Rouco, Universidad Pontificia Comillas (Spain) • Clara Jiménez, Universidad Pontificia Comillas (Spain)
- 2251 **Multi-dimensional energy consumption scheduling for an event-based demand response.**
Rohit Rana, university of ottawa (Canada) • Javad Fattahi, university of ottawa (Canada) • Henry Schriemer, university of ottawa (Canada)
- 2271 **Battery Energy Storage for Frequency Control in an Electricity Market with High Penetration of Renewable Energy**
Gustavo Chamusca de Azevedo, University of Queensland (Australia) • Mithulan Nadarajah, University of Queensland (Australia)

Block 3: Optimising DER

- 20 **Analysis of the optimum allocation of BESS for contingency support**
Pablo Eguia, University of the Basque Country (Spain) • Esther Torres, University of the Basque Country (Spain) • Javier Garcia, University of the Basque Country (Spain) • Agurtzane Etxegarai, University of the Basque Country (Spain) • Inmaculada Zamora, University of the Basque Country (Spain)
- 21 **Stochastic Generation of Aggregated Charging Profiles of PEVs for the Operation Analysis of Low Voltage**
Andres Cortes, University of the Basque Country (Spain) • Julia Merino, Tecnalia (Spain) • Esther Torres, University of the Basque Country (Spain)

- 69 **Grid-friendly Operation of a Hybrid Battery Storage System**
Lukas Held, Karlsruhe Institute of Technology (Germany) • Nicolas Gerhardt, Karlsruhe Institute of Technology (Germany) • Martin Zimmerlin, Karlsruhe Institute of Technology (Germany) • Michael R. Suriyah, Karlsruhe Institute of Technology (Germany) • Thomas Leibfried, Karlsruhe Institute of Technology (Germany) • Michael Armbruster, Stadtwerke Bühl (Germany)
- 75 **Multi-objective Active Network Management Scheme Studied in Sundom Smart Grid with MV and LV Network**
Hannu Laaksonen, University of Vaasa (Finland) • Katja Sirviö, University of Vaasa (Finland) • Samuli Aflecht, University of Vaasa (Finland) • Petri Hovila, ABB Oy (Finland)
- 81 **Distributed Storage and Solar Study**
Paris Hadjiodyseos, Northern Powergrid (United Kingdom) • Siem Van Limpt, Element Energy (United Kingdom) • Alexey Alexeev, Moixa (United Kingdom)
- 91 **Autonomous and cost-efficient operation of a stationary battery energy storage in low voltage networks**
Lukas Specht, TU Dortmund University (Germany) • Kalle Rauma, TU Dortmund University (Germany) • Alfio Spina, TU Dortmund University (Germany) • Christian Rehtanz, TU Dortmund university - Institute of Energy Systems, Energy Efficiency and Energy Economics (Germany)
- 104 **TECHNICAL PERFORMANCE ENHANCEMENT OF DISTRIBUTION SYSTEMS VIA OPTIMAL DG DEPLOYMENT**
Mohamed Attia Saad, Behera Company for electricity distribution (Egypt) • Hossam Abd el-Ghany, Faculty of Engineering, Tanta University (Egypt) • Ahmed Azmy, Faculty of Engineering, Tanta University (Egypt)
- 196 **Scheduled charging of electric vehicles and the increase of hosting capacity by a stationary energy storage**
David Kröger, TU Dortmund University (Germany) • Kalle Rauma, TU Dortmund University (Germany) • Alfio Spina, TU Dortmund University (Germany) • Christian Rehtanz, TU Dortmund university - Institute of Energy Systems, Energy Efficiency and Energy Economics (Germany)
- 334 **SPORE multifluid microgrid tests and results in the tropics**
Jean Wild, Schneider Electric Industries SAS (France) • Xiaoyong Peng, ENGIE Lab Singapore (Singapore) • Antoine Ballereau, ENGIE Lab Singapore (Singapore) • Quentin ANTOINE, ENGIE Laborelec (Belgium) • Laurie PAZIENZA, ENGIE Laborelec (Belgium) • Soni Wibisono, Schneider Electric Singapore (Singapore) • Tushar Menon, Schneider Electric Singapore (Singapore)
- 430 **Optimal Capacity Design for Solar-assisted CCHP System Integrated with Energy Storage**
Chen Jun, Electric Power Test&Research Institute Of Guangzhou Power Supply Co.,Ltd (China) • Li Shiming, Guangdong Grid Company Power Dispatching Control Center (China) • Huang Huihong, Electric Power Test&Research Institute Of Guangzhou Power Supply Co.,Ltd (China) • Wang Yong, Electric Power Test&Research Institute Of Guangzhou Power Supply Co.,Ltd (China) • Wenxiong Mo, Guangzhou Power Supply Bureau (China) • Zheng Jiehui, South China University of Technology (China)
- 480 **Optimal Power Load Control Strategy Considering End-user Comfort**
Kejun Qian, Suzhou Power Supply Company, State Grid Corporation of China (China) • Chengke Zhou, Glasgow Caledonian University (United Kingdom) • Juping Gu, Nantong University (China) • Xinsong Zhang, Nantong University (China) • Wenjun Zhou, Wuhan University (China)
- 518 **MPPT and Dead-Beat Control for Power Management of Hybrid Micro-Grid Applications**
Ahmed. A.Hossam-Eldin, Faculty of Engineering, Alexandria University (Egypt) • Hamdy. A.Ashour, Faculty of Engineering, Arab Academy for Science & Technology (Egypt) • Mohamed. Maghraby, Faculty of Engineering, Alexandria University (Egypt)
- 539 **Flexibility for congestion management: An operational decision making process**
Rik Fonteijn, Eindhoven University of Technology (Netherlands) • Raoul Bernards, Enexis Netbeheer (Netherlands) • Phuong Hong Nguyen, TU Eindhoven (Netherlands) • Johan Morren, Eindhoven University of Technology / Enexis Netbeheer (Netherlands) • Han Slootweg, Eindhoven University of Technology / Enexis Netbeheer (Netherlands)
- 566 **Optimized economical and technical sector coupling under consideration of defined incentives**
Nicola Gast, Institut für Elektrische Energiesysteme (Germany) • Tamara Schröter, Institut für Elektrische Energiesysteme (Germany) • Klabunde Christian, Institut für Elektrische Energiesysteme (Germany) • Jari Rossberg, Institut für Thermische Verfahrenstechnik (Germany) • Martin Wolter, Institut für Elektrische Energiesysteme (Germany)
- 627 **Optimal DG allocation in LV distribution networks considering repairing fault periods**
Abd El-Fattah Hamad, Behira Electricity Distribution Company (Egypt) • Hossam Abd el-Ghany, Faculty of Engineering, Tanta University (Egypt) • Ahmed Azmy, Faculty of Engineering, Tanta University (Egypt)

- 644 **Integrating Smart Storage and Aggregators for Network Congestion Management & Voltage Support in a Pilot**
Sharmistha Bhattacharyya, Enexis (Netherlands) • Ton van Cuijk, Enexis (Netherlands) • Rik Fonteijn, Eindhoven University of Technology (Netherlands)
- 936 **Residential Battery Controller For Solar PV Impact Mitigation: A Practical and Customer-friendly Approach**
Kyriacos Petrou, The University of Melbourne (Australia) • Andreas Procopiou, The University of Melbourne (Australia) • Luis F. Ochoa, The University of Melbourne (Australia) • Tom Langstaff, AusNet Services (Australia) • John Theunissen, AusNet Services (Australia)
- 993 **Control of EV charging to reduce peak powers in domestic real estate**
Toni Simolin, Tampere University (Finland) • Antti Rautiainen, Tampere University (Finland) • Pertti Järventausta, Tampere University of Technology (Finland)
- 1065 **Two Years of Battery Energy Storage System performance in automatic islanding in the Portuguese MV network**
André Neves, EDP Distribuição (Portugal) • André Falcão, EDP Distribuição (Portugal) • Miguel Louro, EDP Distribuição (Portugal) • José Manuel Terras, EDP Distribuição (Portugal) • Bernardo Almeida, EDP Distribuição (Portugal) • Miguel Veríssimo, EDP Distribuição (Portugal) • José Ferreira Pinto, EDP Distribuição (Portugal) • José Damásio, Siemens S.A. (Portugal)
- 1120 **A Proposal of Average-Consensus-Based Load Control Reducing Unfairness in Use of Customers' Loads**
Hiroumi Saitoh, Tohoku University (Japan) • Junichi Toyoda, Tohoku University (Japan)
- 1150 **Electric Vehicles as flexibility providers for distribution systems. A techno-economic review.**
Felipe Gonzalez-Venegas, PSA Groupe/CentraleSupélec-GeePs (France) • Marc Petit, GeePs-CentraleSupélec (France) • Yannick Perez, LGI-CentraleSupélec (France)
- 1156 **Uniform Web of Things based Access to Distributed Energy Resources via Metadata Registry**
Aleksi Mashlakov, LUT University (Finland) • Antti Keski-Koukkari, VTT Technical Research Centre of Finland (Finland) • Ville Tikka, Lappeenranta University of Technology (Finland) • Anna Kulmala, VTT Technical Research Centre of Finland (Finland) • Sami Repo, Tampere University of Technology (Finland) • Samuli Honkapuro, LUT University (Finland) • Matti Aro, VTT Technical Research Centre of Finland (Finland) • Peyman Jafary, Tampere University (Finland)
- 1217 **A centralized control for the operation of low voltage distribution networks with multiple Distributed Energy**
Konstantinos Kotsalos, Efacec (Portugal) • Ismael Miranda, Efacec (Storage) (Portugal) • Nuno Silva, Efacec (T&I) (Portugal) • Helder Leite, University of Porto (FEUP) (Portugal)
- 1334 **Smart hubs – DC interconnection and management of PV, EV and ESS**
Neal Wade, Newcastle University (United Kingdom) • Chris Mullen, Newcastle University (United Kingdom) • Mansoureh Zangiabadi, Newcastle University (United Kingdom) • Martin Feeney, Newcastle University (United Kingdom) • Rob Carpenter, Flexisolar (United Kingdom) • Nigel Jakeman, Turbo Power Systems (United Kingdom) • Olivia Carpenter, Ricardo (United Kingdom)
- 1365 **Energy storage capacity configuration of electric vehicle charging station with PV under peak shaving mode**
Shanshan Shi, State Grid Shanghai Electric Power Research Institute (China) • Yu Zhang, State Grid Shanghai Electric Power Research Institute (China) • Hailong Bao, State Grid Shanghai Electric Power Research Institute (China) • Yang He, Shanghai University of Electric Power (China) • Yufei Wang, Shanghai University of Electric Power (China) • Li Zhu, Shanghai University of Electric Power (China)
- 1413 **Impact and Value of Energy Storage on a High-DER Penetration Distribution Feeder in Southern California**
Jouni Peppanen, Electric Power Research Institute (USA) • Jorge Araiza, Jr, Southern California Edison (USA) • Ramakrishnan Ravikumar, Electric Power Research Institute (USA) • Tanguy Hubert, Electric Power Research Institute (USA) • Giovanni Damato, Electric Power Research Institute (USA) • Loic Gaillac, Southern California Edison (USA) • Matthew Kedis, Southern California Edison (USA)
- 1481 **Experience from Deployment of Battery Storage in Czech Distribution Grid**
Michal Jurík, E.ON Distribuce (Czech Republic) • Martin Kurfiřt, E.ON Distribuce (Czech Republic) • Petr Vaculík, E.ON Distribuce (Czech Republic)

- 1496 **Technical Solutions for Increasing DER Hosting Capacity in Distribution Grids in the Czech Republic in Terms of**
Stanislav Hes, CEZ Distribuce, a.s. (Czech Republic) • Jan Kula, CEZ Distribuce, a.s. (Czech Republic) • Jan Svec, CEZ Distribuce, a.s. (Czech Republic)
- 1505 **Potential Analysis for the Integration of Renewables and EV Charging Stations within a Novel LVDC Smart-**
Mahjar Wazifehdust, Bergische Universität Wuppertal (Germany) • Dirk Baumeister, Bergische Universität Wuppertal (Germany) • Mohammed Salih, Bergische Universität Wuppertal (Germany) • Philippe Steinbusch, Bergische Universität Wuppertal (Germany) • Markus Zdrallek, University of Wuppertal (Germany) • Stan Mour, SWS Netze Solingen GmbH (Germany) • Conrad Troullier, Stadtwerke Solingen GmbH (Germany)
- 1517 **Voltage Control in Distribution Feeders with High Solar PV Penetration: Case Study for Different Approaches.**
Neshwin Rodrigues, The Energy and Resources Institute (India) • Alekhya Datta, The Energy and Resources Institute (India) • Shashank Vyas, The Energy and Resources Institute (India)
- 1526 **LISCOOL – A Demonstration Project of an Automated Fast Demand Response Management System: Main**
Luis Marques, EFACEC (Portugal) • Filipe Campos, Efacec (Portugal) • RUI Fonseca, DAIKIN (Japan) • KOICHI NAKAGAWA, DAIKIN (Japan) • RYOH MASUDA, DAIKIN (Japan)
- 1542 **A rolling horizon approach for the optimal real-time dispatch of energy sources in smart residential buildings**
Mohammad Ali Fotouhi Ghazvini, Chalmers University of Technology (Sweden) • David Steen, Chalmers University of Technology (Sweden) • Anh Tuan Le, Chalmers University of Technology (Sweden)
- 1571 **Results from the project “eTaxi for Vienna” concerning the integration of EVs in the distribution grid**
Dominik Fasthuber, TU Wien (Austria) • Johannes Asamer, AIT (Austria) • Martin Reinthaler, AIT (Austria)
- 1577 **Case study for understanding impact of residential batteries on LV grids**
Parvathy Chittur Ramaswamy, Tractebel (Belgium) • Damien Schyns, Tractebel (Belgium) • Louise De Vos, Tractebel Engie (Belgium) • Christian Czajkowski, InnogySE (Germany) • Michael Wilch, Innogy SE (Germany) • Armin Gaul, InnogySE (Germany)
- 1599 **Combined Solar Photovoltaic and Energy Storage Sizing in Constrained Distribution Networks**
Matthew Deakin, University of Oxford (United Kingdom) • Jouni Peppanen, Electric Power Research Institute (USA) • Tanguy Hubert, Electric Power Research Institute (USA) • Ramakrishnan Ravikumar, Electric Power Research Institute (USA) • Andres Cortes, Electric Power Research Institute (EPRI) (USA)
- 1607 **Integrating DER Management Systems into Industrial Energy Management - Deployment Results**
Graham Ault, Smarter Grid Solutions (United Kingdom) • Rachael Taljaard, Smarter Grid Solutions (United Kingdom) • Robert Swan, Smarter Grid Solutions (United Kingdom) • Robert MacDonald, Smarter Grid Solutions (United Kingdom) • Finlay McNicol, Smarter Grid Solutions (United Kingdom) • Hugo Gil, Smarter Grid Solutions (USA) • Sam Ashfield Murphy, Laing O'Rourke (United Kingdom) • Torsten Hildebrandt, SimPlan (Germany)
- 1615 **Grid Flexibility 4 Chile**
Ricardo Pérez Sánchez, Enel (Spain) • Hans Christian Rother Salazar, Enel (Chile) • Juan Refoyo Mayoral, Enel (Spain) • Ammi Amarnath, EPRI (USA) • Mukesh Khattar, EPRI (USA) • Carlos Leon de Mora, University of Seville (Spain) • Antonio Parejo, University of Seville (Spain)
- 1647 **INTEGRATION OF ELECTRIC VEHICLES AND RAILTHROUGH PARK-AND-RIDE INFRASTRUCTURE**
Christopher Webb, Newcastle University/ ARUP (United Kingdom) • Mansoureh Zangiabadi, Newcastle University (United Kingdom) • Roberto Palacin, Newcastle University (United Kingdom) • Neal Wade, Newcastle University (United Kingdom)
- 1687 **MITIGATING IMPACT OF LARGE-SCALE PV INTEGRATION ON MV DISTRIBUTION NETWORK WITH SEQUENTIAL**
Firstian Kautsar Adiguno, Eindhoven University of Technology (Netherlands) • Tam Mai, Eindhoven University of Technology (Netherlands) • Phuong Hong Nguyen, TU Eindhoven (Netherlands)
- 1716 **Case study on commercial sized MW-level microgrid**
Lasse Peltonen, Tampere University of Technology (Finland) • Pertti Järventausta, Tampere University of Technology (Finland) • Joni Rintala, Lempäälän Energia Oy (Finland)

- 1740 **Inner current control loop influence on islanded microgrid dynamic behavior**
Guy Wanlongo Ndiwulu, Université catholique de Louvain (UCLouvain) (Belgium) • Emmanuel De Jaeger, Université catholique de Louvain (UCLouvain) (Belgium) • Angelo Kuti Lusala, Université Kongo (UK) (Congo, the Democratic Republic of the)
- 1745 **Demonstrating the Control of Aggregated Domestic Battery Energy Storage Systems for LV Network Efficiency**
David Dale, Nortech Management Ltd (United Kingdom) • Samuel Jupe, Nortech Management Ltd (United Kingdom) • Ricky Duke, Western Power Distribution (United Kingdom)
- 1751 **Maximizing the utilization of DERs with the Interflex Aggregation Platform for Flexibility**
Bob Ran, TNO (Netherlands) • Michiel Klever, Priogen (Netherlands) • Wilco Wijbrandi, TNO (Netherlands) • Jorrit Nutma, TNO (Netherlands) • Joost Laarakkers, TNO (Netherlands)
- 1763 **Incorporating Ageing parameters into Optimal Energy Management of Distribution Connected Energy Storage**
Adib Allahham, Newcastle University (United Kingdom) • David Greenwood, Newcastle University (United Kingdom) • Charalampos Patsios, Newcastle University (United Kingdom)
- 1764 **Utilisation of Energy Storage to Improve Distributed Generation Connections and Network Operation on**
Fulin Fan, University of Strathclyde (United Kingdom) • Han Xu, University of Strathclyde (United Kingdom) • Ivana Kockar, University of Strathclyde (United Kingdom)
- 1766 **Small-Signal Stability Optimization of LV microgrids with Grid-forming and Grid-supporting Inverters**
Simon Eberlein, University of Stuttgart (Germany) • Krzysztof Rudion, University of Stuttgart (Germany) • Marius Radloff, University of Stuttgart (Germany)
- 1769 **Energy Storage and Energy Management in Distribution Grids, Communities and Buildings: Results from**
Ricardo André, EDP NEW R&D (Portugal) • Eldar Naghiyev, Univ. Nottingham (United Kingdom) • Andre Leonide, Siemens AG (Germany) • Stefan Langemeyer, Siemens AG (Germany) • Clara Gouveia, INESC TEC (Portugal) • Arno Dentel, Univ. Nuremberg (Germany) • Catherine Murphy-O'Connor, Indra (Portugal) • Olli Kilkki, Empower (Portugal)
- 1816 **Local Voltage Control Strategies for Storage Systems in Distribution Networks with a High Penetration of Inverter-**
Eleni Daridou, Department of Electrical and Computer Engineer, National Technical University of Athens (Greece) • Vasilakis Athanasios, Department of Electrical and Computer Engineer, National Technical University of Athens (Greece) • Nikos Harziargyriou, National Technical University of Athens (Greece)
- 1830 **Resilience improvement from P2P EMS in microgrids considering faults, carbon emissions and economic benefits**
Nikolas Spiliopoulos, Newcastle University (United Kingdom) • Uma Rajarathnam, Enzen Global Solutions (India) • Damian Giaouris, Newcastle University (United Kingdom) • Phil Taylor, Newcastle University (India) • Neal Wade, Newcastle University (United Kingdom)
- 1853 **Model Predictive Control for the Management of DC Microgrids**
Marcel Pendieu Kwaye, RSE S.p.A (Italy) • Riccardo Maria Vignali, RSE S.p.A (Italy) • Riccardo Lazzari, RSE S.p.A (Italy) • Carlo Sandroni, RSE S.p.A (Italy)
- 1854 **Transactive Demand Response—Hydro Ottawa Experience**
Marc Lacroix, eMcREY (Canada) • Raed Abdullah, Hydro Ottawa (Canada)
- 1855 **Economic Feasibility Study of the Implementation of PEVs Charging Stations at a Brazilian University**
Wanessa Guedes, Federal University of Juiz de Fora - UFJF (Brazil) • José Carlos Martins, Federal University of Juiz de Fora - UFJF (Brazil) • Bruno Dias, Federal University of Juiz de Fora - UFJF (Brazil) • Leonardo de Oliviera, Federal University of Juiz de Fora - UFJF (Brazil) • Matheus de Souza, Federal University of Juiz de Fora - UFJF (Brazil) • José Luiz Pereira, Federal University of Juiz de Fora - UFJF (Brazil) • Jairo Quirós-Tortós, University of Costa Rica - UCR (Costa Rica)
- 1916 **Vehicle-To-Grid Based Frequency Regulation Method In An Isolated Microgrid Considering Charging Requests Of**
Hoyong Jeong, Hyundai Electric & Energy Systems (Korea, Republic of) • Mugu Jeong, Hyundai Electric & Energy Systems (Korea, Republic of) • Sangjin Lee, Hyundai Electric & Energy Systems (Korea, Republic of)
- 1946 **Demand response field trial experiences**
Pekka Koponen, VTT Technical Research Centre of Finland (Finland) • Robert Weiss, VTT Technical Research Centre of Finland (Finland) • Jaakko Ketomäki, VTT Technical Research Centre of Finland (Finland)

- 1956 **RESOLVD - Renewable penetration levered by efficient Low Voltage Distribution grids. Specifications and use**
Joaquim Melendez Frigola, Universitat de Girona (Spain) • Isidoros Kokos, INTRACOM TELECOM (Greece) • Heidi Tuiskula, Smart Innovation Norway (Norway) • Stefan Marksteiner, JOANNEUM RESEARCH (Austria) • Andreas Sumper, UNIVERSITAT POLITÈCNICA DE CATALUNYA (Spain) • Ramon Gallart, ESTABANELL DISTRIBUCIÓ (Spain) • Miha Smolnikar, COMSENSUS (Slovenia) • Ferran Torrent Fontbona, Universitat de Girona (Spain)
- 2043 **MV microgrids –case study**
Emil Constantinescu, Electrica S.A. (Romania) • Dorel Stanescu, SDEE Transilvania Sud (Romania) • Mihai Sanduleac, Romanian Energy Centeri (Romania)
- 2069 **Impact of batteries in the hosting capacity of a grid with photovoltaic generation**
Marc Cañigueral Maurici, Universitat de Girona (Spain) • Joaquim Melendez Frigola, Universitat de Girona (Spain) • Ferran Torrent Fontbona, Universitat de Girona (Spain)
- 2080 **Active Response to Distribution Network Constraints**
Nathaniel Bottrell, Ricardo Energy and Environment (United Kingdom) • Simon Terry, Ricardo Energy and Environment (United Kingdom) • Nick Ash, Ricardo Energy and Environment (United Kingdom) • Luca Grella, UK Power Networks (United Kingdom)
- 2135 **Optimal allocation of energy storage and conversion technologies in an urban distributed energy system**
Christoph Maier, TU Wien, Institute of Energy Systems and Electrical Drives (Austria) • Sabina Nemec-Begluk, TU Wien, Institute of Energy Systems and Electrical Drives (Austria) • Wolfgang Gawlik, TU Wien, Institute of Energy Systems and Electrical Drives (Austria)
- 2238 **DC-Based Interconnected-Modified Nanogrids within an Open Energy Distributed System (OEDS)**
Nourhan Ahmed, Electronic research institute (Egypt) • Essamudin Ali, Electronic research institute (Egypt) • Naser Abdelrahim, Future university (Egypt) • Fahmy Bendary, Faculty of Engineering Shoubra, Benha University (Egypt)
- 2274 **DER Flexible Interconnection Framework and Case Study**
Dean Weng, Electric Power Research Institute (USA) • Matthew Rylander, Electric Power Research Institute (USA) • Brian Seal, Electric Power Research Institute (USA) • Dean Weng, Electric Power Research Institute (USA)
- 2285 **DERMS Reference Control Methods for DER Group Management**
Dean Weng, Electric Power Research Institute (USA) • Ajit Renjit, Electric Power Research Institute (USA) • Tanguy Hubert, Electric Power Research Institute (USA) • Brian Seal, Electric Power Research Institute (USA)
- 2286 **Evaluating the Value of DERMS: Methods and Mitigation to Increase Feeder Hosting Capacity**
Ajit Renjit, Electric Power Research Institute (USA) • Alison O'Connell, Electric Power Research Institute (Ireland) • Devin Van Zandt, Electric Power Research Institute (USA) • Brian Seal, Electric Power Research Institute (USA)
- 2309 **Optimization of distribution network configuration: an experimental testbed in the InteGRIDy project framework**
Davide Falabretti, Politecnico di Milano (Italy) • Maurizio Delfanti, Politecnico di Milano (Italy) • Marco Merlo, Politecnico di Milano (Italy) • Aitazaz Ali Raja, Politecnico di Milano (Italy)

Session 5 - Planning of power distribution systems

Wednesday, 5 June 2019 from 9:00 to 18:00

1116 **Grida: introducing a self-learning artificial intelligence for autonomous network planning**

Age van der Mei, Duinn (Netherlands) • Jan-Peter Doomernik, Enexis Netbeheer (Netherlands)

Block 1: Risk Assessment and Asset Management

118 **Identifying reliability-driven asset management strategies in active distribution grids**

Iraklis-Marios Katsolas, ETH Zurich (Switzerland) • Stavros Karagiannopoulos, ETH Zurich (Switzerland) • Thilo Krause, ewz (Switzerland) • Carsten Schroeder, ewz (Switzerland) • Gabriela Hug, ETH Zurich (Switzerland)

375 **A Combined Planning and Simulation Approach for Smart Grid Reliability Analysis**

Marcelo Pelegrini, Sinapsis Inovação em Energia (Brazil) • Diogo Serra Baldissin, Sinapsis Inovação em Energia (Brazil) • Gustavo Travassos, Neoenergia (Brazil) • Gustavo Himeno, Sinapsis Inovação em Energia (Brazil) • Henrique Kagan, Sinapsis Inovação em Energia (Brazil) • Ricardo Padilha, Neoenergia (Brazil) • Daniel Duarte, Sinapsis Inovação em Energia (Brazil)

623 **Multi-dimension Evaluation and Investment Route for Next-generation Smart Distribution Network**

Hongjun Gao, Sichuan University (China) • Junyong Liu, Sichuan University (China) • Youbo Liu, Sichuan University (China) • Lin Lv, Sichuan University (China) • Jiayi Wang, Sichuan University (China) • Zhihui Feng, Sichuan University (China)

631 **Asset simulation in distribution network using tools for evaluation of technical condition**

Adam Teringl, ČEZ Distribuce, a.s. (Czech Republic) • Daniel Kašpar, ČEZ Distribuce, a.s. (Czech Republic) • Ondřej Tupý, ČEZ Distribuce, a.s. (Czech Republic)

640 **Distribution network observation based on security region geometry**

Jun Xiao, Tianjin University (China) • Baoqiang Zhang, Tianjin University (China) • Fangxing Li, The University of Tennessee (USA)

754 **Clustering and determination of relevant network operating points in analytical reliability calculations**

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Bruno Fasoli, Edyna srl (Italy) • Marco Birello, Edyna srl (Italy) • Arnold Rofner, Edyna srl (Italy) • Giacomo Viganò, RSE (Italy) • Michelangeli Chiara, RSE SpA (Italy) • Massimo Gallanti, RSE SpA (Italy) • Giovanni Paolucci, Alperia SpA (Italy) • Dieter Theiner, Alperia SpA (Italy)
- 1743 **Automated Planning of High Voltage Grids for DER Integration Studies – Results of a study for the German state**
Roman Bolgaryn, Fraunhofer IEE (Germany) • Alexander Scheidler, Fraunhofer IEE (Germany) • Johannes Dasenbrock, Fraunhofer IEE (Germany) • Martin Braun, Fraunhofer IEE (Germany)
- 1778 **Optimal Planning of High Voltage Distribution Grids under a Combined Use of Energy Storage Systems and**
Ouafa Laribi, University of Stuttgart (Germany) • Krzysztof Rudion, University of Stuttgart (Germany) • Tobias Lübbe, Netze BW GmbH (Germany)
- 1877 **Recommendations for Distribution Network Planning Based on Benchmarking of Energy Losses in Croatian DSO**
Tomislav Baricevic, Energy Institute Hrvoje Pozar (Croatia) • Minea Skok, Energy Institute Hrvoje Pozar (Croatia) • Danko Vidovic, Energy Institute Hrvoje Pozar (Croatia)

- 1885 **Comprehensive framework for PV integration with an OLTC in a rural distribution grid within the SMAP project**
Mahana BERNIER, Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab (France) • Marie-Cecile Alvarez-Herault, Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab (France) • Florent CADOUX, Fondation Partenariale de Grenoble INP (France) • Nouredine HADJSAID, Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab (France) • Alexis LAGOUARDAT, Enedis (France)
- 1955 **Taming uncertainty in distribution grid planning – A scenario-based methodology for the analysis of impact of**
Damiano Toffanin, Adaptricity AG (Switzerland) • Andreas Ulbig, Adaptricity AG (Switzerland)
- 1988 **Effectivity of active voltage control concepts in distribution grids**
Christian Aigner, TU Muenchen (Germany) • Rolf Witzmann, Technical University of Munich (Germany)
- 1993 **A Distribution System Expansion Planning method Considering Integrated Energy Service Providers' Revenue on**
Yuquan Liu, China Southern Power Grid Corp. Limited (China) • Xinyi Zhao, Tsinghua-Berkeley Shenzhen Institute, Tsinghua University (China) • Xinwei Shen, Tsinghua-Berkeley Shenzhen Institute, Tsinghua University (China) • Wen Xiong, China Southern Power Grid Corp. Limited (China) • Li Wang, China Southern Power Grid Corp. Limited (China) • Shunqi Zeng, China Southern Power Grid Corp. Limited (China) • Zhiwen Yu, China Southern Power Grid Corp. Limited (China) • Xin Li, Guangzhou Power Supply Co. Ltd. (China)
- 2018 **Novel Analysis Techniques for LV Network Planning using Smart Meter Data**
Diptargha Chakravorty, TNEI Services (United Kingdom) • Charlotte Higgins, TNEI Services (United Kingdom) • Gruffudd Edwards, TNEI Services (United Kingdom) • Gordon McFadzean, TNEI Services Ltd (United Kingdom) • Francis Shillitoe, WSP (United Kingdom) • Alan Creighton, Northern Powergrid (United Kingdom)
- 2030 **Investigation of the Impacts of Primary Substation's OLTC on Voltage Regulators Placement in Distribution**
Mehdi Attar, Tampere university (Finland) • Sami Repo, Tampere University of Technology (Finland) • Omid Homaei, Iran university of science and technology (Iran, Islamic Republic of)
- 2035 **Economic Evaluation of Energy Storage used for Reliability Improvement in Distribution Networks**
Alberto Escalera, IMDEA Energy/University Carlos III de Madrid (Spain) • Milan Prodanovic, IMDEA Energy (Spain) • Edgardo D. Castronuovo, University Carlos III de Madrid (Spain)
- 2051 **Application of dynamic transformer ratings to increase the reserve of primary substations for new load**
Ildar Daminov, Tomsk Polytechnic University (Russian Federation) • Anton Prokhorov, Tomsk Polytechnic University (Russian Federation) • Tatiana Moiseeva, Tomsk Distribution Company (Russian Federation) • Marie-Cecile Alvarez-Herault, Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab (France) • Raphael Caire, Univ. Grenoble Alpes (France)
- 2079 **Long-term Economically Efficient Design of Low and Medium Voltage Distribution Networks**
Predrag Djapic, Imperial College London (United Kingdom) • Goran Strbac, Imperial College London (United Kingdom) • Danny Pudjianto, Imperial College London (United Kingdom)
- 2090 **An empirical study on risk assessment and reliability improvement of large-scale distribution grids considering**
Sajad Najafi Ravadanegh, Azarbaijan Shahid Madani University (Iran, Islamic Republic of) • Rahim Ajabi-Farshbaf, Tabriz Electric Distribution Company (Iran, Islamic Republic of) • Adel Kazemi, Tabriz Electric Distribution Company (Iran, Islamic Republic of)
- 2118 **BI & Analytics for smart planning in distribution systems**
MÁRIO MIGUEL FILHO, DAIMON ENGENHARIA E SISTEMAS (Brazil) • CARLOS CÉSAR BARIONI DE OLIVEIRA, DAIMON ENGENHARIA E SISTEMAS (Brazil) • ANDRÉ MEFFE, DAIMON ENGENHARIA E SISTEMAS (Brazil) • WLADMIR SYBINE, DAIMON ENGENHARIA E SISTEMAS (Brazil) • OLÍVIO CESÁRIO DOS SANTOS, EDP SP (Brazil) • EDUARDO DUTRA DA SILVA, EDP ES (Brazil)
- 2126 **Exploring the Requirements and Considerations for a Probabilistic Simulation Toolset Leveraging OpenDSS**
Alexander Melhorn, Electric Power Research Institute (USA) • Jason Taylor, EPRI (USA)
- 2128 **DER Integration Study for the German State of Hesse – Methodology and Key Results**
Alexander Scheidler, Fraunhofer IEE (Germany) • Roman Bolgaryn, Fraunhofer IEE (Germany) • Jan Ulfers, Fraunhofer IEE (Germany) • Johannes Dasenbrock, Fraunhofer IEE (Germany) • Daniel Horst, Fraunhofer IEE (Germany) • Philip Gauglitz, Fraunhofer IEE (Germany) • Carsten Pape, Fraunhofer IEE (Germany) • Holger Becker, Fraunhofer IEE (Germany)

- 2131 **An Advanced Distribution Planning and Optimization Process**
Jeffrey Roark, Electric Power Research Institute (USA) • Alison O'Connell, Electric Power Research Institute (Ireland) • Jason Taylor, EPRI (USA)
- 2150 **Planning Integrated Energy Systems in Local Communities under Uncertainty**
Wei SUN, University of Edinburgh (United Kingdom) • Jingjie YANG, University of Edinburgh (United Kingdom) • Gareth HARRISON, University of Edinburgh (United Kingdom)
- 2198 **Universal procedure for determining the optimal connection to the distribution network**
Marina Cavlovic, HEP ODS d.o.o. (Croatia)
- 2267 **The Next Generation of Distribution Analysis Tools**
Davis Montenegro, EPRI (USA) • Mobolaji Bello, EPRI (USA) • Roger Dugan, EPRI (USA) • Jason Taylor, EPRI (USA) • Jeff Smith, EPRI (USA)
- 2301 **Optimal location of energy storage systems with robust optimization**
Nayeem Chowdury, University of Cagliari (Italy) • Fabrizio Pilo, University of Cagliari (Italy) • Giuditta Pisano, University of Cagliari (Italy) • Matteo Troncia, University of Cagliari (Italy)
- 2308 **Planning Tool for Non-Interconnected Islands**
Georgia Asimakopoulou, National Technical University of Athens (Greece) • Aris Dimeas, National Technical University of Athens (Greece) • Nikos Harziargyriou, National Technical University of Athens (Greece) • Theodora Patsaka, HEDNO (Greece) • Andreas Reppas, HEDNO (Greece) • George Milionis, National Technical University of Athens (Greece) • Eirini Stavropoulou, HEDNO (Greece) • George Tekelis, National Technical University of Athens (Greece)
- 2317 **Comparison of models and tools for distribution planning**
Gianni Celli, University of Cagliari (Italy) • Fabrizio Pilo, University of Cagliari (Italy) • Simona Ruggeri, University of Cagliari (Italy) • Heloise Baraffe, EDF R&D (France) • Josselin Fournel, EDF R&D (France) • Gilles Malarange, EDF R&D (France) • Juliette Morin, EDF R&D (France)
- 2326 **Microgrid Value Stacking to Defer Distribution Capacity Upgrades of Radial Feeders**
Hamideh Bitaraf, ABB (USA) • Britta BUCHHOLZ, ABB (Germany) • Pablo ASTORGA, ABB (Spain) • John GLASSMIRE, ABB (USA)

Block 4: Methods and Tools

- 42 **Application of importance sampling method for non-technical losses detection in electrical distribution systems**
Mojtaba Khederzadeh, Shahid Beheshti University (Iran, Islamic Republic of)
- 131 **Methodology for Load Shedding Actions Planning in Medium Voltage Electric Distribution Systems.**
Guilherme Borges, Daimon (Brazil) • Rogério Lima, University Of Sao Paulo (Brazil) • Fabio Romero, Daimon (Brazil)
- 133 **Investigating the Impact of representation of MV power lines in the distribution system for the studies of power**
Guilherme Saggioratto, Daimon (Brazil) • Guilherme Borges, Daimon (Brazil) • Vitor Takeda, Daimon (Brazil) • MÁRIO MIGUEL FILHO, DAIMON ENGENHARIA E SISTEMAS (Brazil) • Pablo de Paula e Silva, Energisa (Brazil) • Gustavo Paiva Guedes, Energisa (Brazil)
- 212 **Advanced Modelling of Inverter-Based Generators for Short-Circuit Current Calculations Based on IEC 60909-**
Benjamin Niersbach, Technische Universität Darmstadt (Germany) • Imen Ghourabi, Netze BW GmbH (Germany) • Benjamin Braun, Technische Universität Darmstadt (TU DA) (Germany) • Jutta Hanson, Technische Universität Darmstadt (Germany)
- 257 **The Application of NILM in Demand Response**
Tian Liu , Guangzhou Power Supply Bureau (China) • Wenxiong Mo , Guangzhou Power Supply Bureau (China) • Hongbin Wang , Guangzhou Power Supply Bureau (China) • Le Luan , Guangzhou Power Supply Bureau (China) • Zhong Xu, Guangzhou Power Supply Bureau Co. Ltd (China) • Kai Zhou, Guangzhou Power Supply Bureau (China) • Yanjun Feng, Jiangsu Intelever Energy Technology Co., Ltd. (China) • Meng Fu, Southeast University (China)
- 294 **Survey of Distribution Planners on Current Forecasting Practices and Concerns**
Jason Taylor, EPRI (USA) • Mobolaji Bello, EPRI (USA) • Steven Coley, EPRI (USA)

- 420 **Applying smart meter data to low voltage network planning**
Michiel Nijhuis, Phase to Phase (Netherlands) • Nard Vermeltfoort, Alliander (Netherlands) • Raoul Bernards, Enexis Netbeheer (Netherlands)
- 559 **Short-term load forecasting on MV/LV transformer level**
Rik Fonteijn, Eindhoven University of Technology (Netherlands) • Thomas Castelijns, Enexis Netbeheer (Netherlands) • Marinus Grond, Enexis Netbeheer (Netherlands) • Phuong Hong Nguyen, TU Eindhoven (Netherlands) • Johan Morren, Eindhoven University of Technology / Enexis Netbeheer (Netherlands) • Han Sloopweg, Eindhoven University of Technology / Enexis Netbeheer (Netherlands)
- 620 **Analysis of Daily Load Curve by taking into consideration Electric Vehicle by Charging Station in Seoul of South**
sang bong choi, korea electrotechnology research institute (Korea, Republic of)
- 758 **Research and Application of Project Investment Conversion Prediction Based on Improved BP Neural Network**
Fan Ru Sen, State Grid Shanghai Qingpu Electric Power Supply Company (China) • Li Ya, State Grid Shanghai Qingpu Electric Power Supply Company (China) • Ma Tao Tao, State Grid Shanghai Qingpu Electric Power Supply Company (China)
- 891 **Data Analytics and Stochastic Simulation Methods for Risk-Controlled Network Planning: Validation Case Study**
André Águas, EDP Distribuição (Portugal) • Vera Pereira, EDP Distribuição (Portugal) • Inês Roça, EDP Distribuição (Portugal) • Luísa Jorge, EDP Distribuição (Portugal) • Ricardo Prata, EDP Distribuição (Portugal) • João Machado, AmberTREE (Portugal) • Pedro Carvalho, AmberTREE (Portugal) • Luís Marcelino Ferreira, Ambertree (Portugal)
- 978 **Enhancing the Understanding of Distribution Network Losses**
David Greenwood, Newcastle University (United Kingdom) • Ilias Sarantakos, Newcastle University (United Kingdom) • Peter Davison, Newcastle University (United Kingdom) • Charalampos Patsios, Newcastle University (United Kingdom) • Aisha Ahmad, Northern Powergrid (United Kingdom) • Mary Black, Northern Powergrid (United Kingdom)
- 1053 **Residential Area Spatial Load Forecasting Method Based on Big Data Mining Technology**
Xujun Zhang, Huazhong University of Science and Technology (China) • Yan Li, Huazhong University of Science and Technology (China) • Yiming Liu, Huazhong University of Science and Technology (China) • Xusheng Guo, Huazhong University of Science and Technology (China) • Zhifei Cai, State Grid Xuchang Power Supply Company (China) • Song Ke, State Grid Xuchang Power Supply Company (China)
- 1063 **GIROSCOP: a generator of consumption and production joint scenarios for the Distribution System Operator**
Audrey Pichavant, EDF R&D (France) • Josselin Fournel, EDF R&D (France) • Juliette Morin, EDF R&D (France) • Leticia De Alvaro Garcia, Enedis (France) • Virgile Fritsch, EDF R&D (France) • Thi Thu Huong Hoang, EDF R&D (France) • Gilles Malarange, EDF R&D (France)
- 1068 **Methodology for Annual Load Profile Estimation at the Outgoing Feeder of Distribution Transformers in Urban**
Simon Kreutmayer, Augsburg University of Applied Sciences (Germany) • Christoph J. Steinhart, Augsburg University of Applied Sciences (Germany) • Michael Finkel, Augsburg University of Applied Sciences (Germany) • Christian Gutzmann, SWM Infrastruktur GmbH & Co. KG (Germany)
- 1088 **Providing simulation scenarios for the electricity grid in a smart grid environment**
José Gonçalves, EDP Distribuição, Direção Tecnologia e Inovação (Portugal) • Pedro Miguel, INESCC – Institute for Systems Engineering and Computers at Coimbra (Portugal) • Luís Neves, Polytechnic Institute of Leiria (Portugal) • A. Gomes Martins, Energy for Sustainability Initiative, University of Coimbra (Portugal) • Oana Pascu, EDP Distribuição, Direção Gestão de Energia (Portugal)
- 1102 **Reliability analysis methodology for smart fault handling in MV distribution grids**
Tonje Skoglund Hermansen, SINTEF Energy Research (Norway) • Hanne Vefsnmo, SINTEF Energy Research (Norway) • Gerd Kjølle, SINTEF Energy Research (Norway) • Kjell Anders Tutvedt, Hafslund Nett (Norway) • Stig Simonsen, Skagerak Nett (Norway)

1125 Probabilistic models in power distribution electrical networks

João Tavares, Mathematical Department, Faculty of Sciences of University of Porto (Portugal) • Sónia Gouveia, Mathematical Department, University of Aveiro (Portugal) • João Pedro Pedroso, Computer Science Department, Faculty of Sciences of University of Porto (Portugal) • Luís Oliveira, EDP Distribuição (Portugal) • Ricardo Prata, EDP Distribuição (Portugal) • Pedro Cruz, Physics Department, Faculty of Sciences of University of Porto (Portugal) • Miguel Freitas, EDP Distribuição (Portugal) • Ana Lopes, EDP Distribuição (Portugal)

1212 Big Data challenges - a multidisciplinary team approach

Isabel Fonseca, EDP Distribuição (Portugal) • João Castro, EDP Distribuição (Portugal) • André Águas, EDP Distribuição (Portugal) • Pedro Gonçalves, EDP Distribuição (Portugal) • Susana Magalhães, EDP Distribuição (Portugal) • Joana Braamcamp, EDP Distribuição (Portugal)

1234 Simple technique for detection of outliers in one-dimensional numerical data used for point out anomalous

Davi Mantovani Ricci, Daimon (Brazil) • Paulo Henrique Baumann, Daimon (Brazil) • Fabio Romero, Daimon (Brazil) • ANDRÉ MEFFE, DAIMON ENGENHARIA E SISTEMAS (Brazil) • Armando H. S. G. Jesus, CEMAR (Brazil) • Eliezer S. Oliveira, CEMAR (Brazil) • Lucas A. Pinheiro, CEMAR (Brazil)

1495 Utilization of augmented reality in underground network visualization on field

Joona Siivonen, GE Healthcare (Finland) • Ville Kenttämä, Elenia Palvelut Oy (Finland) • Evgenia Tkachenko, Elenia Palvelut Oy (Finland)

1523 Ampacity calculation of multi-system cable crossings at 40 MVA frequency converter station Mendrisio

Damian Aegerter, Braavos GmbH (Switzerland) • Stephan Meier, Emetor AB (Sweden)

1568 Scenario Analysis Heating Markets - Effects to Future Energy Grids

Peters Klaus, Westnetz GmbH (Germany) • Markus Schmies, Vesta GmbH (Germany) • Michael Wilch, Innogy SE (Germany)

1578 A case study to assess data management and performance of optimal power flow algorithm based tool in a DSO

Parvathy Chittur Ramaswamy, Tractebel (Belgium) • Pierre Garsoux, Tractebel (Belgium) • Christophe Del Marmol, Tractebel (Belgium) • Lorian Pellichero, ORES (Belgium) • David Vangulick, ORES (Belgium)

1630 Combined Medium Voltage and Low Voltage simulation to accurately determine the location of Voltage

Werner van Westering, Alliander DNO and Delft University of Technology (Netherlands) • Barbera Droste, Alliander DNO (Netherlands) • Hans Hellendoorn, Delft University of Technology (Netherlands)

1633 PERFORMANCE EVALUATION OF DISTRIBUTION SYSTEM STATE ESTIMATOR USING DIFFERENT MEASUREMENT

Loïc Eggenschwiler, University of Applied Sciences and Arts Western Switzerland (Switzerland) • Patrick Favre-Perrod, University of Applied Sciences and Arts Western Switzerland (Switzerland) • Olivier Nauts, Romande Energie SA (Switzerland) • Omid A.-Mousavi, DEPSys SA (Switzerland) • Jérôme Rampazzo, Swiss Federal Office of Energy (Switzerland)

1672 Probabilistic load models and Monte Carlo simulations used in distribution system planning

Erling Tønne, NTE Nett AS (Norway) • Kjell Sand, NTNU (Norway) • Jan Andor Foesnæs, NTE Nett AS (Norway)

1722 Advanced Modelling of Complex Networks to Reduce Losses

Russell Bryans, SP Energy Networks (United Kingdom) • Wendy Mantle, SP Energy Networks (United Kingdom) • Matthew Jones, SP Energy Networks (United Kingdom) • Charlotte Higgins, TNEI Services (United Kingdom) • Diptargha Chakravorty, TNEI Services (United Kingdom) • Malcolm Bebbington, SP Energy Networks (United Kingdom)

1728 Effects of Distribution System Characteristics on TSO-DSO Ancillary Services Exchange

Giacomo Viganò, RSE (Italy) • Marco Rossi, RSE (Italy) • Diana Moneta, RSE (Italy)

1756 Electricity demand forecasting 2030 by decomposition analysis of open data

Otto Räisänen, LUT University (Finland) • Juha Haakana, LUT University (Finland) • Jouni Haapaniemi, LUT University (Finland) • Jukka Lassila, LUT University (Finland) • Jarmo Partanen, LUT University (Finland)

1779 Using Big Data analytics to improve flood resilience of the distribution grid

Sébastien Folleville, Enedis (France) • Jérémie Mérigeault, Enedis (France) • Odilon Faivre, Enedis (France) • Alain Tholon, Enedis (France) • Didier Broussard, Enedis (France) • Olivier Aubujeault, Enedis (France)

- 1785 Electricity demand profile for residential customer 2030**
 Juha Haakana, LUT University (Finland) • Jouni Haapaniemi, LUT University (Finland) • Jukka Lassila, LUT University (Finland) • Jarmo Partanen, LUT University (Finland) • Raimo Härmä, Kymenlaakson Sähköverkko Oy (Finland) • Matti Ryhänen, Savon Voima Verkko Oy (Finland)
- 1798 TLC Pointer – THE USE OF GEOSPATIAL DATA FOR NON TECHNICAL LOSSES DETECTION**
 Paolo Santi, Senseable City Lab, Massachusetts Institute of Technology (USA) • Massimo Zerbi, Enel Global Infrastructures And Networks (Italy) • Carlo Ratti, Senseable City Lab, Massachusetts Institute of Technology (USA) • Domenico Tresoldi, Enel Global Infrastructures And Networks (Italy) • Carlo Papa, Enel Foundation (Italy) • Giuseppe Montesano, Enel Foundation (Italy)
- 1819 Energy losses estimation tool for Low Voltage Smart grids**
 Jose Angel Velasco, Universidad Carlos III (Spain) • Hortensia Amaris, Universidad Carlos III (Spain) • Monica Alonso, Universidad Carlos III (Spain) • Marta Casas, Naturgy (Spain)
- 1825 Synthesizing Electromobility Charging Profiles**
 Noah Pflugradt, Bern University of Applied Sciences (Switzerland) • Urs Muntwyler, Bern University of Applied Sciences (Switzerland)
- 1857 PV Predictions Made Easy: Flexibility Through Simplicity**
 Marco E. T. Gerards, University of Twente (Netherlands) • Johann L. Hurink, University of Twente (Netherlands)
- 1939 Integration of storage and PV in the DSO power losses cost assessment method for LV planning studies**
 Ahmed Hadjsaid, Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab (France) • Marie-Cecile Alvarez-Herault, Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab (France) • Vincent Debusschere, Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab (France) • Raphael Caire, Univ. Grenoble Alpes (France)
- 1972 Determination of Constant Seasonal Values for the Current Rating of Overhead Lines in the Network Planning**
 Markus Miller, University of Stuttgart (Germany) • Pascal Wiest, University of Stuttgart (Germany) • Krzysztof Rudion, University of Stuttgart (Germany) • Franziska Fischer, Netze BW GmbH (Germany)
- 1987 An Adaptive Photovoltaic Production Estimator Based on Artificial Neural Networks**
 Edoardo Corsetti, RSE (Italy) • Antonio G. Guagliardi, RSE (Italy) • Carlo Sandroni, RSE S.p.A (Italy)
- 2008 Game Approaches for joint peak shaving planning in industrial park distribution networks**
 Yuquan Liu, Guangzhou Power Supply (China) • Wen Xiong, Guangzhou Power Supply (China) • Li Wang, Guangzhou Power Supply (China) • Ying Cai, Guangzhou Power Supply (China) • Shunqi Zeng, Guangzhou Power Supply (China) • Zhiwen Yu, Guangzhou Power Supply (China) • Xiao Hu, Shanghai Jiao Tong University (China)
- 2046 Managing uncertainty in load related investment decisions**
 Mary Black, Northern Powergrid (United Kingdom) • Andrew Spencer, Northern Powergrid (United Kingdom) • Mark Nicholson, Northern Powergrid (United Kingdom)
- 2107 Modelling of Synthetic Power Distribution Systems in Consideration of the Local Electricity Supply Task**
 Jacob Tran, FGH e.V. (Germany) • Pascal Pfeifer, FGH e.V. (Germany) • Christoph Wirtz, FGH e.V. (Germany) • Dominik Wursthorn, FGH e.V. (Germany) • Hendrik Vennegeerts, FGH e.V. (Germany) • Albert Moser, FGH e.V. / RWTH Aachen (Germany)
- 2196 Impacts of reactive power and harmonics on LV network losses**
 Andrew Urquhart, Loughborough University (United Kingdom) • Murray Thomson, Loughborough University (United Kingdom) • Chris Harrap, Western Power Distribution (United Kingdom)
- 2228 Loss Calculation with Smart-Meters Measures in Distributed Systems**
 Bruno Canhoto, INESC TEC & FEUP (Portugal) • Jorge Pereira, INESC TEC & FEP (Portugal)

Session 6 - DSO business environment enabling digitalization and energy transition

Tuesday, 4 June 2019 from 9:00 to 18:00

Block 1: Flexibility

- 5 **Advanced energy meter with load control based on ESP8266 module and MQTT protocol**
Damir Jakus, University of Split - FESB (Croatia) • Josip Vasilj, University of Split - FESB (Croatia) • Petar Sarajčev, University of Split - FESB (Croatia)
- 48 **Effects of flexibility market models on grid management tasks and systems**
Christina Sufke, Westnetz GmbH (Germany) • Nele Schlenker, innogy SE (Germany) • Erik Hauptmeier, Westnetz GmbH (Germany)
- 51 **Pushing the transition towards transactive grids through local energy markets**
Gisela Mendes, EDP NEW R&D (Portugal) • José Rui Ferreira, EDP NEW R&D (Portugal) • Susete Albuquerque, EDP Distribuição (Portugal) • Célia Trocato, EDP Distribuição (Portugal) • Olli Kilkki, Empower (Portugal) • Sami Repo, Tampere University of Technology (Finland)
- 95 **Flexibility to DSO by VPP – Benefits, Regulatory Barriers, and Potential Solutions**
Jibrán Ali, PhD Student - MEAN4SG & DITEN (University of Genova) (Italy) • Stefano Massucco, DITEN - University of Genoa (Italy) • Federico Silvestro, DITEN - University of Genoa (Italy)
- 288 **An innovative distributed Demand Response strategy in smart grid via Blockchain-enabled bilateral smart**
Hamidreza Mansouri, Tehran Electrical Power Distribution Co (Iran, Islamic Republic of) • MohammadMajid Jalali, Tehran Electrical Power Distribution Co (Iran, Islamic Republic of) • Hossein Sabouri, Tehran Electrical Power Distribution Co (Iran, Islamic Republic of)
- 382 **Local flexibility markets: An economic solution for the upcoming influence of electrical charging station**
Kevin Kotthaus, University of Wuppertal (Germany) • Sven Pack, University of Wuppertal (Germany) • Jessica Hermanns, University of Wuppertal (Germany) • Frederik Paulat, University of Wuppertal (Germany) • Jan Meese, University of Wuppertal (Germany) • Markus Zdrallek, University of Wuppertal (Germany) • Nils Neusel-Lange, SPIE SAG GmbH (Germany) • Sebastian Raczka, SPIE SAG GmbH (Germany)
- 411 **System architecture for managing congestions in distributions grids using flexibility**
Ingrid Munne-Collado, Universitat Politècnica de Catalunya (Spain) • Pau Lloret-Gallego, Universitat Politècnica de Catalunya (Spain) • Pol Olivella-Rosell, Universitat Politècnica de Catalunya (Spain) • Roberto Villafafila-Robles, Universitat Politècnica de Catalunya (Spain) • Stig Ø. Ottesen, eSmart Systems (Norway) • Ramon Gallart, ESTABANELL DISTRIBUCIÓ (Spain) • Vera Palma-Costa, Estabanell (Spain) • Andreas Sumper, Universitat Politècnica de Catalunya (Spain)
- 424 **Self-Supply and regulated tariffs: Dynamic equilibria between photovoltaic market evolution and LV rate**
Ricardo Prata, EDP Distribuição (Portugal) • Pedro Carvalho, Instituto Superior Técnico, University of Lisbon (Portugal)
- 512 **Interoperability Strategy for an AMI deployment in the US**
Iker Urrutia, Iberdrola (Spain) • Iñigo Larumbe, Iberdrola (Spain) • Phil Morneault, Avangrid (USA) • Paul Sisson, Avangrid (USA) • Ed Beroset, EPRI (USA) • Tim Godfrey, EPRI (USA)
- 556 **Design and Implementation of a Decentralized AMR System using Blockchains, Smart Contracts, and LoRaWAN**
Ioannis Vlachos, National Technical University of Athens (Greece) • Nikos Harziargyriou, National Technical University of Athens (Greece)
- 576 **Grid Management System to solve local congestion**
Robert Steegh, Enexis BV (Netherlands) • Ton van Cuijk, Enexis (Netherlands) • Dela Pourasghar-khomami, Enexis BV (Netherlands)

- 583 **Change and change management - unlocking power flexibility meeting Sweden's capacity challenge**
Yvonne Ruwaida, Vattenfall Eldistribution AB (Sweden) • John Backe, E:on Energidistribution AB (Sweden) • David Bjarup, E:on Energidistribution AB (Sweden)
- 587 **Investigating the impacts of Demand Side Management in Guilan Distribution Company**
Fateme Mohammadi sarsar, guilan power distribution company (Iran, Islamic Republic of) • Ebrahim Khoshnood, guilan power distribution company (Iran, Islamic Republic of) • Mohammad taghi Mehdizade, guilan power distribution company (Iran, Islamic Republic of) • Jamshid Talebi, guilan power distribution company (Iran, Islamic Republic of)
- 629 **Power-Based Tariff as an Incentive for Distribution System Operator's Customers to Reduce their Peak Powers**
Anmari Koski, Elenia Oy (Finland) • Juha Järvenpää, Elenia Oy (Finland) • Johannes Salo, Elenia Oy (Finland) • Mikko Järvinen, Elenia Oy (Finland) • Jouni Pylvänäinen, Elenia Oy (Finland) • Samuli Honkapuro, LUT University (Finland)
- 636 **Battery system as a service for a distribution system operator**
Ilari Alaperä, Fortum Power and Heat Oy (Finland) • Tomi Hakala, Elenia Oy (Finland) • Samuli Honkapuro, LUT University (Finland) • Jouni Pylvänäinen, Elenia Oy (Finland) • Tero Kaipia, Zero Hertz Systems Ltd (Finland) • Pekka Manner, Fortum Power and Heat Oy (Finland) • Tatu Kulla, Fortum Power and Heat Oy (Finland)
- 725 **Demand response pilot experiment and its evaluation on residential and small commercial & industrial**
Donsik Jang, Korea Electric Power Corporation (KEPCO) (Korea, Republic of) • Seon-hee Lee, Korea Electric Power Corporation (KEPCO) (Korea, Republic of) • Jiyong Eom, Korea Advanced Institute of Science and Technology (Korea, Republic of) • Changhoon Shin, Korea Electric Power Corporation (KEPCO) (Korea, Republic of)
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- 1959 **Interoperability for an open energy flexibility market with congestion management services**
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Antti Mutanen, Tampere University (Finland) • Kimmo Lummi, Tampere University (Finland) • Pertti Järventausta, Tampere University of Technology (Finland)
- 1840 **Going beyond the AI hype with a bottom-up holistic approach focused on improving business processes and**
Karl Axel Sträng, Enedis (France) • Claude Bouquet, Enedis (France) • Maxime Dupont, Enedis (France) • Stéphane Gossweiler, Enedis (France) • Richard Bavarin, Enedis (France) • Stéphanie Delaunay, Enedis (France)
- 1844 **Investment Decision of Households in Distributed Energy Resources with regard to Price Degression of PV and**
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- 1870 **Econometric Estimation of a Cost Function of the Power Distribution Grid**
Mathieu Bordigoni, Enedis (France) • Laurent Gilotte, Enedis (France)
- 1876 **DSO tariff driven customer grid defections – Techno-economical risks for DSO?**
Jouni Haapaniemi, LUT University (Finland) • Juha Haakana, LUT University (Finland) • Otto Räisänen, LUT University (Finland) • Jukka Lassila, LUT University (Finland) • Jarmo Partanen, LUT University (Finland)
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- 1929 **The embedding of Energy Communities in the unified LINK-based holistic architecture**
Albana Ilo, TU Wien (Austria) • Ricardo Prata, EDP Distribuição (Portugal) • Antonio Iliceto, TERNA (Italy) • Goran Strbac, Imperial College London (United Kingdom)
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- 2010 **Elektro Ljubljana: Big Data Challenges In The Field Of Advanced Electricity Metering**
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- 2026 **Business Models for Electricity Distribution in Europe: Evidence from the JRC DSO Observatory 2018**
Nikoleta Andreadou, Joint Research Centre, European Commission (Italy) • Marco Flammini, Joint Research Centre, European Commission (Italy) • Silvia Vitiello, Joint Research Centre, European Commission (Italy)
- 2027 **Value-added Electricity Services: Role of Microgrid Services In Distribution Network Planning**
Milad Hoseinpour, Tarbiat Modares University (Iran, Islamic Republic of) • Mahmoud-Reza Haghifam, Tarbiat Modares University (Iran, Islamic Republic of)
- 2028 **SP Energy Networks: Our Vision of Future DSOs**
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- 2083 **Identification and validation of new business models for DSO business environment using business model canvas**
Heidi Tuiskula, Smart Innovation Norway (Norway) • Sanket Puranik, Smart Innovation Norway (Norway) • Iliana Ilieva, Smart Innovation Norway (Norway) • Christian Kuntze, Smart Innovation Norway (Norway)
- 2148 **Relevance and boundaries of innovation cooperation in the Smart Grid and its influence on energy transition**
Julia Köhlke, OFFIS Institute for Information Technology (Germany)

- 2157 **Time-based and locational distribution use of system tariffs with selective consideration of network components**
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- 2192 **Regulatory incentives for improving the resilience of electricity distribution grids in Italy**
Luca Lo Schiavo, ARERA (Italian Regulatory Authority) (Italy) • Ferruccio Villa, ARERA (Italian Regulatory Authority) (Italy) • Carlo Turconi, ARERA (Italian Regulatory Authority) (Italy)
- 2213 **Evaluating the value proposition of microgrids for utilities**
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- 2254 **Binomial tariff: an alternative modality to Brazilian low voltage consumer**
Lorena Cardoso Borges dos Santos, CPFL (Brazil) • Jairo Eduardo de Barros Alvares, CPFL (Brazil) • Rafael de Oliveira Gomes, CPFL (Brazil) • Carlos Cesar Barioni de Oliveira, Daimon (Brazil) • Cristiano da Silva Silveira, Daimon (Brazil) • Denis Antonelli, Daimon (Brazil)
- 2264 **Introducing the Concept of Technical Debt to Smart Grids: a System Engineering Perspective**
Johann Schütz, OFFIS – Institute for Information Technology (Germany) • Mathias Uslar, OFFIS (Germany)

Block 4: Information Management

- 50 **Trial application of SDN(Software Defined Network) technology under Cloud environment in State Grid Shanghai**
HU Junyi, Information & Communication Company. SMEPC (China) • Fang Xiaorong, Information & Communication Company. SMEPC (China) • Wu Yuanxin, Information & Communication Company. SMEPC (China)
- 78 **Research on Enterprise Cloud Platform Security System**
Nan Chen, State Grid Shanghai Municipal Electric Power Company Information and Communication Company (China)
- 117 **Implementing an ISA/IEC-62443 and ISO/IEC-27001 OT Cyber Security Management System at Dutch DSO Enexis**
Carlos Montes Portela, Enexis Netbeheer B.V. (Netherlands) • Maarten Hoeve, European Network for Cyber-Security (Netherlands) • Fook Hwa Tan, Northwave (Netherlands) • Han Sloopweg, Eindhoven University of Technology / Enexis Netbeheer (Netherlands)
- 141 **Managing OT cyber security risks using BowTies and Risk & Opportunity Based Asset Management at Dutch DSO**
Maarten Hoeve, European Network for Cyber-Security (Netherlands) • Carlos Montes Portela, Enexis Netbeheer B.V. (Netherlands) • Gido Brouns, Enexis Netbeheer B.V. (Netherlands)
- 272 **The principle of Information security protection on “State Grid Cloud” in State Grid Shanghai Data Center**
HU Junyi, Information & Communication Company. SMEPC (China) • Liu Wenyi, Information & Communication Company. SMEPC (China) • Wu Yuanxin, Information & Communication Company. SMEPC (China)
- 655 **A HOLISTIC REVIEW OF CYBER RISK FOR THE DISTRIBUTION OF POWER**
Steve Little, AFIMA (United Kingdom) • Anuj Nayyar, IET (United Kingdom) • David Neilson, SP Energy Networks (United Kingdom)
- 681 **Using technology and sharing data to improve electricity services**
MR.VATCHARA GUAYSIRIKUL, Metropolitan Electricity Authority - MEA (Thailand)
- 810 **Global System of Record and Framework to Preserve Energy Consumption with Blockchain**
Gideon Praveen, Fluentgrid Limited (India) • Puneet Paneri, Fluentgrid Limited (India)

- 813 **Private LTE Field tests and Results for Smart Grid services**
Marta Solaz Hernández, Iberdrola Distribución (Spain) • Juan Sebastián Gómez Guajardo, Iberdrola España (Spain) • Alberto Sendín Escalona, Iberdrola España (Spain) • Javier Noguero Oliván, Ericsson (Spain)
- 934 **Implementing CIM model in Distribution System Operator**
Mihael Medved, Elektro Ljubljana d.d. (Slovenia) • Manca Kavšek, Elektro Ljubljana d.d. (Slovenia)
- 1054 **Data collecting and processing method in distribution system using edge computing technology**
Haizhu Wang, Electric Power Dispatching Control Center of Guangdong Power Grid Co., Ltd (China) • Wenxin Guo, Electric Power Dispatching Control Center of Guangdong Power Grid Co., Ltd (China) • Caishan Guo, School of Electric Power, South China University of Technology (China) • Yuyan Sun, School of Electric Power, South China University of Technology (China) • Jiangang Lu, Electric Power Dispatching Control Center of Guangdong Power Grid Co., Ltd (China) • Ruifeng Zhao, Electric Power Dispatching Control Center of Guangdong Power Grid Co., Ltd (China) • Yang Liu, Electric Power Dispatching Control Center of Guangdong Power Grid Co., Ltd (China)
- 1060 **Assessment of Cyber Security Requirements for the Future Digital Power System**
Roberta Terruggia, RSE Ricerca Sistema Energetico (Italy) • Giovanna Dondossola, RSE Ricerca Sistema Energetico (Italy) • Mauro Giuseppe Todeschini, RSE Ricerca Sistema Energetico (Italy)
- 1147 **CROSS-CUTTING ISSUES IN THE EPES DIGITAL ERA:AN OVERVIEW OF PROMINENT SMART GRID USE CASES**
Eduardo Rodrigues, EFACEC (Portugal) • Alberto Rodrigues, EFACEC (Portugal) • Nuno Silva, Efacec (T&I) (Portugal)
- 1241 **Computational tool to improve the information's quality of the DSO's geographic database (BDGD) for regulatory**
Davi Mantovani Ricci, Daimon (Brazil) • Paulo Henrique Baumann, Daimon (Brazil) • Fabio Romero, Daimon (Brazil) • ANDRÉ MEFFE, DAIMON ENGENHARIA E SISTEMAS (Brazil) • Armando H. S. G. Jesus, CEMAR (Brazil) • Eliezer S. Oliveira, CEMAR (Brazil) • Lucas A. Pinheiro, CEMAR (Brazil)
- 1340 **Data Platform as an Enabler for Piloting in Smart Otaniemi Ecosystem**
Anna Kulmala, VTT Technical Research Centre of Finland (Finland) • Teemu Vesänen, VTT (Finland) • Kari Mäki, VTT Research Center of Finland (Finland) • Seppo Horsmanheimo, VTT (Finland) • Kimmo Hätönen, Nokia Bell Labs (Finland) • Pekka Kupila, Nokia Bell Labs (Finland) • Jarno Halme, Nokia (Finland)
- 1436 **Digitalization for Sustainably Smart Electricity Distribution System**
AMITH VIJAYAN, Kerala State Electricity Board Ltd. (India)
- 1441 **Security Testing for Preventing Backdoor Threat in Smart meter Implementation In Indonesia**
Mukhamad Faiz Fanani, PLN (Indonesia) • Astri Kartika, PLN (Indonesia)
- 1451 **Aspects of implementing GIS as a centralized system in enterprise IT/OT environment**
Aleš Leban, Elektro Primorska d.d. (Slovenia) • Primož Košir, GDI d.o.o. Ljubljana (Slovenia)
- 1482 **First of its kind implementation of IOT system in Indian Power Sector**
Yash Kulkarni, OrxaGrid Ltd (India) • Akshat Kulkarni, OrxaGrid Ltd (United Kingdom)
- 1548 **Implementing Cybersecurity Strategy from Distribution System Operator Perspective**
Ozden Ercin, Enerjisa Electricity Distribution Company (Turkey) • Meltem Civlez, Enerjisa Electricity Distribution Company (Turkey)
- 1616 **Capturing Post Transactional Customers Feedback across key customer touch-points using online and real time**
Manoj Gupta, The Tata Power Company Limited. (India) • Sunny Puthran, The Tata Power Company Limited. (India) • Vishwas R Shrikhande, The Tata Power Company Limited (India)
- 1621 **Implementation of IVR for Complaint Management.**
Manoj Gupta, The Tata Power Company Limited. (India) • Sunny Puthran, The Tata Power Company Limited. (India) • Vishwas R Shrikhande, The Tata Power Company Limited (India)

1655 **CheckIn – Work Force Management Platform**

José Sousa, EDP Distribuição (Portugal) • Diogo Lopes, EDP Distribuição (Portugal) • David Fonseca, EDP Distribuição (Portugal)
• Carlos Oliveira, EDP Distribuição (Portugal) • Patrick Mendes, EDP Distribuição (Portugal) • Vera Pereira, Do It Lean (Portugal)
• Tiago Gafeira, Do It Lean (Portugal)

1797 **(ADMS4LV) – Improved observability of LV grids based on advanced analytics**

Konstantinos Kotsalos, Efacec (Portugal) • André Simões, Efacec (Portugal) • Luis Marques, EFACEC (Portugal) • Filipe Campos, Efacec (Portugal) • Clara Gouveia, INESC TEC (Portugal) • Henrique Teixeira, INESC TEC (Portugal) • Gil Sampaio, INESC TEC (Portugal) • Jorge Pereira, INESC TEC & FEP (Portugal)

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Deepak Ojha, Tata Power Company Limited (India)

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Stephan Cejka, Siemens AG (Austria) • Felix Knorr, Siemens AG (Austria) • Florian Kintzler, Siemens AG (Austria)

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Andrej Souvent, Elektroinstitut Milan Vidmar - EIMV (Slovenia) • Timotej Kodek, Elektroinstitut Milan Vidmar - EIMV (Slovenia)
• Mateja Kavčič, GDI d.o.o. (Slovenia) • Viki Petrovič, GDI d.o.o. (Slovenia) • Dušan Rauter, Bintegra, d.o.o. (Slovenia) • Nikola Risteski, Bintegra, d.o.o. (Slovenia) • Rene Benassi, Iskratel, d.d. (Slovenia) • Peter Lubej, Elektro Celje, d.d. (Slovenia)

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Forough Alsadat Khatami, Tehran Electrical Distribution Company (Iran, Islamic Republic of) • Amir Navidi, Tehran Electrical Distribution Company (Iran, Islamic Republic of)

2261 **A LOW-COST LORAWAN WIRELESS IoT SOLUTION FOR REMOTE MANAGEMENT AND ANALYSIS OF CONSUMERS'**

ANDRÉ MEFFE, DAIMON ENGENHARIA E SISTEMAS (Brazil) • Mauricio Andres Paez Prieto, DAIMON (Brazil) • Fabio Romero, Daimon (Brazil) • Álvaro Garcez Neto, SULGIPE (Brazil) • Aldo Santana Jesus, SULGIPE (Brazil) • José Raimundo TEORODO Jr., SULGIPE (Brazil)

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Boya Qin, Shanghai Jiao Tong University (China) • Dong Liu, Shanghai Jiao Tong University (China)